

SECOND EDITION

---

# Encyclopedia of Mind Enhancing Foods, Drugs and Nutritional Substances



DAVID W. GROUP

Encyclopedia of Mind Enhancing Foods,  
Drugs and Nutritional Substances,  
*Second Edition*

This page intentionally left blank

# Encyclopedia of Mind Enhancing Foods, Drugs and Nutritional Substances

*Second Edition*

DAVID W. GROUP



McFarland & Company, Inc., Publishers  
*Jefferson, North Carolina*

Though every attempt has been made to insure that the information contained in this book is accurate, it is not a substitute for consultation with a physician or health care provider. Any attempt at self-diagnosis or treatment is strongly discouraged. The publisher and author are not responsible for any adverse affects or unforeseen consequences as a result of ingesting or otherwise using any of the foods, drugs or other substances described in this book. Should there be any questions or concerns about any of the information in this book, it is always advisable to consult with a knowledgeable physician or health care provider.

LIBRARY OF CONGRESS CATALOGUING-IN-PUBLICATION DATA

Group, David.  
Encyclopedia of mind enhancing foods, drugs and  
nutritional substances / David W. Group. — Second edition.  
p. cm.  
Includes bibliographical references and index.

**ISBN 978-0-7864-4142-6 (softcover : acid free paper) ∞**

**ISBN 978-1-4766-1915-6 (ebook)**

1. Nootropic agents. 2. Dietary supplements. I. Title.  
RM334.G76 2015 615.1—dc23 2014043657

BRITISH LIBRARY CATALOGUING DATA ARE AVAILABLE

© 2015 David W. Group. All rights reserved

*No part of this book may be reproduced or transmitted in any form  
or by any means, electronic or mechanical, including photocopying  
or recording, or by any information storage and retrieval system,  
without permission in writing from the publisher.*

Cover image © 2015 Pixologic Studio

Printed in the United States of America

*McFarland & Company, Inc., Publishers  
Box 611, Jefferson, North Carolina 28640  
www.mcfarlandpub.com*

## *Acknowledgments*

I would like to thank Joe Cannata of Payless Repairs for removing the viruses and malware that seemed to plague my computer on a regular basis. This book is dedicated to bookstores present—Talking Leaves Books—and past—Oracle Junction Bookstore, Circular Word Books, and The Paperback Trading Post—which have filled my house with books.

**This page intentionally left blank**

# *Table of Contents*

<i>Acknowledgments</i>	v
<i>Preface</i>	1
1. Foods	7
2. Herbs and Spices	45
3. Vitamins, Minerals, and Related Nutrients	85
4. Amino Acids, Peptides, and Proteins	122
5. Lipids	151
6. Nucleic Acids	163
7. Miscellaneous Nutrients	165
8. Hormones and Neurotransmitters	174
9. Essential Oils	192
10. Entheogens	202
11. Medical Drugs	269
12. Nootropics	293
13. Neurobiology and Neurochemistry	334
14. Other	350
<i>Bibliography</i>	367
<i>Index</i>	371



**This page intentionally left blank**

# Preface

## Humans 2.0

In a 2008 poll of 1400 online readers, *Nature* magazine found that a full 20 percent of them used medical drugs such as Ritalin and Provigil for cognitive enhancement, nearly twice as many as used these same drugs for their medically prescribed use. And these weren't just any individuals, Brendan Maher points out, these were scientists, academics, and journalists, among other professionals. This means that the percentage of those using drugs to improve mental performance far outstrips those using drugs to improve athletic performance. Aside from the ethical questions of using drugs for professional gain, many of them knew the risks and took the drugs anyway, knowing they would suffer side effects. Despite this, academics from Stanford, Harvard, Cambridge, and other universities argue that the use of cognitive-enhancing drugs is no different than utilizing good health habits or modern technology in improving academic performance. In a commentary in *Nature* magazine, they argue:

Cognitive-enhancing drugs require relatively little effort, are invasive and for the time being are not equitably distributed, but none of these provide reasonable grounds for prohibition. Drugs may seem distinctive among enhancements in that they bring about their effects by altering brain function, but in reality so does any intervention that enhances cogni-

tion. Recent research has identified beneficial neural changes engendered by exercise, nutrition and sleep, as well as instruction and reading. In short, cognitive-enhancing drugs seem morally equivalent to other, more familiar, enhancements.... Given the many cognitive-enhancing tools we accept already, from writing to laptop computers, why draw the line here and say, thus far but no further?

As for concerns, there is only the brief question "Do [these drugs] change 'cognitive style,' as well as increasing how quickly and accurately we think?" With concerns already being expressed about how computers are eroding concentration and deep thought (apart from the ease of plagiarism and the outsourcing of academic work), more consideration should be given to the downside of cognitive-enhancing drugs before such wholesale endorsement is given. Side effects and harmful interactions with other common substances can often be severe enough to override the benefits, not to mention any long-term effects these drugs may have. As Husain and Mehta have pointed out in a 2011 article in *Trends in Cognitive Sciences*, "[w]e do not understand cognitive systems well enough to understand the potential trade-offs that may exist from taking a cognitive enhancing drug. There are counter-intuitive findings everywhere. For example, young adults who carry the APOE-4 allele (which has been associated with a higher risk of dementia later in life) actually have bet-

ter performance on decision making tasks than those carrying the APOE-3 version. Therefore, it is plausible that drugs targeting memory systems might have detrimental effects on decision making tasks.”

To address this issue, the authors of the editorial call for accelerated research into the effects of these drugs, the formulation of guidelines by medical and scientific organizations, increased public education and awareness of cognitive enhancement, and legal reforms taking into account “emerging social norms and information about safety.” These measures need to be instituted because, as Steven Rose, the head of the Brain and Behavior Research Group at Open University, has noted, the field is riddled with exaggerated claims, shoddy research, and lack of ethical standards, and what may work for animals or cognitive-impaired individuals may not necessarily work for someone who is mentally healthy (he notes that animal studies frequently involve injecting high doses of drugs, sometimes directly into the brain, a method clearly impractical for humans, even in research, and that human trials are often stand-alone studies that are judged based on narrowly focused performance or memory tests). And should these standards be adhered to, there are still the basic moral issues inherent in all biomedical research—designing ethical clinical trials, for example—along with those specific to neurology, such as whether individuals suffering from Alzheimer’s or other degenerative diseases can give informed consent. Interestingly, a 2002 conference on neuroethics at Stanford focused not on an individual’s autonomy regarding the use of brain scans to determine guilt or innocence in a criminal trial or brain implants to monitor and control a citizen’s behavior (not to mention the ethics of administering drugs to enhance moral behavior) but on enhancing the ability of “normal” brains. As columnist William Safire noted, this “Botox in a brain” could eliminate such things as shyness and

bad temperament, “[b]ut what price will human nature pay for these nonhuman artifices?” Francis Fukuyama, author of *Our Posthuman Future*, cautions against this “self-esteem in a bottle” when drugs like Prozac already look too much like *Brave New World’s* soma. Since we may be only a few short years away from the next generation of cognitive enhancers, such fears are not mere idle speculation. Are we even now enforcing a cookie-cutter mentality as ever more powerful drugs loom on the horizon? Where does your true self end, ask critics, and your chemical self begin? And will we eventually evolve into a false “chemocratic” utopia of George Lucas’ *THX-1138* or Stanislaw Lem’s *The Futurological Congress*, blissfully unaware of the social decay around us? In hopes of averting such outcomes, the Institute for the Future in Palo Alto, California, has proposed a “Magna Cortica,” or a bill of rights for neurological enhancement, and the European Commission has recently hosted the Neuroenhancement Responsible Research and Innovation project, the first of many proposed symposiums dealing with this new technology.

An individual’s intelligence was once thought to be static, unchanging, and not subject to improvement. In 1905, Sir William Osler, then aged 55, retired from the medical faculty of Johns Hopkins University, asserting in his farewell speech his belief that men above 40 years of age were useless, and that those over 60 should stop working altogether. This belief was commonplace (even Einstein once said, “A person who has not made his great contribution to science before the age of 30 will never do so”), though it did not prevent Osler from holding a post at Oxford University until his death at age 70. Little more than a century later, Bruce Weinberg, labor economist at Ohio State University, concluded that, based on an analysis of Nobel laureates in physics from 1901 to 2008, the average age at which physicists did their ground-breaking work shifted from the 20s to age 48.

It was also once thought that we only use ten percent of our brain, a statement which makes little sense either from a commonsense or evolutionary standpoint (as one researcher put it, “No doctor has ever said, ‘Thank God the bullet went through the ninety percent of the brain he didn’t use.’”). This belief persists, albeit in a somewhat altered form, fueling the exploding industry in “brain-training” games which purport to increase memory and other vital capacities of the mind. This industry was given a boost in 2008 by a study led by Susanne Jaeggi and Martin Buschkuhl which challenged the notion that intelligence was largely fixed and unchangeable. In this study, they claimed to have increased subjects’ IQ by six points after only several hours of training in specific cognitive tasks. Critics such as David Z. Hambrick, an associate professor of psychology at Michigan State University, have pointed out that significant increases—if they occur at all—would take years of intense work, and that overall intelligence cannot be measured by a single test of one specific ability (and this doesn’t begin to address the issue of what IQ is and whether it can really be measured at all, given the complexity and subtlety of human abilities). For this study to have any validity, it first needs to be successfully replicated by other researchers, which has not yet been done. So the question remains: What can be done to increase our intelligence?

The brain, which reaches its peak size at around age 25, gradually begins to shrink, losing functions thereafter like most of the organs and tissues of the body. Creativity, reaction time, memory, learning, and the ability to multi-task begin a long, slow decline (though at least some of this “decline” may actually be illusory, as the brain has to dig through more information to deal with a particular problem, much as a computer with a full hard drive may take longer to accomplish certain tasks). As the Baby Boomer generation reaches retirement age, many realize two things: the incidence of Alzheimer’s disease and related dementias is

on the rise, and much age-related cognitive decline can be prevented or even reversed through readily accessible means. (For a particularly poignant account of a genius mind succumbing to the effects of Alzheimer’s, read the final chapter of Gary Small’s *The Naked Lady Who Stood on Her Head*.) It is only in recent years that the concept of neuroplasticity, or the brain’s ability to change, adapt, and even improve under certain conditions, has taken hold. Studies have shown that, with daily brain exercises, the mind can significantly improve its “fluid intelligence,” which includes such abilities as problem-solving, abstract thinking, and response time. And when coupled with a positive lifestyle—a healthy diet, regular exercise, adequate sleep, meditation, and the avoidance of tobacco, undue stress, and excessive alcohol consumption—the deterioration of physical and mental abilities can be reduced to insignificance. This holds true even for those in their 60s and 70s. Even more recently, studies have found that exercise can not only improve general cognitive functioning, but promote neurogenesis—the growth of new brain cells, an ability that was once thought impossible. For some, however, this is not enough. One extreme example is inventor and futurist Ray Kurzweil who, among other dietary and lifestyle changes, ingests 150 vitamin and mineral supplements a day (down from a high of 180 to 210 a day)—so many that he had to hire a “pill wrangler” to organize them all on a daily basis. (American billionaire David Murdock, who is 91 at the time of this writing, takes a more natural approach, with a daily regimen of one hour of exercise, exposure to sunlight for vitamin D, and twenty fruits and vegetables consumed as three smoothies a day. This, along with abstinence from dairy and red meat, is his prescription for living to 125.)

Closely related to the concept of neuroplasticity is the Flynn Effect, named after its discoverer, philosopher James R. Flynn. Flynn discovered, after analyzing studies of IQ tests in the early ’80s, that test scores increased from

generation to generation, by 14 to 17 points over a 40- or 50-year period. Various theories as to why this was so—better diet, smaller families, more liberal child-rearing—were considered and rejected. There seemed to be no direct correlation, and none of the studies could explain why there were large gains in some abilities and insignificant gains in others. Flynn, after twenty years of study, believes he has found the solution, and that is that we are better at discovering abstract patterns than previous generations. In essence, “we weren’t more intelligent than they, but we had learnt to apply our intelligence to a new set of problems. We had detached logic from the concrete, we were willing to deal with the hypothetical, and we thought the world was a place to be classified and understood scientifically rather than to be manipulated.” Dealing with technology, he believes, whether it’s programming a VCR or playing a video game, seems to be accelerating this process.

Even more pervasive than the use of cognitive enhancers to prevent mental decline is the use of these drugs to provide an extra little boost to those who are already high achievers or who are working at their optimum level. Though there is some debate as to the ethics of taking drugs for cognitive enhancement, clearly many people—even highly intelligent professionals and academics—have no such reservations, even if it is for such short-term gain as overcoming jet lag or stage fright, or dealing with a day’s heavy workload. A particularly sticky issue is the use of cognitive boosters for taking tests or college entrance exams. Already, there is a pervasive atmosphere that even the most questionable drugs are seen as no more innocuous than a cup of coffee or a multi-vitamin to boost performance. Estimates of college students taking prescription drugs to enhance performance range as high as 25 percent to 35 percent. As William Saletan in *Slate* magazine has pointed out, “The more common they become, the more they feel like necessities.” Neurologist Anjan Chat-

terjee of the University of Pennsylvania goes even further, foreseeing a day in the not-too-distant future when “cosmetic neurology,” as he calls it, will be as acceptable as cosmetic surgery, and neurologists will become “quality of life consultants” for those seeking a safer, more personalized, approach to mind enhancement. With several hundred new drugs being developed as neuroenhancers, the effects on society could be staggering, even if only a small fraction of them pan out. We may be able to erase bad memories, as in the film *Eternal Sunshine of the Spotless Mind*, take virtual vacations à la Arnold Schwarzenegger in *Total Recall*, or achieve unimaginable success as portrayed in the film *Limitless*. Though it is too detailed to summarize here, Ronald Bailey’s article “The Case for Enhancing People” in *The New Atlantis* (No. 32, Summer 2011, pp. 16–38) addresses many of the concerns about the new technologies of mind enhancement and life extension.

The downside is readily apparent. The emphasis on improving a particular ability—focusing on a task, for example—might come at the expense of another, such as creativity, which depends on daydreaming and lack of focus. Individuals might feel pressured to take such drugs to keep up with co-workers already dosing themselves to improve performance, or might even be required by their employers to take various enhancement pills in order to improve productivity. Parents would have no qualms about feeding their kids custom cocktails of prescription meds to ensure their children would outperform classmates (or, to take this scenario still further into the future, genetically modifying an embryo for greater potential, something that may already be on the horizon, as Zhao Bowen of BGI Shenzhen is overseeing a project that is sequencing the genomes of genius IQ individuals to find what makes them so smart). A new social structure could emerge—those who could enhance versus those who couldn’t. Proven methods of maintaining peak mental performance, such

as adequate sleep, proper nutrition, regular exercise, meditation, and mental discipline, would fade before the promise of a quick fix. Those who have developed a dependency on one or more of these performance boosters—surgeons or airline pilots, for example—may suddenly be faced with a crisis if they are unable to obtain their drug during a critical period. Higher and higher doses may be needed to compensate for habituation. A more basic concern is the chemical effect these drugs will have on our brain or, as Steven Rose puts it, “it can be positively deleterious to throw chemical spanners into the exquisitely balanced biochemical system that is the human brain.” And then there is the question of how beneficial these drugs really are; as Margaret Talbot has stated in a *New Yorker* magazine article, “Neuroenhancers don’t offer freedom. Rather, they facilitate a pinched, unromantic, grindingly efficient form of productivity.” Are we beginning to see the emergence of a cognitive “arms race,” one in which there may be more losers than winners? In the next few decades, will we see the dawn of a “Neurotopia” or will we descend into a Philip K. Dick world of amorphous nootropic realities?

There would be other problems, as well. Higher intelligence would not necessarily lead to greater social cohesion or cooperation among those with opposing viewpoints. Theoretical neurobiologist Mark Changizi and philosopher Mark Walker warn that our obsession with superior intelligence could lead to a neglect of social skills and behavior, resulting in a loss of morals and empathy and an increase in evil and psychosis. Mental illness and crime would continue to be problems with no simple solutions, and those who lack moral or social standards would only up the ante if given access to a higher IQ.

In one sense, mankind has always been using cognitive enhancers, whether it is caffeine or nicotine or hallucinogenic drugs, and some argue that it is no more unnatural than vac-

cines or pasteurized milk. After all, they say, Sir Francis Bacon tried to improve his mind with everything from tobacco to saffron, Balzac wrote ninety novels in twenty years while consuming endless cups of coffee, Sartre took speed to help him finish his “Critique of Dialectical Reason,” Paul Erdos fueled his career with coffee and amphetamines, and Carl Sagan claimed to have gotten some of his deepest insights after smoking marijuana. And if one willingly takes a drug to enhance memory or learning, can that really be so bad? Wouldn’t more emotionally balanced and intelligent people make better choices in life?

In the dozen or so years since the first edition of this book, the field has expanded immensely, and the result is that this book has at least 60 percent more information on more than 1,000 substances ranging from basic foods to the newest wonder drugs, from the most commonplace substances to the most obscure—by far the most complete work on the subject.

The chapters are arranged progressively, beginning with the safest and most natural substances and ending with synthetic drugs and additives that are experimental and potentially hazardous.

The entries for the substances are alphabetized by popular name within the appropriate chapter, and include such information as alternative names and forms (scientific, brand names, and so forth), sources (such as foods), effects (benefits), precautions (side effects, interactions, overdose, medical conditions that may render the substance ineffective or toxic), and dosage. In the interest of brevity, I have eliminated much of the history, folklore, background, detailed analysis of individual studies, and non-cognitive benefits, dealing only with that information that can help the reader evaluate each substance.

This book does not contain a discussion of how the brain works and the various theories of aging. Neither does it deal with all the vi-

tamins and nutritional supplements required by the human body—only those that have a more-or-less direct effect on the brain.

As for what to include, I have cast as broad a net as possible. Included are substances that not only claim to improve thinking and other

brain functions, but those that presumably help prevent brain damage and degeneration, prevent aging and extend the human lifespan, enhance social skills and moral behavior, induce altered states of consciousness, and improve mood, stamina, and energy.

# *Foods*

There is a great diversity of opinion, even among experts, about what diet remains best for human health, but research indicates that the traditional Japanese or Mediterranean diets (Italian and Greek) are the most beneficial for the average individual, in terms of both physical and mental health. In the latter case, according to the Harvard School of Public Health, this means large amounts of vegetables, fruits, nuts, olive oil, and legumes, moderate amounts of alcohol (a glass or two of wine during meals), and small amounts of meat and meat products (Trichopoulos et al., 2009). The Mediterranean diet, in particular, has been associated with a reduced risk of depression (Sánchez-Villegas et al., 2009), a better quality of life (Henríquez Sánchez et al., 2012), the ability to maintain memory and thinking ability (Scarmeas et al., 2010; Tsigoulis et al., 2013), and the prevention of cognitive decline in the elderly (Martinez-Lapiscina et al., 2013). Columbia University researchers found that those eating a Mediterranean diet had a 40 percent less chance of getting Alzheimer's than those whose diet least resembled this Mediterranean ideal.

The Food Guide Pyramid can be a good starting-off point as to the proportions of foods that should be eaten, though it does have its drawbacks. For one, it fails to distinguish between nutrient-dense and nutrient-poor foods (whole grains vs. refined grains, for example), and it does not include herbs and

spices which, when properly used, can play an important role in human health. It also does not deal with food synergy, wherein food combinations can either complement or work against each other.

Ultimately, the ideal diet should accomplish five things—provide adequate amounts of all the necessary nutritional elements needed by the human body, provide a balance of essential foods and nutrients, give just the right amount of calories to maintain ideal body weight, be comprised of moderate amounts of all foods, and encompass a wide variety of foods, as well. A healthy diet is especially important in the first three years of life, as that is when most of the brain's growth occurs.

It is recommended that a person get 8 to 10 servings of fresh fruits and vegetables a day in order to get the maximum antioxidant benefits of at least 6,000 ORACs a day. An ORAC is the oxygen radical absorbance capacity, or the antioxidant power of food, and the best sources are cranberries, blueberries, raspberries, strawberries, pears, grapefruits, cherries, cinnamon, mustard, oregano, and turmeric.

Recent evidence suggests that, contrary to what was previously believed, antioxidants may do more harm than good. Studies have shown that antioxidants may increase a person's overall mortality rate, and that free radicals—once thought to contribute to aging and such diseases as cancer and heart disease—may actually contribute to health by neutral-



izing toxins and inhibiting cancer, and may actually be a result of the aging process rather than its cause (Hekimi et al., 2010). There is even evidence to suggest that taking high-dose antioxidant supplements may interfere with chemotherapy and increase the risk of cancer by protecting cancer cells against the body's defenses by deactivating the p53 gene (Bergö et al., 2014). They may also inhibit fertility in women by neutralizing the hormone that triggers ovulation (Dekel et al., 2011). A 2008 review of dozens of antioxidant studies by an international consortium of scientists known as the Cochrane Collaboration concluded "We found no evidence to support antioxidant supplements for primary or secondary prevention, [and] Vitamin A, beta-carotene, and vitamin E may increase mortality." The most likely explanation for this unexpected finding is that antioxidants interfere with immune-system cells, which fight infection and cancer. Some nutrition experts, such as Douglas McKay, N.D., of the Council for Responsible Nutrition, dispute this, stating that a re-analysis of the data showed no increase in mortality. Other research conducted at University College London and the University of Texas indicates that the whole theory of aging caused by the accumulation of molecular damage due to oxidative stress may be wrong, and that there may be other factors at play as well.

Of course, free radicals—or reactive oxygen species (ROS)—which are a part of the normal process of metabolism (though they are mainly generated by dietary fat and iron-rich foods) still do a lot of damage. And the studies seem to indicate that it is mainly the supplement form of antioxidants, rather than those pre-existing in natural foods, which do the most harm. So it appears that an individual must find the proper balance of free radicals (low levels of which may help protect against diabetes (Tiganis et al., 2009) and cancer) and antioxidants, mainly by eating a healthy diet and following a healthy lifestyle.

Another controversial aspect of diet was reignited by an opinion piece titled "Breeding the Nutrition Out of Our Food" by Jo Robin-

son in the May 26, 2013, *New York Times*. Robinson stated that much of our food is lacking in phytonutrients, compounds which help fight four of the biggest health problems facing our society today: cancer, cardiovascular disease, diabetes and dementia. She contends that this situation first arose, not 50 or 100 years ago, but 10,000 years ago when man stopped foraging for wild plants and began farming for food. An analysis of wild foods versus store-bought produce is startling: "Wild dandelions, once a springtime treat for Native Americans, have seven times more phytonutrients than spinach, which we consider a 'superfood.' A purple potato native to Peru has 28 times more cancer-fighting anthocyanins than common russet potatoes. One species of apple has a staggering 100 times more phytonutrients than the Golden Delicious displayed in our supermarkets."

Why the disparity in nutrients? Since farming first began, farmers have shunned plants that tasted the most bitter in favor of those that were more flavorful. Unfortunately, these bitter plants had the highest amounts of phytonutrients, while the tastier ones were high in sugar, starch, and oil, and low in fiber and phytonutrients. The extra-sweet corn consumed today is far removed from the teosinte of several thousand years ago, and even of the corn eaten by Native Americans three hundred years ago.

Others have disputed some of the assertions in her article, claiming that the loss of nutrients and the remarkable healing properties of these phytonutrients are not supported by facts. Are we deficient in these nutrients, and has our health suffered as a result? Robinson presents no solid evidence. As for the claim that bitterness equals healthy, this is an oversimplification, as plants have evolved for their own benefit, not ours, and many harmful plants taste bitter as well. Monica Reinagel, MS, LD/N, CNS, of the Nutrition Diva website, who is a board-certified, licensed nutritionist, professionally trained chef, and author of six books on nutrition, challenges the claim that wild versions of fruits and vegetables are healthier. How can they be healthier, she says, if they taste so bad as to be almost inedible?

You won't get the nutritional benefits of a food you can't stomach. And rather than breeding nutrition out of our food, scientists are now engaged in putting more nutrition in. Also suspect is Robinson's assumption that more is better, when in actual fact there is an optimum level for any nutrient, beyond which higher amounts do little or no good, and possibly even some harm.

Is organic the answer? In order to be labeled "100% organic," products should contain all organic ingredients; to be labeled "organic," 95 percent of the ingredients must be organic; and the label "made with organic ingredients" are applied to products that have at least 70 percent organic ingredients. The situation is complicated by the area where crops are grown, changing weather conditions, and farming practices. One 2003 study in the *Journal of Agricultural and Food Chemistry* found that organically grown (i.e., no herbicides, pesticides or fertilizers) and sustainably grown (i.e., fertilizers but no herbicides or pesticides) corn, strawberries and marionberries contain significantly higher levels of cancer-fighting antioxidants than their conventional counterparts, the conclusion being that herbicides and pesticides inhibit the production of these beneficial compounds. A second study, published in the same journal four years later, found that organic tomatoes had almost twice the level of some flavonoids as did non-organic. However, a spokesperson for the Food Standards Agency cautions that these differences don't necessarily mean that organic is healthier.

Ashley Mullins, R.D., L.D., CNSC, a registered dietitian at Baylor All Saints Medical Center, contends that the higher nutritional content of organic foods has not been fully proven, and that the levels of pesticides used in conventional produce have not been proven harmful (side note: this last claim may be true for the consumer, but not for the farm workers). And there is evidence to back up her claims. A study conducted by the Danish National Food Institute's department of food chemistry at the University of Copenhagen found no difference in a comparison of antioxidant levels of onions, carrots, and potatoes (Knuthsen, 2010).

Additionally, according to *Consumer Reports*, the term "natural" is a weasel word that could be applied to almost any food, even junk food, and "free range/free roaming" could apply to any animal that merely had access to time outside a barn or cage, regardless of whether it actually did spend any time outside.

The controversies regarding genetically modified foods and Paleolithic diets are still unresolved and beyond the scope of this book.

## ACAI

**AKA:** *Euterpe oleracea*.

**Effects:** Contains substantial amounts of phytochemicals, or non-nutritive compounds, which may protect against brain degeneration. A 2011 study at Tufts University found that an extract of acai was "able to combat some of the inflammatory and oxidative mediators of aging at the cellular level" in rats. In other words, it helped in the prevention of the development of neurodegenerative diseases by blocking the harmful effects of substances that promote inflammation. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** There have been many exaggerated claims about its healthful properties (using words such as "miracle" and "superfood"), or misleading information about where and how it was grown; there is no evidence that it promotes weight loss, reverses diabetes, or has any other specific health effect. Its antioxidant levels are in the mid-range for fruits popular in the Western diet. Any fruit should be ripe or slightly overripe to get its maximum benefits. According to Leigh Erin Connealy, M.D., "Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not

provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Studies by the Linus Pauling Institute and European Food Safety Authority conclude that fruit flavonoids such as anthocyanins (responsible for the red, purple, and blue coloring in plants) are part of the plant’s defense mechanisms, and that they have no antioxidant value to the person eating them (Simon, 1997; Williams et al., 2004; Lotito and Frei, 2006; EFSA Panel on Dietetic Products, Nutrition and Allergies, 2010). Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

**Dosage:** One cup per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day.

## ALCOHOL

**Effects:** According to a 2004 study by the University College of London, a few glasses of wine a day can sharpen thought processes, possibly by increasing blood flow to the brain. Improvements in verbal skills, mathematical ability, and memory can be seen with just one glass of wine per week, especially in women. Benefits in memory, though, may be limited to subconscious environmental cues associated with drinking; according to neurobiologist Hitoshi Morikawa of the Waggoner Center for Alcohol and Addiction Research at the University of Texas at Austin, alcohol triggers the release of dopamine, which enhances synaptic plasticity and strength, which in turn reinforces the memories and habits of the social situation (food, music, people) in which the drinking occurs (similarly, those who drink to forget

bad memories may have actually be achieving the exact opposite). It has also been found that white wine can be just as beneficial as red. Other evidence, including a University of Wisconsin study which found that, among 550 individuals who had family risk factors for Alzheimer’s, those who averaged one or two drinks a week scored 6 percent higher on wordlist recall than those who abstained or drank less, indicates that moderate drinkers show less cognitive decline with age than teetotalers. Several other studies indicate that moderate drinking (one to two drinks a day) can significantly reduce the chance of getting Alzheimer’s and certain types of dementia (vascular dementia and cognitive decline excepted), even in the elderly; however, epidemiologist Francine Grodstein of the Harvard School of Public Health in Boston, Massachusetts found that, in a study involving over 12,000 women aged 70 to 81, those with a genetic susceptibility to Alzheimer’s (specifically the gene that codes for apolipoprotein E) appeared to derive no mental benefits from moderate alcohol consumption.

Resveratrol, a bioactive compound in wine (which is found in greater amounts in red wine than white), also reduces the stickiness of blood platelets and increases the flexibility of blood vessels. Resveratrol may help prevent age-related disorders such as neurodegenerative diseases, inflammation, diabetes, and cardiovascular disease. Johns Hopkins University School of Medicine researchers have also found that resveratrol may help prevent stroke-related damage by increasing the level of heme oxygenase, an enzyme that protects nerve cells (Dore et al., 2010). Research by Philippe Marambaud and others at the Litwin-Zucker Research Center for the Study of Alzheimer’s Disease and Memory Disorders in Manhasset, New York indicates that resveratrol can also reduce the levels of Alzheimer’s Disease-causing amyloid-beta peptides. Harvard Medical School researchers, in conjunction with the National Institute on Aging, have found that resveratrol counteracts the effects of a high-calorie diet in mice to the point

where they lived just as long as mice on a standard diet (Sinclair et al., 2006) (UCLA biochemists have found that ethanol can double the lifespans of *Caenorhabditis elegans*, a worm commonly used in aging studies, though it is not known how or why).

**Precautions:** Stephen Braun, author of *Buzz: The Science and Lore of Alcohol and Caf  feine*, says that the body sees alcohol as a poison, and fights back with an enzyme called alcohol dehydrogenase. A full stomach delays the alcohol's entry into the small intestine, which helps the enzyme break down the alcohol. This enzyme is more effective in men than women, but by age 55 to 60, the reverse is true, and one-third to one-half of Asians have a genetic mutation which reduces the effectiveness of the body to render alcohol harmless, which may result in a flushing of the face, heart palpitations, dizziness, and severe nausea. Women susceptible to Alzheimer's may or may not benefit from moderate alcohol consumption; more research is needed to come to a definite conclusion, as genetics and environment may also play a role in the disease. A 2013 Indiana University study has found that even a tiny sip, or just the smell, of alcohol can trigger the release of dopamine in the brain, resulting in binge drinking as well as the inability of alcoholics to quit.

According to Dr. Anne Corbett, research manager at the Alzheimer's Society, it is not yet clear which types of alcohol have the most beneficial effects, or whether other lifestyle factors play a role in neuroprotection. Too much alcohol can have the opposite effect; specifically, more than 3 to 5 drinks per day was associated with a greater risk of cognitive impairment and dementia. Harvard Medical School researchers have found that moderate amounts of red wine activate the SIRT1 longevity gene, but that higher amounts also activate other targets, causing negative effects (Sinclair et al., 2012). More than one drink a day is not recommended. A study conducted by scientists at the National Institute on Alcohol Abuse and Alcoholism (NIAAA) and UNC's Bowles Center for Alcohol Studies on mice found that heavy drink-

ing could rewire the brain, preventing the mice from overcoming their fear of a tone previously associated with an electric shock, leading to a form of post-traumatic stress disorder (Holmes et al., 2012). Similar research has found that alcohol does not kill brain cells, but hinders the firing of neurons throughout the entire brain (Braun; Jensen et al., 1993).

Other negative effects, associated mainly with heavy drinking, include loss of reasoning ability (resulting in snap judgments and a tendency to interpret accidental acts by others as deliberate and malicious), inhibited sex drive, loss of memory and blackouts during inebriation, disruption of normal sleep (including essential REM sleep), hangover, depression, alcoholism, cirrhosis of the liver, and cancer; a recent study has concluded that even moderate drinking (one and a half drinks per day) can be linked to almost 6000 cancer deaths in the United States each year, specifically, mouth, throat, and esophageal cancer in men and breast cancer in women (Naimi et al., 2013). According to Timothy Naimi, a Boston University School of Medicine and School of Public Health associate professor, for every person who benefits from alcohol, five to ten people die from it, and that studies which show heart benefits from moderate drinking have failed to adequately compare moderate drinkers with teetotalers, or have failed to take into account socioeconomic status (higher status people having better health and more moderate drinking habits).

Alcohol can interact with many drugs, prescription and illegal, resulting in increased or decreased effects of the drug and/or alcohol, serious side effects, and death. Aspirin, for example, can greatly decrease the effectiveness of the body to break down alcohol, resulting in a more severe hangover. Always consult with a medical health professional before combining alcohol with any drug, legal (over-the-counter as well as prescription) or illegal.

For a detailed discussion of the pros and cons of resveratrol, see the entry under Miscellaneous Nutrients.

**Dosage:** Up to 30 units of alcohol (two

pints of beer or half a bottle of wine) a day. Wines made from pinot noir grapes have the highest levels of resveratrol. According to Philippe Marambaud, white wines have only one to five percent of the resveratrol that red wines do. Stephen Taylor, professor of pharmacology at the University of Queensland, Australia, recommends sipping wine, rather than gulping, as absorption by the mucous membranes in the mouth can result in 100 times the blood levels of resveratrol as opposed to absorption via the stomach (where it is mostly inactivated), possibly increasing its benefits.

## ALMOND

**AKA:** *Prunus amygdalus*.

**Effects:** Almonds are a good source of vitamin E and B vitamins. Mice with induced amnesia had better recall of a maze 24 hours later if they were fed an almond paste first, suggesting that almonds may help fight the decline in mental abilities associated with Alzheimer's, possibly due to the effects of phenylalanine and L-carnitine.

**Precautions:** Wild almonds are toxic; domesticated almonds are the result of a mutation that allows them to be eaten. Bitter almonds contain significant amounts of hydrogen cyanide, and side effects may include vertigo and death. "Raw" almonds from California may be chemically treated with the fumigant propylene oxide (PPO), traces of which may still be present at the time of consumption; the Environmental Protection Agency classifies PPO as a "probable" carcinogen. Almonds can also be infected with molds which produce carcinogenic aflatoxins. Almonds should not be eaten by those with tree nut allergies.

**Dosage:** None established, though 10 to 20 a day should be sufficient for any health benefits.

## APPLE

**AKA:** *Malus domestica*.

**Effects:** Contains the antioxidant quercetin which, according to C.Y. Lee, Ph.D., professor

and chairman of the Department of Food Science & Technology at Cornell University, may protect brain cells against oxidative damage that is typically associated with Alzheimer's and other degenerative brain diseases. This and other antioxidants may play a role in improved cognition and memory, according to Thomas Shea, Ph.D., director of the University of Massachusetts Lowell Center for Cellular Neurobiology and Neurodegeneration Research; studies on mice at the University of Massachusetts Lowell suggest that consumption of apples and apple juice improve memory by facilitating the production of the neurotransmitter acetylcholine in the brain. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014). A Dutch study found that eating at least six ounces of white-fleshed produce a day may cut the risk of stroke by half (Griep, 2011).

**Precautions:** The consumption of any specific food to fight Alzheimer's is still theoretical, as most positive results have been limited to cell studies, as opposed to more advanced research in animals; genetics and environment may also play a role in the development of the disease. The most nutritious part, the skin, can also contain the most pesticide residue (The Environmental Working Group advises buying organic, as conventional apples contain more pesticide residue than almost any other fruits or vegetables.), though washing and peeling of produce will not remove all of it. According to Leigh Erin Connealy, M.D., "Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical

exposure.” Any fruit should be ripe or slightly overripe to get its maximum benefits. A 2010 study found that quercetin can aggravate and possibly trigger kidney cancer.

Apple sauce and apple juice may lack the beneficial effects found in unprocessed apples, as they contain insignificant amounts of skin, though quercetin can remain fairly stable during cooking. Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent. A 2011 *Consumer Reports* study found that many popular store brands contain arsenic and lead in levels that were high enough to pose a danger to children. Anecdotal reports that drinking apple juice before going to bed can result in vivid dreams are unsupported by any scientific evidence.

**Dosage:** One apple per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day. Contrary to popular belief, the nutrients in fruits and vegetables are well distributed and not concentrated mainly in the skin. Quercetin, however, is an exception, as it is concentrated mostly in the skin of the apple, and red apples (Braeburn, Cortland, Discovery, Fuji, Gala, Granny Smith, Honey Crisp, Ida Red, Liberty, and Red Delicious) have more of the antioxidant than other varieties (Golden Delicious, Pink Lady), though all are good sources of quercetin. Lee recommends eating at least one apple a day. A study published in the January 2009 issue of the *Journal of Alzheimer’s Disease* by Amy Chan and Thomas B. Shea of the University of Massachusetts Lowell concluded that rats given the equivalent of two glasses of apple juice a day did not suffer the neurological degeneration of beta amyloid production (commonly associated with Alzheimer’s) as did a control group.

## BANANA

**AKA:** Cavendish banana, *Musa acuminata*, *Musa balbisiana*, *Musa cultivars*, *Musa x paradisiaca*, plantain.

**Effects:** Contains serotonin, which can ease depression. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013, and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014)). A Dutch study found that eating at least six ounces of white-fleshed produce a day may cut the risk of stroke by half (Griep, 2011).

**Precautions:** Any fruit should be ripe or slightly overripe to get its maximum benefits. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Tropical fruits (e.g., bananas, melons, papayas, pineapples) are higher in sugar and much lower in antioxidants than other fruits. Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients.

**Dosage:** One banana per day. The average person should consume at least five servings of different fruits and vegetables per day.

## BEE POLLEN

**AKA:** Ambrosia, bee bread, pollen ball.

Bee pollen is pollen that has been formed into granules by honeybees using honey or nectar, enzymes, fungi, and bacteria.

**Effects:** It may relieve stress, fatigue, and depression, as well as improve physical energy and endurance. Its nutritional content in-

cludes the B-complex vitamins, vitamin C, amino acids, carotene, calcium, copper, iron, magnesium, and potassium.

**Precautions:** The chemical and nutritional composition can vary considerably depending on plant pollens and other factors. Its numerous purported benefits have not been proven scientifically. Mild side effects include rash, itching, swelling, and (for injections) pain at the injection site. Serious side effects include anaphylactic shock. Women who are breastfeeding should only take it while under the guidance of a medical care professional. It should not be taken by women who are pregnant or planning to get pregnant, by those who are allergic to bee stings, or who have gout or kidney disease. It should not be given to children under the age of two, as it could contain spores of *Clostridium botulinum*, the organism that causes botulism; while adults and older children have stomach acid that can kill the bacterium, infants do not, leaving them susceptible to sickness or even death. Commercial flower pollen preparations may not contain pollen collected from bees.

**Dosage:** None established; like honey, it should probably be used sparingly.

## BEET AND BEETROOT JUICE

**AKA:** Beetroot, *Beta vulgaris*, garden beet, golden beet, red beet, table beet

**Effects:** Beets contain uridine monophosphate which, when combined with choline and docosahexaenoic acid, was found to increase the brain synapse activity in gerbils, indicating improved intelligence. Beetroot juice contains nitrate, which dilates blood vessels, supplying more blood to the brain. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** It is not known if uridine monophosphate has an equivalent effect on human subjects. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Bulbs should be unmarked and have smooth skins.

Consumption can result in pink urine in some individuals, due to the fact that the red color compound betanin does not break down in the body, though this does not appear to be associated with any health problems (betanin is commonly used as a food coloring).

**Dosage:** One cup per day. The average person should consume at least five servings of different fruits and vegetables per day.

## BILBERRY

**AKA:** Blaeberry, European blueberry, fraughan, myrtle blueberry, *Vaccinium myrtillus* (and related species), whinberry, whortleberry, wimberry, winberry, windberry.

In some European countries, the common name translates as “blueberry.”

**Effects:** A 2008 study, published in the *Journal of Agricultural & Food Chemistry*, found that an extract reduced chemical stress indicators in the livers of mice. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** It is not known if there is a similar effect in humans. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used

today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

**Dosage:** One cup per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day.

## BLACK CHERRY

**AKA:** Mountain black cherry, *Prunus serotina*, rum cherry, wild black cherry.

**Effects:** Studies indicate that its antioxidants may inhibit the enzyme xanthine oxidase, a primary source of free radicals. A study by University of Rochester psychiatrist Dr. Wilfred Pigeon has found that those who drank cherry juice enjoyed an average gain of 17 minutes of sleep, possibly due to the high melatonin content of the fruit. There is one anecdotal report of Rainier cherries reversing mental decline due to Alzheimer’s disease. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Any fruit should be ripe or slightly overripe to get its maximum benefits. Cherries are on the Environmental Working

Group’s “Dirty Dozen” list of produce containing the most pesticides. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

**Dosage:** One cup per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day. For better sleep, a glass of juice in the morning and a glass at night.

## BLACK RASPBERRY

**AKA:** Mac Black, *Rubus coreanus* (Korean black raspberry), *Rubus leucodermis*, *Rubus occidentalis*.

**Effects:** Contains high levels of antioxidants. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Any fruit should be ripe or slightly overripe to get its maximum benefits. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic



produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

**Dosage:** One cup per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day.

## BLACK RICE

**AKA:** Forbidden rice, Indonesian black rice, purple rice, Thai jasmine black rice.

**Effects:** According to researcher Dr. Zhimin Xu, black rice contains more anthocyanin antioxidants than the equivalent amount of blueberries, along with less sugar, more fiber, and more vitamin E antioxidants.

**Precautions:** Tsanangurayi Tongesayi, Ph.D., has analyzed rice imported from Asian and European countries and found that all contain lead levels of from 6 to 12 milligrams/kilogram, dozens of times higher than the provisional total tolerable intake (PTTI) allowed by the FDA. According to lab results released in 2012 from both *Consumer Reports* and the Food and Drug Administration, arsenic can be found in approximately 200 rice products ranging from baby cereal to rice cakes; not only that, but brown rice had higher levels than white rice, as the arsenic is concentrated in the hull, which is discarded to make white rice. *Consumer Reports* stated that inorganic arsenic levels in rice were found to be five times higher than levels found in other ce-

real grains, such as oatmeal, and that rice grown in the southern United States had higher levels of arsenic than rice grown elsewhere (this is possibly due to the use of older pesticides for cotton which contained lead arsenate compounds, or the use of arsenic additives in chicken feed in nearby farms, which inadvertently contaminates the crops). Unfortunately, neither organization makes much distinction between organic and inorganic arsenic (organic arsenic, which contains the element carbon, is much easier for the body to metabolize), or states whether these levels are high enough to be a matter for concern. Yamily J. Zavala, in a 2008 paper in *Environmental Science & Technology*, does make the distinction, finding that inorganic arsenic was found in rice from Europe and Asia, while organic arsenic was found in rice largely grown in the United States. Toxic levels are unknown, as it is hard to measure a person’s total exposure during the course of a lifetime. In decades past, it had been used in food coloring for candies and in some women’s cosmetics. Arsenic is associated with skin, bladder, and lung cancers, as well as neuropathy, heart problems, and kidney failure.

**Dosage:** It is recommended that a 2000-calorie diet contain 300 g/day of complex carbohydrates.

## BLUEBERRY

**AKA:** *Vaccinium cyanococcus*.

**Effects:** Contains substantial amounts of phytochemicals, or non-nutritive compounds, which may protect against brain degeneration. Contains high amounts of antioxidants called flavonoids, which can improve memory—possibly by enhancing communication between brain cells—and may be able to help protect against degenerative diseases such as Alzheimer’s by preventing inflammation of the brain, a major factor in the progression of these diseases. Studies have found that it can limit brain damage in rats with induced strokes (Sweeney et al., 2002; Wang et al., 2005). It is also one of the best sources for anthocyanins and flavanols,

which encourage the growth of connections between brain cells. Also contains high amounts of the antioxidant quercetin, which may protect brain cells against oxidative damage that is typically associated with Alzheimer's and other degenerative brain diseases. Improvements in cognition and motor control have also been found. They may also help in improving mood and preventing depression. Ronald L. Prior, PhD, at the Mayer Center on Aging, rates it as number one in antioxidant activity among forty common fruits and vegetables, and a 2012 review of the literature by Marshall G. Miller and Barbara Shukitt-Hale of the Human Nutrition Research Center on Aging at Tufts University confirms these beneficial effects of strawberries and other berries. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Any fruit should be ripe or slightly overripe to get its maximum benefits. Dr. C. Y Lee, Ph.D., professor and chairman of the Department of Food Science & Technology at Cornell University, cautions that the use of food to fight Alzheimer's is theoretical, as genetics and environment may also play a role. Frozen blueberries should move loosely in the bag, as clumping indicates the fruit has been thawed and refrozen. The Environmental Working Group advises buying organic, as conventional blueberries contain more pesticide residue than almost any other fruits or vegetables, and washing will not remove all of it. According to Leigh Erin Connealy, M.D., "Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free

radical exposure." Canned and processed blueberries have fewer antioxidants due to exposure to heat. A 2010 study found that quercetin can aggravate and possibly trigger kidney cancer. Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

Consuming milk within two hours before or after eating blueberries reduces the effectiveness of the antioxidant phenols, as they bind with the protein in the milk.

**Dosage:** Dutch researchers have found that about three ounces of berries a day can improve memory scores by almost 50 percent; a 2008 study found that volunteers who added 300 grams of blueberries a day to their normal diet noticed improvements in memory within three weeks. Wild blueberries have more antioxidants than cultivated ones, and frozen ones are better than those picked off-season. The average person should consume at least five servings of different fruits and vegetables per day.

## BREAST MILK

**Effects:** Contains sialic acid, a nutrient essential for brain development and cognition in the human infant; infant formulas do not contain enough for proper brain growth (Wang, 2009; Wang, 2012). Premature infants who were fed a substantial amount of breast milk (at least 75 percent of their nutritional intake) during the first few months of life had significantly better neurobehavioral profiles and cognitive development than those receiving a smaller percentage of their nutritional intake from breast milk (Feldman and Eidelman, 2003). In particular, they were more alert during social interactions and had greater de-

velopment in their motor skills. A study of nearly 3000 children conducted by the University of Western Australia since the early '90s found that boys who had been breast-fed for six months or longer had higher scores in math, reading, and spelling than those fed for fewer than six months; a similar comparison of girls found a small advantage in reading skills. MRI scans of babies' brains found that, by age two, those who were breastfed for three months or more had 20 to 30 percent more white matter in their brains than those who were fed wholly or partly by formula, especially in key areas of the brain associated with language, visual reception, motor control, and emotional function (Deoni et al., 2013). Researchers at Tel Aviv University have also found that breastfeeding appeared to offer some protection against Attention Deficit/Hyperactivity Disorder (ADHD), though whether this is due to the breast milk itself or the act of breastfeeding is as yet unknown (Mimouni-Bloch et al., 2013).

**Precautions:** Breast milk may contain any number of environmental toxins which may be detrimental to the developing infant brain. If the nursing mother is taking any drugs, illegal or prescription, they may be present in her breast milk and affect the infant.

**Dosage:** None established.

## BREWER'S YEAST

**AKA:** *Saccharomyces cerevisiae*.

**Effects:** A non-leavening yeast grown from hops, it is said to fight nervousness and fatigue, though these claims have not been scientifically tested. It is considered a good source of protein, phosphorus, chromium, and most B vitamins.

**Precautions:** Mild side effects include headache, upset stomach, nausea, and diarrhea. It should not be taken by those with candidiasis.

It should not be taken with any medications or herbal remedies unless under the guidance of a physician.

**Dosage:** None established.

## BROCCOLI

**AKA:** *Brassica oleracea*.

Closely related to brussels sprouts, cabbage, cauliflower, collard greens, kale, and kohlrabi.

**Effects:** A Dutch study found that, out of 394 women, those who ate seven ounces of broccoli or more scored higher on memory tests than those who ate less. Broccoli contains sulforaphane, which activates antioxidant genes and enzymes in certain immune cells, providing protection against free radicals that contribute to the effects of aging. More specifically, sulforaphane interacts with Nrf2, a protein which acts as a "master regulator" of hundreds of antioxidant genes and enzymes (Nel et al., 2008). Other cruciferous vegetables may have a similar effect. Also contains the antioxidant quercetin, which may protect brain cells against oxidative damage that is typically associated with Alzheimer's and other degenerative brain diseases. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Vegetables should be cooked to kill bacteria and to make more of their nutrients available to the body; steaming and stir-frying are two methods that retain the most nutrients. According to Leigh Erin Connealy, M.D., "Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure."

**Dosage:** Approximately seven ounces a day. The average person should consume at least five servings of different fruits and vegetables per day.

## CABBAGE

**AKA:** Bok choy, *Brassica oleracea* (and variants), red cabbage, Savoy cabbage, white cabbage.

Closely related to broccoli, brussels sprouts, cauliflower, collard greens, kale, and kohlrabi.

**Effects:** Red cabbage contains the phytonutrient anthocyanin, which acts as an anti-inflammatory agent, which could help protect against dementia. All cabbages are rich in various phytonutrients, vitamins C and K as well as B vitamins, minerals, and omega-3 fats. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Unlike most vegetables, cabbage becomes less digestible the more it is cooked; microwaving also destroys some of the beneficial compounds. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.”

**Dosage:** Approximately seven ounces a day. The average person should consume at least five servings of different fruits and vegetables per day.

## CARBOHYDRATES

Carbohydrates are the principal source of the body’s energy and are divided into two types—simple (monosaccharides and disaccharides) and complex (oligosaccharides and polysaccharides). Simple carbohydrates include the various sugars found in fruit (fructose), milk (lactose), and table sugar (sucrose).

Complex carbohydrates are found in vegetables, whole grains, and legumes. Complex carbohydrates are preferable, as it takes longer for the body to break them down, releasing the sugar into the bloodstream slowly.

**Food Sources:** Fruits, whole grains, vegetables.

**Effects:** Carbohydrates help relax the brain and are necessary for good mental functioning. They act as an anti-depressant for people with less sugar-induced serotonin in the brain than normal (such as those who suffer from seasonal affective disorder [SAD]), possibly by amplifying serotonergic neurotransmission. If consumption is timed right, they can increase the brain’s energy levels, as they are readily broken down into glucose, a simple sugar found in nature that is necessary for the brain’s functioning. One study (Markus et al., 1993) has found that carbohydrate-rich, protein-poor meals have a positive effect on serotonin and tryptophan levels under stressful situations, preventing a rise in depression and cortisol levels and a decline in vigor and reaction time when compared to subjects on protein-rich, carbohydrate-poor meals.

**Precautions:** Dr. David Perlmutter, author of the diet book *Grain Brain*, says most whole grains should be avoided, as they increase blood sugar levels, leading to inflammation and dementia. Most nutrition experts disagree, asserting that carbohydrates are a good source of glucose—the brain’s main fuel—as well as other nutrients such as B vitamins and iron, and point to research that shows that eating whole grains decreases inflammation. This is aside from the fact that celiac disease, or gluten intolerance, can cause many health problems. Yet a twelve-year study involving over 43,000 women seems to indicate that a carbohydrate-rich diet can lead to a 21 to 29 percent increase in depression (Lucas et al., 2013). The women were said to have consumed pasta, chips, bread, red meat, and soft drinks, though it is unclear what percentage of the pasta and bread was whole grains, and salty chips and sugary soft drinks—if consumed in significant quantities—could have certainly contributed to the

depression and other health problems mentioned in the study. According to both The Harvard Health Letter and Australian researchers, following a low-carbohydrate diet for just a few weeks as promoted by Atkins or The Zone can result in fatigue, irritability, and loss of ability to think quickly.

Simple carbohydrates, especially table sugar, can flood the body and trigger an oversecretion of insulin by the isles of Langerhans, resulting in an initial surge of energy from the sugar followed by lethargy caused by the sudden rush of insulin. Foods should be unrefined, fresh, and natural; refined foods, canned goods, and snack foods should be avoided.

Fructose does not have the same calming effect. Simple sugars (table sugar, brown sugar, and honey, for instance) have no nutritional value except for calories, and can promote cavities, cause rapid changes in blood sugar and insulin, and lead to obesity, hypoglycemia, and diabetes, among other disorders. Some people are “carbohydrate cravers,” and need them to prevent drowsiness, restlessness, or boredom; instead of becoming sleepy, these people become more focused and alert, and better sustain concentration. Carbohydrates are safe and, to quote Dr. Stuart Berger, “They are the only food category not linked to any killer diseases.”

**Dosage:** 300 to 400 g/day from complex carbohydrates, or about 1200 to 1600 kilocalories/day (out of an average total of 1800 to 2200 kilocalories/day). Ideally, 65 percent of a person’s caloric intake should be carbohydrates—55 percent from complex carbohydrates and starches and 10 percent from natural sugars such as those found in fruit. A minimum of 50 g/day are needed to prevent ketosis, an acidic condition of the blood. For best effect, carbohydrates should be taken with as little protein and fat as possible, as these slow down or hinder serotonin on its way to the brain.

## CARROT

**AKA:** *Daucus carota*.

**Effects:** Carrots contain the flavonoid lu-

teolin, which has been found to reduce the levels of beta-amyloid, the sticky deposits associated with Alzheimer’s disease, in mice (Tan et al., 2008) and to inhibit age-related inflammation of the brain and associated memory problems in mice (Jang et al., 2010). A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Vegetables should be cooked to kill bacteria and to make more of their nutrients available to the body; steaming and stir-frying are two methods that retain the most nutrients. Carrots are on the Environmental Working Group’s “Dirty Dozen” list of produce containing the most pesticides. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.”

**Dosage:** Approximately seven ounces a day. The average person should consume at least five servings of different fruits and vegetables per day.

## CELERY

**AKA:** *Apium graveolens var. dulce*.

**Effects:** Celery contains the flavonoid luteolin, which has been found to reduce the levels of beta-amyloid, the sticky deposits associated with Alzheimer’s disease, in mice (Tan et al., 2008), and to inhibit age-related inflammation of the brain and associated memory problems in mice (Jang et al., 2010). A New Zealand study involving 281 healthy young

adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Vegetables should be cooked to kill bacteria and to make more of their nutrients available to the body; steaming and stir-frying are two methods that retain the most nutrients. Celery is on the Environmental Working Group's "Dirty Dozen" list of produce containing the most pesticides. According to Leigh Erin Connealy, M.D., "Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure." Celery should be avoided by those who are allergic to it, as it can cause a potentially fatal anaphylactic shock.

**Dosage:** Approximately seven ounces a day. The average person should consume at least five servings of different fruits and vegetables per day.

## CHIA SEEDS

**AKA:** *Salvia hispanica*.

A member of the mint family, it was a common food in Aztec and Mayan societies.

**Effects:** According to Andrea McNinch, owner of the Healing Yourself Institute in Royal Oak, Michigan, chia seeds contain twice the potassium of bananas and three times the antioxidants of blueberries. They are also a good source of protein, omega 3 fatty acids, and fiber. Though similar in nutritional value to flaxseeds, they have a longer shelf life and do not go rancid like flaxseeds do. They are also low in calories and fat.

**Precautions:** Seeds should be black or

white; brown seeds are immature and not recommended for consumption. And if there is an odor or flavor, or if there are sticks and other seeds in the package, then it is not one hundred percent chia seeds.

**Dosage:** None established, though they can be ground and added to baked goods or smoothies, or sprinkled onto yogurt, cereals, and salads.

## CHOCOLATE AND COCOA

**AKA:** Chocolatl, *Theobroma cacao*.

**Effects:** Though it is an addictive psychoactive which some believe mimics the effects of marijuana, not much is known about its pharmacology and cognitive effects, and since over 300 different compounds in chocolate have been identified, it may be some time before its effects are fully understood. Caffeine may account for some of its psychoactive properties (though one ounce of milk chocolate contains about the same amount as a cup of decaffeinated coffee), but some researchers state that most of its effects are attributable to theobromine, an alkaloid found in chocolate that is similar to caffeine but which does not have as strong an effect on the nervous system. Chocolate also contains phenylethylamine (PEA), also known as the "love chemical" due to the fact that it releases dopamine, which may contribute to feelings attraction, excitement, giddiness, apprehension, and euphoria, though some dispute this, claiming that most, if not all, of the phenylethylamine is metabolized before it reaches the central nervous system. Researcher Daniele Piomelli has found that chocolate contains anandamide, a natural chemical also found in the brain, which reacts the same way marijuana does; it also contains two other ingredients (N-oleoethanolamine and N-linoleoethanolamine) that inhibit the natural breakdown of anandamide. Still, researchers agree that the "high" produced by chocolate is extremely mild; in fact, researcher Christian Felder of the National Institute of Mental Health calculates that a 130-pound person would have to eat the equivalent of 25

pounds of chocolate in one sitting to get anything close to a marijuana high. Theobromine mainly affects the muscles, kidneys, and heart. In addition to providing proteins, vitamins, and minerals (calcium, iron, niacin, potassium, riboflavin, sodium, thiamine, and vitamin A, among others), it may also have a sexually stimulating effect caused by theobromine and the possible ingredient B-phenethylamine, the latter a biochemical manufactured by the brain of a person in love. Chocolate also contains tryptophan, though in doses too small to have much effect, and neuroactive alkaloids called tetrahydro-beta-carbolines (which are also found in beer, wine, and other liquors), though their effects are, as yet, unknown. Chocolate can trigger the release of pain-reducing endorphins and neutralize the effects of sugar, reducing tooth decay. One study suggests that even the smell of chocolate can significantly reduce theta activity in the brain, promoting relaxation. Cravings by premenstrual women may be due partly to its high magnesium content (which may relieve symptoms) and women's high levels of the hormone progesterone, which increases fat storage in the body and may trigger a craving for fatty foods.

In addition to affecting mood, chocolate can also impact intelligence. A 2006 study by Dr. Bryan Raudenbush at the Wheeling West Jesuit University in West Virginia found that consuming 85 grams of milk chocolate significantly improved verbal and visual memory, and that both milk chocolate and dark chocolate improved impulse control and reaction time. Researcher Ian McDonald of the University of Nottingham found that cocoa increased blood flow to the brain for two to three hours in healthy individuals, possibly due to the antioxidant flavanols, which may help prevent high blood pressure and dementia, a finding echoed by a 2008 University of Oxford study involving 2000 men in their seventies, which found that those who ate chocolate scored better on tests of cognitive ability than those who didn't, and a 2013 study led by Farzaneh A. Sorond, MD, PhD, of Harvard

Medical School in Boston, which found that two cups of hot chocolate a day improved the working memory of elderly subjects. A study on mice conducted at Johns Hopkins University School of Medicine found that the flavanol epicatechin can reduce brain damage caused by strokes if consumed before or up to three-and-a-half hours after a stroke (Shah et al., 2010). It is believed that epicatechin is the most likely candidate for cocoa's beneficial effects on the cardiovascular system by stimulating the release of nitric oxide.

A 1998 Harvard study by Dr. I-Min Lee of 7841 older men found that those who ate chocolate lived longer than those who didn't, with those eating just three chocolate bars a month living the longest. Some have questioned the results of this study, as eating more chocolate was not correlated with longer life, and three chocolate bars a month was too little for it to be perceived as having any significant effect (chocolate does contain antioxidants known as phenols, but this alone could not account for the increase in life expectancy, and there are no other known chemicals that could account for this effect). A 2006 Dutch study found that, over a fifteen-year period, men who consumed four grams of cocoa a day halved their risk of death from heart disease over those who ate no cocoa.

Dark chocolate has more fat and sugar than regular chocolate; despite this, the high cocoa content means it has more of the cardioprotective ingredients epicatechin and gallic acid, which lower blood pressure, reduces LDL cholesterol, and decreases the chances of a heart attack when consumed in moderate amounts (women over 70 who ate chocolate at least once a week were significantly less likely to die of heart disease and heart failure than those who didn't [Lewis et al., 2010]). Semisweet chocolate has half the sugar of dark chocolate, and bittersweet chocolate is chocolate liquor to which sugar, cocoa butter, vanilla, and lecithin have been added. Unsweetened, or baking, chocolate has no added ingredients, and has a bitter taste. Chocolate is a bitter Aztec drink made from the cacao beans and

flavored with pepper, vanilla, and other spices. Heating cocoa releases more of the antioxidants.

Chocolate may work synergistically with selective MAO-b inhibitors such as selegiline or rasagiline to relieve depression. Bupropion (Wellbutrin, Zyban) reportedly decreases chocolate cravings in some individuals, but not others.

Studies suggest that cocoa extracts may prevent the growth of *Helicobacter pylori* (responsible for stomach ulcers) and strains of *E. coli* in the human body.

**Precautions:** It is addictive, and has a high (40 to 60 percent) fat, sugar, and caloric content, which could contribute to obesity. Most cocoa has been stripped of most of its beneficial antioxidants and flavanols, as the latter imparts a bitter taste, which is usually done by processing with alkali. Epicatechin can be easily destroyed by heat and light, and not all dark chocolate may have significant quantities of this flavanol. Chocolate can also contain varying amounts of lead acquired during production. Chocolate and nuts should be avoided by those with herpes, as the high arginine content can aggravate the symptoms. It should not be taken by anyone with allergies, as it can worsen symptoms, or anyone with canker sores, as it can delay healing. Sensitivity to chocolate can trigger migraine headaches. Most research on the health benefits of chocolate is preliminary, and studies which appear to promote chocolate as a health food may be funded by chocolate companies in an attempt to put a positive spin on their product.

It can decrease the effectiveness of antihistamines, tranquilizers, sedatives, and relaxants, and can cause severe hypertension in anyone taking an MAO inhibitor or antidepressant.

It can deplete the body of inositol and the B vitamins, particularly B-1, and partially prevent the absorption of calcium. It also has significant levels of caffeine, which can place stress on the endocrine system and deplete the body's stores of potassium and zinc.

White chocolate contains cocoa butter but not cocoa solids (and, thus, no alkaloids), and

carob, which comes from the evergreen tree (*Ceratonia siliqua*), is unrelated to chocolate.

Because their bodies cannot process the theobromine as readily as humans' can, chocolate can be deadly to animals, including cats, dogs, parrots, foxes, and coyotes.

**Dosage:** About one chocolate bar a week. Julia Zumpano, a clinical dietician in the department of preventive cardiology at the Cleveland Clinic in Ohio, recommends a maximum of one ounce of 70 percent dark chocolate a day, or one-half ounce for individuals counting calories.

## COCONUT OIL

**AKA:** *Cocos nucifera*.

**Effects:** According to Mary Newport, M.D., her husband's dementia was mostly cured by the oral administration of coconut oil, based on the evidence that the liver converts the medium-chain triglycerides into ketone bodies, which is then used by neurons in the brain (which normally require glucose). Coconut oil is approximately 60 percent medium-chain fatty acids.

**Precautions:** Research needs to be done, as this is just one anecdotal case and, even then, may only work for certain individuals or certain types of dementia. The coconut oil should be non-hydrogenated (no trans fats) virgin organic oil, as the chemicals used to extract non-virgin oil could be harmful. It is inadvisable to eat large amounts of coconut oil due to its high saturated fat content.

**Dosage:** Newport recommends about seven level teaspoons a day, though she had actually given this dose to her husband twice daily to prevent any relapse.

## COFFEE

**AKA:** *Coffea Arabica* and related species.

**Effects:** Contains caffeine, one of the most powerful legal stimulants available; it gives a mental boost by releasing adrenaline and noradrenaline into the bloodstream. It interferes on a cellular level with the compound adeno-



sine, in effect flatlining the body's state of arousal, allowing the body to shift into high gear. It may also affect dopamine, acetylcholine, and other neurotransmitters, and may stabilize the blood-brain barrier. It improves typing skills, word retrieval skills (in women), mental alertness, energy, reaction time, attention, concentration, problem-solving skills, short- and long-term memory, and accuracy in performing tasks, and relieves fatigue, mainly by causing the release of norepinephrine in the brain. Some claim that caffeine can make an individual more open to changing his or her attitude when presented with a strong argument for a particular viewpoint. It improves physical endurance by stimulating the skeletal muscles, increases the production of stomach acid and urine, causes bowel movements, and dilates the bronchial tubes (making it easier to breathe). According to studies, it has no effect on clarity of thought. In addition, the presence of polyphenols in coffee and tea may prevent cancer by inhibiting the conversion of highly carcinogenic nitrosamines in the body. A cup of coffee a day can guard against the harmful effects of cholesterol on the brain—specifically, harmful substances passing through leaks in the blood-brain barrier—possibly delaying the onset of Alzheimer's (Geiger et al., 2008), and middle-aged individuals who drink three to five cups a day may decrease their risk of developing dementia and Alzheimer's by 60 to 65 percent (Kivipelto et al., 2009). Moderate caffeine intake can also delay the onset of Alzheimer's and dementia in the elderly who suffer from mild cognitive impairment (Cao et al., 2012). Two or more cups of coffee a day can reduce the risk of developing Parkinson's disease by 40 percent, a few cups of coffee a day can help prevent gallstones in men, and four to five cups a day can reduce colorectal cancer by 24 percent. A 2013 study by Gerasimos Siasos, a medical doctor and professor at the University of Athens Medical School in Greece concluded that the longevity of the inhabitants of the island of Ikaria (fully one percent live to be over 90 years of age, or ten times the rate of other Eu-

ropeans) may be at least partly due to the fact that they boil their daily coffee, which improved endothelial function (the endothelium is a membrane that lines blood vessels and related organs such as the heart), protecting coronary circulation against the effects of aging and smoking.

All coffee, including decaffeinated, contains at least three compounds that act like opiates, or heroin, on the brain. A Norwegian study found that black coffee is richer in polyphenol antioxidants than a serving of either blueberries, raspberries, pineapples, or fruit juice. Coffee also contains more antioxidants than cranberries, apples, or tomatoes, though Professor Joe Vinson of the Department of Chemistry at the University of Scranton in Pennsylvania warns that his does not necessarily mean that these higher levels are absorbed by the body. He also states that these antioxidants may mute some of the effects of caffeine on the body, preventing the heart rate and blood pressure from increasing too much. A 2011 Harvard School of Public Health study found that those who drank at least four cups of coffee a day had a 20 percent less chance of developing depression than those who drank one cup or less; a second study by the HSPH found that the risk of suicide was half that for those who drank two to four cups of coffee a day than for those who drank decaf coffee or little to no coffee at all, and that higher consumption produced no additional benefits (Lucas et al., 2013) (however, a large Finnish study found that there was a higher risk of suicide for those who consumed eight or nine cups a day). And a 2009 University of South Florida study found that caffeine reversed the effects of Alzheimer's in mice by reducing amyloid-beta plaques and restoring memory, though researchers caution that what often works in mice fails in humans, and the equivalent level for individuals would be 500 mg, a dangerous level for some people. Still, a Portuguese study in 2002 found that there was a positive correlation between caffeine intake and a lower risk of Alzheimer's; it is believed that the caffeine in coffee may work synergistically with an-

other compound to counteract the damage of Alzheimer's (Cao et al., 2011).

Caffeine may work synergistically with aspirin, taurine, sugar, and carbohydrates when consumed in moderate amounts.

**Precautions:** Unfiltered coffee (prepared by boiling or using a French press, as is done in Europe) contains higher amounts of cafestol, which can raise cholesterol; paper filters and K-Cups can remove most of this substance. Some products, even those labeled "natural," may contain synthetic caffeine (man-made from petroleum-derived building blocks) rather than caffeine derived naturally from plant sources (Zhang et al., 2012). Coffee that is "shade grown" requires fewer pesticides, but it must be linked with a particular certifying organization (e.g., Rainforest Alliance) for it to have any meaning.

Caffeinated products should not be taken by anyone who is allergic to stimulants, has heart disease or irregular heartbeats, suffers from insomnia, anxiety, or panic disorders, or has a peptic ulcer of the stomach or duodenum. Women who are pregnant or nursing should limit their use of caffeine, as it does enter the placenta and can be found in breast milk; it can also limit the flow of blood to the placenta, putting stress on fetal metabolism. While there is no evidence that caffeine causes birth defects, it could complicate pregnancy, and can cause insomnia and hyperactivity in infants. A 2008 study found that just 200 mg of caffeine, or two cups of regular coffee, can increase the risk of low-birth-weight babies and double the risk of miscarriage, particularly in the first trimester (in fact, the lead researcher of the study, De-Kun Li, has stated that "to me, the safe dose is zero"). A physician should be consulted first if any of the following conditions are present: hypoglycemia, epilepsy, or high blood pressure. To discontinue use, gradually decrease the amount over a month or more, or headaches, irritability, and drowsiness may result. Coffee increases the risk of high blood pressure in individuals who already suffer from high blood pressure, causes anxiety, irritability, headaches, muscle

twitches, insomnia, and heart palpitations (a condition known as coffee intoxication, which can occur when daily caffeine intake is over 250 mg/day), can worsen the symptoms of premenstrual syndrome, cause heartburn and indigestion, and reduce the fertility of women. Dark roasts are better than lighter roasts for those with stomach acid problems. Caffeine can remain in the body for up to twelve hours; caffeine consumed at night will severely hinder recovery sleep the following day, as an individual will find it much harder to get to sleep, and will not be able to enter the deep, restful sleep needed to energy and alertness.

Not all researchers are convinced of caffeine's mental benefits. A study found that the feeling of alertness a morning cup of coffee provides may actually be the reversal of fatigue resulting from acute caffeine withdrawal, returning a person to normal rather than improving his or her usual state of awareness (Rogers et al., 2010). According to some studies, it has no effect on memory or clarity of thought. Other studies show no improvement in recall or response time, and others show that high doses can impair a person's ability to work with numbers. And it may have a negative effect on a person's ability to quickly process ambiguous or confusing stimuli. Any improvements in mental functioning may peak at a certain dosage, then decline with increasing consumption. Overall, caffeine may benefit the performance of simple tasks but have no effect on more complex ones such as reading comprehension or advanced mathematics. There may be gender-related factors, as well—a 2011 Bristol University study found that, while coffee improves women's ability to work with others, especially in stressful situations, it impaired men's memory and decision-making under the same conditions.

Though it is readily absorbed into the bloodstream, researchers still do not understand caffeine's full effects upon the human body. Caffeine can lead to a condition in coffee drinkers called coffee intoxication, in which more than four or five cups a day results in irritability, muscle twitches, rambling

speech and thought, and trouble sleeping. It can also worsen existing health problems, and may contribute to birth defects, bladder and colon cancer, kidney disease, gout, osteoporosis, hypertension, abnormal heart rhythms, stomach ulcers, and heart disease, though more recent studies refute these findings. When combined with sugar, as in many cola drinks, it can be particularly addictive or habit-forming. It does not replenish a person's noradrenaline once it is used up, and either depletes or limits the absorption of many vitamins and minerals. Withdrawal symptoms can begin 12 to 36 hours after the last dose, and can include lethargy, irritability, severe throbbing headaches, anxiety, depression, fatigue, and possibly even nausea and vomiting; symptoms can last from one and one-half to seven days.

Other adverse effects include heart palpitations, high blood pressure, muscle twitches, rapid heartbeat, low blood sugar, nervousness, insomnia, increased urination, anxiety, indigestion, increased production of gastrointestinal acid, rectal itching, constipation, impaired concentration, a weakened immune system, bladder irritation and urinary problems (especially in women), and interference with DNA replication. It has been shown to trigger panic attacks in susceptible people—which it does by lowering the body's production of DHEA and increasing its production of cortisol—and interfere with the ability to sleep in most coffee drinkers. Decaffeinated coffee still contains some caffeine (according to a 2007 *Consumer Reports* test of brands from major chains, from 5 to 30 percent of the caffeine content of regular coffee) and can also cause these symptoms. More severe and infrequent symptoms include confusion, nausea, stomach ulcers, indigestion, and a burning feeling in the stomach. Overdose symptoms include excitement, insomnia, rapid heartbeat, confusion, fever, hallucinations, convulsions, and coma.

More than five cups a day can increase the heart attack risk to three times that of a non-coffee drinker. Some evidence suggests that

seven or more cups a day can result in auditory hallucinations in certain people, possibly as a result of its increasing the level of the stress hormone cortisol. Long-term high-dose caffeine intake can promote calcium loss due to its diuretic effect, weakening bones. The lethal dosage has been estimated to be about 10 grams or, more accurately, about 150 to 200 mg per kilogram of body weight (roughly 100 cups of coffee in four hours). If caffeine must be consumed, it should be derived from plant sources, as the synthetic form does not have the fat-burning properties the natural form does. As for the natural forms, kola nut and yerba mate are the best caffeine sources, guarana is adequate, and tea and coffee rank lowest. Boiled or percolated coffee can increase serum cholesterol levels and the risk of heart disease; drip coffee does not, as the paper filters absorb the harmful oils in the coffee grounds.

Food and drug interactions with caffeine are also a cause for concern:

- Combined with other caffeinated beverages, chocolate, or products such as Vivarin, caffeine is likely to be more stimulating and produce a greater chance of side effects.
- Adding milk ties up some of the beneficial compounds of coffee, rendering them useless.
- Grapefruit juice can increase the level of caffeine and extend its effects by up to one-third.
- Caffeine can reduce the absorption of iron and B vitamins, and increase the excretion of calcium, potassium, magnesium, and trace minerals.
- Caffeine can increase the elimination of lithium from the body, reducing its effectiveness.
- Certain antibiotics such as Cipro (ciprofloxacin) and Penetrex (enoxacin) can significantly intensify and prolong the effects of caffeine.
- Consuming it with other caffeine-containing drugs, central nervous system

stimulants, or sympathomimetics can result in overstimulation.

- Combining it with Cimetidine (Tagamet), oral contraceptives, or Isoniazid, can increase sensitivity to the effects of the caffeine (Tagamet can increase caffeine levels by as much as 70 percent).
- Combining it with sedatives, sleep inducers, or tranquilizers can increase sensitivity to the sedative or tranquilizer.
- Combining it with MAO inhibitors can lead to heart arrhythmias and dangerously high blood pressure.
- Combining it with beta blockers can reduce the effectiveness of both.
- Combining it with bronchodilators may increase the effect of caffeine along with increased side effects.
- Combining it with Disulfiram (for treatment of alcohol dependency) may reduce the elimination of caffeine from the body, intensifying its effects.
- Combining it with thyroid hormones can cause an increase in the thyroid effect.
- Taken with alcohol, caffeine can slow a person's reaction time and intensify the effects of alcohol. It can also encourage a person to drink more alcohol than usual, as the caffeine can create feelings of wakefulness and sobriety, masking the drowsiness and depressive effects of alcoholic beverages and increasing the risk of alcohol poisoning and blackouts.
- Taken with central nervous system stimulants such as amphetamines and pseudoephedrine, it can cause overstimulation and other adverse side effects.
- Taken with cocaine, it can lead to convulsions or extreme nervousness.
- Taken with ecstasy (MDMA), it could lead to a rapid heartbeat and life-threatening increase in body temperature.
- Taken with marijuana, it can lead to an increased effect of both substances along with a rapid heartbeat.
- Taken with tobacco, it can lead to an accelerated heartbeat and a decreased caffeine effect.

- Caution should be exercised when combining caffeine with barbiturates, ulcer medications, antacids and other supplements with calcium, erythromycin, and troleandomycin, as the interactions have not been fully researched.

**Dosage:** One to two cups a day, with no milk, sugar, or cream. The majority of the research shows that healthy people can consume up to two cups of coffee (200 mg) a day for maximum benefits without suffering any ill effects; more than 300 mg of caffeine a day, however, is not recommended. For maximum effect, it may be better to have several half-cups of coffee during the day, large than one large cup in the morning, as the effects only last for about three hours. Professor Vinson has found that organic coffees have more antioxidants and fewer pesticide residues than non-organic brands; proponents of organic coffee also claim that mulch made from nitrogen-rich elements such as the coffee cherry provide a deeper, cleaner taste.

## COFFEEBERRY

**AKA:** California buckthorn, coffee cherry, *Frangula californica*, *Rhamnus californica*.

A fruit that contains seeds that look like coffee beans, though they are not a coffee substitute.

**Effects:** An extract has been found to have high levels of antioxidants, along with low caffeine content (less than 1 percent). A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** None known.

**Dosage:** One cup per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day.

## CRANBERRY

**AKA:** *Vaccinium erythrocarpum*, *Vaccinium macrocarpon*, *Vaccinium microcarpum*, *Vaccinium oxycoccos*.

**Effects:** Contains high amounts of antioxidants called flavonoids, which can improve memory—possibly by enhancing communication between brain cells—and may be able to help protect against degenerative diseases such as Alzheimer’s by preventing inflammation of the brain, a major factor in the progression of these diseases. It is also one of the best sources for anthocyanins and flavanols, which encourage the growth of connections between brain cells. It also contains high amounts of the antioxidant quercetin, which may protect brain cells against oxidative damage that is typically associated with Alzheimer’s and other degenerative brain diseases. Improvements in cognition and motor control have also been found. Cranberries have higher levels of antioxidant phenols than any other fruit. A 2012 review of the literature by Marshall G. Miller and Barbara Shukitt-Hale of the Human Nutrition Research Center on Aging at Tufts University confirms these beneficial effects of cranberries and other berries. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** The consumption of any specific food to fight Alzheimer’s is still theoretical, as most positive results have been limited to cell studies, as opposed to more advanced research in animals; genetics and environment may also play a role in the development of the disease. Any fruit should be ripe or slightly overripe to get its maximum benefits. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxi-

dants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Uncooked berries and pure juice have the highest levels of antioxidants, as heating, storing, and processing reduces those levels. A 2010 study found that quercetin can aggravate and possibly trigger kidney cancer. Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar (sweetened cranberry juice may have more sugar than soft drinks), and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

Cranberry juice should not be consumed by those taking warfarin, as there appears to be an increased susceptibility to bruising, as well as other side effects, in certain genetically predisposed individuals (Li et al., 2006; Pham and Pham, 2007; Hamann et al., 2011). Though it is a common belief that cranberry juice can nullify the effects of a date-rape drug (Rohypnol or GHB), the sole evidence seems to come from an apparent incident in the 1980s in which a woman on a cranberry juice diet remembered enough details about her attack to bring two serial rapists to justice.

**Dosage:** One cup per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day.

## EDAMAME

**AKA:** *Glycine max*, green soybeans.

**Effects:** Prevents mood swings by normalizing blood sugar levels. Also contains omega-3 fatty acids, which help counteract depression.

**Precautions:** When served in restaurants,

they may be heavily salted. Also, see entry for Soy.

**Dosage:** None established. They are served as a side dish in Japanese restaurants.

## ENERGY DRINKS

**AKA:** 5-Hour Energy, Monster Energy, Red Bull Energy, Rockstar Energy.

**Effects:** Provides energy. One study found that Red Bull significantly improved athletic performance, as well as mental performance, including alertness, reaction time, and short-term memory (Cox and Westcott, 2001).

**Precautions:** In 2012, the Food and Drug Administration released adverse-event reports citing ninety-two illnesses and thirteen deaths attributed to 5-Hour Energy shots, forty illnesses and five deaths attributed to Monster Energy drinks, and thirteen illnesses and two long-term disabilities attributed to Rockstar Energy drinks over the past eight years, though definitive proof was lacking to remove the products from store shelves. The purported effects included deaths due to heart attack, convulsions, irregular heartbeat, and migraine, among others. The American College of Emergency Physicians reported that in 2011 there were 20,000 emergency room visits for anxiety, rapid heartbeat, seizures, and heart attacks due to energy drinks. In 2013, a lawsuit was filed against the makers of Red Bull energy drink, alleging that a man died of a heart attack after drinking a Red Bull following a basketball game. The lawsuit cites nine other deaths from consumption of Red Bull, and the FDA has stated they received nearly two dozen reports from medical personnel linking Red Bull to a variety of symptoms, including fatigue, dizziness, increased heart rate, chest pain, and anxiety. They should not be consumed by children and adolescents, and may pose health risks to athletes. Supporters of energy drinks point out the fact that billions of cans are consumed yearly without anyone suffering adverse health risks.

Most of the energy-enhancing effect comes from the ingredients caffeine, taurine, and glu-

curonolactone (a carbohydrate produced in the human body), rather than protein and carbohydrates. An internet rumor from 2000 claims that glucuronolactone was an artificial stimulant given to U.S. troops during the Vietnam war, and was responsible for several deaths and hundreds of cases of health problems ranging from migraines to brain tumors; snopes.com found no factual basis for this rumor.

Energy drinks should not be combined with any other caffeinated product, alcohol, or prescription drugs (especially stimulants).

**Dosage:** None established, but one or two drinks a day should not pose any problems for most individuals, provided the daily caffeine intake does not exceed 300 mg/day.

## FATTY FOODS

**Effects:** According to a study published in the August 2011 issue of the *Journal of Clinical Investigation*, fatty foods can temporarily reduce feelings of sadness. Subjects fed dodecanoic acid (a fatty acid found in breast milk) and Twinkies exhibited significant improvement in mood over those fed a placebo of saline liquid.

**Precautions:** A steady diet of fatty foods can lead to obesity and many other serious health problems.

**Dosage:** Regular consumption is not recommended.

## FISH

**Effects:** The omega-3 fatty acids in fish boost brain functioning and, according to a six-year study of Chicago residents by researchers at Rush University Medical Center, reduce the rate of mental decline by 10 to 13 percent a year. A study of 899 elderly men and women by the U.S. Department of Agriculture Human Nutrition Research Center on Aging at Tufts University in Boston found that those who ate fish had a 43 percent less chance of mental decline than those who didn't. Another study, conducted by the Columbia University

Medical Center in New York, found that, in individuals over 65 years of age, consuming one gram of omega-3 fatty acids per day (roughly half a fillet of salmon per week) lowered beta amyloid levels in the blood by 20 to 30 percent (Gu et al., 2012).

A long-term study of 9000 mothers and their children in the city of Avon in England found that there was a direct correlation between the amount of fish and omega-3 fatty acids consumed by the pregnant women and the development of motor skills, verbal IQ, and social interaction in their offspring. Research at the University of Connecticut suggests that regular fish consumption during pregnancy can help protect against post-natal depression in some women. A 2012 study found that pregnant women who eat more than two servings of fish a week were half as likely to have a child with symptoms of ADHD; however, the same study found that women with above-average mercury levels were 70 percent more likely to have a child with symptoms of ADHD.

**Precautions:** Fish can contain high levels of mercury (generally, the larger the fish, the more mercury it contains), which is especially dangerous to pregnant women and children, as even small amounts can hinder brain development. Tuna and oily fish such as mackerel, salmon, sardines, and trout should not be eaten by pregnant women more than twice a week, and shark, swordfish, and marlin should be avoided entirely; cod liver oil and omega-3 supplements containing vitamin A should also be avoided, according to Dr. Carrie Ruxton of the Health Supplements Information Service. A 2008 study commissioned by The New York Times found that the bluefin tuna sushi sold in a random sampling of twenty New York restaurants had mercury levels so high that “a regular diet of six pieces a week would exceed the levels considered acceptable by the Environmental Protection Agency.” According to Marion Nestle, chairwoman of New York University’s Department of Nutrition and Food Studies, mercury has a “half-life” of three months, which means that ab-

staining from eating anything with mercury will decrease the amount in the body by half in ninety days; after a year, the mercury level will have decreased 94 percent, which—according to Nestle—means “you’re clean enough.” Farmed fish may have low levels of mercury, but contain high levels of contaminants from the pesticide residues and industrial contaminants in the processed food that they are fed.

Researchers in Sweden have found that fish there have measurable levels of benzodiazepines in their bodies, significantly altering their behavior. It is believed that fish in many parts of the world may be ingesting numerous pharmaceutical drugs—including various psychiatric medications—that pass through waste treatment plants. What effect this may have on the fish, and humans, eating them, is currently unknown.

Any fish should be baked or broiled; fried fish do not appear to offer any benefits, leading neurologist Richard Lipton of the Albert Einstein College of Medicine to conclude that it might not be the fish itself that offers mental benefits to older individuals, but the fact that it is part of an overall healthy lifestyle.

**Dosage:** Two to three servings per week. Cold-water fatty fish have the highest levels of omega-3s; these include salmon (Alaskan wild-caught has the fewest contaminants, while farmed salmon—usually labeled “Atlantic salmon”—are raised in crowded pens and fed fishmeal, and may have dangerously high levels of pesticides, PCBs, dioxins, and antibiotics, according to the Institute for Health and the Environment at the University at Albany), herring, mackerel, anchovies, and sardines. Other fish which are low in mercury—but have fewer omega-3s—include catfish, crawfish, croaker, flounder, perch, pollock, scallops, sole, and tilapia. Oysters (cooked, to avoid bacteria), king crab, and shrimp are also good choices. Canned light tuna is generally low in mercury and omega-3s, but fresh tuna steaks and canned white or albacore tuna can be high in mercury and omega-3 oils (though this can depend on how

the fish was caught—“troll-or-pole-caught” from the U.S. or British Columbia are much lower in mercury). Fish with the highest levels of mercury include grouper, king mackerel, orange roughy, shark, swordfish, and tilefish.

## GRAPE

**AKA:** Raisin, *Vitis labrusca*, *Vitis vinifera*.

**Effects:** In a Georgetown University Study published in the June 12, 2001 issue of *Circulation*, grape juice improves cardiovascular health by reducing platelet activity (platelets are blood cells that can form clots which, if not controlled, can block arteries and lead to heart attacks) and the free radical superoxide, and increasing nitric oxide production, which maintains blood vessel elasticity and reduces the clotting of blood; research indicates this is mainly due to resveratrol, a compound found in grape skins. A University of Cincinnati study also found that a glass a day significantly improved memory when compared with a placebo, and research at the University of Missouri-Columbia’s School of Medicine indicates that the consumption of grapes before and after a stroke may help reduce damage to the brain. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Any fruit should be ripe or slightly overripe to get its maximum benefits. White grapes do not have the same benefits as red or purple grapes. Grapes do not have the high concentrations of resveratrol seen in wine, and may not have the same level of protection, but still have some benefits. Imported grapes are on the Environmental Working Group’s “Dirty Dozen” list of produce containing the most pesticides, and they advise buying organic, as conventional grapes contain more pesticide residue than almost any other

fruits or vegetables, and washing will not remove all of it. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Though resveratrol may improve health, it does not appear to extend lifespan.

Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent. A 2011 Consumer Reports study found that many popular store brands contain arsenic and lead in levels that were high enough to pose a danger to children.

**Dosage:** One cup per day, a cup or two of juice per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day. Purple grape juice has the most benefits, while red and white grape juice contains fewer beneficial free radicals.

## HONEY

**Effects:** Contains polyphenols, antioxidants which counteract free radicals. The darker the honey, the more the antioxidants; for instance, honey made from Illinois buckwheat flowers has 20 times the antioxidants as honey made from California sage. Tupelo honey has the most fructose of any of the honeys and doesn’t cause the insulin rush that others do.

**Precautions:** For the most health benefits, the honey should be unfiltered, unheated, and



unprocessed. Despite the claims of some health advocates, the vitamin and mineral content of honey is minimal, and any derived benefits negligible. Honey also has the highest sugar content of all the natural sweeteners, and even has more sugar content than refined sugar; in fact, it can rot teeth faster than table sugar, possibly because of its stickiness and the fact that its vitamin and mineral content, however small, may provide a favorable environment for bacteria, though there is some evidence that it may prevent tooth decay, due to its acidity and the fact that it contains glucose oxidase, which can form hydrogen peroxide, an antiseptic.

The quality of honey from any given area can vary from year to year, as it is impossible to determine where millions of bees get their nectar, or to control the environmental pollutants and contaminants which may find their way into the honey. Compounding the problem is the fact that manufacturers may feed bees sugar water or add sugar syrup to the honey to increase the sweetness (a tip-off is inexpensive brands that pour easily). Further, the honey is heated to high temperatures, destroying much of the protein and nutritional content. Honey could also contain carcinogens that bees have inadvertently picked up from flowers sprayed with pesticides, or traces of penicillin and sulfite, which could pose a threat to susceptible individuals. Honey should never be fed to infants under one year of age, as it contains spores of *Clostridium botulinum*, the organism that causes botulism; while adults and older children have stomach acid that can kill the bacterium, infants do not, leaving them susceptible to sickness or even death.

**Dosage:** About four tablespoons a week is enough to raise the antioxidant activity in the blood and reduce arterial damage.

## IRVINGIA

**AKA:** African mango, agbono, bread tree, bush mango, dika nut, dikanut, dikka, duiker nut, etima, IGOB131, *Irvingia barteri*, *Irvingia excelsa*, *Irvingia gabonensis*, *Irvingia grandifolia*,

*Irvingia malayana*, *Irvingia robur*, *Irvingia smithii*, *Irvingia wombolu*, kaka, *Mangifera gabonensis*, manguier sauvage, odika, ogbono, wild mango.

**Effects:** Helps reduce the caloric value of food absorbed by the body which, in turn, may aid in the extension of lifespan. It aids in weight loss, but does not reduce the percentage of body fat, as has been claimed (Ngondi et al., 2009). A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Side effects include flatulence. Crude seed extract of *Irvingia gabonensis* appears to be safe for adults when taken orally for up to four weeks; standardized seed extract (IGOB131) appears to be safe for adults when taken orally for up to ten weeks. Since little is known about other potential side effects, it is recommended that it not be used by pregnant or breast-feeding women.

There are no known interactions with any other foods or drugs.

There is not yet enough evidence to fully support any claims of health benefits or understand any potential side effects.

**Dosage:** About one gram of crude seed extract of *Irvingia gabonensis* three times a day, or 150 mg twice a day of the standardized seed extract (IGOB131).

## MICROALGAE AND SEAWEED

**AKA:** *Aphanizomenon flos-aquae*, blue-green algae, chlorella, cyanobacteria, Green Magma, microphytes, nori, SBGA, spirulina, Super Blue Green Algae.

Microalgae are single-celled plants that grow in fresh water or bacteria. The most common types used for food are chlorella and spirulina, though seaweed could probably be placed in this category also.

**Effects:** Super Blue Green Algae (SBGA) is said to increase energy and give feelings of euphoria, cleanse the blood, reduce inflammation, rejuvenate the body, improve mental alertness, and boost the immune system, among other claims. All forms of microalgae and seaweed are excellent sources of amino acids, chlorophyll, protein (higher than meats or soybeans), unsaturated fats, minerals, vitamins A, B-12, C, and E, and antioxidants.

**Precautions:** Microalgae and seaweed are good sources of amino acids and some vitamins but, beyond that, claims of their nutritional or therapeutic value are overstated and have not been proven scientifically. Very few studies have involved humans, with most having been conducted on animals and test tube cultures. According to Dr. Andrew Weil, M.D., there is no evidence SBGA strengthens the immune system, and Sheldon Saul Hendler, M.D., Ph.D., states there is no scientific evidence for the salubrious effects attributed to these organisms, except for one report that spirulina is a good source of gamma-linolenic acid (GLA). If these plants are grown in water that is contaminated, they will contain those contaminants. They should not be taken by women who are pregnant, planning on getting pregnant, or are breast-feeding. They should not be given to children under the age of two.

Super Blue Green Algae can cause such serious side effects as abdominal distress, diarrhea, dizziness, gastrointestinal problems, headaches, heart palpitations, nausea, skin rashes, vomiting, and women may even experience uterine bleeding. Adverse side effects may result from an allergy or intolerance, either to contaminants in harvesting or possible natural toxins in the SBGA itself. *Aphanizomenon flosaquae*, used in the making of SBGA, is capable of producing two toxins, one of which affects the liver and the other the nervous system; it could also contain any number of naturally occurring toxins that are as yet undiscovered.

Spirulina is high in phenylalanine, and so should not be taken by anyone with phenylketonuria (PKU) or skin cancer. There is no way

of controlling the purity or potency of spirulina—consider the fact that Elliot Shubert, Ph.D., professor of biology at the University of North Dakota at Grand Forks, has found that every sample tested had significant levels of the toxic metals mercury and lead. Not only that, Harvard researchers have discovered that some components of this microalgae may encourage the growth of cancerous tumors. And the fact that no one knows what the pharmacological agent is that provides the stimulant effect worries Dr. Andrew Weil, as it may cause dependency.

There are no known interactions with other substances.

**Dosage:** None established.

## MILK

**Effects:** According to a 2009 study at Oxford University, it could help prevent neurodegenerative disease such as Alzheimer's, possibly due to the protective effect on nerve cells from vitamin B-12. This holds true even for skimmed milk.

**Precautions:** Whole milk contains significant amounts of saturated fats, though some contend that low-fat milk is a greater contributor to obesity, as the fat is replaced with sugar (Jon White, "Is full-fat milk best? The skinny on the dairy paradox," *New Scientist*, February 21, 2014). Milk may also contain recombinant bovine somatotropin (rBST, or bovine growth hormone), a genetically engineered synthetic hormone used to increase milk production in cows; its health effects on humans who consume milk is a subject of great controversy. According to Molly Raisch, writing in *Prevention* magazine, cafeteria milk may contain the artificial sweetener aspartame. Raw milk, or milk that has not been pasteurized, may contain harmful bacteria.

About 1 in 4 Americans show symptoms of lactose intolerance, though Josh Harkinson in a *Mother Jones* article asserts that this may be due to the fact that they are unable to digest the A1 protein, which is found in the Holstein cows favored by American and European

dairies, but not other breeds of cows (whose milk contains the A2 protein). Goat and human breast milk also contain the A2 protein, but much less vitamin B-12. There is some controversy over whether the A1 protein contributes to a whole range of health problems (e.g., asthma, eczema, heart disease, diabetes, autism) due to its release of the opioid beta-casomorphin7 (BCM7), though the evidence is far from conclusive, and much more research needs to be done.

When consumed within two hours before or after eating blueberries, the milk protein can reduce the effectiveness of the antioxidant phenols in the blueberries. Adding milk to coffee ties up some of the beneficial compounds of coffee, rendering them useless.

**Dosage:** From two glasses to half a liter or more of milk per day.

## MINERAL WATER

According to the U.S. Food and Drug Administration, water must naturally contain at least 250 parts per million total dissolved solids (minerals cannot be added). In popular terminology, “mineral water” could refer to plain soda water, as well.

**Effects:** According to Chris Exley, Ph.D., professor of bioinorganic chemistry at Keele University, mineral water high in silica may help protect the brain from the harmful effects of aluminum, which is considered a neurotoxin (Histology and Histopathology, August 2012).

**Precautions:** None known.

**Dosage:** None established.

## MULBERRY

**AKA:** *Morus genus* (there are some two dozen different species worldwide).

**Effects:** Preliminary research at the Khon Kaen University in Thailand indicates that mulberries can protect against oxidative stress and memory loss in mice. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in

mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Any fruit should be ripe or slightly overripe to get its maximum benefits. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

**Dosage:** One cup per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day.

## NEW ZEALAND GREEN-LIPPED MUSSEL

**AKA:** Greenshell mussel, kuku, kutai, *Perna canalicula*, sea mussel.

**Effects:** The oil of this shellfish is rich in amino acids, enzymes, and essential trace elements, and is said to be similar to omega-3, but more potent in its health benefits.

**Precautions:** None known. The New Zealand Greenshell mussel industry operates under strict quality standards, with both the mussels and water regularly tested for toxins, bacteria, and contaminants.

**Dosage:** Two to three servings per week.

## NONI

**AKA:** Beach mulberry; cheese fruit; great morinda; Indian mulberry; *Morinda citrifolia*; Proxenol.

See also the entry for Proxeronine.

**Effects:** Reportedly aids cell regeneration, strengthens the immune system, and slows aging. One study on rats indicates that *Morinda officinalis*, used in traditional Chinese medicine, may have anti-depressant properties (Zhang et al., 2002). A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Side effects may include diarrhea. The juice should not be consumed by anyone with kidney dysfunction, who take ACE inhibitors or angiotensin-receptor blockers, as it contains significant amounts of potassium. It may have anti-clotting properties, and should probably be used with caution by those taking anti-clotting medications. There are several cases of individuals who have suffered liver damage from drinking the juice. According to Dr. Ray Sahelian, “there is no firm scientific data to support the use of *Morinda citrifolia* juice as a substitute for any standard medical treatment.” There appears to be some disagreement concerning what parts of the plant are most beneficial, whether processing destroys its beneficial ingredients, and whether the immature fruit is healthier than the ripe fruit. The capsule form may contain toxic ingredients such as barium carbonate.

**Dosage:** None established. Dr. Sahelian recommends no more than an ounce of juice every other day.

## OLIVE OIL

**AKA:** *Olea europaea*.

**Effects:** Contains the compound oleocanthal, which is believed to protect the nerve

cells from the beta amyloid damage associated with Alzheimer’s disease (Abuzniat et al., 2013). Also contains the flavonoid luteolin, which has been found to reduce the levels of beta-amyloid, the sticky deposits associated with Alzheimer’s disease, in mice (Tan et al., 2008) and to inhibit age-related inflammation of the brain and associated memory problems in mice (Jang et al., 2010).

**Precautions:** It is recommended that extra virgin olive oil be used, as it is made by a purely physical process rather than using solvents, heat, and intense pressure, and it should be kept away from heat and light until used. Unfortunately, much imported olive oil may be heavily adulterated with sunflower, canola, or hazelnut oil (so much so that, in the late nineties, the European Union had to form a special task force to combat the problem), and products sold as Italian olive oil may actually be using oil produced in Spain, Greece, or Turkey. There are also no regulations regarding labeling and various claims about olive oil; terms such as “premium,” “cold-pressed,” and “imported from Italy” are meaningless and misleading, “refined” means that the oil has been processed with solvents to make the smell and taste more pleasing, and “pure” refers to an olive oil that is a mixture of virgin and refined. Olive oil can stay usable for up to two years; rancid oil smells or tastes of wax, salami, or peanuts, and should not be used.

**Dosage:** About 2 tablespoons per day.

## ONION

**AKA:** *Allium cepa*, bulb onion, common onion.

**Effects:** Contains the antioxidant quercetin, which may protect brain cells against oxidative damage that is typically associated with Alzheimer’s and other degenerative brain diseases. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eat-

ing seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014). A Dutch study found that eating at least six ounces of white-fleshed produce a day may cut the risk of stroke by half (Griep, 2011).

**Precautions:** The consumption of any specific food to fight Alzheimer's is still theoretical, as most positive results have been limited to cell studies, as opposed to more advanced research in animals; genetics and environment may also play a role in the development of the disease. According to Leigh Erin Connealy, M.D., "Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure." A 2010 study found that quercetin can aggravate and possibly trigger kidney cancer.

**Dosage:** One cup per day. The average person should consume at least five servings of different fruits and vegetables per day.

## PEPPER

**AKA:** *Capsicum genus*.

**Effects:** Virtually all types of peppers contain some capsaicin, a phytochemical (a non-nutrient compound found in plant foods), which is the source of its heat, or spiciness. Capsaicin improves circulation and reduces clotting of the blood. The heat rating of peppers is measured in Scoville units, with bell peppers having a rating of zero and the hottest, the habenero, having a rating of about 250,000 Scoville units; the average jalapeno has a rating of about 5500. In general, the rating is inversely proportional to the size of the pepper. Green peppers contain the flavonoid luteolin, which has been found to reduce the levels of beta-amyloid, the sticky deposits associated with Alzheimer's disease, in mice (Tan et al., 2008), and to inhibit age-related inflammation of the brain and associated memory prob-

lems in mice (Jang et al., 2010). A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Bell peppers are on the Environmental Working Group's "Dirty Dozen" list of produce containing the most pesticides, and they advise buying organic bell peppers, as conventional ones contain more pesticide residue than almost any other fruits or vegetables, and washing will not remove all of it. According to Leigh Erin Connealy, M.D., "Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure."

**Dosage:** One cup per day. The average person should consume at least five servings of different fruits and vegetables per day. To obtain the most capsaicin, eat the entire pepper, seeds and all.

## PISTACHIO

**AKA:** *Pistacia vera*.

**Effects:** According to researchers at Penn State, pistachios are "high in lutein, beta-carotene and gamma-tocopherol relative to other nuts" and can increase the levels of these antioxidants in the blood of individuals with high cholesterol.

**Precautions:** None known.

**Dosage:** Approximately 1.5 to 3 ounces in a diet consisting of 30–34 percent total fat and 8 percent saturated fat.

## POMEGRANATE

**AKA:** *Punica granatum*.

**Effects:** Contains higher amounts of the

antioxidant flavonoids than red wine, green tea and most fruits and vegetables. In a study published in the medical journal *Neurobiology of Disease* (December 2006), researchers suggest that it may work just as well as some prescription drugs at preventing the progression of Alzheimer's disease. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** According to *Consumer Reports Health*, “[l]ike grapefruit juice, pomegranate juice appears to interfere with an enzyme that’s critical to the proper metabolism of many common medications.” Any fruit should be ripe or slightly overripe to get its maximum benefits. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Dr. C. Y Lee, Ph.D., professor and chairman of the Department of Food Science & Technology at Cornell University cautions that the use of food to fight Alzheimer’s is theoretical, as genetics and environment may also play a role. Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

**Dosage:** One cup per day, or one-half cup

of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day. One glass a day of the juice should be adequate to reap the benefits of its antioxidants.

## POPCORN

**AKA:** Corn, maize, *Zea mays everta*.

**Effects:** Researcher Joe Vinson and others at the University of Scranton in Pennsylvania have found that popcorn has a higher concentration of polyphenols, or antioxidants, than fruits or vegetables, due to its low water content (4 percent as opposed to up to 90 percent). One serving of popcorn can contain up to 300 mg of antioxidants, as opposed to 160 mg for fruits, and provide an individual with almost 75 percent of their daily requirement for whole grains. The hulls, in particular, have high levels of antioxidants and fiber. It also has fewer calories than other snacks such as chips or trail mix.

**Precautions:** No known side effects. It lacks vitamins and other essential nutrients found in fruits and vegetables. Popcorn must be eaten plain, without salt, butter, or other added ingredients. Some brands, such as Pop Secret’s Movie Style Popcorn, may have as much as 4.5 grams of trans fats. Movie theater popcorn is often popped in coconut oil, then flavored with butter or margarine, so that a medium-sized popcorn can easily exceed the recommended dietary fat intake for an entire day. Microwave popcorn has twice the calories of popcorn that is air-popped, and contains perfluorooctanoic acid (PFOA), and perfluorooctane sulfonate (PFOS), which prevent grease from leaking through the packaging, both of which are associated with cancer, endocrine problems, infertility, thyroid disease, heart disease, suppression of the immune system, and increased cholesterol levels. Some microwave popcorns may also contain the butter-flavoring agent diacetyl, which has been linked to respiratory problems and Alzheimer’s disease.

**Dosage:** A person should consume 300 to 400 g/day of complex carbohydrates.

## PROBIOTICS

**AKA:** *Bifidobacterium infantis*; *Bifidobacterium animalis subsp Lactis*; *Bifidobacterium longum*; *Lactobacillus bulgaricus*; *Lactobacillus helveticus*; *Lactobacillus rhamnosus*; *Lactococcus lactis subsp Lactis*; *Streptococcus thermophiles*.

Beneficial bacteria found in certain foods, including kefir, kimchi, kombucha, miso, sauerkraut, tempeh, and yogurt.

**Effects:** Studies have shown that mice that ate probiotic foods were better able to handle anxiety and showed increased activity in the areas of the brain dealing with emotions and memory. A 2011 study published in the British Journal of Nutrition found that probiotics (*L. helveticus* and *B. longum*) may help alleviate stress, depression, and anxiety in people, though the two strains used are not currently available in foods. A 2013 study by Tillisch et al. using magnetic resonance imaging concluded that a “[f]our-week intake of an FMPP (fermented milk product with probiotic) by healthy women affected activity of brain regions that control central processing of emotion and sensation,” reducing the time needed to perform a task with strong emotional content. *B. infantis* and *L. rhamnosus* have been found to reduce depression and anxiety in animals respectively; *L. rhamnosus* can also reduce OCD-like behaviors in mice as well as alter GABA receptors and synthesize and release GABA (see entry). A research team led by Mitsuahara Matsumoto found that mice fed *B. animalis* subspecies *lactis* LKM512 had longer lifespans. See also entry under Microbiota.

**Precautions:** No known side effects, though research on, and understanding of, probiotics is still in its infancy. John Cryan, professor of anatomy and neuroscience, and Timothy Dinan, professor of psychiatry, state in a 2014 New Scientist article that most probiotics don’t provide any psychological benefits, and those that do are no substitute for traditional treatments for depression and other mental disorders. There are a number of dif-

ferent strains, each with its own specific benefits. Though Dr. Joseph E. Pizzorno Jr., former member of the White House Commission on Complementary and Alternative Medicine Policy has used probiotics to treat such conditions as irritable bowel disease, acne, and premenstrual syndrome, he cautions that commercial products may contain bacterial strains that have not been medically tested and/or may actually be dead.

Probiotic bacteria can be killed off by prolonged storage, antibiotic drugs, and stomach acid.

**Dosage:** None established.

## PROTEIN-RICH FOODS

**AKA:** Dairy products (milk, eggs), meat, protein-enriched foods, protein supplements.

**Effects:** Research by Akiva Cohen and others of the University of Pennsylvania in Philadelphia seems to confirm the findings of Simona Viglio and other Italian biochemists of the University of Pavia that protein aids in recovery from brain injuries. The belief is that the branched-chain-amino-acids (leucine, isoleucine, and valine) in such foods as chicken, fish, and protein shakes may restore normal levels of neuronal excitation and inhibition by forming new neurotransmitters

**Precautions:** Improvements in functioning and behavior may be very limited. Consuming too much protein (especially in combination with insufficient carbohydrates) may result in a diet containing too much fat, too many calories, and not enough vitamins and other nutrients, which can lead to a buildup of ketones, resulting in kidney damage due to buildup of ammonia in the blood, dehydration, loss of muscle mass, loss of calcium, cardiac problems due to high cholesterol, and reduced brain and nervous system function due to hepatic encephalopathy. Symptoms may include fatigue, nausea, diarrhea, headache, dizziness, heart palpitations, and bad breath. According to Valter Longo of the University of Southern California Longevity Institute, caloric intake of at least 20 percent animal protein is associated

with a much higher risk of death from cancer or diabetes.

**Dosage:** About 10 to 35 percent of daily caloric intake. Women need about 46 g/day, while men need about 56 g/day. It is generally believed we get sufficient protein from our diets without need for supplementation (in fact, the average American and Western European diet supplies up to twice the recommended amount).

### ROQUEFORT CHEESE

**Effects:** A research team led by Dr. Ivan Petyaev and Dr. Yuriy Bashmakov found that Roquefort cheese may have anti-inflammatory properties and help protect against cardiovascular disease.

**Precautions:** It is high in salt and saturated fat.

**Dosage:** None established.

### ROYAL JELLY

Royal jelly is made from bee pollen, saliva secretions of worker bees, and honey, and has a thick, milky texture.

**Effects:** Alternative medicine practitioners believe it has anti-aging effects. Evidence indicates it can stimulate the growth of glial cells in the mouse brain (Hashimoto et al., 2005) and neural stem cells in vitro (Hattori et al., 2007). It is said to protect against bacteria, viruses, and fungi. It contains many vitamins, minerals, amino acids, fatty acids, enzymes, and testosterone, and is one of the richest natural sources of B-5, as well as the sole natural source of pure acetylcholine.

**Precautions:** John H. Renner, M.D., president of the Consumer Health Information Research Institute, asserts that any health benefits of bee pollen are a myth, and that it can even be harmful, as it may contain harmful bacteria, or trigger an allergic reaction from the variety of pollens it may contain. The few studies that have been conducted bear out this statement.

It should not be eaten by those who are al-

lergic, as it could lead to hives, asthma, and fatal anaphylaxis.

It is more stable when mixed with honey, and it loses some of its nutritional value when exposed to air, room temperature, or sunlight. It should never be used in hot drinks, nor should anything hot be consumed immediately after taking it. Some avoid the freeze-dried form, as the chemical structure is said to be altered in the process. Pure royal jelly, the most potent form, is extremely unstable and should always be kept refrigerated.

**Dosage:** Approximately 1/3 of a teaspoon daily; in capsule form, some recommend 150 mg/day, others 600 mg/day. Manufacturers say several weeks may pass before the beneficial effects of improved mental functioning and concentration are evident. It is available in sealed capsules, frozen, freeze-dried, or mixed with honey.

### SESAME SEED

**AKA:** *Sesamum indicum*.

**Effects:** Contains high amounts of the amino acid arginine, which is necessary for the synthesis of nitric oxide, a compound that increases blood flow in the body. This may also hold true for tahini, or sesame seed paste.

**Precautions:** Should not be eaten by those who are allergic. Symptoms include nasal problems such as sneezing, nasal itching, congestion, and rhinorrhea; respiratory problems such as wheezing, coughing, tightness in the throat, and difficult breathing; and other problems, including facial flushing, hives, swelling of the lips and eyelids, abdominal pains, dizziness, drowsiness, chills, unconsciousness, and shock with attendant drop in blood pressure.

**Dosage:** None established.

### SORGHUM BRAN

**AKA:** *Sorghum genus* (about thirty species).

**Effects:** According to a 2010 University of Georgia study, the black and sumac varieties of sorghum bran have greater antioxidant



properties than fruit such as blueberries and pomegranates or bran from other grains such as oats, rice, and wheat.

**Precautions:** The sorghum must be a high-tannin product; most sorghum is low-tannin, and is used for cattle feed or to manufacture ethanol fuel for cars.

**Dosage:** None established, though normal dietary levels should be sufficient.

## SOY

**AKA:** Edamame (whole soybeans), *Glycine max* (L.) Merr., hydrolyzed soy protein, hydrolyzed vegetable protein, lecithin (soy oil extract), miso (soybean paste), natto, soya bean, soy flour, soy milk, soy protein concentrate, soy protein isolate (SPI), soy sauce, tamari, tempeh, textured vegetable protein (TVP), tofu (soy bean curd), vegetable oil.

**Effects:** Preliminary research has shown that an enzyme from fermented soy—nattokinase—can degrade fibers in beta-amyloid plaques. Tempeh has been found to be associated with better memory in the elderly (Hogervorst et al., 2008). Soy has also been shown to improve cognitive function and verbal memory in post-menopausal women (Kritz-Silverstein et al., 2003; File et al., 2005). One study has found that a high-soy diet consumed by men and women in their 20s resulted in an improvement of verbal-memory skills. Soybeans are considered to be a source of complete protein, i.e. having significant amounts of all the essential amino acids.

**Precautions:** The subjects in the latter study knew that their consumption of soy was supposed to result in better test scores, and presumably tried harder the second time, tainting the results. Evidence suggests that some forms of soy may have negative effects on cognitive function in the elderly (White et al., 2000; Sirtori, 2001; Hogervorst et al., 2008), though at least one of the studies (White) was criticized as being flawed (Guo et al., 2000). Raw soybeans are generally considered to be toxic and unfit for consumption. Modern processing of soy removes many of the

nutrients, but leaves in the anti-nutrients and introduces toxins. Some FDA researchers warn that soy may promote cancer and thyroid disorders, and that it may be a factor in the formation of kidney stones in those who are susceptible. There is conflicting evidence on whether the isoflavones, or estrogen-like compounds, in soy contribute to the formation of breast tumors. Bill Helferich, a University of Illinois nutritionist feels that isoflavones may promote existing breast cancers but prevent them in women who do not have them, while Ruth McDonald, a University of Missouri-Columbia professor of food science and human nutrition believes that isoflavones may prevent breast cancer until menopause but increase the risk of developing it afterwards. According to Dr. Joseph Mercola, 90 to 95 percent of soybeans grown in the United States are genetically engineered and may cause reproductive problems in women and serious birth defects in children, including autism. While fermented soy is generally considered healthy, unfermented soy is not—Dr. Mercola states that “[t]housands of studies have linked unfermented soy to malnutrition, digestive distress, immune-system breakdown, thyroid dysfunction, cognitive decline, reproductive disorders and infertility—even cancer and heart disease,” and that it can be found in foods under the terms “soy protein isolate,” “bouillon,” “natural flavor,” and “textured plant protein.” In 1979, the Federation of American Societies for Experimental Biology (FASEB) stated that the only safe use for soy protein isolates was for sealers for cardboard packages. Certified nutritionist Dr. Kaayla T. Daniel in her article “The DARK Side of Soy: America’s Favorite ‘Health’ Food” (and her book *The Whole Soy Story*) says research has shown there are several anti-nutrients in soy, including “[p]rotease inhibitors [which] interfere with protein digestion and have caused malnutrition, poor growth, digestive distress, and pancreatitis, [p]hytates [which] block mineral absorption, causing zinc, iron, and calcium deficiencies, [l]ectins and saponins [which] have caused leaky gut and other gastrointestinal and

immune problems, ... [o]xalates-surprisingly high in soy-[which] may cause problems for people prone to kidney stones and women suffering from vulvodinia, a painful condition marked by burning, stinging, and itching of the external genitalia,” phytoestrogens or isoflavones, which can cause thyroid problems and hormone disruption associated with fertility problems in both men and women (as little as 45 grams per day may disrupt menstrual cycles in women), and toxic levels of manganese, which have been linked to learning disorders, including dyslexia and attention-deficit problems. In traditional Asian diets, soy is only eaten in modest amounts (9.3 to 36 grams per day), most of which is fermented, while a cup of tofu or soy milk can average 240 to 250 grams. Dr. Mark Messina, adjunct professor of nutrition at Loma Linda University in Southern California, and consultant for the soy industry, refutes many of Daniel’s claims as quasi-science, citing several decades of research attesting to soy’s safety. An August 2005 report by the National Institute of Health concluded that “the long-term adverse effect of soy in a large population is uncertain.”

Soy should not be eaten by women who are pregnant, as it may damage the developing fetus, or who are at risk of developing—or who have—breast cancer. Individuals with a tendency to thyroid conditions may want to limit their intake of soy. Soy, especially soy formula and soy milk, should not be given to infants or children (The Israeli health ministry has advised against feeding any soy formula at all to infants.) due to its high manganese content (the immature livers of infants cannot process it adequately) and high aluminum levels from processing (ten times higher than other formulas and one hundred times higher than breast milk); problems with the latter include dementia, memory loss, confusion, coordination problems, and digestive difficulties. High isoflavone levels in soy-based formulas, according to Daniel, may be partly to blame for the premature onset of puberty in girls, though many prominent pediatric doctors who have reviewed the literature dispute this,

stating that these compounds consumed early in life should not affect childhood development years later. Children who suffer from peanut allergies and asthma may have a greater risk of allergic reactions to soy, according to the Swedish Ministry of Health and Social Affairs, which issued a warning after researchers in that country found that severe allergic reactions were the cause of five deaths of children from 1993 to 1996. Those allergic to soy may experience coughing, sneezing, runny nose, hives, diarrhea, problems with swallowing, and anaphylactic shock, or delayed symptoms that may include sleep disruption, bed-wetting, sinus and ear infection, moodiness, joint pain, chronic fatigue, and gastrointestinal problems that can occur from one-half day to one week after ingestion.

Soy can often be adulterated with hydrogenated fats, sugar and other sweeteners, salt, artificial flavorings, colors, and monosodium glutamate (MSG).

**Dosage:** No more than 36 grams per day; the Food and Drug Administration recommends 25 grams per day.

## SPINACH

**AKA:** *Spinacia oleracea*.

**Effects:** One study reported that a diet supplemented with spinach can “reverse age-induced declines in beta-adrenergic receptor function in cerebellar Purkinje neurons” as well as improve learning on motor tasks and memory in aging rats (Bickford et al., 2000). A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** The Environmental Working Group advises buying organic, as conventional spinach contain more pesticide residue than almost any other fruits or vegetables, and

washing will not remove all of it. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.”

**Dosage:** One cup per day. The average person should consume at least five servings of different fruits and vegetables per day.

## STRAWBERRY

**AKA:** *Fragaria x ananassa*.

**Effects:** Contains substantial amounts of phytochemicals, or non-nutritive compounds, which may protect against brain degeneration. Contains high amounts of antioxidants called flavonoids, which can improve memory—possibly by enhancing communication between brain cells—and may be able to help protect against degenerative diseases such as Alzheimer’s by preventing inflammation of the brain, a major factor in the progression of these diseases. Is also a good source of anthocyanins and flavanols, which encourage the growth of connections between brain cells. Also contains high amounts of the antioxidant quercetin, which may protect brain cells against oxidative damage that is typically associated with Alzheimer’s and other degenerative brain diseases. Improvements in cognition and motor control have also been found. A 2012 review of the literature by Marshall G. Miller and Barbara Shukitt-Hale of the Human Nutrition Research Center on Aging at Tufts University confirms these beneficial effects of strawberries and other berries. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014).

**Precautions:** Any fruit should be ripe or slightly overripe to get its maximum benefits. Strawberries are on the Environmental Working Group’s “Dirty Dozen” list of produce containing the most pesticides. According to Leigh Erin Connealy, M.D., “Because of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” Canned fruit and fruit consumed in baked goods may contain high amounts of sugar and other unhealthy ingredients. Drinking fruit juices without pulp is not as beneficial as eating the whole fruit, as juices lack dietary fiber and phytochemicals, have added sugar, and may add excess calories if more than a half-cup a day is consumed; a 2013 Harvard University study found that drinking a glass of fruit juice a day increases the risk of diabetes by 21 percent.

**Dosage:** One cup per day, or one-half cup of dried fruit. The average person should consume at least five servings of different fruits and vegetables per day.

## TOFU

**AKA:** *Glycine max*, soy bean curd.

**Effects:** According to a study published in the *American Journal of Epidemiology*, of 1155 men and women living in the city of Shenyang, China in the 1980s, there was a negative correlation between the amount of tofu eaten and high levels of lead in the blood, possibly due to calcium in the tofu preventing the body from absorbing and retaining the toxic metal.

**Precautions:** See the entry for Soy.

**Dosage:** No more than 35 grams per day.

## VEGETABLES

**Effects:** According to a study in the journal *Neurology* by epidemiologist Martha Clare Morris of the Rush University Medical Center

in Chicago, more than two servings a day, especially of the leafy green vegetables such as spinach, kale, and collards, can slow cognitive decline by approximately 40 percent. It is not known why vegetables have this effect, but it is believed that vegetable fats and oils may help the body absorb vitamin E. A 2004 study conducted by Antonio Martin of the Nutrition and Neurocognition Laboratory at the Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University in Boston, Massachusetts found that eating two bowls a day (for a total of 17 ounces) of gazpacho for two weeks significantly reduced the levels of stress molecules in the blood, and a 2001 study suggests that delphinidin, the antioxidant in eggplants, can protect cells from free radical damage and reduce DNA damage. Root vegetables, such as rutabagas, turnips, parsnips, carrots, and beets, are high in antioxidants. A New Zealand study involving 281 healthy young adults found that eating seven to eight fruits and vegetables per day could lead to improvements in mood within 24 hours (White et al., 2013); a study of 80,000 Britons the year before found a strong correlation between eating five to eight servings of fruits and vegetables per day with happiness and psychological health (though, it should be noted, it was unclear in that case whether improvement in diet caused improvement in mood, or whether happier people have healthier diets), and another study involving 65,000 adults found that those eating seven fruits and vegetables a day had a decreased risk of death over those who ate just five (Oyebode et al., 2014). A Dutch study found that eating at least six ounces per day of white-fleshed vegetables such as cauliflower and cucumbers can cut the risk of stroke by half (Griep, 2011).

**Precautions:** Vegetables should be cooked to kill bacteria and to make more of their nutrients available to the body; steaming and stir-frying are two methods that retain the most nutrients. Canned vegetables can be contaminated with the toxic chemical BPA, which has been linked to reproductive problems, breast and prostate cancer, diabetes, and heart dis-

ease; acidic foods (e.g., tomatoes) cooked in aluminum pots and pans can absorb trace amounts of the metal, a known neurotoxin. According to the Environmental Working Group, celery, cherry tomatoes, cucumbers, hot peppers, bell peppers, spinach, kale, collard greens, summer squash, and potatoes contain more pesticide residue than any other vegetables, and washing and peeling of produce will not remove all of it. Leigh Erin Connealy, M.D., states that “[b]ecause of pesticides and the diminished mineral levels in soils used today, eating non-organic produce will not provide you with the antioxidants (or vitamins and minerals) that your body needs. On average, organic produce contains nearly 30 percent more nutrients than non-organic and is grown without using harsh chemicals that can lead to further free radical exposure.” A Dutch study involving half a million Europeans found that smokers who ate plenty of fruits and vegetables slightly increased their risk of colon cancer.

**Dosage:** At least two servings a day. Contrary to popular belief, the nutrients in fruits and vegetables are well distributed and not concentrated mainly in the skin.

## WALNUT

**AKA:** *Juglans cinerea*, *Juglans major* (Arizona walnut), *Juglans nigra* (Black walnut), *Juglans regia* (English walnut, Persian walnut).

**Effects:** A good source of antioxidants and alpha linolenic acid (an omega-3 fatty acid), as well as vitamins, minerals, fiber, and high-quality protein. According to a 2009 study published in the British Journal of Nutrition, Tufts University researchers found that elderly rats fed a diet of six percent walnuts showed significant improvements in memory tests and motor skills; however, those fed a diet of nine percent walnuts experienced a decline in memory and other cognitive functions. Other research has found that half a cup a day can increase verbal reasoning in humans. Beneficial compounds, including vitamin E, folate, melatonin, and antioxidant polyphenols, keep the

central nervous system healthy and maintain rapid synaptic transmission, and the alpha-linolenic acid in walnuts helps maintain neuronal membranes. A Spanish study has found that individuals who ate nuts had higher levels of brain-derived neurotrophic factor (BDNF), a protein necessary for cell growth and transmission in the brain, than those who didn't. Joe Vinson of the University of Scranton in Pennsylvania states that a handful of walnuts contains about twice as much antioxidants as an equivalent amount of other commonly consumed nut, including peanuts, almonds, pecans, and pistachios, and that these antioxidants are up to fifteen times as potent as vitamin E. A 2010 Penn State study found that walnuts and walnut oil can help the body deal with stress and lower blood pressure, while a

2013 study lead by Dr. Charles Fuchs found that daily consumption of nuts can lead to at least an 11 percent reduction in deaths compared to those who don't eat nuts, though an association with a healthier lifestyle could not be completely ruled out.

**Precautions:** Walnuts are high in fat, though most of it is monounsaturated and polyunsaturated fats, which have no detrimental effect with respect to heart disease or cholesterol levels.

**Dosage:** The optimal dose in rats was equivalent to seven to nine walnuts in humans.

In the Penn State study, about 1.3 ounces (nine whole walnuts) or one teaspoon of walnut oil per meal was used, while in the Fuchs study subjects ate 1.5 ounces of nuts a day.

## *Herbs and Spices*

Since the mid-1990s, the sale of herbal supplements has nearly doubled, with many individuals using them to treat specific conditions, often without the consent of medical professionals. Care should be taken when using herbs, even teas, for medicinal purposes, as some of them (comfrey, aconite, pennyroyal, and ephedra, for example), including ones sold in health food stores, are very powerful, even deadly, if used indiscriminately. Individual herbs may have several active ingredients that enhance each other's effects; other herbs may be added in a blend that increases the absorption, transport, and effectiveness of the main herb. Preparing herbs from extracts insures the standardization of the level of the active ingredients, as the ingredients in the plants themselves can vary according to soil conditions, climate, when the plant is harvested, and the method of preparation (the word *standardized* should be on any herbal product). Brand-name herbal products made in the U.S., where qualitative standards are higher than in other countries, are preferred. Nevertheless, there is a lack of regulatory oversight and, according to a congressional investigation, virtually all herbal supplements that were tested had some levels of harmful contaminants (over half the FDA recalls since 1994 involved dietary supplements).

A 2013 study of imported spices by the Food and Drug Administration found that 7 percent had significant amounts of salmonella,

most notably in coriander, oregano, basil, and black pepper. Three outbreaks of salmonella poisoning in the previous five years have been traced to spices. Heat kills the bacteria, so seasoning food before cooking will remove the risk. In the same year, Canadian researchers, using DNA tests, found that most of the forty-four supplements sold by twelve companies were largely composed of powdered rice and weeds, and often had none of the herbs they were supposed to contain. Though genetic testing is not perfect (it cannot assess potency and may not be able to detect chemical extracts lacking genetic material), the fact that other plants (including those that were potentially allergenic or otherwise harmful) were identified and the stated herbs were not should be a caveat for any consumer of these products. As a general rule, herbs are only good for about a year, and spices about two years.

Self-diagnosis and self-treatment are not encouraged. A doctor should always be informed of what herbs are being taken, because some can interact with medications and prescription drugs. Pregnant or nursing women should avoid herbal supplements as a general rule. Supplements based on Ayurvedic medicine of Indian or South Asian tradition may be adulterated, and could contain toxic metals such as lead and mercury.

**Please note that many of the traditional claims of the benefits of most of these herbs have not been scientifically verified.**

## ANISE

**AKA:** Aniseed, common anise, *Pimpinella anisum*.

**Effects:** Contains several estrogen-like compounds, which could improve mood in women. It is said to increase male libido, though there is no scientific evidence for this.

**Precautions:** Anise oil can cause upset stomach, diarrhea, nausea, and vomiting. Japanese anise (*Illicium lanceolatum*) is poisonous.

**Dosage:** James Duke, Ph.D., recommends adding 1 to 2 teaspoons of crushed seed per cup of boiling water, steeping for 10 to 15 minutes, then straining. Take once in the morning and once in the evening.

## ASHWAGANDHA

**AKA:** Ashwaganda, Winter cherry, *Withania somnifera*.

Sometimes referred to as the “Indian ginseng,” Ashwagandha is a member of the nightshade family, along with potatoes, tomatoes, and eggplants; it is unrelated to fruit cherries (*Rosaceae*). The term “winter cherry” could refer to other plants of the *Solanaceae* genus, some of which may be poisonous.

**Effects:** According to traditional Indian medicine, it is said to reduce stress, anxiety, depression, and physical and mental fatigue, and to improve vitality, learning, and memory. There have been few studies, but those conducted have yielded encouraging results: it enhanced mood and improved hemoglobin and blood plasma protein levels in a 1993 study, was shown to alleviate withdrawal symptoms in morphine addiction in a 1995 study, and showed positive results for patients with anxiety neurosis in a 1997 study. A 2001 study by J. N Dhuley of the Laboratory Pharmacology and Toxicology, Research Centre, Hindustan Antibiotics Ltd., in India, concluded that it improved the memory of rats subjected to electroconvulsive shock and scopolamine.

Works synergistically with gotu kola, shatavari (Indian asparagus), and Siberian ginseng to relieve stress.

**Precautions:** It may cause mild gastrointestinal problems, but this can be prevented by taking it with meals. Exceeding the recommended dose is not advised, as it may contain some compounds that are harmful when taken in significant quantities. Herbal products from India may be contaminated with mold, insects, and animal feces. The berries, when eaten, can cause severe gastrointestinal pain.

Children should not be given this herb unless prescribed by a medical health practitioner. It should not be taken by women who are nursing or pregnant, or by individuals who are taking monoamine oxidase inhibitors (MAOIs).

When taken with other herbs, it is recommended that a lower dosage be used. When combined with benzodiazepines, selective serotonin reuptake inhibitors (SSRIs) or serotonin norepinephrine reuptake inhibitors (SNRIs), it could result in drowsiness.

**Dosage:** One to two cups of tea a day, or 50 to 250 mg per day in capsule form.

## ASTRAGALUS

**AKA:** *Astragalus hoantchy*, *Astragalus membranaceous*, huang chi, huang qi, milk-vetch root.

**Effects:** An adaptogen that may provide energy and stamina, boost the immune system, detoxify various drugs and metals, have antiviral properties, improve peripheral circulation, balance the bodily systems, counteract stress, and improve mental functioning. A 2008 study by Rita Effros has found that TAT2, a drug extracted from astragalus, can enhance the body’s immune response and increase lifespan by reducing telomerase shortening, resulting in increased cell division and enhanced antiviral activity; furthermore, it was found that it did not result in a higher risk of cancer normally associated with telomerase production.

Said to work synergistically with schizandra berry.

**Precautions:** Though TAT2 may have antiaging properties, the herb may not, and experts

recommend against taking it for this reason, especially for any length of time. It should not be taken by those running a fever. Since it can enhance the immune system, it should not be taken by those who have had organ transplants or who are taking immune-suppressing drugs. It should not be taken by children or pregnant women unless prescribed by a medical health practitioner.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** In China, the usual dose of a decoction is 9 to 16 g/day, or 9 g/day of a powder composed of 15 to 20 percent astragalus. Cancer patients are generally given up to 30 g/day. Earl Mindell, R.Ph., Ph.D., recommends 400 mg 1 to 3 times a day.

### ATRACTYLODES (WHITE)

**AKA:** AMK, ATR, Atractylenolide, *Atractylis lancea*, *Atractylis ovata*, *Atractylodes chinensis*, *Atractylodes japonica*, *Atractylodes lancea*, *Atractylodes macrocephala*, *Atractylodes ovata*, *Atractylodis Radix*, Bai Zhu, Bai-Zhu Atractylodes, Byaki-jutsu, Cang Zhu, Cangzhu, Chang Zhe, Jutsu, Paekch'ul, Red Atractylodes, *Rhizoma Atractylodis*, *Rhizoma Atractylodis Macroce*, *Rhizoma Atractylodis Macrocephalae*, So-jutsu, White Atractylodes, White Atractylodis.

**Effects:** In traditional Chinese medicine, it is prescribed for fatigue.

**Precautions:** No known side effects. It should not be used by women who are pregnant or breast-feeding. It may cause an allergic reaction in individuals who are sensitive to the Asteraceae/Compositae family (ragweed, chrysanthemums, marigolds, daises, etc.).

There are no known interactions with other substances.

**Dosage:** None established.

### BACOPA MONNIERA

**AKA:** Andri, Bacopa, *Bacopa monniera*, *Bacopa monnieri*, *Brahmi*, Herb of Grace, Herpestis Herb, *Herpestis monniera*, Indian Pen-

nywort, Jananimba, Jal-Brahmi, Jalnaveri, Keenmind, Nira-Brahmi, *Moniera cuneifolia*, Sambrani Chettu, Thyme-Leave Gratiola, Water Hyssop.

**Effects:** Has been used in traditional Ayurvedic medicine for centuries to enhance learning, concentration, and memory, and to relieve anxiety. One recent study has found that it can increase the speed at which visual information is processed in the brain, the rate of learning, and improve memory consolidation and retention (Stough et al., 2001), another, that it can significantly improve working memory, in particular, the accuracy of spatial memory (Stough et al., 2008); other researchers have found that its benefits are limited to the retention of new material in subjects aged 40 to 65 (Roodenrys et al., 2002). In addition, its antioxidants may provide protection against free radical damage.

**Precautions:** Side effects include nausea, dry mouth, and fatigue. It should not be used by women who are pregnant or breast-feeding. It is recommended that it not be used for more than twelve weeks. It should not be confused with other substances called brahmi, including *Hydrocoteyle asiatica*.

There are no known interactions with other substances, though research has yet to be conducted to determine any potential hazards.

**Dosage:** The dosage used in one study was 300 mg/day, however, an effective dosage range has not yet been determined.

### BALM OF GILEAD

**AKA:** Balsam poplar, Pappelknospen, Poplar, Populi Gemma, *Populus balsamifera*, *Populus candicans*, *Populus gileadensis*, *Populus tacamahaca*.

Balm of Gilead is a North American poplar that is different from the biblical plant (*Commiphora meccanensis*) and Canada Balsam (Hemlock spruce, *Picea sp.*) of the same name.

**Effects:** May have antioxidant properties.

**Precautions:** Common side effects include skin rashes and allergic reactions.

It should not be taken by women who are



pregnant or breast-feeding, or individuals who are allergic to aspirins or similar medications, allergic to bee propolis, or allergic to Peru balsam.

There are no known interactions with other substances.

**Dosage:** None established.

## BILBERRY

**AKA:** Black whortleberry; blueberry; burren myrtle; dyeberry; European bilberry; huckleberry; hurtleberry; *Vaccinium corybosum*; *Vaccinium myrtillus*; whineberry; whortleberry; wineberry.

**Effects:** A natural antioxidant.

Works synergistically with citrus fruits.

**Precautions:** Though the fresh berries can stop diarrhea in some people, they can cause it in others; eating fresh or dried berries can also cause intestinal irritation. Use of the leaves over an extended period of time can cause poisoning.

It can interfere with the absorption of iron. When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** Two to three teaspoons of leaves boiled in one cup of water. As a tincture, 15–40 drops in water 3 times a day.

## BLACK COHOSH

**AKA:** Black snakeroot; bugbane; bugwort; cimicifuga; *Cimicifuga racemosa*; rattleroot; rattleweed; richweed; Remifemin; squawroot.

**Effects:** May be a mild relaxant. It contains estrogen-like substances which may be helpful in treating symptoms associated with menstruation and menopause. Various extracts have displayed anti-inflammatory, sedative, and blood pressure-lowering effects in animals. It has traditionally been used by Native Americans to treat chronic fatigue, among other health problems. Herbalists have used it for high blood pressure and anxiety.

Remifemin is an extract and natural alternative to hormone replacement therapy. Several studies have shown it to be more effective in relieving menopausal symptoms, including depression and anxiety, than conjugated estrogens.

**Precautions:** No scientific studies of its effects have been done on humans. It may have a stimulating effect on the cardiac system. Serious side effects include diarrhea, abdominal pain, nausea, joint pain, headache, lowered heart rate, lowered blood pressure; mild side effects include stomach irritation and irritation of the uterus. It has also been known to cause major liver damage, sometimes requiring liver transplants. Consumption of large amounts could cause nausea (though mild nausea may just be a response to its bitter taste), vomiting, sweating, and dizziness.

It should not be used by anyone suffering from a chronic disease, especially liver disease.

It can interfere with the cancer drug tamoxifen, and should not be combined with any medications that are potentially harmful to the liver, including acetaminophen, erythromycin, lovastatin, simvastatin and methyl dopa.

**Dosage:** None established.

## BLESSED THISTLE

**AKA:** *Cerbenia benedicta*.

**Effects:** According to James Balch, Ph.D., and Phyllis Balch, C.N.C., it “may act as brain food.”

**Precautions:** It is a strong emetic which could cause vomiting. It is recommended that it only be used in the prescribed doses and under a doctor’s supervision. Blessed thistle should not be used by pregnant women or those with ulcers; it should only be given to children by a medical health practitioner, and then for no more than seven to ten days. Handling the plant can cause toxic skin reactions.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One ounce of herb in one pint of boiling water taken 1 cup at a time, 3 times a day between meals.

## BRAHMI

**AKA:** *Hydrocotyle asiatica*.

**Effects:** Said to relieve anxiety.

**Precautions:** No known side effects.

**Dosage:** None established.

## BUPLERUM

**AKA:** Ch'ai hu.

**Effects:** Said to reduce anxiety. It has been used to treat nausea, fever, and pain.

**Precautions:** No known side effects.

**Dosage:** None established.

## BUTCHER'S BROOM

**AKA:** Box holly, knee holly, *Ruscus aculeatus*, sweet broom.

Butcher's Broom is an evergreen shrub in the lily family that is closely related to asparagus.

**Effects:** Said to increase blood flow to the brain.

Said to work synergistically with vitamin C.

**Precautions:** May increase blood pressure in some individuals. It should not be used as a substitute for anti-coagulant medication. It should only be given to children by a medical health practitioner, and then for no more than seven to ten days. It should be avoided by women who are pregnant or breastfeeding, as effects are not known.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** Earl Mindell, R.Ph., Ph.D., recommends 400 mg/day.

## CALIFORNIA POPPY

**AKA:** *Eschscholtzia californica*, golden poppy.

Though its alkaloids are nowhere near as powerful, the California poppy is related to the opium poppy. Despite this, it is perfectly legal to grow and, in fact, is the state flower of California.

**Effects:** May relieve insomnia and anxiety. It may also be used to treat nervous tension and muscle tics. The alkaloids are different from those of the opium poppy and, though they have not been thoroughly studied, are not known to be narcotic or addictive.

Works synergistically with such sedative herbs as valerian.

**Precautions:** Overdose symptoms include headaches, hangover-like effects the next day, and other minor side effects. As with poppy seeds, use can cause a urine test to read positive for opiates.

It should not be combined with alcohol, prescription sedatives, or other depressants.

**Dosage:** The usual dose is 30 drops of tincture, or a spoonful of whole dried herb in a cup of tea 2 to 3 times a day.

## CARDAMOM

**AKA:** *Amomum cardamomum*, Bai Dou Kou, Bastard cardamom, Black Cardamom, Cardamomo, Cardamom Essential Oil, Cardomom, *Cardomomi Fructus*, cardamon, Ela, *Elettaria cardamomum*, Green Cardamom, Indian Cardamom, Lesser Cardamom, Malabar cardamom.

**Effects:** Contains cineole, a mild central nervous system stimulant, which may account for its reputation in Arab cultures as a male aphrodisiac. Herbalists have used it to treat colic, diarrhea, and headaches.

**Precautions:** No known side effects.

Individuals with gallstones should not exceed the amount normally found in food.

There are no known interactions with other substances.

**Dosage:** None established.

## CATNIP

**AKA:** Catmint, catnep, catrup, catswort, field balm, *Nepeta cataria*.

A member of the mint family, one active ingredient is similar to an ingredient in valerian. It has a similar effect to marijuana, but much milder.

**Effects:** A mild sedative used in the treatment of insomnia, it reportedly also relieves stress and anxiety and stimulates the appetite. It is high in vitamin C and is good for colds, flu, inflammation, and pain.

**Precautions:** Used as a folk remedy for a variety of conditions, though scientific evidence is lacking. Some claim that smoking the

leaves results in a mild marijuana-like high; this is not recommended.

It should not be used by pregnant women unless under the care of a medical health professional; children and the elderly should be given smaller-than-normal doses, which can then be increased in strength as needed.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** Up to 3 cups of tea a day (one ounce of herb per pint of water).

### CAT'S CLAW

**AKA:** Griffé Du Chat, Life-giving Vine of Peru, Samento, Uña De Gato, *Uncaria guianensis*, *Uncaria tomentosa*.

**Effects:** An antioxidant. It also has anti-inflammatory properties, cleanses the intestinal tract, and stimulates the white blood cells. It is said to relieve stress and depression.

**Precautions:** Mild side effects include headache, dizziness, nausea, and diarrhea. There is only one documented case of an individual having suffered any adverse reactions.

It should not be used by women who are pregnant or breast-feeding, or children, as effects are not known. It should also be avoided by those who have had organ transplants, or individuals suffering from leukemia and autoimmune diseases such as multiple sclerosis and lupus, as it can worsen these conditions. It should be used with caution by individuals with low blood pressure, as it can lower it even further. Those taking cat's claw should stop taking it at least two weeks before surgery to prevent difficulties in controlling blood pressure.

When taken with other herbs, it is recommended that a lower dosage be used. Cat's claw can decrease the effectiveness of medications that are broken down or changed by the liver (Allegra or Halcion, for example), decrease the effectiveness of immunosuppressants, and increase the effectiveness of high blood pressure medications to a dangerous level.

**Dosage:** None established.

### CAYENNE

**AKA:** Africa pepper, America pepper, bird pepper, capsicum, *Capsicum anuum*, *Capsicum frutescens*, chili pepper, cockspur pepper, goat's pepper, hot pepper, pod pepper, red pepper, Spanish pepper, Zanzibar pepper.

**Effects:** A rich source of vitamins, especially A, B6, E, and K, as well as capsaicin, which can help control inflammation in the body. It may improve blood circulation and help prevent blood clots. Cayenne is also said to help the body utilize other herbs more effectively, stimulate appetite and digestion, and normalize blood pressure. It may help prevent colds, flu, depression, arthritis, headaches, heart attacks, and strokes.

**Precautions:** Mild side effects include nausea, vomiting, stomach pain, and intoxication. Overconsumption can lead to gastroenteritis, kidney damage, nerve damage, and permanent loss of the sense of taste; some may experience a burning sensation during defecation. Prolonged skin application (for treating arthritis, pericarditis, pleuritis, and rheumatism) can result in dermatitis and blisters, and it can be very irritating to the mucous membranes if inhaled.

Those with duodenal ulcers, bleeding problems, or who are taking anti-coagulants should consult a physician before using cayenne.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One-quarter teaspoon 3 times a day.

### CELERY

**AKA:** *Apium graveolens*, garden celery, wild celery.

**Effects:** Contains apigenin, which dilates the blood vessels, and several antioxidant vitamins.

**Precautions:** It is high in sodium. It is also a strong diuretic, and should not be used by those with kidney problems.

**Dosage:** At least one celery stalk a day. As a tea, one-half teaspoon of seeds in one-half cup of boiling water and strain. As a juice, one tablespoon two or three times a day an hour before meals.

## CHAMOMILE

**AKA:** *Anthemis nobilis* (Roman chamomile), camomile, *Chamaemelum nobile* (Roman chamomile), Kamilloosan, *Matricaria chamomilla* (German chamomile), *Matricaria recutita* (German chamomile), Perkamillon.

**Effects:** Chamomile is said to stimulate the brain, dispel weariness, calm the nerves, counteract insomnia, aid in digestion, break up mucus in the throat and lungs, and aid the immune system. Kamilloosan and Perkamillon are German pharmaceutical brands used to treat indigestion and ulcers.

Works synergistically with other sedative herbs.

**Precautions:** Can cause dermatitis and reactions in those allergic to other plants in the daisy family, including ragweed, aster, or chrysanthemums. There have also been reports of asthma, hay fever, and hives in susceptible individuals. Overdosing can cause nausea and vomiting. An overdose of the tincture may cause diarrhea.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** The tea contains only 10 percent of the sedative-inducing chemicals of the herb.

## CHAPARRAL

**AKA:** Creosote bush, *Larrea divaricata*, larreastat, *Larrea tridentata*.

**Effects:** Contains nordihydroguaiaretic acid (NDGA), a chemical which has shown antioxidant and antiseptic qualities. Used as a mouthwash, it can reduce cavities by up to 75 percent, though all of it should be spit out immediately after rinsing the mouth, as swallowing could produce side effects.

**Precautions:** Scientific evidence for any claims is lacking. The plant could cause inflammation of the skin if touched. Internal use may cause damage to the liver (including cirrhosis and liver failure) and kidney problems, especially if taken in large doses or for prolonged periods of time. It may also stimulate the growth of tumors. A 2010 *Consumer Re-*

*ports* study rated it as one of the twelve most dangerous supplements on the market.

**Dosage:** None established.

## CHICKWEED

**AKA:** Adder's mouth, *Cerastium vulgatum* (mouse-ear chickweed), Indian chickweed, satin flower, starweed, starwort, *Stellaria media* (common chickweed), *Stellaria pubera* (star chickweed), stitchwort, tongue-grass, winterweed.

**Effects:** It is high in vitamin C. Herbalists have used it to treat fatigue and inflammation.

**Precautions:** There is no scientific evidence for any of its supposed health benefits, though it is generally considered very safe.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** It is best used sparingly as a vegetable or salad green.

## CHINESE CLUB MOSS

**AKA:** Club moss, foxtail, *Huperzia serrata*, lycopod, *Lycopodium calvatum*, staghorn, vegetable sulfur, wolf claw.

**Effects:** Contains huperzine, which inhibits the breakdown of acetylcholine, which may aid in the alleviation of symptoms of Alzheimer's disease. Used by herbalists as a diuretic for kidney disorders and as a treatment for nervous disorders and epilepsy.

**Precautions:** Only the spores should be used, as the plant itself is poisonous.

**Dosage:** One to two cups of tea a day.

## CHINESE FOXGLOVE ROOT

**AKA:** Chinese Foxglove, Chinese Rehmanniae Radix, Chinese RR, Di Huang, Dihuang, Gun-Ji-Whang, Japanese Rehmanniae Radix, Japanese RR, Jio, Juku-Jio, Kan-Jio, *R. Glutinosa*, Rehmanniae, *Rehmannia Glutinosa Oligosaccharide*, *Rehmannia glutinosa*, Rehmannia Radac, Rehmanniae, Radix, Rehmanniae Root, RR, Rhemanniae Root, Rehmanniae, Steamed Root, RGAE, RGX,

ROS, Saeng-Ji-Whang, Sho-Jio, Shu Di Huang, Sook-Ji-Whang, To-Byun.

**Effects:** Used in traditional Chinese medicine to treat insomnia and restlessness.

**Precautions:** Side effects include diarrhea, nausea, and abdominal pain, though grains-of-paradise fruit is usually added to prevent such problems.

It should not be used by women who are pregnant or breast-feeding, and be used with extreme caution by diabetics, as it can affect blood sugar levels. It should be used with caution by individuals with digestive problems or a tendency to produce intestinal gas. Those already taking it should stop at least two weeks before surgery, as it can affect blood glucose levels during and after surgery.

**Dosage:** None established.

## CHINESE YAM

**AKA:** *Dioscorea opposita*.

**Effects:** In traditional Chinese medicine, it is used in conjunction with codonopsis root to treat fatigue, weakness, and poor appetite.

**Precautions:** Side effects may include abdominal swelling and pain.

It should not be combined with kan-sui root.

**Dosage:** One cup of tea a day.

## CINNAMON

**AKA:** Cassia, *Cinnamomum cassia*, *Cinnamomum ceylanicum*, *Cinnamomum zeylanicum*.

**Effects:** In traditional Chinese medicine, it is used for colds, flatulence, nausea, diarrhea, and painful menstrual periods. It is also said to improve mood, energy, vitality, and circulation. Even smelling cinnamon is said to boost cognitive function and memory. It is also a good source of manganese, iron, calcium, and fiber. Researchers at Tel Aviv University have found that CEppt, an extract of cinnamon bark, can significantly delay the development of Alzheimer's disease in mice and fruit flies and break up amyloid fibers in test tube models; Professor Michael Ovadia believes that, in

the future, this extract may not only help slow the progress of this disease, but cure it, as well.

**Precautions:** Most claims of its health benefits do not have any scientific backing. To achieve the results of the Tel Aviv study, a person would have to take more than ten grams of raw cinnamon a day, or well above the toxic level. Cinnamon contains the organic compound cinnamaldehyde, which is potent enough to be used as a fungicide and pesticide, and which can cause skin and eye irritation in individuals who come into contact with it. It also contains the essential oil cinnamal, which can cause severe reactions in those who are allergic. Cassia cinnamon contains coumarin, the main compound of warfarin, an anti-clotting medication, which can worsen blood sugar levels in diabetics and worsen liver disease in individuals who are susceptible. The "cinnamon challenge," a fad that became popular in 2012, involves eating a teaspoon of ground cinnamon in less than a minute, and can result in coughing, choking, gagging, vomiting, life-threatening bronchial constriction, inflammation and scarring of the respiratory tract, and lung damage (including collapsed lungs) that can persist for months afterward (its cellulose fibers do not break down in the lungs).

**Dosage:** No more than the small amounts used as seasoning in foods.

## CLOVE

**AKA:** *Caryophyllus aromaticus*, *Eugenia aromatica*, *Syzygium aromaticum*.

**Effects:** An antioxidant. It increases circulation and thins the blood. It also aids digestion and is used in the treatment of flatulence, vomiting, and nausea. The oil has anti-fungal and anti-bacterial properties.

**Precautions:** May cause a numbing effect on the tongue, as it contains eugenol, a strong anesthetic. Clove oil is toxic in large amounts.

**Dosage:** None established.

## CODONOPSIS ROOT

**AKA:** Bastard Ginseng, Bellflower, Bonnet Bellflower, Chuan Dang, *Codonopsis Modestae*,

*Codonopsis pilosula*, *Codonopsis Pilosula Modesta*, *Codonopsis tangshen*, *Codonopsis tubulosa*, Dangshen, Dong Seng, Radix Codonopsis, Radix Codonopsis Pilosulae.

**Effects:** In traditional Chinese medicine, it is used in conjunction with Chinese yam to treat fatigue, weakness, and poor appetite. It is often used as a substitute for Asian ginseng, as it is believed to be milder and safer. Studies indicate that it improves the physical stamina of mice.

**Precautions:** No known side effects. It should not be used by women who are pregnant or breast-feeding, as not enough is known about its effects.

It should not be combined with veratrum.

**Dosage:** None established.

## CORDYCEPS

**AKA:** Caterpillar fungus, Caterpillar Mushroom, Cs-4, *Cordyceps sinensis*, Dong Chong Xia Cao, Dong Chong Zia Cao, Hsia Ts'ao Tung Ch'Ung, Tochukaso, Vegetable Caterpillar.

**Effects:** In traditional Chinese medicine, it is a mushroom that is used as a tonic to increase energy and stamina, either as a tea or an extract.

**Precautions:** No known side effects.

It should not be used by women who are pregnant or breast-feeding, as not enough is known about its effects. It should not be used by individuals suffering from autoimmune disorders such as multiple sclerosis, lupus, or rheumatoid arthritis, as it could increase the symptoms.

Cordyceps should not be taken with immunosuppressants, as it could alter their effectiveness.

**Dosage:** None established; traditional dosage likely dependent on the individual and the condition being treated.

## COUNTRY MALLOW

**AKA:** Bala, Bariar, Heartleaf, Indian Chikana, Khareti, Malva Blanca, Malva-Branca, Malva-Branca-Sedosa, *Sida Cordifolia*, Silky White Mallow, Vatya, White Mallow.

**Effects:** Contains the stimulant compound ephedrine, which may explain its reputation as an aphrodisiac. It has been used to treat bronchial congestion and narcolepsy.

**Precautions:** Side effects include dizziness, restlessness, irritability, insomnia, headaches, lack of appetite, nausea, vomiting, flushing, tingling, difficult urination, pounding heartbeat, heart attack, heart arrhythmia, stroke, and death. According to the website webmd.com, it is unsafe for any use, as it contains ephedrine, and could cause such serious side effects as high blood pressure, heart attacks, muscle disorders, seizures, strokes, irregular heartbeat, loss of consciousness, and death. A 2010 *Consumer Reports* study rated it as one of the twelve most dangerous supplements on the market.

It should not be combined with other stimulants, as it could increase the side effects. It should not be combined with medications that cause irregular heartbeat, methylxanthines, stimulant drugs, dexamethasone, ergot derivatives, MAO inhibitors, or diabetes medications.

**Dosage:** James A. Duke, Ph.D., recommends five teaspoons of the herb in a cup of boiling water, though this is not recommended, considering its adverse effects.

## CURRY

A mixture which generally consists of such herbs and spices as turmeric, coriander, cumin, ginger, fenugreek, nutmeg, fennel, cinnamon, white pepper, cardamom, cloves, black pepper, and cayenne red pepper.

**Effects:** Initial research indicates that bisdemethoxycurcumin, a natural ingredient of turmeric root, may help the immune system in clearing the amyloid beta plaques in the brains of Alzheimer's patients.

**Precautions:** No known side effects.

**Dosage:** None established.

## CYPERUS

**AKA:** *Cyperus rotundus*.

**Effects:** In traditional Chinese medicine, is used to treat depression and moodiness.

**Precautions:** No known side effects.

**Dosage:** None established.

## DAFFODIL

**AKA:** *Crinum* and *Crytanthus* species.

**Effects:** Professor Birgen Broden and other researchers at the University of Copenhagen have found that compounds from a South African species of snowdrops and daffodils can cross the blood-brain barrier, which may help in the treatment of depression.

**Precautions:** Tea, extracts, essential oil, or other products produced from daffodils have no known benefits in the treatment of depression.

**Dosage:** None established.

## DAMIANA

**AKA:** *Turnera aphrodisiaca*, *Turnera diffusa*.

Popular in Mexico, it is used to make both a tea and a liqueur.

**Effects:** It may have a calming or sleep-inducing effect. It is traditionally thought of as an aphrodisiac, and has been used to treat anxiety, depression, mood disorders, and chronic fatigue.

**Precautions:** Side effects can include headache and insomnia. It can interfere with the absorption of iron. Evidence for its supposed aphrodisiac qualities is only anecdotal. Though it is generally considered a safe herb with no reports of toxicity, it should not be administered to children unless under the guidance of a medical care professional.

**Dosage:** James A Duke, Ph.D., recommends a tablespoon of dried herb in a cup of boiling water.

## DANDELION

**AKA:** Blowball, cankerwort, lion's tooth, priest's crown, puffball, pu gong ying, swine snout, *Taraxacum mongolicum*, *Taraxacum officinale*, white endive, wild endive.

**Effects:** A good source of lecithin and

choline, both of which are beneficial to memory, plus the antioxidant carotenoids lutein and violaxanthin. It may be helpful in treating insomnia.

**Precautions:** Side effects of *Taraxacum officinale* include allergic dermatitis, stomach upset, diarrhea, flu-like symptoms, and liver pain. An overdose can cause mild diarrhea. Preparations using the root of the Chinese dandelion (*Taraxacum mongolicum*) may cause heartburn.

When taken with other herbs, it is recommended that a lower dosage be used. When taken with lithium or potassium, it can elevate the level of these substances in the blood. Individuals taking prescription diuretics should consult a physician before taking dandelion.

**Dosage:** One cup of tea a day using one tablespoon of dried leaves or two tablespoons of fresh leaves. Fresh leaves can be added to a salad or blended in a juicer with other green vegetables.

## DA T'SAO

**AKA:** Jujube date.

**Effects:** Da t'sao is said to promote calmness and is used in China to treat insomnia and dizziness.

**Precautions:** No known side effects.

**Dosage:** None established.

## DEVIL'S CLAW

**AKA:** *Harpagophytum procumbens*.

**Effects:** In Europe, it has been used to treat senility, as well as allergies, arthritis, and diabetes. In Africa, it is used to treat fever, indigestion, malaria, and skin cancer.

**Precautions:** It has an extremely bitter taste. There is no scientific evidence for any of its claims. Studies which have shown it relieves the symptoms of gout through anti-inflammatory properties and by lowering uric acid levels have employed injections; it is not known if ingesting this herb would have the same effects. It should not be taken by individuals with gastric or duodenal ulcers, as it can cause gastric irritation.

When combined with anti-coagulant or

anti-platelet drugs, it may increase the risk of bleeding. When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** None established.

## DINH LANG

A Vietnamese herb.

**Effects:** Said to increase lifespan.

**Precautions:** No known side effects.

**Dosage:** None established.

## DON SEN

**AKA:** *Campanumaea pilosula*, don shen, tang shen.

**Effects:** Considered similar in effect to ginseng, though milder. It is said to restore energy and improve digestion, and is used to treat heartburn.

Works synergistically with astragalus.

**Precautions:** No known side effects.

**Dosage:** None established.

## DONG QUAI

**AKA:** *Angelica sinensis*, Chinese angelica, dang quai, tang keui, tang kwei.

Dong quai is similar to western angelica (*Angelica archangelica*), though its effects are milder and slightly different.

**Effects:** Known as an anti-aging herb. It is also used to treat insomnia, among other disorders.

In traditional Chinese medicine, it is combined with astragalus to treat fatigue.

**Precautions:** No known side effects.

It should not be taken by pregnant women, and used with caution by those with diarrhea or abdominal bloating.

When combined with warfarin, it can increase bleeding time.

**Dosage:** Three cups of tea a day, or four tablets or capsules a day in two divided doses.

## FENUGREEK

**AKA:** Greek hayseed, *Trigonella foenum-graecum*.

**Effects:** A good source of choline and beta-carotene, both of which are useful in the treatment of Alzheimer's disease.

**Precautions:** Serious side effects include uterine contractions.

It should not be given to children under the age of two. Pregnant women should consult a physician before using; children and the elderly should be given lower dosages.

Defatted fenugreek seed powder may increase the effectiveness of insulin or other diabetic drugs used to control blood sugar levels; it may also reduce the absorption of various minerals, including calcium, copper, magnesium, and zinc. When fenugreek is taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** Two teaspoons of seeds per cup of water for up to two to three cups a day.

## FIELD MINT

**AKA:** *Mentha arvensis*, *Mentha haplocalyx*.

**Effects:** In traditional Chinese medicine, it is used to treat emotional instability.

**Precautions:** No side effects known.

**Dosage:** None established.

## FRANKINCENSE

**AKA:** *Olibanum*.

Frankincense is the resin from trees of the *Boswellia* genus.

**Effects:** An antioxidant.

**Precautions:** Side effects or long-term effects are unknown. Each species produces a different type of resin, and various climate and soil conditions can add to this diversity. The resin should be a translucent light yellow with a slightly greenish tint, and absent of any black or brown impurities.

**Dosage:** None established.

## FU LING

**AKA:** Muk sheng (red fu ling), *Poria cocos*.

**Effects:** Said to be useful in treating insomnia and "emotional imbalances" such as apprehension, fear, instability, and insecurity.



**Precautions:** No known side effects, though it is one of the most powerful diuretics known.

**Dosage:** None established.

## GALANTHAMINE

**AKA:** Caucasian snowdrop; Common snowdrop; *galanthamine hydrobromide*; *Galanthus caucasicus*; *Galanthus nivalis*; Voronov's snowdrop

**Effects:** Said to protect against Alzheimer's disease. It is the basis of the Alzheimer's treatment drug Galantamine (see entry).

**Precautions:** Its effectiveness against Alzheimer's disease is questionable. Galanthamine should not be taken by individuals with a slow pulse, poor muscle tone, recent heart attack, epilepsy, "unusually increased muscle activity," or Parkinson's disease.

Side effects may include abdominal pain, lightheadedness, dizziness, agitation, nausea, diarrhea, and sleep disturbances.

It should not be combined with MAO inhibitors, and should not be taken by anyone exposed to organophosphate fertilizers.

**Dosage:** None established.

## GARLIC

**AKA:** *Allium canadense*, *Allium sativum*, hu suan.

**Effects:** Garlic can increase the body's natural supply of hydrogen sulfide, an antioxidant that also relaxes blood vessels and increases blood flow. It also inhibits the formations of nitrosamines, compounds which lead to the development of cancer, especially digestive and colon cancers, and has been used to treat diabetes, heart disease, high blood pressure, high cholesterol, allergies, arthritis, arteriosclerosis, cancer, hypoglycemia, gastrointestinal disorders, asthma, bronchitis, candidiasis, and pneumonia. Because it contains sulfhydryl compounds (which regulate immune function) and the minerals selenium and germanium, it can fight infection by stimulating the immune system, and has been shown to have anti-bacterial, anti-microbial,

and anti-fungal properties. Studies have revealed that garlic destroys the *Helicobacter pylori* bug, a bacterium that plays a role in the development of stomach ulcers and possibly even stomach cancer. Garlic can also trigger enzymes in the liver to deactivate aflatoxin, a strong carcinogen found on mold in peanuts and grains. One study has shown that those who took supplements of 300 mg/day of garlic had aortas that were 15 percent more supple than those who didn't.

**Precautions:** Garlic can create a pungent sulphurous odor on the breath and in sweat, which can be reduced significantly by drinking milk or eating fennel seeds at the same time or slightly after; whole milk works better than skim milk, which may suggest that it is the fat content in milk that neutralizes the odor-producing compound. It can cause a rash when touched or eaten by those allergic to this herb. Very large doses of garlic may cause gastrointestinal problems; even in moderate amounts, it can aggravate gastroesophageal reflux disease, or acid reflux, by relaxing the lower esophageal sphincter muscle. Garlic's effectiveness depends on its allicin production, which occurs as a result of a reaction between the compound alliin—a sulfur amino acid—and the enzyme allinase. Fresh, whole garlic is the only effective form, as the allicin breaks down quickly after it is cut or sliced; allicin is not activated in garlic that has been aged or dried, though Dr. Isadore Rosenfeld states that sanitized capsules are also effective, and these are recommended for those concerned about the odor. On the other hand, Joe and Teresa Graedon, Ph.D., recommend that a clove of garlic should be crushed at least ten minutes before heating to obtain the full cancer-fighting benefits. Garlic stored in water at room temperature preserves more of the allicin than that stored in vegetable oil, losing about half of the compound over six days, as opposed to losing the equivalent amount over a few hours with the latter method. Recently, a process developed by the Japanese ages garlic for a year, enhancing its antioxidant effects by fully metab-

olizing allicin into other biologically active sulfur compounds while eliminating its odor. The beneficial compounds in garlic supplements may be ineffective due to processing. Garlic supplements should be stopped about two weeks before surgery, as it could cause excessive bleeding.

Garlic will increase the blood thinning properties of aspirin and other anticoagulants, so caution should be exercised when combining them. It can also interact with the immunosuppressant cyclosporine.

**Dosage:** A clove of garlic a day (about 4 grams). Supplements should provide at least 10 mg/day of alliin or a total allicin potential of 4000 mcg/day (equivalent to roughly 4000 mg of fresh garlic). A recommended dose of aged extract is 600 to 1200 mg/day, or 2 to 5 mg/day of garlic oil.

## GAY GEE

**AKA:** Lycii, *Lycium chinenses*, lycium chinese, wolfberry.

**Effects:** It is believed that this herb can contribute to a long life span and a sunny disposition. It is high in antioxidants and carotenoids, and is said to increase testosterone levels in men who are deficient.

**Precautions:** No known side effects.

**Dosage:** None established.

## GENTIAN

**AKA:** Bitter root, bitterwort, *Gentiana catesbaei* (blue gentian, American gentian), *Gentiana crinita* (fringed gentian), *Gentiana lutea* (yellow gentian), *Gentiana officinalis*, *Gentiana quinquefolia* (stiff gentian, gallweed), gentian root, pale gentian.

**Effects:** Gentian may increase circulation, aid digestion, and stimulate the appetite.

**Precautions:** Mild side effects include upset stomach, nausea, and vomiting. Gentiana (*Gentiana scabra*), a Chinese herb, may not have the same effects.

**Dosage:** One teaspoon in one or two cups of water, simmered for 30 minutes.

## GINGER

**AKA:** African ginger, *Asarum canadense*, black ginger, Canada snakeroot, gan jiang, Indian ginger, race ginger, wild ginger, *Zingiberis officianalis*, *Zingiber officinale*.

**Effects:** Has been used to treat anxiety and depression. It is also a stimulant, and is said to help cleanse the body through sweating.

**Precautions:** Mild side effects include heartburn. Large doses can cause stomach upset. Pregnant women should consult a medical care professional before using. Use of the whole plant causes liver damage in animals. In the 1930s, Jamaican ginger used in an alcoholic beverage caused major neurological symptoms in some people.

When taken with other herbs, it is recommended that a lower dosage be used. It can interact with aspirin and the anti-clotting drug warfarin.

**Dosage:** One to two teaspoons of dried gingerroot in one cup of water.

## GINKGO BILOBA AND EGB 761

**AKA:** EGb 761, ginkgo, Ginkgold, maidenhair tree, Rokan, Tanakan, Tebonin.

**Effects:** Acts as a vasodilator, improving circulation in the medium and small capillaries in the brain and extremities (it also increases the circulation of the microcapillaries, something no other known substance is known to do), prevents free radical damage in cell membranes (and repairs lesions caused by free radicals), protects nerve tissue from damage resulting from hypoxia (lack of oxygen), helps the brain to metabolize glucose better, facilitates nerve transmission, and increases alertness (by reducing theta brainwaves, the presence of which indicates inattention and lack of concentration), short-term memory, and overall brain functioning.

It has been used to treat, among other conditions, age-related dementia, memory and concentration problems, depression, and anxiety in Europe for years, as it has been found to produce the same consistent EEG changes

as those produced by drugs prescribed for dementia, though it may take six months before changes become apparent. It may have no memory or brain-enhancement effect in healthy people with no brain impairment. It may inhibit mental deterioration in the early stages of Alzheimer's disease for six to twelve months, though some dispute this. EGb 761, an extract of ginkgo biloba, has been demonstrated to have neuroprotective and anti-apoptotic effects in vivo and in vitro (apoptosis is a genetically based form of cell self-destruction) which is consistent with the effectiveness of oral treatments for mild to moderate dementia (Ablemeyer et al., 1999; Bastianetto et al., 2000; Chandrasekaran et al., 2003).

Ginkgo biloba contains ginkgolides, molecules that are antagonistic to Platelet Activating Factor (PAF), a major component of asthma, allergies, and inflammatory conditions.

**Precautions:** Most studies involving ginkgo biloba have been small, and the results have been inconsistent. Some suggest it may not provide protection against age-related memory loss, while others suggest that it may provide some minor benefit to older adults with dementia but no benefits to older adults not suffering from dementia. The circulation-enhancing effects can also be obtained by exercising, with more benefits and fewer side effects.

Serious side effects include irritability, restlessness, diarrhea, nausea, vomiting, and increased risk of stroke. It has been found to reduce the ability of sperm to penetrate eggs, and individuals should exceed the average daily dose only under a physician's care. High doses may cause diarrhea, headaches, irritability, nausea, restlessness, skin irritations, and vomiting. There is no evidence it can help sustain male erections. Taking the extract may lead to an increased risk of stroke. The fruit can cause severe allergic reactions much like poison ivy and poison oak, and the leaves should not be used, even as a tea, as they contain a possible neurotoxin. Though commercially sold ginkgo biloba products are tannin-free, there may be a chance that some extracts are not, and these tannins, or astringent chem-

icals, may cause gastrointestinal disorders. A 2013 study found that ginkgo biloba extract can cause cancer in lab animals, mainly in the thyroid, liver, and nasal passages, including some very aggressive cancers that were rarely seen; critics counter that the doses given were much higher than those taken by humans.

Products containing EGb 761, though widely used in Europe, are not approved for use in the United States by the FDA. Much more research is needed to determine its exact effects.

It should not be used by women who are pregnant or nursing, and it should only be prescribed to children by a medical care professional. Because of the relationship to PAF (platelet activating factor), it can be a problem for those with clotting disorders. The elderly should exercise caution, as there may be an increased risk of bleeding and cerebral hemorrhage.

When taken with other herbs, it is recommended that a lower dosage be used. It may interact with such blood thinners as Warfarin (coumadin) and aspirin.

**Dosage:** From 120 to 160 mg/day of flavonoid extract in three divided doses (Dr. Isadore Rosenfeld recommends half that, while James A. Duke, Ph.D., considers 60 to 240 mg/day safe); it has a half-life of three hours, and it is pretty much gone after 6 hours. The extract must be at least a 50-to-1 concentration (50 pounds of leaves used to make 1 pound of extract), along with 24 percent active ingredients (ginkgo flavoglycosides, also referred to as flavoglycosides, flavone glycosides, or ginkgo-heterosides), primarily quercetin, kaempferol, and isorhamnetin; quite a few products available are lower in concentration and are taken in doses as high as 1000 mg/day. Improvements should be seen within three to six months.

## GINSENG

**AKA:** *Eleutherococcus senticosus* (Siberian ginseng), *Panax ginseng* (Asiatic ginseng, Chinese ginseng, Wonder-of-the-world), *Panax*

*notoginseng* (Tienchi ginseng), *Panax quinquefolium* (American ginseng, five fingers, five-leaved ginseng, redberry), *Panax schin-seng* (Asiatic ginseng, Chinese ginseng, Wonder-of-the-world), *Panax trifolius* (dwarf ginseng), ren shen, *Withania somnifera* (Indian ginseng).

It has been used as a general health tonic in China for the past forty centuries.

**Effects:** Works as an adaptogen, a non-toxic substance that normalizes body functions and protects against various stressors on the body. Many people believe ginseng stimulates the brain and improves concentration, memory and learning, visual acuity, color perception, and aural acuity; works as a general stimulant to combat fatigue and stress; fights free radicals; reduces cholesterol; improves brain circulation; reduces heart rate; normalizes blood pressure; normalizes blood sugar; stimulates endocrine activity and metabolic functions; aids circulation and digestion; helps the body resist toxins, chemotherapy, alcohol, and drugs; boosts athletic performance and recovery from workouts; helps reduce insomnia and sleep disturbances; stimulates macrophage activity in the immune system; normalizes body functions; and improves sexual performance (though it is not an aphrodisiac). It has also been used to treat arthritis, tuberculosis, indigestion, cancer, and the symptoms of menopause. Preliminary research indicates that extracts of Indian ginseng, sитоindosides VII-X and withaferin-A, may be effective Alzheimer's treatments due to its ability to increase cortical muscarinic acetylcholine receptor capacity in the brain (Schleibs et al., 1997).

**Precautions:** Solid research of its benefits is lacking. Quality can vary widely, and good ginseng is very expensive. Unfortunately, most of what is available is cheap and offers very little in the way of active ingredients: one study in the 1980s found that 50 to 70 percent of the products sold were diluted or adulterated, and a 1997 study by the Bureau of Alcohol, Tobacco, and Firearms found that most liquid ginseng contains alcohol, some as much as 34 percent. Many commercial products which contain ginseng, such as soft drinks, contain

too little of the herb to provide any health benefits. Further, there are over two hundred different varieties, and experts cannot come to a consensus on what is the best type. Even within each variety, the quality can vary widely. Koreans routinely strip the bark during processing, the part of the plant which contains the highest amount of the active ingredients; red ginseng always has an intact bark, but white may or may not be stripped. Products should only be made with six-year-old roots, as it should not be harvested before then.

Some prefer American ginseng because it is a milder form than its Asian counterpart and avoids some of the side effects. Those suffering from acute inflammatory disease, anxiety disorder, bipolar disorder, heart palpitations, asthma, emphysema, or bronchitis should avoid American and Asian ginseng. *Panax* ginseng contains an estrogen-like compound that could cause problems in some individuals. Siberian ginseng is, strictly speaking, not ginseng at all, even though it comes from the same plant family; it has fewer side effects and more consistent results, but since it creates heat in the body, it should be avoided by those suffering from hot dry eyes, rashes, chronic sore throats, or high blood pressure. Ginseng should be used only under the guidance of a medical care professional by pregnant women and those with insomnia, hay fever, fibrocystic breasts, asthma, emphysema, high blood pressure, blood-clotting problems, heart disorders, and diabetes. It should only be prescribed to children by a medical care professional.

Mild side effects include allergy symptoms, diarrhea, gastrointestinal problems, headaches, hypertension, insomnia, nervousness, anxiety, tissue swelling, skin eruptions, weakness, tremors, breast soreness, loose stools, and skin rashes, especially if taken at high doses for prolonged periods of time. Serious side effects include asthma attacks, increased blood pressure, heart palpitations, postmenopausal bleeding, and masculinization in women and feminization in men. Large doses should not be taken

during an acute infection, as that may suppress the immune system. Pregnant women should avoid notoginseng, as it can cause a miscarriage in certain cases.

When taken with other herbs, it is recommended that a lower dosage be used. There should be at least a three-hour span between taking ginseng and taking vitamin C, as some of the ginseng may be neutralized.

**Dosage:** One tablespoon of fresh root in one cup of water, for up to two cups a day. From 500 to 3000 mg/day in divided doses. Extracts produce the most consistent results. Taking higher doses should be done only under the supervision of a health professional, and avoided as a general rule. Thomas H. Crook III, Ph.D., and Brenda Adderly, M.H.A., do not recommend taking it, based on many of the precautions cited above, while Dharma Singh Khalsa, M.D., recommends taking four to eight tablets a day of the Chinese medicine Ching Chun Bao, which contains, among other things, Royal Manchurian ginseng, the strongest and most effective form of ginseng.

## GOLDENROOT

**AKA:** Aaron's Rod, hong jing tian, *Rhodiola rosea*, roseroot.

**Effects:** It has long been used as a folk remedy in Russia and the Scandinavian countries to deal with stress and the cold climate. Studies have shown that it may possibly reduce fatigue and improve physical performance and mental concentration (Darbinyan et al., 2000; Shevtsov et al., 2003), as well as elevate mood and relieve depression (Darbinyan et al., 2007; van Dierman et al., 2009; Dwyer et al., 2011), the last effect possibly due to its effect as an MAO inhibitor. It has been shown to alleviate stress-related symptoms in rats (Mattioli et al., 2008).

**Precautions:** If taken in the evening, it can cause sleep interference.

**Dosage:** For mild to moderate depression, an extract of 340 to 680 mg/day has been shown to be effective.

## GOTU-KOLA

**AKA:** Brahmi, *Centella asiatica*, gota-kola, Indian pennywort.

Gotu-kola is a plant found throughout Africa and the East and, like ginseng, is considered an adaptogen. Polygonum (fo-ti-tieng) is so similar that botanists think it may be a geographic variant.

**Effects:** Gotu-kola may improve attention and concentration, have an anti-stress tranquilizing effect, stimulate the brain by increasing blood flow, detoxify the body, and energize the cells. It is said to increase longevity.

Taken with calamus root, it may improve memory and mental clarity.

**Precautions:** Solid scientific evidence is lacking for many of its benefits, but it appears to be a safe herb. Mild side effects include skin rashes, minor gastric irritation, and headaches. It should not be taken by women who are pregnant or nursing, or by those with an overactive thyroid or who are taking tranquilizers or sedatives. Adults over 65 should start with a lower dosage, and it should only be prescribed to children by a medical care professional. Gotu-kola can cause dermatitis if applied to the skin.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One-half cup of tea using one ounce of gotu-kola per pint of water, taken three times a day.

## GRASS, WHEAT AND BARLEY

**AKA:** Green Kamut, Green Magma.

**Effects:** Wheat grass is an excellent source of such antioxidant vitamins as A, B, C, and E. Both wheat grass and barley grass contain all the minerals essential for health, especially calcium, cobalt, iron, phosphorus, potassium, sulfur, and zinc. In addition to all the vitamins and minerals, they are high in chlorophyll, which according to some experts helps rid the body of toxins (including pesticides, drugs, and radiation) and discourages the growth of harmful bacteria. Barley also contains the

antioxidants superoxide dismutase (SOD) and 2–0-GIV.

**Precautions:** Since these grasses cannot be digested by the human body in their solid state, they must be juiced, and they must be consumed before they go bad (within ten minutes). However, they can be stored in plastic containers in the fridge for up to a week, and even longer frozen, but at the expense of some of their nutritional value.

**Dosage:** None established.

## GREEN TEA

**AKA:** Bancha tea, *Camellia sinensis*, gunpowder tea, Imperial tea, kukicha tea, matcha tea, sencha tea, Yamashire tea.

Green tea is made from the same plant as black tea, but is processed by steaming before drying, rather than being fermented by “sweating,” as is done with black tea. Oolong tea (also known as red tea or yellow tea) stands in the middle, as it is fermented, but not for as long as black tea.

**Effects:** All teas contain mind-altering alkaloids known as methylxanthines, which are also found in chocolate, coffee, cola, guarana, kola nut, and yerbe mate, and include caffeine, theophylline, and theobromine. Though tea leaves have a higher caffeine content than coffee beans (1 to 4 percent as opposed to 1 to 2 percent), green tea may have a much lower level of caffeine than coffee (20 to 30 mg compared to 75 to 150 mg) because caffeine is more readily leached into coffee than tea, and tea is diluted more with water than coffee is. Tea has a calming effect conducive to mental activity, as opposed to the sudden stimulation of coffee, which is more suitable to physical activity, and lacks the toxic or carcinogenic compounds found in coffee (e.g., caffeol, creosote, phenol, tars). Tea that is brewed for only two to three minutes has about half the caffeine as tea brewed for five or more minutes, and is not as bitter. High quality tea is dependent upon three things: (1) leaves and buds that are young and small, (2) leaves that are whole in-

stead of broken, and (3) the absence of less beneficial parts such as twigs and stems. Gunpowder tea from China and matcha and sencha tea from Japan are examples of such teas. Chinese Imperial and Japanese Yamashire teas, though made from older leaves, are still of good quality, while the Japanese bancha and kukicha teas, being the lowest grade as they contain a high amount of twigs and stems, have the lowest amount of caffeine. Tea also contains polyphenols, compounds which have 25 to 100 times the antioxidant properties of vitamins C or E. It has been shown to lower levels of LDL, or “bad” cholesterol, and raise the levels of HDL, or “good” cholesterol. It is also said to prevent the buildup of plaque, prevent tooth decay because of its high fluoride content, and contribute to weight loss because of the metabolism-increasing effects of caffeine and the fat-burning property of the polyphenols. Preliminary research has shown that, when applied to the skin, it is an effective sunscreen.

According to researchers at the University of Surrey, “[black t]ea ingestion is associated with rapid increases in alertness and information processing capacity and tea drinking throughout the day largely prevents the diurnal pattern of performance decrements found with the placebo (no caffeine) condition” (Hindmarch, et al., 1998). An eleven-year study, published in the *Journal of the American Medical Association* in 2006, involving over forty thousand Japanese found that green tea consumption was correlated with a reduced incidence of cardiovascular disease and all types of mortality, with the exception of deaths related to cancer. Studies have found that the rate of cognitive decline and functional disability in the elderly is greater among non-tea drinkers than among those who regularly drink tea (Arab et al., 2010; Tomata et al., 2012), and research at Newcastle University in Scotland and the Eve Topf and USA National Parkinson Foundation Centers of Excellence for Neurodegenerative Diseases Research and Department of Pharmacology in Israel have found that regular consumption of

green tea could protect the brain against Alzheimer's, as well as other forms of dementia. The polyphenol (-)-epigallocatechin-3-gallate (EGCG) in green tea is currently being studied for its possible effects in preventing neurodegenerative disorders such as Parkinson's and Alzheimer's (Hyung et al., 2013; Rushworth et al., 2013).

Works synergistically with red wine, grape-seed, and borage oil.

**Precautions:** Caffeine may be both physically and psychologically addicting, and consuming high amounts could cause restlessness, anxiety, tremors, insomnia, abdominal pain, high blood pressure, and heart palpitations. There is some concern that consuming large amounts of tea may cause problems, due to the caffeine content and the strong tendency of the polyphenols to bind with other nutrients, though research is lacking regarding such effects and the amounts needed to produce them. A 2010 study found that quercetin, an antioxidant found in tea, can aggravate and possibly trigger kidney cancer. Women who drink more than four-and-a-half cups of green tea a day are much more likely to suffer from PMS. Studies on whether green tea or black tea causes esophageal cancer are inconclusive, leading some to conclude that the disease may be due more to the habit of drinking tea scalding hot than to any particular ingredient in the tea. The tea found in tea bags is generally of a lower quality, as it contains a large amount of dust, as opposed to loose tea, which is mostly leaves and twigs. Bottled tea contains levels of polyphenols that are well below levels found in brewed teas (sometimes as low as 1/20 the amount), and also contain sugar and other additives; the polyphenol content listed on the bottle may also be incorrect, as there are no government standards for measuring or listing polyphenol compounds.

Tea leaves from China may be contaminated with lead (plants absorb it easily from soil), according to a report published by ConsumerLab.com, though this doesn't necessarily mean that the lead leaches out into the tea itself, and should not be a health concern. Tea grown in

China is also sprayed with the insecticide endosulfan, a known carcinogen; symptoms of poisoning include headache, nausea, vomiting convulsions, and—in rare cases—unconsciousness and death. Endosulfan has also been shown to be a causative factor in abnormal development of testicles, low sperm count, miscarriages, and autism. India, which grows 31 percent of the tea produced worldwide, has found that recent climate change has caused production levels to drop and weakened the taste of its teas. ConsumerLab.com found that commercial green tea drinks may contain levels of polyphenols and catechins far lower than what is stated on the label, along with high amounts of caffeine and sugar.

Adding milk to green tea may prevent the absorption of at least some of the polyphenols. Green tea contains a small amount of Vitamin K, which could reduce the effectiveness of drugs that prevent blood clotting.

**Dosage:** Five cups or more a day for at least six months have been shown to significantly lower the risk of pancreatic and colorectal cancers. Five to ten cups a day is believed to normalize blood sugar by regulating insulin production, and 100 to 150 mg/day of caffeine may be necessary for weight loss. Extracts may have lower levels of caffeine and higher levels of polyphenols than the tea.

## GUARANA

**AKA:** Brazilian chocolate, Brazilian cocoa, Energy Elixir, Guarana Tai (soft drink), Hit Energy, Josta (soft drink), *Paullinia cupana*, *Paullinia pachycarpa*, *Paullinia yoco*, Super Pep, Zoom.

**Effects:** Traditionally used as a stimulant, aphrodisiac, and appetite suppressant, it is also used by herbalists to treat diarrhea, fever, and headaches. It does not cause the caffeine "jitters" that coffee normally does, possibly because the fats and oils in the seeds allow the caffeine to be digested much more slowly, resulting in a milder and longer-lasting high, though research has, as yet, not borne this out. Has been shown to have a positive effect on

memory acquisition in mice and rats (Espinola et al., 1997). The various saponins in guarana may enhance the health benefits of this herb.

**Precautions:** Has a higher caffeine level than tea or coffee, though the caffeine content may sometimes be misleadingly referred to as guaranine, a name bestowed upon it by early researchers who did not realize the two alkaloids were identical. Guarana sodas have, at most, 0.3 to 0.6 percent of the herb. More unfortunately, however, modern processing grinds the seeds at high temperatures, which oxidizes some of the compounds and produces a product that is both bitter-tasting and potentially irritating to the stomach. Of nearly three dozen species, only *Paullinia cupana*, *Paullinia pachycarpa*, and *Paullinia yoco* were found to have the stimulant alkaloids.

**Dosage:** None established.

## GUAYUSA

**AKA:** *Ilex guayusa*.

A member of the holly family, it is related to yaupon and yerbe mate.

**Effects:** One of the richest plant sources of caffeine (up to 7.6 percent), it has traditionally been used by the indigenous peoples of South America as a stimulant, a headache remedy, and as a purgative in ceremonial rituals.

**Precautions:** No known side effects.

**Dosage:** None established.

## GUGGUL

**AKA:** African myrrh; Arabian myrrh; *Commiphora mukul*; *Commiphora wightii*; devadhupa; guggulu; Gugulipid; gum guggul; Indian Bdellium; pura.

A tree resin similar to myrrh. Due to overharvesting, the tree producing this resin is now an endangered species. It should not be confused with salai guggul, the gum resin of the *Boswellia serrata*.

**Effects:** A strong antioxidant that is said to relieve arthritis and other inflammatory diseases. It has been shown to lower LDL cholesterol and triglycerides and raise HDL cholesterol.

**Precautions:** In traditional ayurvedic medicine, it is never taken by itself, and is always combined with other herbs. It has been used for thousands of years in India as part of treatments for a wide variety of problems, including arthritis, obesity, hemorrhoids, acne, high cholesterol, and urinary tract infections, though there is little or no scientific evidence supporting any of these claims. Guggul must undergo a purification process in simmering milk, and it is believed that the age of the resin, as well as when it was harvested, changes its potency and properties. It is also advised that the individual avoid sour or bitter foods, alcohol, prolonged exercise, mental strain, anger, and direct sunlight. None of this information has been scientifically tested.

It should not be used by children, women who are pregnant or nursing, individuals taking medications for cardiovascular disease, or individuals suffering from thyroid disorder, cancer of the breast, uterus, or ovaries, or who have endometriosis or uterine fibroids. Guggulu should be used with caution by individuals suffering from diarrhea or inflammatory bowel disease. It should not be taken in the two weeks preceding surgery, as it could increase the risk of bleeding.

Side effects may include stomach upset, headache, nausea, vomiting, diarrhea, gas, hiccups, and skin irritation, usually occurring in doses of 6000 mg/day or more. According to the Memorial Sloan Kettering Cancer Center, one study found that it raised cholesterol levels instead of lowering them, and Beth Israel Deaconess Medical Center reported one case suggestive of rhabdomyolysis.

Guggul should not be taken with any other herbs or supplements that increase the risk of bleeding, including (but not limited to) garlic, ginkgo biloba, and saw palmetto. It may inhibit the actions of many drugs, including (but not limited to) atorvastatin, cyclosporine, diltiazem, fexofenadine, lovastatin, propranolol, quinidine, tamoxifen, and triazolam (Brobst et al., 2004), and increase the actions of others, including anticoagulants, contraceptive drugs, estrogens, and thyroid hormones (RxList.com).



**Dosage:** None established. For ayurvedic medicine, the traditional dose is an extract with 25 mg of guggulsterones taken two to three times a day for three to six months.

## HAWAIIAN BABY WOOD ROSE

**AKA:** *Argyrea nervosa*, baby Hawaiian woodrose, elephant creeper, Hawaiian wood rose, mile-a-minute, miniature wood rose, monkey rose, silver morning glory, woodrose, woolly morning glory.

Despite its popular name, it is not a member of the rose family, but is a woody liana in the morning glory family. It should not be confused with the Hawaiian woodrose (*Ipomoea tuberosa*), which is not psychoactive.

**Effects:** In Ayurvedic medicine, the root is considered a tonic for the nerves and brain, with rejuvenating, aphrodisiacal, and intelligence-boosting properties.

**Precautions:** These claims have not been scientifically proven. The white fuzz on the seeds contains strychnine. The seeds of the plant are often used for its psychoactive properties, and side effects may include nausea, a hangover characterized by blurred vision, vertigo, physical inertia, exhaustion, and constipation. High doses could result in intense nausea and death. Filtered, cold-water infusions of the ground seeds are said to present fewer hazards than ground seeds eaten whole. Extreme nausea might be the result of strychnine ingestion.

**Dosage:** None established.

## HAWTHORN

**AKA:** *Crataegus laevigata*, *Crataegus oxyacantha*, English hawthorn, haghorn, May bush, May tree, quickset, thorn-apple tree, whitethorn.

**Effects:** May relieve anxiety and insomnia and improve circulation. It contains many bioflavonoids and is used by herbalists for various heart conditions—such as high blood pressure, myocarditis, arrhythmic heartbeat, and arteriosclerosis—digestive problems, and kidney disorders.

**Precautions:** Children and women who are pregnant or nursing should only use this under the guidance of a medical care professional. Its concentrated form should be used only under the guidance of a physician. Using large amounts can cause a serious drop in blood pressure.

According to Michael Murray, N.D., in *The Pill Book Guide to Natural Medicines*, “[t]heoretically, hawthorn may potentiate or interfere with the effects of drugs used for angina, arrhythmia, high blood pressure, and congestive heart failure, such as digoxin, beta-blockers such as propranolol (Inderal), and calcium channel blockers such as diltiazem (Cardizem) and nifedipine (Procardia).”

**Dosage:** One teaspoon of flowers steeped in one-half cup of water, for up to one and one-half cups a day, or three capsules a day in three divided doses.

## HOPS

**AKA:** *Humulus lupulus*.

A member of the hemp family, it is used to add flavor to beer.

**Effects:** May have a relaxing, sedative effect that promotes restful sleep and relieves anxiety.

Works synergistically with skullcap.

**Precautions:** It cannot be stored for long, as it deteriorates rapidly and becomes very unstable when exposed to light and air. Mild side effects include sleepiness, upset stomach, diarrhea, constipation, skin rash, and eye irritation. Because of its sedative effect, it should be taken just before sleep, and should not be taken during the day, especially by those who are driving or operating heavy machinery. For extended or daytime use, it should only be taken under the guidance of a medical care professional. It should not be taken by those with depression, as it can worsen this condition, or by pregnant women, women with estrogen-dependent breast cancer, and children under the age of two. Adults over 65 should start with a lower dosage, and children should only be given hops for more than seven

to ten days while under the guidance of a medical care professional.

When taken with other herbs, it is recommended that a lower dosage be used. Hops may interact with prescription sedatives and anti-anxiety drugs.

**Dosage:** Two teaspoons of dried herb per cup of water.

## HORSEBALM

**AKA:** American horsemint, English horse-mint, horsemint, *Mentha sylvestris*, monarda, *Monarda didyma* (bee balm, blue balm, high balm, low balm, mountain balm, mountain mint, Oswego tea), *Monarda fistulosa* (wild bergamot), *Monarda punctata*.

**Effects:** Contains carvacrol and thymol, both of which prevent the breakdown of acetylcholine, which may aid in the alleviation of symptoms of Alzheimer's disease. These compounds may be able to cross the blood-brain barrier, so it may be beneficial even when used externally. It has been used to relieve the symptoms of various digestive, respiratory, and cold-related ailments.

**Precautions:** No known side effects.

**Dosage:** One teaspoon of leaves or tops per cup of water, up to one to two cups a day.

## HYSSOP

**AKA:** *Hyssopus officinalis*.

**Effects:** Used as a sedative, muscle relaxant, digestive aid, and expectorant, it is said to relieve anxiety and hysteria.

**Precautions:** Mild side effects include upset stomach and diarrhea. Use of the tea for more than three days should only be done under the guidance of a medical care professional. It should not be used by pregnant women (it was once used as an abortifacient) or to children under the age of two. Older children and adults over 65 should be given lower dosages.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** Two teaspoons of dried herb per cup of water.

## INDIAN SNAKEROOT

**AKA:** *Rauwolfia serpentina*, *Rauwolfia*, *Rauwolfia serpentina*, *Rauwolfia serpentina*, serpentwood.

**Effects:** Dilates the blood vessels and contains the alkaloid reserpine, which has a tranquilizing effect. It is used to treat insomnia, mild hypertension, anxiety, mental disorders, and Raynaud's disease. Though it contains some yohimbine, it should not be considered a substitute for yohimbe.

**Precautions:** Side effects of extracts include muscle relaxation, dilated blood vessels, abnormal heart rhythm, acidosis, shock, and death from cardiac arrest.

It should not be taken by anyone who suffers from an allergy to rauwolfia alkaloids, depression (its depressive effects can persist long after its use), peptic ulcers, or ulcerative colitis. Those who suffer from epilepsy or who have had surgery in the past two months requiring general or spinal anesthesia should consult a physician first. Those over age sixty may suffer increased adverse reactions or side effects. Performing isometric exercises while on rauwolfia may cause the blood pressure to rise too high.

Common side effects to prescription rauwolfia alkaloids include depression, dizziness, headache, faintness, drowsiness, lethargy, red eyes, stuffy nose, impotence, reduced sex drive, diarrhea, and dry mouth. Less common side effects include black stools, bloody vomit, chest pain, shortness of breath, heartbeat that is irregular or slow, stiffness (muscles, bones, and joints), trembling in the hands, and swelling in the feet and legs. Rare side effects include a rash or itchy skin, sore throat, fever, abdominal pain, nausea, vomiting, unusual bruising or bleeding, jaundice, painful urination, and nightmares.

Overdose symptoms include drowsiness, a pulse that is slow and weak, breathing that is slow and shallow, diarrhea, flushing, coma, lowered body temperature, and pupils contracted to pinpoints.

The effects of rauwolfia alkaloids may be increased by other antihypertensives, beta-

adrenergic blocking agents, Carteolol, and Lisinopril, and decreased by Sotalol. Rauwolfia alkaloids can increase the effects of antidepressants, antihistamines, central nervous system depressants, Ethinamate, and Methyprylon, and decrease the effects of aspirin, levodopa, Pergolide, and terazosin. The effects of both rauwolfia alkaloids and Dronabinol, Fluoxetine, Guanfacine, Loxapine, or Sertraline are increased when combined. When combined with oral anticoagulants, it can result in an unpredictable increase or decrease in the anticoagulant effect; with anti-convulsants, it can result in changes in the seizure pattern; with Clozapine, the two could be toxic to the central nervous system; with digitalis preparations, it could result in an irregular heartbeat; with Leucovorin's high alcohol content, it could cause some side effects; with any mind-altering drug, it could cause excessive sedation; with MAO inhibitors, it could cause severe depression; with Nabilone it could cause increased depression of the central nervous system; with Nicardipine or Nimodipine, it could result in a drop in blood pressure; and with Procarbazine, there could be a marked increase in blood pressure.

Combining rauwolfia alkaloids with alcohol can lead to greater intoxication, while carbonated beverages can decrease the rauwolfia effect, cocaine can increase the risk of heart block and high blood pressure, spicy foods can cause an upset stomach, and marijuana can cause drowsiness, low blood pressure, and depression.

**Dosage:** None established.

## JASMINE

**AKA:** *Jasminum officinale*.

**Effects:** Jasmine is believed to promote relaxation and is a possible aphrodisiac.

**Precautions:** No known side effects.

**Dosage:** None established.

## JATOBA BARK

A plant used as a tea in the rain forests of Brazil and Peru.

**Effects:** Has an energy-boosting effect.

**Precautions:** No known side effects.

**Dosage:** None established.

## KANNA

**AKA:** Channa, gauwgoed, kaugood, *Mesembryanthemum expansum*, *Mesembryanthemum tortuosum*, *Scelletium expansum*, *Scelletium tortuosum*, *Sclerocarya caffra*, *Sclerocarya schweinfurthii*, umganu.

**Effects:** Said to improve mood and relieve anxiety, stress, and tension. There have also been reports of increased tactile sensations, sexual response, vivid dreams, meditative states, and a deeper sense of self-knowledge.

Kanna may work synergistically with marijuana, and is considered an enhancer for other entheogens, as well.

**Precautions:** Side effects include headache, listlessness, loss of appetite, and depression. An overdose can result in delirium and loss of consciousness.

Kanna should not be combined with SSRIs, MOAIs, or cardiac medications. Use with alcohol may cause headaches.

**Dosage:** a dose of 50 mg is said to improve mood, relieve anxiety, and induce a state of relaxation, as well as a sense of well-being. At 100 mg, it can induce feelings of calmness, euphoria, and empathy. Higher doses will result in hallucinations and other mind-altering effects (see entry under Entheogens).

## KAVA AND KAWAIN

**AKA:** Ava, awa, kasa, kava kava, Kavaform, Kaviase, kawa, kawa kawa, keu, Laitan, lewena, *Piper methysticum*, *Piper wichmannii*, sakau, seka, waka, wati, yagona, yaqona.

A Polynesian herb used by native peoples to make an alcoholic drink. The practice of preparing the root and stem for the drink by having a designated person chew on them is no longer done because of health risks. Kava contains several active compounds called kavalactones, also known as kava alphaspyrones or kava-pyrones, which include kawain (or

kavain), dihydrokawain, methysticin, dihydromethysticin, and yangonin; each kavalactone has a different effect on the body, and the effects of different plants may vary according to the levels of the various kavalactones. It's uncertain whether the leaves and stems produce different effects from the roots, or whether older plants are more potent than younger ones.

**Effects:** May induce a sense of well-being in small doses, and relaxation, lethargy, and drowsiness in larger doses. The effects begin after twenty or thirty minutes and generally last two to three hours. According to Dr. Harold Bloomfield, "Medical studies have shown that kava can often relieve mild to moderate anxiety as effectively as benzodiazepine tranquilizers." It has been found to improve memory, reaction time, and vigilance, relax muscles, and decrease anxiety. Unlike other psychoactive plants (e.g., mushrooms and peyote), it does not produce altered states of consciousness, though anecdotal evidence indicates it may enhance visual and auditory perception as well as produce more vivid dreams. Kava is currently being studied as a treatment for General Anxiety Disorder (GAD) (Lakhan and Vieira, 2010; Sarris, 2013). How the kavalactones work is still not known, though it is believed they pass through the blood-brain barrier and affect certain neurotransmitters.

Kawain, a resinous pyrone extracted from the root of the kava plant, has been shown to control lipofuscin deposits. *Waka* is a Fijian term that refers to the kava taken from the plant's lateral roots, and *waka* is the most expensive and potent form. *Lewena*, the rootstock, and *kasa*, the lower stems, are cheaper and less potent forms.

Kava works synergistically with chamomile, hops, licorice, and valerian.

**Precautions:** Kava has a smell and taste that has been likened to dirty dishwater. It should not be taken by those with Parkinson's disease (it could worsen muscular weakness and twitching), by those who are severely depressed, or by those allergic to it. The elderly

or ill should take smaller doses, and then only under the care of a physician. Kava is not advisable when driving or operating heavy machinery. It can be habit-forming. No clinical studies have been done in the U.S., and some are concerned that it might be abused, as it has psychotropic properties similar to opium and cocaine. It probably should not be used for severe anxiety or for long-term treatment. Neither should it be used as a substitute for benzodiazepines, as it is not as effective in inducing sleep; is not as effective for severe agitation, severe anxiety, or convulsions; is slower to take effect; and does not remain effective for as long a period as the prescription drug. It should not be taken by children for more than seven to ten days unless under the guidance of a medical care professional. A 2010 *Consumer Reports* study rated it as one of the twelve most dangerous supplements on the market. It is banned in Canada, Germany, and Switzerland.

A pungent and numbing aftertaste deters the drinker from consuming too much. Tea made from the dried and powdered root bark may not have the pleasant lilac aroma and flavor of freshly made kava. Stronger effects may be achieved by chewing the root, though this is something even the indigenous populations of the South Seas do not engage in, as the taste and thick fibers of the root make this an unappealing alternative.

Mild symptoms include increased sensitivity to light and sound. Extended use of doses equal to 400 mg/day of kavalactones and higher could result in a buildup of toxins in the liver, damage to the heart, lungs, eyes, and spinal cord, and skin that is pigmented or darkened, dry, and covered with scales, particularly on the palms, soles, forearms, back, and shins (which may clear up when use is discontinued). Other symptoms include numbness of the tongue and face, dizziness, gastrointestinal distress, grogginess, inflammation of the skin and eyes, insomnia, sudden muscle spasms, nausea, biochemical abnormalities, vision disturbances, and shortness of breath.

When taken with other herbs, it is recom-

mended that a lower dosage be used. There is one documented case of a man who lapsed into a brief coma after combining kava with the drug Xanax. It is recommended that kava not be combined with benzodiazepine tranquilizers, barbiturates, prescription sedatives, drugs used for treating Parkinson's disease, alcohol, antidepressants, or sleeping pills.

**Dosage:** The most effective method of consumption is by eating the dried root, as saliva activates the kavalactones. An acceptable dosage is 1.5 to 3 mg/day in divided doses. Probably the least effective method of consumption is as a tea, as water does not release the kavalactones the way oil does. An acceptable compromise is liquid extract formulas or standardized extract capsules. Generally, kava root of high quality will contain approximately 5 to 8 percent kavalactones. Though kavalactones are not, for the most part, water soluble, a water-soluble extract can be made; it differs from the usual fat-soluble extract in that it does not induce sleep, but it does have some pain-killing properties. Fat-soluble kava, on which most of the studies have been done, induces sleep and has much greater pain-killing abilities. If taking a tincture with a 1:2 ratio, dosage should be between 3 to 6 ml/day in divided doses. The initial dose should be about 70 mg of kavalactones, which should be gradually increased to about 100 mg. Reports indicate that 150 to 210 mg/day of kavalactones relieves anxiety, while one daily dose of this amount taken a half hour before bedtime induces sleep. It is more effective when taken on an empty stomach. Kava should not be taken on a daily basis for more than four to six months.

## KOLA

**AKA:** Cola, *Cola nitida*, *Cola vera*.

Cola soft drinks do not contain the herb, but they do share the stimulating compound caffeine.

**Effects:** May relieve mental fatigue and depression. Contains the compounds theobromine, kolanin, and caffeine, all of which

are stimulants. It is used as a female aphrodisiac in Jamaican and West African societies.

Kola nuts contain more caffeine proportionally than coffee beans.

**Precautions:** Should be used with caution by those sensitive to caffeine. The herb should not be taken by children unless under the guidance of a medical care professional.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One-half teaspoon of powdered seeds in one cup of water, for up to three cups a day.

## LAVENDER

**AKA:** *Lavandula officinalis*, *Lavandula vera*.

**Effects:** Lavender may relieve stress, depression, and insomnia because of its ability to slow nerve impulses, producing an anesthetic effect. According to James A. Duke, Ph.D., the sedative compounds can be absorbed in the skin, and tossing a handful in bathwater is a good way to relax.

**Precautions:** No known side effects. Some species, such as Spanish lavender, are stimulating rather than tranquilizing. The oil should not be used internally.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One teaspoon of dried leaves in one-half cup of water, for a maximum of one cup a day.

## LEMON BALM

**AKA:** *Melissa officinalis*.

**Effects:** Has been traditionally used as a mild sedative, and is said to relieve insomnia, tension, and depression. One study has found that a standardized extract increases calmness starting at doses of 300 mg, sustained improvements in attention were seen at 600 mg, while alertness was reduced at doses of 900 mg, indicating it can modulate both mood and cognitive performance (Kennedy et al., 2003). Due to its cholinergic binding properties, it

has been suggested that extracts may be an effective treatment for cognitive decline in Alzheimer's patients.

**Precautions:** No known side effects. It should only be used under a physician's guidance by those with thyroid-related conditions.

When taken with other herbs, it is recommended that a lower dosage be used. It may increase the effectiveness of other diaphoretic (sweat-inducing) medicines.

**Dosage:** Two to three teaspoons of dried leaves in one cup of water.

## LETTUCE

**AKA:** *Lactuca sativa* (common lettuce, garden lettuce, salad lettuce), *Lactuca virosa*.

**Effects:** The leaves of *Lactuca sativa* produce a milky substance which has a narcotic and sedative effect; eating a few leaves before bedtime is said to relieve insomnia. Jonathan Ott says trace amounts of morphine have been discovered in lettuce (lactucarium, or lettuce opium), but then, it is a trace constituent in human milk and cow's milk also, and is a natural product of brain chemistry (see also entry under *Entheogens*).

**Precautions:** It is not addictive, though large doses are toxic. Side effects include perspiration, enhanced breathing, heart palpitations, dilated pupils, itching, vertigo, headache, distorted vision, increased urination, sleepiness, and death.

*Lactuca virosa* (acid lettuce, poison lettuce, prickly lettuce, wild lettuce) is much more potent and should not be used without medical supervision.

**Dosage:** None established. The leaves should be as fresh as possible, as it quickly loses its medicinal properties after being picked.

## LICORICE

**AKA:** Gan cao, *Glycyrrhiza glabra*, licorice root, sweet licorice, sweet wood.

Most licorice candy does not contain any trace of the herb but, instead, anise; some European licorice candies, however, may contain

dangerously high levels of licorice. Licorice is a legume, part of the same family as beans and peas.

**Effects:** Licorice has been used to treat depression, as well as many other disorders.

**Precautions:** Mild side effects include upset stomach, diarrhea, headache, edema, grogginess, and weakness. Licorice should not be used by women who are pregnant, or those with high blood pressure, hypertension (it could raise the blood pressure even more), depression (it can elevate blood cortisol and deepen the depression), severe menstrual problems, heart disease, kidney disease, diabetes, or glaucoma. Children should not be given licorice for more than seven to ten days unless under the guidance of a medical care professional.

Overdosage or constant use (i.e., on a daily basis for more than a week) can result in headache, electrolyte imbalance, high blood pressure, hypertension, lethargy, retention of water and salt, and excessive loss of potassium. One man suffered congestive heart failure after eating a pound and a half of the herb for a week, and one woman suffered cardiac arrest (among other side effects) after consuming four pounds a week over an unknown period of time.

When taken with other herbs, it is recommended that a lower dosage be used. At least eight compounds in licorice are MAO inhibitors, so it should not be combined with certain drugs such as Digoxin or blood pressure medications.

**Dosage:** One teaspoon of rootstock in one cup of water for up to three cups a day.

## LIGUSTRUM

**AKA:** *Ligustrum lucidum*.

**Effects:** Its medicinal qualities are said to be similar to astragalus; it contains two potentially immune-regulating ingredients, syringin and a terpene compound. In China, it has been used to treat fatigue and prevent aging.

**Precautions:** No known side effects.

**Dosage:** From 6 to 15 g/day of a decoction made from the berries.

## LINDEN

**AKA:** Lime blossoms, lime flowers, linden flowers, tilia, *Tilia x europaea*.

**Effects:** May relieve insomnia and headache. It may have a calming effect when mixed with hops.

**Precautions:** No known side effects. Should not be used by children for more than seven to ten days or those with heart problems unless under the care of a physician.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One teaspoon of blossoms in one cup of water for up to three times a day.

## MAGNOLIA

**AKA:** Hou po, koboku, *Magnolia officinalis*, Relora.

**Effects:** It has been used in traditional Chinese medicine to treat insomnia, stress, depression, and nervous tension. Studies with mice have shown that the bark is five times more effective in reducing anxiety than Diazepam, without the side effects (Maruyama et al., 1998; Kuribara et al., 1998; Kuribara et al., 1999) possibly due to the compound honokiol; the sesquiterpene lactones may also have beneficial properties.

An Italian study found that an extract from the bark, when combined with magnesium, improved sleep. Other studies have found that Relora, a combination of magnolia and phellodendron extracts, provided some relief for premenopausal women with mild transitory anxiety (Kalman et al., 2008) and significantly reduced tension, depression, anger, fatigue, and confusion, and improved global mood state and vigor in moderately stressed individuals (Talbot et al., 2013).

**Precautions:** No known side effects. According to Ray Sahelian, M.D., some studies have used the stem or flower instead of the bark, while others do not mention which part of the plant is used.

**Dosage:** One tablespoon of bark in one cup of water once a day.

## MEXICAN WILD YAM

**AKA:** *Dioscorea barbasco*, *Dioscorea composita*, *Dioscorea mexicanan*, *Dioscorea villosa*.

**Effects:** Contains DHEA and diosgenin, or steroid saponins, which are the precursor to the hormone progesterone. Said by herbalists to be good for estrogen imbalances in women.

**Precautions:** There is little scientific evidence to back up any of its supposed benefits.

Possible side effects of high doses include nausea and vomiting. Only whole yam will provide benefits. Synthetic progesterone, called progestins or preestrogens, or products containing wild yam may be lacking in essential nutrients and may have many side effects, including depression, kidney problems, and increased risk of cancer.

**Dosage:** None established.

## MILK THISTLE

**AKA:** *Carduus marianus*, holy thistle, Marythistle, St. Mary's thistle, *Silybum marianum*, wild artichoke.

**Effects:** Contains the bioflavonoid mixture silymarin, which protects the liver against hepatitis, cirrhosis, and toxins such as carbon tetrachloride, alcohol, and the poisonous Amanita mushroom. It may also help protect the liver from otherwise beneficial pharmaceuticals such as anti-anxiety drugs, antidepressants, cholesterol-lowering drugs such as Zocor (simvastatin) and Mevacor (lovastatin), and high doses of Tylenol (acetaminophen) and iron. Milk thistle may even reverse damage that has already occurred. Studies published in the *Journal of the American Medical Association* have revealed that at least three-quarters of all adult Americans show at least some sign of chronic liver damage—which could manifest itself as irritability, fatigue, malaise, anxiety, depression, and mild intellectual impairment—possibly indicating that this may be an important herb to add to the diet. Silymarin and its basic component silybin may protect cell membranes from free radicals through antioxidant properties.

**Precautions:** There appears to be little chance of any side effects with moderate use: studies have shown that less than one percent of users have suffered side effects—and then only gastrointestinal discomfort and loose stools. It should not be taken by children for more than seven to ten days unless under the guidance of a medical care professional. Those taking any medication or suffering from liver damage should consult a physician first.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One teaspoon of freshly ground seeds in one cup of water for up to three times a day. The common dosage is a 200 mg pill containing a standardized extract of 80 percent silymarin (160 mg of silymarin) taken one to three times a day. Silymarin is not very soluble in water, so the extract may be more effective than the tea.

## MOTHERWORT

**AKA:** *Leonurus cardiaca*.

**Effects:** May relieve anxiety and menopause- or PMS-related insomnia.

**Precautions:** Mild side effects include rash, upset stomach, and diarrhea. Anyone considering using motherwort should consult with a physician first. It should not be used by those with a blood or cardiac disorder unless prescribed by a medical care professional. Women should consult a physician before using, especially if pregnant, as it can induce labor, those over 65 years of age should start out at lower dosages, and it should not be taken by children unless under the guidance of a medical care professional. Children under two should not be given this herb at all.

When taken with other herbs, it is recommended that a lower dosage be used. Motherwort may interact with other medications, and it is recommended that individuals consult with their physician first.

**Dosage:** One to two teaspoons of dried herb in one cup of water.

## MUGWORT

**AKA:** *Artemisia argyi*, *Artemisia vulgaris*, common mugwort, felon herb, sailor's tobacco.

**Effects:** Has been used to reduce nervousness and insomnia. May relieve mental fatigue and improve memory.

**Precautions:** High doses can lead to poisoning, but normal usage reportedly produces no adverse symptoms.

**Dosage:** One tablespoon of dried herb steeped in half a cup of water or one-half teaspoon of powdered rootstock with water twice a day.

## MURIA PUAMA

**AKA:** *Ptychopetalum olacoides*.

**Effects:** Used as a stimulant in Brazil. Also said to be an aphrodisiac.

**Precautions:** No known side effects.

**Dosage:** None established.

## MYRRH

**AKA:** *Commiphora molmol*, *Commiphora myrrha*, gum myrrh tree.

**Effects:** An antioxidant.

**Precautions:** Mild side effects include stomach upset and diarrhea. Serious side effects include severe diarrhea, sweating, vomiting, rapid heartbeat, and kidney damage. Those with kidney disease or women who are pregnant or nursing should consult a physician first. It should not be taken by children for more than seven to ten days unless under the guidance of a medical care professional. Children under two should not be given this herb at all.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One teaspoon steeped in one pint of boiling water for a few minutes before straining, or two to five drops of tincture at a time as needed.



NETTLE

**AKA:** Common nettle; common stinging nettle; dwarf nettle; great stinging nettle; stinging nettle; *Urtica dioica*; *Urtica urens*.

**Effects:** Contains high levels of boron, which can increase the body's estrogen levels, improving mood and short-term memory in those with Alzheimer's. It is also a rich source of vitamins A, C, and E, protein, and minerals.

**Precautions:** Scientific evidence is lacking, and effectiveness in such cases is very doubtful. Eating old, uncooked plants can cause kidney damage and poisoning. Side effects from the tea include upset stomach, a burning sensation on the skin, constipation, difficult urination (even though it is normally a mild diuretic), loss of potassium, and bloating.

It should not be used by women who are pregnant or breastfeeding, as effects are not known.

When taken with other herbs, it is recommended that a lower dosage be used. When combined with NSAIDs, it may increase the effects of these drugs. Because of its Vitamin K content, it should not be used by individuals taking warfarin.

**Dosage:** Two to three tablespoons of leaves or plants in one cup of water.

OAT

**AKA:** *Avena sativa*.

**Effects:** Said to relieve anxiety and insomnia, and have anti-depressant and aphrodisiac properties. Preliminary studies have shown that extracts have some success in helping individuals overcome opiate and nicotine (from cigarette smoking) addiction. Herbalists combine it with damiana, kola, skullcap, mugwort, or lady's-slipper (*Cypripedium pubescens*) to treat anxiety and depression.

**Precautions:** Evidence of its anti-depressant and aphrodisiac qualities is lacking, though it is a source of melatonin. Mild side effects include cramps and intestinal gas. Large doses can cause headaches as a mild side effect.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** Two to three ounces of oat fiber (oatmeal, porridge, oat bran) per day, or teaspoons of dried oat straw in one cup of water for up to three times a day.

OREGANO

**AKA:** Marjoram, mountain mint, *Origanum majorana*, *Origanum vulgare*, wild marjoram, winter marjoram, wintersweet.

**Effects:** An antioxidant. It may have a calming effect, and a pillow made from the bruised leaves may help insomnia.

**Precautions:** No known side effects.

**Dosage:** Two or three teaspoons of herb in one cup of water once or twice a day.

PASSION FLOWER

**AKA:** Maypops, *Passiflora incarnata*, passion vine, purple passion flower.

**Effects:** Passion flower is said to relieve depression and anxiety and promote restful sleep. It has been used to treat anxiety, convulsions, and neuralgia. A review of the literature suggests it may be an effective treatment for anxiety disorders (Lakhan and Vieira, 2010).

Works synergistically with other sedative herbs.

**Precautions:** Scientific evidence is lacking for many of its health claims. It should only be used under the care of a medical care professional. It should only be taken an hour or two before sleep. Herbalists advise using only preparations made by reputable manufacturers or herbalists, to ensure that another species, *Passiflora caerulea*, which contains cyanide, is not used. Mild side effects include upset stomach, nausea, vomiting, diarrhea, and sleepiness. It should not be used by pregnant women, as it could stimulate the uterine muscles. It should not be taken by children unless under the guidance of a medical care professional. Adults over 65 should start out with a lower dosage.

Caution is advised when using with pre-

scription sedatives, anti-anxiety medications, or any antidepressant drug, as the combination can have a synergistic effect.

**Dosage:** One to two teaspoons of dried herb per cup of water before bedtime for insomnia. From 200 to 300 mg of extract one hour before bedtime, containing 3.5 to 4 percent isovitexin (flavonoids). The fruit, though low in nutrition, may be eaten when ripe, simmered for 5 minutes to make a tea, or made into a jelly.

## PENNYROYAL

**AKA:** *Mentha pulegium*.

**Effects:** May relieve anxiety.

**Precautions:** No known side effects. The recommended dosage should not be exceeded, or taken for more than a week at a time. It should not be used by pregnant women, as it could trigger uterine contractions. It has been used in the past as an abortifacient, though it is strongly advised that it not be used as such, as the amount needed is close to the lethal dose, and hemorrhaging, convulsions, and death could result. It should not be taken by children unless under the guidance of a medical care professional; children under two should not be given pennyroyal under any circumstances. The oil is toxic if taken internally in any amount.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One to two teaspoons of dried leaves in one cup of water for up to two cups a day.

## PEPPERMINT

**AKA:** American mint, brandy mint, lamb mint, *Mentha piperita*, mint.

**Effects:** An antioxidant. It is said to be good for anxiety, headache, insomnia, and nervousness.

**Precautions:** It can worsen heartburn and gastroesophageal reflux disease, or acid reflux. Overdosage may cause heart problems. Pregnant women should only use a very di-

luted tea, and it should not be used at all by women with a history of miscarriage. Children under two should also be given very dilute preparations, and then only under the guidance of a medical care professional. Pure peppermint oil is extremely toxic, and can cause cardiac arrhythmias; pure menthol can cause death with as little as one teaspoon when taken internally.

It may interfere with the absorption of iron. When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** Two to three teaspoons of leaves per cup of water, not to exceed one and a half to two cups a day for eight to twelve days.

## PHELLODENDRON

**AKA:** Huáng bò, *Phellodendron amurense*, pinyin, Relora.

**Effects:** The bark is said to reduce anxiety by lowering stress hormones.

Other studies have found that Relora, a combination of magnolia and phellodendron extracts, provided some relief for premenopausal women with mild transitory anxiety (Kalman et al., 2008) and significantly reduced tension, depression, anger, fatigue, and confusion, and improved global mood state and vigor in moderately stressed individuals (Talbot et al., 2013).

**Precautions:** None known.

**Dosage:** None established.

## POLYGONUM

**AKA:** Asian marsh pennywort, fleecflower, fo-ti, fo-ti-tieng, Ho shou wu, *Hydrocotyle asiatica minor*, *Polygonum multiflorum*. Polygonum (fo-ti-tieng) is so similar to gotukola that botanists think it may be a geographic variant.

**Effects:** In traditional Chinese medicine, it is used to treat insomnia and chronic fatigue (not to be confused with Chronic Fatigue Syndrome). It may improve attention and concentration, have an anti-stress tranquilizing effect, stimulate the brain by increasing blood flow,

detoxify the body, and energize the cells. It is said to increase longevity.

Taken with calamus root, it may improve memory and mental clarity.

**Precautions:** Solid scientific evidence is lacking for many of its benefits, but it appears to be a safe herb. Mild side effects include a flushing of the skin, more frequent bowel movements, diarrhea, skin rashes, headaches and mild abdominal pain. It should not be taken by women who are pregnant or nursing, or by those with an overactive thyroid or who are taking tranquilizers or sedatives. Adults over 65 should start with a lower dosage, and it should only be prescribed to children by a medical care professional

When taken with other herbs, it is recommended that a lower dosage be used. Some Chinese herbalists advise anyone taking this herb to avoid eating garlic, onions, or chives.

**Dosage:** None established; traditional dosage likely dependent on the individual and the condition being treated.

## PURSLANE

**AKA:** *Portulaca*, *Portulaca oleracea*, pussley.

**Effects:** Rich in antioxidants, including glutathione, and vitamins A, C, and E. It also contains high levels of Omega-3 fatty acids, magnesium and potassium, along with calcium, folate, and lithium, all of which may help relieve depression. Purslane has also been used to treat chronic fatigue syndrome.

**Precautions:** No known side effects.

**Dosage:** The fresh stems and leaves can be used as salad greens.

## REISHI

**AKA:** Ganoderma, *Ganoderma lucidum*, ling-chih-tsao, ling-zhi, wu-ling-chih.

Reishi is a mushroom that grows in the mountains of Asia.

**Effects:** An adaptogen that boosts the immune system, balances the bodily systems, counteracts stress, and improves mental functioning. In traditional Chinese medicine, it is

used to treat nervousness, insomnia, and dizziness.

**Precautions:** It should not be taken by hemophiliacs because it is high in adenosine. It should not be taken for longer than two or three months on a daily basis, as long-term effects are unknown. Side effects include aches, more frequent bowel movements in the first few days, hardened feces, dizziness and vertigo, itchiness, and skin eruptions.

Reishi can interact with Thorazine and barbiturates.

**Dosage:** Between 750 and 1000 mg/day of extract in three divided doses.

## RHODIOLA ROSEA

**AKA:** Arctic root, Extrait de Rhodiola, golden root, Hongjingtian, King's Crown, Lignum Rhodium, Orpin Rose, Racine d'Or, Racine Dorée, Racine de Rhodiola, Rhodiola Rougeâtre, rhodaxon, Rhoziva, rodia riza, rosavin, rosenroot, rose root, Rosewort, Sedum rhodiola, Sedum rosea, SHR-5, Siberian Golden Root, Siberian Rhodiola Rosea, Snowdown Rose.

An adaptogen herb that grows in Siberia, Asia, and mountain regions in Europe. There are 24 different species, of which *Rhodiola rosea* is the most potent.

**Effects:** Traditionally used to relieve mild stress, anxiety, mental and physical fatigue, and mild depression. It is also a potential antioxidant, memory enhancer, and blood pressure medication. The ancient Greeks used it for medicinal purposes, the Vikings believed it gave them physical strength and endurance, and Mongolian physicians used it to treat tuberculosis and cancer. It has been found to extend the lifespan of the fruit fly by nearly 25 percent (Jafari et al., 2013), protect human cultured cells against oxidative stress, and help mice survive lethal doses of gamma radiation.

**Precautions:** Much more research is needed to verify its many reputed health benefits; long-term effects are unknown.

Rare side effects include headache, stomach upset, drowsiness, dizziness, and difficulty

sleeping. Paradoxically, some individuals may feel increased anxiety or hyperactivity. Side effects of high doses may include heart palpitations, panicky feelings, and rapid heartbeat.

It should not be taken by children, women who are nursing or pregnant, individuals suffering from bipolar disorder, or those taking prescription MAOIs (it is itself an MAO inhibitor).

When combined with benzodiazepines, selective serotonin reuptake inhibitors (SSRIs), or serotonin norepinephrine reuptake inhibitors (SNRIs), it could result in drowsiness.

**Dosage:** The recommended dose is 100 to 300 mg daily, approximately thirty minutes before a meal. It should probably not be taken for more than a few weeks at a time. The standardized extract should contain approximately 2 to 3 percent rosavin and 0.8 to 1 percent salidroside, both polyphenols. Some sources recommend 200 to 600 mg a day, though this may depend on how much polyphenols the extract contains, and it is best to start out with a smaller dose and gradually increase it, if necessary.

## ROSEMARY

**AKA:** Compass plant, incensier, mi die xiang, *Rosmarinus officinalis*.

Should not be confused with wild rosemary (*Ledum palustre*, marsh tea, *Rhododendron tomentosum*).

**Effects:** An antioxidant which also prevents the breakdown of acetylcholine. It acts as a stimulant and improves blood circulation, and may relieve mental fatigue, insomnia, and depression. Research on mice with age-related cognitive decline indicates that extract made from its antioxidants can improve learning and memory (Ellis, 2013); a 2010 study suggests it may improve cognitive function.

**Precautions:** Raises blood pressure. Excessive amounts, especially of the oil, taken internally can be fatal. It should not be used by pregnant women or those with high blood pressure. Children under two should be given a very dilute dosage.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** One teaspoon in half a cup of water once or twice a day, or 5 to 20 drops of tincture a day.

## ROSY PERIWINKLE

**AKA:** Madagascar periwinkle, sorcerer's violet, *Vinca rosea*.

**Effects:** Though it has traditionally been used for its various healing and medicinal properties, it is mainly drunk as a tea to prevent diabetes, and some of its alkaloids have been found to be effective in the treatment of various cancers. One of its traditional uses is in the treatment of memory loss.

**Precautions:** No known side effects.

Aside from its use in fighting cancer, none of its beneficial effects—despite the long history of traditional use—have been verified.

**Dosage:** None established.

## SAFFRON

**AKA:** Autumn crocus, *Crocus sativus*, Spanish saffron.

**Effects:** One study involving thirty adults indicates that it may be at least as effective as imipramine in treating mild to moderate depression (Akhondzadeh et al., 2004), while another indicates it may be at least as effective as fluoxetine in doses of 30 mg/day (Noorbala et al., 2005). Contains crocetin, which lowers blood pressure. It has been used in traditional Persian medicine to treat depression, and by herbalists to treat insomnia. Saffron oil, or safrol, can be processed to make the narcotic MDA (methylenedioxymphetamine).

**Precautions:** No known side effects, though large-scale studies are needed to more accurately assess its benefits and hazards. Only the stigmas of the plant contain the active agent crocetin; the leaves and petals do not. It contains a poison that can affect the central nervous system and damage the kidneys, and can be fatal at doses of 10 to 12 grams. It should not be used as an abortifacient, as the

dosage needed could result in death. It should not be given to children under the age of two; older children and adults over 65 should start out at lower dosages. Other species of *Crocus* may not have the benefits of *Crocus sativus*; at least one other species is toxic.

When taken with other herbs, it is recommended that a lower dosage be used.

**Dosage:** A dosage of 30 mg/day was found to relieve mild to moderate depression.

## SAGE

**AKA:** Garden sage, *Salvia lavandulaefolia* (Spanish sage), *Salvia officinalis*.

**Effects:** Sage is an antioxidant, a central nervous system stimulant, and a producer of estrogen-like effects. It may help oxygenate the brain, and may also be helpful in treating nervous conditions and depression. One study found that 50 microliters of an essential oil extract of Spanish sage significantly improved memory in young adults (Tildesley et al., 2003).

**Precautions:** Mild side effects include inflammation of the lips and mouth. It should not be taken by those with seizure disorders or in large quantities because it contains thujone, which can cause convulsions in high doses, however heating during cooking or preparation of the infusion can reduce the toxicity. Prolonged use or overuse can lead to poisoning. It should not be used by women who are pregnant or nursing. Adults over the age of 65 should take a lower dosage. Children under 12 should take a lower dosage, and for no more than seven to ten days unless under the guidance of a medical care professional.

When taken with other herbs, it is recommended that a lower dosage be used. It can interfere with the absorption of iron and other minerals.

**Dosage:** One teaspoon of leaves steeped in one-half cup of water for 30 minutes and taken one tablespoonful at a time, for up to one cup a day. One-quarter to one-half teaspoon of powdered leaves at a time. Fifteen to 40 drops of tincture three or four times a day.

## ST. JOHN'S WORT

**AKA:** Amber; chase-devil; common St. John's wort; goatweed; hypericum; *Hypericum perforatum*; Johnswort; Kira; Klamath weed; LI-160; Saynt Johannes Wort; SJW; Tipton's weed; Tipton weed.

**Effects:** Probably the most effective natural anti-depressant known (it is used extensively throughout Europe), working much like Prozac and similar drugs, possibly by keeping serotonin in the brain for longer periods of time. The flowers contain hypericin, a substance which has germicidal, anti-inflammatory, and antidepressant properties, along with high levels of flavonoids. Dr. Klaus Linde, of the Center for Complementary Medicine in Munich, after a review of 29 studies, has stated that it is just as effective as Prozac, and has fewer side effects. It enhances three important neurotransmitters—serotonin, norepinephrine, and dopamine—the first substance known to do so. Benefits may include longer and deeper sleep, improved mood, greater energy, and increased appetite. It has been used to treat exhaustion, headaches, and insomnia. It may have antiviral properties and be useful against herpes, HIV, chronic fatigue syndrome, and Seasonal Affective Disorder (SAD).

A 2001 study at the University of Latvia in Riga found that a hypericum extract enhanced learning ability and memory in rats, in addition to almost completely reversing scopolamine-induced amnesia; it is not yet known whether it has similar effects in humans. The supplement Kira contains 300 mg of LI-160, an extract of St. John's wort containing 0.3 percent hypericin that has been proven in studies to have anti-depressant effects.

Works synergistically with kava.

**Precautions:** It may only work for mild depression, and not severe—or clinical—depression or dysthymia (mild, chronic depression), and Kimberly Zoberi, M.D., associate professor of family and community medicine at Saint Louis University School of Medicine, says there is no evidence it works for anxiety,

either; it is recommended that a physician be consulted before use. A review of the literature suggests it is not an effective treatment for anxiety disorders (Lakhan and Vieira, 2010). As yet, there is not enough evidence to determine whether it is an effective treatment for Attention Deficit Hyperactivity Disorder (ADHD).

Mild side effects include anxiety, dizziness, confusion, tiredness, sedation, vivid dreams, headache, insomnia, skin rash, and tingling. Serious side effects include high blood pressure, headaches, stiff neck, nausea, vomiting, and increased risk of sunburn leading to blistering. It may cause the skin to be sensitive to light, and can cause cataracts if the individual is exposed to bright light. It has a very mild MAO inhibitor effect, but not enough to warrant food restrictions. Evidence has shown that it can completely prevent the ability of sperm to penetrate eggs and may cause a genetic mutation which, if found in adult women, is correlated with an increased risk of breast and ovarian cancer. Less common side effects include gastrointestinal irritation, dizziness, tiredness, hair loss, dry mouth, and mild allergic reactions. Overdose symptoms, which can occur at dosages of 900 mg/day or more, include depression, gastrointestinal problems, nervousness, irritability, mild anxiety, restlessness, insomnia, headaches, cardiac symptoms, and sweating. It should not be used for serious depression. Extracts containing hypericin can cause a reddening of the skin sores, paralysis of the lips and eyelids, and necrosis (death of tissue), causing skin that is leathery and parchment-like after coming into contact with skin. Hypericin poisoning can also cause loss of appetite, peeling skin, loss of hair, convulsions, and coma.

It should not be taken by women who are pregnant or breastfeeding, as effects are not known.

In 1998, a study commissioned by the *Los Angeles Times* found that seven out of ten of the leading brands of St. John's wort had only 20 to 90 percent of the potency listed on the label.

It can interfere with the absorption of iron

and other minerals. It can interact with the amino acids tryptophan and tyrosine, resulting in high blood pressure and nausea, and should not be taken with any tyramine-rich foods (including beer, coffee, wine, chocolate, fava beans, salami, smoked or pickled foods, and yogurt) or drugs, and high doses should not be combined with high doses of 5-HTP. It should not be combined with amphetamines, asthma inhalants, cold or hay fever medications, narcotics, or nasal decongestants, as it could result in high blood pressure and nausea. It should not be combined with Prozac, Paxil, or other anti-depressants, as it could cause dangerously high blood pressure, hypertension, severe anxiety, fever, muscle tension, and confusion; there should be at least a four week interval between taking an MAO inhibitor and taking St. John's wort. When combined with antidepressants, CNS stimulants, or psychedelic drugs, it can result in the serotonin syndrome, a serious life-threatening condition resulting from high 5-HT (serotonin) levels in the central nervous system. It can also neutralize the effectiveness of certain HIV medications and heart drugs such as digoxin and warfarin, and can interact with transplant drugs. According to some studies, it may reduce the effectiveness of contraceptive pills and the contraceptive implant Implanon. Significant interactions can occur with antiretrovirals, non-nucleoside reverse transcriptase inhibitors, benzodiazepines, immunosuppressants, and calcineurin inhibitors. Interactions with other drugs not mentioned here are considered likely.

**Dosage:** One to two teaspoons of dried herb in one cup of water for up to three cups a day. From 600 to 900 mg/day in three divided doses of 0.3 percent hypericin strength (Rosenfeld recommends 300 mg/day). Extracts must be at least 0.3 percent hypericin to be effective. Just 300 mg/day has proven effective against Seasonal Affective Disorder (SAD). Standardized extracts are more likely to have active ingredients, and extracts using the whole plant are more effective than extracts derived solely from the hypericin com-

pound. Dr. Isadore Rosenfeld does not recommend using it for more than eight weeks at a time; others recommend not using it for more than six to eight months at a time. St. John's wort as a tea is not very effective, as just 10 to 20 percent of the active ingredients are dissolved in water. It may take three to six weeks for it to fully take effect.

### SARSAPARILLA

**AKA:** *Aralia hispida* (bristly sarsaparilla), *Aralia nudicaulis* (wild sarsaparilla), *Aralia racemosa* (spikenard), Chinese root, life-of-man, small spikenard, *Smilax officinalis*.

**Effects:** Sarsaparilla is said to increase energy, regulate hormonal activity and protect against radiation.

**Precautions:** No known side effects.

**Dosage:** One teaspoon of rootstock in one cup of water for one to two cups a day.

### SCHIZANDRA BERRY

**AKA:** Schisandra; *Schisandra chinensis*; *Schizandra chinensis*; *Schizandra fructus*; wu-wei-tzu.

**Effects:** An adaptogen and antioxidant that reduces fatigue and stress, and reportedly boosts the immune system, balances the bodily systems, counteracts stress, and improves mental functioning. It appears to have some cortisone-like effects.

Works synergistically with astragalus.

**Precautions:** Side effects may include increased appetite, stomach upset, and skin rash.

It should not be used by women who are pregnant or breastfeeding, as effects are not known. It should not be used by children unless under the guidance of a physician.

**Dosage:** None established.

### SHANKA PUSPI

**AKA:** *Convolvulus mycophyllus*.

**Effects:** An herb used in India to relieve anxiety.

**Precautions:** No known side effects.

**Dosage:** None established.

### SHI QUAN DA BU WAN

**AKA:** All-Inclusive Great Tonifying Pills, Shih Chuan Ta Bu Wan.

**Effects:** In traditional Chinese medicine, it is used as a tonic for fatigue with coldness. It is a preparation which includes the ingredients astragalus, atractylodes, cinnamon bark, codonopsis, dang gui, licorice, ligusticum, poria, cooked rehmannia, and white peony root.

**Precautions:** Side effects include heat and fever; use should be discontinued if these occur.

**Dosage:** None established; traditional dosage likely dependent on the individual and the condition being treated.

### SKULLCAP

**AKA:** Blue skullcap, blue pimpernel, helmet flower, hoodwort, maddog-weed, scullcap, *Scutellaria biacalensis*, *Scutellaria baicalensis* (Chinese skullcap), *Scutellaria laterifolia*, *Scutellaria lateriflora*, side-flowering skullcap, Virginia skullcap.

**Effects:** Reported to reduce insomnia, nervous tension, irritability, anxiety, and stress. Bioflavonoids in Chinese skullcap have anti-inflammatory and anti-allergic properties.

Works synergistically with hops.

**Precautions:** Scientific evidence is lacking for many of its claims, including its ability to reduce insomnia and anxiety. Mild side effects of *Scutellaria lateriflora* include drowsiness, stomach upset, and diarrhea. An overdose of the tincture can cause confusion, giddiness, stupor, twitching, and other neurological problems. There are a few recorded cases where high doses have caused liver damage. It should not be taken by children unless under the guidance of a medical care professional.

When taken with other herbs, it is recommended that a lower dosage be used. Some

Chinese herbalists claim that Chinese skullcap nullifies the effects of moutan and veratrum.

**Dosage:** None established for Chinese skullcap; traditional dosage likely dependent on the individual and the condition being treated. Two teaspoons of dried leaves in one cup of water for up to three times a day for *Scutellaria lateriflora*.

### SPEARMINT

**AKA:** Lamb mint, *mentha spicata*, Our Lady's mint, sage of Bethlehem.

**Effects:** Research on mice with age-related cognitive decline indicates that extract made from its antioxidants can improve learning and memory (Ellis, 2013).

**Precautions:** None known.

**Dosage:** None established.

### SUMA

**AKA:** Para todo, *Pfaffia paniculata*.

**Effects:** Promotes energy and stamina. Has been used to treat exhaustion resulting from Epstein-Barr disease and chronic fatigue syndrome.

**Precautions:** No known side effects.

**Dosage:** Three to six capsules a day in three divided doses.

### SWEET FLAG

**AKA:** *Acorus calamus*, calamus, flag root, grass myrtle, myrtle flag, rat root, sweet calomel, sweet cinnamon, sweet grass, sweet myrtle, sweet root, sweet rush, vacha.

**Effects:** Relieves anxiety. It was used by Indians in the Northwest to increase endurance and stamina.

**Precautions:** When chewed, the dried root can cause nausea in smokers, a property which leads some to promote it as an aid for those wishing to quit. The species native to India, Europe, and North America may each have very different pharmacological properties.

**Dosage:** One teaspoon of rootstock in one-half cup of water, for up to one cup a day.

### TARRAGON

**AKA:** *Artemisia dracunculus*, estragon.

**Effects:** When taken as a tea just before bedtime, it may help relieve insomnia

**Precautions:** Contains a weak carcinogen.

**Dosage:** One-half teaspoon of dried plant in one-half cup of water, for up to one cup a day.

### TURMERIC AND CURCUMIN

**AKA:** Curcuma, *Curcuma domestica*, *Curcuma aromatica*, *Curcumae longa*, *Curcumae longae rhizoma*, Curcumine, Curcuminoid, Curcuminoids, Halada, Haldi, Haridra, Indian Saffron, Nisha, Pian Jiang Huang, Rajani, Radix Curcumae, *Rhizoma Cucurmae Longae*, Turmeric Root, Yu Jin.

**Effects:** The main spice in curry, turmeric is a strong antioxidant; its main curcuminoid is curcumin. In traditional Chinese medicine, curcumin—the main active ingredient in *curcuma longa*—is prescribed for stress and depression-related disorders. Turmeric may be beneficial to those with atherosclerosis, cancer, gallbladder disease, indigestion, inflammation, liver disease, obesity, osteoarthritis, and rheumatoid arthritis. Preliminary research indicates that it may be an anti-depressant, and that bisdemethoxycurcumin, a natural ingredient of turmeric root, may help the immune system in clearing the amyloid beta plaques in the brains of Alzheimer's patients. A 2006 study by Xu et al. has found that curcumin can provide some protection against the physiological effects of stress in rats, and a 2002 study by Yu et al. has shown turmeric to have more potent anti-depressant properties than fluoxetine when administered to mice. Curcumin also has antioxidant and anti-inflammatory properties which may protect against age-related neurodegenerative diseases such as Alzheimer's; in a 2001 study by Frautschy et al., curcumin proved superior to ibuprofen in



protecting the brain against amyloid beta-protein-induced damage in rats. Research by Mahtab Jafari at the University of California at Irvine has shown that curcumin can increase the lifespan of fruit flies—which have many genes and aging pathways in common with humans—by 20 percent.

Works synergistically with artichoke, dandelion root, licorice, and milk thistle.

**Precautions:** Mild side effects include heartburn, upset stomach, nausea, and diarrhea; one animal study indicates it may reduce fertility in women. Curcumin may also cause iron deficiency in individuals who are susceptible. According to the website [www.brainresearchsupplements.com](http://www.brainresearchsupplements.com), some individuals cannot digest these herbs and others may experience significant side effects; any positive effects are said to be short-lived. It should not be taken by women who are pregnant or breast-feeding, as it could trigger a menstrual period or stimulate the uterus (possibly leading to a miscarriage), or by individuals with gallbladder problems, as it could worsen the symptoms. Individuals with blood-clotting disorders should consult a physician before using. Adults over the age of 65 should start out with a lower dosage. Children should be given a lower dosage, and not for more than seven to ten days unless under the guidance of a medical care professional; children under the age of two should not be given turmeric. Those already taking it should discontinue use two weeks before surgery, as it could slow blood clotting and cause bleeding problems during surgery.

When taken with other herbs, it is recommended that a lower dosage be used. It should not be combined with medications that slow blood clotting, such as aspirin and warfarin, as it could cause bruising and excess bleeding.

**Dosage:** None established. It could cause problems when used in large quantities.

## VALERIAN

**AKA:** All-heal, Biral, Euvegal, moon root, Nutrasleep, phu, setwall, Undine's herb, Valdispert forte, *Valeriana officinalis*, Valmane.

**Effects:** Reduces anxiety and insomnia to a moderate degree, possibly because of chemicals called valepotriates and an as yet poorly understood ability to interact with either of the neurotransmitters serotonin and GABA. It may be used as a treatment for nervousness, headaches, high blood pressure, and tense muscles. It is the most widely used sedative in Europe.

Works synergistically with other sedative herbs.

**Precautions:** Mild side effects include mild headaches and upset stomach. Serious side effects include severe headaches, restlessness, nausea, morning grogginess, and blurred vision. Though it is said to be safe, it should not be used by those with impaired kidney or liver function or those with chronic insomnia; a few individuals may experience paradoxical reactions, finding that it makes them more alert and excitable. The plant has a strong unpleasant odor which some liken to smelly socks. Its daily use should be limited to a few weeks, and definitely no more than six months, as a tolerance toward the herb could develop, and long-term effects are not known. It should not be taken during the day, as it produces lethargy. Some of its components are very unstable, making accurate dosage difficult. Some studies indicate that valepotriates may cause cancer, but other studies do not bear this out. Claims by herbalists that it is good for chest congestion, digestive problems, menstrual pains, sores, wounds, epilepsy, convulsions, and the plague are unproven.

Rare side effects include restless legs during sleep and stomach upset. Overdose symptoms in susceptible individuals include tiredness the following day, restlessness, lethargy, mild confusion upon awakening, heart palpitations, and headaches. There is one case on record of an 18-year-old college student who took approximately 20 grams of powdered valerian root in capsule form and experienced fatigue, abdominal cramps, tightness of the chest, tremors in the hands and feet, and mild pupil dilation; her EKG, blood, and liver enzymes were all normal and, after treatment

in a hospital, she fully recovered within 24 hours.

It should not be taken by women who are pregnant or breastfeeding unless under the guidance of a physician, as its effects have not been fully evaluated.

When taken with other herbs, it is recommended that a lower dosage be used. It should not be used with alcohol, some antihistamines, tranquilizers, sedatives, muscle relaxants, psychotropic drugs, or narcotics, unless under the guidance of a physician. It can also interact with anaesthetics.

**Dosage:** Two teaspoons of powdered root in one cup of hot water (the herb should not be put in boiling water, as that will destroy some of its beneficial oils).

Sheldon Saul Hendler, M.D., Ph.D., recommends no more than two cups of tea or two capsules of 500 mg each per day. Ray Sahelian, M.D., recommends 300 to 500 mg/day of concentrated root extract containing 0.5 to 1 percent of essential oils about one-half to two hours before sleep, and 100 mg/day to reduce anxiety. Valepotriates are very unstable, and their levels in products may decline after a few months. With the dried root, the potency is directly related to the strength of its smell.

## VANILLA

**AKA:** *Vanilla planifolia*.

**Effects:** An antioxidant. It has been traditionally used in Mexico for gastrointestinal disorders and as a mild brain stimulant.

**Precautions:** No known side effects.

**Dosage:** None established.

## WILLOW

**AKA:** *Salix alba* (salicin willow, white willow, withe, withy), *Salix caprea* (goat willow, sallow), *Salix nigra* (black willow, catkins willow, pussywillow), *Salix purpurea* (purple osier, purple willow).

Willow is the herbal origin of aspirin.

**Effects:** May aid in the prevention of Alzheimer's disease much in the same manner

that anti-inflammatory drugs for arthritis seem to, as studies of those individuals taking the drugs seem to show a lower incidence of that disease

**Precautions:** Mild side effects include upset stomach, nausea, and ringing in the ears. Because it contains other compounds that the body can metabolize into salicylic acid, it can act more slowly and over a greater period of time than aspirin. It should not be taken by anyone allergic to aspirin. It should not be given to children unless under the guidance of a medical care professional, and not at all to children under 16 with a cold, flu, or other viral illness. It should be used with caution by those with ulcers or other stomach conditions, as it can make these problems worse.

When taken with other herbs, it is recommended that a lower dosage be used. It should not be combined with other salicylates, such as aspirin or wintergreen oil. It could interfere with the absorption of iron and other minerals. Taking it on a regular basis with large doses of vitamin C could cause it to build up to dangerous levels in the body.

**Dosage:** One to two teaspoons of powdered bark in one cup of water for up to three cups a day.

## WORMWOOD

**AKA:** Absinthe, *Artemisia absinthium*.

**Effects:** A mild sedative.

**Precautions:** May be habit-forming if used for a prolonged period of time or cause poisoning if taken in large quantities; the pure oil is a strong poison.

**Dosage:** Two teaspoons of leaves or tops in one cup of water for one-half cup a day to be taken in one teaspoonful doses.

## XIAO CHAI HU WAN

**AKA:** Minor Buplerum Pills.

**Effects:** In traditional Chinese medicine, it has been used to treat irritability and fatigue. It has also been used to treat Chronic Fatigue Syndrome and the Epstein-Barr virus. It is a

standardized formula consisting of buplerum, Chinese dates, fresh ginger root, ginseng, honey-fried licorice, pinellia, and scutellaria.

**Precautions:** Mild side effects include fever and chills, which may occur when first taking it. It should not be taken by individuals with high blood pressure, severe headaches, or bleeding gums. It should not be confused with Buplerum Sedative Pills (Hsiao Yao Wan, Rambling Powder Pills).

**Dosage:** Traditional dosage likely dependent on the individual and the condition being treated.

## YARROW

**AKA:** *Achillea millefolium*.

**Effects:** It has been used to treat anxiety and insomnia; it also has anti-inflammatory and pain-relieving effects. It contains a number of active ingredients, including thujone—which has sedative properties—salicylic acid, menthol, and camphor.

**Precautions:** It should be used with caution by individuals allergic to ragweed.

**Dosage:** One to two teaspoons of dried herb in one cup of water for up to three cups a day, though it is advisable to consult a qualified herbalist for a precise dosage for a specific condition.

## YAUPON

**AKA:** Black drink plant, cassene, cassina, emetic holly, *Ilex vomitoria*, Indian black drink, Indian Black Tea, yaupon holly.

A rare North American shrub, it is related to yerbe mate and guayusa, and is the only plant native to the U.S. to contain caffeine.

**Effects:** A mild stimulant because of its caffeine content, which is rather small (0.1 percent). Indians have used it to induce ecstasy and visions.

**Precautions:** As its Latin name suggests, it can readily induce vomiting. The berries are slightly poisonous and can cause vomiting and diarrhea.

**Dosage:** The plant can be made into a tea

by drying in the oven until black and then steeping in hot water.

## YERBE MATE

**AKA:** Chimarrao, holly, *Ilex paraguayensis*, *Ilex paraguayensis*, Jesuit's tea, mate, mate yerba, Morning Thunder (tea), Mucho Mate (tea), Paraguay tea, St. Bartholomew's tea, South American holly, yerba.

**Effects:** A caffeine-like stimulant reputed to relieve fatigue and insomnia, it may also cleanse the blood, control the appetite, benefit the nervous system, encourage the production of cortisone, and work synergistically with other healing herbs

**Precautions:** Researchers have noted a correlation between mate drinkers and cancer of the esophagus, though other factors such as the steaming hot temperature at which the tea is sometimes consumed, other lifestyle factors (tobacco and alcohol consumption), and contaminants in the tea may also play a role. However, another study noted a 60 percent increase in the risk of digestive and respiratory cancers among yerba mate drinkers, and a 2007 review in the *Journal of Food Science* found conflicting evidence, with some studies showing a correlation with oral, esophageal, and bladder cancers, and others showing that it kills cancer cells and inhibits cancer cell growth. James A. Duke, Ph.D., does not recommend it for treating chronic fatigue syndrome.

Excessive consumption can lead to a feeling of exhaustion, overstimulation, insomnia, and dehydration. Overdose symptoms include nausea, high blood pressure, and increased heart rate, along with symptoms of caffeine overdose, which include vomiting, hallucinations, sweating, and death.

It should not be taken by individuals suffering from depression, heart disease, hypertension, kidney disease, or ulcers. It should not be taken by pregnant women, as it may increase the risk of miscarriage and birth defects due to its high caffeine content (Schweitzer, 2006).

Combining yerba mate with other caf-

feinated products can increase the risk of side effects. It should not be combined with various prescription drugs, including antibiotics, antidepressants, asthma medications, cimetidine, clozapine, cold medications, contraceptives, diabetes medications, estrogen, Lamisil, Lithium, among others, as it can increase the side effects of these drugs. When combined with other stimulants such as amphetamines, cocaine, or ephedrine, serious side effects can occur, including rapid or irregular heartbeat, high blood pressure, increased risk of heart attack, and stroke.

**Dosage:** One cup of tea or one dropperful of extract. Do not exceed 300 mg of caffeine a day.

### YOHIMBE AND YOHIMBINE

**AKA:** Actibine, Aphrodyne, Baron-X, *Corynanthe johimbi*, *Corynanthe yohimbe*, *Corynanthe johimbi*, Dayto Himbin, lizard tail, *Pausinystalia yohimbe*, Prohim, Thybine, yerba del pasmo, yerba mansa, Yocon, Yohimar, yohimbine hydrochloride, Yohimex, Yoman, Yovital.

**Effects:** Yohimbe is said to produce a tingling feeling along the spine, followed by a mild, pleasant, and euphoric high lasting four to six hours. In high enough doses, it can produce mild hallucinogenic-like effects. It contains a number of psychoactive alkaloids, including yohimbine, and has shown positive results in treating both psychological and physiological impotence; it even increases the sex drive of men with normal libido. It may have the same effects on women, with the added benefit of helping them lose weight. According to Ward Dean, M.D., it "is the only substance with a specific FDA-approved indication as an aphrodisiac." The active compound, called yohimbine or yohimbine hydrochloride, is isolated and sold as a prescription medication, and is much safer. One study has found that it enhances the recall of material involving strong emotional content (O'Carroll et al., 1999).

Works synergistically with 500 to 1000 mg

of vitamin C, which quickens its effects and reduces the nausea.

**Precautions:** It should not be used by those with an allergy to yohimbine or any of the Rauwolfia alkaloids, angina pectoris, hepatitis, hypoglycemia, blood pressure disorders, ulcers, diabetes, kidney disease, liver disease, heart disease, panic attacks, bipolar disorder, or schizophrenia. Those suffering from or being treated for depression, any psychiatric disorder, any other allergy, or those taking any drugs that interfere with norepinephrine's neuronal uptake or metabolism (including Selegiline) should use yohimbe only under a physician's guidance; in fact, many herbalists caution that the potent herb should never be used without the advice of a physician or herbalist.

According to James A. Duke, Ph.D., using the herb in its natural form (dried bark) is dangerous. The amount of yohimbine in herbal products can vary considerably.

There are no known life-threatening or common side effects. Less common side effects include anxiety, high blood pressure, rapid heart rate, lack of coordination, overstimulation, increased blood pressure, dizziness, salivation, hallucinations, panic attacks, and headache. Rare side effects include nausea, vomiting, flushed skin, sweating, and tremors. High doses can result in severe low blood pressure, heart problems, and death. The doses needed to produce the hallucinogen-like effects are very high and potentially toxic. It is not physically addictive, but can create a psychological dependence. The whole herb is a complex combination of adrenergics, cholinergics, yohimbine alkaloids, and reserpine alkaloids, substances which act counter to each other and which could cause serious health risks.

While yohimbine is not an MAO inhibitor, yohimbe is, and so should not be combined with tyramine-rich foods or MAO inhibitors. The effects of yohimbe can be decreased by alcohol. Yohimbe can decrease the effects of antidepressant and antihypertensive drugs, blood pressure medications, MAO inhibitors, and

anti-psychotic medications. It should also not be combined with antihistamines, tranquilizers, diet pills, narcotics, amphetamines, cocaine, marijuana, or any mood-altering drugs. W. Nathaniel Phillips does not recommend taking it with meals.

Some supplements may contain little or no active yohimbine. A 2010 *Consumer Reports* study rated it as one of the twelve most dangerous supplements on the market.

**Dosage:** Six to ten teaspoons of shaved bark boiled in a pint of water for five minutes. Mark Mayell recommends 15 to 20 drops of tincture, 250 to 500 mg of the dried herb in capsules, or one cup of tea a day. Sheldon Saul Hendler, M.D., Ph.D. recommends one 5.4 mg tablet three times a day for up to ten weeks, with the dosage cut in half and gradually built up to a full dose if side effects occur. It may take two to three weeks for any effects to occur.

## ZHI MU

**AKA:** *Anemarrhena asphodeloides*.

**Effects:** Has been found to have antidepressant effects (Ren et al., 2006) and to reduce the effects of brain injury due to deficiency of blood in lab rats (Oh et al., 2011).

**Precautions:** Side effects include breathing problems and low blood pressure. It should not be used by individuals suffering from diarrhea.

**Dosage:** Dose range is said to be between 6 to 12 grams.

## ZIZYPHUS

**Effects:** Induces relaxation and sleep. In traditional Chinese medicine, it is often combined with other herbs for a sedative effect, which could be useful in cases of insomnia.

**Precautions:** None known.

**Dosage:** None established.

## *Vitamins, Minerals and Related Nutrients*

About half of all Americans take vitamin supplements, fueling a multi-billion-dollar-a-year industry that crams store shelves with more than 54,000 dietary supplements for weight loss, sports gain, or just maintaining good health. Unfortunately, this industry is largely unregulated.

According to a 2001 statement by Christine Rosenbloom, professor of nutrition at Georgia State University and spokesperson for the American Dietetic Association, the vitamins and minerals in supplements are synthetic, even the ones that claim they are natural. In general, they appear to be utilized in the same way that the natural ones are. But to ensure that you are getting good quality, look for the USP symbol on the label, which means that the U.S. Pharmacopeia, an independent testing organization, has found that the supplement will dissolve in the stomach, making it much more likely that the nutrients will be absorbed by the body. The lack of regulation in the supplement industry means that companies can make unsubstantiated claims about their products, using such phrases as “high potency” or “laboratory approved.” Not only that, ConsumerLab.com has found that a third of vitamin supplements contain significantly more or less ingredient than stated on the label, and many are contaminated with lead and other

heavy metals; according to Sayer Ji of [www.greenmedinfo.com](http://www.greenmedinfo.com), vitamin supplements may also contain minerals and chemicals that may be carcinogenic and genotoxic—sodium selenite, sodium selenate, nickelous sulfate, stannous chloride, ferrous fumarate, manganese sulfate, and cupric sulfate—in amounts that are sometimes higher than the Environmental Protection Agency allows in a liter of drinking water. As if this weren’t enough, a Congressional investigation found that, in nearly half the supplements they tested, levels of pesticide residues appeared to be above the legal limit. Additionally, some companies are now using nanomaterials in their supplements, the potential effects of which are still largely unknown (“A Hard Pill To Swallow: Barriers to Effective FDA Regulation of Nanotechnology-Based Dietary Supplements,” The Project on Emerging Nanotechnologies [PEN], 2009).

Overall, the products sold by vitamin chains are more reliable than drugstore brands, and price is no indication of quality. To ensure maximum potency, supplements should be stored at room temperature or below, and away from direct sunlight. However, natural foods are preferable to supplements, as they may contain other nutrients which work synergistically with vitamins and minerals (e.g., glucosinolates in broccoli and cabbage, phytochemicals

that may reduce the risk of certain cancers), making them more effective at nourishing the body and fighting off diseases and the ravages of age (which may explain why those who consume a healthy diet suffer less from cancer and other diseases, while clinical trials often find that individual nutrients have no effect in staving off various maladies), though in some instances the synthetic forms may be more readily absorbed than their natural counterparts (folic acid, for instance). To cite just one example, a 2007 study of 300,000 men published in the *Journal of the National Cancer Institute* concluded that men who took high-dose multi-vitamins were twice as likely to get fatal prostate cancer as those who didn't take any vitamin supplements. Other research has also shown that normal doses of supplements are ineffective, and higher doses are potentially harmful (Naqvi et al., 2013; *Annals of Internal Medicine*, December 16, 2013; Paul A. Offit, "How Lobbyists Will Keep You Hooked on Vitamins," *The Daily Beast*, December 21, 2013), though Balz Frei, professor and director of the Linus Pauling Institute at Oregon State University, in a review of vitamin research published in the journal *Nutrients* at the same time as Offit's article, has stated that the methodology of many of the studies condemning supplements is flawed. As a contrary example, it has been found, for instance, that multivitamin users have telomeres that average five percent longer than non-multivitamin users (Chen et al., 2009), though lead researcher Honglei Chen M.D., Ph.D. cautions that other lifestyle factors could not be ruled out (telomeres—the protective DNA sequences at the end of chromosomes—can be damaged by oxidative stress and is widely considered to be an indicator of biological aging). B. N. Ames, of the Nutrition and Metabolism Center, Children's Hospital of Oakland Research Institute, Oakland, California, hypothesizes that, due to periodic shortages of micronutrients during evolution, natural selection sacrificed long-term health for short-term survival by the human body's triage allocation of

micronutrients during times of scarcity, which accounts for such late-onset diseases as cancer, and that taking a multivitamin-mineral supplement would be one way of maintaining health throughout life (Ames, 2006; Ames, 2010).

## BORON

**Food sources:** Most fruits and vegetables, particularly dried fruits.

**Effects:** Boron helps keep the brain alert and able to perform simple functions. It also helps keep the bones strong and metabolizes calcium, magnesium, and phosphorus.

Deficiency is rare.

**Precautions:** While there appear to be no adverse effects with doses as high as 6 mg/day, dosage should not exceed 20 mg/day.

Supplements should not be taken by anyone with hormone-sensitive conditions or those with kidney problems or disease.

When combined with estrogens, it could increase the level of estrogens in the body to an unsafe level.

**Dosage:** There is no RDA. The recommended dose is 3 mg/day. It is best if taken with a multi-vitamin which includes calcium, magnesium, manganese, and riboflavin.

## CALCIUM

**AKA:** Ca, calcium carbonate.

**Food Sources:** Milk and other dairy products. Also broccoli, spinach, collard greens, and tofu, although the body absorbs much less calcium from these foods than from milk (roughly 5 percent and 28 percent respectively).

**Effects:** Calcium deficiency may be associated with depression, delusions, and irritability.

**Precautions:** Calcium supplements made from shells and bones is in the form of calcium phosphate, which is poorly absorbed by the body compared with other forms. In addition, they can contain dangerous levels of mercury and lead, and it is recommended that calcium carbonate be used instead. Supplements also

containing vitamin D may have amounts that are wildly inconsistent with their calcium levels (vitamin D is needed for the absorption of calcium). Antacids contain calcium, but their habitual use can decrease stomach acids, interfering with digestion and nutrient absorption, especially among the elderly. Experts such as Dr. Clifford J. Rosen, osteoporosis expert at the Maine Medical Center Research Institute, and Dr. J. Christopher Gallagher, director of the bone metabolism unit at the Creighton University School of Medicine in Omaha, Nebraska, state that most people do not need supplementation, and that excess consumption could even be harmful.

Toxicity is rare, as the body can protect itself by limiting the intake of calcium. Hypercalcemia, a high level of blood calcium, has been seen in individuals taking two or more grams of calcium and 1000 IUs of vitamin D per day for prolonged periods of time. Symptoms may include decreased absorption of other minerals, the formation of kidney stones (particularly among older women, who may ingest too much), and an increased risk of heart disease.

Adolescent girls are particularly at risk for deficiency, mainly due to poor or inadequate diet. A deficiency results in bone loss (osteoporosis), particularly among older women. It may also play a role in the development of hypertension. Anorexics and female athletes with low body fat (especially in cases where the menstrual period is disrupted) are especially at risk for osteoporosis later in life, as peak bone mass accumulates before age 30. Most adults in the U.S. may not consume enough calcium to prevent the gradual loss of this mineral in their bones.

**Dosage:** The RDA is 800 mg/day, though pregnant and post-menopausal women may need as much as 1200 to 1500 mg/day.

### CHROMIUM AND CHROMIUM PICOLINATE

**Food Sources:** Beef, beer, black pepper, bran, brewer's yeast, cheese, chicken, clams,

corn oil, liver, meat, mushrooms, poultry, shellfish, thyme, wheat germ, whole-grain cereals.

**Effects:** Chromium assists in the breakdown and distribution of proteins and carbohydrates in the body. It is also essential for the production of an enzyme-like substance called Glucose Tolerance Factor or GTF (chromium combined with nicotinic acid and amino acids), which aids in the making and proper utilization of insulin; this insulin, in turn, takes carbohydrates from the blood and gets them to the brain cells, which use them for energy. It is believed that sufficient amounts keep the blood sugar on a consistent level, preventing mood swings, depression, and adult-onset diabetes, and providing energy throughout the day. Chromium picolinate is a scientifically developed form which appears to be more efficient than regular chromium; it may also have a mild muscle-building effect on people with a regular exercise program. Chromium picolinate, as well as chromium polynicotinate and chromium chloride, can inhibit sugar-induced high blood pressure. The picolinate and polynicotinate forms (the latter sold under the brand name Chrome-Mate) also act as antioxidants. One small study found that chromium supplementation led to a remission of the symptoms of dysthymic disorder, a psychological condition characterized by a general feeling of depression and despondency (McLeod et al., 1999). Studies on rats have shown that chromium picolinate could have similar antidepressant qualities (Franklin and Odontiadis, 2003).

Deficiency (which may be very widespread in the U.S. population) can lead to diabetes mellitus (though this condition may result from a chromium-poor diet that is deficient in other minerals, too), arteriosclerosis (though chromium's exact role in this is not yet clear), alcohol intolerance, variable blood-sugar levels, and possible diabetes-like symptoms (tingling in the extremities, poor muscle coordination) or hypoglycemic symptoms (fatigue,



dizziness). Chromium deficiency may be associated with anxiety. Refined sugar should be avoided for three reasons: it has been stripped of its chromium (along with the magnesium), it requires chromium to metabolize it, and it causes a loss of chromium through the urine.

**Precautions:** Chromium is not absorbed very well by the body, so that only a small portion of the dietary intake is used, supplementation with chromium citrate or chromium picolinate may be helpful; dosages greater than 1000 mcg/day can interfere with insulin activity and be toxic to the liver and kidneys. Chromium salts, which are an inorganic form of chromium, do not seem to be absorbed by the body very well and so are of little use as supplements. As people get older, they retain less of this mineral in their bodies. A few more things should be kept in mind: cases of allergies to this mineral have been reported; and the chromium content of brewer's yeast, though often high, varies among brands. There are no known symptoms of toxicity, attributable, perhaps, to the low absorption rate (about 2 percent of intake); however, ulceration of the nasal tissues and toxic levels can occur with long-time exposure in workers who deal with chromium in metal plating or making dyes. There is one case of a false-positive reading for a test of porphyria in a man who took one-third of an ounce a day. Chromium picolinate's reputation as a muscle-building nutrient may be overrated, its effect possibly due to the fact that subjects may have been deficient in chromium to begin with. One study in 1996 showed that chromium picolinate caused chromosome damage in cells that had been grown in a laboratory; what this means for individuals taking the supplement is, as yet, undetermined.

Chromium supplements may worsen such conditions as anxiety, depression, and schizophrenia. When taken with Levothyroxine, it could decrease the effectiveness of this drug. NSAIDs could increase levels of chromium in the body. Some people cannot convert chromi-

um chloride or chromium from chelated supplements into the "biologically active" form, or GTF, that the body can use, in which case chromium should only be taken under a doctor's supervision, especially in cases of those who are diabetic or women who are pregnant.

When taken with diabetic medications, it could increase the effectiveness of these drugs. Chromium supplements should not be taken at the same time as vanadium supplements, as there could be a negative interaction between them.

**Dosage:** The RDA has not yet been established. The adequate daily intake is 35 mcg/day for men and 25 mcg/day for women.

## COPPER

**AKA:** Cu.

**Food Sources:** Beef, chicken, lamb, liver, milk, oysters. The copper in cookware and water pipes can also provide significant amounts, as heat can cause it to leech into food and water.

**Effects:** Copper deficiency may be associated with depression. Research at The Birchall Centre at Keele University, Staffordshire, U.K., suggests it may protect against Alzheimer's disease by preventing amyloid beta from forming plaques (Mold et al., 2013).

Deficiency symptoms include anemia and reduced growth.

**Precautions:** No known side effects.

Overdose is rare, though it can result from the consumption of 10 mg/day or more.

**Dosage:** None established, though a provisional adult RDA is 2 to 3 mg/day, about twice what is needed to prevent deficiency.

## DIOSMIN

**Food Sources:** Citrus fruits.

**Effects:** A plant flavonoid, it has been found to reduce the levels of beta-amyloid, the sticky deposits associated with Alzheimer's disease, in mice (Tan et al., 2008).

**Precautions:** Supplementation should not

be taken for more than three months unless under the guidance of a physician, and avoided by women who are pregnant or breastfeeding.

**Dosage:** None established.

## DMAE

**AKA:** Acumen, Atrol, Bimanol, Cervoxan, dimethylaminoethanol cyclohexyl carboxylate fumurate, dimethylaminoethanol p-acetamidobenzoate, Deaner, deanol, Diforene, Dimethaen, Dimethylaminoethanol, DMAE II, DMAE-H3, Elevelan, Pabenol, Paxanol, Risatarun, Tonibril, Varesal.

**Food Sources:** DMAE exists in tiny amounts in the brain and is found in such seafoods as anchovies, herring, and sardines. The prescription drug Deaner (deanol) is chemically similar.

**Effects:** When combined with phosphatidyl choline and vitamin B-5, it produces acetylcholine, the neurotransmitter essential for short-term memory. It also removes the cellular aging pigment called lipofuscin, a waste product that may inhibit nerve cell functioning. There is some evidence it stabilizes the cell membranes of neurons, preventing one of the major factors of aging, the breakdown of neuronal membranes. It is similar in effect to centrophenoxine or Lucidril, in that it elevates mood, strengthens memory and learning, improves intelligence, lengthens the life span of lab animals (in one study, it lengthened the life span of mice 33–50 percent), reduces fatigue, produces sounder sleep, and decreases the amount of sleep needed. It has been found that one form, DMAE II (dimethylaminoethanol cyclohexyl carboxylate fumurate), can significantly improve the working memory in mice (Levin et al., 1995). It can cross the blood/ brain barrier more readily than choline or lecithin, so an effective dosage is much lower than for the other two supplements, and it has a mild, steady stimulant effect which is said to lead to no letdown or side effects. No letdown or depression is experienced if use is discontinued.

Works synergistically with choline, Hydergine, Piracetam, Selegiline, and vasopressin, so lower doses should be taken if any of these supplements are also being taken.

**Precautions:** People with bipolar disorder should not take DMAE, as it can worsen the depressive phase; those with epilepsy or seizure disorders should only do so under a physician's guidance. Too high a dosage (at least 500 mg/day in some cases) can cause anxiety, nervousness, increased blood pressure, insomnia, dull headaches, or muscle tension (especially in the jaw, neck, and legs), which disappear if dosage is reduced. There are no known serious side effects or contraindications.

**Dosage:** Gradually increase the dosage until it is around 500 to 1000 mg/day, though many people may respond well to lower dosages; one study recommends oral doses as low as 10 to 30 mg/day, which is enough to produce the desired effects. In general, older people can tolerate higher doses, either because they have lower levels of acetylcholine, they may have reduced receptor sensitivity to acetylcholine, or they may have altered feedback in their brain metabolism. It may take up to three weeks before the effects are noticed. It should be stored in a cool, dark place, as it can deteriorate rapidly.

## FISETIN

**Food Sources:** Strawberries, tomatoes, onions, oranges, apples, peaches, grapes, kiwi fruit, and persimmons.

**Effects:** A plant flavonoid, it has been found to stimulate signaling pathways in the brain that enhance long-term memory and also prevent memory loss associated with Alzheimer's disease in mice (Maher et al., 2006; Maher et al., 2014).

**Precautions:** It does not appear to reduce amyloid-beta plaques. Research has not yet been done on humans.

**Dosage:** It would take about ten pounds of

strawberries a day to achieve the effect of the study.

## FOLIC ACID

**AKA:** Folacin, folate, vitamin Bc, vitamin B-9, vitamin M, vitamin U.

Folic acid is considered one of the B vitamins. Folate is the natural form found in foods, while folic acid is the form used in supplements and fortified foods; the former is converted into the latter by the body. One microgram of folate is considered one Dietary Folate Equivalent, while one microgram of folic acid is equivalent to 1.7 DFEs (when taken with meals) to 2 DFEs (when taken on an empty stomach).

**Food Sources:** Almonds, apricots, asparagus, avocados, beans, beets, brewer's yeast, cantaloupe, carrots, celery, egg yolk, fish, flour (whole wheat and dark rye), fresh fruits, kidneys, legumes, liver, milk, mushrooms, nuts, orange juice, peas, peanuts, pumpkins, salmon, seeds, strawberries, green leafy vegetables (such as collard greens, kale, lettuce, and spinach), fortified breakfast cereals.

**Effects:** Needed for synthesis of RNA and other molecules in the brain, the manufacture of DNA coding in the cells, and help maintain brain's protein metabolism. Preliminary studies have shown that supplementation of B-12 and folic acid may prevent or delay the onset of Alzheimer's. Combined with vitamin B-12 and methionine, it can manufacture choline in the body. According to John Mann, it may increase life span when combined with the sulfhydryl drug 4-thiazolidine carboxylic acid, and may restore hair to its original color when 5 mg of folic acid are combined with 300 mg each of pantothenic acid and PABA, along with sufficient amounts of the other B vitamins (the addition of 1500 mg of inositol, 50 to 100 mg of B-6, and sufficient amounts of protein may restore hair growth). A 2011 Columbia University study found that women who did not take folic acid supplements dur-

ing pregnancy increased the risk of giving birth to children with significant speech deficits; though the researchers cautioned that correlation was not conclusive, it was enough for lead researcher Dr. Ezra Susser to state, "[t]he recommendation worldwide is that women should be on folate supplements through all their reproductive years." One small study has found that the combined mega-doses of folic acid (four times the daily recommended levels), Vitamin B-6 (15 times the daily recommended levels), and Vitamin B-12 (300 times the daily recommended levels) reduced the rate of mild cognitive impairment in subjects over 70 years of age (Smith et al., 2010), while a similar study conducted at Australian National University using 400 mcg of folic acid and 100 mcg of B-12 found modest gains in short- and long-term memory in subjects 60 to 74 years old over a two-year period (Walker et al., 2012), and a study conducted by researchers at Wageningen University in the Netherlands has found that supplementation of folate alone (800 mcg/day) can improve memory, information-processing speed, and verbal fluency in adults aged 50 to 70 (Durga et al., 2007). One small British study in 2000 found that, of 127 patients taking Prozac, those given 500 mcg/day of folic acid had a significant improvement in mood over those given a placebo.

Deficiency symptoms include headache, pallor, fatigue, loss of appetite, insomnia, bleeding gums, forgetfulness, graying hair, irritability, sore tongue and throat, inflammation and redness of the tongue, occasional diarrhea and constipation, gas and abdominal discomfort, weight loss, lack of development of red blood cells, and infertility. A chronic deficiency may lead to a condition called megaloblastic folic-acid-deficiency anemia. A deficiency of both B-6 and folic acid is correlated with a high level of the amino acid homocysteine, which plays a role in heart disease. There appears to be some correlation between deficiency levels and depressive disorders, insomnia, and para-

noia, though more research is needed to fully define the exact relationship (Abou-Saleh and Coppen, 1986; Young and Ghadirian, 1989; Levitt and Joffe, 1989; Bottiglieri, 1996; Hutto, 1997; Alpert and Fava, 1997). A deficiency is most likely seen in alcoholics, individuals with gastro-intestinal diseases, teenagers who eat a lot of junk food, women taking oral contraceptives, and pregnant women not taking folic acid supplements.

**Precautions:** It should not be taken by those who are allergic to any of the B vitamins, and those with liver disease and pernicious anemia should consult a physician first. A common side effect is yellow urine; rare side effects include rash, itching, and bronchospasm. In one preliminary study dosages above 400 mcg/day blocked the absorption of zinc in the body, though zinc levels remained within the normal range. Dosages above 1000 mcg/day range may block and mask the absorption of vitamin B-12, and the symptoms may include anorexia, nausea, abdominal bloating, insomnia, nightmares, malaise, irritability, impaired concentration, and pernicious anemia. Permanent nerve damage may result. Supplements should not be taken by anyone with hormone-related cancer. Too high a dosage can mask symptoms of pernicious anemia. A 2009 study published in the Journal of the National Cancer Institute has found that taking high doses of folic acid may double the risk of prostate cancer in men.

Folic acid can be depleted by the anti-convulsant drugs (such as sodium phenytoin) used to treat epilepsy, and may, in dosages above 1000 mcg/day, interact with anti-psychotic medication. It can also inhibit the effectiveness of sulfonamides like Gantrisin. Those with chronic liver disease may be candidates for a folic acid deficiency. Those taking methotrexate as part of a chemotherapy treatment are advised not to take folic acid supplements, as it will interfere with the effectiveness of the drug. Cases of allergies to this vitamin are extremely rare.

Folate is easily degraded by food processing and storage. Folic acid in the body can be destroyed or inhibited by alcohol, analgesics, antibacterial drugs, anticancer drugs (e.g., methotrexate), anticonvulsant drugs, anti-tuberculosis drugs, aspirin, barbiturates, birth control pills, blood pressure pills such as Dyazide (triamterene and hydrochlorothiazide), chloramphenicol, coffee, cortisone, estrogen, food processing, heat, para-aminosalicylic acid (PAS), pyrimethamine, stress, sulfa drugs, sulfasalazine, sunlight, tobacco, trimethoprim, vitamin C (in dosages above 2000 mg/day), and water. It can also be destroyed by cooking, especially cooking with copper pots.

**Dosage:** The RDA is 200 mcg/day for men, 180 mcg/day for women, though women of child-bearing age are advised to take 400 mcg/day to prevent birth defects such as spina bifida and cleft palate during pregnancy. Individuals with injuries, diseases, or who habitually take aspirin or oral contraceptives may also need a higher dosage.

### FRENCH MARITIME PINE BARK EXTRACT

**AKA:** Pine bark extract, *Pinus maritima*, *Pinus pinaster*, Pycnogenol.

A complex of some 40 antioxidant flavonoids and organic acids working together synergistically, it is one of the polyphenol extracts known as oligomeric proanthocyanidins (OPCs), which also include grape seed extract.

**Effects:** One of the most potent antioxidants available (it is 50 times more powerful than vitamin E and 20 times more powerful than vitamin C), it can extend the effectiveness of vitamin C over a longer period of time and can effectively protect against the hydroxyl free radical, which can directly damage DNA. The extract can also cross the blood/brain barrier and protect brain cells from harmful compounds in the body. It also aids the immune system, strengthens and repairs

connective tissue, helps prevent heart disease, strengthens the capillaries, and has anti-inflammatory properties that protect against such ailments as arthritis and allergic reactions. Studies have also shown that it can protect against stroke, stress-related ulcers, diabetic retinopathy, and some forms of cancer. It may also increase athletic performance because of its antioxidant properties, and it can relieve the symptoms of psoriasis and swelling of the lower legs. Its anti-coagulant effect is five times greater than that of aspirin. Current research is attempting to determine whether it has any effect on attention deficit hyperactivity disorder (ADHD).

Works synergistically with vitamin E.

**Precautions:** No adverse side effects have been found in doses as high as 35,000 mg/day over a six month period.

**Dosage:** Antioxidant expert Laster Packer, Ph.D., recommends 50–100 mg/ day.

## GERMANIUM

**AKA:** GE-132, Germanium sesquioxide, PCAGeO, PCAGeS, vitamin O.

**Food Sources:** Aloe, barley, chlorella, comfrey, garlic, ginseng, onions, shiitake mushrooms, suma.

**Effects:** Germanium acts as a free radical blocker, and improves brain functioning by oxygenating the brain.

GE-132, PCAGeO, and PCAGeS are organic forms which have been shown to inhibit the growth of tumors in mice, but no studies on humans have yet been done.

**Precautions:** Only the organic form (sesquioxide) of germanium has the beneficial effects. There is insufficient evidence for its use against depression or as an aid to the immune system.

Supplementation is considered dangerous, as it accumulates in the body, and there have been at least thirty reports of kidney failure and death. Other serious side effects include anemia, muscle weakness, and nerve problems.

**Dosage:** The RDA has not been established. According to James F. Balch, M.D., and Phyllis A Balch, C.N.C., a beneficial intake of 100 to 300 mg/day can be obtained through dietary means.

## GRAPE SEED EXTRACT

**AKA:** Activin, MegaNatural-AZ, Resivit.

**Effects:** Like French maritime pine bark extract, it is one of the polyphenol extracts known as oligomeric proanthocyanidins (OPCs), and is 50 times more powerful than vitamin E and 20 times more powerful than vitamin C in its antioxidant properties. One study indicates that it reduces amyloid-beta accumulation and plaque formation in mice with an Alzheimer's-like condition, thereby reducing the rate of cognitive decline (Pasinetti et al., 2008).

**Dosage:** Approximately one glass of red wine a day for women and two glasses a day for men.

## INOSITOL AND IP6

**AKA (Inositol):** Inositol nicotinate, myo-inositol, phosphatidylinositol, phytic acid.

**AKA (IP6):** Inositol hexaphosphate, InsP6, myo-inositol hexakisphosphate, phytate, phytic acid.

A sugar-like molecule that exists in large amounts in the brain and regulates mood by making its receptors more sensitive to serotonin, inositol is considered part of the B vitamin complex, though it is not, itself, a B vitamin. Myo-inositol is the nutritionally active form, and a component of phosphatidylinositol which, in turn, is a phospholipid molecule that is a small component of cell membranes. Its plant form is known as phytic acid or IP6 (inositol plus six phosphate groups of PO<sub>4</sub>), and is one component of insoluble fiber.

**Food Sources (Inositol):** Beans (almost all kinds), brown rice, calf's liver, cantaloupes, chick peas, most citrus fruits (lemons are one exception), lentils, nuts (almost all kinds), oatmeal, pork, veal, wheat germ, and whole-grain flour.

**Food Sources (IP6):** In descending order: Corn, sesame, wheat beans, rice, peanuts, sunflower seeds, soybeans, barley, peas, oats.

**Effects:** Inositol acts as a cell membrane stabilizer. Claims that myo-inositol lowers triglycerides and cholesterol in the blood, protects against cardiovascular disease, promotes sleep, or relieves anxiety are, as yet, unproven, though these last two effects may result from its effects on phosphatidylinositol levels in brain cells. It has been shown to provide some benefit in improving sensory nerve function in those with diabetic peripheral neuropathy, though more research is needed to determine its exact role in this disease. One study has found that 12 grams/day of inositol had beneficial effects on patients with illnesses such as depression, panic disorders, and obsessive-compulsive disorders, with results similar to those obtained with selective serotonin reuptake inhibitors, but no beneficial effects when given to individuals with schizophrenia, Alzheimer's, attention deficit disorder with hyperactivity, autism, or electroconvulsive therapy-induced memory impairment (Levine, 1997).

No definite deficiency symptoms have been identified in humans.

Phytic acid (IP6) is an antioxidant.

**Precautions:** In general, studies assessing its effectiveness in treating depression have been inconclusive.

Frozen, canned, or salt-free foods contain less myo-inositol than fresh foods. No adverse effects have been reported in those taking supplementation of myo-inositol or phosphatidylinositol, though the former is the one that should be taken, as it is the nutritionally active form.

Supplements should not be taken by women who are pregnant or breastfeeding, as effects are not known, and used with caution by those with allergies, diabetes, heart disease or heart problems, gall bladder disease, gout, low blood pressure, kidney disease, liver disease, sensitivity to niacin, or ulcers, as it may worsen those conditions.

Consuming large amounts of caffeine (coffee, tea, soft drinks) can deplete the amount of inositol in the body. Inositol can decrease the effectiveness of diabetes medications, increase the effectiveness of anticoagulants, cause muscle problems when combined with statins, and increase flushing and dizziness when combined with a nicotine patch.

**Dosage:** Inositol has so far been found to be non-toxic in doses as high as 50 grams. Those who have taken it to relieve insomnia or anxiety have generally taken 1 to 2 g/day of myo-inositol, and up to 3 g/day have been taken for short periods of time with no apparent ill effects. The average American diet for adults provides approximately 1 grams/day of myo-inositol. Abul Kalam M. Shamsuddin, M.D., Ph.D. recommends 1 to 2 grams/day of IP6 plus inositol.

## IODINE

**Food Sources:** Seafood, seaweed, iodized salt, vegetables grown in iodine-rich soil, animals that eat grass in iodine-rich soil.

**Effects:** Iodine deficiency can result in goiters, cretinism, and dwarfism. It is also the most common cause of mental retardation, and it is estimated that as many as one-third of the world's population do not get enough in their daily diet. Even a moderate deficiency, particularly in infants and pregnant women, can decrease a person's intelligence by 10 to 15 I.Q. points (one estimate is that this deficiency alone is responsible for the loss of more than a billion I.Q. points worldwide).

**Precautions:** Long-term overdose symptoms include nervousness, hyperactivity, headaches, rashes, a metallic taste, and goiter.

**Dosage:** The RDA for adults, 150 mcg/day; for pregnant woman, 175 mcg/day.

## IRON

**Food Sources:** Heme iron is found in meat and animal products; nonheme iron is found

in plant foods (e.g., whole grains, nuts, dark green vegetables, dried fruit).

**Effects:** Sufficient iron is necessary for the development of the fetus and the subsequent cognitive and intellectual development of the child. One 2004 study led by John Beard of Penn State University has found that women, even those who were considered to have an adequate dietary intake, who were given 60 mg/day of iron supplementation for 16 weeks achieved significant improvements in memory and concentration.

Iron deficiency may be associated with depression, apathy, sudden fatigue during exercise and, in children, with attention deficit hyperactivity disorder (ADHD).

Vitamin C can increase absorption of iron.

**Precautions:** High intake of iron can inhibit absorption of phosphorus, suppress immune function, and increase risk of developing cancer, cirrhosis, or heart attack. Toxicity symptoms include diarrhea, vomiting, headache, dizziness, fatigue, stomach cramps, and weak pulse.

Supplementation should be used with caution by women who are pregnant or breastfeeding, or those with diabetes, ulcers, intestinal inflammation, or hemoglobin disease.

Absorption can be inhibited by coffee, tea, soy, antacids, tetracycline, as well as, high amounts of calcium, manganese, and zinc. Iron can interfere with the effectiveness of antibiotics, bisphosphonates, Levodopa, Levothyroxine, Methyl dopa, Mycophenolate Mofetil, Penicillamine, and Chloramphenicol.

**Dosage:** The RDA is 8 mg/day for men, 18 mg/day for women, and 30 mg/day for pregnant women. Dosage should not exceed 45 mg/day.

## LUTEOLIN

**AKA:** Digitoflavone, Flacitran, Luteoline, Luteolol.

**Food Sources:** Carrots, celery, chamomile tea, citrus fruits, dandelion, green pepper, olive oil, oregano, peppermint, rosemary, thyme.

**Effects:** A plant flavonoid, it has been found to reduce the levels of beta-amyloid, the sticky deposits associated with Alzheimer's disease, in mice (Tan et al., 2008), as well as reduce inflammation of the brain and restore memory and learning in mice (Jang et al., 2010).

**Precautions:** Side effects may include nausea, vomiting, and gastric hypersecretion.

**Dosage:** None established.

## MAGNESIUM

**AKA:** Magnesium ascorbate, magnesium chloride (MgCl<sub>2</sub>), magnesium gluconate, magnesium lactate, magnesium-L-threonate (MgT), magnesium orotate, magnesium oxide, Mg<sup>2+</sup>.

**Food Sources:** Almonds, apples, apricots, avocados, bananas, blackstrap molasses, Brazil nuts, brown rice, cantaloupes, corn, dairy products, figs, filberts, grapefruit, lemons, milk, nuts, peaches, seafood, seeds, soy products, sunflower seeds, green leafy vegetables, hard water, whole grains.

**Effects:** Magnesium provides energy, yet can also act as a sedative; aids in the metabolism of calcium and vitamin C; enhances the immune system; plays a key role in the chemical reactions of some 325 essential enzymes; plays a role in the manufacture of DNA and RNA coding in cells; and contributes to the formation and growth of cell membranes, nerves, muscles, and the heart. It protects against anxiety, calcium buildup in neurons (a common condition found in those with Alzheimer's), depression, fatigue, insomnia (when combined with calcium), poor memory, and migraines. A preliminary study has shown that 200 mg/day of magnesium combined with 50 mg/day of vitamin B-6 significantly reduces anxiety-related premenstrual symptoms such as nervous tension, mood swings, irritability, and anxiety (De Souza et al., 2000). Anecdotal evidence indicates that 125 to 300 mg/day with each meal and before bed-

time can help recovery from major depression in as little as seven days, even when associated with traumatic brain injury, headache, suicidal thoughts, anxiety, irritability, insomnia, postpartum depression, substance abuse (cocaine, alcohol, and tobacco), hypersensitivity to calcium, short-term memory loss, and IQ loss, and that it is generally effective in the treatment of depression in most cases (Eby and Eby, 2006). Studies involving rats indicate that magnesium chloride could help recover some cognitive functions following brain trauma (Hoane, 2003; Hoane, 2004; Hoane, 2005; Hoane, 2007). According to researchers at the Chemical Abuse Centers in Boardman, Ohio, magnesium oxide combined with the calcium channel blocker verapamil was more effective in controlling manic symptoms in patients than a drug combined with a placebo. Most people may not get enough, and athletes should be especially aware of their intake, as exercise depletes the body of this nutrient. In combination with vitamins C and E and choline, it may prevent some of the side effects of vitamin A and D overdoses.

Magnesium orotate may help control lipofuscin deposits, and a new compound, magnesium-L-threonate (MgT) has been found to improve the working memory, long-term memory, and learning ability of mice by increasing the plasticity of synapses, the connections between neurons, and increasing the density of synapses in the hippocampus, a region of the brain most responsible for learning and memory (Liu, 2010).

Deficiency symptoms are vague and ill-defined, but signs of severe deficiency include loss of coordination, loss of appetite, anxiety, confusion, depression, diarrhea, disorientation, headaches, heart palpitations, high blood pressure, hyperactivity, irritability, kidney disease, listlessness, memory impairment, muscle weakness, nausea, nervousness, restlessness, vomiting, tremors, and sometimes fatal convulsions. Chronic deficiency can result in various cardiovascular problems. Even a mild de-

ficiency can lead to abnormal heart rhythms. Because of its depletion in soil on U.S. croplands, the daily intake of the average American is about one-half to one-third of what it was nearly a century ago.

**Precautions:** Those with severely impaired kidney function or some types of heart rhythm abnormalities should consult a physician before taking supplements.

Magnesium can be toxic in high dosages if calcium and phosphorus intakes are also high, and it can interfere with calcium absorption if too much or too little is taken (ideally, magnesium and calcium intake should be a 1:1 to 1:2 ratio). Magnesium salts have a laxative effect in healthy individuals in doses of 3000 to 5000 mg/day, and toxicity involving magnesium generally occurs in the 9000 mg range. Some over-the-counter products are hidden sources of magnesium, including Bayer Plus, Bufferin, De-Gel, Epsom salts, Maalox, magnesium citrate, Mylanta, and Phillips' milk of magnesia. Supplements should only be taken under the guidance of a physician. Symptoms of magnesium toxicity include diarrhea, fatigue, muscle weakness, and—rarely—a severely depressed heart rate, extremely low blood pressure, shallow breathing, loss of reflexes, coma, and death. Individuals abusing laxatives or experiencing kidney failure are the most susceptible to magnesium toxicity.

Magnesium in foods can be depleted by poor soil conditions, milling (in grains), processing, and cooking. Magnesium absorption can be decreased by a diet high in fats and proteins, foods rich in oxalic acid (almonds, cocoa, spinach, tea), and malabsorption disorders such as Crohn's disease. The magnesium stored in the body can be depleted by the synthetic vitamin D in milk, coffee, tea, alcohol, heart medications such as digitalis and digoxin, antibiotics, anticancer drugs, anticonvulsants, diuretics, oral contraceptives, Premarin, and stress.

**Dosage:** A maximum intake of 500 to 750 mg/day (the RDA for men is 350 mg/day, for



women 280 mg/day, and for pregnant women 320 mg/day), though evidence indicates that less than 400 mg/day increases the risk of allergies, asthma, and heart disease. Magnesium ascorbate is a combination of the mineral with vitamin C, and should be in the proper proportions of one part magnesium to nine parts vitamin C.

## MANGANESE

**AKA:** Manganese gluconate, manganese sulfate, Mn.

**Food Sources:** Avocados, bananas, beans, bran cereal, brown rice, fruits, milk, nuts, oranges, organ meats, dried peas, seeds, shellfish, strawberries, green vegetables, wheat germ, and whole grains.

Manganese is a little-understood mineral, and much more research needs to be done to determine its effects on human metabolism.

**Effects:** It is an antioxidant, and also helps to produce energy from foods. Manganese is involved in the formation of bones and the growth of connective tissue, activates some enzymes and other minerals, helps utilize vitamins B1 and E, aids in cell division and the production of DNA and RNA.

A deficiency, which is virtually unheard of, can cause confusion, convulsions, eye and ear problems, muscle contractions, a rapid pulse, a lowering of serum cholesterol, impaired blood clotting, a reduction in the growth of hair and nails, and scaly dermatitis. Without exception, tumors are deficient in superoxide dismutase, which contains manganese.

**Precautions:** Overdose through diet is extremely unlikely, though miners in northern Chile exposed to manganese dust have commonly developed a disorder known as “locura manganica,” or manganese madness. The first sign is a manic stage characterized by inexplicable laughter, heightened libido, impulsiveness, insomnia, delusions, and hallucinations, followed by a depressive stage of extreme drowsiness, impotence, and slowed speech.

The third and final stage is distinguished by symptoms much like those of Parkinson’s disease and, like Parkinson’s, can be treated by levodopa. Other overdose symptoms may include liver damage, muscle spasms, and a monotone voice.

The absorption of manganese may be decreased by high dietary levels of magnesium, calcium, iron, phosphate, antacids, magnesium-containing laxatives, fiber (including bran), phytates in vegetables, tannins in tea, and oxalic acid in spinach. Manganese can interfere with the effectiveness of antibiotics.

**Dosage:** The adequate intake is 2.3 mg/day for men; 1.8 mg/day for women, 2 mg/day for pregnant women, and 2.6 mg/day for breastfeeding women.

## NICOTINAMIDE RIBOSIDE

**AKA:** NmR, NR.

**Food Sources:** Milk.

**Effects:** Has been found to increase the lifespan of yeast cells and increase sirtuin activity (Belenky et al., 2007; Belenky et al., 2009; Lu et al., 2009; Chi and Sauve, 2013). It is also a precursor of nicotinamide adenine dinucleotide, and helps to counteract the effects of Alzheimer’s in mice (Gong et al., 2013).

**Precautions:** None known.

**Dosage:** None established.

## OPCs

**AKA:** Oligomeric proanthocyanidins, oligomeric procyanidolic complexes, PCOs, proanthocyanidins, procyanidins, procyanidolic oligomers.

The OPCs are polyphenol extracts derived from plant sources, the most popular being French maritime pine bark extract (Pycnogenol), grape seed extract (Activin and Resivit), and Landes pine bark (Flavan). They have often been mistakenly referred to as bioflavonoids; they share a similar chemical

structure, but OPCs are 100 percent bioavailable, non-toxic, colorless, and can bind with proteins, whereas bioflavonoids are, for the most part, not biologically active, sometimes toxic, yellow in color, and unable to bind with proteins.

**Food sources:** Blueberries, cherries, cranberries, grapes, raspberries.

**Effects:** The OPCs are antioxidants. They can also lower LDL cholesterol levels, reduce the risk of atherosclerosis, improve the strength and elasticity of blood vessels, maintain cardiovascular health, protect against age-related and degenerative diseases by increasing collagen's ability to repair itself, prevent edema and inflammation, relieve the symptoms of varicose veins, relieve the discomfort of PMS and menopause, reduce the probability of developing diabetic retinopathy, and maintain skin health. They are one of the keys to understanding the "French paradox," the fact that the French consume just as much dietary fat and cholesterol as Americans, yet do not suffer the same rate of cardiovascular disease, mainly due to their intake of red wine.

**Precautions:** No known side effects.

**Dosage:** Optimal dosage appears to be 100 to 200 mg/day for the average healthy individual. Grape seed extracts are superior to pine bark extracts, as the former contains 92 to 95 percent OPCs, compared to 80 to 85 percent in the latter; grape seed extracts also contain the gallic esters of OPCs, the most effective form for scavenging free radicals, while pine bark extract does not. In addition, a new process (called the phytosome process) also binds grape seed extract OPCs to lecithin, allowing them to be better absorbed by the gastrointestinal tract and more fully utilized by the body, making it preferable to the unbound form.

## POLYPHENOLS

**AKA:** Polyhydroxyphenols.

**Food Sources:** Plant foods (cocoa, coffee,

fruits, grains, herbs, legumes, nuts, red wine, tea, vegetables).

**Effects:** Polyphenols are antioxidant micronutrients found in plants, and number over 8000 (several hundred of which are in edible plants). They include flavonoids (flavonols, flavones, isoflavones, flavanones, anthocyanidins, and flavanols (catechins and proanthocyanidins)).

**Precautions:** The most common polyphenols are not always the most biologically available. Polyphenol content of foods is dependent on the environmental conditions during growth, particularly exposure to light, though there are exceptions—in red wine, genetics plays a more dominant role than light or climate. Fruits and vegetables grown by conventional or hydroponic methods contain fewer polyphenols than those grown by sustainable or organic methods (there is some evidence to suggest that plants develop more antioxidants when pesticides are not present, as plants use polyphenols to defend themselves from ultraviolet radiation, diseases, and pests). Little is known about the specific actions of many of these nutrients in the body (Manach et al., 2004), particularly health benefits, as most studies have been performed in vitro or on animals, with doses that are far higher than what humans can obtain through diet (Scalbert et al., 2005).

Polyphenol content can be reduced by oxidation (e.g., browning), food processing, prolonged storage, boiling and frying, converting into juice. Stress can also use up polyphenols faster. Despite early reports, milk does not interfere with the bioavailability of polyphenols in tea, yet other research suggests that consumption of any food may inhibit the body's ability to absorb at least some of these nutrients.

**Dosage:** None established, though it is believed by some researchers that individuals eating a healthy diet (including several fruits and vegetables a day) consume approximately 1g/day of total polyphenols. Foods should be fresh and moderately cooked. Fruits and veg-

etables should be brightly colored, and should taste strongly flavored, bitter, or astringent.

## POTASSIUM

**AKA:** K.

**Food Sources:** Beans, citrus fruit, whole grains, dandelion greens, lean meats, potatoes, vegetables.

**Effects:** Potassium deficiency may be associated with depression, insomnia, mental impairment, and nervousness.

**Precautions:** Supplementation should only be under the guidance of a physician. Side effects may include stomach upset, nausea, diarrhea, vomiting, and intestinal gas. Overdose symptoms include a burning or tingling feeling, weakness, listlessness, dizziness, mental confusion, low blood pressure, irregular heartbeat, paralysis, and death.

When combined with high blood pressure medications or water pills, it can increase potassium levels in the blood.

**Dosage:** 2000 mg/day.

## PYRITINOL

**AKA:** Bonifen, Cerbon 6, Encefabol, Encepan, Encephabol, pyridoxine disulfide, pyriothioxine, pyriothioxine hydrochloride, pyritinol hydrochloride.

A synthetic analogue of vitamin B6, it is two B6 molecules bound together by two sulfur atoms.

**Effects:** Prescribed in some European countries as a treatment for cognitive impairment in dementia, for negative aftereffects of head and brain trauma, and for cognitive and learning disorders in children. One study found it improved reaction times in test subjects (Hindmarch et al., 1990).

**Precautions:** Its use as a nootropic (an enhancer of learning, memory, cognition, attention, concentration, energy, or restful sleep) in healthy individuals is unsupported by any evidence.

Side effects may include nausea, headache, and allergic reaction. Rare side effects may include acute pancreatitis, acute hepatitis, and photoallergic eruption, which were ascribed to doses of 400–600 mg/day and the individual's physiology.

**Dosage:** Dependent on the condition being treated. For over-the-counter or nootropic use, no dosage has been established.

## SALT

**AKA:** Sodium, sodium chloride, table salt.

**Food Sources:** Found in almost every form of processed foods, including frozen dinners, fast food, and restaurant meals.

**Effects:** Recent research on rats at the University of Iowa indicates that it might be an anti-depressant (Johnson et al., 2009).

**Precautions:** It contributes to high blood pressure and heart disease, and—according to Ulla Toft, Senior Researcher at the Research Centre for Prevention and Health in Copenhagen—may also play a role in stomach cancer, osteoporosis, kidney stones, obesity, and diabetes. A deficiency produces cravings and changes in brain activity in rats similar to those produced by drugs, indicating it may be just as addictive. Studies on rats and cultured cells indicate it may also play a role in the development of autoimmune diseases such as multiple sclerosis and inflammatory bowel disease by triggering the maturity of TH17 immune cells, though more research needs to be done to determine if this is true for humans, as well.

According to Dr. Joseph Mercola, table salt contains dangerous chemicals such as ferrocyanide and aluminosilicate, and that it is preferable to eat pure, unrefined salt, such as all-natural sea salt.

In 2013, a 19-year-old college student suffered seizures and went into a three-day coma from hypernatremia, or too much salt in the blood, after drinking a quart of soy sauce. It was only swift and aggressive medical intervention that prevented him from suffering

neurological damage and eventual death, as in such cases the body attempts to equalize the salt concentration in the body by taking water from the brain, leading to shrinkage and bleeding in that organ. In ancient China, consuming large amounts of salt was a traditional way of committing suicide.

**Dosage:** The U.S. Food and Drug Administration recommends 4 grams/day, though this may be twice what the body actually needs. Ulla Toft asserts that one-and-a-half grams/day is enough.

## SELENIUM

**AKA:** L-selenomethione, selenium ascorbate, selenocystine, selenomethionine, sodium selenate, sodium selenite.

A trace element that, until recently, was unjustifiably considered a deadly poison. It is one of the most powerful of the antioxidant minerals.

**Food Sources:** Asparagus, Brazil nuts, broccoli, brown rice, cabbage, celery, cucumbers, dairy products, eggs, garlic, herring, organ meats (such as liver and kidneys), mushrooms, onions, poultry, radishes, sardines, shellfish, tomatoes, and tuna can have high levels. Barley, bran, whole-grain breads and cereals, brewer's yeast, and wheat germ may have high levels if grown in soil that is high in selenium, but levels can vary widely.

**Effects:** Selenium detoxifies heavy metals (such as arsenic, cadmium, lead, and mercury), alcohol, peroxidized fats, and some drugs; reportedly slows down some of the aging processes, and inhibits the oxidation that leads to hardening of the tissues, keeping them more elastic. Studies have shown that, when given in doses around 220 micrograms/day, it improves moods and thinking, even in those who are not deficient, indicating most people do not get enough.

Selenium has a synergistic effect when taken with vitamin E, as both are strong antioxidants. It strengthens the immune system—some say

that when selenium and vitamin E are taken together, the body's antibody defenses experience a thirty-fold increase. When combined with zinc, it can improve mental performance.

The only known deficiency symptom is a heart condition known as Keshan's disease.

**Precautions:** Men, especially sexually active men, have a greater need for it than women, as this mineral is lost through semen. Selenium in its natural state is poisonous, though some say organic selenium is three times less toxic than inorganic selenium, and can cause symptoms when approximately 2400 to 3000 mcg/day is taken over a long period of time. Some studies have found no harmful effects in people whose daily intake averages 1500 mcg/day. Pearson and Shaw, however, claim that an inorganic form, sodium selenite, is relatively nontoxic, while selenomethionine and selenocystine—two organic forms—are potentially harmful, as the body may mistake these amino acids for sulfur-containing amino acids and make them perform functions they are incapable of carrying out. Sayer Ji of [www.greenmedinfo.com](http://www.greenmedinfo.com) disagrees, citing evidence that both the Environmental Protection Agency and the European Union classify sodium selenite and sodium selenate as environmental toxins, and that toxicology reports from PUBMED and the Hazardous Substances Databank consider them to be possibly carcinogenic and genotoxic, with the potential to cause reproductive and developmental problems.

Side effects may include muscle tenderness, tremors, lightheadedness, facial flushing, blood clotting problems, and liver and kidney problems. Overdose symptoms include a metallic taste in the mouth, garlic breath, skin inflammation, loss of hair, brittle or blackened nails, bad teeth, swelling fingers, discoloration of skin, dizziness, nausea, vomiting, fatigue and lethargy, gastrointestinal problems, irritability, jaundice, and progressive paralysis; acute poisoning from long-term use (similar to arsenic poisoning) is evidenced by fever, rapid breathing, upset stomach, hair loss, hor-

horizontal streaks on the fingernails, nail inflammation, inflammation of the spinal cord and bone marrow, anorexia, and death. Long-term use may also increase the risk of prostate and skin cancer. Permanent side effects are rare, and most adverse effects disappear within a few weeks, even after several months of high dosages. The risk of toxicity is low because selenium is quickly excreted by the body; metal and refinery workers, however, may be exposed to toxic levels, as selenium is used in the processing of some metals, though this occupational poisoning has been characterized as “mostly accidental and rare.” Another risk group may be office workers who are at a copy machine all day, as these machines use selenium plates, which release this mineral into the air.

Selenium citrate and selenium picolinate are high-dose supplements that should only be taken under a doctor’s prescription.

Selenium supplementation may cause fertility problems in men and increase the symptoms of those with hypothyroidism. Supplementation should not be taken in the two weeks before surgery, to reduce risk of bleeding. There have been documented cases of cystic fibrosis patients who have become gravely ill or died after taking supplemental doses that would have been well within the safe range for the average person. Despite early reports, there appears to be no link between high selenium levels and amyotrophic lateral sclerosis (ALS, otherwise known as Lou Gehrig’s disease).

Selenium can increase the effectiveness of anticoagulants and warfarin, and increase the effectiveness and side effects of sedative medications such as barbiturates. Gold salts may decrease the actions of selenium in the body, leading to symptoms of deficiency.

**Dosage:** The RDA is 55 mcg/day for adults, not to exceed 400 mcg/day.

## SULBUTIAMINE

**AKA:** Arcalion.

A synthetic derivative of vitamin B1 (thi-

amine) that can pass through the blood-brain barrier. A compound similar to Hydergine, but stronger.

**Effects:** Promotes alertness, strengthens long-term memory, improves reaction time, fights fatigue, lowers anxiety, and improves resistance to stress. One study found that it was able to improve working memory and counteract dizocilpine-induced amnesia affecting episodic memory in rats (Bizot et al., 2005).

**Precautions:** More than three 200 mg tablets a day may result in severe headaches. It has been found to cause skin reactions, and may cause problems in those with bipolar disorder.

**Dosage:** 400 mg/day with breakfast for 20 days.

## SULFUR

**Food Sources:** Dried beans and peas, lean beef, brussels sprouts, cabbage, clams, eggs, fish, garlic, onions, peanuts, wheat germ.

Necessary for good complexion, healthy hair, and strong nails.

**Effects:** Helps provide the brain with sufficient oxygen, and also helps the blood resist bacterial infections.

Sulfur works synergistically with the B vitamins to maintain basic body metabolism and strong nerves.

There are no known deficiency symptoms.

**Precautions:** It is not known whether any overdose symptoms are associated with organic sulfur, but inorganic sulfur may pose problems.

**Dosage:** No RDA has been established, but since sulfur is an important component of many amino acids, those eating sufficient protein are most likely getting adequate amounts of sulfur.

## VITAMIN A, BETA-CAROTENE, CAROTENOIDS

**AKA:** Acon, Afaxin, Alphalin, Aquasol A, carotene, Dispatabs, pro-vitamin A, retinalde-

hyde, retinoic acid, retinol, retin A, Sust-A, vitamin A acetate, vitamin A acid, vitamin A palmitate.

Beta-carotene (sometimes called carotene or pro-vitamin A) is found almost exclusively in plant foods and is a precursor to vitamin A, which, after it is converted by the body, works as an antioxidant (prevents vitamin C from oxidizing). Carotenoids, of which there are over 600, are also found in plant foods, but are not as plentiful or important. Retinol is the form of vitamin A found in animal foods. Vitamin A acetate and vitamin A palmitate are synthetic forms found in fortified foods.

**Food Sources (vitamin A):** Beef, butter, chicken, egg yolk, fish, fish liver, fish liver oils, heart, kidney, liver, milk, sea food.

**Food Sources (Beta-carotene):** Some fruits, dark-green and orange vegetables, tomatoes.

**Food Sources (carotenoids):** egg yolks, pink grapefruit, oranges, parsley, red palm oil, shellfish, spinach, tomatoes.

**Effects:** Vitamin A is essential for the skin, hair, nails, and vision; helps the immune system work better; helps fight infections and speeds up healing; shields the skin from the harmful effects of the sun's UV rays; and protects the membranes of brain cells, which have lots of fat and thus are readily damaged by free radicals. Both beta-carotene and vitamin A each have their own specific antioxidant properties. A recent study by the Salk Institute for Biological Studies indicates vitamin A may be an important factor in memory and learning.

Beta-carotene appears to prevent lung cancer and tumors of the mouth and throat, and recent research has shown that it may protect against memory loss and other forms of cognitive impairment.

The carotenoids lutein and zeaxanthin, found in spinach and collard greens, may help prevent macular degeneration, one of the main causes of blindness in old people. Other carotenoids could lower the chance of heart attack in men with high blood pressure by 60

to 70 percent. Astaxanthin, which exists in some plants, yeasts, and marine animals, has 5 to 20 times the antioxidant activity of beta-carotene.

Deficiency is rare, as the liver can store enough for months or even years before it is depleted, even if none is consumed in the diet. A deficiency can result in dry skin, eyes, and mucous membranes; loss of vitamin C; impaired night vision; degeneration of tooth enamel and gums; problems with bone growth; sinus trouble; loss of smell; and increased susceptibility to infections.

**Precautions:** Daily doses of vitamin A higher than 25,000 IU taken over an extended period of time can result in abdominal pain, loss of appetite, blurred vision, bone pain, confusion, diarrhea, dizziness, drowsiness, fatigue, hair loss, headaches, irritability, joint swelling, dry cracked lips, sensitivity to light, liver enlargement, irregular menses, muscle pains, nausea, rashes, restlessness, dry rough or scaly skin, swelling over the long bones, vomiting, weight loss, and liver and eye damage (the main storage sites in the body for vitamin A). These disappear when the dosage is reduced. There are some reports that large doses of vitamin C can prevent these problems. Those with kidney disorders should consult a physician before increasing intake of vitamin C. According to Andrew Weil, M.D., some supplements of vitamin A, even in moderate doses, can be toxic, and he advises that mixed carotenoids be taken instead.

Individual needs vary widely, and what might be a low dose for one person could be toxic to another. Beta-carotene, on the other hand, is non-toxic, as the body only converts it into vitamin A when it is needed; excessive amounts may cause a yellowing of the skin (carotenosis), which is harmless and disappears when the dosage is reduced.

There are other common precautions that should be kept in mind: polyunsaturated fatty acids with carotene can work against vitamin A if antioxidants are not present; women on

oral contraceptives have a decreased need for vitamin A; at least 10,000 international units (IU) of A are needed if more than 400 IU/day of vitamin E are taken; and vitamin A can interfere with the effectiveness of phenytoin. If more than 10,000 IU/day are taken, it will increase the effect of anticoagulants.

Antacids, aspirin, barbituates, pollution, stress, and various prescription drugs can all take their toll on the body's supply of vitamin A. The absorption of vitamin A can be inhibited by alcohol, coffee, mineral oil, an excess of iron, a deficiency of vitamin D, calcium supplements, and the drugs cholestyramine, colestipol, and neomycin. The cholesterol-reducing drug Questran (cholestyramine) may interfere with the absorption of vitamin A to such an extent that supplementation may be needed. If taking a broad-spectrum antibiotic, do not take high doses of vitamin A. And vitamin A should not be taken with the acne drug Accutane (isotretinoin). The fat substitute Olestra can interfere with the absorption of carotenoids, a situation which alarms some because the average American diet is already deficient in this important class of nutrients.

Paradoxically, beta-carotene and vitamin A has been found to significantly increase the death rate of smokers due to lung cancer if their levels of vitamin C are low, resulting in an increase of free radicals rather than a reduction, a finding confirmed by a 2012 Cochrane review, which found an increase in mortality for anyone taking these supplements. According to a 2002 Harvard study, women who consumed high levels of vitamin A had an almost 50 percent increase in risk for hip fractures than those who consumed low amounts of the vitamin.

**Dosage:** The RDA for vitamin A is 3000 IU/day for men, 2300 IU/day for women, 2500 IU/day for pregnant women, and 4000–4300 IU/day for breastfeeding women. Nutritionists recommend taking more beta-carotene than vitamin A. About 20 to 25 mg of zinc may be needed to help utilize vitamin

A that is stored in the liver, along with adequate supplies of the B vitamins, vitamin C, vitamin D, vitamin E, calcium, choline, and phosphorus. Both vitamin A and beta-carotene are absorbed more readily if consumed with foods containing fat and any hard physical activity is avoided for four hours afterwards. Carotenoids are more effective if taken in combination—for instance, alpha and beta carotenes from carrots, spirulina (an algae), dimallela salina (a marine plant), lycopene from tomatoes, and lutein from spinach.

Those with poor health habits—such as smokers—and those with specific problems that inhibit absorption of vitamin A and beta-carotene—such as those with gastrointestinal or liver diseases, gall bladder problems, or diabetes—may require a higher dosage; in the latter case, higher dosages should only be taken under the guidance of a qualified health professional.

Mycelized vitamin A can be at least five times as powerful as oil-based supplements, due to its higher degree of absorption. Retin A, or vitamin A acid, is commonly used in prescription doses of 10,000 to 25,000 IU/day.

## VITAMIN B-1

**AKA:** Betalin S, Betaxin, Bewon, Biamine, thiamin, thiamine.

**Food Sources:** Asparagus, beans, bran, broccoli, brown rice, fish, kelp, lima beans, liver, lean pork, milk, nuts, oatmeal, split peas, poultry, soybeans, sunflower seeds, fresh green vegetables, wheat germ, whole-grain cereals, yeast.

**Effects:** A strong antioxidant, vitamin B-1 also helps in stabilizes the brain and nervous system's energy production from glucose, aids in the functioning of the nervous system, and helps repair cell damage. One study found that low thiamin intake in women was associated with poor mood, a condition that was improved when thiamin intake was increased (Benton et al., 1995).

A deficiency (dosages below the minimum daily requirement of 1 mg/day) known as beriberi often results in physical and mental deterioration, manifesting itself in anxiety, neurosis, depression, loss of manual dexterity, shortness of breath, numbness in hands and feet, weakness, fatigue, sensitivity to noise, loss of appetite, vision problems, irritability, confusion, poor memory, sleep disturbances, and gastrointestinal disturbances.

Benfotiamine is a vitamin B-1 analogue which has been used to treat the complications from diabetes.

**Precautions:** There is a wide variation in the amount individuals need; some people seem to be able to manufacture it from their intestinal bacteria, though antibiotics may disturb the natural balance of these bacteria. High doses can result in deficiencies of other B vitamins, which can be prevented by increasing the intake of other B vitamins accordingly, such as with a B-complex supplement. Overdosages can also affect thyroid and insulin production, and symptoms—though rare, and usually resulting from injections of B-1—include allergic reactions, edema, faintness, headache, herpes, hives, insomnia, irritability, severe itching, muscle tremors, nervousness, rapid pulse and heartbeat, rash, weakness, and wheezing.

Antibiotics, oral contraceptives, chronic heavy drinking, antacids, barbituates, caffeine, carbonated citrates in food and drinks, estrogen, fever, stress, sulfa drugs, tobacco, and eating fish, clams, eggs, brussels sprouts, and red cabbage in their raw state can destroy or inhibit the absorption of B-1. Cooking, food processing, and marinating meat in soy sauce, vinegar, or wine can also contribute to the destruction of this vitamin in foods. Vitamin B-1 should be taken with carbohydrates, as it helps metabolize them, though a diet too high in carbohydrates may increase the need for B-1. Its benefits are enhanced when taken with adequate amounts of other B vitamins, vitamins C and E, manganese, and sulphur.

It may enhance the effects of neuromuscular blocking agents, a class of drugs used with anesthesia to relax the muscles during surgery. It should not be taken in high doses in combination with vitamin C and the amino acid L-cysteine except under the supervision of a doctor, as these can render insulin inactive. High doses can produce false positive results in tests for uric acid and urobilinogen; it can also produce a false reading in a test for the level of theophylline (a drug used for the treatment of bronchial asthma) in the blood.

**Dosage:** The RDA is 1.5 mg/day for men, 1.1 mg/day for women. It is best taken with the other B vitamins, including pantothenic acid, folic acid, B-12, and the equivalent amounts of B-2 and B-6.

## VITAMIN B-2

**AKA:** Riboflavin.

**Food Sources:** Dairy products, meats, whole-grain and enriched-grain foods, and some dark green leafy vegetables.

**Effects:** Vitamin B-2 deficiency may be associated with depression, irritability, dementia, mental impairment, and moodiness. One study found that women given ten times the recommended daily dose of nine vitamins reported an improvement in mood after a year, and that this improvement was associated mainly with vitamins B-2 and B-6 (Benton et al., 1995).

**Precautions:** Toxicity due to high intake appears to be non-existent; excess riboflavin is quickly excreted by the body.

A deficiency is known as ariboflavinosis, and can occur if prolonged intake of the vitamin is less than half of the RDA; it is characterized by cracks in the skin around the nose, reddening of the eyes, inflammation and soreness of the lips and tongue, and greasy, scaly skin eruptions. It can also leave permanent scars around the mouth. Those at most risk for deficiency are vegans and others who restrict their intake of dairy and meat products,



alcoholics, individuals taking tranquilizers and anti-depressants, individuals with thyroid disease, and newborns undergoing phototherapy for the treatment of jaundice.

**Dosage:** The RDA is 1.8 mg/day for men, 1.2 mg/day for women.

### VITAMIN B-3

**AKA:** Inositol hexaniacinate, niacin, niacinamide, nicotinic acid, nicotinamide, xanthinol nicotinate.

The information in this entry applies to the vitamin only, and not the cholesterol-reducing drug also known as niacin (AKA Niacin-time, Niacor, Nicobid, Nicolar, Slo-Niacin), which may have very different side effects and interactions. L-tryptophan can be converted by the body into B-3, though it takes 60 parts tryptophan to make one part niacin, and a person who is deficient in B-1, B-2, and B-6 may not be able to produce niacin in this manner.

**Food Sources:** Avocados, brewer's yeast, dates, eggs, figs, fish, enriched flour, lima beans, liver, lean meat, milk, mushrooms, nuts, roasted peanuts, poultry (white meat), prunes, rice, wheat bran, wheat germ, whole wheat products. With sufficient B-6 in the body, it can also be produced from the amino acid tryptophan, found in cheese, eggs, and milk.

**Effects:** Relieves depression, insomnia, and hyperactivity, improves memory and other mental functions, protects against stress, reduces blood clotting, and improves the oxygen-carrying ability of red blood cells. Drs. Humphry Osmond and Abram Hoffer contended that B-3 is an effective treatment for schizophrenia, though other researchers have not been able to duplicate their success, and this treatment is now considered invalid. Vitamin B-3 is a histamine releaser, which can cause a flushing, tingling, and redness of the skin in some people, effects which can heighten sexual pleasure. It is also necessary for the synthesis of cortisone, throxine, and insulin, as well as the sex hormones estrogen,

progesterone, and testosterone. One study found that B-3 and nicotinamide can increase the lifespan of roundworms by ten percent by—paradoxically—promoting the formation of free radicals, generally considered to be injurious to health, though this effect may mimic the effects of exercise; it is thought that this could hold true for humans, as well (Schmeisser et al., 2013).

The active co-enzymatic form, and a natural metabolite, of B-3, called variously niacinamide adenine dinucleotide, nicotinamide adenine dinucleotide, NAD, or NADH (the reduced form), has shown promise in mental enhancement, though only recently has a process been developed that can stabilize this nutrient so that it can be taken orally, and one admittedly flawed study using 17 subjects suggests that 5 mg twice daily can improve the symptoms of Alzheimer's. Another study found that nicotinamide could help protect against Alzheimer's-associated memory loss in mice, and that even healthy mice benefitted from high doses of this form of the vitamin (Green et al., 2008), though whether similar results can be obtained in human trials is yet to be determined. Much more research is needed.

An extreme deficiency, now rare in the United States due to fortified foods, is known as pellegra, and is characterized by gastrointestinal disturbances leading to a redness of the skin and inflammation, inability to recall recent events, apprehension, confusion, depression, dermatitis, diarrhea, emotional instability, and hyperirritability. There is some evidence to indicate that low dietary intake of niacin is associated with increased risk of Alzheimer's disease. An unusual sensitivity of the skin to sunlight may be an early warning sign. The victims of pellegra suffer from dermatitis, diarrhea, dementia, and some cases lead even to death.

**Precautions:** It should not be taken by those sensitive to niacin or who have liver disease, stomach ulcers, very low blood pressure,

gout, or hemorrhaging. It should be taken only under the guidance of a physician if any of the following conditions are present: diabetes, gall bladder or liver disease, glaucoma, gout, high blood pressure, impaired liver function, porphyria, sensitivity to tartrazine dye, or ulcers. Those with ulcers may have to take an antacid to prevent aggravating their condition, and those with gout may find their symptoms increasing because of increased uric acid levels in the blood. Individuals with allergies may have problems, as nicotinic acid reportedly raises the histamine level in the body. Some may also find that they have an abnormal glucose tolerance such as found in diabetics.

In some cases, extremely high doses—over 750 mg/day—can cause abdominal cramps, diarrhea, fainting, body flush, itchy skin, jaundice, lightheadedness, liver damage, nausea, rash, sweating, vomiting, weakness, and “niacin hepatitis,” though the latter is not life-threatening. In doses larger than 50 mg, it may cause dry skin, a flushing or redness of the skin accompanied by a tingling, dizziness, itching, or headaches for about 10 to 20 minutes when first starting supplementation; the flushing usually occurs on an empty stomach, is reportedly harmless, and should go away within two months. Some say this only occurs with pure niacin, and that taking aspirin an hour before taking B-3 or drinking a glass of water with the vitamin can prevent these symptoms, while others say that this only occurs with nicotinic acid. It should be noted that there is good evidence that toxicity can result from long-term intake of as low as two and one-half times the RDA. There are time-release niacin tablets that avoid the flush, but some evidence indicates that the continuous release of niacin may be detrimental to the liver. Other uncommon side effects may include abdominal pain, bloating, low blood pressure, diarrhea, fainting, gas, rapid or irregular heartbeat, heartburn, and hunger pains. Even rarer are incidents of nervousness and panic caused by high doses of nicotinic acid, blurred vision and re-

lated eye problems, and apparently one case of hypothyroidism. “Nicotinic analogues” or “niacin analogues” are drugs used to treat specific conditions, and have no value as vitamin supplements. Similarly, niacinimide, which avoids the niacin flush, lacks many of the beneficial effects of niacin, and can also cause liver damage and, in some people, depression. As for liver damage, psychiatrist Dr. Abram Hoffer, M.D., who conducted the first double-blind, placebo-controlled clinical trials of niacin, says, “Niacin is not liver toxic. Niacin therapy increases liver function tests. But this elevation means that the liver is active. It does not indicate an underlying liver pathology.” ([www.naturalhealthnews.com](http://www.naturalhealthnews.com), December 9, 2008).

Deficiency symptoms include indigestion, diarrhea, headaches, muscle weakness, loss of appetite, irritability, anxiety, depression, dermatitis exacerbated by sunlight, mouth sores, and a red, inflamed tongue. Individuals most likely to be deficient are women who are pregnant or breast-feeding, the elderly, alcoholics, and those with hyper-thyroidism.

Nicotinic acid can also interact with ganglionic blocking drugs, enhancing their blood pressure-lowering effect. Isoniazid, used to treat tuberculosis, can increase the need for niacin. Nicotinic acid can also interfere with the Benedict’s reagent test for sugar in the urine, the measurement of catecholamines in the blood or urine, and—in one case—it has decreased the liver’s uptake of the chemical used to make that organ visible for a liver scan. Niacin can reduce the effectiveness of antidiabetic drugs, probenecid, and sulfapyrazone. Combining with beta-andrenergic blocking agents, mecamylamine, methyl dopa, or alcohol could result in excessively low blood pressure. Combining with HMG-CoA reductase inhibitors could increase the risk of heart or kidney problems. With cocaine, it could cause an increased flushing of the skin.

Niacin can be destroyed by alcohol, antacids, aspirin, estrogen, food processing,

sleeping pills, sulfa drugs, and water. Its effectiveness can be reduced by tobacco and obesity.

**Dosage:** The RDA is 19 mg/day for men, 15 mg/day for women, and 17 mg/day for pregnant women. Start at low doses and gradually increase to 100 to 200 mg/day. It should be taken in 3 to 4 divided doses, preferably with meals. A high-protein diet with meat, eggs, enriched cereals, and other foods high in B-3 can provide adequate amounts.

## VITAMIN B-5

**AKA:** Calcium pantothenate, Dexol T.D., pantothenic acid, panthenol.

**Food Sources:** Avocados, broccoli, chicken, egg yolks, lentils, liver and other organ meats, nuts, oats, fresh vegetables, and yeast are the best sources. Vitamin B-5 occurs in such a wide variety of foods that a deficiency is rare and, if it does occur, indicates a diet so poor that deficiency symptoms of other vitamins are also likely to be present.

**Effects:** A strong antioxidant, stamina enhancer, and protector against stress. It helps in the synthesis of acetylcholine, is essential for the synthesis of antibodies, and is needed for the utilization of PABA and choline. It may help promote sleep when combined with inositol.

A naturally occurring deficiency is probably extremely rare, and is characterized by blood and skin disorders, duodenal ulcers, and hypoglycemia. A deficiency may also be associated with depression and irritability.

**Precautions:** It can cause heartburn or, less frequently, cramps. Rare symptoms include hives, rash, and difficult breathing. There are no known overdose symptoms, though initial large doses can cause temporary diarrhea. Taken by itself over an extended period of time may increase the need for B-1, leading to neuritis. There is no known toxicity. It should not be taken by those who are allergic to pantothenic acid, and those with hemophilia should consult a physician first.

Vitamin B-5 can be destroyed by alcohol, caffeine, canning, cooking, estrogen, food processing, heat, sleeping pills, sulfa drugs, and tobacco. It can reduce the effectiveness of levodopa (but not carbidopa-levodopa). Chloramphenicol, cycloserine, ethionamide, hydralazine, immunosuppressants, isoniazid, and penicillamine can all reduce the absorption of B-5 and cause anemia and tingling or numbness in the hands and feet.

**Dosage:** The recommended dose is 4 to 7 mg/day.

## VITAMIN B-6

**AKA:** Beesix, Hexa-Betalin, pyridoxal, pyridoxamine, pyridoxine, Pyroxine, Rodex, Vitabec 6.

Vitamin B-6 is actually a trio of very similar substances—pyridoxine, pyridoxal, and pyridoxamine—working together. Though it is a water-soluble vitamin that needs to be supplied every day, there is some evidence that it can be manufactured by intestinal bacteria, possibly by the cellulose in a largely vegetarian diet.

**Food Sources:** Bananas, beef, blackstrap molasses, bran, brewer's yeast, brown rice, cabbage, cantaloupe, carrots, dairy products, eggs, fish, grapes, kidney, lamb, liver, meat, milk, nuts, peas, pork, potatoes, poultry, prunes, wheat bran, wheat germ, whole grains.

**Effects:** Vitamin B-6 protects against stress by regulating the production of the hormones serotonin and GABA (responsible for controlling depression, pain perception, and anxiety) (McCarty, 2000), and is needed by the brain for transporting and metabolizing amino acids to develop various neurotransmitters (such as norepinephrine, serotonin, and dopamine) needed for mental energy and memory. The vitamin also helps the immune system by producing antibodies and red blood cells. It is necessary for the proper functioning of the thymus, spleen, and sexual organs. Those on a high-protein diet will need more B-6. It may

play a key role in fat metabolism, so a diet rich in animal fats may be more likely to result in cholesterol plaques if there is insufficient B-6. Diabetics may find that B-6 can be used to decrease their need for insulin, though experimenting with supplements could be risky. It may also help in relieving the symptoms of depression and sickle-cell anemia. Research has shown that women can cut their risk of heart disease in half by consuming at least 400 mcg/day of folic acid and 3 mg/day of B-6; it is believed men can enjoy similar benefits from such an increase. A preliminary study has shown that 50 mg/day of vitamin B-6 combined with 200 mg/day of magnesium significantly reduced anxiety-related premenstrual symptoms such as nervous tension, mood swings, irritability, and anxiety (De Souza et al., 2000), and one small study has found that the combined mega-doses of folic acid (four times the daily recommended levels), vitamin B-6 (15 times the daily recommended levels), and vitamin B-12 (300 times the daily recommended levels) reduced the rate of mild cognitive impairment in subjects over 70 years of age (Smith et al., 2010). One study found that women given ten times the recommended daily dose of nine vitamins reported an improvement in mood after a year, and that this improvement was associated mainly with vitamins B-2 and B-6 (Benton et al., 1995); on the other hand, a study involving three dozen women aged 65 to 92 found no significant benefits to mood or cognition when doses of 75 mg/day were given (Bryan, 2002), and another study involving 76 healthy men aged 70 to 79 given 20 mg/day of B-6 found a similar lack of benefits (Deijen, 1992).

A deficiency can be similar to thiamin and niacin deficiencies, resulting in acne, anemia, arthritis, brain-wave abnormalities, convulsions, depression, glossitis, hair loss, migraine headaches, inflammation of the mouth and tongue, irritability, learning disabilities, mental confusion, nausea, malfunctioning of the nervous system, nervousness, chronic pain, se-

borrheic dermatitis, and possible cardiovascular disease. Studies indicate that low vitamin B-6 intake is common among the elderly, and it is believed that hyperhomocysteinaemia may be a factor in the development of certain forms of dementia, including Alzheimer's. A deficiency of both B-6 and folic acid is correlated with a high level of the amino acid homocysteine, which plays a role in heart disease.

**Precautions:** A 2003 review of the literature found that B-6 did not provide short-term benefits in mood or cognitive functions in the elderly. Too much B-6 in the body can result in night restlessness and very vivid dream recall. Taking more than 200 mg/day can cause peripheral neuropathy, and such high dosages should be administered only under the guidance of a physician. Doses higher than 500 mg/day may be toxic, leading to serious central nervous system problems, with such symptoms as pain in the arms and legs, numbness or tingling in the hands and feet, clumsiness, loss of balance, and difficulty in walking. Chronic megadoses of 2 to 6 grams/day used to treat carpal tunnel syndrome have led to vitamin toxicity and sensory neuropathy, which go away once the dosage is reduced, though some permanent nerve damage (such as loss of sense of touch) may remain. High doses of B-6 can lead to increased susceptibility to cadmium toxicity. High protein diets increase the need for B-6. One study found that high-dose supplementation with B6 and B12 did not slow the rate of cognitive decline in individuals with mild to moderate Alzheimer's disease and adequate levels of vitamin intake (Aisen, 2008).

Vitamin B-6 can be destroyed by alcohol, birth control pills, canning, estrogen, food processing (up to half the B-6 in flour may be lost in the refining process), roasting or stewing of meat, radiation, and tobacco.

The following drugs may increase the need for B-6: birth control pills, chloramphenicol, cycloserine (Seromycin), estrogens, ethionamide, the ingredient Hydralazine (contained in such blood pressure medications as Apre-

sazide, Apresoline, Rezone, Ser-Ap-Es, Serpasil-Apresoline, and Unipres), Isoniazid, and Penicillamine (a drug unrelated to penicillin which is used to treat rheumatoid arthritis and rare genetic diseases), and immuno-suppressants. The vitamin can interfere with the effects of hypnotic barbiturates, L-dopa (though the drug Sinemet may be able to bypass this interaction, and a carbidopa-levodopa combination does not have this problem), phenobarbital, and phenytoin.

**Dosage:** The RDA is 1.3 to 1.7 mg/day for men, 1.3 to 1.5 mg/day for women (though some suggest it should be 1.5 to 1.7 mg/day), 1.9 mg/day for pregnant women, and 2 mg/day for breastfeeding women. Best taken with vitamins B-1, B-2, pantothenic acid, C, and magnesium.

## VITAMIN B-9

The study cited below may have used this as another name for folic acid.

**Food Sources:** Unknown.

**Effects:** Said to be helpful during the development of the brain and to preserve memory in the elderly (Bourre, 2006).

**Precautions:** None known.

**Dosage:** None established.

## VITAMIN B-12

**AKA:** Acti-B-12, Alphamin, Alpha Redisol, Anocobin, Bedoc, Berubigen, Betalin 12, cobalamin, Codroxomin, Cyanabin, cyanocobalamin, Droxomin, hydroxocobalamin, Kaybovite, Kaybovite-1000, Redisol, Rubion, Rubramin, Rubramin-PC.

The only B vitamin that can be stored by the body (the liver can store three to five years' worth).

**Food Sources:** Beef, brewer's yeast, cheese, dairy products, egg yolk, fish, kidney, liver, milk, pork, seaweed, soybeans and soy products, yeast, yogurt.

**Effects:** Encourages RNA and DNA syn-

thesis in nerve cells, is needed for the transportation and storage of folic acid, helps stabilize the brain's metabolism of carbohydrates and proteins and its synthesis of myelin in the nerves, plays an indirect role in making choline available for the synthesis of neurotransmitters, protects against stress and fatigue (promotes the release of energy in foods), and is an essential growth factor needed for healthy brain and nerve function. Evidence indicates that normal levels of B-12 can help protect against emotional distress (Newbold, 1989), and both a 2008 University of Oxford study and a 2010 Karolinska Institute of Stockholm, Sweden, study found that older people with lower than average levels of B-12 were at least six times more likely to experience brain shrinkage, even though those levels were not low enough to qualify as a deficiency. Lab rats experience an increase in their rate of learning, and it has been used to treat depression, insomnia, and memory loss. Preliminary studies have shown that supplementation of B-12 and folic acid may prevent or delay the onset of Alzheimer's. One small study has found that the combined mega-doses of folic acid (four times the daily recommended levels), vitamin B-6 (15 times the daily recommended levels), and vitamin B-12 (300 times the daily recommended levels) reduced the rate of brain atrophy and mild cognitive impairment in subjects over 70 years of age (Smith et al., 2010), while a similar study conducted at Australian National University using 400 mcg of folic acid and 100 mcg of B-12 found modest gains in short- and long-term memory in subjects 60 to 74 years old over a two-year period (Walker et al., 2012). According to Pearson and Shaw, a dose of approximately 1000 micrograms taken immediately before sleep has about a 50 percent chance of creating dreams in color. Combined with folic acid and methionine, it can help manufacture choline in the body.

Because the body can recycle the vitamin, deficiency is rare, and years of chronic inadequate intake may precede the onset of symp-

toms. Those at risk include smokers, heavy drinkers, pregnant women, vegans, those who do not produce enough intrinsic factor in the stomach to help utilize it, those with chronic malabsorption problems, those who have undergone stomach surgery, and those taking estrogen, potassium supplements, sleeping pills, and anticoagulant drugs. A deficiency is known as pernicious anemia, and symptoms include poor appetite, a tingling in the hands and feet, depression, nervousness, nerve disorders, fatigue, weakness, digestive disorders, memory loss, moodiness, difficulty walking and maintaining balance. The effects of pernicious anemia may include nerve transmission problems, severe psychosis, brain damage, and death. Debbie Nathan, author of *Sybil Exposed*, presents good evidence that this most famous of multiple personality disorder cases suffered instead from congenital pernicious anemia, a genetic inability to absorb vitamin B-12. (It should be noted that most of the facts previously publicized in this case are distortions or outright fabrications.) Deficiency symptoms of B-12 can be masked by taking more than 1000 mcg/day of folic acid. According to a study published in the April 2004 issue of *Neuropsychology*, individuals who have a genetic risk factor for Alzheimer's do significantly worse on memory tests than others when deficient in B-12. There appears to be some correlation between deficiency levels and disorders such as depression and psychosis, though more research is needed to fully define the exact relationship (Zucker et al., 1981; Levitt and Joffe, 1989; Dommissie, 1991; Bottiglieri, 1996; Hutto, 1997).

**Precautions:** It should not be taken by those with Leber's disease (optic nerve atrophy). Those with gout should consult a physician before taking supplements. The RDA for adults is 3 micrograms, yet no toxicity was observed in tests where individuals took 500 to 1000 micrograms (0.5 to 1 mg) for up to five years, or took 100,000 micrograms in a single dose. Allergies to this vitamin are rare, and re-

actions (the symptoms for which include acne, eczema, and a swelling or crusting of skin around the lips) usually occur with injections, rather than tablets. Rare side effects consist of itchy skin, wheezing, and diarrhea. Life-threatening symptoms, usually resulting from overdose, consist of faintness (from anaphylaxis), hives, itching, and rash.

One study found that high-dose supplementation with B6 and B12 did not slow the rate of cognitive decline in individuals with mild to moderate Alzheimer's disease and adequate levels of vitamin intake (Aisen, 2008).

Dilantin can deplete the body's stores of B-12, and an underactive thyroid gland can interfere with the absorption of this vitamin. It can also be destroyed or have absorption interfered with by acids and alkalies, alcohol, anticonvulsants, chloramphenicol, cholestyramine, cimetidine, coffee, colchicine, estrogen, famotidine, laxatives, neomycin, nizatidine, oral contraceptives, potassium (extended-release forms), ranitidine, sleeping pills, stomach medications (such as Prevacid, Prilosec, Pepcid, Tagamet, and Zantac), sunlight, tobacco, vitamin C (if taken within two hours of each other), and water. One large-scale study found that those who took proton pump inhibitors (e.g., Prilosec, Prevacid, Nexium) for longer than two years had a 65 percent greater risk of B-12 deficiency (Corley et al., 2013). As it is only found in meat and dairy products, strict vegetarians may not get enough, though lack of deficiency in non-meat eaters leads some to speculate that some vegetables may contain bacteria that produce B-12. The vitamin needs to be taken with calcium to be properly absorbed and utilized by the body.

**Dosage:** The RDA is 2.4 mcg/day for adults. 2.6 mcg/day for pregnant women, and 2.8 mcg/day for breastfeeding women. It is absorbed best when taken with meals that contain calcium. It is recommended that those age 51 and over take 4 mcg/day; evidence suggests that some older people who have less stomach acid and more digestive bacteria may need to

take as much as 25–100 mcg/day. Some tablets sold contain the B-12 intrinsic factor, a mucoprotein secreted in the stomach which aids in the absorption of this vitamin, overcoming deficiency. Vitamin B-12 injections are generally regarded as worthless.

### VITAMIN B-15 AND DIMETHYLGLYCINE

**AKA:** Calcium pangamate, pangamic acid.

**Effects:** Said to prevent oxygen deprivation in the body's tissues, while reducing oxidation within cells. The active ingredient is dimethylglycine (DMG), a metabolic brain enhancer said to detoxify the body, lower cholesterol, and protect the liver. Its advocates contend that DMG increases energy, endurance, and strength (mainly by reducing the lactic acid in the muscles), improves the immune system (mainly by creating phosphocreatine, which also helps the muscles contract), and maximizes blood transport from the blood to the heart and brain.

**Precautions:** Though it is non-toxic, sale of B-15 is illegal. It is not a vitamin, as there is no evidence that the body has a need for it. None of the benefits claimed for it or DMG have any basis in fact. In fact, there is evidence that DMG and another component, diisopropylamine-dichloracetate (DIPADCA), are potential carcinogens.

**Dosage:** Sheldon Saul Hendler, M.D., Ph.D., does not recommend supplementation under any circumstances.

### VITAMIN C AND BIOFLAVONOIDS

**AKA (Vitamin C):** Ascorbic acid, Ascorbicap, ascorbyl palmitate, calcium ascorbate, Cecon, Cemill, Cenolate, Cetane, Cevalin, Cevi-Bid, Ce-Vi-Sol, Cevita, cevitamin acid, C-Span, Ester C, Flavorcee, magnesium ascorbate, Redoxon, sodium ascorbate, Sunkist.

**AKA (Bioflavonoids):** Flavonoids, vitamin P.

Man is the only animal that cannot synthesize vitamin C in the body (apes and guinea pigs have a similar problem in that their bodies cannot synthesize it fast enough), though some research indicates that human placentas and nursing mothers may have this ability.

There are two new forms of vitamin C. One, Ester C, has a higher level of bioavailability—patients given this form of the vitamin only need 20 to 30 percent of the usual dose of vitamin C, as it enters the body tissues faster and remains there longer than regular vitamin C. The other, ascorbyl palmitate, is a fat-soluble form (vitamin C is basically water-soluble): it remains in the fat tissues until used by the body and is not wasted through excretion. The dosage is about 250 mg/day.

Bioflavonoids, which include rutin and hesperidin, are part of the C complex of vitamins, and work synergistically with C. They give plants their color, and researchers have identified over 500 of them.

**Food Sources:** Bean sprouts, berries, cauliflower, citrus fruits, liver, potatoes, sweet potatoes, tomatoes, green leafy vegetables.

**Effects:** Vitamin C has been found to improve mood (Brody, 2002), especially in emergency rooms patients, whose vitamin C levels were often found to be at near-scurvy levels, as discovered in a 2008 clinical trial at the Jewish General Hospital in Montreal, Canada. Anecdotal evidence on prison inmates and others indicates it may curb violent, anti-social behavior and clinical depression, though research is needed to determine if there is a true correlation between the two. A study conducted on mice has found that it can dissolve the protein aggregates that make up the beta-amyloid plaques associated with Alzheimer's disease (Cheng et al., 2011), and a German study of elderly subjects found that the serum concentration of vitamin C and beta-carotene were significantly lower in Alzheimer's patients than in those not suffering from demen-

tia (Nagel and Armin, 2012), though more research is needed to determine its effectiveness on humans. It also works as an antioxidant (unlike antioxidants vitamin E, beta-carotene, and CoEnzyme Q10, which reduce oxidation damage, vitamin C works pre-emptively, intercepting the oxidants that initiate the free-radical cycle), is needed for the manufacture of neurotransmitters and cell structures, helps preserve the elasticity of the skin and capillaries, protects the lungs by preventing oxygen from converting into peroxides, boosts the immune system, helps wounds heal faster, helps the intestine absorb iron, lowers blood cholesterol, protects the body against the effects of pollutants (particularly the metals lead, mercury, and aluminum) and chemical toxins (such as formaldehyde, organic solvents, and pesticides), protects against bacteria and viruses, protects against heart and blood diseases, protects against heart attacks, reduces anxiety, and aids in restful sleep. Additionally, vitamin C, a natural antihistamine, increases alertness and mental functioning, may help safeguard against and reduce the symptoms of colds and flu, helps build collagen (the connective tissue in the body), and diminishes the duration and severity of herpes blister outbreaks. It also helps regenerate vitamin E after the latter has done its own job of eliminating free radicals. With vitamin E, it can counteract the effects of a fatty meal, especially damage done to blood vessels from high cholesterol. According to some studies, students with high vitamin C levels did better on IQ tests than those with lower levels, and a preliminary study, published in the *American Journal of Clinical Nutrition* in June 2009, has found a positive correlation between supplemental use of vitamins C and E and telomere length (telomeres are the DNA sequences at the ends of chromosomes which regulate cell division), though it was uncertain as to what extent a healthy lifestyle and diet may have also played a role.

A deficiency is known as scurvy which,

though rare, may be the end result of long-term deprivation of vitamin C. Symptoms include bleeding gums, hemorrhaging, loose teeth, emotional disturbances, and poor healing of wounds. Deficiency may also be associated with depression and irritability. Some contend that the U.S. RDA of 60 mg/day prevents these obvious symptoms, but does not prevent the occurrence of subclinical deficiency, a slight deficiency which may have no readily identifiable symptoms and which may lead to health problems years down the line. The only deficiency symptom of bioflavonoids that has been identified is bleeding gums.

**Precautions:** Taking megadoses of vitamin C was first popularized by Nobel-prize winning chemist Linus Pauling who, though a brilliant scientist, had no medical training.

Supplements should not be taken by those with increased iron absorption (caused by such conditions as hemochromatosis), diabetes, folic acid deficiency (from such conditions as alcoholism), serious kidney disease or kidney failure, leukemia, polycythemia (an increase in the blood's total cell mass), thalassemia (hereditary anemia), thrombosis, or an allergy to vitamin C. It can also cause problems in people with sickle cell anemia, G-6PD deficiency, kidney stones, or gout. Some brands contain tartrazine dye, and should be avoided by those who are allergic. A Finnish study published in 1994 involving 29,000 men who smoked found that those who took beta-carotene for at least five years had a greater chance of dying from lung cancer or heart disease; a similar study two years later involving 18,000 smokers had to be stopped because the risk of death from lung cancer was so great, and a 2004 review confirmed these findings.

Contrary to Linus Pauling and popular myth, vitamin C has no effect on the common cold (a finding which has been known since World War II [Cowan et al., 1942]) or cancer, and high doses can actually be harmful. A 2009 study found that vitamin C and E supplements can cancel some of the beneficial ef-



fects of exercise, specifically short-circuiting the body's sensitivity to insulin and preventing the activation of the body's natural defenses against oxidative damage, though lead researcher Dr. Michael Ristow points out that this effect does not apply to fruits and vegetables, which may have other nutrients that outweigh the negative factors. Supplementation has also been found to produce DNA-damaging compounds much more readily than metal ions do, rendering it useless as a cancer treatment. Research at Memorial Sloan-Kettering Cancer Center in New York has found that vitamin C protects cancer cells as well as healthy cells.

With too high a dose, diarrhea, dizziness, gastritis, gas, headaches, lightheadedness, nausea, and vomiting can occur, though these may be just temporary. Rare symptoms include abdominal pain and anemia. Lowering the dosage or using a buffered form (such as sodium ascorbate, calcium ascorbate, and Ester C) can stop these symptoms. In fact, the first sign of diarrhea (called the "bowel tolerance") is a sign that the body's optimal dosage of vitamin C has been surpassed.

Daily dosages above 500 mg/day may deplete the level of copper in the blood of males, leading to anemia; whether this also occurs in females is unknown. Vitamin C may also deplete the sulfur reserves in the body, placing vegetarians at risk, as this mineral is mainly found in eggs. Women taking 2000 mg or more a day may experience fertility problems; individuals taking 2000 mg or more a day may lower the resistance of their white blood cells to fight one common form of bacteria, and may need to take a folic acid supplement, as such a high dose of C will deplete this B vitamin. Those taking 3000 mg or more a day may experience reduced levels of the amino acid cysteine in the blood (though this condition is not serious) and lowered resistance to high altitude conditions. Dosages above 4000 mg/day can increase kidney stone formation in those already susceptible (though magne-

sium supplements may prevent this problem). Deficiency symptoms related to scurvy that accompany a sudden withdrawal of high dosages are rare.

Vitamin C should not be taken in large doses in conjunction with vitamins B-1 and the amino acid L-cysteine, as they can render insulin ineffective. In doses above 200 mg/day, vitamin C by itself may reduce the effectiveness of warfarin and other oral anticoagulants, dicoumarol, amphetamines, anticholinergics, mexiletine, quinidine, tranquilizers such as phenothiazine, and a class of drugs called tricyclic antidepressants, including Amitriptyline (also known as Elavil, Endep, Etrafron, Limbitrol, Triavil), Amoxapine (also known as Asendin), Desipramine (also known as Norpramin, Pertofrane), Doxepin (also known as Adapin, Sinequan), Imipramine (also known as Tofranil), Nortriptyline (also known as Aventyl, Pamelor), Protriptyline (also known as Vivactil), Trimipramine (also known as Surmontil). It can also slow down the metabolizing of aspirin by the body, which can lead to a toxic buildup after several doses. Vitamin C can increase the effect of barbiturates, increase the iron absorption from iron supplements, increase the side effects from estrogens (if vitamin C taken is more than 1 g/day), and lead to salicylate toxicity if such supplements are taken.

Drugs whose long-term use may increase the need for vitamin C include barbiturates, birth control pills, cellulose sodium phosphate, cortisones, levodopa, phenacetin, salicylates, sulfonamides, and tetracycline. More than eight aspirin a day for more than a week can cause the body to excrete more vitamin C; even a few can cause the body to excrete it at up to three times the normal rate.

Vitamin C can give false readings for the following blood and urine lab tests: blood bilirubin, blood glucose, creatinine, LDH, occult blood test for colon cancer, SGOT, uric acid, and urinary glucose.

Chewable vitamin C can lead to severe den-

tal erosion. Extra care should be taken when using the powdered form, mixing it fresh each time, as C will readily oxidize to the toxic form dehydroascorbate. Those who experience stomach problems or heartburn from taking ascorbic acid may eliminate these problems by taking calcium ascorbate, magnesium ascorbate, or sodium ascorbate. Contrary to earlier beliefs, large doses of C do not destroy B-12 (if taken more than two hours apart) or contribute to the formation of kidney stones in those not already susceptible.

Alcohol, antibiotics, aspirin, baking soda, cooking, copper pots, cortisone, heat, high fever, light, oxygen, smoking (each cigarette can destroy 25 to 100 mg), stress, vitamin A deficiency, and water can all contribute to the loss or reduced effectiveness of this vitamin. Vegetables should be washed, but not soaked, to prevent vitamin loss, and fruits and vegetables should be cut with a sharp knife immediately before consumption, as bruising with a dull knife and letting cut food stand can destroy vitamin C. Fresh fruits and vegetables should be eaten within a few days, and frozen vegetables should not be thawed before cooking. There should be at least a three-hour span between taking vitamin C and taking ginseng, as some of the ginseng may be neutralized.

**Dosage:** The RDA is 90 mg/day for men, 75 mg/day for women, and 120 mg/day for women who are pregnant or breastfeeding, though a 1999 research paper in the *Journal of the American Medical Association* recommends that this be increased to 200 mg/day. Smokers should take an additional 35 mg/day. It has often been taken in doses up to 10,000 mg/day without serious consequences; it encourages the production of other enzymes that utilize C and is water-soluble, so it is readily excreted by the body. In fact, one would probably have to ingest several pounds a day to reach toxic levels, though levels over 2000 mg/day are not recommended. It is more effectively utilized by the body if taken with bioflavonoids, plus the minerals calcium and magnesium. Earl

Mindell recommends 100 mg of bioflavonoids for every 500 mg of C, with the ideal balance of ten parts bioflavonoids to one part rutin and hesperidin. Dr. Stuart Berger states that bioflavonoids, or the so-called vitamin P, are not a vitamin at all, but a growth factor needed by certain organisms, excluding man. Moreover, Sheldon Saul Hendler, M.D., Ph.D., states that there is no solid evidence that bioflavonoids help the body utilize vitamin C better; in fact, one study shows that synthetic vitamin C is absorbed more fully than “natural” vitamin C from orange juice or vitamin C with rutin.

## VITAMIN D

**AKA:** Calciferol, cholecalciferol (vitamin D3), ergocalciferol (pre-vitamin D, vitamin D2).

Not only can it be obtained from non-food sources, but vitamin D is the only vitamin that is a hormone.

**Food Sources:** Cereals (fortified), cod liver oil, milk (fortified), wild-caught oily fish (salmon, mackerel, bluefish, canned tuna), orange juice (fortified). Smaller amounts are found in beef liver, cheese, and egg yolks. Some mushrooms contain vitamin D2.

**Effects:** It may improve memory. In a 2009 study published in the *Journal of Geriatric Psychology and Neurology*, researchers found that there was a correlation between cognitive impairment and low vitamin D levels in the elderly, though they cautioned that dementia was a very complicated disease and that deficiency of the vitamin was not the cause. More recent research has found that vitamin D3 can help stimulate the immune system to remove amyloid-beta proteins, though researchers are still unclear how this is achieved (Fiala et al., 2012). A 2007 study conducted at King’s College London found that individuals with higher levels of vitamin D aged more slowly than those with low levels but, again, researchers said that no direct cause-and-effect should be inferred. And one study of post-

menopausal women found that those who consumed 400 to 800 IU/day were 20 percent less likely to suffer from depression than those who consumed fewer than 100 IU/day (Bertone-Johnson, 2011). Receptors for vitamin D have recently been found in virtually every organ and tissue system, which suggests that its effects may be far more widespread than previously thought.

When acquired through sunlight, toxicity is virtually non-existent, as the body has a natural cut-off which can limit the amount absorbed; the only risk is skin cancer. Both Dr. Edward Giovannucci, nutrition researcher at the Harvard School of Public Health, and Dr. Michael Holick, a leading expert on vitamin D from Boston University, state that toxic levels are not easily achieved, even through supplementation—healthy adults have been known to take 10,000 IU/day for at least six months with no apparent side effects, and those with a serious vitamin D deficiency have been prescribed 50,000 IU a week until cured.

Vitamin D deficiency is seen mainly in individuals with darker skin. Deficiency can also result from overuse of sunscreen, obesity, and inadequate consumption of milk, and is characterized by soft, fragile bones, known as rickets when it affects children and osteomalacia when it affects adults; it may also be a small contributing factor in osteoporosis. Low blood levels of vitamin D appeared to be associated with increased risk of death, especially from cardiovascular causes (Melamed et al., 2008; Dobnig et al., 2012); paradoxically, one Dutch study found that low levels of vitamin D were associated with longevity, though this may be due more to a lack of genetic variation in the CYP2R1 gene than to vitamin D intake (van Heemst et al., 2012). Symptoms in children can include fatigue, lethargy, eating difficulties, mood swings, leg pains, convulsions, and heart failure. Possible risks of deficiency in adults include increased susceptibility to diabetes, heart disease, cancer, and autoimmune diseases. A 2009 study of 13,000 Americans

found that one-half to three-quarters of them were deficient by current standards, however, a 2010 expert committee convened by the Institute of Medicine concluded—after reviewing almost one thousand published studies—that nearly everyone falls within the normal range of 20 to 30 nanograms per milliliter of blood. Sunlight exposure is essential, as it is almost impossible to get adequate amounts from food. Those most at risk of deficiency are individuals with dark skin, people who avoid sunlight or use lots of sunscreen, babies who are breast-fed only (especially if the mothers are vitamin D deficient), and the elderly.

**Precautions:** Experts such as Dr. Clifford J. Rosen, osteoporosis expert at the Maine Medical Center Research Institute, and Dr. J. Christopher Gallagher, director of the bone metabolism unit at the Creighton University School of Medicine in Omaha, Nebraska, state that most people do not need supplementation, as adequate amounts can be obtained from sunlight and fortified foods. Others assert that, even with fortified foods, adequate levels are unobtainable without sufficient sunlight exposure (Dr. Edward Giovannucci, nutrition researcher at the Harvard School of Public Health, in an article in the *Archives of Internal Medicine*, wrote that few people have a “natural” level of 50 nanograms per milliliter or more). Supplements should be taken with caution by individuals with liver, kidney, and vascular problems.

A toxic dose can result from as little as twice the RDA for children and ten times the RDA for adults, though such cases are extremely rare, and are much more likely to occur from supplements than from foods. Symptoms include dangerously high blood calcium levels, calcium deposits in the soft tissues of the heart, kidney and brain, high blood pressure, nausea, vomiting, joint pain, weakness, weight loss, confusion, seizures, abnormal heart rhythms, excessive urination, kidney failure, anorexia, and weight loss. High doses in general can increase the risk of bone fractures, increase the

risk of other diseases, and increase the risk of death in general. In children, high doses can cause permanent mental retardation. Recent research may indicate that low levels of vitamin D are the result of—not the cause of—many health problems, and that supplementation may do little, if any, good (Autier et al., 2013).

According to Dr. Andrew Weil, inexpensive supplements contain vitamin D-2 (ergocalciferol), the kind which is readily synthesized by plants, but which is of little use to humans, as only a small percent is converted to vitamin D-3 (cholecalciferol), the form most useful by the human body. Recent research seems to support this view (Tripkovic, 2012).

A 2012 French study indicates that pregnant women who are exposed to urban air pollution, especially in the third trimester of pregnancy, may give birth to children who are low in vitamin D, increasing the risks of developing asthma and allergies later in life.

Vitamin D metabolism and calcium absorption can be inhibited by corticosteroid medications such as prednisone. Vitamin D absorption can also be adversely affected by the weight-loss drug orlistat (Xenical, alli™) (McDuffie et al., 2002), the cholesterol drug cholestyramine (Questran, LoCholest, Prevalite) (Compston and Horton, 1978), and the anti-seizure medications phenobarbital and phenytoin (Dilantin) (Gough et al., 1986).

**Dosage:** At least five minutes a day of unobstructed sunlight (no smog, shade, or cloud cover) between the hours of 10 a.m. and 3 p.m. without sunscreen (though the head and neck should be protected); glass can block some of the sun's rays and prevent the production of vitamin D, so indoor exposure is not as beneficial as unobstructed outdoor exposure. Incandescent and fluorescent light bulbs do not emit light in the ultraviolet spectrum, and therefore cannot be used in lieu of sunlight. Infants should be kept out of direct sunlight, and be protected by clothing and sunscreen.

The amount of dietary vitamin D needed

is subject to considerable debate, based mainly on what is considered the optimal level needed for proper bone health, though some researchers claim that vitamin D has other functions which are not being considered when dosage levels are set (it is necessary for healthy muscles and an immune system, and may prevent allergies and juvenile diabetes); the main problem is that a direct cause-and-effect relationship cannot be currently established regarding this vitamin and specific health issues, even though receptors for vitamin D exist in virtually every organ and tissue system of the human body. While D3 is chemically indistinguishable from the vitamin D produced by the body, D2 is generally used by doctors to counteract deficiency in patients. The RDA is 200 to 600 IU/day (or 5 to 15 mcg/day of cholecalciferol), with an upper limit of 2000 IU, though some researchers recommend at least 600 IU/day, with an upper limit of 10,000 IU; other researchers dispute this, saying there is not enough evidence to justify these higher levels. Individuals over 50 may have a reduced ability to synthesize this vitamin, and studies suggest that 700 to 800 IU/day is needed to prevent bone fractures. Dr. Michael Holick of Boston University, author of *The Vitamin D Solution*, recommends using sunscreen only on the face and wearing minimal clothing outdoors from the hours of 10 a.m. to 3 p.m. for periods of five to ten minutes, two or three times a week (a mild sunburn over most of the body produces approximately 10,000 IU of vitamin D). Drs. Holick and Giovannucci recommend that adults take a supplement of 1000 to 2000 IU/day. The fact sheet provided by the Office of Dietary Supplements recommends that breastfed infants be given 400 IU/day of vitamin D.

## VITAMIN E

**AKA:** Aquasol E, Chew-E, d-alpha-tocopherol, d-alpha-tocopheryl acid succinate, dl-alpha-tocopherol, dl-alpha-tocopheryl,

Eprolin, Epsilan-M, Pheryl-E, tocopherol, tocotrienol, Viterra E.

Eight different forms of vitamin E molecules, or vitamers, are found in nature (alpha, beta, gamma, delta, epsilon, zeta, eta, and theta), each of which is absorbed differently in the body and stays in the body for varying amounts of time. As yet, there is no evidence that each of these forms serves a specific purpose. Even so, some recommend switching back and forth between these mixed tocopherols and D-alpha-tocopherol, both in their natural forms.

Controversy has arisen over the efficacy of natural versus synthetic forms of vitamin E. While most synthetic vitamins are just as effective as the natural forms, such is not the case with E. Vitamin E exists in two forms, each a mirror image of the other, the d-tocopherol (right-handed) form and l-tocopherol (left-handed) form. Only the “d” forms are produced in nature, while the synthetic products are a mixture of both “d” and “l” forms, therefore d-alpha-tocopherol would be a natural vitamin whereas d/l-alpha-tocopherol would be synthetic. Synthetics are only 50 to 70 percent as effective as naturals. Still, synthetic and natural are equally as effective in preventing heart disease and inhibiting the oxidation of LDL cholesterol. According to one study, doses of 400 to 800 IU/day can reduce heart attacks by 77 percent in those already suffering from heart disease.

Though vitamin E is fat-soluble, it acts more like a water-soluble vitamin, as it is excreted by the body rather quickly.

**Food Sources:** Eggs, nuts and oils of nuts, seeds, soybeans, soybean oils (cold-pressed and unrefined only), fresh wheat germ, wheat germ oil, whole grains; smaller amounts are found in asparagus, broccoli, brussels sprouts, cabbage and other dark leafy vegetables, molasses, and sweet potatoes.

**Effects:** Vitamin E is a strong antioxidant, especially when taken in conjunction with selenium. It also strengthens the immune sys-

tem; enhances the ability of brain cells to use oxygen; increases the ability of cells to make energy; helps preserve the lung function of elderly people; and it may slow the aging process by protecting the skin and brain cells (which have high percentages of fat compared to the rest of the body’s cells) from free radicals (as people age, their ability to absorb E decreases). It has been used by NASA astronauts to fight the breakdown of red blood cells from radiation. In the past few decades in the U.S., there seems to be a direct correlation between the decline in the amount of vitamin E in the diet and the rise in heart attacks, but hard evidence is still lacking.

Evidence indicates that an optimum level of 200 IU/day can protect the elderly from heart disease and dementia, as well as boost the immune system; higher doses, however, have not led to greater protection. One study found that alpha tocopherol, when given in doses of 2000 IU/day, will maintain daily functioning of patients with mild to moderate Alzheimer’s disease for up to six months, an effect that was greater than a combination of vitamin E and memantine (Dysken et al., 2013), though it is still not known whether it can protect healthy people from getting the disease (studies at the University of Pennsylvania School of Medicine using mice indicate that it may reduce the rate at which plaques develop if given before symptoms appear, but have little effect in later stages of Alzheimer’s); an identical dose was correlated with a death rate that was 26 percent lower among Alzheimer’s patients when compared with those who didn’t take vitamin E (Pavlik, 2008). Doses of 1000 IU/day in combination with 5 mg of donepezil have been used to slow memory decline in patients with Alzheimer’s.

A dosage of as little as 50 IU/day, or five times the minimum daily recommended intake for men, can help protect against lung, colorectal, and—especially—prostate cancers, and one 2006 study has shown that just 100 IU/day resulted in an 18 percent decrease in

risk factors for death—30 percent for cancer or cardiovascular disease alone—in men aged 50 to 69 who smoked. A preliminary study, published in the *American Journal of Clinical Nutrition* in June 2009, has found a positive correlation between supplemental use of vitamins C and E and telomere length (telomeres are the DNA sequences at the ends of chromosomes which regulate cell division), though it was uncertain as to what extent a healthy lifestyle and diet may have also played a role.

Regular supplementation has also been proven to protect against exercise-induced DNA damage that may lead to cancer. In lab rats, it has been shown to prevent liver damage and liver cancer caused by DHEA.

It also helps the body utilize vitamin A better, and raises the levels of HDLs, the “good” cholesterol. It is reported to extend the life of red blood cells, dilate the blood vessels, and thin the blood. It can even halt, and sometimes reverse, nerve damage caused by such neurological disorders as cystic fibrosis and chronic liver disease.

Vitamin E breaks down sodium nitrate, a food additive and suspected carcinogen; blocks the formation of nitrosamine, another carcinogen; prevents lung damage from nitrogen oxides; and can counteract the effects of a fatty meal, especially damage done to blood vessels from high cholesterol.

Vitamin E works synergistically with the steroid DHEA.

Deficiency symptoms include gastrointestinal problems, dry dull hair, heart disease, impotency, miscarriages, enlarged prostate, and sterility.

**Precautions:** No known toxicity up to 3200 IU, though it should not be taken by those who are allergic to vitamin E. Those with thrombophlebitis (blood clots in the leg veins) or liver disease should consult a physician first. Evidence indicates that it may suppress the immune system when taken in doses of 100 IU or more. It can elevate blood pressure when first taken, so those with high blood

pressure or heart disease should not take more than 200 IU without consulting a physician first. Dosages above 600 IU/day should not be taken by those with high blood triglyceride levels or a thyroid condition. Vitamin E prolongs the clotting of blood, which can lead to problems such as bleeding-type strokes, cerebral hemorrhage, internal bleeding or ecchymoses (discoloration of the skin due to blood leaching into body tissues) if there is a deficiency of vitamin K, certain rare medical conditions are present, or if a person is taking coumarin-type drugs or drugs with anti-clotting properties, such as Warfarin (Coumadin) or aspirin. A 2010 review by experts at the Harvard Medical School found that while taking doses of at least 50 mg/day could decrease the risk of ischemic stroke (in which a blood clot forms in the brain) by 10 percent, it could increase the risk of hemorrhagic stroke (in which bleeding in the brain occurs) by 22 percent. Even normal doses of vitamin E can promote the aggressive growth of lung cancer tumors in mice, contributing to a quick death; higher doses only made the cancer worse (Bergo et al., 2014). Vitamin E supplementation should be stopped about two weeks before surgery, as it could cause excessive bleeding. Paradoxically, vitamin E may *cause* blood clots if taken in doses above 800 IU/day. Common side effects include breast enlargement, dizziness, and headaches. It may also cause abdominal pain, diarrhea, fever, gas, hives, chapped lips, muscle aches, nausea, upset stomach, fatigue, weakness, and blurred vision, though these are rare. Allergies can also occur when vitamin E is used in skin preparations, but these are extremely rare. Overdose symptoms consist of fatigue, nausea, and vomiting. Lab animals given extremely high doses have experienced adverse effects on their adrenal, thyroid, and sex glands.

Recent evidence indicates that the pill form may be harmful, as most only contain alpha-tocopherol, and may do an incomplete job of neutralizing some harmful compounds. Only

gamma-tocopherol can eliminate peroxy-nitrite, a very destructive nitric oxide radical found at sites of inflammation which can lead to cancer and heart disease, and remove nitrogen oxide, a component of air pollution. High levels of alpha-tocopherol can suppress levels of gamma-tocopherol in the blood. Unfortunately, it is impossible to maintain adequate levels, even from a healthy diet; some, however, say a healthy diet can offset this deficiency. A 2009 study found that vitamin C and E supplements can cancel some of the beneficial effects of exercise, specifically short-circuiting the body's sensitivity to insulin and preventing the activation of the body's natural defenses against oxidative damage, though lead researcher Dr. Michael Ristow points out that this effect does not apply to fruits and vegetables, which may have other nutrients that outweigh the negative factors.

Vitamin E can increase the effect of oral anticoagulants, decrease the effect of iron supplements in those with iron-deficiency anemia, and deplete the body of vitamin A if vitamin E is taken in excessive amounts (and yet, in recommended doses, E can increase the benefits and decrease the side effects of A). When high dosages are combined with high dosages of BHA, BHT, or 2-MEA, it may shorten the life span.

Beyond this, researchers are evenly divided on whether vitamin E is harmful or not. One study indicates that, in some people, doses in the 800 IU/day range may cause weakness and fatigue—symptoms which disappear a day or so after supplementation is stopped—and damage to the skeletal muscles. The findings are supported by the fact that excessive amounts of creatinine, an end product of muscle metabolism, were found in subjects' urine. Claims that it is a causative factor in phlebitis, breast tumors, and breast enlargement (in men as well as women) are unsupported by hard evidence. Several recent studies have shown that vitamin E supplementation has no effect on cancer or heart disease and, in fact, may be

more harmful than beneficial—a Johns Hopkins School of Medicine review of clinical trials, for example, found that doses greater than 400 IU/day increases a person's risk of death by 4 percent (this increased to 6 percent when taken with other vitamins and minerals). Another study found that vitamin E supplements can increase the risk of heart failure by 13 percent.

Vitamin E can be destroyed or rendered ineffective by birth control pills, chlorine (including chlorinated drinking water, which is common in most communities), cholestyramine, colestipol, cooking in copper pots, food processing, estrogen, freezing, heat, inorganic iron (ferrous sulfate; organic iron, such as ferrous gluconate, peptonate, citrate, or fumarate has no known adverse effect), iron supplements (in healthy individuals), mineral oil, neomycin, rancid fat and oil, Olestra, and oxygen. Individuals using mineral oil on a frequent basis may need more vitamin E, as do those eating a lot of polyunsaturated vegetable oils. If taking a multi-vitamin supplement with iron, make sure there is at least a six- to eight-hour span between taking the supplement and vitamin E.

In 1998, the University of Arizona found that microbiologist Dr. Marguerite Kay had published erroneous research papers on aging, including one study that concluded that vitamin E had some positive effects on aging.

**Dosage:** Some suggest 100 to 1000 IU/day, others 800 to 1200 IU/day, with daily doses not to exceed 1600 IU/day. A dose of 400 IU/day, however, is reportedly enough to protect against heart disease (the RDA is only 30 IU/day). To increase potency, it is recommended that 25 micrograms of selenium be taken with each 200 IU of vitamin E; adequate amounts of inositol and choline should also be present in the diet. It also works synergistically with French maritime pine bark extract, another antioxidant. Those engaged in regular strenuous exercise have a greater need for this vitamin than most people. It is recommended

that those who are elderly or who have digestive problems take the dry or succinate form.

### XANTHINOL NICOTINATE

**AKA:** Androgeron, Angiomanin, Angiomin, Cafardil, Circulan, Clofamin, Complamex, Complamin, Dacilin, Emodinamin, Jupal, Landrina, Niconicol, Sadamin, SK 331 A, Vasoprin, Vedrin, Xanidil, and Xavin.

A form of niacin that passes through cell membranes more readily than niacin.

**Effects:** Xanthinol nicotinate increases ATP production, dilates blood vessels, and improves short-term and long-term memory.

**Precautions:** People with ulcers, cardiovascular problems, or liver problems (xanthinol nicotinate can cause liver dysfunction) should avoid taking it. There may be minor reactions such as blurred vision, diarrhea, headaches, heartburn, heart palpitations, itchy skin, muscle cramps, nausea, skin flushing or a sense of warmth, skin rash, skin-color changes, or vomiting; these generally disappear with continued use or when use is discontinued. It may cause postural hypotension, or a sudden drop in blood pressure when going from a sitting to a standing position.

**Dosage:** 300 to 600 mg/day in three divided doses with meals.

### ZINC

**AKA:** Chelated zinc, Egozinc, Orazinc, PMS Egozinc, Verazinc, zinc chloride, zinc acetate, zinc ascorbate, Zincate, zinc gluconate, Zinkaps-220, zinc pyrithione, zinc sulfate, Zinc 220, Zn.

A mineral important to many of the brain's enzyme systems, it is a component of 90 essential enzymes, including superoxide dismutase. Most of the medical research has been done with zinc sulfate, which is 22 percent zinc by weight; however, most of the supplements sold to the public are zinc gluconate, which is 14 percent zinc by weight and is not

widely researched. There are no studies comparing the two. Likewise, almost nothing is known about chelated zinc. Zinc acetate causes fewer gastrointestinal problems than the other forms, yet is not widely available. Zinc pyrithione is used for shampoos and hair conditioners and is not intended for oral use. Zinc aspartate, chelated zinc, and zinc picolinate are the most readily absorbed forms.

**Food Sources:** Beef, blackstrap molasses, bran (wheat and rice), cheese, egg yolk, fish (particularly herring), lamb, legumes, liver, nonfat dry milk, ground mustard, nuts, lean meats, organ meats, oysters, peanuts, pork, poultry, pumpkin seeds, seafood and shellfish, soybeans, sunflower seeds, turkey, wheat germ, whole-grain flour. The zinc content of vegetables is dependent on the soil in which they are grown. More readily available zinc is found in meats than from other sources.

**Effects:** Zinc is important in protecting cell membranes against free radical damage, essential for the growth and development of the reproductive organs, helps the body get rid of carbon dioxide, helps in the manufacture of DNA and RNA, aids in the smooth contraction of muscles, and boosts the immune system. It also helps the body absorb vitamins (especially the B vitamins), synthesize proteins, metabolize carbohydrates, and form insulin. There are significant amounts of zinc in the brain, which may help protect against lead poisoning from the environment. Additional reported benefits include faster healing of wounds, a restoration of loss of taste, protection against prostate problems, and lower cholesterol deposits. It has been used to treat psoriasis (when used in combination with sulfur), acne (when used in combination with vitamin A), rheumatoid arthritis, impotence, and irregular menses. A preliminary study (Maylor et al., 2006) suggests that 15 to 30 mg/day for three months may improve spatial working memory in adults aged 55 and older, but have a detrimental effect on attention. Another preliminary study indicates zinc may be a viable



treatment for depression (Nowak et al., 2005). Zinc gluconate is said to help speed recovery from the common cold.

A deficiency may be associated with depression, irritability, lethargy, memory impairment, and paranoia.

When combined with selenium, it may improve mental performance. Some say that a combination of zinc and manganese supplements help guard against senility.

**Precautions:** It should not be taken by anyone with an upper respiratory infection. Rare side effects, which occur with an overdose, consist of chest pain, chills, dehydration, dizziness, drowsiness, fever, headaches, heartburn, impaired immune function, indigestion, poor muscle coordination, nausea, shortness of breath, sore throat, stomachaches, extreme fatigue or weakness, ulcers in the throat or mouth, vomiting, yellow eyes and skin, and possible kidney failure. Any stomach discomfort can usually be avoided by taking zinc after meals or with milk. Some have reported mouth irritation and taste distortions when dissolving lozenges (those made for swallowing) in the mouth for 10 to 20 minutes. Too much zinc, which can even occur from eating too much high-zinc foods or from foods which have been stored in galvanized containers, can interfere with the body's absorption of copper. Dosages above 80 mg/day can cause levels of high-density lipoprotein-cholesterol (the "good" cholesterol) in the blood to fall, possibly leading to heart disease. Supplemental doses over 100 mg/day for more than ten years can double the risk of developing prostate cancer. The dosage normally used for treating acne, 135 mg/day, is very near the toxic level for some individuals, and some may experience the overdose symptoms mentioned above. Dosages above the 50 to 150 mg/day range can cause severe anemia due to iron and copper deficiency (Conversely, a high level of copper can collect in the blood and sap the brain's supply of zinc). Zinc supplements can also irritate the stomach lining and perforate ulcers. Those in-

involved in smelting operations can suffer from zinc poisoning by inhaling the fumes.

On the other hand, some feel that zinc deficiency is very common in the U.S., and is often characterized by hypogeusia (a loss of taste and smell), white streaks on finger- and toe-nails, dermatitis, scaly skin, slow healing of wounds, loss of appetite, depression, fatigue, mental dullness, difficulty in concentration, hair loss or discoloration, decline in the number of red and white blood cells, diarrhea, lowered resistance to infections, low sperm count and, in severe cases, atrophy of the sex glands. Young children, pregnant women, the elderly, alcoholics, diabetics, strict vegetarians, and heavy exercisers need higher than normal levels of zinc, as do persons eating high-fiber diets, living in hot climates (heavy sweating depletes the body's supply to a significant extent), or taking vitamin B-6 supplements. Medical conditions associated with insufficient zinc in the body include chronic infections or inflammatory diseases, kidney disease, pancreatic disease, psoriasis, sickle-cell anemia, and thalassemia.

Whole grains and breads that have been prepared without yeast have a high level of phytic acid, a phosphorus compound that prevents the body from absorbing the zinc in the food; this is especially true if extra bran has been added (though phytic acid is now believed to prevent colon cancer). Also, cadmium, a toxic mineral which can be found in food as a result of pollution, can take the place of zinc where both are present. This is a problem with white bread, in particular, because zinc is concentrated in the bran (largely absent from white bread), whereas cadmium is concentrated in the white part of the grain. A zinc deficiency can make a vitamin A deficiency worse (conversely, zinc supplements may increase the need for vitamin A).

Zinc can be destroyed or inhibited by alcohol, bran, cadmium, EDTA (a food additive found in beer, canned foods, soft drinks, and foods high in vegetable oils), fiber,

phosphorus-containing additives used in foods, phytic acid (phytates), stress, folic acid supplements, iron supplements, and tobacco.

Decreased absorption of zinc can be caused by tetracycline (Achromycin V, Mysteclin F, Sumycin). Other drugs that inhibit or deplete zinc include penicillamine (Cuprimine) and the antibiotics chlortetracycline (Aureomycin) and oxytetracycline (Terramycin). There is one case where the anti-cancer drugs mercaptopurine (Purinethol) and methotrexate caused a deficiency. Corticosteroids, or cortisone medications, may cause an excessive amount of zinc to be excreted and may retard wound healing. These medications include dexamethasone (Decadron), prednisone, prednisolone (Deltasone), betamethasone (Celestone), desoxycortisone (Percoten), and methylprednisolone (Depo-Medrol, DepoPredate). Diuretics like chlorthalidone (Combipres, Hygroton, Regreton) and thiazide diuretics may also increase the excretion of zinc. Birth control pills increase the amount of zinc in the red blood cells but, as yet, the consequences of this have not yet been determined.

Zinc can interfere with the absorption of

quinolone and tetracycline antibiotics. When taken with EDTA and cisplatin, it can increase the effects and side effects of cisplatin. It can also decrease the absorption and effectiveness of penicillamine. When combined with amiloride, it can increase the amount of zinc in the body.

**Dosage:** The U.S. RDA is 11 mg/day for men, 8 mg/day for women, and 11 to 12 mg/day for pregnant and breastfeeding women. Doses higher than 40 mg/day are not recommended, as long-term effects are not known. Zinc sulfate and zinc gluconate are both well tolerated by the body, but the latter is less susceptible to side effects; in both, side effects occur in many individuals in the 100 to 200 mg/day range, but taking frequent small doses throughout the day with meals may prevent some of these. If high doses of vitamin B-6 are taken, there is a greater need for zinc, especially for alcoholics or diabetics. The best supplements to take are those composed of chelated zinc. Individuals taking zinc should take adequate amounts of vitamin A, calcium, and phosphorus for zinc to work with maximum efficiency.

## *Amino Acids, Peptides and Proteins*

Though most of the amino acids needed are manufactured by the body, nine are not; these are known as the essential amino acids—L-histidine, L-isoleucine, L-leucine, L-lysine, L-methionine, L-phenylalanine, L-threonine, L-tryptophan, and L-valine—and all are provided by proteins in the diet. The other fifteen not needed in the diet are alanine, arginine, asparagine, aspartic acid, carnitine, cysteine, cystine, glutamic acid, glutamine, glycine, hydroxyproline, ornithine, proline, serine, and tyrosine. The line between essential and non-essential amino acids is fuzzy, as children require arginine for growth and, for adults under such condition as stress to the body (extreme heat, extreme cold, shock, drugs, toxic agents), illness (fever), or pregnancy, any one of the non-essential amino acids, mostly the “branch-chain” ones (leucine, isoleucine, valine), can become essential. Those with allergies, for example, use an excess of histamine in their bodies, which is manufactured from histidine. Genetic problems can also lead to deficiencies.

Complete proteins provide the proper balance of all the amino acids, and these foods include meats, poultry, seafood, eggs, milk, and cheese. Incomplete proteins—such as those found in beans, grains, nuts, peas, and seeds—lack some essential amino acids and must be eaten in combination for best results.

The functioning of the brain relies on amino acids, as these are the essential components for the development of neurotransmitters. In turn, neurotransmitters are important factors in brain chemistry, as certain deficiencies or excesses of some neurotransmitters can cause mood disorders. Though amino acids play an essential role in brain function, there are some experts, such as Dr. Andrew Weil (author of *Natural Health, Natural Medicine*) and Dr. Stuart Berger, who do not believe they should be taken as supplements, as they can severely disrupt brain chemistry. Some reference texts, such as the *Psychotropic Drug Handbook*, caution that non-dietary amino acid supplements may produce effects different from those found in food. Also, a highly imbalanced intake of amino acids could have an adverse effect on protein synthesis in children.

Amino acids can be in either the “L” or “D” form. The “L” forms are readily absorbed and utilized by the body as proteins, while the “D” forms must be converted by the body into a usable form first; despite the therapeutic value found in some “D” forms, the FDA bans sale of the latter, so you may not encounter it when buying supplements.

Free-form amino acids are ones that have been taken from complex proteins, and you must be sure that, when buying powdered amino

acid supplements, the label specifies the amount of free-form amino acids in the product. Chances are that if the label says only “amino acids,” the bottle may contain mostly inexpensive protein filler and not much of any amino acids.

Amino acids should be taken with cofactors—such as vitamins, minerals, or nutrients—that assist the body in metabolizing them; it is also a good idea to take a variety of amino acids together and in their proper proportions to one another.

There is one instance, however, where two amino acids play opposite roles and are not compatible with each other: L-tyrosine, which the brain uses to manufacture the neurotransmitters norepinephrine and dopamine—both of which have a stimulating effect, contributing to clear, fast thinking, long-term memory, and alertness—and L-tryptophan, used by the brain to synthesize the neurotransmitter serotonin—which has a sedative effect on the brain, leading to a slower reaction time, a feeling of fullness after a meal, and sleepiness. To get the mental lift from L-tyrosine, it is necessary to eat the proteins (meat, poultry, seafood, beans, tofu, and lentils) in the meal before the food that contains carbohydrates. To relax or fall asleep, it is necessary to eat the foods high in L-tryptophan (bananas, milk, sunflower seeds) first, along with the foods rich in carbohydrates, because they enhance the effect of L-tryptophan. In order to get an energy boost, it is necessary to eat foods high in L-tyrosine. The reason for this is that, even though L-tryptophan needs carbohydrates to get into the brain, it does so much more readily than L-tyrosine.

This chapter has been expanded from the last edition to include non-nutritive amino acids, proteins, and peptides.

## ABCC1

A transport protein.

**Effects:** Has been found to play a major

role in removing amyloid-beta plaques from the brains of mice (Pahnke et al., 2011).

**Precautions:** Has not yet been tested on humans.

## AcSDKP

**AKA:** N-Acetyl-Seryl-Aspartyl-Lysyl-Proline.

**Effects:** A peptide that has been found to significantly reduce brain damage following stroke and aid recovery if administered within four hours after an ischemic stroke; unlike other neuroprotective agents, it can cross the blood-brain barrier (Zhang et al., 2014). It is also known to have anti-inflammatory properties.

**Precautions:** Has not yet been tested on humans.

## ALPHA-LACTALBUMIN

**Effects:** Has a higher ratio of tryptophan than other amino acids. Ingestion results in enhanced serotonin synthesis due to increased tryptophan access to the brain. When fed diets enriched with alpha-lactalbumin, rats appeared to have reduced anxiety levels (Orosco et al., 2004).

**Precautions:** The effects on human are unknown.

**Dosage:** None established.

## ARGININE

**AKA:** L-arginine.

Arginine is needed for the normal functioning of the pituitary gland.

**Food Sources:** Buckwheat, carob, corn, cereals, chicken, chocolate, dairy products, gelatin desserts, meat, nuts, oats, popcorn, protein-rich foods, raisins, brown rice, sunflower and sesame seeds, whole wheat bread.

**Effects:** The body converts it to spermine, found in semen, blood tissue, and brain cells. Reduced levels have been found in people with senility and memory loss.

A deficiency can result in male infertility,

premature aging, increased free radical activity, and obesity.

**Precautions:** Supplements should not be taken by those with schizophrenia, though there is no evidence that it aggravates this condition. Individuals with any medical condition should consult a physician before taking supplements. Supplementary forms should not be taken by children or teenagers, as there is the possibility it could cause bone and skin disorders, or by women who are pregnant or breastfeeding unless under the guidance of a physician. Too large a dose can result in diarrhea, nausea, a thickening or coarsening of the skin, and the possible promotion of the herpes virus (though Sheldon Saul Hendler, M.D., Ph.D., says this last has not been proven). In fact, those with herpes should avoid arginine supplements and arginine-rich foods, though sufficient amounts of lysine may help counteract this; in such cases, ornithine may be used in place of arginine. Dosages over 20 to 30 grams a day could lead to enlarged joints and bone deformities.

**Dosage:** The RDA has not yet been established. The large doses given to sick people are safe only for short periods of time; the safe level for healthy people has not yet been determined, though WebMD suggests that 2 to 3 g/day is sufficient.

## BDNF

**AKA:** Brain-derived neurotrophic factor.

BDNF is one of the neurotrophins that regulate neuronal plasticity in the brain. Research has shown a connection between low levels of BDNF and such disorders as depression, bipolar disorder, epilepsy, Parkinson's, and Alzheimer's. Exercise and a healthy diet can help modulate BDNF levels, while research indicates that early childhood trauma and stress and adult stress can eventually disrupt information processing in neuronal networks, leading to depression and other mood disorders (Kozisek et al., 2008).

**Effects:** Has an anti-depressant effect. When injected, this protein produced significant results in preventing or reversing memory loss, cognitive impairment, brain cell degeneration, and cell death in rats and monkeys. In contrast to NGF (Nerve Growth Factor) therapy, which merely halts the progression of Alzheimer's, BDNF shows promise in reversing some of the damage caused by this disease (Tuszynski et al., 2009). It may also be useful in treating phobias and post-traumatic stress disorder (Quirk et al., 2010).

**Precautions:** Injection into the mesolimbic dopamine pathway increases depression-like symptoms. This may indicate that mood disorders are a result of a loss of function, or modulation, in critical neuronal networks (Castren et al., 2007).

Stress and depression can decrease levels of BDNF in the brain.

## BETA-ARRESTIN

**Effects:** A "scaffolding protein" that helps maintain plasticity in synapses in the brain. It also disassembles old connections so that the brain has room to form new connections. When this delicate balance goes awry, as it does, for example, in Alzheimer's disease, when the clearing out of old synapses outpaces the formation of new ones, short-term memory loss occurs (Pontrello et al., 2012). With the help of metabolic glutamate receptor 1 (mGlu1 receptors), it also prevents apoptotic cell death from glutamate-induced excitotoxicity following brain injury, stroke, or neurodegenerative diseases (Georgetown University Medical Center, 2009).

## BRANCHED CHAIN AMINO ACIDS

**AKA:** BCAAs.

**Effects:** One study using mice indicates it may help treat a certain form of autism associated with epilepsy (Gleeson et al., 2012).

**Precautions:** None known.

**Dosage:** None established.

### CALCINEURIN

**AKA:** Calcium-dependent serine-threonine phosphatase; PP2B; PPP2B; PPP3; PPP3CA; Protein Phosphatase 2B; Protein Phosphatase 3.

An enzyme that plays an important role in immune system function, and may be involved in learning and memory.

**Effects:** Mice that were genetically altered to not produce calcineurin exhibited symptoms indicative of schizophrenia, including loss of working memory, attention problems, and aberrant social behavior (Miyakawa et al., 2003). Inactivation can slow the aging of the *C. elegans* worm (Mair et al., 2011)

**Precautions:** Its activity can be inhibited by immunosuppressive drugs such as cyclophilin, cyclosporine, FK506, FKBP12, pimecrolimus, and tacrolimus.

### CARNOSINE

**AKA:** L-carnosine.

Carnosine is a dipeptide, a composite of two amino acids, that works synergistically with other antioxidants such as vitamin C, E, B-complex, beta-carotene, selenium, and the sulfur-containing amino acids cysteine and methionine.

**Food Sources:** It is found only in animal foods such as eggs, fish (all kinds), meat (all kinds), and milk.

**Effects:** Carnosine stabilizes some thirteen important functions of the body. it is also an antioxidant that fights certain free radicals found in air pollution and second-hand smoke, protects against molecular and cellular damage from free radicals (Boldyrev et al., 1997), protects neurons from copper and zinc toxicity (Horning et al., 2000), acts as a neuroprotector in cases of cerebral ischemia (Stvolinsky et al., 1999), possibly in-

hibits the formation of amyloid-beta plaques (Munch et al., 1997), prevents excitotoxicity (which plays a possible role in the devastating effects of stroke and Alzheimer's) in the brain (Boldyrev et al., 1999; Doble, 1999; Harkany et al., 2000), prevents possible aging of the brain by regulating cellular calcium levels (Mattson et al., 1992; Hattori et al., 1998; Pascale and Etcheberrigaray, 1999), and helps block protein carbonylation—or glycation (a process whereby sugars are cross-linked to proteins, causing the latter to lose their elasticity and form free radicals, resulting in aging effects such as wrinkled skin, neurodegeneration, atherosclerosis and diabetic problems) (Hipkiss et al., 1998). It has been shown to lower the death rate when administered to rats, and increase the lifespan of age-accelerated mice (Stvolinskii et al., 2003).

**Precautions:** Should not be used by women who are pregnant or breastfeeding, as effects are not known.

**Dosage:** None established; dosage may be dependent on the individual's age, health, and other factors.

### CBP

**AKA:** CREB binding protein.

**Effects:** A protein which is essential to the production of CREB and brain-derived neurotrophic factor, other proteins that help create memories. Researchers have found that it can restore learning and memory in mice specially bred to develop Alzheimer's (Caccamo et al., 2010).

### CITRULLINE

**Food Sources:** Watermelon.

**Effects:** An amino acid which the body uses to make another amino acid, arginine. In one 2007 study conducted by the USDA Agricultural Research Service, volunteers who drank glasses of watermelon juice had

higher levels of arginine in their blood than control subjects. Citrulline may also help blood flow by opening up veins and arteries.

**Precautions:** One study found that it increased exhaustion during treadmill exercise.

It should not be taken by women who are pregnant or breastfeeding, as effects are not known.

**Dosage:** None established.

## COG1410

An apolipoprotein E-based peptide.

**Effects:** In animal models, it has been found to have neuroprotective and neuroregenerative effects following brain injury (Hoane et al., 2007; Hoane et al., 2009; Kaufman et al., 2010).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## CREATINE

Creatine is a compound found in muscle tissue that is taken in supplement form to increase athletic performance.

**Food Sources:** Meat.

**Effects:** It plays a key role in maintaining energy levels in the brain. Research at the University of Sydney and Macquarie University has found that it can significantly boost working memory and general intelligence (Rae et al., 2003), and one small study in 2012 found that, in women suffering from major depression, creatine worked faster than, and twice as well as, the antidepressant SSRI drug Lexapro. Studies on animals have shown that it can protect against neurodegenerative diseases such as Huntington's, Parkinson's, and amyotrophic lateral sclerosis, though studies on humans need to be done.

**Precautions:** Long-term use may have a detrimental effect on blood glucose levels—diabetics are advised not to take it—and may

produce a bad body odor. Disease and age may decrease the effectiveness of creatine. Anecdotal reports indicate that side effects may include severe acne and significant hair loss. Much more research needs to be done to understand the role of this amino acid in the body and how it interacts with other substances.

Caffeine and carbohydrates may have a negative effect on the absorption, metabolism, and elimination of creatine (Persky et al., 2003).

**Dosage:** For improving intelligence, 5 g/day from supplements; one would have to eat about four and a half pounds of meat a day to get the equivalent amount.

## CREB

**AKA:** cAMP (Cyclic adenosine monophosphate) response element binding protein.

A cellular transcription factor, or protein, that binds to DNA and helps regulate gene expression.

**Effects:** Helps maintain neuronal plasticity, learning, and the formation of long-term memory, partly by switching on the gene for BDNF. Artificially modifying CREB levels could help treat memory disorders. It also plays an important role in neuronal survival after ischemic brain injury (Sasaki et al., 2011).

**Precautions:** Its mechanism of action is still not fully understood.

## CRF1

A protein in the pituitary gland.

**Effects:** Dubbed the “misery molecule” because it triggers cells to release hormones associated with anxiety and stress, and may also play a role in depression. This discovery by the medical company Heptares Therapeutics could lead to the development of drugs to control these conditions.

**Precautions:** This is just a preliminary finding, and has not yet been tested.

## CYPIN

**Effects:** Protein that regulates neuronal dendrite patterning in the hippocampus. It may prevent long-term neurological damage following a stroke (Tseng and Firestein, 2011).

**Precautions:** Has not yet been tested on humans.

## CYSTEINE AND N-ACETYL-CYSTEINE

**AKA:** Cysteine hydrochloride monohydrate, L-cysteine, NAC, N-acetyl-L-cysteine.

Manufactured from methionine or serine by the liver. N-acetyl-cysteine (NAC) is a form of cysteine that is a precursor to the neurotransmitter glutamate and is more fully utilized by the body.

**Food Sources:** Some cereals, dairy products, eggs, meat.

**Effects:** Cysteine is a strong antioxidant believed to purify the body, removing heavy metals and protecting the blood, lungs, intestinal tract, and liver against the harmful effects of alcohol, smoking, and pollution by detoxifying acetaldehyde. It has been proven to extend the life span of mice and guinea pigs, possibly because it contains sulfur, a substance that deactivates free radicals; Pearson and Shaw claim that it can restore hair growth and extend a person's life span.

NAC has been found to decrease compulsive and addictive behaviors and reduce cravings by restoring levels of glutamate, which is associated with feelings of reward-seeking in the brain. Two studies found that it significantly reduced the craving for cocaine (LaRowe et al., 2007; Mardikian et al., 2007), and a third study found that it was effective in reducing gambling addiction dramatically (Grant et al., 2007). It has also shown promise in the treatment of trichotillomania (compulsive hair-pulling) comparable to behavior therapy or drug-therapy combinations (Grant et al., 2009).

Cysteine helps protect against radiation damage when combined with vitamins C and B1, and also works synergistically with vitamin E and selenium. When combined with minocycline, NAC was found to improve cognition and memory in rats with traumatic brain injury (Abdel Baki et al., 2010).

**Precautions:** Anyone with diabetes or blood sugar problems should not take supplements in doses above 3000 mg and in combination with large doses of vitamins B-1 and C except under the guidance of a physician, as it can inactive insulin production. On the other hand, Pearson and Shaw recommend taking three times as much vitamin C as the total cysteine intake and plenty of fluids to prevent the formation of kidney and bladder stones. No adverse side effects were seen in the studies utilizing NAC. However, the studies were small and short-term (up to a few weeks); long-term effects are unknown. They also involved subjects who sought treatment, a not insignificant factor in overcoming addiction.

When combined with nitroglycerin, it could increase the effects and side effects of the drug. It could also decrease the effectiveness of activated charcoal. Anecdotal evidence indicates that it could increase the toxicity of monosodium glutamate (MSG) in those already susceptible.

**Dosage:** Up to 1 to 3 g/day, along with vitamin C (in doses three times the amount of cysteine so that the body does not produce too much cystine) and vitamin B-6, though Sheldon Saul Hendler, M.D., Ph.D., recommends no more than 1.5 g/day. It should also be taken on an empty stomach and with water. Ray Sahelian, M.D., states that because cysteine cannot cross cell membranes, supplements are useless. The doses of NAC used in the studies were between 600 and 1800 mg/day. Dusty R. Green, M.Ed., of the SmartBodyz Nutrition website, recommends that it be taken with two to three times as much vitamin C, and that anyone taking it drink plenty of water to prevent cysteine renal stones.



CYSTINE

An amino acid composed of two cysteine molecules.

**Effects:** Removes heavy metals from the body. It may also help tissue healing after surgery and protect the liver against damage from exposure to carbon tetrachloride.

**Precautions:** Cystine should be used with caution by those susceptible to kidney, liver, or bladder stones.

**Dosage:** None established.

DAPK-1

**AKA:** Death-Associated Protein Kinase 1.

**Effects:** During a stroke, the DAPK-1 enzyme binds to a part of the NMDA receptor and triggers calcium overload and the death of cells. Youming Lu and others at Louisiana State University and the University of Central Florida have developed a compound that can block the DAPK-1-NMDA binding, preventing brain cell death without any adverse effects to the receptors (Tu et al., 2010).

**Precautions:** None known.

DBI

**AKA:** ACBP, diazepam binding inhibitor.

A protein secreted in parts of the mammalian brain, it can also be found in every cell in the body.

**Effects:** It has a Valium-like effect during some types of epileptic seizures, which could lead to specific treatments for epilepsy, anxiety, and sleep disorders (Huguenard et al., 2013). It also augments the inhibitory effect of GABA on cells, though why this occurs is uncertain.

**Precautions:** Has not yet been tested on humans.

DICKKOPF-1

**Effects:** A signaling molecule that, when turned off in older mice, restores mental per-

formance in spatial orientation and memory to that of young mice. It does this by reversing the age-related decline in the generation of new neurons in the hippocampus (Martin-Villalba et al., 2013).

**Precautions:** Has not yet been tested on humans.

DOPAMINE

**AKA:** 2-(3,4-dihydroxyphenyl) ethylamine; 3,4-dihydroxyphenethylamine; 3-hydroxytyramine; 4-(2-aminoethyl)benzene-1,2-diol; DA; Intropin; Revivan; Oxytyramine.

A neurotransmitter and hormone that is a precursor to the synthesis of adrenaline and noradrenaline, it has been linked to extroversion and reinforcement learning (i.e., reward-seeking behavior).

**Effects:** Using PET scans and incentives of money that increased with the difficulty of a particular task, a 2012 study at Vanderbilt University found that highly motivated individuals (“go-getters”) had higher levels of dopamine release in the striatum and ventromedial prefrontal cortex, regions of the brain associated with reward and motivation, while less-motivated individuals (“slackers”) had high levels in the anterior insula, associated with emotion, perception, social behavior, and self-awareness. This study showed that dopamine’s effects can vary depending on the region of the brain, complicating the use of medications for treatment of such disorders as attention-deficit disorder, depression, and schizophrenia. Individuals suffering from Parkinson’s disease have depleted levels in the basal ganglia, resulting in a loss of trial-and-error learning behavior (Frank et al., 2004).

**Precautions:** Various addictive drugs, including cocaine and methamphetamine, directly target the dopamine system, and schizophrenia has been linked to high levels in the mesolimbic pathway and subnormal levels in the prefrontal cortex. Dopamine does not

cross the blood-brain barrier, and increases heart rate and blood pressure, so treatment of certain disorders involves the dopamine precursor levodopa.

## DYNORPHINS

**Effects:** Opioid peptides found in the central nervous system that act as neurotransmitters. They are produced mainly in the hypothalamus, hippocampus, and spinal cord, and regulate such functions as appetite, body temperature, emotion, sleep, stress response, and pain response. Research indicates that they may be six times as powerful in painkilling ability as morphine, and they may play a role in, among other conditions, depression and addictions.

**Precautions:** Unlike the other opioid peptides, the endorphins and enkephalins, they can increase pain and cause depression, rather than relieve pain and produce euphoria.

## EDTA

**AKA:** Ethylene diamine tetraacetic acid.

A synthetic amino acid used to remove heavy metals from the body.

**Effects:** EDTA binds to harmful metals in the brain and body and removes them. It has been used in chelation therapy to treat Alzheimer's patients, and is also added as a preservative in foods with iron.

**Precautions:** Though chelation therapy appears to be effective in removing calcium and heavy metals such as lead and aluminum from the body, its role in improving the conditions of patients with atherosclerosis and other vascular diseases remains controversial, and unproven in cases of those with Alzheimer's. Serious side effects include kidney damage, osteoporosis, decreased calcium in the blood, and recurrence of tuberculosis. Patients should be monitored by a qualified health care practitioner.

Side effects may include abdominal cramps,

nausea, vomiting, diarrhea, headache, low blood pressure, skin problems, and fever.

EDTA should not be taken by those with asthma, diabetes, epilepsy, heart rhythm problems, hypocalcemia, hypokalemia, hypomagnesemia, kidney problems, liver problems, or tuberculosis, as it could worsen these conditions. It should not be taken by women who are pregnant or breastfeeding, as effects are not known.

Chelation therapy may interfere with the effectiveness of insulin, diuretic drugs, and anti-coagulant drugs.

**Dosage:** None established. The levels consumed in a normal diet should be safe; anything over 3 g/day, or supplementation for more than a week could result in kidney damage, dangerous loss of calcium, and death.

## EPHRIN-B3

**Effects:** A protein released by myelin that sends signals to prevent the growth of axons. Stephen Strittmatter of the Yale School of Medicine and his colleagues have discovered that removing this protein permits greater-than-normal growth of axons in mice after brain injury.

## FGF2

**AKA:** Fibroblast growth factor 2.

**Effects:** Provides nourishment to neurons so that they can grow and develop.

**Precautions:** Its actions are inhibited by the nogo receptor.

## 5-HTP

**AKA:** 2-amino-3-(5-hydroxy-1H-indol-3-yl) propanoic acid, 5-hydroxytryptophan, 5-hydroxy l-tryptophan, 5-OHT, Cincofarm, Levothym, Levotonine, oxitriptan, Oxyfan, Telesol, Tript-OH, Triptum.

**Effects:** It is converted by the body into serotonin (5-hydroxytryptamine, 5-HT) and

melatonin after it has been converted from the amino acid tryptophan. It induces calmness and reduces insomnia, and has also shown promise in treating anxiety and panic disorder. Unlike serotonin, it can cross the blood/brain barrier. It was thought to be effective in treating mild depression, but a 2002 review of 108 studies of the effects of 5-HTP on depression found that only one met the required standards, and that one concluded that 5-HTP was no more effective than a placebo.

It works synergistically with melatonin.

**Precautions:** It should not be taken by children with Down's syndrome (some have experienced seizures), or anyone with ulcers or other gastrointestinal diseases, Crohn's disease, scleroderma, excess prolactin secretion, or carcinoid syndrome. Those over 60 may need smaller doses. The effect on children, pregnant women, breast-feeding mothers, and those with kidney or liver disorders is not known, and use should be avoided unless under the guidance of a medical professional. There is no evidence that it benefits anyone with attention deficit hyperactivity disorder (ADHD), obsessive-compulsive disorder (OCD), common or chronic headaches, sleep disorders, or Alzheimer's disease. Despite widespread practice, there is no hard evidence that taking 5-HTP will alleviate post-MDMA dysphoria. It is suggested that supplementation be stopped a week before any surgery, as its effects are not yet known.

Nausea and fatigue occur initially, but may eventually disappear. Daytime drowsiness, heartburn, hypertension, dizziness, nightmares, loss of appetite, diarrhea, cramps, upset stomach, gas, vomiting, sweating, muscle problems, and lowered sex drive may also result, generally from higher doses. Rare side effects include allergic reactions, long-term fatigue, stuffy or runny nose, and headaches. Daily use can lead to increased tolerance, with the result that higher doses are needed to achieve the same effects, and it can sometimes be hard to determine if 5-HTP will make you

alert or drowsy (dosage, time of meals, time of day, supplements or medications, age, and hormonal levels all play a part). Long-term effects are not known.

Overdose symptoms include heart valve damage or disease and the serotonin syndrome, where serotonin levels are too high, and which is characterized by restlessness, confusion, sweating, diarrhea, excessive salivation, high blood pressure, increased body temperature, rapid heart rate, tremors, seizures, and—in rare cases—death. Recovery is complete if dosage is stopped.

In 1989, thousands of individuals developed a rare and serious blood disorder known as Eosinophilia-Myalgia Syndrome (EMS) due to a contaminant in tryptophan supplements from one manufacturer; there are no known cases of this disorder occurring in those taking 5-HTP.

Some 5-HTP supplements contain vitamin B-6 (pyroxidal phosphate), which helps to convert tryptophan to melatonin. However, there is concern that the vitamin may convert 5-HTP to serotonin in the blood or tissues, which could cause adverse reactions or increase the manufacture of norepinephrine and dopamine, counteracting any sedative effects of 5-HTP. More ominously, while the brain creates 5-HTP and immediately destroys it, the pill distributes it, through the bloodstream, all over the body; the consequences of this are as yet unknown.

It should not be combined with selective serotonin reuptake inhibitors (SSRIs) and other antidepressants, or the diet drug dexfenfluramine (Redux). It should only be combined with MAO inhibitors under the guidance of a physician; combining 200 mg of 5-HTP with MAO inhibitors can result in high blood pressure and emotional instability. When combined with the antiparkinsonian drug carbidopa, the side effects of 5-HTP could be increased, including anxiety, aggression, rapid speech, and a scleroderma-like condition. When combined with dextromethor-

phan (Robitussin DM), meperidine (Demerol), or pentazocine (Talwin), it could result in too much serotonin in the brain, with serious side effects that include shivering, anxiety, and heart problems. When combined with tramadol (Ultram), it could result in too much serotonin in the brain, with side effects including confusion, shivering, and stiff muscles. Possible interactions with the anti-migraine drug zolmitriptan (Zomig) may occur, though specific side effects are unknown at this time.

When combined with St. John's Wort or SAM-e, both should be taken in smaller doses to prevent the serotonin syndrome. Though Ray Sehalian states that an ounce or two of wine should pose no problems in combination with 5-HTP, he cautions that higher amounts of alcohol should be avoided. When taken with MDMA, side effects could occur, including nausea.

**Dosage:** It is about ten times more potent than tryptophan, and caution should be exercised, as individual response may vary considerably. The website WebMD does not recommend its use under any circumstances until more is known about this compound. Ray Sahelian recommends 10 to 50 mg one-half to one hour before sleep, preferably on an empty stomach to increase absorption; he considers any dose above 100 mg to be too high. Side effects generally occur in doses above 100 mg. It should be taken no more than once or twice a week; and any prolonged continuous use should be avoided. Taking it with 25 to 50 mg of vitamin B-6 may increase the amount converted to serotonin in the brain, and eating it with carbohydrates may help improve the rate at which it enters the brain.

## FKBP52

A brain protein that folds and unfolds other proteins.

**Effects:** Levels of this protein were 75 percent lower in the frontal cortex of individuals

who had died of Alzheimer's and similar diseases, and it is believed that lack of this protein allows tau tangles to form inside brain cells and kill them, a key feature of these degenerative diseases. Measuring levels of FKBP52 could lead to early diagnosis, and raising these levels could slow or halt the progression of mental decline (Baulieu et al., 2012).

**Precautions:** Its exact role regarding Alzheimer's disease and tau is still not fully understood.

## FLCN

**AKA:** BHD, FLCL, FLCN\_HUMAN, Folliculin, MGC17998, MGC23445.

**Effects:** A protein that regulates lifespan in the *C. elegans* nematode worm; when this function is suppressed, the lifespan of the worm increased 19 percent, possibly by initiating an overall slowing down of cell functions or by increasing cell autophagy (Gharbi et al., 2013).

**Precautions:** Its mechanism of action is not yet fully understood. In humans, FLCN may act as a tumor suppressor, and mutations are linked to various cancers.

## 4-AMINOPIPERIDINE

### ANALOGUES

**Effects:** Found to have cognitive-enhancing properties when administered to lab mice (Manetti et al., 2003). Researchers think it could lead to a new class of drugs used to treat neurodegenerative disorders such as Alzheimer's disease.

**Precautions:** None known.

**Dosage:** None established.

## FOXN1

A protein involved in the switching on of genes.

**Effects:** Professor Clare Blackburn and others at Edinburgh University have found that reactivation of this protein in old mice restored

the function of the thymus and increased its size to twice what it was before, reversing age-related shrinkage and possibly leading to treatments that could improve immune function and increase lifespan in humans.

**Precautions:** Has not yet been tested on humans.

## GABA

**AKA:** GABA Calm, GABA Plus, Gaba-tol, Gabatrol, gamma-aminobutyric acid.

**Effects:** An amino acid and neurotransmitter, it metabolizes to produce GHB in the brain, reducing anxiety and inducing relaxation and sleep by regulating the firing of nerve cells and countering the excitatory effects of acetylcholine, noradrenaline, and other neurotransmitters. It has been found to reduce anxiety, post-traumatic stress disorder (PTSD), social phobia, and insomnia. A 2003 study conducted by Dr. Audie Leventhal of macaque monkeys found that administration of GABA or GABA-like drugs restored functioning in the information-processing part of the cerebral cortex related to sensory input, boosting sensory discrimination and potential reaction times to levels equivalent to younger macaques, and another 2003 study led by M. S. Chambers of the Neuroscience Research Centre in England found that an inverse agonist, 6,6-Dimethyl-3-(2-hydroxyethyl)thio-1-(thiazol-2-yl)-6,7-dihydro-2-benzothiophen-4(5H)-one(43), enhanced performance in rats in a memory-dependent task without the risk of convulsant side effects compared to other forms of GABA. Paradoxically, one study found that decreasing the levels of GABA in the brain by as much as 30 percent increased learning speed of motor skills (specifically, learning to press buttons on a keypad in a certain sequence) by 70 percent (Stagg, 2011).

**Precautions:** As a supplement, its effectiveness is short-term. One Chinese study indicates that increased levels of GABA in the brain are not conducive to learning and memory.

It should not be combined with other drugs, especially alcohol and other depressants. There is one anecdotal case of difficulty breathing after GABA was combined with salvia.

**Dosage:** Mark Mayell recommends 500 to 750 mg to reduce anxiety, and 750 to 1500 mg an hour before bedtime for insomnia. Its effects may be enhanced by taking it with 25 to 50 mg each of vitamin B-3 and B-6.

## GAS6

**Effects:** A protein that stimulates the production and maintains the existence of oligodendrocytes, special glial cells which form myelin around axons in the brain and spinal column. This process slows down as the brain ages, says Professor Arthur Butt, of the School of Pharmacy and Biomedical Sciences at the University of Portsmouth, and studying them may help gain insight into brain aging and diseases such as Alzheimer's.

## GDF11

**Effects:** When the circulatory systems of a young mouse and an old mouse were surgically conjoined, it reversed the age-related cardiac hypertrophy of the older mouse. A 2013 study headed by Amy Wagers of Harvard University and Richard Lee of Brigham and Women's Hospital in Boston, Massachusetts found that a protein in the blood, GDF11, a key factor in cell development and healing, was responsible. It had previously been found that the blood of young mice could reverse cognitive decline in older mice, though it was uncertain what substances were responsible.

**Precautions:** Has not yet been tested on humans.

## GDNF

**AKA:** ATF1, ATF2, Glial cell derived neurotrophic factor, HSCR3, HFB1-GDNF, HSCR3.

**Effects:** A protein that protects various neurons.

## GLUTAMINE

**AKA:** L-glutamine.

A free-form amino acid that produces glutamic acid, a brain chemical that protects against ammonia metabolic waste.

**Effects:** It manufactures GABA, a neurotransmitter which soothes and calms the mind. It has been used to treat depression, anxiety, insomnia, ADHD, moodiness, and irritability.

A deficiency can result in moodiness, ill temper, and a weakened immune system.

**Precautions:** There is insufficient evidence to determine its effectiveness against the above conditions. Glutamic acid, unable to cross the blood-brain barrier, provides no known benefit. Over 2 g/day of glutamine can cause manic behavior. One individual taking high doses of glutamine experienced sleep loss, hyperactivity, and vivid uncontrollable thoughts. In a second reported case, a man taking four grams a day of L-glutamine for three weeks became psychotic, with hallucinations, grandiose delusions, insomnia, and a voracious sex drive.

Those with sensitivity to the food additive monosodium glutamate (MSG) may experience an allergic reaction to glutamine. It should not be taken by those with hepatic encephalopathy, mania, or seizures, as it could worsen these conditions. Women who are pregnant or breastfeeding should avoid use.

Glutamine could decrease the effectiveness of lactulose, anti-seizure medications, and—possibly—chemotherapy drugs.

**Dosage:** None established. Some suggest starting with 250 to 500 mg/day and increasing to as much as 1 to 2 g/day. Earl Mindell, R.Ph., Ph.D., recommends 1 to 4 g/day in divided doses. WebMD recommends that no more than 40 g/day be taken by adults.

## GLUTATHIONE

**AKA:** Glutaplex, GSH, GSH 250 Master Glutathione Formula.

A stable tripeptide made by the body from the three amino acids L-cysteine, L-glutamic acid, and glycine. It does not break down into the toxic product cystine (which can crystalize and produce kidney stones), but is totally absorbed by the gastrointestinal tract.

**Food Sources:** Asparagus, avocados, broccoli, cabbage, cauliflower, grapefruit, meat, oranges, peaches, potatoes, purslane, strawberries, tomatoes, watermelon.

**Effects:** Has been used by individuals to prevent aging, memory loss, and Alzheimer's disease. Glutathione is said to protect the brain cells against the cross-linking of proteins—a condition which reduces the efficiency of the brain cells—and increases the flow of oxygen and blood to the brain. It reportedly deactivates free radicals and counters the effect of lipid peroxides, which may be the key to its antiaging effect.

The effectiveness of glutathione can be increased by lipoic acid, selenium, and vitamins B-2 and E.

**Precautions:** There is insufficient evidence for its use in treating the above conditions.

Persons with kidney disease, severe liver disease (especially that resulting from cirrhosis or Reye's syndrome), or those with seizure disorders should not take glutathione supplements without first consulting a physician. Those with diabetes or blood sugar problems should avoid doses above 3000 mg except under the care of a physician, as a combination of L-cysteine and large doses of vitamins B1 and C may inactivate insulin. Cysteine may also make some people more sensitive to the food additive MSG.

**Dosage:** None established. Some suggest 250 to 500 mg/day, though Leon Chaitow recommends 1 to 3 g/day. The precursor N-acetyl-cysteine has been proven a more potent source of glutathione, but the exact dosage

needed has not yet been determined. It may be more effective to consume the three amino acids and allow the body to manufacture glutathione on its own, rather than taking supplements.

## GLYCINE

**AKA:** L-glycine.

**Food Sources:** Protein-rich foods (dairy, fish, legumes, meat).

**Effects:** A non-essential amino acid that acts as a neurotransmitter and helps in the formation of glutathione. It has been used to treat schizophrenia and limit brain damage due to ischemic stroke.

**Precautions:** There is insufficient evidence for its use as a memory enhancer.

Women who are pregnant or breastfeeding should avoid use, as effects are not known.

Glycine can interfere with the effectiveness of clozapine.

**Dosage:** None established.

## GnRH

**AKA:** Gonadotropin-releasing hormone.

**Effects:** Researchers have found that by activating the NF- $\kappa$ B (nuclear factor kappa-light-chain-enhancer of activated B cells) protein complex, they increased hypothalamic inflammation and decreased levels of gonadotropin-releasing hormone (GnRH), both of which accelerated aging in mice; blocking this pathway, on the other hand, slowed aging and increased lifespan approximately 20 percent. When GnRH was injected into aging mice on a daily basis it protected them from impaired neurogenesis and decreased the rate of age-related cognitive decline (Cai et al., 2013).

**Precautions:** Has not yet been tested on humans.

## GOT

**AKA:** Glutamate-oxaloacetate transaminase.

**Effects:** An enzyme that could prevent much of the damage caused by stroke and head trauma by removing glutamate from the brain. Glutamate, a transmitter, is normally present in trace amounts in the brain, but after a severe trauma, it floods the brain, killing off cells. Neurologists at two different hospitals found that they could predict the odds of recovery and the amount of brain damage by the levels of glutamate and GOT in the brain (Campos et al., 2011).

**Precautions:** Has not yet been tested on humans.

## HAMARTIN

**Effects:** A protein in the hippocampus that prevents neurons from dying due to lack of oxygen and glucose following a stroke. This could lead to the development of drugs that mimic its effect to treat stroke, Alzheimer's, and other conditions (Buchan et al., 2013).

**Precautions:** Has not yet been tested on humans.

## HDAC2

**Effects:** Overproduction of this enzyme in patients with Alzheimer's disease results in a lack of new memories due to certain genes responsible for synaptic plasticity being shut off; in mice, the inhibition of this enzyme leads to a reversal of Alzheimer's symptoms. This may explain why anti-Alzheimer drugs are only partly successful, as they clear the amyloid-beta plaques but do nothing to stop the production of HDAC2, which is increased by the plaques (Gräff et al., 2012).

**Precautions:** Has not yet been tested on humans.

## HIF-1

**AKA:** Hypoxia-inducible factor 1.

**Effects:** Stabilization of this protein increases the lifespan of the *Caenorhabditis elegans* worm (Leiser et al., 2013).

**Precautions:** Stabilizing mammalian HIF-1 $\alpha$  can contribute to tumor growth and cancer.

## HISTIDINE

**AKA:** L-histidine.

**Effects:** Histidine is converted by the body into the neurotransmitter histamine, which plays a role in smooth muscle function and the dilation and contraction of blood vessels. It removes heavy metals from the body, helps protect nerves by maintaining the myelin sheath, and helps protect against radiation damage. Additionally, it promotes the manufacture of both red and white blood cells. It has been used in the treatment of rheumatoid arthritis, poor sexual arousal, ulcers in the digestive tract, and nausea during pregnancy.

A deficiency can lead to partial or total deafness and one form of schizophrenia (sufferers are referred to as histagenics).

**Precautions:** Histidine should not be used by persons with bipolar disorder having elevated levels of histamine or by women suffering from premenstrual depression. Whereas a deficiency can lead to one form of schizophrenia, an overdose can lead to another form (sufferers are referred to as histadelics; in some cases, methionine can decrease the level of histamine). Excessive histidine intake in males can lead to premature ejaculation, which can be countered with a supplementation of 500 mg of methionine, 500 mg of magnesium, and 50 mg of vitamin B-6. Dosages of over 4 g/day in women can trigger menstruation.

**Dosage:** Between 1 to 6 g/day with vitamin C.

## HLH-30 AND TFEB

**Effects:** A transcription factor, or protein that acts as an on/off switch for genes, that regulates autophagy, a cleansing process whereby waste material and debris in cells is consumed; this plays an important role in

aging in cells and, consequently, aging and age-related diseases in the organism.

**Precautions:** Studies so far have just focused on HLH-30 in *C. elegans* worms and mice. There is a similar transcription factor in mammalian cells called TFEB which was only just discovered in 2011.

## HSP70

**AKA:** Heat shock protein 70.

A protein in cells that protects other proteins by maintaining proper re-folding under stressful conditions (such as excessive heat).

**Effects:** Mice bred to mimic the symptoms of Alzheimer's disease and engineered to produce extra HSP70 produced fewer amyloid precursor proteins, removed amyloid-beta plaques more quickly, and retained more of their cognitive abilities than those mice producing normal levels of the protein (Mizushima et al., 2011).

**Precautions:** Has not yet been tested on humans.

## HYPOCRETIN

**Effects:** A peptide neurotransmitter whose release rises and falls with a person's mood. Increasing levels could help treat depression, narcolepsy, sleep disorders, and improve alertness (Blouin et al., 2013). A previous study had shown that individuals with narcolepsy had only 5 percent hypocretin nerve cells compared to a control group.

**Precautions:** Research is still preliminary.

## ICSM 18 AND ICSM 35

Antibodies that attack the prion protein responsible for Creutzfeldt-Jakob Disease.

**Effects:** Have been found to block the effects of amyloid-beta protein by researchers at the Medical Research Council Prion Unit at University College London.

**Precautions:** Research is preliminary.



INTERLEUKIN 4**AKA:** IL-4.

**Effects:** T cells around the lining of the brain protect it from the immune system—which may see waste products produced as a result of learning as an infection—by producing a molecule called interleukin 4, which inhibits the inflammatory response to a viral threat, and which has been found in mice to improve learning. According to neuroscientist Jonathan Kipnis, this may explain why people feel mentally foggy when sick, as fighting off an infection takes greater priority over protecting the brain.

**Precautions:** Research is preliminary.ISOLEUCINE**AKA:** L-isoleucine.

**Effects:** A University of Milan study found that, when given to healthy, middle-aged mice in combination with leucine and valine, isoleucine extended lifespan an average of 12 percent by increasing the activity of SIRT1 (a longevity gene), boosted the energy supply to cells by producing more mitochondria in the heart and skeletal muscles, and reduced free radical oxidative damage (Nisoli et al., 2010). In addition, the mice had more stamina and improved muscle coordination when compared with untreated mice. One study funded by the National Institutes of Health has found that, in combination with leucine and valine—two other branched-chain amino acids—isoleucine has shown promise as a treatment for amyotrophic lateral sclerosis (ALS), or Lou Gehrig’s disease. Subjects given these amino acids over the course of a year retained more of their muscle strength and ability to walk than those given a placebo, a result which may have been due in part to leucine and isoleucine’s assistance in the breakdown of glutamate; valine was added because of a deficiency noted in the blood and cerebrospinal fluid of ALS patients. This combination also may prevent, and even reverse, liver

damage resulting from alcoholism. Positive results have been recorded in the treatment of hepatic encephalopathy, chronic liver disease, and muscle atrophy in chronic heavy drinkers.

**Precautions:** The life-extending effects on humans are unknown.**Dosage:** None established.JNK**AKA:** c-Jun N-terminal kinase.

**Effects:** Regulates the DAF-16/forkhead transcription factor in the *Caenorhabditis elegans* worm which, in turn, is necessary for regulating lifespan and countering stress (Oh et al., 2005).

KA1**AKA:** Kainate receptor 1.

Kainate receptors are a family of proteins that have been found to play a role in clinical depression.

**Effects:** Continued stress on rats resulted in an increase in production of KA1 in the hippocampus, though injections of corticosteroids produced an inverted U response, in which high doses of steroids did not trigger an increase in KA1 (Hunter et al., 2009).

**Precautions:** In simulated strokes in mice, KA1 production increases greatly, killing off huge numbers of cells in areas deprived of blood (Chen et al., 2008).

KALIRIN-7

**Effects:** A brain protein that plays a critical role in learning and memory; it does this by building up the synaptic spines, the sites where neurons communicate. This is why individuals who maintain an active intellectual life can delay cognitive decline (Penzes et al., 2007). Individuals with Alzheimer’s and schizophrenia have been found to have reduced levels.

**Precautions:** No known side effects.**Dosage:** None established.

## KDI

**AKA:** KDI tripeptide.

KDI is a protein that occurs naturally in the body.

**Effects:** Due to its ability to block the harmful effects of glutamate, it may be useful in treating people with Alzheimer's, Parkinson's, and other neurodegenerative brain diseases by increasing the connections between surviving neurons (Liesi et al., 2005). Tests on spinal cord injuries have injected it directly into the problem area.

**Precautions:** More research is needed, but it is not believed to have any major side effects; however, it could disrupt the balance of electrical activity in neurons. It is not seen as a cure for Alzheimer's, though it could halt its progression. Oral and intravenous methods of delivery would result in the tripeptide being broken down by the body, possibly rendering it ineffective.

**Dosage:** None established.

## KIF17

**AKA:** Kinesin family member 17; kinesin superfamily motor protein 17.

**Effects:** A protein that helps transport NR2B along dendrites in mammalian hippocampal neurons, a process necessary for synaptic plasticity, learning, and memory (Guilaud et al., 2003; Yin et al., 2011; Yin et al., 2012). It may also reduce learning deficits in mice with Down's syndrome (Toso et al., 2008).

**Precautions:** Prenatal stress in male mice can lead to long-term deficits in the expression and function of KIF17 and, consequently, reduction in learning and memory (Zhao et al., 2012).

## KIR4.1

**Effects:** A protein which helps control oligodendrocytes, or special glial cells which form myelin around axons in the brain and spinal column, and which University of

Portsmouth biologists believe may help prevent dementia.

## LEUCINE

**AKA:** L-leucine.

**Effects:** A University of Milan study found that, when given to healthy, middle-aged mice in combination with isoleucine and valine, leucine extended lifespan an average of 12 percent by increasing the activity of SIRT1 (a longevity gene), boosted the energy supply to cells by producing more mitochondria in the heart and skeletal muscles, and reduced free radical oxidative damage (Nisoli et al., 2010). In addition, the mice had more stamina and improved muscle coordination when compared with untreated mice. One study funded by the National Institutes of Health has found that, in combination with valine and isoleucine—two other branched-chain amino acids—leucine has shown promise as a treatment for amyotrophic lateral sclerosis (ALS), or Lou Gehrig's disease. Subjects given these amino acids over the course of a year retained more of their muscle strength and ability to walk than those given a placebo, a result which may have been due in part to leucine and isoleucine's assistance in the breakdown of glutamate; valine was added because of a deficiency noted in the blood and cerebrospinal fluid of ALS patients. This combination also may prevent, and even reverse, liver damage resulting from alcoholism. Positive results have been recorded in the treatment of hepatic encephalopathy, chronic liver disease, and muscle atrophy in chronic heavy drinkers.

**Precautions:** The life-extending effects on humans are unknown.

**Dosage:** None established.

## LIPOCALIN-2

**AKA:** LCN2; oncogene 24p3.

**Effects:** A protein produced by the brain that reduces the number of junctions between

cells, limiting communication so that future stressful events won't create as much anxiety. Researchers at Leicester University, headed by Dr. Robert Pawlak, found that mice without this protein reacted much more strongly to stress than normal mice. This could lead to new treatments for post-traumatic stress disorder, phobias, and depression.

**Precautions:** Has not yet been tested on humans. Critics claim that by erasing bad memories, we will be unable to learn from our mistakes.

### L-PROLYL L-LEUCYL GLYCINE AMIDE

**AKA:** Melanocyte-stimulating hormone release inhibiting factor-1; MIF-1; PLG; Pro-Leu-Gly; Pro-Leu-Gly-NH<sub>2</sub>.

A tripeptide formed by three amino acids linked together.

**Effects:** It has been found to enhance learning and memory in rats; it may also have potential to treat Parkinson's and depression by acting on the dopamine receptors and on the c-Fos gene in areas of the brain regulating mood, anxiety, depression, and memory (US Patent 3719761; Khan et al., 2010; Kastin and Pan, 2010).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### LYNX1

A protein that regulates the level of nerve cell activity, preventing them from firing too much or too infrequently (the excitatory/inhibitory balance).

**Effects:** Takao Hensch and his colleagues found that when mice were genetically engineered without lynx1, a protein found in greater quantity in mature brains than developing brains, they recovered from vision problems and retained neuroplasticity, even as adults (Hensch et al., 2010).

**Precautions:** Hensch found that the mice lacking lynx1 began to show damage to their brains indicative of dementia earlier than their normal counterparts, suggesting that there is a trade-off between plasticity and degeneration (this may explain why, in rare cases, very accomplished musicians find that they are so used to using their fingers as one unit when playing an instrument that they are no longer able to pluck a single string). Also, too much plasticity could reinforce and intensify fears and anxieties (which may explain why geniuses often have their eccentricities—Howard Hughes and his increasing fear of germs, or Nikola Tesla and his compulsion to calculate the cubic volume of his food before eating it, for example).

### METHIONINE

**AKA:** L-methionine.

A sulfur-containing amino acid.

**Food sources:** Found only in animal foods such as eggs, fish (all kinds), liver, meat (all kinds), milk, and poultry (all kinds).

**Effects:** Methionine is an antioxidant that is also said to protect against the accumulation of chemicals and heavy metals (e.g., cadmium, mercury) in the brain and body, play a key part in the production of the brain neurotransmitter choline (not to mention adrenaline, lecithin, and vitamin B12), prevent fat from getting into the arteries and liver, render selenium available to the body, and play an important role in the biosynthesis of two other amino acids—cysteine and taurine. Methionine is believed to relieve some cases of schizophrenia by lowering the level of histamine in the blood, and may help protect the liver against damage from carbon tetrachloride.

Deficiency symptoms include bad skin tone, loss of hair, a buildup of toxic wastes in the body and fat in the liver, anemia, impeded protein synthesis, and atherosclerosis.

Selenomethionine is a variant in which selenium atoms replace the sulfur atoms.

**Precautions:** There is insufficient evidence for its effectiveness in the treatment of depression and schizophrenia. When injected into the brains of healthy well-reared adult rats, it changed them into rats that were more stressed and showed less exploratory behavior (Szyf et al., 2005).

Methionine should always be taken with B-6—to prevent an excess of homocysteine—and magnesium. Capsules are preferable to other forms because they avoid the rotten egg smell that usually accompanies it.

It should not be used by individuals suffering from acidosis, arteriosclerosis, liver disease, MTHFR deficiency, and schizophrenia, as it could worsen these conditions. Women who are pregnant or breastfeeding should avoid supplementation.

One study suggests that methionine might be destroyed by excessive alcohol consumption.

**Dosage:** 100 to 250 mg/day. Leon Chaitow, N.D., D.O., recommends 200 to 1000 mg/day with vitamin B-6 and magnesium; Sheldon Saul Hendler, M.D., Ph.D., advises against supplementation.

## MHC CLASS 1 D AND HLA

**AKA:** D.

Immune system proteins that also help develop the nervous system.

**Effects:** As the brain develops in the newborn, many nerve connections are formed, but as the nervous system takes shape, those that work together survive, and those that don't die off and get eliminated ("Fire together, wire together. Out of sync, lose your link."). These proteins—MHC in mice and HLA in humans—help get rid of these excess connections. In research led by Carla Schatz, Stanford University professor of biology and neurobiology, mice bred without MHC Class 1 D, all nerve connections fired in sync with each other, and other proteins were unable to determine which to keep and which to remove.

This could explain why individuals with mutations in HLA, or who have improperly formed connections, are more likely to get schizophrenia.

## MTC PROTEINS

**Effects:** Mitochondria are the structures within cells which produce enzymes that convert food into energy. One theory of aging is that these mitochondria also produce toxic byproducts that damage and eventually disable the cells. Researchers at the University of Gothenburg, Sweden, have found that a category of proteins, called MTC proteins, may actually help delay the aging process; when a genetic mutation omits a specific type of MTC protein in fungi, worms, or flies, other types step in to help stabilize the genome and defend against protein damage, resulting in a longer lifespan. Not only that, but this form of aging regulation is dependent on the same signaling pathways as caloric restriction. This could lead not only to advances in increasing lifespan, but to insights into dealing with such diverse conditions as cancer and Alzheimer's disease.

## NERVE GROWTH FACTOR

**AKA:** NGF.

**Effects:** Has been found to promote neurogenesis in the hippocampus of adult rats, which may lead to new treatments for dementia (Frielingsdorf et al., 2006). Research led by Mark Tuszynski, MD, PhD, professor of neurosciences at the UC San Diego School of Medicine, has shown that surgically implanting NGF genes into the brains of Alzheimer's patients can slow the rate of cognitive decline, though not stop it. Professor Rita Levi-Montalcini, a 1986 Nobel Prize winner for Medicine, attributes her mental vigor at age 100 to regular doses of nerve growth factor in the form of eyedrops.

**Precautions:** Research needs to be done in order to assess the efficacy of nerve growth fac-

tor as a neuroprotectant, and to judge the validity of Dr. Levi-Montalcini's claim and whether there are any side effects.

**Dosage:** None established.

## NOGO

**AKA:** Neurite outgrowth inhibitor; Reticulon-4.

A protein that prevents the growth of new connections in a neuron (hence the name Nogo), and has previously been the main focus in the research to regrow spinal nerve fibers until neuroscientists at the University of Rochester Medical Center, led by Roman Giger, Ph.D., disproved that theory in 2007.

**Effects:** Giger's research team has also found that, in parts of the brain, there are ten times more nogo receptors than there are in the spinal cord, and that it plays an important role in neuroplasticity (i.e., learning and memory). Research performed by Peter Shrager, Ph.D. and colleagues discovered that mice that have fewer than normal nogo receptors had stronger brain signaling, or long-term potentiation, and a different ratio of dendritic spines than normal mice, though the implications of this latter finding are, as yet, unknown. And Dr. Stephen M. Strittmatter of the Yale School of Medicine has led research that shows that mice genetically bred without the gene for Nogo Receptor 1 retained the neuroplasticity of young mice into adulthood; the same results were achieved in normal adult mice when their nogo receptors were chemically blocked. These findings could lead to an understanding of the brain's recovery after stroke or brain injury. According to researchers at the Karolinska Institute in Stockholm, exercise can reduce the number of nogo receptors within the brain.

Nogo receptor 1 (**AKA:** RTN4R; Nogo-66 Receptor) may also play a role in modulating a genetic variant of schizophrenia (Hsu et al., 2007).

**Precautions:** Giger cautions that any at-

tempts to boost IQ in normal people by reducing the number of nogo receptors may have unintended negative consequences, as these receptors are found in other areas, as well.

## NRF2

**Effects:** A protein that regulates protein processing, or how quickly misfolded (damaged) proteins are removed from neurons, called proteostasis. When activated, Nrf2 reduced the time the huntingtin protein (responsible for the neurodegenerative disorder Huntington's disease) spent in the neuron, increasing the neuron's lifespan (Tsvetkov et al., 2013). Researcher Jeff Johnson and others at the University of Wisconsin's School of Medicine had previously found that it powers all of a neuron's defense mechanisms, possibly leading to treatments for various diseases such as Alzheimer's, Parkinson's, Huntington's, and Lou Gehrig's disease, which all have a common etiology, but manifest themselves in different ways. Using mice, they found that the protein not only protects the inside of the cell, but the cells around it, too, successfully fighting off toxins that kill neurons.

**Precautions:** Has not yet been tested on humans.

## NR2B

**AKA:** Glutamate receptor subunit epsilon-2; GRIN2B; NMDAR2B; N-methyl D-aspartate receptor subtype 2B.

**Effects:** A protein that, among other things, plays a role in synaptic plasticity, the basis for learning and memory; it binds to calcium/calmodulin dependent protein kinase II (CaMKII), which has a similar role (Cheriyana et al., 2011). One study has shown that overexpression of NR2B in transgenic mice led to an increase in learning and memory in behavioral tasks (Tang et al., 1999).

**Precautions:** Long-term memory may be

largely dependent on NR2A:NR2B ratio (Cui et al., 2013). NR2A and NR2B may each have a unique role in synaptic plasticity (Massey et al., 2004). Abnormal activation of these receptors is linked with some neurological disorders and diseases (Jang et al., 2004).

NMDA receptor antagonists include amantadine, dextromethorphan, ethanol, HU-211, ketamine, lead, memantine, nitrous oxide, phencyclidine, and xenon.

## OPIOID RECEPTORS

**Effects:** Opioid receptors are the brain's "pleasure molecules." Of these four receptors, only two—the "mu" and the "kappa"—have been deciphered. The "mu" is connected to endorphin neurotransmitters and reacts to morphine, codeine, heroin, and opium. The "kappa" responds to *Salvia divinorum*, one of the most potent hallucinogens in nature (see entry). Research into these receptors could lead to treatments for addiction and pain relief, as well as provide greater understanding of perception and consciousness.

**Precautions:** The other two receptors, and the interactions of all four, are not yet understood.

## PEROXIREDOXIN 1

**AKA:** Prx1.

**Effects:** An enzyme identified by Mikael Molin and colleagues at the University of Gothenburg that helps extend lifespan by preventing genetic defects, including those leading to cancer. It also breaks down hydrogen peroxide in cells and is necessary for caloric restriction to effectively extend lifespan. This and other peroxiredoxins are known to prevent damage and aggregation of proteins, which has been implicated in some age-related nervous system disorders such as Alzheimer's and Parkinson's.

**Precautions:** Has only been tested on yeast cells.

## PHENYLALANINE

**AKA:** DL-phenylalanine (DLPA), D-phenylalanine, L-phenylalanine.

Phenylalanine helps create the neurotransmitters, chiefly norepinephrine, epinephrine (or adrenalin), and dopamine, that produce mental arousal, alertness, and a better emotional state. It is often used by those attending raves.

**Food sources:** Almonds, aspartame (NutraSweet), beef, black beans, chicken, cottage cheese, dairy products, eggs, fish, lima beans, milk, nuts, peanuts, pumpkin and sesame seeds, soybeans, sunflower seeds, watercress. Plants contain mostly the "D" form, while animal proteins contain mostly the "L" form.

**Effects:** Phenylalanine may contribute to a more positive mental state, alertness, more motivation and ambition, more energy, an increase in learning ability, better memory, and an increased ability to focus and pay attention. (Leon Chaitow, N.D., D.O., claims only the "D" form produces these beneficial results, while Mark Mayell claims that the "L" form stimulates the nervous system and libido, enhances mood and cognition, and suppresses the appetite, whereas the "D" form elevates mood and enhances memory, and DLPA combines the effects of both.) It may help counter jet lag when taken first thing in the morning or right after a long flight, as it helps regulate the body's biological clock. It is believed that DLPA activates the morphine-like endorphins in the body, hormones which act as painkillers.

One study has shown that 150 mg/day of DL-phenylalanine was just as effective as the anti-depressant drug imipramine in treating depression (Beckmann et al., 1979), and another study found a significant percentage of individuals suffering from depression exhibited rapid improvements in mood when given 500 mg/day of L-phenylalanine (which was gradually increased to 3 to 4 g/day), along with 100 to 200 mg a day of vitamin B-6 to facilitate the effects of the amino acid. Another

study showed significant improvements in those with depression when 250 mg of L-phenylalanine was combined with 5 to 10 mg of Eldepryl. In combination with B-6, it produces the compound phenylethylamine (PEA), which may elevate mood based on its action as a neurotransmitter. There is some evidence that, in combination with other substances, phenylalanine can help suppress addictive behavior and cravings, but there is no evidence that it suppresses appetite or enhances the libido.

A deficiency can result in mood swings, weight gain, and problems with blood circulation.

**Precautions:** It does not appear to be effective in the treatment of ADHD.

It should not be taken by those with pigmented malignant melanoma cancer, phenylketonuria (or PKU, a genetic metabolic disorder), psychosis, or Wilson's disease (otherwise known as hepatolenticular degeneration, a rare hereditary disease chiefly characterized by a toxic buildup of copper in the organs and tissues of the body). Likewise, those taking MAO-inhibitor drugs should avoid phenylalanine, as should pregnant women (too much, even from dietary sources, can cause birth defects). Early studies seem to indicate that phenylalanine and tyrosine encourage the growth of melanomas (or skin cancers, one of the deadliest forms of cancer), and doctors usually have patients restrict their intake of these amino acids. Those with high blood pressure should only take it under the guidance of a health professional.

Some warn that the daily dosage should not exceed 2.4 grams a day. Too much phenylalanine can result in overstimulation, nervousness, heart palpitations, high blood pressure, and irritability; if taken later in the day, it may cause insomnia. Mayell says these symptoms only occur with the "L" form, and can be avoided by reducing the dosage, switching to DLPA, or taking it only in the morning. Other symptoms include headaches and nausea.

When combined with levodopa, it can worsen the symptoms of Parkinson's disease. When combined with MAO inhibitors or anti-psychotic medications, it can increase the risk of some side effects.

**Dosage:** The RDA has not been established. It is recommended that both "D" and "L" forms be used, especially in the treatment of depression or for increased energy. A dose of 1000 to 1500 mg of DLPA may be taken in the morning without food; a second dose may be taken later in the day, this time with 100 mg of B-6, 500 mg of vitamin C, and some fruit or fruit juice to help convert the amino acid to norepinephrine. Hendler, M.D., Ph.D., recommends no more than 1.5 g/day, with 20 to 30 mg/day of vitamin B-6 (not to exceed more than 50 mg/day). Mayell advocates a more modest dose of 375 to 500 mg of the "L" form or 750 to 1000 mg of DLPA, first thing in the morning and at least 30 minutes before breakfast.

## PKMZETA

**AKA:** Protein kinase C zeta (PKC2; PKCzeta; PRKCZ); Protein kinase M zeta.

**Effects:** An enzyme that can help to preserve detailed memories in long-term storage by strengthening the synaptic connections between neurons (Serrano et al., 2008). Columbia University neurologist Todd Sacktor, who developed a PKMzeta inhibitor called zeta-interacting protein (ZIP), thinks it may help prevent memory loss or, conversely, be useful in the treatment of disorders resulting from the over-strengthening of synaptic connections, including neuropathic pain, phantom limb syndrome, dystonia, and post-traumatic stress.

**Precautions:** It only improves the retention of specific memories, rather than the general ability to remember, and it does not help to control or process these memories. Research on mice by researchers at the Johns Hopkins University School of Medicine's Department

of Neuroscience has cast doubt on the theory that PKMzeta plays a role in long-term memory formation, as mice who had the enzyme disabled in various ways suffered no loss of memory function (Volk et al., 2013).

### POLYAMINES

**Effects:** Researchers have found that it increased learning and memory in fruit flies when added to their diet.

**Precautions:** Its effects on humans are not yet known.

### PRESENILINS

**Effects:** A family of proteins that help maintain the efficient transportation of materials along microtubule highways within each neuron; disruption of this process, or mutations in presenilin-1 or presenilin-2, can lead to Alzheimer's and other diseases. Researchers at the University of Buffalo have found that, by cutting the amount of presenilin in half in fruit fly larvae, they could increase the speed and efficiency of molecular motors, or kinesins and dyneins.

**Precautions:** Its effects on humans are not yet known.

### PRION DISEASES

**Effects:** Insight into how neurodegenerative disorders such as mad cow disease and variant Creutzfeldt-Jakob disease spread rapidly throughout the body by causing healthy proteins in cells to misfold may provide insight into how other neurological disorders can misfold proteins and develop. This could lead to methods of stopping not only Alzheimer's, Parkinson's, and Lou Gehrig's disease, according to Neil R. Cashman, a neurologist in the Brain Research Centre at the University of British Columbia, but dozens of other conditions such as Type 2 diabetes, cataracts, cystic fibrosis, and emphysema. Similar research is

being done at the University of Pennsylvania, the Michael J. Fox Foundation for Parkinson's Research, the Austrian biotech firm Affiris AG, the Institute for Neurodegenerative Diseases at the University of California, San Francisco, and the University of Toronto.

### PROTEIN PEPTIDE

**Effects:** A novel treatment for major depression developed by research led by Dr. Fang Liu of the Centre for Addiction and Mental Health that targets an enhanced coupling between the D1 and D2 dopamine receptors found in individuals suffering from this disease (Pei et al., 2010).

**Precautions:** Has not yet been tested on humans. When first developed, the peptide had to be injected directly into the brain; Dr. Liu has since found that a nasal spray can effectively cross the blood-brain barrier (Brown and Liu, 2014).

### PROTEIN POWDER

**AKA:** Aminotrofic.

**Effects:** Italian researchers have found that a protein powder containing the amino acids leucine, isoleucine, and valine can increase the lifespan of mice by 80 days, or some 12 percent, which could equal ten years in a human lifespan. It also increased muscle strength, boosted energy levels, and improved coordination and balance (Nisoli et al., 2010).

**Precautions:** The experiments suggest that there are few benefits, if any, for those under age 55. The effects on human lifespan are unknown. Rare side effects include allergic reactions, and should only be used under a physician's guidance by those with chronic kidney disease.

**Dosage:** None established, though the amount recommended by the manufacturer should be sufficient. The powder used contained two parts leucine to one part each of isoleucine and valine. These amino acids are also found



in chicken, but in powder form they enter the bloodstream much more quickly.

## PRX6

**Effects:** A protein that helps protect the human brain against Alzheimer's and other dementias. Researchers at Arizona State University's School of Life Sciences and the Norwegian University of Life Sciences have found that bees that take care of larvae do not age like their food-gathering counterparts. When aging food-gatherers were pressed into service as caretakers for baby bees, they regained much of their ability to learn. Not only that, but their brains had changed on a molecular level, possibly due to Prx6.

**Precautions:** It may take years to develop a medication for dementia based on this research.

## PYROGLUTAMATE

**AKA:** 2-oxo-pyrrolidone carboxylic acid, 5-OP, 5-oxoproline, 5-oxopyrrolidine-2-carboxylic acid, Adjuvant, Alpha-aminoglutaric acid lactam, Amino Mass, Arginine Pidolate, arginine pyroglutamate (arginine pidolate, pir-glutargine), Deep Thought, glutamic acid lactam, glutimic acid, glutiminic acid, Mental Edge, PCA, Pidolic acid, pyroGA, pyroGlu, pyroglutamic acid, pyrrolidone carboxylic acid.

Pyroglutamate is a metabolite of glutamic acid and amino acid derivative that is able to cross the blood/brain barrier, and is found in significant amounts in the brain, the cerebrospinal fluid, and blood. It is used to make various nootropic drugs such as piracetam and oxiracetam. Similar in effect to piracetam, though not as strong, Monosodium glutamate (MSG) is the sodium salt of glutamic acid.

**Food sources:** Dairy products, fruits, meats, vegetables.

**Effects:** Has been found to have learning- and memory-enhancing effects in rats (Drago

et al., 1987), as well as anti-anxiety effects. In humans, it has been found to improve alcohol-induced, age-related, and dementia-related memory deficits (Sinforiani, 1985; Griolo et al., 1990).

Works synergistically with choline, DMAE, and other acetylcholine-enhancing nutrients.

**Precautions:** The metabolism of glutamic acid is a complex process that involves numerous pathways, and may not yet be fully understood. A 2007 study by Pederzolli et al. cites numerous papers in which pyroglutamate was shown to be a neurotoxin in mice by inhibiting antioxidant activity in the brain, however, it may be that the levels administered were far higher than would be ingested by humans under normal circumstances (Garattini, 2000).

**Dosage:** 500 to 1000 mg/day for arginine pyroglutamate; a bit less for plain pyroglutamate. Medical writer Ray Sahelian, M.D., who has written extensively on nutrition and hormones, urges caution until further research has been done.

## RAP-1

**Effects:** A protein, discovered by Alexei Morozov and colleagues at the Virginia Tech Carilion Research Institute, that helps form long-term memories by activating ion-conducting L-type calcium channels, chiefly found in nerve terminals, at the appropriate times. Certain genetic mutations linked to changes in these channels have been associated with bipolar disorder and schizophrenia, and research could lead to better understanding of these disorders.

## RBAp48

**Effects:** Researchers led by neurologist Scott Small of Columbia University have found that loss of this protein in the hippocampus is linked to age-related memory decline, and by increasing the levels in older

mice, they could restore their memory function to what it was when they were younger.

**Precautions:** The protein's exact role regarding memory is still unclear, as is the reason for its decline with age.

## REST

**AKA:** Neuron-Restrictive Silencer Factor (NRSF), RE1-Silencing Transcription factor.

A protein and gene regulator in fetuses that is essential for developing proper brain function.

**Effects:** May protect neurons in older individuals from age-related stress (e.g., inflammation, oxidative stress) by turning off the genes that bolster cell death; in those suffering from various dementias, certain regions of the brain, such as the prefrontal cortex and hippocampus, are found to be severely deficient (Yankner et al., 2014). It is believed that, in old age, as in birth, neurons that cannot regenerate need protection from stress. This may explain why some people with amyloid plaques and tau tangles develop Alzheimer's and others do not.

**Precautions:** It is not known if REST is a cause or effect of mental decline. Other factors may be involved in age-related dementia, as well, such as genetics, disease, and environmental factors.

## RGS-14

**Effects:** A protein in the brain than can boost visual memory. Spanish researchers found that mice could increase their memory of an object from one hour to two months.

**Precautions:** It only works for visual memories.

## RUBISCOLIN-6

**AKA:** Tyr-Pro-Leu-Asp-Leu-Phe.

An opioid peptide derived from a protein in spinach leaves.

**Effects:** Has been shown to act as an analgesic, assist in memory consolidation (Yang et al., 2003), and act as an anti-anxiety agent in mice (Zhao et al., 2008).

**Precautions:** Its effects on humans are not yet known.

## SIK2

**AKA:** Salt-inducible kinase 2.

**Effects:** A molecule that is part of the SIK2-TORC1-CREB signaling pathway, and which plays an important role in neuronal survival after ischemic brain injury, in that degradation of SIK2 through oxygen and glucose deprivation triggered increased CREB activity and neuronal protection (Sasaki et al., 2011).

## SIRT1

**AKA:** NAD-dependent deacetylase sirtuin-1; sirtuin 1.

**Effects:** A protein and enzyme that may have neuroprotective and longevity properties (see entry for SIRT genes).

## SRX-1

**Effects:** An enzyme in cells that repairs peroxiredoxin 1 (Prx1), which helps prevent aging and age-related disorders (such as Alzheimer's), as peroxiredoxin breaks down hydrogen peroxide within cells. Caloric restriction can cause the body to increase its production of Srx1.

## SUBSTANCE P

**AKA:** SP.

A neuropeptide, or small chain of eleven amino acid residues, that mediates pain signals across nerve synapses, delivering these signals from the sensory nerves to the central nervous system.

**Effects:** It is involved in the regulation of pain and anxiety, as well as being associated

with inflammation, the regulation of mood disorders, and the feelings of stress and nausea, as well as many other functions. Stress releases Substance P, and it is believed that inhibition of this neuropeptide may be a way of treating anxiety and depression.

**Precautions:** The anti-depressive effects of antagonist MK-869 have proven disappointing.

**Dosage:** None established.

## SUCCINATES

Succinates are metabolites necessary for energy production in cells, and are esters or salts created by neutralizing succinic acid (succinic acid is used to control acidity in foods).

**Effects:** Said to increase energy and endurance.

**Precautions:** There is no evidence that supplementation provides any benefits.

**Dosage:** None established.

## SYNAPTOTAGMIN-IV

**AKA:** Syt-IV.

**Effects:** A study by University of Wisconsin-Madison researchers has shown that this protein can maintain brain plasticity by regulating the strength of synapses, enhancing learning and memory by aiding signal transmission between nerve cells (Chapman et al., 2009). It may also be useful in treating people with Alzheimer's, Parkinson's, and other neurodegenerative brain diseases, as well as those with epilepsy.

**Precautions:** More research is needed to assess its effects and develop useful treatments.

**Dosage:** None established.

## TAURINE

**AKA:** L-aurine.

**Food sources:** Eggs, fish (all kinds), lamb, meat (all kinds), milk, pork, shellfish. Though it is not found in any plant foods, it can be

manufactured in the human body from cysteine. High levels are found in human milk, but not cow's milk.

**Effects:** An electrical-charge stabilizer in the nerves of the brain and nervous system (it can decrease or even prevent epileptic seizures, and may even prove beneficial in other brain disorders such as Huntington's chorea), it is important for muscle function, and plays a role in the manufacture of the neurotransmitter glutamate. It is said to help the heart function better by conserving potassium and calcium, and help regulate insulin and blood sugar levels. Since taurine controls the synthesis of glutamate, it acts as a depressant. It may be necessary for proper growth of the human body. Women require taurine more than men because its synthesis is inhibited by the female hormone estradiol.

Individuals deprived of full-spectrum light may suffer a deficiency of taurine in the pineal and pituitary glands, leading to depression and mental impairment. In moderate amounts, taurine can work synergistically with caffeine (Warburton et al., 2001).

**Precautions:** There is good evidence that taurine is a central nervous system depressant and that it can impair short-term memory, so supplementation is not advised.

**Dosage:** Sheldon Saul Hendler, M.D., Ph.D., advises against supplementation.

## TELOMERASE

Composed of protein and RNA, telomerase is an enzyme that "maintains the length of telomeres—the end section of chromosomes—by adding repeating sequences of DNA to them, preventing damage during each cell-division cycle, when chromosomes are shortened" (Bonner, 2008). Called the "immortality enzyme" because it encourages cell division for an indefinite period of time, preventing the cells from dying of old age (Normal human cells divide approximately 75 times over a person's life span before the telomere—

the protective end of the chromosome—wears away and becomes too short to protect the chromosome, leading to the death of the cell. This is known as the Hayflick limit.)

**Effects:** It could extend life span and health indefinitely. Among Ashkenazi Jews, it was found that a common factor in those who lived the longest was that they had inherited a hyperactive version of telomerase (Atzmon et al., 2010). Telomerase in the body can be boosted by exercise and a healthy diet, and destroyed by smoking, obesity, stress, and a sedentary lifestyle. Harvard researchers have found that they could reverse the effects of aging in mice (genetically manipulated to lack telomerase) by injecting them with telomerase (Jaskelioff et al., 2010). Scientists in Barcelona have rejuvenated mice by treating them with a DNA-modified virus which deposits the telomerase gene in cells; though this was most effective in younger mice than older, they did not develop cancer, a significant breakthrough (Blasco et al., 2012).

**Precautions:** Its life-extension and rejuvenation abilities may be over-rated, as most studies have been done on rats, whose biological aging may not be as complex as humans', where telomerase activity does not continue for the full lifespan and other factors may come into play (Jaskelioff et al., 2010). Furthermore, no one has definitely proven that the Hayflick limit restricts the lifespan of an organism (for one, studies on cell samples tend to contradict this). There is some debate whether it could be a carcinogen, as it has been found in 90 percent of all cancer cells. Some say that telomerase by itself does not create cancer cells, while others counter that its ability to promote cell division could cause cancer cells to proliferate unchecked. Studies using mice have found that those with elevated levels of telomerase have a higher incidence of cancer, nullifying any increase in lifespan, and those without any active telomerase do not show any signs of premature aging. Elizabeth Blackburn, one of the discoverers of telomerase,

has found telomerase activity to be a possible factor in sudden heart attacks in that it may fuel the growth of coronary artery blockage.

## THEANINE

**AKA:** Gamma-ethylamino-L-glutamic acid, L-theanine r-glutamylethylamide.

A neurologically active amino acid found in tea plants (*Camellia* sp.), it is the main amino acid in green tea leaves, and is responsible for its characteristic umami taste.

**Effects:** It has a calming effect, producing a feeling of relaxation 30 to 40 minutes after ingestion, both by stimulating the production of alpha brain waves (resulting in a meditation-like state of intense relaxation coupled with mental alertness) and by assisting in the formation of gamma amino butyric acid (GABA), a neurotransmitter which regulates the levels of dopamine and serotonin. These effects are not accompanied by any feelings of drowsiness, and may last eight to ten hours. Its effect on the neurotransmitters dopamine and serotonin may also improve memory and learning ability. It also has mild antioxidant abilities. According to Carolyn Perrini, CLS, CNC, "Current areas of ongoing research include using L-theanine as an alternative to Ritalin in children and adults, as a treatment for PMS, in controlling certain conditions of high blood pressure, in sharpening mental acuity and concentration, and as an anti-cancer agent alone and in synergy with other cancer-fighting agents. L-theanine may find another area of application for its use as a supplement in reducing the negative side effects of caffeine brought on by the over-consumption of coffee, soft drinks, or other caffeine-containing substances."

**Precautions:** No known side effects. It is considered extremely safe, though pregnant and nursing women are discouraged from using it due to lack of research regarding any adverse reactions.

There are no known interactions with any food or drugs.

**Dosage:** The most effective range is 50 to 200 mg, which can be taken at the first sign of stress. The FDA recommends a maximum dose of 1200 mg/day.

## TRYPTOPHAN

**AKA:** L-tryptophan.

**Food sources:** Bananas, unripened cheese, chicken, chicken liver, chocolate, cottage cheese, evening primrose seeds, eggs, fish, lentils, meat, milk, peanuts, pineapple, pumpkin seeds, seaweed, shellfish, soybeans and soybean products, spinach, spirulina, sunflower seeds, tuna, turkey, yogurt.

**Effects:** Tryptophan is necessary for the manufacture of the neurotransmitter serotonin, which regulates mood and sleep patterns. It has been used in the treatment of jet lag, depression, binge eating, obsessive-compulsive disorder, some forms of vascular migraines, panic attacks (when taken with vitamin B-6), and chronic pain. One study found that repeated doses of tryptophan improved the memory of rats (Khaliq et al., 2007). A study of 42 countries found that there was a negative correlation between estimates of dietary tryptophan intake and national suicide rates, even after controlling for such factors as national affluence, alcohol consumption, and happiness levels (Voracek, 2006). Research at Leiden University in the Netherlands has found that the consumption of tryptophan is associated with feelings of trust.

A deficiency may be characterized by insomnia, mental disturbances (particularly aggressive behavior), depression, bad skin color and tone, brittle fingernails, indigestion, and a craving for carbohydrates.

**Precautions:** There is insufficient evidence for its use in the treatment of depression, seasonal affective disorder (SAD), ADHD, sleep disorders, and anxiety.

Side effects may include nausea, headaches, gastric discomfort, constipation, nausea, vomiting, diarrhea, loss of appetite, lightheadedness, drowsiness, dry mouth, blurred vision, muscle weakness, and sexual problems. Specific tryptophan metabolites could cause bladder cancer. If the level of tryptophan is high in relation to the other amino acids, fatigue may result. It is not recommended that more than 2 grams a day be taken; nausea and vomiting are likely to occur in doses used to treat depression (6 to 9 grams and higher), though some studies have given subjects as much as 15 grams a day with no serious consequences. Scientists have still not unraveled the complicated process by which tryptophan is converted into serotonin, and some question whether oral doses are effective in this regard. Because there are rare cases where tryptophan can cause excitability and insomnia, those who experience such symptoms should cease taking it immediately.

It may be harmful to pregnant women, and may worsen the symptoms of bronchial asthma and lupus.

When combined with anti-depressants, it could increase serotonin in the body to an unsafe level. It could enhance the effects of selective serotonin reuptake inhibitors such as fluvoxamine, fluoxetine, citalopram, amitriptyline, clomipramine, and nortriptyline if taken together (Lucini et al., 1996). When combined with sedative medications, it could increase sleepiness and result in serious side effects. When combined with St. John's Wort, it could result in high blood pressure and nausea.

In 1989, some 1500 people suffered debilitating health problems from impurities in a batch of L-tryptophan distributed by Showa Denko, a Japanese firm that did not specialize in drugs or nutritional supplements; 37 of them died and many more were left permanently handicapped. As a result, the sale of L-tryptophan supplements was banned in 1990. The FDA contends that the illness suffered by these victims, a blood disease called

eosinophilia-myalgia syndrome (EMS), and related illnesses are attributable to L-tryptophan itself. Cases have also been reported for uncontaminated batches and for the similar compound L-5-hydroxytryptophan, but many experts dispute the validity of these reports.

**Dosage:** For the cure of insomnia, Dr. Stuart Berger recommends 2 grams of tryptophan, 100 mg of vitamin B-6, and 1 gram of vitamin C on an empty stomach before going to bed, though some research indicates that 1 gram of tryptophan may be sufficient for most people (this applies only to late at night; to sleep during the day, the need for tryptophan will be higher); some supplemental B-3 (in a ratio of two parts tryptophan to one part B-3) and magnesium may also be helpful. High-tryptophan foods should be combined with carbohydrate-rich foods such as bread, pasta, or potatoes for best results. Proteins inhibit the brain's ability to absorb this amino acid. Eating sugary snacks can cause wild swings in insulin production and interfere with the body's ability to absorb tryptophan.

## TYROSINE

**AKA:** L-tyrosine.

**Food sources:** Fish, particularly shellfish.

**Effects:** Boosts the brain neurotransmitters epinephrine (adrenaline), norepinephrine (noradrenaline), and dopamine, though the mental stimulation only occurs if the brain has used up these neurotransmitters. Elevates mood and energy (it has been effective in treating patients with depression), improves reaction time, alertness, attention, and motivation. It may help protect the liver from damage due to carbon tetrachloride, and has been used to treat stress, PMS, cocaine abuse, and cases of uni-polar depression (i.e., unaccompanied by a manic phase) that do not respond to tryptophan. One study found that 150 milligrams per kilogram of body weight was able to partly counteract the negative effects of

sleep deprivation on cognitive and motor skills (Magill et al., 2003).

**Precautions:** The fish or shellfish should be baked, broiled, grilled, steamed, or stewed, as fat and deep-frying destroys some of the beneficial effects. For best results, eat fish alone or with carbohydrate-rich foods (e.g., bread, potatoes).

It appears to be ineffective in treating moderate depression, attention deficit disorder (ADD), and ADHD. There is insufficient evidence for its use in treating stress, chronic fatigue syndrome, Alzheimer's, and schizophrenia.

Side effects may include headache, nausea, fatigue, heartburn, and joint pain. Because it might increase blood pressure in a small percentage of susceptible individuals, those with high blood pressure should take it only under the guidance of a physician. It could also trigger headaches in those already susceptible. Tyrosine should not be taken by anyone with melanoma or thyroid disorders. It should not be used by women who are pregnant or breastfeeding, as effects are unknown.

Those taking MAO-inhibiting antidepressants should not take tyrosine supplements, as they can have adverse effects on blood pressure, as well as other serious consequences. Tyrosine may decrease the effects of levodopa. It should not be taken with St. John's Wort, as it could cause high blood pressure and nausea. Tyrosine appears to decrease some of the stimulant effects of amphetamines (McTavish et al., 1999).

Supplements should be taken with vitamins B-6 and C, as the brain needs these to turn the amino acid into norepinephrine. Supplements can create mild gastric problems if taken on an empty stomach. High doses can cause irritability, anxiety, and heart palpitations.

**Dosage:** The RDA has not been established. Three to four ounces of fish seems to be the optimal amount for most people; eating more will not result in any significant increase in effect. Leon Chaitow, N.D., D.O., recom-

mends 100 mg per kilo of body weight per day; a dosage of 6 g/day in three divided doses for a two week period is recommended for the treatment of depression. Mark Mayell recommends that dosage not exceed 2 to 3 g/day (initial dosage should be 250 to 500 mg/day, working up to 750 mg twice a day until effects are noticed), that it be taken on an empty stomach, that it not be combined with other amino acids, and that it be taken with 25 mg/day of vitamin B-6 or B complex and 250 to 500 mg of vitamin C.

## VALINE

**AKA:** L-valine.

A branched-chain amino acid.

**Food Sources:** Beans, dairy, legumes, meat, soy.

**Effects:** Normalizes the nitrogen balance in the body and it is necessary for proper mental and neural functioning, and for muscle coordination.

A University of Milan study found that, when given to healthy, middle-aged mice in combination with isoleucine and leucine, valine extended lifespan an average of 12 percent by increasing the activity of SIRT1 (a longevity gene), boosted the energy supply to cells by producing more mitochondria in the heart and skeletal muscles, and reduced free radical oxidative damage (Nisoli et al., 2010). In addition, the mice had more stamina and improved muscle coordination when compared with untreated mice. One study funded by the National Institutes of Health has found that, in combination with leucine and isoleucine—two other branched-chain amino acids—valine has shown promise as a treatment for amyotrophic lateral sclerosis (ALS), or Lou Gehrig’s disease. Subjects given these amino acids over the course of a year retained more of their muscle strength and ability to

walk than those given a placebo, a result which may have been due in part to leucine and isoleucine’s assistance in the breakdown of glutamate; valine was added because of a deficiency noted in the blood and cerebrospinal fluid of ALS patients. This combination also may prevent, and even reverse, liver damage resulting from alcoholism. Positive results have been recorded in the treatment of hepatic encephalopathy, chronic liver disease, and muscle atrophy in chronic heavy drinkers.

Deficiency symptoms include nervousness, disrupted sleep patterns and mental functioning, and a nitrogen imbalance in the body.

**Precautions:** An overdose can lead to feelings of “crawling skin” and hallucinations. Any physical or mental benefits of supplementation by healthy individuals are unproven.

**Dosage:** None established, though it is believed to be 10 mg per kilogram of body weight. According to Leon Chaitow, N.D., D.O., it should be taken with the following amino acids in these proportions: one part tryptophan, two parts valine, two parts methionine, and three parts phenylalanine.

## VHL1

**AKA:** pVHL, Von Hippel–Lindau tumor suppressor.

**Effects:** Regulates longevity in the *C. elegans* worm; a reduced level of this protein dramatically increases lifespan (Mehta et al., 2009; Müller et al., 2009).

**Precautions:** Reduced levels also promote tumor growth.

## WNT

**Effects:** A protein and signaling molecule that aids in embryonic processes and the development of young neurons.

## *Lipids*

Lipids are fats and fat soluble compounds, and this category can encompass a variety of essential nutrients, including the fat soluble vitamins, various steroid hormones, cholesterol, and the different dietary fats. After adipose tissue, the brain is the organ richest in lipids.

### AL721

**AKA:** Egg lecithin; EggsACT.

An extract of egg yolk, AL721 is seven parts neutral lipids, two parts phosphatidylcholine, and one part phosphatidylethanolamine.

**Effects:** Lecithin from egg yolk is said to improve thinking. It shows some promise in enhancing the immune system and in the treatment of herpes, AIDS, drug addiction, and alcohol dependency.

**Precautions:** Reports of improved mental abilities are only anecdotal. It should not be taken by those suffering from manic-depression, because it may deepen the depressive phase.

**Dosage:** 2 to 10 g/day is considered a sufficient dose, though it should be taken with 1 g/day of vitamin B-5.

### CHOLINE AND LECITHIN

Choline, an essential nutrient sometimes classified as a B vitamin, is a precursor to acetylcholine, an important neurotransmitter that aids memory, learning, and mental alert-

ness, and is necessary in maintaining cell membrane fluidity. It works with inositol to emulsify fats and cholesterol, and seems to have a synergistic effect with nootropic drugs. Choline can be manufactured by the body from folic acid, B-12, and methionine, and both choline and inositol are components of lecithin, a fat-like compound which destroys fats such as cholesterol. There are at least three different forms of choline—choline bitartrate, choline chloride, and phosphatidylcholine (or pure lecithin)—all of which may enhance memory, though phosphatidylcholine is a necessary component of every cell membrane in the body and is believed to have the best memory-boosting effect.

Lecithin is a natural compound composed of fatty acids, phosphorus, and choline which helps keep cell membranes from hardening.

**Food Sources (choline):** Very little free choline is found in foods, most of what we get being in the form of lecithin: beans, Brazil nuts, breast milk, brewer's yeast, cabbage, cauliflower, cheese, dandelion flowers, egg yolks, fenugreek, fish, liver, meat, peanuts, peas, poppy seeds, seed oils, soybeans, green leafy vegetables, and wheat germ. Soybean oil is the best source, containing 2 percent lecithin and supplying both essential fatty acids (Omega-3 [9 percent] and Omega-6 [57 percent]), unlike most other oils, which only supply Omega-6.



Food sources (lecithin): Cabbage, calves' liver, cauliflower, chickpeas, corn, eggs, green beans, lentils, fatty meats, and soybeans.

**Effects:** Reportedly improves memory in healthy people. One study found that MIT students showed a greater ability to recall a list of words after taking 3 grams a day; in fact, an improved memory can usually result after only a few days of taking choline or lecithin. Though individuals with Alzheimer's and Parkinsonian dementia suffer from a deficiency of acetylcholine in the brain, attempts to reverse the symptoms (loss of memory, judgment, and orientation, for example) with supplements of phosphatidylcholine, lecithin, or choline have proved disappointing, mainly because increased consumption will not reverse the impaired activity of acetylcholine transferase, which is necessary for cholinergic transmission (Amenta et al., 2001). Both have been shown to be effective treatments for bipolar disorder in those individuals who have shown little or no improvement with standard drugs such as lithium. Based on research conducted at Duke University and the University of North Carolina, it is thought that choline plays an important role in nerve cell division in the developing fetus, thus improving memory in the child after birth. Studies on rats have shown that choline taken during pregnancy can improve the memory of offspring and increase their IQ by 30 to 35 percent, though studies of human infants found that those who were breast fed had more modest increases of 5–10 IQ points over those who were formula-fed. Adequate prenatal and post-natal intake may also help to prevent schizophrenia in at-risk individuals later in life, and research at the University of Colorado Denver School of Medicine indicates that choline supplementation given perinatally lowers the risk factors for schizophrenia in newborns as exhibited in a one-month follow-up (Ross et al., 2013). One study published in the *Federation of American Societies for Experimental Biology Journal*

found that a combination of choline, uridine monophosphate, and docosahexaenoic acid improved the synapse activity of gerbils, indicating increased intelligence.

Both choline and phosphatidylcholine have the same effects, and both also emulsify cholesterol, lowering the blood cholesterol level, though choline needs inositol (another B-complex vitamin) to achieve this. Choline and inositol also maximize the efficiency of vitamin E. There is no definitive evidence that either choline or phosphatidylcholine protect against cardiovascular disease. They have been used to effectively treat tardive dyskinesia, but results have proven inconclusive in treating such other neurological disorders as Parkinson's disease, Huntington's disease, Tourette's syndrome, and Friedreich's ataxia. Some studies have shown that phosphatidylcholine is effective against viral hepatitis types A, B, and C, and chronic hepatitis, but only when it is accompanied by unsaturated fatty acids; phosphatidylcholine with unsaturated fatty acids may also play an anti-aging role by keeping cell membranes fluid, as a decrease in phosphatidylcholine and an increase in cholesterol as a consequence of aging makes these membranes more rigid. It is this same imbalance of the two that creates gallstones, and it is believed that supplementation may prevent such stones from forming, though this has yet to be proven.

Deficiency may lead to high cholesterol, high blood pressure, certain types of cardiac problems, skin problems such as psoriasis, low tolerance of fats in the diet, cirrhosis and fatty degeneration of the liver, hardening of the arteries, gastric ulcers, gall stones, liver disease, memory deficits, and Alzheimer's disease.

Lecithin is said to be helpful in the treatment of fatigue, insomnia, bipolar depression, memory loss, and (in combination with certain drugs) Alzheimer's disease.

**Precautions (choline):** Choline should not be taken by those with bipolar disorder, as it may worsen the depression (even those

who aren't bipolar may experience depression if taking doses in the range of 20 grams a day), nor should it be taken by those with Parkinson's disease, epilepsy, or those taking prescription anticholinergic drugs. Though choline may prevent schizophrenia in susceptible individuals, this has not yet been proven, and it is definitely not a cure for schizophrenia (there is, in fact, no recognized cure for schizophrenia). Those with gastric ulcers or a history of ulcers should only take choline under a doctor's orders. Though women who are pregnant should include choline-rich foods in their diet, some should be avoided: liver is also high in retinol, which can cause birth defects, and swordfish and tuna are high in mercury, which is extremely harmful to the brain.

Certain forms of choline, such as choline bitartrate and choline chloride can cause a fishy body odor and diarrhea, especially if more than 16 grams a day are taken. The body odor and diarrhea are often the result of intestinal bacteria breaking down the choline into trimethylamine (though liver disease may also be a cause), and may be prevented by eating yogurt, eating a high-fiber diet, or drinking acidophilus milk. A strong, often fishy, body odor may also occur in individuals with the genetic disorder trimethylaminuria, a condition in which the body cannot break down trimethylamine, and it may be necessary to restrict consumption of foods containing choline. Other overdose symptoms include nausea, vomiting, and dizziness. Choline can also cause muscle tension, a stiff neck, headaches, restlessness, insomnia, and gastric cramps. Lecithin may not cause these, but it does have two significant drawbacks—the supplements sold in health food stores usually have lots of fat, and they can usually peroxidize (go rancid) quite easily. Peroxidized fats in lecithin can damage DNA, impair the immune system, and cause atherosclerosis, cancer, and abnormal blood clots. Symptoms of choline deficiency include fatty liver, hemorrhagic kid-

ney necrosis, and muscle damage; those most at risk include endurance athletes, postmenopausal women, and individuals who drink a lot of alcohol. An analysis of data from 2003 to 2004 found that fewer than 10 percent of Americans consumed adequate levels (Zeisel and da Costa, 2009), though the body may be able to synthesize some of what it needs.

Very high doses of choline over an extended period of time may produce a vitamin B-6 deficiency. There is no known toxicity level for choline.

Choline and lecithin can be destroyed by alcohol, estrogen, food processing, refined flour, refined sugar, sulfa drugs, and water. Consuming large amounts of caffeine (coffee, tea, soft drinks) can deplete the amount of inositol in the body.

Choline may exacerbate the negative effects of nicotine and interact with antidepressant drugs and morphine.

**Precautions (lecithin):** Only the polyunsaturated form, from soybeans and vegetables, can process fat and cholesterol; eggs and other animal products contain the saturated form. Supplements are not necessary if a well-balanced diet is consumed, though supplementation may be necessary if niacin or nicotinic acid is being taken for the treatment of high cholesterol, as the B vitamins can deplete the choline in the body.

Serious side effects include loss of appetite, nausea, vomiting, diarrhea, abdominal bloating, gastrointestinal pain, and dizziness.

There are no known drug interactions.

**Dosage (choline):** Phosphatidylcholine is more beneficial when consumed in foods that have polyunsaturated fatty acids (e.g., soybeans and soybean products, cauliflower, cabbage) than in foods that are high in saturated fatty acids (e.g., egg yolk, meat, and other animal products). The intake of phosphatidylcholine by the average American is 3.1 g/day, or 300 mg of choline; this is higher than that consumed by Europeans, but may still be too

low, according to some. The recommended intake for choline is 425 mg/day for women (450–550 mg/day if pregnant or nursing) and 550 mg/day for men; the National Academy of Sciences recommends a maximum of 3.5 g/day. The RDAs of either have not been established, and much research needs to be done in this area. Recommended dosage is 2.5 to 3 g/day in three to four divided doses; other B vitamins, including 1 gram of B-5, should be taken with any form of choline or lecithin to help convert them to acetylcholine, and they should be taken with meals to aid in absorption. Sheldon Saul Hendler, M.D., Ph.D., states that up to 10 g/day of phosphatidylcholine or 1 g/day of choline can be taken without side effects. Fifteen to 30 g/day have been found to be effective in treating bipolar disorder and Alzheimer's disease, though these doses should only be taken under the guidance of a physician. Some recommend that 2.5 to 3.5 g/day (approximately 1 gram three times a day) be taken by women in the third trimester of their pregnancy.

**Dosage (lecithin):** If taking lecithin, a supplement of chelated calcium should also be taken to keep a stable balance of phosphorus and calcium in the body. Dharma Singh Khalsa, M.D., also recommends taking DMAE with lecithin, despite the fact that it may be too stimulating for some people. Lecithin has a time-release effect, so it is only necessary to take it twice a day, though the dose may have to be larger, as most supplements only contain 10 to 20 percent phosphatidylcholine (look for supplements that contain at least 35 percent phosphatidylcholine).

## CYTIDINEDIPHOSPHOCHOLINE

**AKA:** CDP-choline, citicoline, cytidine diphosphate choline.

**Effects:** CDP-choline is the active form of choline and a precursor of phosphatidylcholine. It is used in Japan and parts of Europe

to stimulate brain circulation following brain injury or brain surgery, and to treat Alzheimer's disease, severe depression, Parkinson's disease, and similar degenerative brain disorders. Though the exact mechanism by which it works is unknown, it is believed to increase the blood flow and the utilization of oxygen in the brain. It also reduces edema formation and blood-brain barrier disruption resulting from traumatic brain injury, may reduce cell damage from ischemia by preventing the release of free fatty acids, and may defend cell membranes from damage by speeding up the resynthesis of phospholipids. Doses of 200 and 400 mg/kg administered intraperitoneally in rats after traumatic brain injury prevented significant loss of neurons in the hippocampus, reduced cortical contusion volume, and enhanced neurological recovery (Dempsey et al., 2003). It may also prevent brain and skull damage in the fetus from alcohol consumption in the first trimester of pregnancy by blocking the formation of too much ceramide, a lipid that can destroy critical growth cells (Bieberich and Wang, 2013). It may provide some short- to medium-term benefits to the elderly with chronic cerebral disorders, specifically with regard to memory and behavior (Fioravanti and Yanagi, 2005).

**Precautions:** Differences in study methods make it difficult to determine the efficacy of this substance (Fioravanti and Yanagi, 2005). CDP-choline can cause agitation, dizziness, headaches, nausea, and loss of blood pressure.

**Dosage:** None established.

## DHA

**AKA:** Docosahexaenoic acid.

A polyunsaturated fat that is the main structural fatty acid in the brain's gray matter, it is mainly found in fish oils.

**Food Sources** (in descending order of total beneficial fish oils): Herring, salmon, bluefish, tuna, cod, shrimp, flounder, swordfish.

**Effects:** An important component in the

development of vision, and necessary for the transmission of messages via the nervous system throughout the body. It can also protect against cardiovascular disease, arthritis, and possibly cancer, and may prove to be useful in treating kidney disease. It is essential for the growth and development of the infant brain, and is necessary to maintain normal function in the adult brain. One study has shown that subjects given fish oil with 50 percent docosahexaenoic acid—or about four times as much as is normally present—showed a significant decrease in aggression. DHA may help reduce the risk of developing Alzheimer's disease by increasing the levels of LR11 (a protein that can prevent the formation of beta amyloid plaques) in the brain (Ma, et al., 2007; Cole et al., 2011), but have no effect once symptoms begin to occur. One study found that a combination of choline, uridine monophosphate, and docosahexaenoic acid improved the synapse activity of gerbils, indicating increased intelligence (Holguin et al., 2008).

A deficiency in infants can play a factor in fetal alcohol syndrome, attention deficit hyperactivity disorder, cystic fibrosis, phenylketonuria, depression, aggression, and adrenoleukodystrophy. In adults, it can contribute to cognitive decline, Alzheimer's disease, and myocardial infarction.

**Precautions:** Supplements lack sufficient vitamin E to prevent them from rapidly peroxidizing, or going rancid. Supplements should be used only under a physician's guidance by those who have a tendency to hemorrhage or bleed easily, as it can reduce the ability of the blood to clot, or by diabetics, as it can increase blood sugar and decrease insulin secretion in the body. Taking very high doses could also result in hemorrhaging in normal individuals. The need for vitamin E may increase as a person's intake of DHA increases. Supplementation has not been found to slow the rate of cognitive and functional decline in individuals suffering from mild to moderate Alzheimer's disease (Quinn et al., 2010). Fish

oil supplements containing DHA ethyl ester do not have the blood pressure-lowering properties of natural DHA (Hoshi et al., 2013).

**Dosage:** Sheldon Saul Hendler, M.D., Ph.D., does not recommend taking supplements, except for those with hypertension, ischemic heart disease or any other condition that could lead to health-threatening clotting of the blood, rheumatoid arthritis or related inflammation, or psoriasis; in these cases, he recommends 2 to 4 g/day under a doctor's supervision. It is best utilized when combined with eicosapentaenoic acid (EPA), another fish oil fatty acid, and taken with adequate amounts of vitamin E and selenium.

## FATS AND OILS

The largest number of fat cells in the body are found in the brain, where they make up 60 percent of the total brain mass, and play an important role in neural communication. The body manufactures all the fats it needs, except for two—alpha-linolenic acid (also known as omega-3 or Alena, short for *alpha-linolenic acid*), and linoleic acid (also known as omega-6 or CLA, short for conjugated linoleic acid), which are called the essential fatty acids (EFAs). There are different types of omega-3 fatty acids, including eicosapentaenoic acid or EPA (found in fish oil), gamma-linolenic acid (found in borage seed and primrose oil), docosahexaenoic acid (DHA), and docosapentaenoic acid (DPA). Omega-9 fatty acids, specifically oleic acid, do not affect the brain, though a deficiency can have an adverse affect on the fatty acids of other tissues of the body.

Unfortunately, the most important EFA, omega-3, is the one people are most deficient in, and this can lead to such chronic degenerative diseases as cancer, heart disease, high blood pressure, and strokes. Lack of it can also lead to decreased mental functioning. The reason for this lack is threefold: the introduction of white flour, which removes important vitamins, minerals, and fiber; the consumption of

beef as the main source of protein; and the processing (or hydrogenation) of vegetable oils. The kinds of fats commonly ingested, from those in beef to hydrogenated oils, don't do much good and, in the case of hydrogenated fats and oils, can even be toxic to the brain. Hydrogenated fats are known to increase levels of cholesterol and triglycerides in the body, leading to heart disease, heart attacks, and stroke.

While hydrogenated fats (also known as trans fats or trans fatty acids) are harmful because they are processed, natural and unprocessed fats and oils can be harmful, too. In addition to being classified as essential or non-essential, they can be categorized according to their degree of saturation. There are three basic types: saturated, polyunsaturated, and monounsaturated. Saturated forms, such as butter and animal fats, can contribute to cancer, cholesterol buildup, heart disease, and other degenerative illnesses, however a 2014 review of eighty studies involving over half a million individuals found that saturated fats are not linked to an increased risk of heart disease. These fats compete with and slow down those metabolic processes dealing with the essential fatty acids, depriving cells of nutrients and prohibiting the evacuation of toxins, eventually leading to cells that are malnourished and loaded with toxins; when this happens, the results are poor thinking, memory loss, cardiovascular problems, and an overall loss of health. Polyunsaturated forms such as safflower oil, soy oil, and sunflower oil oxidate and turn bad quickly, particularly when heated and exposed to air. One 2009 study conducted at the Universitat Autònoma de Barcelona found that mice fed a diet of antioxidant polyphenols and polyunsaturated fatty acids had increased levels of neurogenesis (the production and differentiation of new brain cells), particularly in the olfactory bulb and hippocampus. Monounsaturated oils like high oleic safflower, high oleic sunflower, olive, peanut, and sesame oils are more stable and

less likely to oxidize. In general, cold-climate oils are more beneficial than warm-climate oils.

**Food Sources:** Eel and cold-water fish such as herring, krill (*Euphausia superba*, okiami), mackerel, salmon, sardines, trout, and tuna (albacore and bluefin) are good sources of omega-3, as are breast milk, canola oil, hazelnuts, linseed oil, flaxseed oil, kiwi, seeds, soybeans, tofu, leafy green vegetables, walnuts, eggs, red meat, and animal organs. The oil of the Chinese water snake (aka Erabu sea snake), used in traditional Chinese medicine, has been found to have 20 percent EPA, or 2 percent more than salmon. According to biochemist Dr. Haengwoo Lee, calamarine has some of the highest concentrations of omega-3s of any food. A DHA extract recently developed from the marine algae *cryptocodinium cohnii* could be a good source of omega-3 for vegans. Primrose oil is a good source of omega-6.

**Effects:** DHA is necessary for the growth and development of the infant brain, and for the proper functioning of the adult brain. A Harvard study found that pregnant women who ate fish during the second trimester gave birth to infants who performed better on cognitive tests six months after birth, and an Australian study found that children who drank a beverage fortified with omega-3 performed better on tests of verbal intelligence and memory than their peers. Since damage to fats is central to biological aging, eating good fats is important to developing and maintaining the healthy brain. Four grams a day of omega-3 reduce cholesterol and blood pressure, and as little as two servings of fish a week may protect against heart disease. Fish oil may protect against nervous system disorders such as multiple sclerosis, as these occur at higher rates in inland areas. One study has shown that subjects given fish oil with 50 percent docosahexaenoic acid—or about four times as much as is normally present—showed a significant decrease in aggression. Krill oil, developed from the tiny shrimp-like crustaceans in

Antarctic waters, is said to be superior to fish oil in its health benefits, and has been found to improve nutrient flow to the bloodstream, as well as possibly improving mental concentration and focus. Krill oil also contains astaxanthin, an antioxidant that can cross the blood-brain barrier (other antioxidants cannot), potentially protecting the eyes, brain, and central nervous system from damage by free radicals. Paul Montgomery and colleagues at the University of Oxford have found that, in children, fish oil supplementation leads to longer periods of sleep with fewer problems, possibly due to DHA's release of melatonin. A 2012 Ohio State University study involving over one hundred men, mostly middle-aged and overweight, found that a four-month regimen of omega-3 supplements reduced oxidative stress by 15 percent, and helped maintain telomere length, an important indicator of aging in the body. It may improve attention in adults, though more research is needed to determine efficacy (Ross et al., 2007). A review of double-blind clinical trials found that omega-3 can reduce the symptoms of depression (even in individuals with major depressive disorder (MDD) and bipolar disorder) and may help control anxiety disorders, though it was unclear if EPA was better than DHA in this respect (Ross et al., 2007). DHA may protect against Alzheimer's by decreasing the actions of prostaglandins, or hormone-like molecules that trigger inflammation in the body, increasing the production of the brain protein LR11, which helps destroy beta amyloid plaques, and interfering with the accumulation of the protein tau, which promotes the development of neurofibrillary tangles, or lesions, in the brain (Ma et al., 2007; Cole et al., 2011). A study conducted by the Columbia University Medical Center in New York found that, in individuals over 65 years of age, consuming one gram of omega-3 fatty acids per day (e.g., fish, chicken, nuts) lowered beta-amyloid levels in the blood by 20 to 30 percent (Gu et al., 2012). A 2006 Tufts University study found

that elderly people who consumed omega-3 from fish had a 43 percent less risk of developing Alzheimer's than those who consumed significantly less of these oils; however, a later study (Joseph Quinn et al., 2010) found that fish oil supplementation had no effect on those already diagnosed with mild to moderate Alzheimer's. And a long-term study of 9000 mothers and their children in the city of Avon in England found that there was a direct correlation between the amount of fish and omega-3 fatty acids consumed by the pregnant women and the development of motor skills, verbal IQ, and social interaction in their offspring.

A 2014 study conducted by Damien Fair, PA-C, Ph.D., at Oregon Health and Science University found that monkeys who had a diet high in omega-3s—particularly DHA—had stronger neural connections in their visual pathways, as well as stronger connections in the parts of the brain necessary for higher-level thinking.

Fish oils may have other remarkable properties that warrant further study. Dr. Mary Megson, a fellow of the American Academy of Pediatrics has used cod liver oil for years to treat thousands of children with autism; less than a teaspoon a day is all that is needed to bring most of them out of the autism spectrum after six months, and some make the first eye contact in their lives after only three days. And Dr. Alexandra Richardson has published results showing that a combination of EPA and omega-6 can successfully treat concentration, attention, and behavior problems in children suffering from dyslexia, dyspraxia, and ADHD, with the ADHD group showing improvements comparable to those seen with Ritalin. It has also been found that omega-3 oils can reduce problems in some children with visual problems related to the magnocellular pathway, which perceives the motion and placement of objects.

A deficiency of omega-3 seems to be associated with behavior, learning, and health

problems (e.g., allergies, arthritis, asthma, diabetes), and there appears to be a strong correlation between a deficiency and anxiety and depression, specifically low serotonin levels in the brain (Lafourcade et al., 2011); researchers have also found that omega-3 deficiency can weaken the blood-brain barrier (Ziylan et al., 1992) and decrease the flow of blood to the brain (Ito et al., 1996; Kimbrell et al., 2002). Low consumption of fish is correlated with postpartum depression (Hibbeln, 1998) and seasonal affective disorder (Cott and Hibbeln, 2001). Certain brain structures, such as the frontal cortex and the pituitary gland, are affected more than others, leading to behavior disorders related to habituation and adaptability to new situations. Other symptoms include thirst, frequent urination, dry skin, and loss of pleasure (partly due to impairment of hearing, vision, and smell). A deficiency of omega-6 seems to be associated with colds and increased use of antibiotics. An imbalance of these two fatty acids is said by some to be associated with cancer, heart disease, diabetes, arthritis, and obesity.

Fish oil's anti-inflammatory effects and heart benefits appear to be enhanced when taken with aspirin.

**Precautions:** A 2013 University of Iowa study of 2000 elderly women conducted by Eric Ammann and colleagues found that omega-3s did not provide any protection against mental decline over a six-year period. And Toshinori Hoshi, PhD, of the Perelman School of Medicine, University of Pennsylvania, and colleagues have concluded two studies that show that, while fish oils are good at lowering blood pressure, the DHA ethyl ester found in fish oil pills fails to achieve the same effect, and may actually be detrimental, as it competes with natural DHA at ion channels in cell membranes (Hoshi et al., 2013; Hoshi et al., 2013).

Diabetics should avoid taking fish oil capsules; they can raise blood sugar and lower insulin secretion, worsening their condition.

Pregnant or nursing women should consult a physician before taking fish oil supplements. Fish oil and krill oil supplements may cause a reaction in individuals with a seafood allergy. Krill oil in any form should be avoided by women who are pregnant or nursing, as side effects are not yet known. Fish oil supplements in high dosages should not be taken by those with inflammatory bowel disease (IBD) as it can induce severe colitis and aggressive colon cancer (Fenton et al., 2010), and both fish oil and krill oil supplements should not be taken within two weeks before surgery, as it can increase the risk of bleeding.

Common side effects include anemia, adverse effects from ingesting high levels of environmental toxins (both fish and fish oil capsules, though it should be noted that a 2004 analysis by ConsumerLab.com found no unsafe levels of mercury or PCBs in nearly four dozen brands of omega-3 supplements), and toxic levels of vitamins A and D (fish oil capsules and cod liver oil). Still, you should probably look for supplements that state there are "no detectable levels" of contaminants, as "pharmaceutical grade" and "molecularly distilled" are too vague to provide useful information. Other side effects of fish oil supplements (though probably not krill oil supplements) include bad breath, a fishy taste in the mouth, upset stomach, nausea, and loose stools. Rare side effects include gas and a mild increase in the risk of infections. One study found that men with high blood levels of omega-3 fatty acids doubled their risk of developing aggressive prostate cancer compared with those who had low levels (Brasky et al., 2011). A 2008 analysis found that more than half of 27 tested brands of fish oil and cod liver oil supplements sold in Great Britain fell short of the active ingredients listed on the labels.

A review of double-blind clinical trials found that omega-3 had virtually no effect on individuals with schizophrenia or borderline personality disorder, and no more than small benefits for those with attention deficit hyper-

activity disorder and similar disorders (Ross et al., 2007).

It is necessary to determine the intake of omega-3 and omega-6 and reduce fat intake, particularly saturated fats, as eating a lot of fish cannot counteract a high-fat diet. Remove all partially hydrogenated fats from the diet and use cooking oils only once. Never deep-fry (avoid eating at fast-food restaurants). Use oils such as olive (especially extra virgin olive oil, as it is the most natural type), canola, high oleic sunflower, and high oleic safflower when quick-frying, and butter when sautéing; use butter or monounsaturated oil for baking. For salad dressings, use only unfiltered, expeller-pressed vegetable oils, and then only sparingly. Don't cook with polyunsaturated oils; they should only be used in salads and other uncooked foods. Keep oil in the refrigerator after opening; don't heat oil until it smokes, as it is highly carcinogenic. If an oil is rancid or smells bad, don't use it. Diets heavy in highly unsaturated omega-3 oils should be supplemented with antioxidants (vitamin C, vitamin E, selenium, beta-carotene), as omega-3 is easily destroyed by light, oxygen, and high temperature.

Fish from fast-food restaurants are not recommended, as they are white fish cooked in unhealthy fats and almost completely depleted of omega-3. Be aware that cultured or pond-reared freshwater fish, such as much of the white fish sold in the U.S., may have very little omega-3 (they may also be high in pesticides and such industrial chemicals as PCBs). Some experts, including Dr. David O. Carpenter of the Institute for Health and the Environment at the University of Albany, and Jeffrey A. Foran, president of the Midwest Center for Environmental Science and Public Policy, say that the risks from pollutants in farm-raised Atlantic salmon exceed the benefits; Antarctic krill can also contain significant levels of toxins. Wild Pacific salmon was safer, and farm-raised Chilean salmon had the lowest levels of pollutants. *Consumer Reports* found in a 2011 study of 42 samples of tuna that all had de-

tectable levels of mercury, and that albacore tuna had much higher levels than light tuna, though there were occasional spikes in mercury levels in the latter. Consumers Union recommends that pregnant women not eat any tuna (eating just half a can, or 2.5 ounces, would exceed the daily mercury level that the Environmental Protection Agency considers safe), and that children limit their intake to four ounces or less of albacore tuna. Other fish high in mercury include king mackerel, shark, swordfish, and tilefish. Those low in mercury include clams, Alaskan salmon, shrimp, tilapia, oysters, pollock, sardines, Pacific flounder and sole, herring, mullet, and scallops.

Taking too much omega-3 in capsule form may overstimulate the prostaglandins, harming the body. It can also prevent the normal clotting of blood and raise overall blood cholesterol levels, even though it raises only HDL cholesterol. Fish oil capsules are high in cholesterol, and those that aren't may contribute to cell-destroying lipid peroxidation. They may also cause toxicities of vitamins A and D, contain high levels of environmental contaminants, and cause fragile cell membranes. Additionally, other substances in fish may contribute to omega-3's beneficial effects and may not be present in fish oil capsules. Because they could cause slow clotting of the blood and excessive bleeding, fish oil supplements should be stopped about two weeks before surgery, and avoided by those whose blood does not clot normally. Avoid cod liver oil, which has high concentrations of vitamins A and D, fat-soluble vitamins that can easily build up to toxic levels in the body.

The effects of omega-3 in flaxseed is assumed to have the same effects as the omega-3 in fish, even though research has been conducted almost exclusively on fish oil and the results extrapolated to flaxseed, and even though the alpha-linolenic acid in fish oil is already converted to eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) while that in flaxseed oil has to be converted in the body. A



significant number of people, especially when ill, have a limited capacity to biochemically convert the flaxseed oil. Still, flaxseed oil has one hundred times the level of lignans, or beneficial compounds, of other plant foods, and it has been used to treat lupus, high cholesterol and other cardiovascular diseases, allergic and inflammatory conditions (e.g., psoriasis, eczema), and autoimmune diseases (e.g., multiple sclerosis, rheumatoid arthritis, cancer).

Omega-3 oil supplement should meet the following requirements: it should be in a black plastic bottle so as to prevent exposure to light (brown glass is unacceptable, as it still allows certain wavelengths of light to enter), and the bottle should have both a pressing date and a four-month expiration date; it needs to be refrigerated at all times when not in use; and it should have some color to it, as clear and colorless oils have most likely been deodorized and bleached.

Krill oil supplements should have at least 400 mg of phospholipids per 1000 mg capsule and at least 1.5 mg of the antioxidant astaxanthin.

When either fish oil or krill oil is combined with aspirin or anti-coagulant drugs (clopidogrel, dalteparin, doclofenac, enoxaparin, heparin, ibuprofen, naproxen, and warfarin, among others), there will be a decrease in coagulation of the blood and—with aspirin—an increase in the anti-inflammatory effect of the fish oil; a physician should be consulted beforehand. This also holds true for individuals taking herbs and supplements that thin the blood and increase the risk of bleeding, such as ginkgo biloba and garlic. There should be at least a two-hour span between taking krill oil and orlistat, as the weight-loss drug will decrease the absorption of krill oil.

**Dosage:** Before modern food processing stripped most of the omega-3 fatty acids from foods and introduced hydrogenated fats, keeping the levels of omega-3 and omega-6 oils in balance was no problem; now, however, omega-6 consumption can be 10 to 20 times

that of omega-3 intake; the optimum ratio is considered to be 1:1 (though anthropological evidence indicates that our ancestors consumed omega-6s and omega-3s at a ratio of 2:1). Though the optimal range of omega-3 in the diet has not yet been determined, it is recommended that 3 or 4 ounces of fish be eaten two to three times a week. Phospholipids (which contain phosphorus as well as fatty acids) from animal sources are more effective at reversing alpha-linolenic acid deficiency than those from plant sources. When taking flaxseed oil, take one tablespoon twice a day, and with fish oil capsules, it is recommended that one-half gram a day be taken for brain health, and 2 to 4 g/day for heart health, but no more than 5 g/day. The American Heart Association recommends a combination of EPA and DHA for a total of 2000 to 4000 mg/day for those with elevated triglyceride levels, and a combination of EPA and DHA for a total of 1000 mg/day for those with heart disease. Clinical trials suggest that 400 mg/day to 1 g/day provide optimal protection against depression, borderline personality disorder (which manifests itself—but is not limited to—depression, aggression, and compulsiveness), and Alzheimer's (exceeding this amount affords no additional protection); with depression, the EPA form seems to be more efficacious than DHA. Dr. Donald Rudin recommends one teaspoon of linseed oil (about 2 grams of omega-3 fatty acids) as a minimum daily requirement to correct any nutritional deficiency. Those with serious degenerative diseases might need more, but should take higher doses only under the guidance of a qualified health professional. The optimal dosage for krill oil has not yet been established.

## LIPOTROPES

Lipotropes are substances attracted to fat, the four most important being choline, folic acid, methionine, and vitamin B-12.

**Effects:** They play an important role in the synthesis of phosphatidylcholine, prevent the accumulation of fat in the liver, and are necessary for DNA synthesis, maintaining immunity, and preventing cancer.

Cytidine diphosphate choline (CDP-choline) and S-adenosylmethionine (SAM) are the active forms of choline and methionine. CDP-choline is used in Japan and Italy to stimulate brain circulation following brain injury or brain surgery, and to treat Alzheimer's disease, severe depression, Parkinson's disease, and similar degenerative brain disorders. Though the exact mechanism by which it works is unknown, it is believed to increase the blood flow and the utilization of oxygen in the brain. One of the forms, SAM, is being investigated as a treatment for depression, fibromyalgia, and osteoarthritis.

**Precautions:** CDP-choline can cause agitation, dizziness, headaches, nausea, and loss of blood pressure. For SAM, see entry under SAmE.

## PHOSPHATIDYLSERINE

**AKA:** LECI-PS, PS.

One of the four main phospholipids found in lecithin; the others are phosphatidylcholine (PC), phosphatidylethanolamine (PE), and phosphatidylinositol (PI). All are vital components of cell membranes. Phosphatidylserine has its highest concentration in the brain, where it plays a role in various nerve cell functions. It has proven superior to ginkgo biloba and other herbs in its benefits.

**Food sources:** Fish, rice, soy products, green leafy vegetables.

**Effects:** It improves brain functioning in all areas measured: the functioning of nerve cells, electrical activity in the brain, the ability to handle stress, daily hormone rhythms, memory, learning, concentration, vocabulary skills, mood, alertness, and sociability. It has been used effectively in the treatment of people both in the early stages of Alzheimer's and in

severe cases. One study involving rats indicates that phosphatidylserine derived from soy enhanced cognitive abilities, while that derived from eggs did not (Blokland et al., 1999). Researchers at Tel Aviv University's Department of Human Molecular Genetics have shown it can improve gene functioning associated with various brain disorders such as Parkinson's disease and Familial Dysautonomia (FD), though only in mice and in cells taken from patients with FD.

**Precautions:** No known side effects.

**Dosage:** 100 to 200 mg/day to be taken with meals. It should not be taken too late in the evening. A PS "complex" may only be 20 percent pure PS, and so the dosage should be adjusted accordingly.

## SAmE

**AKA:** Ademetionine, S-adenosyl-L-methionine, S-adenosylmethionine, SAM.

SAmE is the active form of methionine and occurs naturally in the body.

**Food sources:** Fish, rice, soy products, green leafy vegetables.

**Effects:** One small study found that it had an anti-depressant effect in normal healthy volunteers (Saletu et al., 2002).

**Precautions:** There is insufficient evidence for its use in treating ADHD, anxiety, and chronic fatigue syndrome, or for improving intelligence.

Side effects may include gas, vomiting, diarrhea, constipation, dry mouth, headache, sweating, dizziness, nervousness, anxiety, insomnia, and anorexia.

It should not be taken by women who are pregnant or breastfeeding, as effects are not known. It should not be taken by those suffering from bipolar disorder or Parkinson's disease, as it could worsen these conditions. Usage should be stopped at least two weeks before surgery, as complications could result.

When combined with anti-depressant medications, dextromethorphan, pentazocine,

meperidine, or tramadol, it could increase the amount of serotonin in the body and subsequent side effects. When combined with levodopa, it could decrease the effectiveness of this drug.

**Dosage:** For depression, 400 to 1600 mg/day.

### VEGETABLE OILS

**Food sources:** Canola oil, corn oil, soy oil.

**Effects:** A good source of linoleic acid (omega-6). See entry for Fats and Oils.

**Precautions:** No known side effects. Kevin Fritsche, a University of Missouri professor of animal science and nutrition, and Guy Johnson, a University of Illinois adjunct professor of food and human nutrition, in a 2013 review of clinical trials involving the consumption of various fats, concluded that vegetable oils do not cause inflammation in the body, contrary to what was found in studies involving animals.

**Dosage:** The American Heart Association recommends 2 to 4 tablespoons a day in foods and cooking oil.

## *Nucleic Acids*

Nucleic acids are large molecules which contain genetic material.

M.D., Ph.D., does not recommend supplementation.

### OROTIC AND INOSINIC ACIDS

**AKA (inosinic acid):** Hypoxanthine riboside, inosine.

**Effects:** Orotic acid is a possible B vitamin and is a precursor of the pyrimidines, which help manufacture nucleotides and nucleosides. Both orotic and inosinic acids are converted by the body into DNA. A few Russian studies have shown that they may be helpful in treating hearts damaged by heart attacks, congestive heart failure, and cholesterol, but much more research needs to be done. Inosinic acid promotes the dilation of blood vessels—increasing blood flow and oxygen delivery in the body—and increases both RNA and DNA production. Athletes use inosinic acid to stimulate protein synthesis in muscle cells, presumably building muscle mass.

**Precautions:** According to W. Nathaniel Phillips, dosages higher than 2 grams a day degrade into uric acid, which can cause joint pain and kidney stones after prolonged use. Those with kidney disease or other kidney problems should avoid using this supplement.

**Dosage:** Phillips recommends 1.5 to 2 g/day an hour before workouts or training, but only for athletes whose training sessions are long and rigorous. Sheldon Saul Hendler,

### RIBONUCLEIC ACID

**AKA:** Ampligen, Poly (A)/Poly (U), Poly (I,C), RNA.

Levels of RNA decrease starting at age 40, along with its resistance to misprogramming of the genetic code caused by the by-products of lipid peroxidation.

**Food sources:** Brewer's yeast, sardines.

**Effects:** Has improved memory in lab animals and protects against oxidizing chemicals contributing to aging, thereby slowing the deterioration seen in older people. It has increased the life span of lab rats by 20 percent, increased immunity to bacterial and fungal infections in humans, and may have anti-cancer properties.

Poly (A)/Poly (U) and Poly (I,C) are two synthetic polyribonucleotides that have shown promise as anti-cancer treatments, particularly in regard to breast cancer.

**Precautions:** It should not be taken by those with gout or high urate levels, as it produces large amounts of uric acid, the cause of gout (the uric acids forms crystals in the joints and kidneys, resulting in extreme pain and permanent damage to the body). Its acidity can also cause upset stomach, possibly prevented with the ingestion of baking soda with the supplements.

Yeast can be 6 to 10 percent RNA but does little good because the cell walls of the plant cannot be digested to any significant extent by the body. Any supplement with less than 12 percent RNA is also of limited value, as it, too, can have too little RNA to have any effect.

**Dosage:** No side effects have been reported for normal people given up to 80 g/day. Sheldon Saul Hendler, M.D., Ph.D., recommends taking up to 1.5 g/ day, or about one tablespoon of brewer's yeast.

## *Miscellaneous Nutrients*

### ACETYL-L-CARNITINE

**AKA:** 3-hydroxy-4-(trimethylazaniumyl) butanoate, ALC, Alcar, carnitine, Carnitor, D-carnitine, DL-carnitine, L-acetylcarnitine, L-carnitine, levocarnitine, N-acetyl-l-carnitine, ProXeed, VitaCarn, vitamin BT.

Though a nutrient, ALC belongs neither to the vitamin nor the amino acid category. It is chemically similar to carnitine but is more efficient. While it is synthesized by the liver from lysine and methionine, adequate amounts of vitamins C, B-3, and B-6, plus iron, lysine, and methionine are needed in the diet for this to occur, and men run a greater risk of deficiency than women. There are two forms of carnitine: L-carnitine and D-carnitine, the former being the biologically active form and the latter being the inactive form which may counteract L-carnitine's benefits.

**Food Sources:** Meat, milk and dairy products. The amount of carnitine in meat is in direct proportion to the redness of the meat. Small amounts are also found in avocados, tempeh, and many other foods.

**Effects:** Chemically related to choline, ALC has many of the same effects. It acts as an antioxidant (increasing the antioxidant effect of vitamins C and E); increases the levels of choline acetyltransferase in the brain; transports fats into the mitochondria, the part of the cell which creates energy; enhances com-

munication between the brain's hemispheres; reduces triglyceride levels and removes ketones (fat waste products) from the blood; helps control hypoglycemia; alleviates angina attacks; and has been used in the treatment of diabetes, infertility, liver disease, and kidney disease. It may help fight cancer by boosting the effect of lymphocytes, white blood cells that serve the immune system. It also slows down the cell damage caused by age-related conditions and may accelerate the repair of damaged DNA in cells ravaged by free radicals. It may help protect the brain from the effects of aging by preventing the accumulation of lipofuscin in the brain. Studies have shown that doses of anywhere from 2000 to 3500 mg a day can slow the onset of Alzheimer's and mental deterioration, specifically memory, attention, language ability, alertness, motor activities, and spatial abilities, though it may take up to six months to begin to work; some—*Textbook of Natural Medicine* authors Joseph E. Pizzorno and Michael T. Murray among them—believe supplementation may only be beneficial to those who are deficient in the first place, though Dr. Russell L Blaylock and Dr. Ray Sahelian believe it can jump-start the brain and improve spatial learning, long-term memory, and discriminatory learning. One study has shown that individuals with Down's Syndrome showed significant improvement in visual memory and attention when given ALC

supplementation. According to one animal study, when administered to stroke victims soon after a stroke, it may minimize the amount of brain damage; even when administered significantly afterwards, it may help in recovery by boosting memory, task performance, and cognition. Long-chain acety-L-carnitines (LCACs) work counter to ALC, preventing the transportation of fats to the mitochondria and suppressing membrane enzymes.

A deficiency can cause damage to heart tissue, muscle weakness, extreme confusion, angina, and male infertility.

It works synergistically with phosphatidylserine. In studies using older rats, acetyl-L-carnitine combined with alpha-lipoic acid gave them more energy, improved their memory, and enhanced the functions of cells, which was achieved by rejuvenating the mitochondria; it is believed that the alpha-lipoic acid removed destructive free radicals in the mitochondria and that the acetyl-L-carnitine boosted the activity of the enzyme carnitine acetyltransferase.

**Precautions:** Those with kidney damage should use supplements with extreme caution.

It may cause atherosclerosis, gastrointestinal disorders and a change in body odor, which can be reduced or eliminated with lower dosages. Less frequent side effects include diarrhea, abdominal pain, nausea, and vomiting. Overdosing can produce severe muscle weakness, though some have experienced only mild diarrhea with doses as high as 26,000 mg a day. As long-term effects of large doses are not known, Dr. Elson Haas suggests stopping supplementation for one week each month as a precaution. Dr. Ray Sahelian states that high doses of acetyl-L-carnitine can disrupt sleep.

“Vitamin B-T” supplements contain dextro-carnitine as well, which cancels out the effectiveness of levocarnitine. Valproic acid, used in the treatment of epileptic seizures and bipolar disorder, will reduce the effect of L-carnitine. ProXeed, a citrus-flavored drink mix containing two types of L-carnitine, is mar-

keted as a cure for low sperm count, though experts point out that there are many causes of male infertility which carnitine does not cure. Supplements should contain only L-carnitine, as DL-carnitine will cause some individuals to develop a myasthenia-type syndrome. According to Sheldon Saul Hendler, M.D., Ph.D., there is no evidence that supplements will benefit those whose levels are already normal, neither will it build muscle or protect against diabetes, kidney disease, or liver disease.

**Dosage:** 1 to 3 g/day in two divided doses. Non-vegans may ingest between 20–200 mg/day. Dr. Ray Sahelian states that 500 mg before breakfast can induce visual and mental clarity within two to three hours. At present, there is no RDA, and non-vegans of normal body weight and healthy heart function may not need supplementation.

## ALPHA-LIPOIC ACID

**AKA:** 1,2-dithiolane-3-pentanoic acid, alpha LA, Alpha Lipotene, LA, lipoic acid, thiotic acid.

A coenzyme.

**Food Sources:** Broccoli, carrots, heart, liver, meat, potatoes, spinach, tomatoes, yams.

**Effects:** A potent antioxidant which can regenerate other antioxidants, such as vitamins C and E, and form another antioxidant, dihydrolipoate, in cells. It is said to improve long-term memory by protecting brain cell membranes from damage by free radicals, insure that the two main enzymes that convert food into energy function properly, enhance the synthesis of glutathione, and, unlike other antioxidants, can attack free radicals in both the watery and fatty parts of the body. It produces a mild feeling of relaxation and well-being, plus a mild visual enhancement. It may also enhance the immune system and prevent atherosclerosis, and may prove helpful in treating diabetes, cataracts, brain and nerve degeneration, cardiovascular and cerebrovascular dis-

eases, high cholesterol, infections (e.g., HIV), mercury poisoning, and cancer. In studies using older rats, acetyl-L-carnitine combined with alpha-lipoic acid gave them more energy, improved their memory, and enhanced the functions of cells, which was achieved by rejuvenating the mitochondria; it is believed that the alpha-lipoic acid removed destructive free radicals in the mitochondria and that the acetyl-L-carnitine boosted the activity of the enzyme carnitine acetyltransferase (Atamna et al., 2001).

**Precautions:** Daily doses above 50 mg may result in gastrointestinal problems such as nausea and upset stomach, allergic skin reaction, and overstimulation. Very high doses may produce an abnormally low blood sugar. Dr. Ray Sahelian states that high doses can disrupt sleep and cause heart rhythm disturbances.

**Dosage:** The body manufactures sufficient amounts on its own, though certain medical conditions may cause deficiencies. Ray Sahelian, M.D., recommends 10 to 50 mg/day. Allan Sosin, M.D., and Beth Ley Jacobs, Ph.D., recommend 50 to 100 mg/day and say that there are no serious side effects even in the 300 to 600 mg/day range used to treat diabetics.

## CEPPT

**Effects:** An extract of cinnamon bark, it has been found to not only prevent the formation of beta-amyloid plaques, but break them up as well, in genetically altered fruit flies and mice, indicating that it may not only prevent Alzheimer's but reverse it, too (Ovadia et al., 2011).

**Precautions:** A person would have to ingest more than 10 grams of cinnamon a day to achieve similar effects, way beyond the toxic level.

**Dosage:** None established.

## COENZYME Q10

**AKA:** CoQ10, Ubiquinone.

Classified as a nonvitamin nutrient, CoEn-

zyme Q10 can be supplied by dietary means or from the body's own resources. The body can usually manufacture it from amino acids L-tyrosine and L-methionine. It is found in high amounts in the human heart and liver, the two organs in the body which need the most energy.

**Food Sources:** Beef, hearts, kidneys, liver, peanuts, polyunsaturated oils, sardines, seafood, and spinach all have significant amounts, with white albacore tuna packed in cans with spring water having the highest amount. It is also found in chicken, mackerel, monounsaturated oils, walnuts, and whole grains.

**Effects:** Helps manufacture ATP (used by the brain for energy), protects the cell membranes from free-radical damage, prevents cholesterol from sticking to arterial walls, prevents damage to tissues caused by hypoxia, increases the life span in lab animals up to 56 percent, helps cure some forms of gum disease, and protects against peroxidation (a means by which oxygen and unsaturated fats combine to form free radicals). In this last respect, it acts much the same way as vitamin E, but is superior in that, unlike E, it is not destroyed in the process. Interestingly, CoEnzyme Q10 may protect against or reverse some of the symptoms of vitamin E deficiency. Other effects include weight loss, stimulation of the immune system, improvement of athletic performance, decreased blood pressure, a lower incidence of heart disease, and improved mental abilities. It is said to help against Alzheimer's diseases and schizophrenia. It may help reduce the side effects of statins (Dr. Peter Langsjoen, a leading cardiologist, claims that statins can increase the risk of heart failure; cholesterol and CoEnzyme Q10 are both produced in the liver and, since statins eliminate both cholesterol and CoEnzyme Q10, the heart loses the natural protection provided by CoQ10).

Works synergistically with the coenzyme NADH.

The body is able to manufacture enough



CoQ10 up until the age of 20, after which this ability slowly declines. Deficiencies of CoEnzyme Q10 have been associated with cardiovascular disease, diabetes, muscular dystrophy, periodontal disease, and those undergoing tube feeding on a liquid intravenous diet (total parenteral nutrition).

**Precautions:** Can sometimes be metabolized by the body to create certain compounds that have damaging effects similar to those caused by free radicals; adequate amounts of antioxidant vitamins (beta-carotene, C, and E) should be able to prevent this, however. CoEnzyme Q10 supplements should be yellow or orange in color; if not, it may contain fillers. Supplements should also be kept cool (but not frozen), dry, and away from sunlight. High doses could cause overstimulation.

CoEnzyme Q10 should not be taken by women who are pregnant or breastfeeding. Individuals with heart disease or on blood pressure medication should consult a physician first.

Drug use, exposure to cold, illnesses, physical activity, and stress can all drain the body's supply of this nutrient. Exercise, however, can increase levels. Some cholesterol-lowering statin drugs (such as Lescol, Lipitor, Mevacor, Pravachol, and Zocor), blood pressure-lowering drugs known as beta blockers (which include Toprol, propranolol, and metoprolol), phenothiazines, and tricyclic antidepressants can also deplete levels of CoEnzyme Q10 or inhibit production in the body, and it is advisable to take supplements to counteract this; Joe and Teresa Graedon, Ph.D., say experts recommend between 50 to 150 mg a day.

**Dosage:** Optimal doses have not yet been determined, but research indicates that a range of 10 to 90 mg/day is safe and effective. Ward Dean, M.D., recommends 60 to 180 mg/day. Most supplements are in the 30 to 50 mg range. It is generally agreed that the liquid form in the soft gelatin capsule is better absorbed than the capsule form. CoEnzyme Q10 should be taken with oily or fatty foods (e.g., fish oil), as it is oil-soluble.

## CYTOCHROMES

**AKA:** Cytochrome-C.

Cytochromes are a component of ATP production.

**Effects:** Said to increase energy and endurance.

**Precautions:** There is no evidence that supplementation produces any benefits.

## EPICATECHIN

**Food sources:** Dark chocolate.

**Effects:** A flavonoid, it protects brain cells from damage apart from its antioxidant effects (Williams et al., 2009). It is one of the few flavonoids that directly enter the brain, though more research is needed to determine its specific effects. It has been found to reduce brain damage in mice when given ninety minutes before or up to three-and-a-half hours after ischemic stroke, possibly by activating two pathways, Nrf2 and heme oxygenase 1 (Dore et al., 2010). This research could also lead to methods of protection against Alzheimer's disease and similar disorders. Sylvain Dore suggests that the epicatechin may be triggering brain cells' defense mechanisms, rather than having any brain-protective qualities in and of itself.

The Kuna Indians, who live on the San Blas islands off the coast of Panama, have a low incidence of cardiovascular disease and cancer, and better kidney function, possibly because of regular consumption (5 to 7 cups a day) of a very thick, very bitter cocoa drink.

**Precautions:** Dark chocolate has more calories, fat and sugar than regular chocolate. Epicatechin is very sensitive to heat and light, and most dark chocolate may not have enough to make a difference. Dr. John Gordon Harold, clinical professor of medicine at UCLA and president of the Los Angeles Division of the American Heart Association, has said that larger and longer-term studies need to be conducted to better assess dark chocolate's benefits.

**Dosage:** None established, but probably small amounts of dark chocolate are sufficient.

## GLUCOSE

**AKA:** Blood sugar, dextrose, grape sugar.

**Food Sources:** Carbohydrates.

**Effects:** E.J. Masicampo and Roy Baumeister of Florida State University have found that ingestion of glucose after exhausting mental work can improve decision-making in college students.

**Precautions:** Refined sugars and grains should be avoided, as they lack fiber and nutrients.

**Dosage:** Between 5 and 9 servings of vegetables and fruits, and between 6 and 11 servings of whole grains and legumes.

## IDEBENONE

**AKA:** Avan.

An antioxidant that is very similar to CoEnzyme Q10.

**Effects:** The same benefits as CoEnzyme Q10, without the hazard of metabolizing into free radicals. Its effects are said to be comparable to the drugs bifemelane, oxiracetam, and nebracetam (Gillis et al., 1994).

**Precautions:** The few studies that have been conducted show no evident toxic side effects.

**Dosage:** 100 mg/day.

## JUVENON

A supplement containing a mixture of amino acids, antioxidants, and herbs.

**Effects:** According to its website, it can supposedly boost energy, improve memory and concentration, provide better sleep, and protect against free radicals, among other claims.

**Precautions:** Ray Sahelian, MD, cautions that the high dosages of alpha lipoic acid (ALA) and acetyl-L-carnitine can have a detrimental effect on sleep and could possibly cause heart rhythm disturbances; he does not recommend taking ALA every day, as recommended by the label. A warning label on the

bottle states, "These [health] statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease."

**Dosage:** None established.

## MANGIFERIN

A xanthonoid found in mangoes.

**Effects:** Has been found to significantly reverse scopolamine-induced learning deficits in mice (Jung et al., 2009) and improve long-term recognition of objects in rats (Pardo Andreu et al., 2010)

**Precautions:** Has not yet been tested on humans.

**Dosage:** The equivalent effective dosage in mangoes is unknown.

## NT-020

**AKA:** NutraStem.

A dietary supplement formulated from blueberry, green tea, vitamin D3, and carnosine extracts.

**Effects:** May help protect against damage from stroke by promoting the proliferation of adult stem cells. A study on rats with surgically induced strokes found that it was 100 times more potent than the individual ingredients themselves (Borlongan et al., 2008).

**Precautions:** None known.

**Dosage:** None established.

## OCTACOSANOL

**Food Sources:** Alfalfa, wheat germ, wheat germ oil, whole grains.

Octacosanol is one of several long-chain alcohol molecules found in wheat germ oil.

**Effects:** It is said to lower blood cholesterol, increase energy storage in muscle tissue, improve stamina and endurance, sharpen reflexes, help the body adjust to high altitudes, improve oxygen utilization, keep the body metabolism balanced under stress, and is an excellent

source of vitamin E. It takes about three weeks before the effects are noticed.

**Precautions:** There is no scientific evidence to support any of its claims.

**Dosage:** Earl Mindell, R.Ph., Ph.D., recommends 1000 to 6000 mg/day.

## POLYAMINES

**AKA:** Dead flesh proteins.

Polyamines are proteins present in all cells in the body, and can be manufactured by gut bacteria. There are three types: putrescine (diamine), spermidine (triamine), and spermine (tetramine), though some sources list a fourth, cadaverine. They are sometimes referred to as “dead flesh proteins” because their structure breaks open when living tissue is shocked (flash-frozen foods) or dies (severe injury).

**Food sources:** Found in virtually all foods, plant as well as animal, though the highest amounts are found in fermented foods.

**Effects:** Necessary for cell renewal, regulating cell functions, and the proper functioning of the nervous system. They have been shown to reverse age-related memory loss in fruit flies. One study suggests it may be why the Mediterranean diet is associated with a low incidence of age-related inflammatory diseases (Binh et al., 2010).

**Precautions:** Levels of polyamines in the body are regulated by dietary lectins, and too much lectin (as in a grain-based vegan diet) can cause children to grow slightly smaller than normal, as the intestinal cells hoard the available polyamines, causing a deficiency in other tissues. Overdose symptoms include headache after eating fermented foods and bad breath. High levels may also promote the growth of cancer. Spoiled food, especially fish, may cause a toxic allergic-like reaction called Scombroid Poisoning (named after the Scombroidea species) when histidine converts to histamine and reacts with polyamines; wildlife, which is not as high in histidine, does not have this problem.

Foods that reduce polyamine levels include

dill, fruits that are dark blue, purple, or red, garlic, green tea, guava, onions, plantains, pomegranates, tarragon, and walnuts.

## PROXERONINE

**Food Sources:** Noni. Also found in smaller amounts in pineapples and other fruits.

**Effects:** A possible precursor to xeronine, an alkaloid essential to cell function. Said to help sustain strength and endurance, relieve depression, boost immunity, cleanse toxic chemicals from the body, and protect against aging.

**Precautions:** It is not a recognized chemical compound and, according to former BBC science correspondent Dr. Toby Murcott, there are no scientific studies on proxeronine or xeronine; discoverer Dr. Ralph Heinicke appears to be the only one who has studied it, and he claimed that it would only cure ailments (including diabetes and cancer) if a xeronine imbalance was the underlying cause. However, there appears to be no evidence for any of its supposed health benefits

**Dosage:** None established.

## RESVERATROL

**Food sources:** Wine.

**Effects:** Resveratrol, a bioactive compound in wine (which is found in greater amounts in red wine than white), reduces the stickiness of blood platelets and increases the flexibility of blood vessels. Resveratrol may help prevent age-related disorders such as neurodegenerative diseases, inflammation, diabetes, and cardiovascular disease. Johns Hopkins University School of Medicine researchers have also found that resveratrol may help prevent stroke-related damage by increasing the level of heme oxygenase, an enzyme that protects nerve cells (Doré et al., 2010). Research by Philippe Marambaud and others at the Litwin-Zucker Research Center for the Study of Alzheimer’s Disease and Memory Disorders in Manhasset, New York, indicates that resver-

atrol can also reduce the levels of Alzheimer's disease-causing amyloid-beta peptides. Harvard Medical School researchers, in conjunction with the National Institute on Aging, have found that resveratrol counteracts the effects of a high-calorie diet in mice to the point where they lived just as long as mice on a standard diet (UCLA biochemists have found that ethanol can double the lifespans of *Caenorhabditis elegans*, a worm commonly used in aging studies, though it is not known how or why).

**Precautions:** Though resveratrol in wine may improve health, it does not appear to extend lifespan in humans—or even mice (Rafael de Cabo, PhD, of the U.S. National Institute on Aging, has been quoted as saying, “the health benefits resveratrol gives these mice are not the things they are dying of.” As Jonah Lehrer at *wired.com* has pointed out, any life-extending benefits of alcohol may be largely due to its role as a stress reducer and “social lubricant,” citing the strong correlation between an active social life and human longevity. Stephen Taylor, professor of pharmacology at the University of Queensland, Australia, recommends sipping—rather than gulping—wine, as the resveratrol is mostly inactivated by the stomach or liver, whereas absorption by the mucous membranes of the mouth can increase the resveratrol levels in the blood by up to 100 times (Brown et al., 2009). Other researchers have asserted, though, that dietary levels are too low to provide any benefits under normal consumption (Manach et al., 2004). According to Philippe Marambaud, the levels of resveratrol in many studies is far higher than that found in grapes and wines, though there is the possibility that there are other compounds in grapes and wine that may work synergistically with resveratrol (Sylvain Doré, PhD, an associate professor of anesthesiology and critical care medicine and pharmacology and molecular sciences at the Johns Hopkins University School of Medicine, says it may be alcohol that helps concentrate the

amounts of resveratrol). Not only that, but Valter Longo, a molecular geneticist at the University of Southern California's Andrus Gerontology Center, has found that higher levels of SIRT1, an enzyme believed to be responsible for resveratrol's action in the body, may increase oxidative damage to the brain (though Sirtris chief executive Dr. George Vlasuk contends that, at some dose levels, it inhibits SIRT1, and Tomas Prolla and others at the University of Wisconsin–Madison have published evidence that resveratrol works independently of SIRT1). To further complicate matters, in the 2012 article “Resveratrol Takes Another Fall,” Hank Campbell states that “[a] three-year investigation by the University of Connecticut [resulting in a 60,000-page report] concluded that Dipak K. Das, the director of its Cardiovascular Research Center but best known for his work on resveratrol, falsified and fabricated data at least 145 times over a seven year period, even digitally manipulating some images using PhotoShop.” And Harvard professor David Sinclair, the discoverer of resveratrol, has been harshly criticized, perhaps unfairly, for his research methods and his association with the pharmaceutical giant Glaxo. In 2011, the pharmaceutical company Sirtris ended its research on resveratrol, based on evidence that maintaining a constant level in the blood was difficult and that its effects seemed to vary with the dosage, though they continue to do research on compounds derived from it and SIRT1 (Hubbard et al., 2013). Sinclair has answered critics by showing that not only does resveratrol work with SIRT1 at certain dosages, it affects dozens of other proteins, and may work synergistically with the AMPK gene (Price et al., 2012).

A University of Copenhagen study found that resveratrol supplementation reduced the effectiveness of exercise training in such factors as blood pressure, cholesterol, and oxygen uptake, especially in older men. The researchers point out, however, that the 250 mg given to subjects in the study was far higher

than what would be obtained from a normal diet; and there are other criticisms of the study, too, including the fact that the study involved only 27 men and lasted only eight weeks (Hellsten et al., 2013). An evaluation of resveratrol supplements in 2007 by Consumer Lab found that the amount of resveratrol varied widely, ranging from one hundred percent to just one-half of one percent of the stated amount on the label. Doré says it is unclear whether supplements are beneficial or not, as they have not been tested for efficacy.

For precautions related to alcohol in general, see entry under Foods.

**Dosage:** Up to 30 units of alcohol (two pints of beer or half a bottle of wine) a day. Wines made from Pinot Noir grapes have the highest levels of resveratrol. According to Philippe Marambaud, white wines have only one to five percent of the resveratrol that red wines do. Stephen Taylor, professor of pharmacology at the University of Queensland, Australia, recommends sipping wine, rather than gulping, as absorption by the mucous membranes in the mouth can result in 100 times the blood levels of resveratrol as opposed to absorption via the stomach (where it is mostly inactivated), possibly increasing its benefits.

## SAPONINS

**AKA:** Triterpene glycosides.

Saponins are steroid-like chemicals connected to sugar molecules that occur naturally in plants. Saponins are only one of a class of nutrients called phytochemicals which are found in all fruits and vegetables, as well as legumes and whole grains. There are several thousand different phytochemicals, including lycopenes (found in tomatoes), genistein (found in soybeans), and flavonoids (found in citrus fruits).

**Food Sources:** Asparagus, bean sprouts, chickpeas, ginseng, guarana, oats, potatoes, soybeans, tomatoes.

**Effects:** Saponins are believed to have antioxidant, anti-cancer, anti-inflammatory, and antiviral properties. They may also bolster the immune system, and have been used to treat mental and physical stress.

## SIALIC ACID

**AKA:** N-acetylneuraminic acid; Neu5Ac; Sia; Sia-glycoconjugates.

Sialic acid is a family of 9-carbon sugar acids.

**Food Sources:** Breast milk.

**Effects:** A nutrient, mostly in the form of N-acetylneuraminic acid (Neu5Ac), which is essential for brain development and cognition in the human infant, specifically forming neural structures and synaptic connections (Wang, 2009; Wang, 2012). In piglets, it has been found to increase the expression of two learning-related genes and improve learning and memory (Wang et al., 2007).

**Precautions:** Infant formulas do not contain enough for proper brain growth, and much of that is in the form of N-glycolylneuraminic acid (Neu5Gc), which has been associated with several human inflammatory diseases (Heine et al., 1993; Wang et al., 2001).

**Dosage:** None established.

## SOUVENAID

**Effects:** A nutritional supplement that seems to improve verbal memory in patients in the early stages of Alzheimer's disease by stimulating the growth of new synapses (Nauert, 2012). EEGs of patients showed that brain activity returned to more normal patterns during the three-month trial. Developed by Richard Wurtman, professor emeritus of brain and cognitive sciences at the Massachusetts Institute of Technology, it is a mixture of choline, uridine, and DHA.

**Precautions:** Patients in the more advanced stages of the disease were not helped.

## SUPEROXIDE DISMUTASE

**AKA:** Cell Guard, Cu/ZnSOD, LIPSOD, MnSOD, SOD.

It ranks fifth among proteins in terms of the amount in our bodies, after collagen, albumin, globulin, and hemoglobin.

**Food Sources:** Barley grass, broccoli, brussels sprouts, cabbage, green plants, wheat grass.

**Effects:** An extremely powerful antioxidant enzyme that works synergistically with catalase to counteract superoxide, the most common and hazardous free radical. The production of SOD in the body decreases as we age.

There are two forms of SOD: copper/zinc SOD (Cu/ZnSOD), which protects the cytoplasm of the cell; and manganese SOD (MnSOD), which protects the mitochondria, where the genetic information resides and cellular energy is produced.

Liposomal superoxide dismutase (LIP-

SOD) is SOD that has been encapsulated in a liposome “delivery vehicle” for subcutaneous injection. Both SOD and LIPSOD have been used in the treatment of rheumatoid arthritis, damage caused by radiation therapy and heart attacks, unresponsive anemia, and various auto-immune disorders such as scleroderma, Crohn’s disease, Behcet’s disease, Raynaud’s syndrome, and Kawasaki disease. It shows promise in the treatment of multiple sclerosis, Alzheimer’s disease, Peyronie’s disease, and possibly AIDS.

Superoxide dismutase contains, and works synergistically with, copper, zinc, and manganese.

**Precautions:** Serious side effects include life-threatening anaphylaxis, with symptoms that include low blood pressure, paleness, severe itching, loss of consciousness, and coma. Stomach acid destroys SOD, so tablet supplements must be enteric coated so that they can be safely absorbed in the small intestine.

## *Hormones and Neurotransmitters*

Hormones are organic compounds secreted by specific cells that control the functions of other cells receptive to those hormone molecules. Neurotransmitters are chemicals that transmit nerve impulses across synapses. Many substances can act as both.

### ADENOSINE

**AKA:** Adenocard; adenosine diphosphate (ADP); adenosine triphosphate (ATP); cyclic adenosine monophosphate (cAMP).

An inhibitory neurotransmitter and vasodilator released by the brain during hypoxia, stroke, and other conditions involving physical damage or metabolic stress where oxygen demand is greater than the supply. It also regulates sleep and arousal states. As a drug, it is given by injection to treat surgical pain, nerve pain, pulmonary hypertension, varicose veins, and some types of irregular heart rhythm, and by mouth to treat shingles.

**Effects:** Has been found to protect CA3 nerve cells in the hippocampus by removing glutamate receptor proteins, making the nerve cells less susceptible to damage from the neurotransmitter glutamate (Mellor et al., 2011).

**Precautions:** It should not be used by women who are pregnant or breastfeeding, and it can worsen cases of gout and heart disease.

Side effects may include breathing prob-

lems, chest pain, headache, pounding heart, low blood pressure, nausea, sweating flushing, lightheadedness, sleeping difficulties, coughing, and anxiety.

Its antagonists are methylxanthines, including caffeine, theobromine, and theophylline. Dipyridamole can slow the breakdown of adenosine in the body and cause heart problems. When taken with carbamazepine, it can slow the heart to an abnormal degree. It can also reduce the effectiveness of gout medications.

### ADRENOCORTICOTROPIC HORMONE ANALOGS

**AKA:** ACTH analogs.

**Effects:** ACTH 4–10 has been shown to produce short-term improvements in reaction time (Gaillard and Sanders, 1975). GMM2 has been found to prevent or significantly reverse the effects of brain injury in head trauma in animal models (Goldman et al., 1993).

**Precautions:** None known.

### ANDROSTENEDIONE

**AKA:** 4-androstenedione; 17-ketoesterone; A-Dione.

A natural hormone produced by the adrenal glands, production of which is believed to decline with age. Though DHEA can be converted to A-Dione, the latter appears to be

much more powerful, converting more rapidly to testosterone than DHEA. It received much publicity in 1998 when it was revealed that the St. Louis Cardinals' home run king, Mark McGwire, used it to enhance his athletic performance.

**Effects:** It is said to increase energy and restore sexual drive—particularly in older individuals—increase muscle and bone mass, and enhance mood in those with depression.

**Precautions:** Possible side effects for men include prostate cancer and enlargement, shrunken testicles, breast development, prolonged or painful erections, changes in behavior, depression, mood swings, heart disease, and baldness; for women, side effects include a deepening voice, facial hair, acne, menstrual abnormalities, baldness, coarse skin, depression, and breast cancer. It may also damage the liver. Studies have found that it has no effect on testosterone levels in the blood or muscular strength in men in doses up to 300 mg/day.

It can be depleted by stress, alcohol, and obesity. In women taking estrogen, it may boost the estrogen to dangerous levels. According to RxList.com, some product labels may misrepresent dosage and purity levels.

**Dosage:** It may not be needed by those under age 45. It should be taken only under the guidance of a physician, and those taking it should start out at a low dosage. Ray Sahelian, M.D., considers any dose over 10 mg to be too high.

## CHOLECYSTOKININ-8

**AKA:** CCK-8; pancreozymin.

A neuropeptide and digestive hormone that is also found in high amounts in the brain.

**Effects:** Has been found to play roles in cognition, anxiety, depression, and psychosis. It can also elevate levels of BDNF in noradrenergic neurons, as well as protecting them (Hwang et al., 2013).

**Precautions:** Is associated with anxiety and panic disorders.

## CORTICOTROPIN-RELEASING HORMONE

**AKA:** Corticoliberin; corticotropin-releasing factor; CRF; CRH.

A polypeptide hormone and neurotransmitter activated by stress which releases ACTH, causing the release of other hormones.

**Effects:** Low levels have supposedly been found in the cerebral cortex of individuals with Alzheimer's disease (De Souza et al., 1987), yet high levels have been found in the paraventricular nucleus of patients with Alzheimer's disease and depression (Raadsheer et al., 1995). Evidence indicates that it can protect against cell death from amyloid-beta peptides, lipid peroxidation, and glutamate (Pedersen et al., 2001; Bayatti and Behl, 2005). Suicide victims have been found to have abnormally high levels in their cerebrospinal fluid (Arató et al., 1989), and activation of the CRH1 receptor is associated with the euphoric sensations produced by drinking alcohol.

**Precautions:** Corticotropin-releasing hormone is associated with the release of the hormone cortisol, and with stress and anxiety, including PTSD and panic disorder, and its attendant detrimental effects on brain and body. Its function can be permanently crippled by physical and sexual abuse in childhood, resulting in adult psychopathology (Claes, 2004).

## DESMOPRESSIN

**AKA:** DDAVP; Minirin; Stimate.

A pituitary hormone replacement drug that is a synthetic version of antidiuretic hormone and is prescribed for bed-wetting and diabetes insipidus.

**Effects:** Increased short-term memory when given to children for night-time enuresis in doses of 20 mcg intranasally or as a 0.9 percent saline solution (Muller et al., 2001).

**Precautions:** Rare side effects include increase in blood pressure, loss of sodium, water intoxication, edema, abdominal cramps, nau-



sea, skin flushing, brief headaches, vulvar pain, and stuffy or runny nose. Overdose symptoms include headache, difficulty breathing, abdominal cramps, nausea, and facial flushing.

When combined with other drugs that increase blood pressure, it may increase their effects. When combined with chlorpropamide or carbamazepine, it can increase the effects of desmopressin.

## DHEA

**AKA:** Astenile, Deandros, dehydroepiandrosterone, dehydroepiandrosterone sulfate (DHEAS), dehydroisoandrosterone, Diandron, Prasterone, Psicosterone, trans-dehydroandrosterone.

A steroid manufactured in the adrenal gland similar to testosterone that is triggered by human growth hormone and is a precursor to all steroid hormones in the body, including testosterone and estrogen. It is found in the bloodstream in greater amounts than any other steroid, and exists in normal brain tissue in amounts six and one-half times greater than in other parts of the body. It is found at its highest levels in the body between ages 20 to 25; after that, its production declines steadily. Those with Alzheimer's have levels lower than healthy individuals of similar age. Individuals under 40 should have their levels checked first, as they may not need supplementation.

**Effects:** Improves physical and mental health, as well as memory and thinking, by keeping the level of cortisol low and by helping neurons grow new dendrites. Levels of this hormone in the body decrease with age (by as much as 95 percent), so taking it may protect brain cells against mental deterioration such as Alzheimer's and senility, may increase mental abilities in those with normal capabilities, and may even extend life (it has been shown to extend the life span of animals by as much as 50 percent and, in humans, the amount of DHEA in the body has been found to bear an inverse correlation with mortality levels).

DHEA has been administered to those battling such disorders as depression, compulsive eating, moodiness, violent behavior, chronic anger, irritability, fear, impulsiveness, hostility, insomnia, impatience, agitation, worry, anxiety, and pessimism. Its use against such a wide range of disorders may be attributable to its ability to normalize and promote electrical activity in the body and brain in several ways.

Serum DHEA levels can be increased by taking supplements of chromium, and decreased by stress. Non-supplementation methods of increasing DHEA are simple and basic: exercise regularly, avoid smoking, avoid alcohol, avoid synthetic steroid hormones, avoid stress, get plenty of sleep, maintain ideal body weight, and reduce the percentage of fat in the body.

It works synergistically with vitamin E.

**Precautions:** Side effects include acne (regardless of a person's age), anxiety, a sense of tightness in the chest, night restlessness, hair loss, voice changes, fatigue, oily skin, high blood pressure, diabetes, strokes, irritability and mood changes, overstimulation, aggressiveness, headaches, insomnia, heart palpitations, and heart irregularities, some of which are irreversible. Women may experience a slight increase in body hair and a deepening of the voice at dosages greater than 25 mg a day, and DHEA may carry the same risks as testosterone, such as the promotion of the growth of prostate cancer in men and breast and uterine cancers in women. Men may also experience breast growth. Though stress may cause the body to decrease its production of DHEA and increase its production of cortisol, taking a DHEA pill cannot repair the damage to the body caused by stress. High doses (above 10 mg) may cause irritability, aggressiveness, and anxiety. Because sufficient research has not yet been done, use is experimental, and nothing is known about long-term effects, though epileptics have been taking it for nearly half a century. In tests where lab rats were given doses equal to dozens of times that normally taken by people, it has caused liver

damage leading to the formation of tumors. It is not known if this same effect occurs in humans, but further tests with rats have shown that vitamin E can offset this damage. Men with prostate problems should not take DHEA. For others, it is recommended that it be taken only under the guidance of a physician, and then only after having tests to determine the levels in the body and whether the liver is functioning properly.

A 2001 review of studies found that it had no effect on memory of normal human adults over a period of three months and, in fact, had a detrimental effect on visual memory following a stress-inducing event (Huppert and Van Niekerk); a 2008 study confirmed this analysis (Kritz-Silverstein et al). Some researchers state that there is insufficient evidence to conclude that it has any beneficial effect on aging or any diseases (most studies have been short-term and involved a dozen people or fewer); any reports of people feeling better physically or mentally (especially with regard to sexual drive) are purely anecdotal. A 2006 Mayo Clinic study seems to confirm this and, since it was a double-blind, placebo-controlled, randomized study involving 144 men and women over two years, these results would appear to be the norm (Nair et al). Over-the-counter brands are unregulated by the FDA, and their ingredients and purity may be questionable. Oral DHEA may be at least partially destroyed by the liver, making supplementation questionable. It is also possible that the increased energy levels felt by those taking it may be only short-term. Though synthetic DHEA is created from the Mexican wild yam, there is no evidence that the plant itself provides the same health benefits.

DHEA should not be taken by women who are pregnant or breast-feeding, or by individuals with prostate or ovarian cancer.

Caffeine can lower DHEA levels and raise cortisol levels, increasing stress to the body and decreasing the individual's panic threshold. It may cause harmful interactions if used in con-

junction with aspirin or blood thinners, stimulants (including herbal stimulants), and thyroid medications; it may also interact with such anti-depressants as Prozac and Zoloft. Those on estrogen replacement therapy may have to adjust their dosage of DHEA accordingly, because the estrogen may induce a deficiency of DHEA. Too much insulin can also lower levels of this hormone.

**Dosage:** For humans, the optimal dosage is as yet not known, though usage has ranged anywhere from 50 to 2000 mg/day. For general health, some recommend a more modest dose of 19 mg/day for women, 31 mg/day for men. Most supplements are 25 mg. Michael Hutchinson recommends 100 to 300 mg/day (in two or three divided doses) for life-extending and cognitive-enhancing purposes, about half the dose normally taken by epileptics. However, one expert, Dr. Ray Sahelian, recommends starting out at 5 to 10 mg/day, and increasing the dosage by 5 mg/day until reaching the optimum daily dosage (which may be as little as 25 mg/day for women, 40 mg/day for men). He also recommends that users take only DHEA or DHEAS and avoid any product sold as a precursor to DHEA. Stephen Cherniske, M.S., also cautions against using any supplement that contains additional ingredients such as ephedra or yohimbe. Some experts strongly advise consulting a physician before taking this supplement.

## DIHYDROTESTOSTERONE

**AKA:**  $5\alpha$ -androstan- $17\beta$ -ol-3-one,  $5\alpha$ -DHT,  $5\alpha$ -dihydrotestosterone,  $17\beta$ -hydroxy- $5\alpha$ -androstan-3-one, androstanolone, DHT.

**Effects:** Has been shown to reduce anxiety and increase cognitive performance in male mice (Frye et al., 2004; Frye et al., 2007) and to reduce Alzheimer-related pathology in mice genetically engineered to develop the disease (Rosario et al., 2010). High levels of androgens in general are associated with enhanced mood and feelings of well-being in

men, while low levels are associated with poor cognitive function as well as anxiety and depressive disorders.

**Precautions:** The exact mechanism of action is still not fully understood. A 2009 study published in *Clinical Journal of Sport Medicine* found that creatine supplementation can significantly increase DHT levels in college rugby players, but cautions that the exact mechanism by which it does this is not fully understood, and long-term effects are unknown; for side effects of creatine supplementation, see entry under Amino Acids. DHT levels may be affected by dietary zinc intake.

DHT can block the positive effects of oxytocin.

**Dosage:** None established.

## EBIRATIDE

A fragment of the ACTH hormone.

**Effects:** In intravenous doses of 60, 300, and 600 mcg, it improved the energy levels and alertness of eight patients with depression and Alzheimer's disease (Heuser et al., 1993).

**Precautions:** None known. It did not have any effect on depression or dementia.

**Dosage:** None established.

## ERYTHROPOIETIN

**AKA:** Epo.

A hormone created by the kidneys which helps in the formation of red blood cells. It is used to treat anemia and chronic kidney failure, and has come under fire as a performance-enhancing drug by athletes.

**Effects:** Research shows it has a potential as an anti-depressant by regulating brain activity associated with emotion, and as a treatment for such diseases as schizophrenia, multiple sclerosis, and Alzheimer's, as it has been shown to increase cognition and memory in subjects suffering from these conditions (Miskowiak et al., 2007). According to researchers, "[t]reatment with EPO seems to in-

crease the number of inhibitory circuits, which actually increases the efficiency of transmission of excitatory nerve impulses in specific neurons, resulting in greater short-term and long-term plasticity in memory pathways in the hippocampus." (Ehrenreich, 2008)

**Precautions:** None known.

**Dosage:** None established.

## ESTROGEN AND ESTRADIOL

**AKA:** Conjugated estrogens (Premarin, Prempro), estradiol (Climara, Estrace, Estraderm, Estring), estropipate (Ogen), ethinyl estradiol, mestranol.

Estrogen is one of the six steroid hormones in the body; estradiol is the most powerful of the six estrogen hormones.

**Food Sources:** Alfalfa sprouts, chickpeas, flaxseed, rye, soybeans, yams. Certain herbs such as blue cohosh, dong quai, hops, and licorice have estrogen-like properties, but may not have the same effects.

**Effects:** Can improve the mood of postmenopausal women, protect against osteoporosis (bone loss), and maintain the health of the heart. It may also relieve or even prevent the symptoms of Alzheimer's disease in postmenopausal women, particularly those of attention and memory loss, apparently by encouraging the growth of brain cells and the connections between them. It may even protect women's brains from damage caused by strokes. In combination with cholesterol-lowering drugs, it can reduce inflammation and clotting of the blood, both of which could otherwise lead to heart attacks and strokes. There is speculation that estradiol may be beneficial in maintaining normal neural functioning in older individuals or after brain injury (Wise et al., 2001). Estradiol has been found to counteract age-related loss of memory in aging mice in specific learning tasks (Frye et al., 2005).

Men also produce estrogen, which is needed to keep sperm strong and fertile.

Research at Louisiana State University has found that, in adult mice, estrogen appeared to reduce the loss of learning and memory due to exposure to THC; however, it was unable to reverse these losses in mice exposed to THC as adolescents.

**Precautions:** High levels in women who are ovulating may cause sluggishness and concentration problems, as well as inhibiting learning and memory (Brake et al., 2010). It should not be taken by individuals who are allergic to any drugs containing estrogen, have impaired liver function or unexplained vaginal bleeding, who smoke, or who have had blood clots, a stroke, or a heart attack. It should not be taken by women who are pregnant or breast-feeding. Those who have had cancer of the breast or reproductive organs, fibrocystic breast disease, fibroid tumors of the uterus or endometriosis, migraine headaches, epilepsy, porphyria, diabetes, high blood pressure, asthma, congestive heart failure, heart disease, blood-clotting disorders, kidney disease, liver disease, gallstones, or are over age 60 should consult a physician first. It may cause an increased sensitivity to sunlight and sunlamps and, in rare cases, a blood clot in the lung, brain, or leg. Estrogen may also cause fluid retention, which can aggravate such conditions as asthma, epilepsy, migraines, heart disease, and kidney disease. Research has shown that older women with cardiac conditions risk a much greater chance of heart attacks and blood clots in the first year of estrogen treatment but, oddly enough, these risks dropped dramatically after four years of treatment. Women on estrogen are also given the hormone progesterin, as the latter prevents the cancer and uterine tumors in postmenopausal women that sometimes develop from estrogen therapy.

It may deplete the levels of vitamins B6, E, folic acid, and DHEA in the body. Common side effects include stomach cramps, appetite loss, nausea, diarrhea, swollen feet and ankles, weight changes, water retention, vomiting, tender swollen breasts, acne, loss of tolerance

to contact lenses, and a change in menstruation. Less frequent side effects consist of rash, stomach or side pains, bloody skin blisters, breast lumps, depression, dizziness, migraine headaches, irritability, bleeding gums, menstrual irregularities, PMS, mild diarrhea, jaundice, growth of uterine fibroids, brown blotches on the skin, hair loss, vaginal discharge or bleeding, and changes in sex drive. Rare symptoms include stroke, the formation of blood clots, involuntary incontinence, loss of coordination, chest pains, leg pains, breathing difficulties, slurred speech, vision changes, hypercalcemia in breast cancer, and involuntary movements. Profuse bleeding could be life-threatening. Overdose symptoms include nausea, vomiting, fluid retention, breast enlargement and discomfort, and excessive vaginal bleeding.

The effects of estrogen can be lessened by anti-infective drugs, hydantoin anticonvulsants, carbamazepine, phenobarbital, primidone, Phenytoin, Ethotoin, Mephenytoin, barbiturates, and rifampin; it can be enhanced by meprobamate, alcohol, and vitamin C. Estrogen can lessen the effects of oral anticoagulants, benzodiazepines, Bromocriptine, clofibrate, dextrothyroxine, guanfacine (anti-hypertensive effects only), insulin, tamoxifen, terazosin, theophylline, thyroid hormones, and ursodiol. It can increase the anti-inflammatory effects of hydrocortisone and related corticosteroid drugs, increase blood levels of tricyclic antidepressants and maprotiline, increase the toxicity of tricyclic antidepressants and Phenothiazine tranquilizers, increase the amount of Cyclosporine and adrenal corticosteroid drugs in the blood, increase the amount of calcium absorbed in the stomach, increase the chance of liver damage from other drugs, cause unpredictable changes in blood sugar when combined with oral antidiabetics, increase the chance of blood clots when combined with antifibrinolytic agents, and increase the risk of pancreatitis when combined with didanosine. Menstrual irregulari-

ties and bleeding between periods may occur when combined with marijuana, and blood clots leading to stroke or heart attack may result when combined with tobacco. It should not be taken with grapefruit juice, birth control pills, or hormone replacement drugs.

**Dosage:** None established.

## GHRELIN

A peptide hormone mainly secreted in the stomach and pancreas that helps to stimulate appetite by triggering the release of neuropeptide Y, and also helps to stimulate the release of growth hormone.

**Effects:** It is necessary for learning and for helping the brain adapt to changing environments, chiefly by increasing synapse density in the hippocampus (Diano et al., 2006). It may also provide some protection against stress-induced depression (Zigman et al., 2008), though research findings are contradictory at this point; the same is true in its relationship to anxiety (Chuang and Zigman, 2010). It has been shown to increase memory retention in rats when injected into the brain (Carlini et al., 2002).

**Precautions:** High levels appear to be associated with short periods of sleep and obesity (high levels can cause the brain to react to food in the same way that an addicted brain reacts to drugs (Callaway, 2008)). Studies showing effects on learning and memory have used levels of ghrelin that are several orders of magnitude of what would normally exist in the bloodstream, and normal levels may not have significant effects on learning and memory (Phillips, 2006). In rats, it has been shown to increase anxiety.

**Dosage:** None established.

## HUMAN GROWTH HORMONE

**AKA:** Growth hormone, HGH, Humatrope, somatotrophin (STH).

Manufactured in the pituitary gland, it ap-

pears to be the main hormone associated with aging. It triggers the development of IGF-1 and DHEA, and begins to decline about 14 percent each decade starting at about age 20, bringing about sagging skin, pot bellies, loss of vitality, and other symptoms of old age. It is used as a treatment for adults with deficiencies resulting from pituitary disease, hypothalamic disease, surgery, radiation therapy, and injury.

**Effects:** Higher energy levels, elevated mood, improved memory, enhanced sleep, increased muscle mass (up to 8.8 percent after six months), enhanced sexual performance, regrowth of vital organs, restoration of immune function, stronger bones, lower blood pressure, faster healing of wounds, smoother skin, regrowth of hair, sharper vision, and a reduction in fat (14.4 percent after six months). It may also extend the human life span. A review of thirteen studies found that growth hormone in those who were deficient produced modest gains in cognitive performance, specifically attention and memory, though these levels were still far below that of control subjects (Falleti et al., 2006).

**Precautions:** It should only be taken under the guidance of a physician, as side effects are still not known. Dr. Sofiya Milman, who has studied the effects of HGH, says that the risks of using the hormone as an anti-aging treatment in older adults outweighs the benefits, as lower levels seem to protect the elderly against age-related diseases, but there is little evidence that higher levels have any positive effects. Taking HGH when it is not needed may train the pituitary gland to release less and less of it. Some research does not confirm its supposed benefits; side effects may include carpal tunnel syndrome, hypertension, and gigantism. The use of synthetic growth hormone has been associated with heart disease and the production of anti-growth hormone antibodies.

Human growth hormone may be expensive and difficult to obtain, and synthetic growth

hormone has only 10 percent of the effectiveness of the natural form. Most animal growth hormone is virtually ineffective.

**Dosage:** Not yet established, but clinical trials have shown that a single daily dose of 25 mg raised the hormone to optimum levels for subjects aged 64 to 81. High levels can be maintained by aerobic exercise (especially if separated from eating and sleeping by at least two hours), maintaining ideal body weight, avoiding eating before exercise, eating foods that have a high arginine-to-lysine ratio (e.g., peanuts, nuts, seeds, whole grains, carob, raisins), taking tryptophan supplements (banned since 1989 because some improperly manufactured supplements caused harm to some users), maintaining stable blood sugar and insulin levels (even if it means snacking), and following a diet that is high in healthy proteins and low in fat, sugar (particularly sugar ingested just before bedtime), and starch. Supplements of L-glutamine, arginine, and ornithine may stimulate the body to make more HGH.

### IGF-1

**AKA:** Insulin-like growth factor 1.

A protein hormone similar to insulin that is regulated by human growth hormone (HGH), and which is not only necessary for bone and muscle strength, but helps fight infections, inflammation, and heart disease. It declines with age, possibly leading to deteriorating health conditions often found in the elderly.

**Effects:** A cell-growth regulating gene that maintains physical and mental health. In simple organisms, such as yeast, mutations can cause a ten-fold increase in lifespan. A study of Ashkenazi Jews aged 95 to 110 found that their daughters had IGF-1 plasma levels that were at least one-third higher than those of other women (Suh et al., 2003).

**Precautions:** Humans with the same life-extending mutation can be somewhat shorter

and have a variety of health problems due to genetic mutations. Higher levels of IGF-1 in older men (above 100 ng/ml) were associated with double the risk of cancer-related deaths over the next 18 years (Major et al., 2010); IGF-1 is also associated with breast tumors in women with BRCA ½ mutations (Kang et al., 2012). Mice put on a calorie-restricted diet lived longer and healthier, and had lower levels of IGF-1; though it is too soon to know if caloric restriction has similar benefits in humans, it appears that the gains may be six additional years of life.

### LEPTIN

An endocrine peptide hormone that is an important factor in a number of central nervous system functions.

**Effects:** It may have potential as a cognitive enhancer, especially in the developing central nervous system (Paz-Filho et al., 2008), and it has been found to play a role in learning and memory, as well as neuronal excitability.

**Precautions:** Leptin plays a complex role in energy homeostasis (including regulating food intake and body weight) and other functions that is still not fully understood.

### MELANIN CONCENTRATING HORMONE

**AKA:** MCH.

**Effects:** Released in small amounts when a person is awake, but in much greater amounts when a person is asleep (Blouin et al., 2013). Research could lead to developments for sleep disorders.

**Precautions:** Research is still preliminary.

### MELATONIN

**AKA:** N-acetyl-5-methoxytryptamine.

A master hormone secreted by the pineal gland that regulates a number of the body's functions and life cycles, including the onset

of puberty; it is stimulated by darkness and suppressed by light, regulating the length and quality of sleep. Production decreases with age when the pineal gland becomes worn out and calcified, which may explain why older people have insomnia. Some elderly people lose their ability to produce it altogether.

**Food sources:** Oats, sweet corn, rice, ginger, tomatoes, bananas, barley, Japanese radish. Tryptophan, which can be converted by the body into melatonin, is found principally in spirulina, soy products, cottage cheese, chicken liver, pumpkin seeds, turkey, and chicken.

**Effects:** Regulates the body's clock, so it can be effectively used to treat insomnia, jet lag, and depression. Unlike sleeping pills, it doesn't interfere with REM sleep (the dream state), and leave the individual feeling groggy upon waking, and it resets the body's clock rather than just knocking the person out. It is known to produce vivid dreams. It also works as a powerful antioxidant (as much as 500 times more powerful than DMSO). Researchers are looking into it as a possible treatment or cure for Alzheimer's disease. Some suggest it may even delay the aging process by limiting the damaging effects of corticosteroids, though it may not be able to reverse it (it has been shown to increase the longevity of lab rats an average of 20 percent), and it may ease some symptoms of autism, epilepsy and diabetes. CPS Research of Glasgow, Scotland, is currently testing a drug containing melatonin to see if it has any benefits on patients with dementia.

Taking adequate amounts of vitamin B-3 can free up more tryptophan to be converted to melatonin. Vitamin B-6 can stimulate the body to produce more melatonin, as the body uses it to convert tryptophan into serotonin, which can then be converted to melatonin. Taking calcium and magnesium at night may also benefit melatonin production.

**Precautions:** It should not be taken by women who are pregnant, nursing, or trying to get pregnant, as it interferes with sex hormones; healthy children, as they produce

enough on their own; those with severe mental illness, as it could worsen the symptoms; those taking steroid drugs such as cortisone and dexamethasone, as it could reduce their effectiveness; and those with overactive immune system abnormalities, including lymphoma, leukemia, allergies, and auto-immune diseases such as arthritis, multiple sclerosis, and lupus, as it could worsen these conditions.

It appears to be non-toxic, though much research still needs to be done, and harmful side effects may yet be uncovered. Most studies have been done on rats, which do not produce their own melatonin. Side effects may include depression, diarrhea, headaches, insomnia, nightmares, grogginess or fuzzy thinking upon arising from sleep, and a reduced sex drive. Taking it at the wrong time could cause problems, such as falling asleep at the wheel of a car; taking too much (more than 0.3 mg) in efforts to fall asleep could result in a melatonin hangover the next day. Paradoxically, women who take it for birth control do not get sleepy; why this happens is not known. When taken counter to the body's normal circadian rhythm (e.g., by those working night shifts), it can have negative effects on memory and cognitive processing. Optimum dosage has not yet been determined, and long-term effects are still not known. There may be a risk of contamination from viruses in the natural form, made from animals, as opposed to the synthetic form; on the other hand, most synthetic forms are manufactured outside the U.S., leaving open the question of quality control. Apart from this, natural and synthetic forms are identical. Melatonin is only effective as a sedative if the pineal gland's production is low; otherwise, doses as high as 75 to 150 mg will have no effect. It should not be used to treat insomnia, as there are numerous causes that result in a loss of sleep, and melatonin may not be effective in countering them. One study has shown that it can worsen clinical depression in some cases, and in non-depression cases can cause fatigue, confusion, and sleepiness.

Some medications, especially hypertension medicines, can interfere or react with melatonin. The production of melatonin can also be inhibited by exposure to electromagnetic fields, lack of sunlight during waking hours, lack of darkness during sleep (caused even by such seemingly innocuous offenders as night lights), aspirin (which can cut production by 75 percent), alcohol, beta-blockers, calcium-channel blockers, sedatives (such as Prozac, Valium, and Xanax), steroids, fluvoxamine (Luvox), desipramine (Norpramin, Perto-frane), most MAO inhibitors, caffeine (including coffee, green tea, colas, and chocolate), tobacco, doses of B-12 above 3000 mcg, ibuprofen, sleeping pills, tranquilizers, and indomethacin (which can completely block the nighttime increase of melatonin). Smoking one joint of marijuana, on the other hand, can increase melatonin levels in the body 4000 percent.

**Dosage:** Levels produced by the body are measured in picograms (trillionths of a gram), averaging around 10 pg per milliliter of blood per day and 50 to 150 pg per milliliter at night. Melatonin output in the body can be improved by eating the foods mentioned above; getting enough niacin, B-6, calcium, and magnesium; meditation, prayer, and other relaxation techniques; and smoking marijuana. Sub-lingual supplements allow the melatonin to reach the brain quicker, but a time-release supplement at bedtime is probably best, as it most mimics natural conditions. Researchers recommend taking only 0.5 to 5 mg a day one-half to one hour before bedtime, though some studies have shown that as little as 0.1 mg (equal in amount to a few grains of salt) can enhance sleep. Most pills are 2.5 to 3 mg, which, according to Dr. Russel J. Reiter, professor of neuroendocrinology at the University of Texas Health Science Center in San Antonio, may be “overkill,” though probably not harmful. Women taking up to 75 mg a day for birth control research have shown no apparent side effects. Reiter himself takes less than 1

mg/day, and Ray Sahelian, M.D., does not recommend its use more than once or twice a week. On the other hand, Crook and Adderly advise its use only for combating jet lag, and Alan Gaby, M.D., who publishes the newsletter *Nutrition and Healing*, states, “We do not at this time believe that melatonin should be a routine part of the average nutritional-supplement program.” Reiter recommends an alternative program of 100 mg of B-3, 1000 mg of calcium, and 500 mg of magnesium at night, plus 25 to 50 mg of B-6 early in the morning, to assist the body’s own production of melatonin.

## NADH

**AKA:** B-DPNH; BNADH; Coenzyme 1; Enada; Nicotinamide adenine dinucleotide + hydrogen.

**Food Sources:** Meat, fish, poultry. Trace amounts are found in fruits and vegetables.

**Effects:** Provides needed energy to brain cells for neurotransmitter production and information processing. Taking it may improve the performance of brain cells and stimulate them to produce the cognitive-enhancing neurotransmitters dopamine, noradrenaline, and serotonin. There are claims that it can enhance memory, slow aging, and help treat Alzheimer’s disease, chronic fatigue syndrome, depression, and lack of energy. As a person ages, the level of NADH decreases.

**Precautions:** Solid evidence for any of the above claims is lacking. According to Dr. Ray Sahelian, regular use may lead to a tolerance, nullifying its effects, and doses above 2.5 mg may cause insomnia, anxiety, fatigue, and overstimulation, though WebMD states that side effects are uncommon in those taking 10 mg/day for up to twelve weeks. Abrupt cessation after regular use can result in a “crash” in which the above side effects are intensified.

It should not be used by women who are pregnant or breastfeeding, as effects are unknown. For all others, WebMD recommends



that a physician or qualified healthcare professional be consulted first.

It should not be combined with other stimulants, as the risk of side effects may increase.

**Dosage:** Dr. Sahelian recommends no more than 5 to 10 mg a few times a month.

## NEUROPEPTIDE Y

**AKA:** NPY.

A neuropeptide currently under study for its brain-boosting effects.

**Effects:** Stimulates the appetite and may play an important role in the modulation of stress and anxiety. Studies with rats and mice indicate that overproduction of this substance in the brain may lead to sensitivity to the sedative effects of alcohol and, consequently, less consumption of alcohol. Charles Morgan III, an associate clinical professor of psychiatry at Yale University and director of the human performance laboratory at the National Center for Posttraumatic Stress Disorder, found that soldiers in the Army Special Forces (or Green Berets) had significantly more neuropeptide Y in their blood than other enlisted men, so much so that he could tell just by analyzing a person's blood whether that person would succeed or fail in elite forces training. He discovered that it works as a tranquilizer in these individuals when they are under extreme stress, and believes this is why they remained mentally clear and focused, and suffered significantly less dissociation (detachment from reality), under stressful situations than the average soldier. Amanda Ripley, author of *The Unthinkable*, speculates that neuropeptide Y pills may one day be a part of every soldier's provisions to help them deal with stress. It may also be associated with the ability to deal with post-traumatic stress disorder, both during and after the fact (Yehuda et al., 2006).

**Precautions:** The above studies also indicate that a deficiency may lead to decreased sensitivity to alcohol and, possibly, greater alcohol consumption. Low levels of neuropep-

ptide Y are associated with anxiety disorders and depression. Studies involving mice and monkeys indicate that repeated stress and a diet high in fat and sugar trigger the release of Neuropeptide Y, resulting in abdominal fat.

**Dosage:** None established.

## NOREPINEPHRINE

**AKA:** 4-[(1R)-2-amino-1-hydroxyethyl]benzen-1,2-diol; Levarterenol, Levophed, Levophed Bitartrate, noradrenaline, norepinephrine bitartrate.

**Effects:** As a hormone, norepinephrine—along with adrenaline—gives the body energy in stressful situations, often characterized as the “fight-or-flight” response. As a neurotransmitter, it sends nerve impulses between neurons. It plays a significant role in attention and focus and, as such, medications that increase levels of norepinephrine and dopamine are used to treat ADHD. It may be needed to retrieve specific types of memories, leading researchers at the University of Pennsylvania School of Medicine to believe that it could be used to help treat PTSD and depression (Thomas et al., 2004).

**Precautions:** Should probably not be taken by those with asthma, high blood pressure, overactive thyroid, sulfite allergy, mesenteric or peripheral vascular thrombosis, or women who are pregnant or nursing, unless under the guidance of a physician. Individuals experiencing mania often have elevated levels of norepinephrine, and excess norepinephrine can increase symptoms of individuals with anxiety disorders. High levels of norepinephrine in schizo-affective patients can result in akathisia (constant restlessness and unwillingness to sit down).

Serious side effects include muscle pain or weakness, numbness or coldness in the body, blue lips or fingernails, mottled skin, breathing trouble, infrequent or cessation of urination, irritation at the site of injection, uneven heartbeat or changes in heart rate, sudden numb-

ness or weakness (particularly if it involves one side of the body), sudden headache, confusion, and problems with balance, speech, or vision. Less serious side effects include signs of allergic reaction (hives, difficulty breathing, and swelling of the face, lips, tongue, or throat). Overdose symptoms include slowed heart rate, severe headache, blurred vision, difficulty concentrating, increased sensitivity to light, sharp pain in the chest or back, pale skin, sweating, vomiting, seizures, or convulsions.

Norepinephrine may interact negatively with blood pressure medications and many antidepressants (including MAO inhibitors).

**Dosage:** For treatment of medical conditions, dosage can vary considerably depending on the individual and the condition being treated. The amino acids tyrosine and phenylalanine are precursors to dopamine which, in turn, is a precursor to norepinephrine; foods which can help maintain levels of norepinephrine include almonds, apples, avocados, bananas, beef kidney and liver, blue-green algae, cheese, fish, green vegetables, lean meat, nuts, grains, pineapple, poultry, and tofu.

## ORG 2766

An ACTH4–9 analog.

**Effects:** A study of twenty autistic children given 40 mg/day of ORG 2766 over eight weeks found that it significantly improved their social skills and interaction (Buitelaar et al., 1992); a previous study of fourteen autistic children found that even 20 mg/day over four weeks produced significant improvements (Buitelaar et al., 1992). In cancer therapy, it can provide protection against cisplatin neurotoxicity, but not taxol neurotoxicity. Numerous studies have shown that it can improve certain cognitive functions in brain-lesioned rats.

**Precautions:** It appears to have minimal effect in those suffering from panic disorder, and no effect in relieving generalized anxiety and social phobia in those suffering from these disorders (Den Boer et al., 1992; Den Boer et al.,

1995). Studies have also shown it has no benefits when given to individuals suffering from Alzheimer's disease.

**Dosage:** Varies depending on use.

## OXYTOCIN

**AKA:** The “cuddle hormone,” the “love hormone.”

A hormone that signals the uterus to contract after birth in pregnant women, and releases breast milk in nursing women (known as the let-down reflex).

**Effects:** Oxytocin plays an essential role in bonding and social recognition, which has led to it being popularly but misleadingly referred to as the “love hormone.” A 2010 study found that a nasal spray containing this hormone made shy people more outgoing, though it had no effect on those who were already socially comfortable; another 2010 study found that the nasal spray made men as empathetic as women. Experiments by neuroeconomist Paul Zak have also shown that it can promote sharing and empathy. A 2013 study found that brain scans of autistic children have shown positive effects in the areas of the brain associated with social situations when a nasal spray containing oxytocin was administered.

**Precautions:** Experiments at the University of Amsterdam in the Netherlands reveal that it can promote feelings of maternal aggression, territoriality, in-group favoritism, and ethnocentrism, possibly leading to xenophobia, prejudice, and violence. Said lead researcher Carsten de Dreu of his 2011 study, “Our findings and those of others indicate that oxytocin should not be used for recreational purposes. And while oxytocin may help in therapeutic settings, much more controlled research is needed—there is a lot we do not yet know about oxytocin.” Oxytocin was also found to increase the incidence of lying if it served to benefit team members or others with strong bonds to the liar (Shalvi et al., 2014). Professor Kevin Pelphrey, who was part of the 2013

autism study, warns that parents should not administer the hormone to their children on their own, as there could be unforeseen side effects.

The effects of oxytocin can be blocked by dihydrotestosterone.

**Dosage:** None established.

## PHENIBUT

**AKA:** Fenibut, Noofen, phenybut, Phenyl-GABA.

A derivative of GABA, it is marketed as a dietary supplement in the U.S., and as a neuropsychotropic drug in Russia for treating post-traumatic stress disorder, anxiety, depression, and insomnia, among other conditions.

**Effects:** A drug introduced in Russia in the 1960s which purportedly has nootropic effects. Cosmonauts have been routinely supplied with it in their medical kits. It is widely prescribed for tension, anxiety, fear, fatigue, and to improve sleep for those suffering from neurosis or psychosomatic disorders, as well as part of the treatment of depression, alcoholism, asthenia, and post-traumatic distress (Lapin, 2001). Anecdotal evidence indicates it can create feelings of euphoria.

**Precautions:** It is sometimes mistakenly referred to as a nootropic, though it appears to have very limited effect on learning, memory, or other mental abilities. Adequate human trials are lacking, and much of the information about its effects (both positive and negative) is anecdotal. Whether it is an effective treatment for any of the above conditions is unknown.

Side effects are similar to baclofen, albeit milder. They include increased sleepiness, “hangover” effects including headaches and depressed mood afterwards, and possible tolerance and addiction. Overdose symptoms (over 40 mg/kg) include lowered body temperature, muscle relaxation, and mild sleepiness. Anecdotal evidence and one medically documented case indicate that withdrawal

symptoms include severe anxiety, nervousness, tremors, agitation, dizziness, irritation, fatigue, lowered inhibition, loss of appetite, rapid heartbeat, nausea, vomiting, feelings of tension, psychosis, hallucinations, and possible insomnia, lasting for up to two weeks. Regular use may result in a rapid tolerance.

It should not be combined with alcohol, sedatives, MAO inhibitors, epilepsy medications, or other prescription drugs unless under the guidance of a physician.

**Dosage:** For medical conditions, the generally prescribed dose is between 250–1500 mg twice a day.

## PREGNENOLONE

**AKA:** Pregnenolone sulfate (PREG-S).

A hormone formed from cholesterol in various organs of the body, including the adrenal glands, liver, skin, the sexual organs, and the brain. The body can use it as it is, convert it into progesterone, or convert it into DHEA and then to over 150 steroid hormones, including androgens and estrogen. Levels in the body decline with age.

**Effects:** May improve mental ability, memory, visual and auditory perception, alertness, awareness, and mood by facilitating the transmission of impulses between neurons. It also relieves the symptoms of PMS in women and prevents arthritis (it was first developed in the 1930s as an arthritis medication). Animal experiments suggest that it can improve cognitive performance, extend life span, resist cancer, and prevent obesity. It may improve learning and memory in aging individuals (Vallée et al., 2001) and may help treat schizophrenia (Marx et al., 2011).

**Precautions:** There is insufficient evidence for many of the above claims. It is not known how supplements work, and they may have effects on the body that are as yet unknown, including the thyroid gland. Side effects may include irritability, anxiety, headaches, insomnia, aggressiveness, overstimulation, mood

changes, acne, hair loss, and abnormal heart rhythms, even at low doses.

It should not be taken by women who are pregnant or breastfeeding, by anyone with hormone-sensitive conditions such as various cancers, or by anyone with conditions that might be made worse with increased estrogen.

When combined with other hormones (especially estrogen), it could result in too much of these hormones in the body. It can prevent the THC in marijuana from activating the CB1 receptor in the brain.

**Dosage:** Ray Sahelian, M.D., recommends no more than 5 mg a few times a week for only short periods of time (and no more than 2 mg/day for more than five days in a row) unless under the guidance of a physician, because it accumulates in the body. He also maintains that it is not needed by healthy people under 40.

## PROGESTERONE

**AKA:** Crinone; Endometrin; P4; progesterin.

A female steroid hormone used in contraceptive pills and hormone replacement therapy. Milk and yams (*Dioscorea* species) have been found to have precursors to progesterone, but eating these foods will not boost levels of this hormone.

**Effects:** Research indicates it may have various neuroprotective effects against secondary, or delayed response, injuries following severe brain injury (Stein and Hoffman, 2003; Sayeed and Stein, 2009; Stein et al., 2010; Stein, 2013; Wei and Xiao, 2013), and works synergistically with vitamin D to reduce cell death (Cekic et al., 2009).

**Precautions:** Despite over 200 studies attesting to its benefits, some researchers argue that the results are too good to be true and, in fact, according to Wei and Xiao, “all TBI [traumatic brain injury] clinical trials have failed in Phase III.” Long-term effects are still unknown.

Side effects may include stomach upset, appetite changes, weight gain, edema, fatigue, acne, drowsiness, insomnia, rashes, hives, fever, headache, depression, breast discomfort, PMS-like symptoms, and menstrual irregularities.

Too little progesterone can cause changes in serotonin levels, leading to increased susceptibility to alcohol, nicotine, and cocaine addiction and increased vulnerability to nicotine’s effects, especially in woman. It should not be used by women who are breastfeeding, or anyone with arterial disease, breast cancer, depression, liver disease, or vaginal bleeding.

Progesterone can decrease the side effects of estrogen.

**Dosage:** None established.

## SELANK

**Effects:** A synthetic peptide that is used as a treatment for generalized anxiety disorder (Kolomin et al., 2013).

**Precautions:** Has fewer side effects than natural peptides, as it is not quickly broken down by proteases in the body, creating toxic byproducts.

## SEMAX

**AKA:** (2S)-1-[2-([(2S)-1-[(2S)-2-([(2S)-2-([(2S)-2-amino-4-methylsulfanylbutanoyl]amino)-5-hydroxy-5-oxopentanoyl]amino)-3-(1H-imidazol-5-yl)propanoyl]amino)-3-phenylpropanoyl]pyrrolidine-2-carboxyl]amino)acetyl]pyrrolidine-2-carboxylic acid, Met-Glu-His-Phe-Pro-Gly-Pro.

A heptapeptide and synthetic analogue of an ACTH (4–10) fragment of adrenocorticotropin.

**Effects:** In Russia, it is used as a treatment for a variety of medical conditions, including strokes (Zayats et al., 2001), memory and cognitive disorders, peptic ulcers, and optic nerve disease. Several studies have shown that it has neuroprotective effects in rats with induced ischemic lesions to the brain. It has been sug-

gested that it could be an effective treatment for depression (Pae, 2008).

**Precautions:** Has fewer side effects than natural peptides, as it is not quickly broken down by proteases in the body, creating toxic byproducts.

**Dosage:** 3 to 300 mg/kg depending on the medical condition being treated.

## SEROTONIN

**AKA:** 5-HT, 5-hydroxytryptamine.

**Food Sources:** Complex carbohydrates (whole grains), chocolate, fruit (eaten in place of sugary snacks), poultry, and plenty of vegetables will help maintain stable serotonin levels, as will regular exercise. Though foods may contain some serotonin, very little of it is biologically available; however, the body can manufacture it from tryptophan or 5-HTP in foods and supplements.

**Effects:** Serotonin has some of the most important functions in the brain and body. It is important in regulating mood and behavior, affects memory and learning, and, among other things, it can regulate platelets (which help blood coagulate), the ability of blood vessels to expand and contract (helping to control blood pressure), the ability of smooth muscles to contract (including abdominal muscles, which push food through the digestive system), and the effects of other neurotransmitters (some of these effects explain why people become violent, impulsive, and anti-social if hungry, and why such foods as chicken soup and chocolate are considered “comfort foods”) (Crockett et al., 2008). Serotonin may also play a role in social behavior, specifically, intimacy and romance in personal relationships (Rogers et al., 2011), and affect moral behavior by increasing a person’s reluctance to harm others (Crockett et al., 2010).

**Precautions:** It cannot pass through the blood/brain barrier. The ability of carbohydrates to raise serotonin may be negated by just 5 percent protein in a meal. Low chole-

sterol diets in animals are associated with lower serotonin levels and higher levels of aggression, though this correlation has not been studied in humans. Serotonin levels are subject to seasonal changes, which may explain why people become depressed during the winter, and women process serotonin differently than men, which may explain why they are more susceptible to depression and chronic anxiety.

Disruption in serotonin levels can result in any number of psychological disorders, including mania, depression and suicide fixation, aggression, impulsiveness, obsessive-compulsive disorder, higher alcohol consumption, eating and sleeping disorders, and possibly schizophrenia and Alzheimer’s disease. Serotonin imbalances may also contribute to the onset of headaches, migraines, and certain cardiovascular conditions such as Raynaud’s disease and hypertension. Those with low serotonin levels tend to binge on fatty or sugary foods, though this type of bingeing does not necessarily indicate a serotonin deficiency. Too much serotonin can cause a potentially life-threatening condition known as serotonin syndrome. Symptoms include confusion, restlessness, dilated pupils, headache, blood pressure changes, nausea, vomiting, diarrhea, rapid heart rate, muscle coordination problems, shivering, and profuse sweating; life-threatening symptoms include fever, seizures, irregular heartbeat, and unconsciousness.

When combined with anti-depressants, migraine drugs, pain medications, lithium, dextromethorphan, nausea medications, LSD, cocaine, St. John’s wort, or ginseng, it could cause a dangerous rise in serotonin levels.

**Dosage:** None established.

## 7-KETO

**AKA:** 7-ketodehydroepiandrosterone; 7-Keto-DHEA; 7-Keto-DHEA acetate; 7-oxodehydroepiandrosterone.

The hormone 7-keto is metabolized from DHEA.

**Effects:** Believed to be identical to DHEA, but without the side effects from metabolism. It is also believed to enhance memory and slow aging.

**Precautions:** There is insufficient evidence for any of its claims, including weight loss, muscle building, and immune system boosting.

There are currently no known side effects or drug interactions. Women who are pregnant or breastfeeding should avoid use to be on the safe side.

**Dosage:** One study found that it was safe at doses up to 200 mg/day for four weeks (Davidson et al., 2000).

## TESTOSTERONE

**Effects:** Testosterone loss with age is generally associated with erectile dysfunction, loss of physical strength, and loss of memory. Preliminary research at UCLA indicates that testosterone replacement therapy may improve energy levels, physical health, and interpersonal relationships in elderly men with mild Alzheimer's disease, but there was no reported improvement in memory or other cognitive skills (Lu et al., 2005). However, one study on 25 men, aged 50 to 80, found that intramuscular injections of 100 mg of testosterone enanthate significantly improved cognitive abilities, specifically spatial memory, spatial ability, and verbal memory (Cherrier et al., 2001).

**Precautions:** Testosterone treatment can have adverse effects on the prostate and cardiovascular system; on the other hand, the beneficial effects of short-term (six-month) testosterone treatment are not maintained six months after treatment ceased (Wu et al., 2010).

Testosterone production in the body, particularly the brain and other organs, can be depressed by just a single shot of morphine or other opioids (Aloisi et al., 2010).

**Dosage:** None established.

## THYROID HORMONES

**AKA:** Cytomel, Dextrothyroxine, Eltroxin, Euthroid, Levoid, Levothroid, Levothyroxine, Levoxyl, Liotrix, Liothyronine, Proloid, Synthroid, Thyroglobulin, Thyroid, Thyrolar, Thyroxine.

**Effects:** A class of drugs that mimic the hormone produced in the thyroid gland. Subclinical hypothyroidism, or a slightly under-functioning thyroid, can be one reason for poor concentration, mental confusion, and memory disturbances. The condition is also characterized by such symptoms as cold hands and feet, menstrual problems, dry skin, thin hair, and low energy levels. It is little-known and often overlooked by doctors.

**Precautions:** Any thyroid drugs should be taken only under the guidance of a physician. Common symptoms include tremors, headaches, irritability, insomnia, changes in appetite, diarrhea, leg cramps, menstrual irregularities, fever, heat sensitivity, unusual swelling, weight loss, and nervousness. Less frequent symptoms include hives, rash, vomiting, chest pain, heartbeat irregularities, and shortness of breath. Overdose symptoms, which can be life-threatening, consist of a "hot" feeling, heart palpitations, nervousness, sweating, hand tremors, insomnia, rapid and irregular pulse, headaches, irritability, diarrhea, weight loss, muscle cramps, angina, and congestive heart failure.

Thyroid hormones should not be taken by anyone who has had a heart attack within the past six weeks or for any reason other than a thyroid deficiency. Those who have heart disease, high blood pressure, diabetes, Addison's disease, who have had adrenal gland deficiency, or who use epinephrine, ephedrine, or isoproterenol for asthma should consult a physician first.

Its effect can be inhibited by cholestyramine, colestipol, oral contraceptives, estrogens, and phenytoin, and enhanced by large continuous doses of aspirin. In combination,

it can enhance the effects of amphetamines, oral anticoagulants, tricyclic antidepressants, oral antidiabetics or insulin, ephedrine, epinephrine, and methylphenidate, and diminish the effects of barbiturates, beta-adrenergic blocking agents, cortisone drugs, and digitalis medications. It can also interact with sympathomimetics, possibly causing a rapid or irregular heartbeat. Combining it with cocaine can result in excessive stimulation.

**Dosage:** None established.

## THYROTROPIN-RELEASING HORMONE

**AKA:** Protirelin; thyroliberin; thyrotropin-releasing factor (TRH); TRH.

**Effects:** A neuropeptide which has been found to have anti-depressant and anti-suicidal effects (Marangell et al., 1997), as well as anti-aging properties in mice (Pierpaoli, 2013).

**Precautions:** None known.

**Dosage:** None established.

## VASOPRESSIN

**AKA:** ADH, Adiuretin SD, antidiuretic hormone, arginine-vasopressin, argipressin, AVP, DAV Ritter, DDAVP, Desmopressin, Desmospray, Diapid, L-desamino-8-D-arginine, LVP, lypressin, lysine-vasopressin, Minirin, Pitressin, Postacton, Pressyn, rinderpressin, Syntopressin, VP.

A hormone and natural brain peptide secreted by the pituitary gland that has antidiuretic properties. Vasopressin is released by experiences of great trauma or intense arousal (which may be one reason why such emotional moments have such a strong impression and can be remembered with vividness long afterwards); stimulant drugs such as amphetamines, cocaine, LSD, and Ritalin (methylphenidate) also release large amounts, and habitual use of these drugs depletes the brain's supply of this hormone. Conversely, depres-

sant drugs such as alcohol and marijuana suppress the secretion, which may be why users frequently do not remember events when drunk or stoned. Diapid is the synthetic version, and it is only available as a nasal spray, which is prescribed for diabetes insipidus and memory loss resulting from aging, Alzheimer's, amnesia, Korsakoff's syndrome, and senile dementia.

Arginine-vasopressin (argipressin) and lysine-vasopressin (lypressin) are forms of vasopressin that have an additional amino acid; their effects are basically the same.

**Effects:** Increases theta wave activity in the brain which, in turn, increases attention span, concentration, memory, short- and long-term recall, recognition, retention, and creativity. It may prove helpful in retaining new information (e.g., a language or new field of study), as it helps imprint this information in the brain. It has been shown to restore memory lost as a result of aging, traumatically induced amnesia (caused by physical injury to the brain), and possibly chemically and electrically induced amnesia, as well. It can counteract the effects of the drugs mentioned above. It may even have anti-depressant qualities, and reports claim it intensifies orgasms.

**Precautions:** Common side effects include pale skin, stomach pain, gas, nausea, vomiting, dizziness, sweating and mild rash. Serious side effects include signs of allergic reaction, severe headache, severe drowsiness, slowed breathing, weakness, lack of urination, numbness or tingling in the mouth, chest pain, breathing problems, skin changes or discoloration, and pain or loss of feeling in parts of the body.

It should not be used by those who are allergic to it. It should be used with caution by women who are pregnant or breastfeeding, or those with coronary artery disease, heart disease, kidney disease, asthma, migraine headaches, or seizure disorders such as epilepsy.

Excessive use of the drug should not be combined with excess water consumption, as it could lead to a rare condition called water

intoxication. Alcohol can decrease the effectiveness of vasopressin. Vasopressin may interact with other drugs (prescription and over-the-counter), vitamins, and herbal products.

**Dosage:** A total dose of 12 to 16 units/day from a nasal spray bottle (one whiff, or approximately 2 U.S.P. [United States Pharmacopeia]

Posterior Pituitary Units, in each nostril three to four times a day) will improve memory, according to most studies. It works extremely fast, as it is absorbed into the mucous membranes of the nose and taken directly into the brain, and improvements may be noticed within seconds.



## *Essential Oils*

Aromatherapy, or the use of herbal oils as medicines, has been practiced for thousands of years. Essential oils, or concentrated liquids extracted from various parts of plants, are believed to help protect plants from certain diseases and pests, and are thought to have effects on the human mind and body as well. They can either be inhaled (by putting a drop or two in a bowl of steaming water), absorbed through the skin (by using three or four drops as a massage oil, or a 1-to-10 ratio of essential oil to a carrier oil such as sweet almond, olive, or sesame seed oil), or both (by putting 5 or 6 drops in warm bath water). Some shops or catalogs sell dispensers, lamps, vaporizers, or diffusers that provide a longer-lasting effect. In a 2012 study, subjects were exposed to an orange-vanilla scent while viewing a ten-minute movie about volunteering, then asked how people could be motivated to volunteer their time; one-third were then exposed to that same scent just before falling asleep, while the other two-third were exposed to a different scent or no scent. Upon awakening, the subjects who were exposed to the same scent came up with far more creative solutions than those in the other two groups (Ritter et al., 2012).

Smells can have a direct influence on the brain, affecting emotion and memory by stimulating the hypothalamus, hippocampus, and amygdala. Studies have shown that pleasant aromas increase productivity in the workplace

by as much as 25 percent, and learning by as much as 17 percent. Many oils work synergistically with each other.

Pure, undiluted oils are extremely concentrated and should never be inhaled directly from the bottle or applied to the skin, and they should not be taken internally (as little as a half teaspoon of pure oil can be fatal). Also, avoid getting essential oils in the eye, as they can be irritating (a cotton swab soaked in vegetable oil and applied to the eye should relieve discomfort). They can last a year or more if stored properly in a cool, dry, and dark place, and the bottle is opened only when dispensing oil (they can evaporate or oxidize quite readily in the open air); a small amount of vitamin E can help preserve the freshness. As for their benefits, little is known about the specifics with which they work: only a handful of studies have been done on aromas and aromatherapy, and most of the purported effects are based on anecdotal evidence or folklore. Even among practitioners, there may be some discrepancy about specific effects, so caution is advised.

They should not be used by those suffering from epilepsy or other seizure disorders, those whose blood pressure is abnormally high or abnormally low, those with asthma, or those being treated for cancer. Allergic reactions or photosensitivity are possible, especially with spice oils such as thyme, sage, and oregano, which can be irritating (patch-test an oil by

dabbing a drop of it on the skin with a cotton swab, placing a bandage over it, and checking it 24 hours later for any adverse reactions). Many essential oils can cause such side effects as headaches, dizziness, and nausea, while some may contain compounds which could be carcinogenic if used regularly for an extended period of time. Oils should generally be reserved for treating specific conditions, and not be used on a daily basis, especially for more than two or three weeks at a time, as they can produce effects that are the opposite of what they normally provide.

Prices can vary depending on such factors as the origin of the plant, the method of extraction, and whether it was grown organically or not. Absolutes—which are essential oils that are viscous or semi-solid—are cheaper, but may contain trace amounts of toxic solvents used in the extraction process, and are not recommended for therapeutic use. Perfumes and fragrance oils sold by cosmetics companies are synthetic (the term “nature identical” is a tipoff), and are of little benefit in aromatherapy. Essential oils themselves can be rather expensive, as it may take a hundred pounds of plants or more to produce one ounce of oil.

### ANGELICA

**AKA:** *Angelica archangelica*.

**Effects:** Said to relieve stress and anxiety, as well as reduce nausea and weakness during recovery from illness, break up congestion in the lungs, and relieve stomach cramps, arthritis pain, PMS, and menstrual pain.

**Precautions:** Avoid sunlight if applying directly to the skin, as it may cause dermatitis. The fresh oil is colorless, and turns yellow, then dark brown, with age; the dark brown oil should not be used.

### BASIL

**AKA:** *Ocimum basilicum*.

There are over a hundred different varieties of basil.

**Effects:** Contains high amounts of cineole, a compound which increases blood flow to parts of the brain. Said to increase concentration, mental functioning, and memory, relieve nervousness and fatigue, and promote feelings of contentment, happiness, and sexuality. It has been used to treat headaches and various respiratory infections, including bronchitis and whooping cough.

**Precautions:** Contains estragol, which may cause adverse reactions and skin sensitization in some people and—possibly—cancer in large doses (varieties low in estragol include *Ocimum Americanum*, *Ocimum canum*, and *Ocimum gratissimum*). Constant use of basil may dull the mind, rather than stimulate it. It should not be used by pregnant women.

### BAY

**AKA:** Bay leaf, *Pimenta acris*.

**Effects:** Said to promote psychic awareness. It can also relieve arthritis pain and the symptoms of respiratory ailments.

**Precautions:** It may be irritating if applied directly to the skin, especially in its pure state.

### BENZOIN

**AKA:** *Styrax benzoin*.

It is more of a resin than an oil, and has to be melted by heat before being used.

**Effects:** Said to increase energy, as well as ease the symptoms of common respiratory problems (colds, flu, coughs, sore throat) and skin conditions such as eczema and psoriasis.

**Precautions:** It may cause allergic reactions in some people.

### BERGAMOT

**AKA:** *Citrus aurantium bergamia*.

**Effects:** Said to relieve stress, anxiety, and depression, and contribute to a calm sleep. It is used in Europe to treat infections of the skin, respiratory tract, and urinary tract.

Works synergistically with angelica, cedar, chamomile, geranium, lavender, lemon, neroli, rose, and ylang-ylang.

**Precautions:** Mild side effects include skin irritation. The undiluted oil should not be applied directly to the skin. Avoid sunlight and tanning booths for several days if applying directly to the skin or using in bath water. It should not be used by individuals predisposed to skin cancer.

## CAMPHOR

**AKA:** *Camphora officinarum*, *Cinnamomum camphora*, *Laurus camphora*.

**Effects:** Said to increase energy.

**Precautions:** Should not be used by those with asthma or allergies. It is a very strong oil, and extra caution should be used to prevent using too much.

## CARAWAY

**AKA:** *Carum carvi*.

**Effects:** Said to increase energy. It is used to treat various digestive problems, including colic, colitis, dyspepsia, flatulence.

## CARDAMOM

**AKA:** Cardamon, *Elettaria cardamomum*.

**Effects:** Said to elevate mood and improve memory and concentration. It is used as a digestive aid, and to treat heartburn, flatulence, and diarrhea.

**Precautions:** Should always be used with a base oil, as it can cause the skin to become sensitive.

## CEDAR

**AKA:** Cedarwood, *Cedrus atlantica*, *Cedrus deodora*, *Cedrus libani*.

**Effects:** Said to promote a sense of spirituality, improve the respiratory system, and be an aphrodisiac.

Works synergistically with bergamot, jasmine, juniper, neroli, and rose.

**Precautions:** Some brands may be adulterated with other essential oils, including juniper, which may cause problems arising from the compound thujone. Though several different trees produce essential oils which are marketed as cedarwood, some aromatherapists recommend that only *Cedrus atlantica* be used, as that has the most reliable therapeutic properties.

## CELERY

**AKA:** Ache, *Apium graveolens*, smallage.

**Effects:** Said to relieve fatigue, contribute to a restful sleep, and be an aphrodisiac.

## CHAMOMILE

**AKA:** *Anthemis nobilis* or *Chamaemelum nobile* (Roman chamomile), *Matricaria chamomila* or *Matricaria recutita* (German chamomile).

**Effects:** Said to relieve stress and stress-related headaches, anxiety, and depression, and contribute to a restful sleep. Roman chamomile is used to treat stomach aches, indigestion, diarrhea, muscle spasms, and PMS; German chamomile is used to treat skin conditions such as acne and eczema, and cold sores.

**Precautions:** German chamomile is one of the safest of the essential oils. Mild side effects include dermatitis. The oil should be blue; a brown color indicates it is no longer fresh.

## CINNAMON

**AKA:** Cassia, *Cinnamomum cassia*, *Cinnamomum ceylanicum*, *Cinnamomum zeylanicum*.

**Effects:** Said to increase energy and promote awareness.

**Precautions:** It should not be used without the guidance of a trained aromatherapist, as it

can be quite toxic. It may cause an allergic reaction in some people. It should always be diluted before being applied to the skin, as it can be irritating in its pure state, possibly causing blisters and burns.

### CLARY SAGE

**AKA:** *Salvia sclarea*.

**Effects:** Said to relieve depression, stress, and fatigue; improve memory and creativity; induce intense and colorful dreams; produce euphoria (in some people); act as an aphrodisiac; and relieve headaches and the symptoms of PMS. Though it is related to common sage (*Salvia officinalis*), its essential oil is very different.

Works synergistically with bergamot, cypress, geranium, jasmine, lavender, and sandalwood. Drinking alcohol is said to intensify its effects, though this is not recommended.

**Precautions:** Aside from sleepiness, there are no known side effects. Clary sage should not be used for more than brief periods of time. It should not be used by women who are pregnant or anyone who suffers from epilepsy. Despite the synergistic effect with alcohol, combining the two can lead to a dangerously heightened sense of drunkenness (and accompanying hangover) with extreme nightmares.

### CORIANDER

**AKA:** *Coriandrum sativum*.

**Effects:** Said to improve memory. It has been used to aid digestion and reduce flatulence.

**Precautions:** Do not use the essential oil internally unless under the guidance of an expert aromatherapist, as the wrong dosage could prove fatal. One case on record relates that several workers who tried to clean up fifty quarts of coriander oil spilled from a large container were overcome by the fumes within a half hour, laughing and giggling at first, then becoming aggressive and belligerent. Before they

could be rescued, two suffered from extreme nausea, and all suffered from extreme fatigue for the next few days.

### CYPRESS

**AKA:** *Cupressus sempervirens*.

**Effects:** It was used in ancient times by Egyptians, Chinese, and Greeks to treat bleeding problems. It is also used to treat insomnia, varicose veins, menstrual pain, problems associated with menopause, rheumatism, and arthritis.

**Precautions:** No known side effects. It should not be used by women who are pregnant or individuals with high blood pressure.

### EUCALYPTUS

**AKA:** *Eucalyptus citriodora*, *Eucalyptus globulus*, *Eucalyptus radiata*, lemon-scented eucalyptus.

**Effects:** Contains cineole and eucalyptol, both of which stimulate the central nervous system. It is said to relieve stress. The oil has antiviral and antibiotic properties, and has been used to treat a variety of respiratory problems. It is a common ingredient in cold remedies, and works as an effective insect repellent.

Works synergistically with angelica, hyssop, lemon, pine, and thyme.

**Precautions:** Mild side effects include irritation to sensitive skin. It should not be taken internally.

### FENNEL

**AKA:** *Foeniculum vulgare*.

**Effects:** Said to relieve nervous tension and increase life span. It has been used to treat muscular aches and pains, digestive problems, nausea, and hangovers.

Works synergistically with detoxifying and cleansing oils such as juniper.

**Precautions:** It should not be used by those suffering from epilepsy; it should not be used indiscriminately because it is high in phenolic

resin; and it should not be used as a diuretic without supervision, as it could cause kidney damage. Some aromatherapists are also concerned about the combination of principal constituents anethol and estragol, which could cause serious side effects, though none have been reported.

## FRANKINCENSE

**AKA:** *Boswellia carteri*, *Boswellia thurifera*, olibanum.

**Effects:** Said to slow down and deepen breathing, and to promote calmness and feelings of spirituality. It has been used to treat sinus congestion, asthma, and even skin cancer.

Works synergistically with sandalwood.

**Precautions:** No known side effects. It should be used with caution by asthmatics, as the hot steam could have an adverse effect.

## GERANIUM

**AKA:** *Pelargonium graveolens*, *Pelargonium odoratissimum*.

**Effects:** Said to reduce stress and depression, induce calmness, and increase energy. It has been used to treat various skin disorders, as well as athlete's foot and hemorrhoids. Applied externally, it is said to relieve premenstrual syndrome, balance hormones, stop the itching of insect bites, and act as an all-purpose healing agent.

Works synergistically with benzoin, bergamot, chamomile, clary sage, lemongrass, melissa, patchouli, and vetiver.

**Precautions:** No known side effects. Since it is quite expensive, cheaper brands may be adulterated with artificial esters, cedarwood, lemongrass, and turpentine. It should not be used by women who are pregnant.

## GINGER

**AKA:** *Zingiber officinalis*.

**Effects:** Said to increase energy. It has been

used to treat diarrhea, catarrh, and rheumatism.

**Precautions:** It could cause a rash or blisters if applied directly to the skin or added to bath water.

## GRAPEFRUIT

**AKA:** *Citrus paradissi*.

**Effects:** Said to relieve anxiety, stress, and depression.

Works synergistically with lavender.

**Precautions:** Can increase chances of sunburn when applied to the skin.

## JASMINE

**AKA:** Jasmine absolute, *Jasminum grandiflorum* (royal jasmine, Spanish jasmine), *Jasminum officinale* (common jasmine).

**Effects:** Said to relieve insomnia and depression, and promote feelings of optimism, confidence, sexuality, and euphoria.

**Precautions:** Mild side effects include insomnia and allergic reactions. It should not be applied to the skin, as some of the ingredients can cause irritation. Since so many flowers are needed to produce an ounce of essential oil, virtually all of the products on the market since the late 1980s are absolutes, which may contain trace amounts of toxic solvents. Jasmine absolute using the process of enfleurage—placing leaves in trays of carrier oil to extract the essential oil—is considered the safest, though some still consider it unsuitable for use. Any product labeled “essential oil” should be avoided, as it has been made through distillation, which destroys the perfume.

## JUNIPER

**AKA:** *Juniperus communis*.

**Effects:** Said to increase happiness, energy, and strength. It is also used for its detoxifying, diuretic, and antiseptic qualities, as well as

maintaining concentration during prayer and meditation.

**Precautions:** Should not be used for kidney problems. The oil could be adulterated with turpentine.

### LAVANDIN

**AKA:** *Lavandula delphinensis*, *Lavandula fragrans*, lavandin.

Lavandin is a hybrid of lavender and aspic.

**Effects:** Said to have a mild calming effect similar to lavender. It is used to treat muscular aches and pains, colds, catarrh, and sinusitis.

**Precautions:** It is often sold as lavender, even though it has a sweet fragrance and is not as potent.

### LAVENDER

**AKA:** *Lavandula angustifolia*, *Lavandula latifolia*, *Lavandula officinalis*, *Lavandula vera*.

**Effects:** Said to relieve stress and anxiety, and contribute to a deeper, more restful sleep. It is used for a wide variety of disorders and medical problems.

Works synergistically with bergamot, chamomile, clary sage, geranium, marjoram, neroli, rose, rosemary, and ylang-ylang.

**Precautions:** A 2003 study at the University of Northumbria found that lavender significantly decreased working memory in individuals and had a negative effect on reaction times for both memory- and attention-based tasks. It may also play a factor in the development of gynecomastia, the abnormal development of breasts in male children, when applied directly to the skin over a prolonged period of time. It should not be applied near the eyes. Species of lavender other than *Lavandula angustifolia* may have different effects. Individuals with other allergies or asthma may suffer an allergic reaction to lavender. Because it is so expensive, it is often adulterated with other oils such as lavandin.

### LEMON

**AKA:** *Citrus limon*.

**Effects:** Said to increase energy and concentration, elevate mood, relieve anxiety, depression, stress, and insomnia, and contribute to health and healing.

Works synergistically with cedar, eucalyptus, fennel, juniper, lavender, and pine.

**Precautions:** If applied to the skin in its pure state, it can cause an allergic reaction or irritation, or even a skin rash if exposed to sunlight or ultraviolet light. Never use oil that is cloudy or pale.

### LEMONGRASS

**AKA:** *Cymbopogon citratus*, *Cymbopogon flexuosus*, melissa grass.

**Effects:** Said to relieve fatigue, induce calmness, and increase concentration.

Works synergistically with eucalyptus, geranium, juniper, lavender, lime, and pine.

**Precautions:** It may be irritating when applied to sensitive skin. It is used to adulterate melissa and, along with geranium and citronella, it is often used to imitate rose and verbena.

### LIME

**AKA:** *Citrus limetta*.

**Effects:** Said to increase energy, relieve depression, and improve memory and concentration.

Works synergistically with bergamot, cedar, clary sage, lemongrass, and pine.

**Precautions:** If applied to the skin, it can cause a rash when exposed to sunlight.

### MARJORAM

**AKA:** Knotted marjoram, *Origanum marjorana*, sweet marjoram.

**Effects:** Said to relieve stress and insomnia. It has been used to treat such conditions as anorexia, diarrhea, flatulence, high blood pres-

sure, PMS, menopause, migraines, and muscular aches and pains.

Works synergistically with bergamot and lavender.

**Precautions:** It should not be used on young or sensitive people, as it could produce an effect opposite to the one intended. It is often confused with oregano, whose calming properties are not as great.

## MELISSA

**AKA:** Balm, bee balm, lemon balm, *Melissa officinalis*, sweet balm.

**Effects:** Said to relieve nervous tension, irritability, anxiety, depression, and insomnia. It has been used to stimulate the appetite and treat cold sores, high blood pressure, shock, migraines, and asthma.

Works synergistically with geranium, lavender, myrtle, neroli, and rose.

**Precautions:** It is a very strong oil and should only be used under the guidance of an expert aromatherapist. It may cause irritation when applied to the skin. Some brands may be adulterated with the much less expensive and less effective citronella, lemon, or lemongrass.

## MYRRH

**AKA:** *Commiphora molmol*, *Commiphora myrrha*.

**Effects:** Used as an aid in meditation. It is also used to treat skin and mouth problems. Myrrh is used as a flavoring in foods, beverages, toothpaste, and mouthwash.

**Precautions:** It may be toxic in high concentrations. It should not be taken internally, as it can irritate the kidneys. It should not be used by women who are pregnant. The oil may be adulterated with ammonia.

## MYRTLE

**AKA:** *Myrtus communis*.

**Effects:** Said to cleanse the mind, spirit,

and body, and to aid concentration during meditation.

Works synergistically with cypress, lavender, lemon, neroli, and pine.

## NEROLI

**AKA:** *Citrus aurantium*, *Citrus aurantium bigardia*, *Citrus bigaradia*.

**Effects:** Said to relieve stress, anxiety, fatigue, depression, insomnia, and pain, and to increase feelings of love and euphoria.

Works synergistically with jasmine and rose.

**Precautions:** No known side effects. It may increase the chance of sunburn if applied to the skin. It is often adulterated with petitgrain.

## NUTMEG

**AKA:** *Myristica fragrans*.

**Effects:** Said to increase energy. It is sometimes used as a tonic for the heart and digestive system.

**Precautions:** It can cause narcosis, vomiting, hallucinations, or even death; even the spice can cause severe adverse reactions. If applied to the skin, it can cause rashes and allergies. Its use is not recommended.

## ORANGE

**AKA:** *Citrus aurantium*, *Citrus aurantium sinensis*.

**Effects:** Said to reduce stress and depression, increase energy, and induce feelings of calm and happiness. It has been used to treat such gastrointestinal disorders as gas, indigestion, and constipation.

Works synergistically with cinnamon, clove, lavender, and nutmeg.

**Precautions:** When applied to the skin, it can increase susceptibility to damage by the sun. The oranges used must be natural and organic, as most are sprayed with ethylene to give them more color and coated with wax to seal in the moisture.

## PALMAROSA

**AKA:** *Cymbopogon martinii*.

**Effects:** Said to elevate mood, refresh the spirits, and to relieve anxiety and stress. It has been used to relieve the muscle aches accompanying flus and fevers.

**Precautions:** It is often adulterated with cedarwood and turpentine. There are no known side effects.

## PATCHOULI

**AKA:** *Pogostemon patchouli*.

**Effects:** Said to relieve anxiety and stress.

**Precautions:** It is often adulterated with cedar and other oils. There are no known side effects.

## PEPPER

**AKA:** Black pepper, *Piper nigrum*.

**Effects:** Said to promote alertness. It has been used to treat dermatitis, flu symptoms, rheumatism, catarrh, colds, and hay fever.

**Precautions:** Undiluted, the oil can be toxic and irritating to the skin. Overuse could damage the kidneys.

## PEPPERMINT

**AKA:** *Mentha piperita*, *Mentha x piperita*.

**Effects:** Contains large amounts of cineole, a compound which increases blood flow to parts of the brain. When rubbed into the forehead, it can relieve tension headaches. It stimulates the nervous system, improves circulation, and increases awareness, alertness, and concentration. It has been used to treat mental fatigue, motion sickness, gas, stomach aches, nausea, vomiting, heartburn, diarrhea, migraines, hangovers, shingles (herpes zoster), and congested sinuses.

**Precautions:** It should always be diluted with vegetable or nut oil before being applied to the skin, and it should not be used in bath

water, as it can be irritating to the skin. It should not be used as a massage oil, as at least half of the essential oil is menthol, an alcohol that has a cooling effect on the skin. And it should not be used undiluted, at night (as it will prevent sleep), or in addition to homeopathic remedies.

Peppermint oil should not be used by those with epilepsy or other neurological disorders, pregnant women, or children under 30 months of age.

## PETITGRAIN

**AKA:** *Citrus aurantium bigaradia*.

**Effects:** Said to relieve nervous tension, fatigue, insomnia, and sadness. Its effects are very similar to neroli, only milder.

**Precautions:** When applied to the skin, it can increase susceptibility to sunburn. It may cause insomnia in some people.

## PINE

**AKA:** *Pinus sylvestris*.

**Effects:** Said to relieve nervous tension, anxiety, and depression.

**Precautions:** It can cause irritation to those with sensitive skin when applied topically. It is often adulterated with turpentine.

## ROSE

**AKA:** *Rosa centifolia* (cabbage rose, Provence rose), *Rosa damascena* (damask rose), *Rosa gallica*.

**Effects:** Said to relieve stress, anxiety, depression, and insomnia, and contribute to feelings of contentment and love. It has been used by herbalists to treat digestive problems.

Works synergistically with jasmine, lavender, neroli, and sandalwood.

**Precautions:** There are no known side effects. Since it is so expensive, cheaper brands may be adulterated with other oils such as *bois de rose*, gaiac, geranium, and palmarosa. Its me-



dicinal properties have not withstood scientific scrutiny. It is also sold as an absolute, which may contain trace elements of toxic solvents.

## ROSEMARY

**AKA:** *Rosmarinus officinalis*.

**Effects:** Has antioxidant properties, and contains high amounts of cineole, a compound which increases blood flow to parts of the brain and stimulates the central nervous system. It can also increase alertness and concentration, improve memory, relieve stress, and promote feelings of happiness and well-being. It is said to relieve depression and increase life span. A 2003 study at the University of Northumbria found that rosemary enhanced the overall quality of memory except for speed of recall, which was reduced.

**Precautions:** There are no known side effects. It should not be used by women who are pregnant, or individuals with epilepsy or high blood pressure. It may be adulterated with aspic, sage, and turpentine.

## SAGE

**AKA:** *Salvia officinalis*.

**Effects:** Said to relieve fatigue and depression, and improve memory.

**Precautions:** Contains compounds (such as thujone) which could cause severe adverse side effects and be carcinogenic if used for an extended period of time, even in small amounts. It should not be used by young or sensitive individuals, and some aromatherapists advise using clary sage instead.

## SANDALWOOD

**AKA:** *Santalum album*.

**Effects:** Said to reduce stress, increase concentration during meditation, and act as an aphrodisiac. It has been used to treat eczema and other skin disorders, sore throats, and urinary tract infections.

Works synergistically with benzoin, frankincense, jasmine, lemon, rose, and verbena.

**Precautions:** The huge demand for this oil has led to the practice of cutting trees before they reach maturity, depleting a once abundant crop. It may be adulterated with castor, linseed, and palm oils.

## STAR ANISE

**AKA:** Badian anise, Chinese anise, *Illicium verum*.

**Effects:** Said to promote awareness. It has no medicinal properties.

**Precautions:** It is not recommended for use as an oil.

## TANGERINE

**AKA:** *Citrus reticulata*.

**Effects:** Said to relieve stress, anxiety, tension, depression, and insomnia.

**Precautions:** If applied to the skin, it could make it more susceptible to damage from the sun.

## TARRAGON

**AKA:** *Artemisia dracunculus*.

**Effects:** Said to relieve anxiety and stress.

**Precautions:** It is considered mildly toxic, and may be carcinogenic. False, or Russian, tarragon is inferior in quality to true, or French, tarragon. Seeds are from false tarragon, as the true plant is sterile. It should not be used by women who are pregnant or by individuals with a sensitivity to estragole or methyl chavicol.

## THYME

**AKA:** *Thymus vulgaris*.

**Effects:** Said to relieve depression and tiredness.

**Precautions:** Thyme should be used in very diluted form, as it can be irritating to the skin

and mucous membranes, and it should not be taken internally, as it can cause kidney damage. Plants harvested in eastern Europe may be contaminated with radiation from fallout originating from the Chernobyl nuclear power plant accident. It should not be used by women who are pregnant or by those with high blood pressure.

## VANILLA

**AKA:** *Vanilla planifolia*.

**Effects:** Said to reduce stress, irritability, and tension.

Works synergistically with bergamot, lime, and rose.

## VERBENA

**AKA:** *Aloysia citriodora*, lemon verbena, *Lippia citriodora*, *Verbena triphylla*.

It should not be confused with vervein, or *Verbena officinalis*.

**Effects:** Said to relieve depression and fatigue, and increase concentration. It is used as a digestive aid, an antiseptic, and to clear up such skin problems as acne.

Works synergistically with cedar, hyssop, jasmine, juniper, myrtle, neroli, and orange.

**Precautions:** The pure oil may irritate sensitive skin, and more than two or three drops in bathwater may sting or blister the skin. It is quite rare and expensive, so cheaper brands may be adulterated with lemongrass and citronella.

## VETIVER

**AKA:** *Andropogon muricatus*, khas-khas, khus-khus, *Vetiveria zizanioides*, vetivert.

**Effects:** Said to reduce stress and nervous tension. It is used mainly in perfumes and

soaps, and as a fixative in aftershaves and colognes.

Works synergistically with cardamom, frankincense, jasmine, neroli, orange, rose, sandalwood, verbena, and ylang-ylang.

**Precautions:** it is quite costly, so less expensive brands may be adulterated with cheaper oils or synthetics.

## YARROW

**AKA:** *Achillea millefolium*.

**Effects:** Said to increase awareness. It has been used to speed the healing of wounds, and to treat headaches, skin rashes, varicose veins, hemorrhoids, vaginal infections, and acne.

Works synergistically with clary sage, cypress, melissa, and myrtle.

**Precautions:** Yarrow should only be used in its diluted state, as it is quite powerful. When applied to the skin, it can make it more susceptible to skin rash when exposed to sunlight or ultraviolet light.

## YLANG YLANG

**AKA:** *Cananga odorata*.

**Effects:** It can slow down rapid breathing and rapid heartbeat. It is said to relieve stress, anxiety, insomnia, depression, and the mood swings of PMS, and promote feelings of love and sexuality.

Works synergistically with bergamot, clary sage, lavender, lemon, and neroli.

**Precautions:** Prolonged or excessive use may cause headaches or nausea. Due to the neglect of this plant as a cash crop, this oil is now hard to come by, and most of the oil now sold is either cocoa butter, coconut oil, or the inferior variant *Cananga macrophylla*, popularly known as cananga.

## *Entheogens*

Entheogens, popularly known as psychedelics or hallucinogenics, are among the most powerful and controversial substances known to man, and comprise approximately one-tenth of the 600,000-plus plant species identified so far. The use—and abuse—of these substances is as old as mankind itself, and has played a vital role in human history, most significantly in religious rituals. Along with these are thousands of possible variations—analogs and homologs—known as designer drugs (pioneering pharmacologist Alexander Shulgin alone synthesized more than 230), which have become possible over the last few decades. These mind-altering substances act by intensifying the user’s mood and the situation he or she is in when taking the drug; as such, they have often been used in religious ceremonies and, more recently, in therapeutic situations. There may be many more psychoactive plants that have yet to be identified; there are certainly many in which the psychoactive ingredient has yet to be identified. A number of these plants are used by various indigenous peoples around the world in their ceremonies, yet they appear to have no psychoactive ingredient, and the often theatrical and bizarre behavior exhibited by those partaking of the so-called hallucinogen may be due more to social expectations and psychodrama than to any actual pharmacological ingredient. The quality of the experience may reflect the variety and

potency of the plant, the method with which it is prepared, the setting or circumstances under which it is taken, and possibly the physiology of the individual taking it. For more detailed information on specific plants, see Ratsch (1998) and Wink and van Wyk (2008).

### ACACIA SPECIES

**AKA:** There are 750 to 800 species of *Acacia*, some that were formerly classified under other genera; conversely, some *Acacia* species have been reclassified under other genera.

**Effects:** Many species contain high levels of N,N-Dimethyltryptamine, and various parts of the plants are used in beverages in Mexico (in a fermented beverage called Pulque), Africa (in a beer called dolo), and Belize (in a ritual drink called balche’ and in a tea to cure impotence)

**Precautions:** None known.

**Dosage:** None established; may vary according to species.

### ACONITE

**AKA:** *Aconitum ferox* (blue aconite, wolfsbane); *aconitum napellus* (blue rocket, monkshood); friar’s cap; mousebane.

**Effects:** A psychedelic when smoked or absorbed through the skin. In medieval times, an extract was used as an ointment by witches,

giving them the feeling that they were flying.

**Precautions:** It is extremely poisonous; the entire plant contains the alkaloid aconitine, making it dangerous even to handle. Water with which it has come into contact should be treated with caution also. According to Christian Ratsch, “[e]ven experienced Tantrists emphatically warn against its use.” Since the Middle Ages, *Aconitum napellus* has been regarded as the most dangerous and poisonous plant in Europe.

Serious side effects include a tingling, prickling, or burning sensation in the mouth and throat, followed by facial twitches and paralysis of the mouth and tongue with loss of speech, a tingling and crawling sensation in the extremities, a numbness of the fingers and toes, cold sweat, chills, hypothermia, nausea, vomiting, severe diarrhea, a slowed and/or irregular heartbeat, numbness, paralysis of the arms and legs, difficulty breathing, dizziness, a buzzing in the ears, increased urination, severe pain, spasms and loss of consciousness. Death can occur within one-half to three hours due to respiratory or cardiac arrest.

**Dosage:** None established. According to Ratsch (1998), “*Aconitum ferox* is the most poisonous plant of the Himalayas ... [a]s little as 3 to 6 mg ... is sufficient to kill an adult.” Handling the fresh tubers of *Aconitum napellus* can cause toxic reactions. Ingestion of only 0.2 mg can cause toxicity.

### AFRICAN RUE

**AKA:** *Harmala*; *Peganum harmala*.

**Effects:** Euphoria and hallucinations. It is chemically similar to ayahuasca. In Asian and Arabic cultures, smoke from the burning seeds is inhaled for its intoxicating and sexually stimulating effects, and it is thought that the colorful and complex designs of oriental rugs, along with the mythical stories of flying carpets, arose from this practice.

**Precautions:** The initial effects are nausea,

dizziness, dry eyes, salivation, aggression, intense vomiting and diarrhea. An overdose can result in nightmarish visions, violent intoxication, recklessness, and subsequent feelings of sickness.

**Dosage:** About 4 mg of the Harman alkaloids.

### AFRICAN WILD YAM

**AKA:** *Dioscorea dregeana*.

The Mexican wild yam which grows in the Americas is also of the same species (*Dioscorea*), but it is not known if it has the same hallucinogenic effects.

**Effects:** Hallucinations. In traditional African medicine, it is used to treat hysteria, epileptic convulsions, and to calm psychotic individuals. It can be used as a food, but only after soaking in water for several days to leach out the poisons.

**Precautions:** The alkaloid compound dioscorine is highly toxic and can result in death.

**Dosage:** None established.

### AGARA

**AKA:** *Galbulimima belgraveana*.

A timber tree native to Malaysia and Australia that is related to the magnolias.

**Effects:** Causes violent intoxication, followed by a deep sleep characterized by vivid dreams and visions. Papuans boil the leaves and bark with the leaves of ereriba to make a drink, or just chew the leaves and bark. Although 28 biologically active alkaloids have been identified, the psychoactive principle has yet to be identified.

**Precautions:** New Guinea natives refer to it as maraba, a name that also refers to at least two other distinctly different psychoactive plants. Side effects are unknown.

**Dosage:** None established.

### AMANITA MUSHROOMS

**AKA:** *Amanita muscaria* (bolond gomba, fly agaric, Gluckspilz, ha ma chun, mukhomor,

Narrenschwamm, tu ying hsin); *Amanita pantherina* (panther mushroom).

The amanita family of mushrooms can range from those that are harmless (and actually quite delicious) to those that are deadly poisonous; the above are the only two that are psychoactive. The name “fly agaric” is derived from the fact that flies will drop into a helpless stupor after sucking on its juices. It is also noteworthy that the mushroom is believed to have contributed to the frenzied behavior of the Norse Vikings known as Berserkers. The degree of psychoactivity is related to its color—yellow is the weakest, red is the strongest, and orange is in between—on where and when it is grown, and on what trees it grows near. It can be dried and smoked; eaten fresh, cooked, or dried; or it can be brewed in a tea. In reindeer-hunting communities in Siberia, only the shamans were allowed to eat the fly agaric mushrooms, but others found they could participate in the experience by drinking the shaman’s urine; supposedly, the unpleasant side effects of nausea and vomiting were lessened in this manner. This is because the kidneys detoxify muscarine, a toxin found in the mushroom, but allow muscimole, the hallucinogen, to pass into the urine largely intact (reindeer, who aggressively seek out this mushroom, will likewise consume the fly agaric-filled waste, and for this reason travelers are advised not to urinate in their presence out of fear for the person’s safety). Urine can be recycled four or five times in this manner.

In Japan, there is mention in ancient literature of the maitake, or “dancing mushroom,” which caused those who ate it to laugh and dance giddily; it has been identified as either *Panaeolus papilionaceus* or *Pholiota spectabilis*, though the former is also known as waraitake, or the “laughing mushroom,” and was once used as a cheap high in the U.S. and allegedly by witches in Portugal. Another “dancing mushroom” is *Gymnopilus* (*Pholiota*) *spectabilis*.

**Effects:** A pleasant, dreamy intoxication—

accompanied by vivid hallucinations and giddiness—that lasts four to eight hours. The main psychoactive ingredients include muscazone, ibotenic acid, muscimole, and bufotenine.

It may work synergistically with the juice of the bog bilberry (*Vaccinium uliginosum*).

**Precautions:** Side effects may include disorientation, dizziness, twitching, trembling, dilation of the pupils, rapid heartbeat, minor convulsions, numbness of the limbs, paralysis, irregular heartbeat, delirium, paranoia, aggression, nausea, vomiting, diarrhea, coma, and even death. *Amanita pantherina* has been known to make people sick for up to twelve hours, though these side effects usually start and end quickly. Other varieties of amanita (*Amanita phalloides*, *Amanita verna*) and other similar-looking mushrooms can be lethal when ingested, so extreme care must be taken when picking them in the wild.

Any mushroom should probably be sauteed before eating because in its raw state, it may contain methyl-hydrazines, compounds similar to rocket propellants (which are, of course, carcinogenic and potentially deadly). Mushrooms may also accumulate such toxins as arsenic and cesium, though not in dangerous levels; cooking will not remove or deactivate them.

The use of atropine by some medical professionals to treat the negative effects is counterproductive; it intensifies, rather than nullifies, them. Mushrooms should not be combined with alcohol, either.

**Dosage:** One medium-sized mushroom is taken initially, to determine tolerance, with 1 to 3 mushrooms per dose thereafter. They are thoroughly dried first, and under no circumstances are more than 3 mushrooms to be taken at any one time.

## ANANDAMIDE

Discovered in 1992 by Raphael Mechoulam, it is an endocannabinoid, or chemical produced by the body that is similar to

THC, the psychoactive ingredient in marijuana.

**Effects:** Identified in 2004 by neuroscientist Arne Dietrich of the Georgia Institute of Technology as the most likely cause of the flow state, or the athlete's feeling of being "in the zone." It is thought that anandamide helps endorphins cross the blood-brain barrier, and that it is crucial to forgetting conditioned fear and trauma. Researchers at NYU Langone Medical Center have found that patients suffering from post traumatic stress disorder have lower levels of anandamide than other people (Neumeister et al., 2013).

**Precautions:** Much more research needs to be done to determine the chemical's exact role in influencing the mind.

**Dosage:** None established. Researcher Daniele Piomelli has found that chocolate contains anandamide, along with two other ingredients (N-oleoethanolamine and N-linoleoylethanolamine) that inhibit the natural breakdown of anandamide. The "high" produced by chocolate is extremely mild; in fact, researcher Christian Felder of the National Institute of Mental Health calculates that a 130-pound person would have to eat the equivalent of 25 pounds of chocolate in one sitting to get anything close to a marijuana high.

## ANIMALS

While it is common knowledge that toad secretions can induce altered states (see entry under Toad), what is not well-known is that other animals have psychoactive properties, as well. Much of the information is sketchy and anecdotal, however.

**Ants.** Several Native American tribes of Southern California have ingested ants on an empty stomach as a means of inducing visions and obtaining supernatural powers, which occur when the ants—still living—start biting the lining of the stomach in an attempt to escape. The ants are then vomited up the next

day. Though the particular species has not yet been identified, author Richard Rudgley suggests they may be the yellow honey ant. In Dubai, youths smoke cigarettes made from red "Samsun" ants; it is said that the formic acid in their glands produces a mild spacey high when burnt.

**Bees and wasps.** Honey made from the nectar of the belladonna plant will retain some of the plant alkaloids' psychoactive effects. Multiple bee and wasp stings can cause the body to release cortisol and dopamine, which induce euphoria and heighten the perception of colors and geometric forms.

**Birds.** The Aztecs used to eat the raw flesh of a bird they called the oconenetl, which was said to produce a high; though they left no description of this bird, ethnobotanist Richard Schultes believed it was of the genus *Pitohui*, which contain hallucinogenic steroidal alkaloids called batrachotoxins.

**Cobra.** Indian holy men supposedly smoke the dried venom of the king cobra (*Ophiophagus hannah*) and the common cobra (*Naja naja*).

**Fish.** The puffer fish is supposedly one ingredient of the Haitian zombie drug. A species of *Kyphosus* (possibly *Kyphosus fuscus* or *Kyphosus vaigiensis*) of Norfolk Island in the Pacific, two species of mullet (*Mugil cephalus* and *Neomyxus chaptalli*), and two species of goatfish (*Mulloidichthys flavolineatus* aka *Mulloidichthys samoensis* and *Upeneus arge*) are known by some as "dream fish" or "nightmare fish." That the effects are genuine—as evinced by infants who have shown all the classic signs of nightmares after consuming it—and that it is not an allergic reaction—as non-toxic species produce no reactions in those who have also eaten the toxic ones—has been proved, though the exact psychoactive principle remains a mystery. While German anthropologist Christian Ratsch states that the fish may contain DMT, others are not so sure (Jonathan Ott asserts that the DMT would not be psychoactive if taken orally, and would

not exist in sufficient quantities to produce the required effects if it were), though bacteria from decay and algae eaten by the fish are two possibilities that are also considered unlikely. Disagreements by various Pacific Islanders concerning the physical characteristics of the relevant fish and the specific parts of the fish purported to be psychoactive only add to the confusion. The sarpa salpa (**AKA:** salema porgy, sea bream), indigenous to the Eastern Atlantic and Mediterranean, can contain psychoactive chemicals in its head, but not in its body. The chemicals come from the compound indole, which the fish obtains from the algae and plankton it eats. The amount of indole can vary widely, and the resulting hallucinations are almost invariably of the “bad trip” variety. Evidently, this can also occur with mullet, tangs, goatfish, and rabbitfish.

The surgeonfish (*Acanthurus sandwicensis*), the rudder fish (*Kyphosus cinerascens*), and the *Siganus spinus* are also rumored to be hallucinogenic.

**Giraffe.** A drink, called umm nyolokh, made from the liver and bone marrow of a giraffe, is said by the Humr people of the Sudan to induce hallucinations and vivid dreams. Richard Rudgley speculates that the bone marrow may harbor DMT.

**Insect larva.** The gusano de mescal, a larva known as the mescal worm, which lives on the Agave, or mexcal plants, is supposedly hallucinogenic, and that consuming several worms will produce the desired effect.

**Moth larva.** It has been said that a “bamboo grub,” called bicho de taquara by the Malalis of Brazil and identified as the larva of the *Myelobia smerintha* moth, induces an opium-like sleep filled with vivid dreams when eaten (minus the head, which is considered poisonous).

**Salamander.** It is possible that medieval alchemists had been able to extract some form of psychoactive substance from the salamander. The secretions have been found to contain steroid alkaloids, one of which is a neurotoxin that can cause convulsions and death. In some

parts of Slovenia, there is a non-commercial product known as salamander brandy, which is prepared by dousing the lizard with brandy until the secretions of the frightened creature infuses the liquor with its poison, supposedly producing a hallucinogenic drink.

**Scorpion.** One researcher has reported that those stung by a scorpion experience hallucinations. An analysis of such poisons has yet to be conducted to determine if they have psychoactive properties.

**Spanish fly.** This notorious aphrodisiac, also known as cantharides, is actually the wings of the *Cantharis vesicatoria* beetle, though its use can cause toxicity in sufficient doses.

## ARBOL DE LOS BRUJOS

**AKA:** *Latua pubiflora*; *Latua venenosa*; latue; latuy; *Lycioplesium pubiflorum*; sorcerers' tree.

Related to the nightshade family, it is the only known species of latua and is used by the medicine men of the Mapuche Indians in central Chile.

**Effects:** Causes hallucinations because of the alkaloids hyoscyamine and scopolamine. Ratsch reported smoking the dried leaves produced “pleasant bodily effects with aphrodisiac sensations and great mental relaxation.”

**Precautions:** Side effects include delirium, dry mouth, dilated pupils, headaches, and confusion lasting up to three days, with aftereffects occurring for weeks afterward. Also said to cause insanity, which may be permanent depending on the dosage.

**Dosage:** The dosage is a closely guarded secret, though the medicine men can reputedly control the duration of the madness quite accurately.

## ARCHONTOPHOENIX CUNNINGHAMIANA

**AKA:** King palm; *Ptychosperma cunninghamiana*; *Seafortia elegans*.

**Effects:** The seeds of this Australian palm are said to be psychoactive.

**Precautions:** None known.

**Dosage:** None established.

## ARSENIC

**AKA:** Arsenate, Arsenic Pentoxide, Arsenic Trichloride.

A trace element found naturally in some foods, such as seafood, poultry, grains, dairy products, and mushrooms.

**Effects:** There are anecdotal reports of it having been used as a hallucinogen in the 19th century.

**Precautions:** Organic arsenic appears to pose no toxicity problems, but the inorganic form can be extremely toxic and even fatal. Arsenic poisoning can occur with consumption of kelp supplements, raw opium, calcium supplements made from algae or shells, and some homeopathic remedies. Measurable levels have also been found in many herbal products.

**Dosage:** Estimated dietary intake of organic arsenic is 12 to 50 mcg/day.

## AYAHUASCA AND CAAPI

**AKA:** *Banisteriopsis caapi* (ayahuasca, caapi, oco-yaje, yaje, yaje, yaje-uco); *Banisteriopsis inebrians*; *Banisteriopsis martiniana*; *Banisteriopsis muricata* (mii, sacha ayahuasca); *Banisteriopsis quitensis*; bejuco de oro; cadana; Daime; dapa; *Diplopterys cabrerana* (*Banisteriopsis rusbyana*, chagropanga, chacruna); kahi; mihi; natema; pilde; pinde; tiger drug; yake.

There are 92 species of this South American liana, or jungle vine. Ayahuasca is chemically similar to *epena* (*Virola* species).

**Effects:** Causes a pleasurable intoxication and colorful visual hallucinations lasting six to twelve hours, reportedly without the subsequent hangover, followed by a deep sleep. It also increases visual acuity and sensory awareness, and acts as an aphrodisiac. It is said to

endow the user with telepathic abilities, but there is no scientific evidence to support this claim. The main psychoactive ingredient is the alkaloid harmine.

There is another type of caapi made from the vine *Tetrapteris methystica*, popularly known as caapi-pinima (painted caapi). The drink, made from the bark by the Maku Indians on the Amazon in northwestern Brazil, has an odd yellowish color and tastes very bitter.

South American Indians sometimes use ayahuasca in combination with the *Brunfelsia* species. According to writer Alex Bellos, followers of the religion Santo Daime in the Brazilian rainforest boil ayahuasca with the *Psychotria viridis* leaf (*The Economist*, May/June 2012).

**Precautions:** The initial effects are nausea, dizziness, shivering, dry eyes, salivation, aggression, intense vomiting and diarrhea. An overdose can result in nightmarish visions, violent intoxication, recklessness, and subsequent feelings of sickness.

It is an MAO inhibitor, and so should not be combined with any substances contraindicated for this type of drug, as it could cause headaches, heart problems, and death. It should not be combined with avocados, ripe bananas, broad beans, aged cheeses, chicken liver, excess amounts of chocolate, cocoa, dill oil, canned figs, pickled herring, excess amounts of licorice, milk or milk products, nutmeg, parsley oil, sauerkraut, wild fennel oil, yeast extract; amphetamines, antihistamines, ephedrine, sedatives, tranquilizers; or alcohol, excess amounts of caffeine, mescaline, or narcotics.

Combinations of tropical plants containing DMT and beta-carbolines may produce similar effects to ayahuasca, and are occasionally passed off as such on the underground drug market. These are sometimes referred to by ethnobotanists as ayahuasca analogues or ayahuasca borealis.

**Dosage:** The bark can be made into a drink, the bark and stems can be chewed, or the plant can be made into a snuff. Various other plants are often added to the drink depending on the



region, some of which, like *Diplopterys cabrerana* (a third species, called oco-yaje by Colombian and Ecuadorian Indians along the Amazon) and various species of *Psychotria*, may be psychoactive themselves. *Diplopterys cabrerana* contains DMT (N,N-dimethyltryptamine) as well, producing higher, clearer visions, as the yaje inactivates the stomach enzyme that usually destroys DMT.

An average cup of the native decoction can contain 400 mg of psychoactive alkaloids. The fact that it is prepared with other plants could present additional problems.

William Burroughs describes his experiences with yaje in *The Yaje Letters*.

### BAIBAI AND BUDZAMAR

**AKA:** Bebai; *Cycas circinalis*.

**Effects:** The pollen of this New Guinea plant is said to induce narcosis. Another member of the *Cycas* genus, locally referred to as budzamar, is used by magicians on islands in the Torres Straits to enter an altered state.

**Precautions:** None known.

**Dosage:** None established.

### BANANA PEELS

**AKA:** Mellow yellow.

**Effects:** According to popular folklore—immortalized in the 1966 Donovan song, “Mellow Yellow”—it produces a high when dried and smoked.

**Precautions:** There are no psychoactive ingredients in banana peels. The psychoactive alkaloid bananadine is fictional, the term having been coined in a 1967 article in the underground newspaper *Berkeley Barb* by editor Max Scherr; despite gaining widespread acceptance, there is no scientific validation behind it.

**Dosage:** None established.

### BELLADONNA

**AKA:** Apples of Sodom; *Atropa belladonna*; banewort; beautiful lady; black

cherry; deadly nightshade; death’s herb; devil’s herb; dwale; hound’s berries; morrel; murderer’s berry; naughty man’s cherry; petty-morrel; poison black cherry; sorcerer’s cherry; witches’ berry.

A member of the potato family, it is used in various medications including sleep remedies, cold remedies, treatments for ulcers and stomach problems, and some asthma drugs.

**Effects:** Hallucinations, which may contain elements of ecstasy and eroticism. It contains the psychoactive alkaloids atropine, scopolamine, and hysoscyamine, along with traces of nicotine. Applying it to the skin in combination with fats and oils can lead to the sensation of flying (which has led to the popular notion of witches flying on broomsticks); oral ingestion of the alkaloids can lead to dreams of being an animal (which may be one factor in werewolf and other human/animal transformation beliefs). In the past, it has been used both as a cosmetic (to dilate the pupils) and an arrow poison.

**Precautions:** Contains the dangerous alkaloid apoatropine. According to Ratsch, “hallucinations are typically described as threatening, dark, demonic, devilish, hellish, very frightening, and profoundly terrifying. Many users have compared the effects to those of a ‘Hieronymous Bosch trip’ and have indicated that they have no intention of repeating the experiment.” Other side effects include dryness of the mouth, eyes, and mucous membranes, rapid heartbeat and pulse rate, hot skin, rash, dilated pupils, blurred vision, fear, restlessness, insomnia, confusion, vomiting, convulsions, paralysis, learning impairment, permanent eye damage, permanent brain damage, coma, and death from heart or respiratory failure. Most of these effects last for three to four hours; those involving vision may last for three to four days.

**Dosage:** Consuming one to two fresh berries can cause mild perceptual changes within an hour or two, and three to ten is considered a hallucinogenic dose. Some people in

Asia and the Middle East eat or smoke the dried, crushed leaves (30 to 200 mg) or the root (30 to 120 mg). Toxicity may vary from plant to plant and from person to person, but can be as little as one berry, though the general toxic dose is approximately 10 to 20 berries, or more than 3 mg of alkaloids. The toxic dose for leaves is 0.3 g.

## BETEL

**AKA:** *Areca catechu*; areca nut; betel nut; betel nut tree; betel palm; paan; ping lang; supari.

A favorite stimulant for thousands of years, it is still one of the most widely used drugs in the world, as popular in Asia as tobacco is in the West. It is reportedly used by some bodybuilders in place of steroids. According to a 2008 monograph by Francesco Della Ferrera “[The areca] palm [tree] is often erroneously called the Betel tree because its fruit, the areca nut, is always chewed along with the betel leaf, a leaf from a vine of the Piperaceae family (Piper Betel).” Arecoline hydrobromide is the synthetic form of the psychoactive alkaloid arecoline.

**Effects:** The main stimulant is the alkaloid arecoline, which increases energy, elevates mood, and acts as an aphrodisiac, though this last effect may just be an indirect result of the first two. Intravenous injections of arecoline have been found to provide mild improvements in verbal and spatial memory in Alzheimer’s patients (Christie et al., 1981); a later study of nine Alzheimer’s patients found that verbal ability was improved at low doses, while attention and visuospatial ability was generally improved with higher doses (Raffaele et al., 1996). The betels from Burma (toung-noo), the Moluccas (pining-mabok), and Ceylon can cause inebriation.

**Precautions:** Its psychoactive properties are still not fully understood, and there may be several distinct mechanisms which produce its effects. Side effects include salivation (often

blood-red), a burning sensation in the mouth and throat, oral lesions, profuse sweating, nausea, aggravation of asthma, slowed heart rate, elevated levels of homocysteine, an increased risk of cardiovascular pathologies (including bradycardia and hypotension following tachycardia and hypertension, and extrasystoles, or premature beat of one chamber of the heart), peptic ulcers, abnormal liver function, increased blood calcium levels, kidney disease, and tremors. Habitual use will stain the teeth, mouth, and gums a dark red or black, as well as promote oral cancers; it may also cause a depletion of vitamins B1, B12, and D, as well as lead to diabetes. Though some claim constant use can lead to habituation, addiction, and withdrawal, others dispute this. Overdose symptoms include a slowed heart rate, tremors, vomiting, spasms, dilated pupils, diarrhea, and respiratory or cardiac arrest. Eight to ten grams of powdered seeds is sufficient to cause death from cardiac or respiratory paralysis. Withdrawal symptoms can include anxiety and mild memory loss.

Pregnant and breastfeeding women should avoid use, as it could lead to birth defects (including low birth weight and delayed growth) and spontaneous abortions.

The betel from Java (akar pining hitam, *Areca catechu* L. var. *nigra*) can cause narcolepsy, sedation, and death. Arecoline is carcinogenic, as well as cytotoxic (damaging to cells) and genotoxic (damaging to genetic material) to mammalian cells in vivo and in vitro. Ingesting too much arecoline, or betel that is not yet ripe, can result in a feeling of drunkenness, followed by dizziness, vomiting, diarrhea, and possibly convulsions.

When combined with alcohol and tobacco use, the cytotoxic and carcinogenic effects can be increased, and when combined with stimulants such as caffeine, guarana, and ephedra, the excitatory effects can be increased. Arecoline can inhibit the anti-anxiety effects of diazepam and tricyclic antidepressants. It can also interact with aloperidol, amantadine,

fenotiazine, loxapine, molindone, and olanzapine, and possibly interact with beta blockers, calcium antagonists, digoxin, and medications that affect glucose levels in the blood (Ferrera, 2008).

**Dosage:** The dried nuts are usually chewed with a betel leaf, but can also be smoked or made into an inebriating beverage. Since colonial times, tobacco has often been added to the chewing mixture. A betel quid will contain roughly one-quarter to one-half nut.

## BLOOD

**Effects:** Schizophrenics have been shown to have a higher concentration of DMT, a naturally occurring psychedelic, in their blood than the average person. The Terry Southern short story “Blood of a Wig” from the 1960s is based on the belief that injecting a schizophrenic’s blood will cause a temporary “high.”

**Precautions:** Beyond this fictional account, there is no record of anyone having ever done this. Due to differing blood types and easy transmission of any diseases, experimentation is strongly discouraged.

**Dosage:** None established.

## BOOK FUNGUS

**AKA:** Unknown.

**Effects:** According to Russ Kick, in his *The Disinformation Book of Lists*, musty old volumes harbor molds that can cause hallucinations. No other information is given.

**Precautions:** Side effects reportedly include dizziness and vomiting.

**Dosage:** None established.

## BOOPHONE DISTICHA

**AKA:** *Boophane disticha*; bushman poison bulb; cowbane; candelabra flower; fan lily; malgif.

**Effects:** The bulb of this South African plant is hallucinogenic, and is used by the Ba-

suto people for its male initiation rite, and some Zimbabweans to communicate with the dead.

**Precautions:** Side effects include dizziness, restlessness, impaired vision, loss of coordination, coma, and death. The Basuto also use the bulb as an arrow poison and as a method of committing suicide.

**Dosage:** None established.

## BORRACHERA

**AKA:** *Lochroma fuchsoides*.

A member of the nightshade family that is native to the highlands of South America.

**Effects:** Supposedly made into a hallucinatory drink by the Sibundoy Valley Indians of southern Colombia. The psychoactive principle has yet to be identified.

**Precautions:** This could be a misidentification of another plant, as neither Wink and van Wyk nor Ratsch mention it. Borrachera could refer to any number of plants, including many of the *Brugmansia* genus.

**Dosage:** None established.

## BORRACHERO

**AKA:** *Ipomoea carnea*; matabra (“goat killer”).

**Effects:** A psychoactive plant with ergot alkaloids found in Ecuador. Probably the most potent of the *Ipomoea* genus.

**Precautions:** Borrachero could refer to any number of plants, including many of the *Brugmansia* genus. Though it is used by Ecuadorian shamans, in some areas it is considered poisonous.

**Dosage:** None established.

## BRUGMANSIA

**AKA:** Angels’ trumpet; *Brugmansia arborea* (baumdatara, borrachera, campachu, campanilla, chamico, cimora, cojones del Diablo, huantac, huanto, huantuc, huarhuar, is-

shiona, kecubong, maicoma, mai ko, mai ko' mo, mataperro, misha huarhuar, misha rastrera blanca, qotu, saharo, tecomaxochitl, tree stramonium, trombeteiro); *Brugmansia aurea* (borrachero, floripondio, gelbe baumdatura, golden angel's trumpet, golden tree datura, guantu, huandauj, kieri, kieri-nanari, yellow tree datura); *Brugmansia x candida* (culebra borrachero, *Methysticodendron amesianum*, mitskway borrachero); *Brugmansia x insignis*; *Brugmansia sanguinea*; *Brugmansia suaveolens*; *Brugmansia versicolor*; *Brugmansia vulcanicola*.

A member of the nightshade family, *Brugmansia* is very closely related to the *Datura* species (the former is composed of trees and shrubs and the latter plants and shrubs). The task of classifying the numerous species is made even harder due to the widespread practice of hybridization. Scopolamine, one of the main psychoactive alkaloids, was tested as a "truth serum" by both the Nazis and the U.S. during World War II to unsatisfactory results.

**Effects:** At low doses, it can have a sedative and depressive effect. High doses can result in deep sleep and hallucinations, including the sensation of flying. The main psychoactive alkaloids are hyoscyamine and scopolamine; the minor ones are atropine, meteloidine, and norscopolamine. Used by many shamans to foresee the future, speak with the dead, and diagnose illnesses. It has also been used in initiation ceremonies and to treat a number of physical ailments.

Its effects can be enhanced when combined with marijuana.

**Precautions:** This species is one of the most potent natural hallucinogens known, and knowledgeable shamans will strongly caution people not to use it. Overdosing can result in a delirium that can last for several days, with aftereffects persisting for weeks afterward. The leaves, flowers, and seeds are very poisonous; even touching the eyes after handling the plant can lead to dry eyes. Its use can also be complicated by the fact that individual reaction to its tropane alkaloids can vary widely,

so that its effects can be unpredictable. The main alkaloid is scopolamine, which is highly toxic; it has proven to have a negative effect on serial learning in doses as low as 0.5 mg. Initial intoxication may be so violent that the user may have to be physically restrained. Other side effects include dry eyes (lasting for as long as six days), confusion, insomnia, and death from respiratory arrest. These precautions apply mainly to the ingestion of the plant; smoking the dried leaves produces only mild effects.

**Dosage:** Establishing a specific dosage can be difficult, as there are many species and hybrids.

It can be smoked, eaten, drunk as a tea, or taken as an enema. In Africa and Asia, it is often combined with cannabis or tobacco and smoked, and in Tanzania it is added to beer.

The ground seeds are often added to maize beer and, in Mexico, the dried leaves of *Brugmansia* are added to tobacco to induce diagnostic visions for treating various diseases.

## BRUNFELSIA

**AKA:** *Brunfelsia Americana*, *Brunfelsia australis*, *Brunfelsia chiricaspi* (borrachero, chiricaspi, chiri-sanango, covi-tsontinba-ko, sanango, yai uhahai), *Brunfelsia grandiflora* (bella union, borrachera, borrachero, chiricaspi, mucapari), *Brunfelsia maritime* (borrachera), *Brunfelsia pauciflora* (Yesterday, today and tomorrow), and *Brunfelsia uniflora* (bloom of the lent, boas noites, *Brunfelsia hopeana*, camgaba, Christmas bloom, Christmas tree, flor de natal, gerataca, good night, jerataca, mercurio dos pobres, Paraguay jasmine, Santa Maria, umburapuama, vegetable mercury, white tree), Manaca.

There are about 40 species, all with similar characteristics.

**Effects:** Hallucinations.

A few of the *Brunfelsia* species are sometimes used by South American Indians in combination with ayahuasca. *Brunfelsia chiricaspi*

is probably the most psychoactive of the species.

**Precautions:** Side effects include tingling, numbness, coldness, paralysis, anxiety, restlessness, rapid heartbeat, enhanced respiration, heavy salivation, foaming at the mouth, swollen tongue, partial facial paralysis, blurred vision, urination, nausea, vomiting, tremors, convulsions, and death from respiratory arrest. There are also reports of blindness, delirium, and “persistent feeble-mindedness.” Aftereffects can include dizziness, exhaustion, and weakness lasting for a day afterwards. Any hallucinogenic effects are unpleasant and apparently vastly outweighed by the negative side effects. Timothy Plowman has compared the drink made from this plant as similar to nicotine on non-smokers, and Jonathan Ott reports that he almost died from experimenting with it.

**Dosage:** None established.

## CAFFEINE

**AKA:** 1,3,7-trimethylxanthine; 1, 3, 7-trimethyl-2, 6-dioxopurine; 1H-Purine-2,6-dione, 3, 7-trimethyl; 3, 7-dihydro-1, 3, 7-trimethyl-1H-purine-2, 6-dione; theine.

**Food sources:** Bissy nut, chocolate, cocoa, coffee, cola nuts, energy drinks, gotu kola, guarana, mate, soft drinks, tea (excluding many herbal teas), some stimulant drugs sold by mail or over-the-counter, and many over-the-counter medications.

**Effects:** Caffeine is one of the most powerful legal stimulants available; it gives a mental boost by releasing adrenaline and noradrenaline into the bloodstream. It interferes on a cellular level with the compound adenosine, in effect flatlining the body’s state of arousal, allowing the body to shift into high gear. It may also affect dopamine, acetylcholine, and other neurotransmitters, and may stabilize the blood-brain barrier. It improves typing skills, word retrieval skills (in women), mental alertness, energy, reaction time, concentration,

memory, and accuracy in performing tasks, and relieves fatigue, mainly by causing the release of norepinephrine in the brain. Some claim that caffeine can make an individual more open to changing his or her attitude when presented with a strong argument for a particular viewpoint. It improves physical endurance by stimulating the skeletal muscles, increases the production of stomach acid and urine, causes bowel movements, and dilates the bronchial tubes (making it easier to breathe). According to studies, it has no effect on clarity of thought. In addition, the presence of polyphenols in coffee and tea may prevent cancer by inhibiting the conversion of highly carcinogenic nitrosamines in the body. A cup of coffee a day can guard against the harmful effects of cholesterol on the brain—specifically, harmful substances passing through leaks in the blood-brain barrier—possibly delaying the onset of Alzheimer’s (Geiger et al., 2008), and middle-aged people who drink three to five cups a day may decrease their risk of developing dementia and Alzheimer’s by 60 to 65 percent (Kivipelto et al., 2009). Moderate caffeine intake can also delay the onset of Alzheimer’s and dementia in the elderly who suffer from mild cognitive impairment (Cao et al., 2012). Two or more cups of coffee a day can reduce the risk of developing Parkinson’s disease by 40 percent, a few cups of coffee a day can help prevent gallstones in men, and four to five cups a day can reduce colorectal cancer by 24 percent.

All coffee, including decaffeinated, contains at least three compounds that act like opiates, or heroin, on the brain. Coffee also contains more antioxidants than cranberries, apples, or tomatoes, though Professor Joe Vinson of the University of Scranton in Pennsylvania warns that this does not necessarily mean that these higher levels are absorbed by the body. In addition to caffeine, cocoa and tea also contain two other methylxanthines, the alkaloids theobromine and theophylline, which have a mild muscle-relaxant effect.

A 2006 University of South Florida study (Arendash et al) found that caffeine reversed the effects of Alzheimer's in mice, though researchers caution that what often works in mice fails in humans, and the equivalent level for individuals would be 500 mg, a dangerous level for some people.

Caffeine may work synergistically with aspirin, taurine, sugar, and carbohydrates when consumed in moderate amounts, and may enhance the effects of theobromine in chocolate.

**Precautions:** It should not be taken by anyone who is allergic to stimulants, has heart disease or irregular heartbeats, suffers from insomnia, anxiety, or panic disorders, or has a peptic ulcer of the stomach or duodenum. Women who are pregnant or nursing should limit their use of caffeine, as it does enter the placenta and can be found in breast milk; it can also limit the flow of blood to the placenta, putting stress on fetal metabolism. While there is no evidence that caffeine causes birth defects, it could complicate pregnancy, and can cause insomnia and hyperactivity in infants. A 2008 study found that just 200 mg of caffeine, or two cups of regular coffee, can increase the risk of low-birth-weight babies and double the risk of miscarriage, particularly in the first trimester (in fact, the lead researcher of the study, De-Kun Li, has stated that "to me, the safe dose is zero"). A physician should be consulted first if any of the following conditions are present: hypoglycemia, epilepsy, or high blood pressure. To discontinue use, gradually decrease the amount over a month or more, or headaches, irritability, and drowsiness may result. Coffee increases the risk of high blood pressure in individuals who already suffer from high blood pressure, causes anxiety, irritability, headaches, muscle twitches, insomnia, and heart palpitations (a condition known as coffee intoxication, which can occur when daily caffeine intake is over 250 mg/day), can worsen the symptoms of pre-menstrual syndrome, cause heartburn and indigestion, and reduce the fertility of women. Caffeine con-

sumed at night will severely hinder recovery sleep the following day, as an individual will find it much harder to get to sleep, and will not be able to enter the deep, restful sleep needed for energy and alertness.

Not all researchers are convinced of its mental benefits. Some studies show no improvement in recall or response time, and others show that high doses can impair a person's ability to work with numbers. And it may have a negative effect on a person's ability to quickly process ambiguous or confusing stimuli. Any improvements in mental functioning may peak at a certain dosage, then decline with increasing consumption. Overall, caffeine may benefit the performance of simple tasks but have no effect on more complex ones such as reading comprehension or advanced mathematics.

Though it is readily absorbed into the bloodstream, researchers still do not understand its full effects upon the human body. Caffeine can lead to a condition in coffee drinkers called coffee intoxication, in which more than four or five cups a day results in irritability, muscle twitches, rambling speech and thought, and trouble sleeping. It can also worsen existing health problems, and may contribute to birth defects, bladder and colon cancer, kidney disease, osteoporosis, hypertension, abnormal heart rhythms, stomach ulcers, and heart disease, though more recent studies refute these findings. When combined with sugar, as in many cola drinks, it can be particularly addictive or habit-forming. It does not replenish a person's noradrenaline once it is used up, and either depletes or limits the absorption of many vitamins and minerals. Withdrawal symptoms can begin 12 to 36 hours after the last dose, and can include lethargy, irritability, severe throbbing headaches, anxiety, depression, fatigue, and possibly even nausea and vomiting; symptoms can last from one and one-half to seven days.

Other adverse effects include heart palpitations, high blood pressure, muscle twitches,

rapid heartbeat, low blood sugar, nervousness, insomnia, increased urination, anxiety, indigestion, increased production of gastrointestinal acid, rectal itching, constipation, impaired concentration, a weakened immune system, bladder irritation and urinary problems (especially in women), and interference with DNA replication. It has been shown to trigger panic attacks in susceptible people—which it does by lowering the body's production of DHEA and increasing its production of cortisol—and interfere with the ability to sleep in most coffee drinkers. Decaffeinated coffee still contains some caffeine and can also cause these symptoms. More severe and infrequent symptoms include confusion, nausea, stomach ulcers, indigestion, and a burning feeling in the stomach. Overdose symptoms include excitement, insomnia, rapid heartbeat, confusion, fever, hallucinations, convulsions, and coma.

More than five cups a day can increase the heart attack risk to three times that of a non-coffee drinker. A 2008 Durham University study, among others, suggests that seven or more cups a day can result in mild auditory—and, rarely, visual—hallucinations in certain people predisposed to such symptoms, possibly as a result of its increasing the level of the stress hormone cortisol. Long-term high-dose caffeine intake can promote calcium loss due to its diuretic effect, weakening bones. The lethal dosage has been estimated to be about 10 grams or, more accurately, about 150 to 200 mg per kilogram of body weight (roughly 100 cups of coffee in four hours). If caffeine must be consumed, it should be derived from plant sources, as the synthetic form does not have the fat-burning properties the natural form does. As for the natural forms, kola nut and yerba mate are the best caffeine sources, guarana is adequate, and tea and coffee rank lowest. Boiled or percolated coffee can increase serum cholesterol levels and the risk of heart disease; drip coffee does not, as the paper filters absorb the harmful oils in the coffee grounds.

Food and drug interactions are also a cause for concern:

- Combined with caffeinated beverages, chocolate, or products such as Vivarin, caffeine is likely to be more stimulating and produce a greater chance of side effects.
- Grapefruit juice can increase the level of caffeine and extend its effects by up to one-third.
- Caffeine can reduce the absorption of iron in the body.
- Caffeine can increase the elimination of lithium from the body, reducing the latter's effectiveness.
- Certain antibiotics such as Cipro (ciprofloxacin) and Penetrex (enoxacin) can significantly intensify and prolong the effects of caffeine.
- Consuming it with other caffeine-containing drugs, central nervous system stimulants, or sympathomimetics can result in overstimulation.
- Combining it with Cimetidine (Tagamet), oral contraceptives, or Isoniazid, can increase sensitivity to the effects of the caffeine (Tagamet can increase caffeine levels by as much as 70 percent).
- Combining it with sedatives, sleep inducers, or tranquilizers can increase sensitivity to the sedative or tranquilizer.
- Combining it with MAO inhibitors can lead to heart arrhythmias and dangerously high blood pressure.
- Combining it with beta blockers can reduce the effectiveness of both.
- Combining it with bronchodilators may increase the effect of caffeine along with increased side effects.
- Combining it with Disulfiram (for treatment of alcohol dependency) may reduce the elimination of caffeine from the body, intensifying its effects.
- Combining it with thyroid hormones can cause an increase in the thyroid effect.
- Taken with alcohol, caffeine can slow a person's reaction time and intensify the effects of alcohol.

- Taken with central nervous system stimulants such as amphetamines and pseudoephedrine, it can cause overstimulation and other adverse side effects.
- Taken with cocaine, it can lead to convulsions or extreme nervousness.
- Taken with ecstasy (MDMA), it can lead to a rapid heartbeat and dangerously high body temperature.
- Taken with marijuana, it can lead to an increased effect of both substances along with a rapid heartbeat.
- Taken with tobacco, it can lead to an accelerated heartbeat and a decreased caffeine effect.
- Caution should be exercised when combining caffeine with barbiturates, ulcer medications, antacids and other supplements with calcium, erythromycin, and troleandomycin, as the interactions have not been fully researched.

Some mail-order “look-alike” drugs that mimic amphetamines have reportedly triggered strokes and irregular heartbeats that ultimately led to death, but this may be blamed more on the stimulant phenylpropanolamine (PPA) than on the caffeine and ephedrine found in these drugs. Still, the health problems associated with ephedrine and caffeine have led the FDA to ban drugs and diet aids that contain these two ingredients.

**Dosage:** The majority of the research shows that healthy people can consume up to two cups of coffee (200 mg) a day without suffering any ill effects; more than 300 mg of caffeine a day, however, is not recommended. Green tea, in addition to containing about 100 mg of caffeine per serving, contains polyphenols, or strong antioxidant nutrients (which protect against arterial damage that can eventually result in heart attacks or stroke), making it preferable to black tea. For maximum effect, it may be better to have several half-cups of coffee during the day, rather than one large cup in the morning, as the effects only last for about three hours. Adding milk ties up some

of the beneficial chemicals, rendering them useless.

## CALAMUS

**AKA:** *Acorus calamus*; flag root; grass myrtle; myrtle flag; rat root; sweet calomel; sweet cinnamon; sweet flag; sweet grass; sweet myrtle; sweet root; sweet rush; vacha.

It should not be confused with giant reed (*Arundo donax*), also known as calamus.

**Effects:** Stimulates, energizes, and in high enough doses, produces a psychedelic effect similar to LSD, though Christian Ratsch states “[t]he assertion that calamus is hallucinogenic appears to be due more to wishful thinking than to actual experiences with the plant,” as he has been unable to detect any effect that could be categorized as hallucinogenic, psychedelic, entheogenic, or visionary, even at high doses. It contains the substance asarone, which is similar to mescaline and amphetamines, but may not create the feeling of tension that amphetamines do.

**Precautions:** It may cause vomiting in high doses. The plant is very similar in appearance to the highly poisonous blue flag. The calamus leaves give off a sweet smell when scratched and the roots have a pleasing aroma and sharp taste; blue flag does not give off any smell, and the roots have a bitter, unpleasant taste. The various species native to India, Europe, and North America may each have very different pharmacological properties.

MAO inhibitors should not be taken less than a week before or a week after taking calamus.

**Dosage:** An initial dose should be a 2-inch length of root the thickness of a pencil, which can either be chewed or brewed in a tea. This will produce stimulation and euphoria. A 10-inch length is said to produce mild LSD-like hallucinations. It should be taken on an empty stomach to prevent vomiting. The root should not be stored for more than a few months, as it will lose potency.



CALEA

**AKA:** Bitter grass; bitter leaf; *Calea ternifolia*; *Calea zacatechichi*; cheech; dog's grass; dream herb; leaf of God; Mexican calea; thlepela-kano; zacatechichi.

A member of the daisy family that grows from Mexico to Costa Rica and is used by the Chontal Indians of Oaxaca.

**Effects:** Calea may produce a sense of calm, drowsiness, mental clarity, vivid dreams, and hallucinations lasting for a day or more. It is also used in traditional medicine to treat fever, nausea, skin disorders, and mild diarrhea.

**Precautions:** None known, though the effects of this plant are not fully known.

**Dosage:** Two tablespoons of dried leaves brewed for five minutes in a pint of boiling water, which is then slowly sipped. The Indians are said to finish off with a few puffs of calea leaves rolled into a joint.

CALIFORNIA POPPY

**AKA:** *Eschscholtzia californica*.

**Effects:** A mild marijuana-like high that lasts for about a half hour. It is not related to the opium poppy, but apparently does contain several psychoactive alkaloids.

**Dosage:** One joint per day—smoking more does not seem to extend or intensify the high. The leaves and petals are dried and rolled into joints.

CANAVALIA MARITIMA

**AKA:** Frijolillo.

A legume that is supposedly used as a marijuana substitute.

**Effects:** Similar to marijuana; its psychoactive properties have not yet been isolated. The mature seeds of *Canavalia ensiformis*, or the jack bean, are roasted and used as a coffee substitute in the West Indies.

**Precautions:** Ratsch questions the psychoactive status of this plant, as no alkaloids have been identified.

**Dosage:** None established.

CARAWAY

**AKA:** *Carum Carvi*.

**Effects:** One anecdotal report indicates that ingestion of the seeds produces a very mellow, clear-headed high said to be “identical to taking an aspirin for a headache, but without having the headache.”

**Precautions:** None known.

**Dosage:** About one teaspoonful of seeds.

CARBOGEN

**AKA:** Meduna's Mixture.

**Effects:** According to Russ Kick in *The Disinformation Book of Lists*:

“When you inhale the mixture of oxygen (70 percent) and carbon dioxide (30 percent), your brain thinks that you're dying of suffocation, although you're actually getting enough oxygen to function normally. In the Seventh Day Adventist magazine *Signs of the Times* (of all places), Dr. Jack Provonsha writes: ‘subjects on carbon dioxide report separation of the self from the body. And as with the [psychedelic] drugs and NDEs [near death experiences], there were reports of caves, tunnels, intensely bright lights, visions of other persons, luminaries, reliving of the past, and ‘spiritual’ experiences.’ He then reprints the experience of a carbogen user as first relayed in Dr. L. J. Meduna's pioneering work on the subject, *Carbon Dioxide Therapy* (1950):

“I felt myself being separated; my soul, drawing apart from the physical being, was drawn ... seemingly to leave the earth and to go upward where it reached a greater Spirit with whom there was a communion, producing a remarkable new relaxation and deep security.... I felt the Greater Spirit even smiling indulgently upon me in my vain little efforts to carry on by myself, and I pressed close [to] the warmth and tender strength and felt assurance of enough power to overcome whatever lay ahead for me.’

“Psychonaut Myron Stolaroff took carbogen once a week for two years under a doctor’s supervision. ‘I always approached the experience with enormous anxiety,’ he wrote, ‘but got considerable relief when I explosively discharged repressed material. I would then feel great for a few days, but then relapse back to my previous condition.’

“During the same time that LSD was being introduced into psychotherapy, carbogen was also used. Stolaroff says that around 200 therapists employed the procedure, and they even formed a short-lived professional organization.”

**Precautions:** Adverse physical and psychological reactions can occur. Experiments should only be conducted under the supervision of an experienced medical professional. (See also entry for Carbon Dioxide)

**Dosage:** 70 percent carbon dioxide, 30 percent oxygen.

### CARDAMINE CONCATENATA

**AKA:** Pepper root; tooth root.

**Effects:** A reputed hallucinogen.

**Precautions:** Psychoactive alkaloids, if they exist, have not been identified.

**Dosage:** None established.

### CAWE

**AKA:** Chawe; *Pachycereus pecten-aboriginum*.

A giant cactus found in Mexico.

**Effects:** Contains phenethylamine alkaloids, but it is not known if they are psychoactive. Its effects are reported to be similar to peyote. The Tarahumara Indians crush the branches in water to make cawe, a ceremonial beverage. It is sometimes added to San Pedro.

**Precautions:** None known.

**Dosage:** None established.

### CEBIL

**AKA:** Aimpa; aimpa-kid; algarobo; *Anadenanthera colubrina*; *Anadenanthera excelsa*

(*Parapiptadenia excelsa* aka cebil blanco, horco-cebil, sacha cebil); *Anadenanthera macrocarpa*; angico; businessman’s trip; cabium; cevil; cevil blanco; cevil Colorado; cibil; curubu’y; curupai; guayacan; hataj; hatax; huilca; jataj; kurupa; *Piptadenia species*; quebracho; sebil; sevil; tara huilca; teek; tek; uataj; uilca; una de gato (cat’s claw); vilca; vilcas; villca; wilka; xatax.

It is often confused with *Anadenanthera peregrina*.

**Effects:** South American Indians use it in the form of snuff (and variously call it cebil, cohoba, huilca, niopo, sebil, vilca, or yopo), and it can also be smoked or consumed in a drink or food. When inhaled as a snuff or smoked, it can produce an immediate high that can last twenty to thirty minutes, and be completely gone after two hours. Visual hallucinations (predominantly black and white rather than color) can often contain erotic content or experiences with alien entities. The high is similar to that of LSD or mescaline, but shorter. Parica is a generic name for snuffs of all kinds.

Coca is often chewed first to clarify the visions and reduce side effects.

**Precautions:** Side effects may include bodily heaviness and slight nausea.

**Dosage:** When taken as a snuff, about 150 to 500 mg of the dried, roasted, and ground seeds have been found to be effective, with one gram (about one large seed) providing a full-blown visionary experience. When smoked, about half a cigarette (comprising five to eight dried, roasted, and crushed seeds mixed with tobacco) is said to be an effective dosage. When taken orally, about two to six boiled seeds are mixed into a liquid or honey and consumed. Chewing coca or sniffing cocaine can clarify the visions and eliminate side effects.

### CHEESE

**Effects:** A 2005 study involving 200 volunteers by the British Cheese Board found that

various cheeses produce vivid dreams. Some cheeses contain high amounts of tryptophan, which aids in restful sleep, though there may be an unknown ingredient which accounts for the dreams. It was found that Stilton cheese produced the most hallucinatory dreams, while cheddar, Red Leicester, and Lancashire produced vivid, if more pedestrian, night visions.

**Precautions:** It is high in saturated fat.

**Dosage:** Approximately 20g.

## CHOCOLATE AND COCOA

**AKA:** Chocolat; *Theobroma cacao*.

**Effects:** Though it is an addictive psychoactive which some believe mimics the effects of marijuana, not much is known about its pharmacology and cognitive effects, and since over 300 different compounds in chocolate have been identified, it may be some time before its effects are fully understood. Caffeine may account for some of its psychoactive properties (though one ounce of milk chocolate contains about the same amount as a cup of decaffeinated coffee), but some researchers state that most of its effects are attributable to theobromine, an alkaloid found in chocolate that is similar to caffeine but which does not have as strong an effect on the nervous system. Chocolate also contains phenethylamine (PEA), also known as the “love chemical” due to the fact that it releases dopamine, which may contribute to feelings attraction, excitement, giddiness, apprehension, and euphoria, though some dispute this, claiming that most, if not all, of the phenethylamine is metabolized before it reaches the central nervous system (see entry). Researcher Daniele Piomelli has found that chocolate contains anandamide (see entry), a natural chemical also found in the brain, which reacts the same way marijuana does; it also contains two other ingredients (*N-oleoethanolamine* and *N-linoleoylethanolamine*) that inhibit the natural breakdown of anandamide. Still, researchers agree that the “high” produced by chocolate is

extremely mild; in fact, researcher Christian Felder of the National Institute of Mental Health calculates that a 130-pound person would have to eat the equivalent of 25 pounds of chocolate in one sitting to get anything close to a marijuana high. Theobromine mainly affects the muscles, kidneys, and heart. In addition to providing proteins, vitamins, and minerals (calcium, iron, niacin, potassium, riboflavin, sodium, thiamine, and vitamin A, among others); it may also have a sexually stimulating effect caused by theobromine and the possible ingredient phenethylamine, the latter a biochemical manufactured by the brain of a person in love. Chocolate also contains tryptophan, though in doses too small to have much effect, and neuroactive alkaloids called tetrahydro-beta-carbolines (which are also found in beer, wine, and other liquors), though their effects are, as yet, unknown. Chocolate can trigger the release of pain-reducing endorphins and neutralize the effects of sugar, reducing tooth decay. One study suggests that even the smell of chocolate can significantly reduce theta activity in the brain, promoting relaxation. Cravings by premenstrual women may be due partly to its high magnesium content (which may relieve symptoms) and women’s high levels of the hormone progesterone, which increases fat storage in the body and may trigger a craving for fatty foods.

In addition to affecting mood, chocolate can also impact intelligence. A 2006 study by Dr. Bryan Raudenbush at the Wheeling West Jesuit University in West Virginia found that consuming 85 grams of milk chocolate significantly improved verbal and visual memory, and that both milk chocolate and dark chocolate improved impulse control and reaction time. Researcher Ian McDonald of the University of Nottingham found that cocoa increased blood flow to the brain for two to three hours in healthy individuals, possibly due to the antioxidant flavanols, which may help prevent high blood pressure and dementia, a finding echoed by a 2008 University of

Oxford study involving 2000 men in their seventies, which found that those who ate chocolate scored better on tests of cognitive ability than those who didn't, and a 2013 study led by Farzaneh A. Sorond, MD, PhD, of Harvard Medical School in Boston, which found that two cups of hot chocolate a day improved the working memory of elderly subjects. A study on mice conducted at Johns Hopkins University School of Medicine found that the flavanol epicatechin can reduce brain damage caused by strokes if consumed before or up to three-and-a-half hours after a stroke (Shah et al., 2010). It is believed that epicatechin (see entry) is the most likely candidate for cocoa's beneficial effects on the cardiovascular system by stimulating the release of nitric oxide (see entry).

A 1998 Harvard study by Dr. I-Min Lee of 7841 older men found that those who ate chocolate lived longer than those who didn't, with those eating just three chocolate bars a month living the longest. Some have questioned the results of this study, as eating more chocolate was not correlated with longer life, and three chocolate bars a month was too little for it to be perceived as having any significant effect (chocolate does contain antioxidants known as phenols, but this alone could not account for the increase in life expectancy, and there are no other known chemicals that could account for this effect). A 2006 Dutch study found that, over a fifteen-year period, men who consumed four grams of cocoa a day halved their risk of death from heart disease over those who ate no cocoa.

Dark chocolate has more fat and sugar than regular chocolate; despite this, the high cocoa content means it has more of the cardioprotective ingredients epicatechin and gallic acid, which lower blood pressure, reduces LDL cholesterol, and decreases the chances of a heart attack when consumed in moderate amounts (women over 70 who ate chocolate at least once a week were significantly less likely to die of heart disease and heart failure than those who didn't [Lewis et al., 2010]). Semisweet

chocolate has half the sugar of dark chocolate, and bittersweet chocolate is chocolate liquor to which sugar, cocoa butter, vanilla, and lecithin have been added. Unsweetened, or baking, chocolate has no added ingredients, and has a bitter taste. Chocolate is a bitter Aztec drink made from the cacao beans and flavored with pepper, vanilla, and other spices. Heating cocoa releases more of the antioxidants.

Chocolate may work synergistically with selective MAO-b inhibitors such as selegiline or rasagiline to relieve depression. Bupropion (Wellbutrin, Zyban) reportedly decreases chocolate cravings in some individuals, but not others.

Studies suggest that cocoa extracts may prevent the growth of *Helicobacter pylori* (responsible for stomach ulcers) and strains of *E. coli* in the human body.

**Precautions:** It is addictive, and has a high (40 to 60 percent) fat, sugar, and caloric content, which could contribute to obesity. Most cocoa has been stripped of most of its beneficial antioxidants and flavanols, as the latter imparts a bitter taste, which is usually done by processing with alkali. Epicatechin can be easily destroyed by heat and light, and not all dark chocolate may have significant quantities of this flavanol. Chocolate can also contain varying amounts of lead acquired during production. Chocolate and nuts should be avoided by those with herpes, as the high arginine content can aggravate the symptoms. It should not be taken by anyone with allergies, as it can worsen symptoms, or anyone with canker sores, as it can delay healing. Sensitivity to chocolate can trigger migraine headaches. Most research on the health benefits of chocolate is preliminary, and studies which appear to promote chocolate as a health food may be funded by chocolate companies in an attempt to put a positive spin on their product.

It can decrease the effectiveness of antihistamines, tranquilizers, sedatives, and relaxants, and can cause severe hypertension in anyone taking an MAO inhibitor or antidepressant.

It can deplete the body of inositol and the B vitamins, particularly B-1, and partially prevent the absorption of calcium. It also has significant levels of caffeine, which can place stress on the endocrine system and deplete the body's stores of potassium and zinc.

White chocolate contains cocoa butter but not cocoa solids (and, thus, no alkaloids), and carob, which comes from the evergreen tree (*Ceratonia siliqua*), is unrelated to chocolate.

Because their bodies cannot process the theobromine as readily as humans' can, chocolate can be deadly to animals, including cats, dogs, parrots, foxes, and coyotes.

**Dosage:** The dosage needed to get a true high is physically impossible to consume.

## CIMORA

A hallucinogenic drink consumed by the Indian witch doctors in Peru and Ecuador, who use it to foretell the future and diagnose their patients. Of its several ingredients, the main psychoactive ones are datura and San Pedro.

**Precautions:** Cimora could refer to any number of plants, including many of the Brugmansia genus.

**Dosage:** None established.

## CLEMATIS VIRGINIANA

**Effects:** Supposedly induces strange dreams and hallucinations.

**Precautions:** It may irritate the skin or, if ingested, cause a burning feeling in the mouth. Other *Clematis* species are mildly toxic.

**Dosage:** None established.

## CLUB MOSS

**AKA:** Devil's claw; Druid's foot; *Lycopodium clavatum* (common club moss); *Lycopodium complanatum*; *Lycopodium selago*; snake moss; witches' plant; wolf's foot.

**Effects:** *Lycopodium selago* can induce a mild hypnotic narcosis or a comatose state, depending

on the dosage taken, yet *Lycopodium complanatum* can have a stimulating effect. *Lycopodium clavatum* contains an alkaloid complex that includes nicotine. In Peru, another species of club moss is often added to San Pedro.

**Precautions:** Side effects include heavy perspiration, nausea, vertigo, speech problems, spasms, vomiting, and diarrhea. James A. Duke, Ph.D., has found that Chinese club moss (*Huperzia serrata*) and *Lycopodium* club mosses both contain the alkaloid compound huperzine; however, for psychoactive effects, it appears each species is distinctly different from the others, and different parts of each plant are used. Michael Wink and Ben-Erik van Wyk do not ascribe any psychoactive properties to any of the *Lycopodium* species.

**Dosage:** According to William Emboden, three stems of *Lycopodium selago* will induce a hypnotic narcosis.

## COAST CORAL TREE

**AKA:** *Erythrina caffra*.

**Effects:** Euphoria, drunkenness, enhanced sex drive.

**Precautions:** The alkaloids are extremely toxic. Side effects include fever, markedly increased or decreased blood pressure, a profound reddening of the skin, deep sleep, and apopleptic stroke. Death from respiratory arrest can occur within two to three days.

**Dosage:** None established.

## COCA AND COCAINE

**AKA:** *Erythroxylum coca*; *mate de coca*.

The psychoactive ingredient of the coca leaf is cocaine, only one of over a dozen compounds in the coca leaf which have a similar effect. There are several different varieties of coca, none of which is related to cocoa.

**Effects:** Euphoria, enhanced sex drive, and hallucinations. It has been used for centuries as a gentle stimulant by indigenous peoples of South America, who use it to treat altitude sick-

ness and brew it into a tea called mate de coca. Coca usually contains less than 0.5 percent active cocaine—because of this, and because it enters the body through the mouth and stomach, rather than through the more direct routes of the lungs and bloodstream common to cocaine users, it is rarely addictive. It contains many vitamins, including thiamine, riboflavin, and vitamin C, along with many compounds that modify the cocaine, rendering it safer to the user; all this is lost when it is refined into cocaine. It helps the body dispose of toxic metabolites, including uric acid. It appears to keep the teeth and gums healthy, have a positive effect on respiration, and alleviate somewhat symptoms of altitude sickness. According to its users, it increases the life span. It has not yet been determined whether it improves any mental functions, though its stimulant effect gives one the feeling of being smarter and mentally sharper. A recent study found that repeated use of cocaine suppressed the expression of protein G9a in the body, possibly allowing more dendritic growth and, it is assumed, an increase in learning ability (Maze et al., 2010).

**Precautions:** Side effects include loss of inhibitions, dilated pupils, severe constriction of the blood vessels in the brain contributing to ischemia and neuronal death, hypertension, rapid heartbeat, stroke, schizophrenic episodes, psychological dependency, and death from respiratory arrest.

**Dosage:** The average Indian consumes about two ounces of dried leaves a day, or about 0.7 grains of cocaine.

## COHOBA

**AKA:** *Acacia* species; acuja; ai'yuku; algarroba de yupa; *Anadenanthera peregrine*; angico; black parica; bois ecorce; bois rouge; cajoba; candelon; caobo; cehobba; curuba; dopa; ebena; hakudufha; hisioma; Inga niopa; iopo; jop; khoba; *Mimosa* species; niopa; parica; paricachi; paricarama; parica rana; paricauva; *Piptadenia* species; savanna yoke;

tabaco-rape; tan bark; yacoana; yarupi; yoco; yopo; yoto; yupa; zumaque.

**Effects:** Used as a hallucinogen by various tribes in South America. When used as a snuff, psychedelic visions can last for ten to fifteen minutes, with aftereffects lasting up to an hour.

**Precautions:** Side effects include headache, salivation, and vomiting.

**Dosage:** None established.

## COLEUS

**AKA:** *Coleus blumei*; *coleus pumilus*.

**Effects:** Young *et al.* claim that the high manifests itself as a “trippy, psilocybin-like state, colorful visual hallucinations and patterns, and telepathic and clairvoyant insights” for a duration of some two hours.

**Precautions:** Despite the fact that the Mazatecs of Oaxaca, Mexico, use these mint plants in the same way they use the hallucinogenic *hojas de la Pastora*, no hallucinogenic agent has been isolated in either of them or in any of the 150 species of *coleus*. William Emboden states that researcher R. Gordon Wasson has reported mind-altering effects, but these have not been verified by others. According to Ratsch, only 30 percent of those who smoke the dried leaves of *Coleus blumei* experience its effects, and he speculates that variations in body chemistry or repeated use may be the reason.

Side effects include brief nausea a half-hour after consumption.

**Dosage:** According to Young *et al.*, between 50 to 70 large fresh leaves; dried leaves will not do. They can be chewed, smoked, or steeped in lukewarm water for an hour and drunk as a tea.

## COLORINES

**AKA:** *Erythrina flabelliformis*.

**Effects:** A feeling of drunkenness accompanied by hallucinations.

**Precautions:** Some species of *Erythrina* are known to contain isoquinoline-type alkaloids, which produce effects similar to the arrow poi-

son curare, while others, like *E. flabelliformis*, appear to have none. The toxic dose is very small. Symptoms include vomiting, a pounding heart, and convulsions, and death may result. The appearance of the bean is very similar to mescal beans—they are often mixed together by herb merchants, and both may be called by the same common name, colorin—and piule seeds (the *Rhynchosia* species—Young *et al.* in fact confuses these two).

**Dosage:** One-quarter to one-half bean; any more could trigger the toxic effects mentioned above. Use is not recommended.

## CORIANDER

**AKA:** *Coriandrum sativum*.

**Effects:** In Iran, the fruit is used as a folk remedy for anxiety and insomnia. The fumes are said to produce uncontrollable laughter, reverie, and hallucinations.

**Precautions:** One case on record relates that several workers who tried to clean up fifty quarts of coriander oil spilled from a large container were overcome by the fumes within a half hour. Laughing and giggling at first, they became aggressive and belligerent. Before they could be rescued, two suffered from extreme nausea, and all suffered from extreme fatigue for the next few days.

**Dosage:** None established.

## CORKWOOD DUBOISIA

**AKA:** *Duboisia myoporoides*.

Should not be confused with *Hibiscus tiliaceus*, also known as corkwood.

**Effects:** Hallucinogenic. At low doses, it can be a depressant and sedative. The main active ingredients are the alkaloids scopolamine and nicotine.

**Precautions:** Side effects include euphoria, confusion, insomnia, vertigo, trembling, impaired speech, excitability, nausea, vomiting, heart palpitations, abnormal dilation of the pupils, and death.

**Dosage:** None established.

## DAMA DE NOITE

**AKA:** *Cestrum laevigatum*; maconha.

**Effects:** Sold in Brazil as a marijuana substitute. No psychoactive ingredient has yet been isolated, though a related species, *Cestrum parqui* (palqui, willow-leafed Jessamine), is mildly psychoactive, producing mild euphoria and relaxation.

**Precautions:** None known.

**Dosage:** None established.

## DAMIANA

**AKA:** *Turnera diffusa*.

**Effects:** A mild marijuana-like high for about an hour. It is said to alleviate fatigue, depression, and stress, induce a restful sleep filled with sexually oriented dreams when taken an hour before going to bed, and act as an aphrodisiac when taken an hour before sex.

Said to work synergistically with a teaspoonful of dried saw palmetto berries.

**Precautions:** Overuse may cause liver damage; there is anecdotal evidence that it may cause hypoglycemia and continuous muscular contractions in the uterus. The compounds have not been adequately studied, and there may be further side effects that are as yet unknown.

**Dosage:** It can be smoked like marijuana, brewed as a tea (4g per cup), prepared as a liquor extract, or burned as incense.

## DARNEL

**AKA:** Bearded darnel; borrachera; borachuela; cizana; hierba loca; ivraie (“inebriating”); *Lolium temulentum*; tares; taumelloch (“delirium grass”).

**Effects:** An inebriant with narcotic properties, this common wild grass contains psychoactive alkaloids. Loline, the main alkaloid, has been found to be non-toxic in doses of up

to 200 mg per kilogram of body weight when injected into mice.

**Precautions:** Side effects include headaches, coordination problems, cloudy thinking, vision problems, violent vomiting, colic, excessive sleepiness, and death from respiratory paralysis.

**Dosage:** Generally used as an additive to beer or fermenting agent in alcoholic drinks.

## DATURA

**AKA:** Concombre zombi (zombi's cucumber); *Datura alba*; *Datura arborea*; *Datura aurea*; *Datura candida*; *Datura ceratocaula* (torna-loco); *Datura discolor*; *Datura dolichocarpa*; *Datura fastuosa*; *Datura ferox*; *Datura inoxia* (*Datura meteloides*, dekuba, toloache, toloatzin, wichri, wysocean); *Datura metel* (dhatura, dutra); *Datura sanguinea*; *Datura stramonium* (devil's apple, devil's snare, devil's trumpet, devil's weed, James Town Weed, jimson weed, loco weed, qui-qui-sawaal, stinkweed, thorn apple, white man's plant, yerba del diablo); *Datura suaveolens*; *Datura versicolor*; *Datura volcanicola*; *Datura wrightii*; jouzmathel; man-t'o-lo; tolouaxihuitl.

Like *Brugmansia*, it is a member of the nightshade family, though it is distinguished by being the plant form, whereas the *Brugmansia* species is composed of trees and shrubs. *Datura* was just one of the psychoactive plants used by European witches, and—according to Wade Davis—is used as an antidote to the zombi drug in Haiti. Scopolamine, one of the main psychoactive alkaloids, was tested as a “truth serum” by both the Nazis and the U.S. during World War II to unsatisfactory results.

**Effects:** Deep sleep and hallucinations, including the sensation of flying. The main psychoactive alkaloids are hyoscyamine and scopolamine; the minor ones are atropine, meteloidine, and norscopolamine. Used by many shamans to foresee the future, speak

with the dead, and diagnose illnesses. It has also been used in initiation ceremonies, to treat a number of physical ailments, and *Datura fastuosa* was once used by Incan priests to sedate patients during surgery. *Datura stramonium* is used by Hindu monks for sacred ceremonies.

**Precautions:** The main alkaloid is scopolamine, which is highly toxic; it has proven to have a negative effect on serial learning in doses as low as 0.5 mg. Initial intoxication may be so violent that the user may have to be physically restrained. Other side effects include diarrhea, nausea, vomiting, confusion, incoherence, dizziness, agitation, heart palpitations, severe anxiety, inability to urinate, and loss of motor coordination. Hallucinations may last from one day to two weeks. Overdose symptoms include convulsions, coma, intoxication lasting days (up to twenty days in some cases, according to Richard Rudgley), permanent damage to the eyes, heart, and brain, and death. Schultes and Hofmann, in *Plants of the Gods*, state that permanent insanity may also occur. According to the American Association of Poison Control Centers, by 2013 its popularity had led to hundreds of deaths and thousands of cases of poisoning each year. The side effects of *Datura stramonium* include fever, chills, loss of coordination, a dry burning in the mouth, difficulty swallowing, hot dry skin, rash, dizziness, pressure in the head, vomiting, heart irregularities, loss of memory, agitation, blurring and distortion of vision, hallucinations, coma, and death. Overdose symptoms include mental disorientation, panic, convulsions, and coma. It is used by South American Indians as a poison on their hunting spears, arrows, and fish hooks and, like Rohypnol, the “date rape drug,” it was once used by criminals to incapacitate their victims.

Similar methods of incapacitating a person occur in Fiji, where datura is sometimes added to kava, and Africa, where it is added to beer or wine.

Carlos Castaneda's *The Teachings of Don*



*Juan* and subsequent books dealing with datura make up a fictional framework on which hang numerous bits of information cribbed from some 200 esoteric works, much of it inconsistent and inaccurate. The film based on Wade Davis' *The Serpent and the Rainbow* bears only a passing resemblance to the book, reinforcing old stereotypes; and Davis' conclusions about the ingredients of the zombi drug itself have been attacked by some as reliant on too little evidence.

**Dosage:** It can be smoked, eaten, drunk as a tea, or taken as an enema. In Africa and Asia, it is often combined with cannabis or tobacco and smoked, and in Tanzania it is added to beer. *Datura suaveolens* is often added to ayahuasca.

The ground seeds are often added to maize beer. The seeds of *Datura stromonium* are poisonous if eaten.

## DDT

**AKA:** Dichlorodiphenyltrichloroethane; Mickey Slim.

A common commercial pesticide now banned from use.

**Effects:** In the 1950s, a cocktail known as a Mickey Slim was created by adding a tiny amount of DDT to gin, the resulting drink producing a mild high.

**Precautions:** Causes endocrine disruption and genetic damage. It has also been linked to diabetes, premature birth and low birth rate, developmental problems in children, neurological problems, Alzheimer's disease, and various cancers.

**Dosage:** There is no safe dosage.

## DILL

**AKA:** *Anathum graveolens*.

**Effects:** Oil of dill will produce hallucinations. The leaves are used as a marijuana substitute.

**Precautions:** The level of oil needed to induce hallucinations is very close to the toxic

level. Side effects include epileptic-like convulsions, kidney damage, and liver damage.

**Dosage:** 5 to 20 drops of oil taken orally.

## DITA TREE

**AKA:** *Alstonia scholaris*; chatian; daivapala; devil tree; dirita; elilampala; maddale; milky pine; nandani; pala; palimara; pulai; saittan ka jat; saptachadah; saptaparna; satvin; schulholzbaum; shaitan; tanitan; weissquirlebaum; yaksippala.

**Effects:** Hallucinations due to numerous alkaloids, including (in some species) yohimbine, as well as alleged aphrodisiac effects. Low doses of the alkaloid alstovenine have MAO-inhibiting effects, while high doses stimulate the central nervous system. The leaves of *Alstonia theaeformis* (bogota tea) are used to make a stimulating tea.

**Precautions:** Side effects include spasms.

**Dosage:** 2 to 3g of seeds brewed as a tea.

## DMT AND RELATED TRYPTAMINES

**AKA (5-MeO-DMT):** 5-methoxy-N,N-dimethyltryptamine.

**AKA (5-MeO-MIPT):** 5-methoxy-N-methyl-N-isopropyltryptamine.

**AKA (5-MeO-MMT):** 5-methoxy-N-monomethyltryptamine.

**AKA (5-OH-DMT):** Bufotenine, 5-hydroxy-N,N-dimethyltryptamine.

**AKA (AMT):** Alpha-methyltryptamine, IT-290.

**AKA (DAT):** N,N-diallyltryptamine.

**AKA (DBT):** N,N-dibutyltryptamine.

**AKA (DET):** N,N-diethyltryptamine, T-9.

**AKA (DHT):** N,N-dihexyltryptamine.

**AKA (DIT):** N,N-diisopropyltryptamine.

**AKA (DMA):** 2,5-dimethoxyamphetamine.

**AKA (DMT):** Dimethyltryptamine, N,N-dimethyltryptamine, 2-(1H-indol-3-yl)-N,N-dimethylethanamine.

**AKA (DOB):** 4-bromo-2,5-dimethoxyamphetamine.

**AKA (DPT):** N,N-dipropyltryptamine.

**AKA (MMT):** N-monomethyltryptamine, NMT.

**AKA (PMA):** 4-methoxyamphetamine.

**AKA (TMA):** 3,4,5-trimethoxyamphetamine.

Existing naturally in human cerebrospinal fluid, DMT and its precursor tryptamine are similar to certain hormones secreted by the pineal gland. Furthermore, receptors for DMT have been discovered in the brains of mammals, and it is the active hallucinogenic ingredient in several South American plants. Other related tryptamines are listed above. AMT was made famous by Ken Kesey and his Merry Pranksters, as chronicled in Tom Wolfe's *The Electric Kool-Aid Acid Test*.

**Effects:** Possibly unique among psychedelics, DMT cannot be taken orally, as stomach enzymes break it down before it can pass to the bloodstream. As a snuff, it can produce an immediate high that can last thirty minutes; when smoked, it can produce an immediate high that can last one to ten minutes. Hallucinations can often contain erotic content or experiences with alien entities. The high is similar to that of LSD or mescaline, but shorter.

The tryptamine AMT produces a stimulating effect similar to LSD and amphetamines.

The tryptamine DET produces a trip that is milder and longer-lasting than DMT.

A close relative to DMT, 5-MeO-DMT is produced both synthetically and in the venom glands of the Sonoran Desert toad of Arizona. However, the two types of 5-MeO-DMT produce vastly different experiences, the former resulting in a frightening "dissolution of reality" when smoked and the toad venom producing a much gentler experience when dried and smoked. Contrary to tabloid reports, only the Sonoran Desert toad has venom that is psychoactive (other toad venoms are just toxic), though it can cause a serious case of poi-

soning if brought into contact with the eyes or mouth.

**Precautions:** Some characterize the odor of DMT as the smell of burning plastic, which may be due to the contaminant skatole. The psychedelic trip may be accompanied by dizziness, rapid heart and respiratory rates, disorientation, and confusion. If taken on a full stomach, DMT could cause nausea. An overdose could result in blood rushing to the head and rupturing weak capillaries. Addiction is unknown, though tolerance is rapid, and like any psychedelic, it can result in bad trips.

An MAO inhibitor, DMT may cause severe headaches, vomiting, dangerously high blood pressure, heart problems, and even death when combined with avocados, bananas, broad beans, caffeine, aged cheeses, chicken liver, chocolate, cocoa, dill oil, fennel oil, canned figs, pickled herring, licorice, milk or milk products, nutmeg, parsley oil, pineapple, sauerkraut, yeast extract, alcohol, amphetamines, antihistamines, atropine, ephedrine, insulin, mescaline, narcotics, ritalin, sedatives, or tranquilizers.

Jonathan Ott and others have concluded that 5-MeO-DMT has "little recreational value," essentially agreeing with a colleague who compared it to "having a large elephant sitting on one's head." It should be noted that, since most types of toad venom are toxic, licking toads can be dangerous, and getting the venom in the eyes or mouth can cause severe poisoning. The venom must be dried and smoked to inactivate the toxins.

Reportedly, 5-MeO-MIPT acts more like amphetamines, providing stimulation without the hallucinations.

The reported hallucinogenic effects of 5-OH-DMT are disputed by research, which also suggests that it creates cardiopulmonary distress and may be toxic even in doses as low as 10 mg when injected intravenously. A CIA experiment nearly killed three individuals with 2.5 to 5 mg of an intramuscular injection after they were premedicated with reserpine and chlorpromazine.

**Dosage:** Readily snorted, eaten, and injected, DMT (in a dose of 3.5 to 5 mg) can also be combined with marijuana, parsley, or tobacco and smoked; there are several methods used to prepare the seeds for consumption. Writer William Burroughs self-experimented with DMT in doses of around 65 mg; he accidentally overdosed at 100 mg, producing a traumatic experience that left him leery of the drug afterward. Timothy Leary and Ralph Metzner reported no ill effects at doses of 1 mg/kg of body weight. The CIA experimented on prison inmates and mental patients, revealing that the snuff is inactive in doses up to 1 gram, and oral doses are inactive up to 350 mg, but intramuscular injections produced visual hallucinations with as little as 10 to 12.5 mg.

According to Jonathan Ott, “DMT is not active orally. Single doses of up to a gram orally have no effect.... Similarly, rectal doses of up to 125 mg DMT in 15 ml water were “without any discernable effect.” ... The average intramuscular dose of the hydrochloride salt is 50 to 60 mg, producing an entheogenic effect commencing in 2 to 5 minutes, peaking in 15 minutes, with the experience lasting a total of 30 to 45 minutes. An effect of equal intensity is produced by 25 to 30 mg of DMT free base smoked, with the entire experience accelerated dramatically. The onset following smoking is almost immediate, attaining a peak in 2 to 3 minutes, with the entire effect lasting only 10 to 20 minutes.... Although DMT-containing plant snuffs are active, intranasal administrations of 5 to 20 mg of pure DMT was inactive.... Orally, in combination with MAO-inhibitors, DMT is active in the same dose range as by intramuscular injection. Tolerance to the entheogenic effects of DMT develop rapidly, but dissipates rapidly as well, and DMT and LSD show cross-tolerance....” Allowing about four hours between doses has been reported to avoid tolerance.

The effective oral dose of AMT appears to be approximately 20 mg.

Unlike DMT, DET is active orally, but only at high doses; when smoked or injected, its potency is roughly equivalent to that of DMT (a dose of 50–60 mg takes effect in 15 minutes, peaks quickly, and lasts 2 to 3 hours).

The effects of DPT are nearly identical to those of DET, with one exception: above 100 mg, the duration of the effects is dependent upon the dosage.

Unless combined with MAO inhibitors at a 10 mg dose, 5-MeO-DMT is not active orally. When smoked, it is four times as potent as DMT. Experiments have found that smoking 6 to 10 mg of the free base can result in a high that begins within a minute, peaks after two, and lasts twenty. Parenteral injections of 5 to 10 mg were also found to produce results.

## DONA ANA

**AKA:** *Coryphantha macromeris*.

A small spiny cactus found in southern Texas and northern Mexico.

**Effects:** Similar to mescaline, but about 1/5 as potent. The hallucinogenic trip begins after about an hour or two and lasts for about twelve hours.

**Precautions:** Nausea and vomiting may result if taken on a full stomach. An overdose can be dangerous.

It should not be combined with any MAO inhibitors.

**Dosage:** The spines are removed from 8 to 12 fresh cacti, after which the plant can be chewed thoroughly and swallowed or consumed as a tea; this latter method involves boiling in water for an hour and straining before drinking.

## ECHINACEA

**AKA:** *Echinacea angustifolia*; *Echinacea purpurea*; elk root; Sampson root.

There are nine species, each having possibly separate and distinct medicinal properties.

**Effects:** The alkylamides in echinacea bind

to both CB1 and CB2 cannabinoid receptors (Bauer et al., 2004).

**Precautions:** The alkylamides' relationship to the cannabinoid receptors helps modulate the body's immune system response, and is not indicative of any psychoactive properties.

**Dosage:** None established.

## ENDOCANNABINOIDS

**AKA:** 2-arachidonoyl glycerol (2-AG); 2-arachidonoyl glyceryl ether (noladin ether); 7,10,13,16-docosatetraenylethanolamide; arachidonoyl ethanolamine (anandamide); homo- $\gamma$ -linolenylethanolamine; N-arachidonoyl-dopamine (NADA); virodhamine (O-arachidonoyl-ethanolamine, OAE).

Endocannabinoids are psychoactive compounds produced naturally by animals—including humans, birds, fish, and reptiles—and have been found in some plants and in chocolate, as well. Since 1988, several have been identified, and they exist in nearly all tissues of the body, including skin. They are similar to plant cannabinoids.

**Effects:** The amounts produced are so small that any psychoactive effect is virtually nonexistent. According to a patent based on research at the National Institute of Mental Health (NIMH), cannabinoids are “useful in the treatment and prophylaxis of wide variety of oxidation associated diseases such as ischemia, age-related, inflammatory, and autoimmune diseases. The cannabinoids are found to have particular application as neuroprotectants, for example in limiting neurological damage following ischemic insults, such as stroke and trauma, or in the treatment of neurodegenerative diseases, such as Alzheimer's disease, Parkinson's disease and HIV dementia.”

**Precautions:** According to researcher Joseph Hibbeln, the overconsumption of vegetable oils such as soybean oil, corn oil, and polyunsaturated vegetable oils causes the brain to produce excess amounts of cannabinoids, increasing hunger in much the same way that

smoking pot leads to a craving for snack foods. Overeating, particularly a high-fat diet, can lead to scarring of the brain, as well as inflammation, which can harm the brain and immune system, permanently disrupting the satiety cues monitoring hunger and food consumption.

**Dosage:** None established.

## EPENA

**AKA:** Akurjua; ebene; hakudufha; nyakwana; parica; *Virola calophylla*; *Virola calophylloidea*; *Virola carinata*; *Virola cuspidata*; *Virola divergens*; *Virola elongata*; *Virola loretensis*; *Virola melinonii*; *Virola multinervia*; *Virola pavonis*; *Virola peruviana*; *Virola rufula*; *Virola sebifera*; *Virola surinamensis*; *Virola theiodora*; *Virola venosa*; yakee; ya-to; yopo.

A tree found in the rain forests of Colombia and Brazil, it is a member of the nutmeg family and chemically similar to ayahuasca.

**Effects:** The hallucinogenic effects take hold almost immediately and lasts about thirty minutes. The chief psychoactive ingredients are DMT and 5-MeO-DMT.

**Precautions:** Indigenous peoples of Colombia and Brazil usually mix it with water and take it as an enema to avoid the side effects associated with snorting.

Side effects include uncontrollable trembling for five minutes, followed by headaches and confusion for another ten minutes. It can also cause numbness of the limbs, facial twitching, loss of muscular control, nausea, and irritation of the mucus membranes, resulting in uncontrollable sneezing. Epena can exaggerate any existing pain, and taking it on a full stomach can cause nausea. The death of a shaman from Virola powder was reported by Schultes in 1954.

If combined with any other MAO inhibitors, headaches, vomiting, heart problems, and death may result.

**Dosage:** Though preparation varies from one area to another, generally the thick red

resin is scraped from the inner bark, dried or boiled down to an amber-red crystalline state, then ground and sifted. The resultant snuff is then blown into the nostrils with a tube. Other regional plants may also be added to vary the effect. Some people eat the resin in the form of pellets, and there are reports that it is even smoked. Oral ingestion may not produce the desired hallucinations.

## EPHEDRA AND MA-HUANG

**AKA:** Dymetadrine 25; *Ephedra gerardiana* (Pakistani ephedra); *Ephedra nevadensis* (American ephedra, Brigham Young weed, cowboy tea, desert herb, desert tea, Mormon tea, squaw tea, teamster's tea, whorehouse tea); *Ephedra sinica* (Chinese ephedra, ma-huang), ephedronin.

**Effects:** Chinese and Pakistani ephedra contain ephedrine, a strong central nervous system stimulant. American ephedra contains norpseudoephedrine, which may be even more powerful. It stimulates the mind, suppresses fatigue, and increases adrenaline production, heart rate, and blood pressure. Dymetadrine 25 is an over-the-counter drug that is pure ephedrine.

Traditional Chinese medicine has used it in conjunction with other herbs.

**Precautions:** In 2004, ephedra was banned by the FDA after evidence was gathered linking it to more than a hundred deaths. Mild side effects of the herb include insomnia, dry mouth, nervousness, irritability, headache, dizziness; serious side effects include increased blood pressure and heart rate, heart palpitations, aggression, personality disorders, and dependency. Overdose symptoms include perspiration, dilated pupils, muscle contractions, hyperglycemia, insomnia, constipation, and urine retention. Mild side effects of the drug include mild nausea, insomnia, nervousness, restlessness, dryness in the nose and throat, and congestion; serious side effects include increased blood pressure and heart rate, trem-

bling, weakness, breathing problems, excessive anxiety and nervousness, dizziness, lightheadedness, muscle cramps, nausea, vomiting, and chest pain.

It should not be used by women who are pregnant or those who suffer from anxiety attacks (panic disorder), diabetes, elevated thyroid, glaucoma, heart disease, hypertension, hyperthyroidism, or high blood pressure, or by those who have a history of abusing stimulant drugs. Lower dosages should be used for children and adults over 65; it should not be given to children under the age of two. Those who are underweight, sedentary, subsisting on a poor diet, recovering from an illness, suffering from extreme stress, have sleep problems, or who have a weak digestive system may find that ma-huang may make them feel more stressed out and run down.

The effects wear off rapidly, so that larger and larger doses are needed to achieve the same effect. Large doses can cause headache, nervousness, nausea, palpitations, dizziness, difficult urination, insomnia, and chest pain. Overuse may also lead to a condition called the serotonin syndrome, where serotonin levels in the body are too high, and which is characterized by restlessness, confusion, sweating, diarrhea, excessive salivation, high blood pressure, increased body temperature, rapid heart rate, tremors, and seizures. There are twenty reported cases of ephedrine psychosis attributed to overuse, and attempts by individuals to obtain a high have led to a few deaths. Its use in treating allergies, asthma, and congestion has largely been replaced by more effective drugs that exhibit fewer side effects. Ephedra could cause a positive response on a drug test for amphetamine use.

It is advisable to consult a physician before combining ephedra with any medication. It should not be combined with MAO inhibitor drugs or 5-HTP. Bodybuilders often take 100 mg of caffeine, 50 mg of ephedrine, and one aspirin three times a day for "cutting up" (reducing fat and increasing muscle definition),

though this is not recommended, as the caffeine-ephedra combination may have been responsible for almost two dozen deaths in recent years. Proponents of ephedra say the evidence is inconclusive, particularly since ephedra has been used for much of recorded history, and ephedra-based alkaloids are found in numerous over-the-counter remedies that have been used by millions, many of whom also regularly drink caffeinated beverages.

**Dosage:** James A. Duke, Ph.D., recommends one level teaspoon of the dried herb or one-half to one teaspoon of the tincture, though he cautions that this should only be done after consultation with a doctor. The FDA does not recommend more than 24 mg of ephedrine a day.

### ERERIBA

**AKA:** *Homalomena belgraveana*; *Homalomena ereriba*; maraba.

Research on the *Homalomena* genus is limited, despite the identification of over 140 species from South America to Asia.

**Effects:** Said to be a narcotic, the leaves of which are combined with the leaves and bark of agara or *Galbulimima belgraveana*, though no psychoactive compounds have yet been isolated from it. Natives of New Guinea use *Homalomena cordata* for “rain magic” and *Homalomena versteegii* for “love magic.”

**Precautions:** The Malaysians use *Homalomena rubescens* as a fish poison which they call ipoh.

**Dosage:** None established.

### ERGOMETRINE

**AKA:** 1-hydroxymethylethylamide lysergic acid; (6a/R/,9/R/)-/N/-((/S/)-1-hydroxypropan-2-yl)-7-methyl-4,6,6a,7,8,9-hexahydroindolo [4,3-/fg/] quinoline-9-carboxamide; d-lysergic acid beta-propanolamide; ergometrine maleate; ergonovine; lysergic acid beta-propanolamide; Methergin.

An ergot alkaloid used in the third stage of labor to prevent and control bleeding following childbirth by constricting the uterus and the blood vessels in the uterus.

**Effects:** Similar to LSD.

**Precautions:** Side effects (clinical doses) include headache, dizziness, abdominal pain, nausea, vomiting, heart palpitations, ringing in the ears of tinnitus, chest pain, irregular or slow heart rate, shortness of breath, constriction of the blood vessels in the extremities of the body, increase in blood pressure, and skin rash. Rare side effects include heart attack. Side effects (recreational doses) include hallucinations, dementia, abortions, gangrene.

It should not be used by anyone with mild to moderate liver disease, mild to moderate kidney disease, mild to moderate heart disease, mild to moderate high blood pressure, individuals with Raynaud’s disease, individuals with porphyrias (a type of hereditary blood disorder), women who have just delivered more than one baby (multiple births), women who are breastfeeding, or those who are allergic to any of its ingredients.

When combined with halothane (a general anesthetic), the effects of ergometrine could be reduced. When combined with the anti-HIV drugs atazanavir or efavirenz, the risk of side effects can be increased.

**Dosage:** Two to 10 mg, or approximately ten times the clinical dose.

### ERGOT

**AKA:** *Claviceps purpurea*; cockspur rye; holy fire (ignis sacer); hornseed; mother of rye; Saint Anthony’s Fire; smut rye; spurred rye; Wolfszahn (Wolf-tooth).

A fungus that grows on various grasses and edible grains; there are about fifty known species, of which *Claviceps purpurea*—found on rye—is the most common.

**Effects:** Hallucinations. Ergot contains ergotamine, which is used to synthesize lysergic acid, a precursor to LSD.

**Precautions:** Side effects include nausea, vomiting, diarrhea, thirst, itching, weak pulse, cardiovascular problems, abnormal sensations, numbness in the arms and legs, confusion, paranoia, convulsions, a weakened immune system, and loss of consciousness. Gangrene of the arms and legs and miscarriages can also result. The epidemic of ergot poisoning during the Middle Ages in Europe was known as Holy Fire (ignis sacer) or Saint Anthony's Fire. One theory is that ergot poisoning triggered the hysteria of the Salem witch trials, as well as the witch hunts and werewolf trials throughout Europe in the 16th and 17th centuries, the religious revival in the 1740s, and the Great Fear during the French Revolution, though such connections are unproven and controversial; it may also have been the inspiration for the epic poem *Beowulf*. Weakened immune systems from ergot poisoning may also have contributed greatly to the devastating losses suffered during the Black Death. John G. Fuller's book *The Day of St. Anthony's Fire* is the story of the ergot poisoning of the French town of Pont-Saint-Esprit in 1951, though some contend the effects were the result of a mercury compound used as a fungicide, the grain having been accidentally ground into flour for bread instead of being planted as seed. More recently, journalist Hank P. Albarelli, Jr. alleges—in an even more controversial theory—that the townspeople were the victim of a CIA LSD experiment.

The alkaloids can be passed on to a child through breast-feeding, causing symptoms of poisoning in the infant. Farm equipment that has harvested contaminated grain can also transfer the fungus.

**Dosage:** None established.

## ET

**AKA:** Etryptamine; 3-(2-amino-butyl)indole.

**Effects:** An MAO inhibitor and possible hallucinogen.

**Precautions:** There is one reported fatal overdose.

**Dosage:** None established.

## ETHYLENE

The oracle of Delphi, high up on the slopes of Mount Parnassus, was the most famous of the four Greek oracles and one of the most sacred sites in all of Greece. Allegedly it was found by shepherds who saw their goats acting strangely, and who then discovered a subterranean vent spewing foul-smelling fumes; anyone inhaling these fumes went into an ecstatic trance whose main feature was prophetic visions. Eventually, virgin priestesses were chosen to relay these prophecies, said to be messages from the god Apollo, and people seeking advice made pilgrimages there from about 1400 BC to 400 AD. According to Greek historian Plutarch, the priestess (or Pythia) would inhale the sweet-smelling fumes, fall into a brief frenzied state, then deliver her cryptic message.

These stories were dismissed as mere myths by historians until 2001, when geologist Jelle Z. de Boer of Wesleyan University in Connecticut found traces of ethylene in the temple's stone walls. He believes that ethylene gas emanated from fault lines in the area, and that these fumes, which can cause euphoria and hallucinations, were the main cause of the priestesses' visions.

This theory has been refuted by Giuseppe Etiope of the National Institute of Geophysics and Volcanology in Rome, who argues that ethylene could not have existed in high enough concentrations to produce the required effects, and that lack of oxygen, plus a mixture of methane (which can also cause hallucinations, and which he and his team found in spring waters nearby) and carbon dioxide could just as easily have produced such visionary trances. The sweet smell, he says, came from benzene, also found in the area.

The methane theory, too, has its faults. It does not explain the sweet smell, the most

prominent characteristic of the gas (benzene, counters de Boer, would have caused sickness and death in many of the oracles; to the contrary, many of the priestesses lived long healthy lives). In addition, oxygen deprivation would most likely cause vomiting, which was definitely not a feature of the trances. And methane can kill a lot quicker than ethylene, especially if it is decomposing to produce carbon dioxide, as a byproduct of this process is carbon monoxide, which can bind quite readily to red blood cells. And since this occurs commonly with most combustion, the ancient Greeks would have been very familiar with these effects and not given them such an aura of mystery.

Some foods are fumigated with ethylene oxide.

**Effects:** An analgesic, euphoric, and hallucinogen. It was used as a painkiller during surgery before nitrous oxide.

**Precautions:** Side effects include suffocation, as it displaces air in the lungs.

**Dosage:** None established.

## FALSE PEYOTE

**AKA:** *Ariocarpus fissuratus*; living rock.

**Effects:** Said to produce strong hallucinations similar to those from peyote.

**Precautions:** It is said to be very dangerous, particularly by Huichol Indians, though precise details are lacking.

**Dosage:** None established.

## 5-MEO-DMT

**AKA:** 2-(5-methoxy-1H-indol-3-yl)-N,N-dimethylethanamine; 5-methoxy-N,N-dimethyltryptamine.

**Effects:** A strong psychedelic closely related to DMT and bufotenine, it is found in *Anadenanthera peregrina* seeds, the bark resin of various virola species, and the venom of the Colorado River toad (*Bufo alvarius*), and has been used in a snuff by South American Indi-

ans. Its effects, including euphoria and profound spiritual experiences, do not include external visual hallucinations.

**Precautions:** Jonathan Ott and others have concluded that 5-MeO-DMT has “little recreational value,” essentially agreeing with a colleague who compared it to “having a large elephant sitting on one’s head,” though health guru Andrew Weil and journalist Larry Gallagher have reported very positive experiences.

Anecdotal reports of side effects include muscle twitching, abnormal vocalizations, unconsciousness lasting up to twenty minutes, dissociation, dysphoria, fear, panic, nausea, and difficulty integrating experiences.

**Dosage:** Unless combined with MAO inhibitors at a 10 mg dose, 5-MeO-DMT is not active when taken orally (this combination is not recommended, as there are reportedly extremely unpleasant side effects). When smoked, it is four times as potent as DMT—experiments have found that smoking 6 to 10 mg of the free base can result in a high that begins within a minute, peaks after two, and lasts twenty. Parenteral injections of 5 to 10 mg were also found to produce results.

## FRAGRANT VALERIAN

**AKA:** All-heal; English valerian; German valerian; great wild valerian; heliotrope; phu; setwall; turnsole; valerian; *Valeriana officinalis*; vandal root; Vermont valerian; wild valerian.

Though it is sometimes referred to as heliotrope, it should not be confused with *Heliotropium arborescens*, a much more poisonous plant also known as heliotrope.

**Effects:** A fairly strong sedative and tranquilizer. An aqueous extract has been found to influence the neurotransmitter GABA.

**Precautions:** The tea’s aroma is intolerable to most people; its taste is slightly less objectionable. High doses could result in headache, restlessness, insomnia, abnormal heart rhythms, paralysis, cardiac arrest, and muta-



tions in the DNA. The tea is not drunk more than twice a day for more than two or three weeks at a time, as overuse could cause poisoning.

**Dosage:** Half an ounce of roots or rhizomes boiled in a covered pot for five minutes and drained, then consumed as a tea. It can also be boiled down to a viscous residue and, with a small amount of flour added, can be put into gelatin capsules.

### FRANKINCENSE TREE

**AKA:** *Boswellia sacra*; olibanum.

**Effects:** It is said to have psychoactive properties, and has been eaten, smoked, and used as incense in various cultures throughout history. In traditional Chinese medicine, it is generally considered to be a stimulant. Despite stories to the contrary, there is no evidence that burning frankincense produces THC, though other psychotropic substances may be present.

**Precautions:** Cases of addiction have been observed, though these may be rare. Other species of *Boswellia*—and their resins—can vary considerably in their effects, yet are also sold as frankincense.

**Dosage:** None established.

### GIANT REED

**AKA:** *Arundo donax*; calamus; cane sticks; great reed; Spanish cane; Spanish reed.

It should not be confused with calamus (*Acorus calamus*).

**Effects:** Though it contains at least five psychoactive components (including N,N-DMT, 5-MeO-DMT, and bufotenine), it does not appear to have any mind-altering effects.

**Precautions:** 50 mg of extract have not produced any psychoactive effects (though there is one report that this dosage did produce an allergic reaction); the toxic dosage level is unknown. The fact that it does not have a tradition of shamanic usage is not encouraging.

**Dosage:** None established.

### GREEN CESTRUM

**AKA:** *Cestrum parqui*; palqui; willow-leaved jessamine. Other species include *Cestrum aurantiacum*; *Cestrum elegans*; *Cestrum laevigatum*.

**Effects:** Used as a stimulant and intoxicant. South Brazilian fishermen use it in combination with *Cestrum laevigatum* as a marijuana substitute.

**Precautions:** Side effects include severe vomiting, abdominal pains, headache, convulsions, coma, and death, sometimes within a few hours. Compounds in green cestrum produce effects similar to that of strychnine, blocking ATP transport in cells, leading to cell death and resulting in paralysis of the central nervous system and muscles. The berries are ten times more toxic than the leaves.

**Dosage:** Three or four leaves smoked or, with bark, brewed as a tea.

### GUARUMA

**AKA:** *Cecropia Mexicana*; *Cecropia obtusifolia*.

**Effects:** A marijuana-like effect when smoked.

**Precautions:** None known.

**Dosage:** None established.

### HAWAIIAN BABY WOOD ROSE

**AKA:** *Argyreia nervosa*; baby Hawaiian woodrose; elephant creeper; Hawaiian wood rose; mile-a-minute; miniature wood rose; monkey rose; silver morning glory; woodrose; woolly morning glory.

Despite its popular name, it is not a member of the rose family, but is a woody liana in the morning glory family. It should not be confused with the Hawaiian woodrose (*Ipomoea tuberosa*), which is not psychoactive.

**Effects:** Similar to that produced by morning glory seeds or LSD. It is said to take effect in an hour and can result in an LSD-like trip

that lasts six to eight hours or more. It may be accompanied by a feeling of contentment that can linger for a few days. Contains the highest amount of lysergic acid amines of any of the morning glories (0.3 percent), as well as several other alkaloids.

In addition to *Argyreia nervosa*, a dozen other species of *Argyreia* contain lysergic acid amines (*acuta*, *aggregata*, *barnesii*, *capitata*, *bainanensis*, *obtusifolia*, *osyrensis*, *pseudorubicunda*, *speciosa*, *splendens*, and *wallichii*).

**Precautions:** The white fuzz on the seeds, containing strychnine, is removed (often with a toothbrush). Side effects may include nausea, a hangover characterized by blurred vision, vertigo, physical inertia, exhaustion, and constipation. High doses could result in intense nausea and death. Filtered, cold-water infusions of the ground seeds are said to prevent fewer hazards than ground seeds eaten whole. Extreme nausea might be the result of strychnine ingestion.

**Dosage:** 4 to 8 seeds. Cleaned seeds are chewed and swallowed or ground into a powder and put into gelatin capsules.

## HENBANE

**AKA:** Bang (bangué, bengi); black henbane; castilago; devil's eye; dream tea; fetid nightshade; goat's joy; henbell; henquale; hog bean; *Hyoscyamus niger*; insana; Iusquiamus; Jupiter's bean; poison tobacco; sakiru; sakrona; shakhrona; stinking nightshade; stinking Roger.

A member of the nightshade family, it was one ingredient in witches' brews in the Middle Ages. Extracts were once used as a replacement for hops in brewing beer. Conversely, it has also been a convenient method of murder and suicide up until medieval times.

**Effects:** Hallucinations involving all the senses, along with a feeling of drunkenness and sedation, for three or four hours.

It has traditionally been used in combination with the fly agaric mushroom in Afghanistan, occasionally smoked with tobacco or marijuana

in Kashmir and Pakistan, and added to alcoholic drinks by Indians in California and Mexico.

**Precautions:** Despite its medicinal uses, it is classified as extremely hazardous by the World Health Organization. Side effects include dry mouth with accompanying thirst, a reddening of the face, hot dry skin, fever, profuse sweating, dilated pupils, inability to focus the eyes on close objects, rapid heartbeat, dizziness, confusion, nausea, diarrhea, constipation, difficult urination, throbbing headache, problems with ejaculation, restlessness, locomotor problems, insomnia, disorientation, delirium, irrational behavior, blackout, temporary amnesia, unconsciousness, coma, and death from respiratory arrest.

**Dosage:** A single dose should not exceed 0.5g, and daily dose not exceed 5.5g. The seeds and dried leaves can be smoked, the crushed root can be brewed into a tea, or the seeds used as incense.

## HIERBA LOCA

**AKA:** Huedhued; *Pernettya furens*.

**Effects:** Intoxication and hallucinations. Related species of *Pernettya* may be toxic.

**Precautions:** It can reportedly cause mental confusion, madness, and permanent insanity.

**Dosage:** None established.

## HIMANTANDRA

### BELGRAEVEANA

**Effects:** The Gimi people of New Guinea use the bark of this tree to induce a trance state.

**Precautions:** It is usually used with other psychoactive plants and has been little studied, so its effects have not been verified.

**Dosage:** None established.

## HOPS

**AKA:** *Humulus lupulus*.

A member of the hemp family, it is used to add flavor to beer.

**Effects:** It acts as a sedative, though it does not appear to produce a mild marijuana-like high, as some attest.

**Precautions:** It may amplify feelings of depression. Overuse can cause dizziness and symptoms of jaundice.

**Dosage:** As a calming tea, two heaping teaspoons of flowers in one-quarter liter of boiling water.

## HYDRANGEA

**AKA:** *Hydrangea arborescens*; *hydrangea paniculata grandiflora*; seven barks; wild hydrangea.

**Effects:** A pleasant, marijuana-like high accompanied by a slight feeling of drunkenness.

**Precautions:** Contains a cyanide-like compound which can result in death, as well as hydragenol, associated with contact allergies. Bert Marco Schuldes (1995) strongly advises against its use.

**Dosage:** No more than one joint of leaves; smoking any more than that could result in severe toxicity.

## IBOGA

**AKA:** Eboga; eboka; Lambarene; *Tabernanthe iboga*.

The only member of the dogbane family known to be used as a hallucinogen.

**Effects:** Hallucinations similar to LSD, but stronger; shamans who use it claim to contact the dead. It is also said to act as a stimulant and aphrodisiac, and to increase muscle strength and stamina. The psychoactive ingredient is ibogaine, which can also be made synthetically. At the turn of the last century, it was used briefly as an antidepressant, and at least one psychotherapist (C. Naranjo) has found it to be useful in inducing fantasies and childhood memories. Early research indicates it may be a treatment for opiate addiction, though Jonathan Ott calls this “a dubious proposition.”

**Precautions:** In high doses, it can cause vomiting, loss of motor coordination, dizziness, convulsions, paralysis, respiratory failure, and death.

**Dosage:** A teaspoon of root powder can produce feelings of stimulation and euphoria. One gram of bark or roots can heighten feelings of sexuality and awareness—users claim that they can engage in sex for up to seventeen hours and remain awake during hunting for two full days. Doses of 3 grams or more of root extracts are needed to induce hallucinations; unfortunately, this is also very close to the toxic dose, and indigenous peoples use this high a dose only on rare occasions. The roots can be chewed or swallowed, or the roots and bark can be boiled into a tea.

## IOCHROMA

**AKA:** Borrachera; hummingbird’s flower; *Iochroma fuchsoides*; yas.

**Effects:** Used by Kamsa Indian shamans of Colombia as an inebriant.

It may also be used as an additive to ayahuasca.

**Precautions:** None known, though little is known about this plant.

**Dosage:** The dried leaves can be smoked or brewed as a tea, though the exact dosage is unknown.

## IPECAC

**AKA:** *Psychotria ipecacuanha*.

**Effects:** Mind-altering, though effects are apparently very minor. The related species *Psychotria viridis*, *Psychotria poeppigiana*, and *Psychotria psychotriaefolia* produce N, N-dimethyltryptamine. The seeds of some species are used as a coffee substitute in the Caribbean.

**Precautions:** Overdose symptoms include inflammation of the nasal membranes, strong irritation of the skin and mucous membranes, coughing, bronchial edema, nausea, severe

vomiting (it is used commercially in syrups to induce vomiting in children who have ingested poisons), inflammation of the mucous membranes in the stomach and small intestine, bloody diarrhea, abdominal pain, slow pulse rate, difficulty breathing, weakness in the muscles, increased salivation and perspiration, and death from cardiac arrest. The fruits of many species are considered poisonous.

**Dosage:** None established.

### JENKEM

**AKA:** Butt hash.

A drug made from fermented human feces and urine.

**Effects:** Reportedly causes visual and auditory hallucinations lasting about an hour.

**Precautions:** According to Fumito Ichinose, an anesthesia specialist, the effects are mainly due to hypoxia, a dangerous lack of oxygen flow to the body (Jamie Pietras, "Smoke this shit," Salon.com, November 9, 2007).

**Dosage:** Use is not recommended.

### JUREMA

**AKA:** Ajuca; caatinga; jurema branca; *Mimosa hostilis* (*Mimosa jurema*); *Mimosa nigra*; *Mimosa pudica* (dormilona, duermidillo, espina dormilona, guaring, muigin, pinahuihuitzli), *Mimosa somnians*; *Mimosa tenuiflora* (tepescohuite); *Mimosa verrucosa*; vinho de jurema.

**Effects:** The roots of this shrub in eastern Brazil said to produce a "miraculous drink" called ajuca or vinho de jurema. This once popular hallucinogen is now rarely used. The main psychoactive ingredient appears to be DMT. Ratsch smoked 1g of the dried and chopped Mexican root cortex, and experienced only mild effects.

**Dosage:** None established.

### KAEMPFERIA

**AKA:** Galanga, gisol, *Kaempferia galanga*, maraba.

A member of the ginger family commonly used as a condiment in Asian cooking. This and related species are used in cough medicines, stomach and headache medications, and perfumes.

**Effects:** Used by people native to New Guinea as a condiment, and to treat boils, burns, and wounds. It is rich in essential oils, but appears to have no psychoactive ingredients, despite its local reputation as a hallucinogen and dream enhancer.

**Precautions:** Very little research has been done on this plant. Galanga refers to other, dissimilar plants as well, which may have confused some researchers.

**Dosage:** None established.

### KANNA

**AKA:** Channa; gauwgoed; kaugoed; kauwgoed, kougoed, *Mesembryanthemum expansum*, *Mesembryanthemum tortuosum*, *Scelletium expansum*, *Scelletium tortuosum*, *Sclerocarya caffra*, *Sclerocarya schweinfurthii*, umganu.

There is some confusion about which of the above plants the Hottentots used to achieve an altered state. It is not considered a true hallucinogen, but a plant which enhances the effects of other psychoactive plants, such as cannabis.

**Effects:** Said to decrease anxiety, stress, and tension, and induce euphoria, giddiness, and hallucinations. Other effects may include greater personal insight, more sociability, a contemplative, grounded feeling, increased tactile and sexual response, and vivid dreams. The two species of *Scelletium* are known to contain an alkaloid which induces sedation.

**Precautions:** Side effects include headache, listlessness, loss of appetite, and depression. An overdose can result in delirium and loss of consciousness.

Research on interactions with drugs is lacking, though it should not be combined with SSRIs, MAOIs, or heart medications. When combined with alcohol, it could cause

headaches. It may work synergistically with cannabis.

**Dosage:** About 5 grams of the alkaloid will induce lethargy; it is not known how much more is needed to produce hallucinations. Other sources say 50 to 100 mg will produce a mild to moderate high. The roots, leaves, and trunk can be chewed or smoked.

## KARA

**AKA:** Capparis.

According to Wade Davis, two of the Capparis species (local names bois ca-ca and cadavre gate) are part of the antidote for zombie poison.

**Effects:** The roots and leaves of this plant are said to have psychoactive properties.

**Precautions:** Little appears to be known about this plant. In Mexico, *Capparis indica* is one of the many plants whose seeds are sold as colorines.

**Dosage:** None established.

## KAWANG

**AKA:** *Castanopsis acuminatissima*.

**Effects:** The seeds of this tree, when steamed and eaten, are said to induce an altered state.

**Precautions:** None known. Research has yet to be done on this plant.

**Dosage:** None established.

## KETAMINE AND GLYX-13

**AKA:** GLYX-13 ((S)-N-[(2S,3R)-1-amino-3-hydroxy-1-oxobutan-2-yl]-1-[(S)-1-((2S,3R)-2-amino-3-hydroxybuta-noyl) pyrrolidine-2-carbonyl]pyrrolidine-2-carboxamide); Green; jet; K; Ketaject; Ketalar; ketamine hydrochloride; kiddie smack; kit kat; special K; super C; super K; vitamin K; Vetalar.

A close relative of PCP, it was first used as a surgical anesthetic in the Vietnam War. It is also used as an animal tranquilizer. Medical researcher John C. Lilly describes his experi-

ments with ketamine in *The Scientist: A Novel Autobiography*.

**Effects:** Produces a vivid 30- to 45-minute LSD-like experience characterized by a dream-like state with intense visual images. Its potency is about 5 to 10 percent that of PCP. In the past few years, researchers at the University of Manchester have been studying it as a possible treatment for depression, as it normalizes activity in the orbitofrontal cortex, an area of the brain from which feelings of guilt, dread, and apprehension possibly originate, and which is overactive in individuals with depression. In addition, research at the Yale University School of Medicine has found that ketamine can also relieve depression by strengthening the synapses in the prefrontal cortex, enhancing communication between neurons, often within hours (Duman, 2010). Ron Duman, a Yale University neurobiologist, states that ketamine works even for those whose mood disorders were not improved by other drugs. According to Carlos A. Zarate, Jr., M.D. of the National Institute of Mental Health, a single injection of ketamine hydrochloride (0.5 mg/kg) can significantly relieve depression within two hours, the effect lasting for up to a week, though he cautions that the results are just preliminary. Researchers at the Mayo Clinic have had similar success in using ketamine to treat major depressive disorder and bipolar disorder (Lineberry et al., 2013). A preliminary study by Russian psychiatrist Evgeny Krupitsky found ketamine to be an effective treatment for patients with heroin dependency.

GLYX-13, a compound similar to ketamine developed by Joseph Moskal, Ph.D., a molecular neurobiologist at Northwestern University, has been found to enhance memory and learning in rats, as well as having antidepressant and analgesic effects. In trials on patients who did not respond to prescribed antidepressants, a single dose reduced symptoms within 24 hours (often in as little as

twenty minutes), an effect which lasted an average of one to two weeks (current antidepressants normally require a few weeks to take effect). It was well tolerated, with none of the side effects associated with ketamine (Moskal et al., 2012), possibly due to the fact that it does not block the ion channel. The memory and learning enhancement may be due to the fact that it promotes synaptic plasticity in the hippocampus. It is seen as a potential treatment for patients who do not respond to traditional anti-depressants, and as a possible treatment for individuals suffering from schizophrenia, attention-deficit hyperactivity disorder, and autism.

**Precautions:** Side effects may be similar to those of PCP: loss of the ability to talk or communicate, rigid muscles, excessive sleepiness, confusion, delusions, memory loss, high blood pressure, euphoria, dizziness, agitation, and paranoia. Heavy users may experience prolonged speech and memory impairment, along with delusional thinking, which may persist even after use is discontinued (*Morgan et al., 2009*). Side effects of frequent use include addiction, episodes of unconsciousness, problems urinating, breathing difficulties, kidney problems (including kidney failure), increased risk of heart attack, cocaine-type deterioration of nasal tissue, and bladder damage (including cases which have necessitated the removal of the bladder and subsequent need for a catheter). An overdose can cause respiratory failure. Long-term effects are not known, but damage to internal organs may be permanent. Nearly two dozen users in the United Kingdom are believed to have died between the years 1993 and 2006 after losing all sense of reality and putting themselves in danger, such as walking into traffic. The medical journal *The Lancet* published research in 2007 ranking ketamine as the sixth most harmful substance out of twenty that were studied. Side effects in low-dose intravenous infusions used for clinical studies of depression (0.5 mg/kg total dose in 100-minute period) include brief

hallucinations (one patient), drowsiness, and dizziness (Lineberry et al., 2013).

GLYX-13 does not appear to produce any of the side effects associated with ketamine, particularly the schizophrenic or psychosis-like effects, even at doses 50 to 100 times greater than the apparent therapeutic dose.

**Dosage:** About 50 to 100 mg, though some users take as much as 5 to 10 g/day. It can be taken as pills, snorted as a powder, injected as a liquid, or even smoked in a cigarette; taking it orally is said to result in a high that lasts longer and is less intense than with the other methods. Surgical doses of the injectable liquid range from 400 to 700 mg. For GLYX-13, a dose range has not yet been established.

## KEULE

**AKA:** *Gomortega keule*; hualhual.

Found only in a small section of central Chile (it may be near extinction), it is the only known species of tree in the rare gomortegaceae family, which is related to the nutmeg family.

**Effects:** The fruit is said to induce intoxication, though it is unknown whether this involves hallucinations or whether there is even a psychoactive ingredient.

**Precautions:** Very little research has been done on this plant.

**Dosage:** None established.

## KHAT

**AKA:** *Catha edulis*; chat; ghat; jaad; kat; miraa; qaat; qat; quat; tchat; tschat.

**Effects:** An Ethiopian shrub that is said to produce bliss, clarity of thought, euphoria, excessive energy, sociability, and hallucinations, as well as suppressing feelings of fatigue, hunger, and thirst, mainly because of its amphetamine-like alkaloids cathine and cathinone. It also contains high levels of vitamin C.

**Precautions:** Long-term use can lead to addiction. Instead of the effects mentioned

above, users may experience dizziness, stomach pains, weariness, manic behavior, hyperactivity, constipation, dilated pupils, increased heart rate, high blood pressure, drowsy hallucinations (hypnagogic hallucinations), lethargy, depression, nightmares, and slight tremors. Overuse can cause tremors, loss of appetite, heart trouble, loss of sex drive, and impaired liver function, permanent staining of teeth, and susceptibility to ulcers. Withdrawal symptoms include tiredness, difficulty concentrating, and psychosis.

When combined with amphetamines, it can induce a schizophrenia-like psychosis.

**Dosage:** About 200 to 400 g of leaves, or the equivalent of 60 to 120 mg of alkaloids. The buds, leaves, and stems can be chewed (the leaves are even swallowed, though they lose their potency when they dry out), or they can be brewed into a tea.

## KIERI

**AKA:** Hueipatl; kieli; *Solandra brevicalyx*; *Solandra guerrerensis*; *Solandra maxima* (chalice vine, cup-of-gold); tecomaxochitl.

**Effects:** Hallucinations. Used by Indians in northern Mexico as “visionary inebriants,” and in traditional medicine as an aphrodisiac, narcotic, and stimulant.

**Precautions:** Side effects of low doses are a reddening of the face, dry mucous membranes, enhanced pulse, dilated pupils, depression and sedation. Side effects of high doses include confusion, insomnia, and death from respiratory arrest.

**Dosage:** None established.

## KIKISIRA

**AKA:** Bubbia.

**Effects:** The bark of this tree causes a dream-like state when smoked with tobacco.

**Precautions:** No other information is available.

**Dosage:** None established.

## KOLA NUT

**AKA:** Bissy nut; caffeine nut; *Cola acuminata*; *Cola nitida*; cola nut; cola vera; guru nut.

**Effects:** Can stimulate the central nervous system and improve mood. It contains about 2 percent caffeine, or as much as coffee, along with theobromine.

**Precautions:** Overuse can cause insomnia, nervousness, and loss of sex drive. Studies with animals have shown that, while low doses may be stimulating, high doses can have a depressive effect.

**Dosage:** About 2 to 6g of nuts and seeds a day. The nuts can be chewed, or brewed into a tea consisting of 1 teaspoon of nut to one cup of water. More than one or two cups a day may be dangerous. Cola drinks contain very little kola.

## KORIBO

**AKA:** *Tanaecium nocturnum*.

**Effects:** Altered states.

**Precautions:** Very little is known about this Central and South American plant.

**Dosage:** The leaves are roasted and pulverized and mixed with tobacco that is then used as a snuff. Tea made from the root-bark is also said to be psychoactive. Researchers have said that even smelling the plant can induce altered states but as yet no studies have been done to determine the psychoactive elements of this plant.

## KRATOM

**AKA:** 4x100, Gra-tom, “incense,” kutum, Maeng Da (pimp grade kratom), mambog, *Mitragyna speciosa*.

A member of the coffee family that is sold as an opium substitute in southeast Asia. *Kratom* refers to the leaves, which can be smoked like a joint or chewed, and *mambog* refers to the thick syrup made from the leaves. A narcotic drink called 4x100 is a combination of kratom, cough syrup, Coke, tranquilizers, and marijuana.

**Effects:** In small doses, energy, and a state of euphoria not unlike a very mild effect from hallucinogenic mushrooms or LSD; in large doses, it may have a mellow, sedative effect. Despite claims to the contrary, there is no scientific evidence for its effectiveness as a pain-killer, antidepressant, anti-diabetes drug, or treatment for any other medical condition. The psychoactive ingredients include the indole alkaloid mitragynine and eight other alkaloids, which act on the central nervous system and the autonomic system. While the leaves produce a stimulating effect, mitragynine itself is a depressant, which suggests that the other alkaloids play an important role. Because it can mimic other hallucinogens unrelated to each other, it is considered by William Emboden to be “one of the most complex of the hallucinogens.”

**Precautions:** It is habit-forming, and a 2005 study at Josai International University in Japan indicates it may be addictive; based on emergency room reports, withdrawal symptoms may include chills, aching muscles, gooseflesh, nausea, vomiting, agitation, aggression, extreme depression, anxiety, and paranoia. Overdose symptoms may include hallucinations, delusions, listlessness, tremors, aggression, constipation, and nausea. Prolonged use can result in nervousness, sleeplessness, loss of libido, constipation, emaciation, a distended stomach, pallor, darkened lips and skin, dried skin, numbness in the peripheral regions of the body, twitching, and unusual cardiac disorders.

**Dosage:** The leaves can be smoked, chewed, or prepared as an infusion. One user, writing in *New Scientist* magazine (September 29, 2006), ingested it as a tea, which tasted nauseating, and made him sick and sleepy.

### KUBILGIM

**AKA:** *Diospyros species*.

**Effects:** A New Guinea plant said to induce altered states.

**Precautions:** No other information is available.

**Dosage:** None established.

### KWASHI

**AKA:** African sea lily; *Pancratium trianthum*; pancrat lily.

**Effects:** Though nothing is known of its psychoactive properties, it is considered a hallucinogen by Botswana Bushman, who rub the bulb into incisions cut into their heads to induce visions. Other species of *Panocratium* are known to contain psychoactive alkaloids, though some may cause death (especially among people with heart conditions, as it contains a number of cardiac toxins) or paralysis of the central nervous system.

**Precautions:** Though it is not known what toxic effects, if any, kwashi may have, William Emboden considers it “perhaps one of the most unusual hallucinogens in terms of mode of use, and one of the most dangerous.” More recently, Jonathan Ott questions whether this is, in fact, a true hallucinogen.

**Dosage:** None established.

### KYKEON

A drink composed of barley mixed with ergot, water, and the mildly psychoactive mint *Mentha pulegium* that was popular in ancient Greece and Rome.

**Effects:** Said to produce bliss and hallucinations.

**Precautions:** The ergot, eaten whole, can interfere with blood flow, and cause muscle spasms, numbness of the limbs, gangrene, and death. Jonathan Ott warns budding experimenters that “ergot has poisoned and killed countless human beings throughout history.” (See entry under Ergot)

**Dosage:** None established.

### LETTUCE

**AKA:** Bitter lettuce, *Lactuca sativa* (common lettuce, garden lettuce, salad lettuce),



*Lactuca virosa* (acid lettuce, poison lettuce, prickly lettuce, wild lettuce), opium lettuce.

**Effects:** The seeds are said to be psychoactive, producing a high similar to opium, but milder; *Lactuca virosa* is much more potent than *Lactuca sativa*. Why bananas (which have no psychoactive ingredients whatsoever) have gained such a reputation and lettuce has not is somewhat of a mystery. Jonathan Ott says trace amounts of morphine have been discovered in lettuce (lactucarium, or lettuce opium), but then, it is a trace constituent in human milk and cow's milk also, and is a natural product of brain chemistry.

**Precautions:** It is not addictive, though large doses are toxic. Side effects include perspiration, enhanced breathing, heart palpitations, dilated pupils, itching, vertigo, headache, distorted vision, increased urination, sleepiness, and death.

**Dosage:** The wild lettuce plant (or the hearts and roots of iceberg lettuce) is liquefied in a blender until about a pint of liquid is produced. The liquid is then left in a bowl under heat lamps or the hot sun until it has evaporated, leaving only a sticky brownish-green residue. The residue is placed in an opium pipe and heated, with the pipe pointed downward so that the residue does not get in the stem. The resultant white smoke is held in the lungs for about half a minute.

## LICHENS

**Effects:** Some varieties of Alaskan lichens are reported to be psychoactive, a belief that has yet to be substantiated. Lichens often grow on psychoactive plants, such as the coca plant and yohimbe tree.

## LOBELIA

**AKA:** Asthma weed; bladderpod; cardinal flower; emetic herb; emetic weed; gag root; Indian tobacco; *Lobelia cardinalis*; *Lobelia in-*

*flata*; pukeweed; red lobelia; vomitroot; vomitwort; wild tobacco.

**Effects:** A mild marijuana-like high. Native Americans have used it as a tobacco substitute.

**Precautions:** Side effects include slow pulse rate, hypotension, abnormal heartbeat, dilated pupils, anxiety, nausea, vomiting, diarrhea with abdominal pain, convulsions, and death from respiratory arrest. Those susceptible to migraines will experience headaches when smoking lobelia. It has an acrid taste when smoked, and causes a prickly feeling in the mouth and throat when consumed as a tea. More than 15 grams may trigger sudden vomiting, circulation problems, nerve damage, and other toxic reactions. The term "Indian tobacco" may refer to any number of unrelated plants. *Lobelia tupa* (tabaco del diablo) is considered toxic by natives in the Andes, and has no psychoactive alkaloids.

**Dosage:** About 2 tablespoons of crushed leaves and stems in a pint of water, which is simmered and strained. For use in a gelatin capsule, a double dose is boiled down to a gummy residue and mixed with dried leaves. It can also be smoked as a joint.

## LOPHOPHINE

**AKA:** 2-(7-methoxy-1,3-benzodioxol-5-yl)ethanamine; 3-methoxy-4,5-methylenedioxyphenethylamine.

**Effects:** A psychedelic and entactogen that is present in small amounts in peyote and San Pedro cactus. It is also a homologue of MMDA and is related to mescaline. Effects include elevation of mood, euphoria, and mild visual enhancement.

**Precautions:** None known.

**Dosage:** According to Shulgin, the effective dose range is 150–250 mg (Shulgin and Shulgin, 1991).

## LSD

**AKA:** Acetylysergic acid diethylamide (ALD-52, N-acetyl-LSD, Orange Sunshine);

acid; Delysid (LSD-tartrate); LSD-25; lysergic acid diethylamide; methyllysergic acid diethylamide (MLD-41).

A semi-synthetic drug first made in 1938 by Swiss chemist Albert Hofmann from the ergot fungus in rye, though he did not become aware of its extraordinary properties until accidentally ingesting some five years later. It is one of the most powerful drugs known, producing a high from as little as 25 micrograms. There are numerous derivatives and analogues of LSD, the effects of which may range from totally inactive to mildly psychoactive (ALD-52 and MLD-41 are two of the more psychoactive ones).

**Effects:** A trip usually begins 45 to 90 minutes after ingestion, and can last eight to twelve hours. The effects can include visual hallucinations, auditory and visual distortions, time distortion, and synesthesia. Some have reported out-of-body and spiritual experiences. It elevates serotonin levels in every area of the brain except the cerebrum and cerebellum. In the mid-1960s, Dr. James Fadiman found that it significantly improved creativity and problem-solving; according to a 2012 article by Tim Doody, the 26 professionals who participated in his studies came up with a variety of solutions, including “a mathematical theorem for NOR gate circuits, a conceptual model of a photon, a linear electron accelerator beam-steering device, a new design for the vibratory microtome, a technical improvement of the magnetic tape recorder, blueprints for a private residency and an arts-and-crafts shopping plaza, and a space probe experiment designed to measure solar properties.” There are a number of famous individuals who have claimed therapeutic or creative benefits from this drug.

Before it was declared illegal, LSD was effectively used in psychotherapy to help uncover repressed or subconscious memories, as well as treat alcoholism. Researchers at Harvard University are currently looking into its use as a treatment for cluster headaches. The Norwegian University of Science and Tech-

nology is viewing it as a treatment for alcoholism, as a review of six studies conducted in the U.S. and Canada between 1966 and 1970 showed that just one dose of LSD help alcoholics quit and significantly reduced their chances of resuming drinking. And researchers from the University of Alabama at Birmingham and Johns Hopkins University School of Medicine, Baltimore found that, of over 25,000 individuals under supervision for drug abuse and alcoholism between 2002 and 2007, those diagnosed with hallucinogen use disorder were less likely to re-enter the criminal justice system as repeat offenders.

**Precautions:** It should not be taken by those suffering from schizophrenia or depression, as it can worsen those conditions.

There can be bad trips, which are sometimes attributable to the general surroundings and atmosphere in which the drug is taken, contaminants (including other drugs) mixed in with the LSD, and the mental instability of the user. After-effects include sluggishness, depression, anxiety, and occasional long-lasting psychological problems. It also causes contractions of the uterus in pregnant women. It could lead to a condition called the serotonin syndrome, where serotonin levels in the body are too high, and which is characterized by restlessness, confusion, sweating, diarrhea, excessive salivation, high blood pressure, increased body temperature, rapid heart rate, tremors, and seizures. Other side effects include numbness, weakness, nausea, hypothermia or hyperthermia, elevated blood sugar, jaw clenching, increased mucus, sleeplessness, hyperreflexia, impaired judgment, problems with abstract thinking, and impaired memory and attention span. Rare side effects include a metallic taste in the mouth, anxiety, paranoia, and delusions. Evidence from CIA and Department of Defense research indicates that it may make individuals more suggestible. Though the effects can last up to two to three days, there can be intermittent effects which last for a week or more.

There is no evidence that it causes flashbacks, is addictive, or causes damage to the chromosomes, the brain, or the body in general. The original chemical, lysergic acid, will produce many side effects but few of the psychoactive benefits that users seek.

Shulgin calls it “an unusually fragile molecule,” and to prevent degradation, it must be stored at low temperature and away from air and light. Contact with high pH conditions, alcohol, or chlorine can render it inactive.

When combined with lithium salts or tricyclic antidepressants, it may cause a dissociative fugue state. SSRIs and MAO inhibitors may reduce the effectiveness of LSD.

John G. Fuller’s *The Day of St. Anthony’s Fire* purports to be the story of an entire French town that succumbed to the effects of a naturally occurring LSD in the grain used to make the town’s bread. This drug does not occur naturally; the townspeople’s hallucinations and temporary madness were most likely the effects of a mercury compound used as a fungicide, the grain having been accidentally ground into flour for bread instead of being planted as seed. More recently, journalist Hank P. Albarelli, Jr. alleges—in an even more controversial theory—that the townspeople were the victim of a CIA LSD experiment.

**Dosage:** Approximately 50 to 500 micrograms will result in altered consciousness, though it could just as well produce a bad trip. The effects peak at 500 micrograms, with the result that the trip will not be longer or more intense with greater dosage. Dr. James Fadiman, who conducted research on LSD in the 1960s, claims that 10 mcg is good for a general mild improvement in mood and performance of daily tasks, 50 mcg is good for a recreational experience, 100 mcg for a creative boost, 100 to 250 mcg for therapeutic purposes, and 400 mcg for an experience with “the Divine.” Lethal dosage is unknown, as some individuals have taken as much as 1 to 2 grams and survived.

## MACE

A spice produced from the outer covering of the nutmeg seed, or *Myristica fragrans*, that is sometimes used to flavor cakes.

**Effects:** A high that can range from mild pleasantness to unbridled delirium.

**Precautions:** The dose needed to get high is close to the toxic level, resulting in a strong hangover the next day.

**Dosage:** None established.

## MACONHA BRAVA

**AKA:** *Zornia latifolia*.

**Effects:** In Brazil, the leaves are smoked as a “marijuana substitute.”

**Precautions:** Little is known about this plant.

**Dosage:** None established.

## MANDRAKE

**AKA:** Apples of the fool; apples of the genie; devil’s testicle; duck’s foot; ground lemon; hog apple; Indian apple; love apple; mandragon; *Mandragora officinarum* (European mandrake, mandragora, Satan’s apple); *Podophyllum peltatum* (American mandrake, may apple); raccoon berry; Satan’s testicles; wild lemon; wild mandrake.

“Of all the sedating-tranquilizing-psychoactive plants known,” writes William Emboden, “the mandrake ... has the most extensive and bizarre history.... This member of the nightshade family has been used as a painkiller, sedative, aphrodisiac, trance mediator, and poison.” According to the ancient “doctrine of signatures,” medicinal plants resembled that part of the human body for which it could affect a cure and, since mandrake resembled the human form, its powers were seen as all-encompassing.

**Effects:** Hallucinations.

**Precautions:** The dosage needed to produce hallucinations is also close to the toxic

dose, both of which are caused by the potent compound scopolamine. Side effects include a burning thirst, dizziness, fever, dilated pupils, rapid heart rate, severe headache, nausea, vomiting, diarrhea, constipation, difficult urination, problems with ejaculation, cramps, restlessness, trembling, insomnia, speech difficulties, disorientation, confusion, vertigo, delirium, coma, amnesia, heart damage, insanity, and death.

*Mandragora officinarum* (European mandrake) is a very different plant from *Podophyllum peltatum*, or American mandrake. Both, however, are very poisonous.

**Dosage:** None established.

### MARIHUANILLA

**AKA:** *Leonurus sibiricus*; Siberian motherwort.

**Effects:** Smoked as a marijuana substitute in Mexico, though the high is very mild.

**Precautions:** None known. There appears to be no toxic dosage.

**Dosage:** 1 to 2g of dried leaves smoked as a joint.

### MARIJUANA

**AKA:** Bhang; cannabis; *Cannabis indica*; *Cannabis sativa*; charas; dope; ganja; grass; hashish; hasheesh; hemp; Indian hemp; kif; majun; pot; sinsemilla; skunk; weed.

**AKA (Butane hash oil):** BHO; budder; butane honey oil; dabs; earwax; honey oil; shatter.

After considerable controversy about its genus and species, it is now believed to belong to its own genus, *Cannabaceae*, consisting of one to three species: *Cannabis sativa*, *Cannabis indica*, and *Cannabis ruderalis*. The molecular structure of its psychoactive properties is unique in the plant world. According to Paul Armentano, in a 2013 article on AlterNet titled “The lie that won’t die: ‘We don’t know enough about marijuana!’” marijuana is “one of the most investigated therapeutically active

substances in history. To date, there are over 20,000 published studies or reviews in the scientific literature referencing the cannabis plant and its cannabinoids, nearly half of which were published within the last five years according to a keyword search on PubMed Central, the U.S. government repository for peer-reviewed scientific research. Over 1,450 peer-reviewed papers were published in 2013 alone,” and “a 2008 meta-analysis published in the *Journal of the Canadian Medical Association* reported that cannabis-based drugs were associated with virtually no elevated incidences of serious adverse side-effects in over 30 years of investigative use.”

**Effects:** Marijuana contains anywhere from 60 to 85 different cannabinoids. Its effects, which can vary widely, are mainly attributable to tetrahydrocannabinol (THC), and mainly involve euphoria, a sense of well-being, intense concentration, perceptual distortions, and—though marijuana is not classified as a hallucinogen—visual and auditory hallucinations for one to three hours. Pharmacologically, it has been used in various medical preparations for dozens of ailments—mostly based on little more than folklore or anecdotal evidence—since ancient times. Today, some—including neurosurgeon and chief medical correspondent for CNN Dr. Sanjay Gupta—advocate its use for relieving the symptoms of various medical conditions, including glaucoma, asthma, arthritis pain, inflammatory bowel disease, post-traumatic stress disorder, seizures, chronic pain, cancer, stiff muscles resulting from brain injuries and multiple sclerosis, and the toxic effects resulting from chemotherapy. Unfortunately, according to Dr. Gupta, only a small percentage of studies conducted involve the medical benefits of marijuana.

Scientists at University College, London found that marijuana can dramatically increase a person’s ability for semantic priming, or word association, possibly by putting the person in a better mood for creative thinking. A study at Ohio State University found that the

THC in cannabis can enhance memory by reducing inflammation and stimulating the production of new brain cells, though only in adults (in adolescents, it can interfere with memory formation) (Wenk et al., 2008), and researchers at Hebrew University in Jerusalem have found that a synthetic analogue of an active component of cannabis can reduce inflammation of the brain and prevent the mental decline associated with Alzheimer's in experiments performed on rats (de Ceballos et al., 2005). THC can also prevent the formation of amyloid plaques, slowing the progression of Alzheimer's disease, according to a 2006 study published in *Molecular Pharmaceutics*. A 2011 study conducted by researchers at Haifa University in Israel found that rats could avoid post-traumatic stress disorder (PTSD) if they were treated with marijuana within 24 hours; according to the nonprofit research organization Multidisciplinary Association for Psychedelic Studies (MAPS), hundreds of vets from the Iraq and Afghanistan wars use marijuana to control their PTSD. Professor Yosef Sarne of Tel Aviv University's Adelson Center for the Biology of Addictive Diseases at the Sackler Faculty of Medicine and others have found that THC in extremely low doses (one-thousandth to one ten-thousandth of that found in the average joint) administered as treatment for hypoxia, seizures, or toxic drugs can protect the brain from long-term cognitive damage, even when given one to seven days before or one to three days afterwards.

**Precautions:** Side effects include dry mouth, rapid heart rate, excessively high or low blood pressure, an increase in the levels of the stress hormone cortisol, tremors, vertigo, loss of coordination, dry reddened eyes, dilated pupils, decreased ability of red blood cells to carry oxygen, heart attack (a four-fold increase within an hour of consumption), increased risk of stroke in young individuals, increased hunger, an increased risk of infection by lowering the body's immune system response, depression, moodiness, temporary am-

nesia (because of its suppression of the brain hormone vasopressin), an uncontrollable fear of death, and panic. Some of its psychological effects may be contradictory, due to the fact that delta-9-THC and cannabidiol have different effects on the brain (Bhattacharyya et al., 2012). It is not physically addictive, but could result in psychological dependence, and habitual use could require higher and higher doses to achieve the same effects. Withdrawal symptoms can include insomnia, anxiety, and nausea.

Recent studies have illuminated the following dangers:

- A 1986 Italian study found that smoking one joint can increase melatonin levels in the body 4000 percent, and a study at the Institute of Clinical Sciences at Imperial College London used PET scans to discover that heavy marijuana smokers who began smoking in their teens had lower levels of dopamine than normal, which could explain their "slacker" reputation (though this complicates other research, which correlates higher levels with schizophrenia) (Bloomfield et al., 2013). Other research indicates it can interfere with REM sleep.
- A 2009 University of Leicester study found that cannabis smoke damages DNA, significantly increasing the risk of lung and other cancers; in addition, the researchers stated that "[t]he smoking of 3 to 4 cannabis cigarettes a day is associated with the same degree of damage to bronchial mucus membranes as 20 or more cigarettes a day." This is mainly because marijuana smokers inhale deeper and hold the smoke longer than tobacco smokers, and because cannabis contains 50 percent more carcinogenic hydrocarbons than tobacco, along with 20 times more ammonia, five times more hydrogen cyanide, and five times more nitrogen oxides, all of which also affect circulation

and immunity. Canadian researchers, by exposing cultured animal cells and bacteria to condensed smoke samples from marijuana and tobacco found that marijuana smoke was much more damaging to cells and DNA than tobacco smoke, but that tobacco smoke caused chromosomal damage, which marijuana smoke did not (Maertens et al., 2009).

- A 2012 study published in *European Neuropsychopharmacology* found that even those who smoked only four times a year had impaired ability to recognize negative emotions in others' faces. A 2006 study by Lambros Messinis and colleagues at the University Hospital of Patras, Greece concluded that those who smoked more than four joints a week over some fifteen years performed significantly worse at learning and remembering verbal information than control subjects. Brain scans performed on young men who had smoked cannabis heavily as teenagers (up to six joints a day) suggested that marijuana damaged the myelin sheath around brain cells, possibly having adverse effects on memory, attention, decision-making, language ability, and executive functioning skills (Ashtari et al., 2009). Researchers Rafael Maldonado and Andres Ozaita of Pompeu Fabra University in Barcelona have found that impairment of memory and other cognitive functions may be long-term, based on changes in protein synthesis in the hippocampus of mice, and a Harvard Medical School study in 2003 found that individuals who smoked cannabis before the age of 17, while the brain is still developing, suffered long-term memory impairment. The level of impairment may be inversely related to the amount of cannabidiol (CBD) in marijuana, though cannabidiol did not reduce the effects associated with psychotic episodes (e.g., hallucinations, paranoia). Another Har-

vard Medical School study concluded that there was a direct correlation between marijuana use and loss of focus and cognitive flexibility when performing specific tasks (Gruber et al., 2010). More recently, a study of more than a thousand New Zealanders found that regular marijuana use in adolescence was correlated with a drop of eight IQ points in adulthood, possibly due to the fact that it disrupts developmental processes that are not yet complete, though researchers could not rule out genetic, social, and environmental factors which could have affected the results (Meier et al., 2012). A study of 2000 adult users aged 20 to 24 over the course of eight years, however, found that there were no negative long-term cognitive effects from regular marijuana use (Tait et al., 2011), and a University of Minnesota study in 2014 concluded that users aged 18–20 did better on tests of cognitive functioning than did non-users, with the exception of decision-making ability and verbal memory function, in which they did worse. A 2012 study by Giovanni Marsicano of the University of Bordeaux, France, and Xia Zhang of the University of Ottawa Institute of Mental Health Research found that marijuana impairs working memory in mice by weakening synapses in a previously undiscovered signaling mechanism whereby astrocytes (see entry) control neurons involved in memory.

- A 2007 McGill University study found that cannabis can relieve depression in low doses, but worsen depression and psychosis at high doses, and a 2007 Cardiff University review of 35 studies involving tens of thousands of individuals found that smoking cannabis increased the risk of developing a psychotic illness (characterized by delusions and hallucinations) later in life by 41 percent. A 2010 study by John McGrath of the Queens-

land Brain Institute in Australia found that young adults who smoked cannabis for more than six years were twice as likely to develop schizophrenia or other psychotic-type illnesses than non-smokers, and four times as likely to score highly on clinical tests measuring delusion. Research at the Yale School of Medicine found that cannabis use can trigger short schizophrenic episodes lasting one-half hour to an hour. Skunk, a more potent form of cannabis developed as a hybrid, increased these risks seven-fold, as it contains 20 percent THC (compared with 4 percent in non-hybrid plants) and contains virtually no cannabidiol (CBD), which counteracts the damage caused by THC (Di Forti et al., 2009). Researchers at the University of Bristol, using rats with electrodes imbedded in their brains, discovered that the equivalent of just one joint of marijuana disrupts the hippocampus and prefrontal cortex—the parts of the brain associated with memory and decision-making—for up to two hours, just as schizophrenia does (Jones et al., 2011). Though a 2012 study published in *Psychiatry Research* found that marijuana improved cognitive functioning in individuals with bipolar disorder, other studies have shown that marijuana use among those with bipolar disorder increases the risk of non-compliance with treatment, psychotic symptoms, and attempted suicide. Whether a marijuana smoker becomes psychotic or not may depend on if the individual has a variant of the dopamine-signaling gene *AKT1*, according to research by Dr. Marta Di Forti of King's College London's Institute of Psychiatry in London.

- Magnetic resonance imaging conducted on long-time habitual cannabis smokers (more than five joints a day for more than ten years) by Murat Yucel, Ph.D., and others at the ORYGEN Research Centre

and the Melbourne Neuropsychiatry Centre at the University of Melbourne, Australia found that the hippocampus (believed to regulate emotion and memory) was an average of 12 percent smaller and the amygdala (which deals with emotional reactions, particularly fear and aggression) was an average of 7.1 percent smaller. Another study using MRI scans found that those who smoke marijuana at least once a week had a nucleus accumbens (a region of the brain associated with reward processing) that was bigger and had more abnormalities than in non-user brains; the amygdalae were also found to be abnormal (Gilman et al., 2014). THC has also been found to cause problems in the cerebellum and basal ganglia, resulting in difficulties with balance, posture, coordination, and reaction time. Research by Giovanni Marsicano of Institut National de la Santé et de la Recherche Médicale (French Institute of Health and Medical Research) has found that working memory may also be diminished through marijuana's effect on astrocytes in the nervous system. And a study involving rats concluded that regular marijuana use in adolescence can affect the frontal cortex, the region associated with executive functions of the brain (Raver et al., 2013).

- A Danish study found that nearly half of patients treated for a cannabis-related mental disorder went on to develop schizophrenia, specifically paranoid schizophrenia for many of them, and at an earlier age than those with a genetic predisposition to schizophrenia. A Norwegian study reported that cannabis can lead to schizophrenia in non-psychotic individuals by causing a temporary cognitive breakdown that mimics the neurocognitive weaknesses of other schizophrenics (Loeberg et al., 2012). A 2008 University of Pittsburgh School of Med-

icine study found that marijuana can worsen the cognitive symptoms of schizophrenia. However, one study suggests that a higher cannabidiol-to-THC ratio can mitigate these schizophrenia-like symptoms (Morgan and Curran, 2008).

- A 2005 study discovered that two male subjects taking oral doses of delta-9-tetrahydrocannabinol (THC)—one a synthetic form called dronabinol generally approved for medical use, and another a decoction of natural THC—experienced impaired psychomotor functions and symptoms of cannabis-induced psychosis (severe anxiety, derealization, depersonalization, and paranoid delusions). What was surprising was that blood concentrations of THC were about half of what was normally thought to induce such effects (Favrat et al., 2005).
- A 2005 University of Aberdeen study concluded that cannabis use increased the risk of brittle bones and osteoporosis. It may also aggravate such conditions as chronic obstructive pulmonary disease, but not increase the risk of lung, head, or neck cancers (despite the fact that marijuana produces levels of carcinogenic compounds 50 percent higher than tobacco, that it deposits four times as much tar in the lungs, and that marijuana smokers hold the smoke four times longer than tobacco smokers (Tashkin et al., 2006). One possible explanation, according to Dr. Tashkin, is that THC causes cells to die before they become malignant.
- A 2005 study published in the *British Medical Journal* found that driving under the influence of cannabis almost doubles the risk of a fatal vehicular accident.
- A 2013 study using rats conducted by the National Institute on Drug Abuse concluded that marijuana was a gateway drug, not for cocaine or heroin, but for nicotine. A 2013 review of 120 studies of

early users concluded that there are likely genetic and behavioral factors in determining whether an individual will develop a dependence on marijuana.

Additional dangers include buying marijuana laced with other drugs or “filler,” or contaminated with herbicides, pesticides, growth enhancers, fungi and molds. Users trying to extract THC using the butane hash oil process have severely injured or killed themselves by either not performing the procedure correctly or using the wrong type of butane and having the mixture explode in their faces.

Marijuana should not be used by women who are pregnant or nursing. Marijuana should not be used by those with multiple sclerosis as it could impair their thinking, specifically attention, information processing, perception of spatial relationships between objects, and executive function (comprised of volitional activities that include planning, organizing, and self-regulation, as well as self-awareness); impairment of just two of these abilities categorizes someone as globally cognitively impaired (Honarmand et al., 2011).

The THC in marijuana can degrade over time, especially when exposed to light and air. Hash smoke, especially when combined with tobacco smoke, can result in bronchitis and other respiratory ailments. When combined with caffeine, marijuana can lead to an increased effect of both substances along with a rapid heartbeat. Combining it with alcohol, sedatives, and sleeping pills can result in increased drowsiness; combining it with anticholinergics and antihistamines can result, paradoxically, in increased heart rate and drowsiness; combining it with antidepressants can cause increased drowsiness, heart rate, and blood pressure; and combining it with theophylline can lower the effectiveness of the bronchodilator. Marijuana, when combined with MDMA (Ecstasy), may work synergistically to negatively affect attention, memory,



and learning tasks, as well as general intelligence (Gouzoulis-Mayfrank et al., 2000).

**Dosage:** The dried leaves can be smoked as a cigarette (joint, reefer), the dried tops of the female plant full of resin smoked with tobacco (ganja, kif). It can be made into a drink with water or milk (bhanga), made into a candy (majun), the resin smoked or eaten with spices (charas) or baked into brownies (hash brownies). Since the resin is soluble in oil but not water, it has a longer-lasting (if slower) effect when eaten, but very little effect when consumed as a tea. According to Dr. Yannick Marchalant, “a puff is enough” to experience its cognitive benefits.

A 2008 review of the worldwide literature by Australia’s National Drug and Alcohol Research Center and the National Drug Research Institute found that the level of THC can vary wildly, and that the potency had doubled in recent years in some countries (from 4.5 percent THC to 8.5 percent in the U.S., for example), but remained constant in others; this was probably due to selective breeding, more indoor and hydroponic growing of cannabis, and greater control over growing conditions, resulting in more mature plants that reach their full potential; as yet, there appears to be no evidence of GMO marijuana. The increase and potency, in and of itself, does not appear to produce greater risks, possibly because users alter their intake in response, either by holding the smoke for shorter periods of time or by increasing the time interval between puffs. Hashish, or hash, is the processed resin from the cannabis plant, and contains about 8 to 14 times the THC of marijuana. Butane hash oil (BHO), which is produced by boiling marijuana or hashish in a solvent (usually butane), contains about 15 to 30 times the THC. Cookies, candies, brownies, and other marijuana-laced edibles can contain much more cannabis than the average joint, and in 2014 there have been reports in Colorado of nausea, hallucinations, and two deaths due to marijuana intoxication from such pot edibles.

## MASHA-HARI

**AKA:** Bolek-hena; curia; *Justicia pectoralis* var. *stenophylla*.

**Effects:** Mild sedation. No psychoactive property has yet been isolated from this plant.

**Precautions:** William Emboden reports that at least three shamans have died from using the snuff of this plant.

**Dosage:** A snuff is made from the dried leaves. For smoking, it is usually mixed with marijuana or tobacco.

## MESCAL BEAN

**AKA:** Coralillo, frijolitos, red bean, *Sophora secundiflora*, Texas mountain laurel.

**Effects:** Hallucinations.

**Precautions:** It contains the alkaloid cytisine, which is highly toxic and has resulted in many deaths. Side effects include burning in the mouth and throat, over-excitement, headache, nausea, prolonged and bloody vomiting, sweating, salivation, diarrhea, sluggishness, heart palpitations, severe gastroenteritis, convulsions, delirium, unconsciousness, paralysis of the respiratory muscles, and death from asphyxiation.

The beans are often confused with colerines.

**Dosage:** No more than one-quarter to one-half bean, which is roasted, crushed, chewed, and swallowed. Delirium can last for up to three days. Even a fraction of a bean more could result in toxicity and death.

## MESCAL PLANT

**AKA:** *Agave* species; century plant; chupalla; henequen; maguey; mezcal plant; meskalpflanze; metl; pita.

Mescal (or mezcal) can also refer to the alcoholic spirits distilled from the Agave, the Yucca whipplei plant of southern California, or the peyote cactus (*Lophophora williamsii*).

**Effects:** Inebriation that is clearer than that

produced by other alcoholic beverages. In addition to tequila and mescal, it is also used in beverages containing various psychoactive ingredients. Despite its name, it does not contain the psychoactive alkaloid mescaline.

**Precautions:** No known side effects.

**Dosage:** None established.

## MESCALINE

**AKA:** Mescal buttons; 3, 4, 5-trimethoxyphenylethylamine.

Mescaline is chemically similar to the hormone epinephrine and the neurohormone norepinephrine. It is the main psychoactive alkaloid in peyote, San Pedro, and other hallucinogenic plants.

**Effects:** Hallucinations, which begin one to two hours after consumption, peak after two hours, and last for approximately twelve hours. It has been used in psychotherapy and as a treatment for opiate and alcohol addiction.

**Precautions:** Use by borderline schizophrenics may worsen their condition irreversibly.

Initial side effects include dilated pupils, vomiting, nausea, stomach disruption, and cardiac irregularities. Higher doses can result in aggression, hyperactivity, mania, paranoia, and psychotic behavior. Tremors, insomnia, and anorexia may also occur. Overdose symptoms include paleness, sweating, anxiety, dilated pupils, coldness in the hands and feet, a bluish discoloration of the skin, and rapid heartbeat. It is not physically or psychologically addicting, though tolerance does develop rapidly.

Aldous Huxley, author of *Brave New World*, reported on his wondrous experiences with the drug in the equally famous books *The Doors of Perception* and *Heaven and Hell*. Religious scholar R. C. Zaehner, in his books *Mysticism Sacred and Profane* and *Drugs, Mysticism and Make-Believe*, strongly disagrees with Huxley's positive assessment.

**Dosage:** None established.

## MEXICAN MARIGOLD

**AKA:** *Tagetes lucida*; tumutsali; xpuhuc; yahutli; ye-tumutsali; yia.

**Effects:** A narcotic or mild psychedelic that is said to induce feelings of tranquility when smoked. Reports of the effects of this plant vary considerably, and chemical analysis needs to be done to determine its psychoactive properties.

**Precautions:** No psychoactive compounds have yet been identified in this plant. One expert has claimed that it is "toxic."

**Dosage:** Two to three cups of tea made from one bundle of leaves for stimulant effects. A more precise dosage has not been established.

## MEXICAN POPPY

**AKA:** *Argemone mexicana*; *Argemone ochroleuca*; Bermuda thistle; donkey thistle; flowering thistle; gold thistle of Peru; hierba loca; Jamaican thistle; Mexican prickly poppy; Mexican thistle; Mexican thorn poppy; prickly pepper; prickly poppy; queen thistle; stinking thistle; thistle; thistley-bush; yellow thistle.

Hierba loca can also refer to other psychoactive plants, such as the *Datura* species.

**Effects:** It has mind-altering and aphrodisiac properties which have yet to be adequately studied (it is sometimes used as a substitute for marijuana). The claim that the plant contains morphine is strongly disputed, as is the purported claim that an opium can be produced by pollinating it with the opium poppy (*Papaver somniferum*), a biological impossibility. The sap is used to treat insomnia, eye complaints, and kidney disorders.

**Precautions:** Side effects include vomiting, diarrhea, and blurred vision, plus possible effects on the heart and respiratory system. Chronic poisoning will result in swollen legs

and other serious symptoms. Prolonged use could lead to DNA mutations and cancer.

**Dosage:** Toxicity occurs in doses above 8.8 ml/kg of body weight.

## MEXICAN WORMWOOD

**AKA:** *Artemisia mexicana*.

**Effects:** Smoking the dried herb produces a mild euphoria not unlike that produced by marijuana.

**Precautions:** It is said to be less toxic and have milder side effects than wormwood (*Artemisia absinthium*).

**Dosage:** None established.

## MORNING GLORY

**AKA:** *Ipomoea carnea* (morning glory bush); *Ipomoea nil* (blue morning glory); *Ipomoea pes-caprae* (beach morning glory); *Ipomoea purpurea* (common morning glory); *Ipomoea tricolor* (heavenly blue morning glory); *Ipomoea violacea* (badoh negro seeds, tliltlitzin); Mexican morning glory; piule; *Turbina corymbosa* (coaxhuatl, *Ipomoea sidae-folia*, lololuiqui, *Rivea corymbosa*).

Contains several ergot alkaloids, the closest substance to LSD found in nature. "Morning glory" actually refers to two distinct species which, due to the uncertainties regarding this family, have other botanical names (see above). Although other members of the morning glory family in other parts of the world have higher levels of psychoactive compounds, only in Mexico is it used as a hallucinogen.

**Effects:** Intoxication and hallucinations lasting four to fourteen hours.

**Precautions:** They should not be used by anyone with liver problems.

They are mildly toxic, producing nausea, vomiting, and weakness, though taking it on an empty stomach may prevent the nausea (Jonathan Ott states that side effects may be due to the fact that users eat whole ground seeds rather than filtered, cold-water infusions

of the ground seeds). Stomach cramps may also occur, though these may pass quickly, especially if the individual lies on his back and breathes deeply. Overdose symptoms may include psychotic reaction, shock, heart failure, and death. Not all varieties of morning-glory seeds are psychoactive (Flying Saucers, Heavenly Blue, Pearly Gates, and Wedding Bells are among those that are) and, of those that are, it may take a whole cupful to produce the desired effect. Commercially sold seeds may be coated with a poison to discourage use as a psychedelic, and may produce such symptoms as dizziness, diarrhea, nausea, vomiting, chills, and severe abdominal pain.

**Dosage:** 100 to 300 seeds (about 5 to 10 grams) to produce the same effects as 200 to 300 mcg of LSD. The hard seeds must be cracked or ground up to release the ergine, as they will produce no results when eaten whole. Young *et al.* state that only 15 of the crushed *Turbina corymbosa* seeds in one-half cup of water will produce the desired effect.

## MULBERRY

**AKA:** *Morus rubra*; red mulberry.

**Effects:** Ingesting the milky juice or large numbers of unripe mulberries can cause mild hallucinations.

**Precautions:** Side effects include severe vomiting and diarrhea.

**Dosage:** None established.

## MUSHROOMS AND PSILOCYBIN

**AKA (mushrooms):** *Conocybe cyanopus*; *Copelandia bispora*; *Copelandia cyanescens*; *Galerina steglichii*; *Gymnopilus aeruginosus*; *Inocybe aeruginascens*; *Inocybe coelestium*; Liberty caps; magic mushrooms; 'nti-si-tho; *Panaeolina foenicicii*; *Panaeolus cyanescens*; *Pholiotina cyanopus*; *Pluteus cyanopus*; *Psilocybe azurescens*; *Psilocybe cubensis*; *Psilocybe Mexicana*; sacred mushrooms; *Stropharia cubensis*; teonanacatl; teyhuintli.

**AKA (psilocybin):** N,N-dimethyl-4-hydroxytryptamine.

Aside from the fly agaric mushrooms, there are at least four other genera that have hallucinogenic properties: *Conocybe*, *Panaeolus*, *Psilocybe*, and *Stropharia*. They are found all over the world, but only in Mexico are they used in rituals. The *Copelandia cyanescens* fungus that is cultivated in Bali is more potent than any of these mushrooms. The main psychoactive ingredients in all of these is psilocine and psilocybin, the latter of which can be manufactured synthetically.

**Effects:** Produces vivid hallucinations similar (though reportedly less intense) to LSD—beginning within a half hour and lasting three to six hours—muscular relaxation, and giddiness. A study by the Johns Hopkins University School of Medicine found that the mystical and spiritual benefits of even a single dose of psilocybin can last for up to a year (Griffiths et al., 2008); it has also shown promise in relieving the suffering and trauma in terminally ill patients. A study at the University of Arizona found that psilocybin could relieve the symptoms of obsessive-compulsive disorder almost immediately, though it is not known how long the effect can last (Moreno et al., 2006). Researchers at Harvard University are looking into its use as a treatment for cluster headaches; it is also being studied as a treatment for drug-resistant depression. Dr. Juan R. Sanchez-Ramos and others of the University of Florida have found that psilocybin in mice can stimulate the growth of new brain cells to replace damaged ones, and that mice given psilocybin were able to overcome fearful responses faster than the control mice, possibly leading to new treatments for depression and post-traumatic stress disorder.

**Precautions:** Most of the studies on the therapeutic benefits of psilocybin are small and preliminary, and some caution against repeating the mistakes of the 1960s.

Common side effects include headache, nausea, pupil dilation, rapid pulse, high or low

blood pressure, slow pulse, high body temperature, shivering, anxiety, numbness in the face, dizziness, difficulty concentrating, loss of coordination, muscle weakness, restlessness, disorientation, abnormal sensations, paranoia, panic, and bad trips. Not everyone sees the “infinite clockwork,” or the cosmic secrets of the mushroom—according to Mexican Mazatec healer Maria Sabina in de Rios’ *Visionary Vine*, “the mushroom is similar to your soul. It takes you where the soul wants to go. And not all souls are the same.” Potency can vary widely, and they can be somewhat indigestible and mildly toxic if not cooked. An overdose (generally said to be in the 50 to 60 mushroom range) can result in severe poisoning and, when taken by adolescents, death. Prolonged excessive use is said to result in permanent insanity, premature aging, and senility. Mushrooms are usually sauteed before eating as, in their raw state, they may contain methylhydrazines, compounds similar to rocket propellants which are carcinogenic and potentially deadly. Mushrooms may also accumulate such toxins as arsenic and cesium, though not in dangerous levels; cooking will not remove or deactivate them. According to a 2004 study funded by the government of Holland, psilocybin by itself had no significant adverse side effects.

They can easily be mistaken for other, poisonous mushrooms. Some dealers may sell ordinary mushrooms laced with LSD.

There is a myth that the mushrooms can be preserved in honey. Jonathan Ott was offered one such sample which, he said, was not only unlikely to contain any psilocybin but was a “disgusting, fermenting mess, crawling with bugs.”

It is an MAO inhibitor, and so should not be combined with any substances contraindicated for this type of drug.

Readers should not be misled by popular books that contain misleading and erroneous information, notably Carlos Castaneda’s *The Teachings of Don Juan* and subsequent sequels,

John Sandford's *In Search of the Magic Mushroom*, John Allegro's *The Sacred Mushroom and the Cross*, or Andrija Puharich's *The Sacred Mushroom: Key to the Door of Eternity*.

**Dosage:** Psychedelic mushrooms can be eaten, smoked or snorted as a powder (it can be years before dried mushrooms lose their potency), or boiled and the liquid drunk with Kool-Aid or injected. Dosage is 1 to 5 grams (dry weight), 10 to 15 grams of fresh mushrooms, or 5 to 15 mushrooms, depending on the size and species.

## NIANDO

**AKA:** *Alchornea floribunda*.

**Effects:** Used as an aphrodisiac, stimulant, narcotic, and hallucinogen by some Africans.

**Precautions:** None known. Little is known about this plant.

**Dosage:** None established.

## NICOTINE

**AKA:** *Nicotiana attenuata*; *Nicotiana benthamiana*; *Nicotiana bigelovii*; *Nicotiana glauca*; *Nicotiana glauca*; *Nicotiana ingulba*; *Nicotiana megalosiphon*; *Nicotiana rustica*; *Nicotiana tabacum*; *Nicotiana trigonophylla*; *Nicotiana velutina*.

Of the over 500 compounds in tobacco, the alkaloid nicotine is the most powerful, and the only addictive one. In fact, it is one of the most addictive substances known—even more addicting than most hard drugs, such as heroin—and one of the most toxic drugs known.

**Sources:** Bell peppers, eggplant, tobacco, tomatoes.

**Effects:** It is believed to improve attention, improve both short- and long-term memory, improve the ability to perform various tasks, reduce the risk of developing Parkinson's disease, help those with Alzheimer's focus better on tasks, prevent toxic chemicals from killing off brain cells, help schizophrenics function better, reduce feelings of hunger, increase tol-

erance to pain, and reduce stress. It may someday result in drugs that treat Alzheimer's and Parkinson's diseases, schizophrenia, and anxiety disorders. It was used by native peoples throughout the Americas to induce trance states and visions. There are anecdotal reports of individuals using nicotine gum or patches to aid in concentration or to improve cognitive functioning in the elderly, and there is one small pilot study involving 67 individuals whose average age was 76 which found that nicotine patches helped subjects regain 46 percent of their long-term memory and improved their attention (though the researchers warn against attempting this without medical supervision) (Newhouse et al., 2012). Based on evidence that individuals with attention-deficit hyperactivity disorder are much more likely to smoke cigarettes than the general population, it is believed that the nicotinic cholinergic systems may be involved in cognitive deficits in this disorder, and that this area of investigation may lead to more targeted treatment (Potter et al., 2006).

**Precautions:** Concentrated nicotine can enter the brain within seconds of smoking a cigarette, even faster than heroin injected into the arm. It is extremely addictive, and may contribute to Alzheimer's disease and other forms of dementia; it is known to stimulate, and then block, sensory receptors, preventing the neurotransmission of new information. The fact that it improves memory may increase the feelings of addiction, as it strengthens the social and environmental cues associated with smoking (e.g., relaxing after work, socializing with friends, eating, drinking in a bar); said Dr. John A. Dani of the Baylor College of Medicine, "[w]e found that nicotine could strengthen neuronal synaptic connections only when the so called reward centers sent a dopamine signal. That was a critical process in creating the memory associations even with bad behavior like smoking." Common side effects of smoking are believed to include persistent cough, shortness of breath, elevated

heart rate, increased salivation, irritated and damaged lung tissue, increased bronchial secretions, constriction of blood vessels, increased blood pressure, slightly enlarged pupils, overstimulation of the central nervous system, tremors, stroke, heart damage, visual impairment, kidney dysfunction, reduced appetite, increased susceptibility to disease, cancer, emphysema, and death. Symptoms of nicotine poisoning include nausea, weakness, headache, increased salivation, tremors, convulsions, rapid heartbeat, perspiration, confusion, diarrhea, difficulty breathing, and hypertension. Overdose symptoms may include delusions, hallucinations, convulsions, unconsciousness, and death from respiratory failure. A recent study found that quitting smoking can improve a person's mood, with the resumption of smoking leading to a recurrence of depression, sometimes to even greater levels than before (Kahler et al., 2010).

Common side effects of nicotine chewing gum include nausea, vomiting, and upset stomach. Less common side effects include dizziness, lightheadedness, irritability, headache, dry mouth, hoarseness, coughing, high blood pressure, heart palpitations, rapid and abnormal heartbeat, sneezing, sleeplessness, confusion, convulsions, depression, euphoria, numbness, tingling in the hands and feet, fainting, weakness, rash, and a buzzing or ringing in the ears. Overdose symptoms include excessive salivation, nausea, vomiting, diarrhea, abdominal pains, headache, cold sweats, dizziness, hearing and visual abnormalities, weakness, and confusion, followed by fainting, dangerously low blood pressure, a weak, rapid, and irregular pulse, convulsions, and paralysis of the breathing muscles leading to death.

Any products containing nicotine should be avoided by women who are pregnant or nursing.

The effects of nicotine can be increased when combined with sugar, choline, or nicotine replacement drugs or products. Nicotine can

alter the effects of any central nervous system drug. The cessation of nicotine intake—cigarettes in particular—may increase the effectiveness of many drugs, including Acetaminophen, bronchodilators, caffeine, Furosemide, Glutethimide, Imipramine, Insulin, Oxazepam, Pentazocine, Propoxyphene Hydrochloride, and Propranolol, and decrease the effectiveness of Isoproterenol and Phenylephrine.

**Dosage:** The lethal dose is 50 mg, and just 60 to 120 mg (a drop or two) of pure nicotine can kill the average adult if applied to the skin; in fact, the nicotine in one cigar can kill at least two people, though most of it is destroyed by burning. Chewing tobacco and snuff is not believed to be as addicting, as the nicotine does not enter the brain directly, but goes through the bloodstream first.

## NIGHTSHADE

**AKA:** Black nightshade; chichiquilitl; hierba mora; *Solanum nigrum*; yocoyoco.

According to legend, it has been used by witches in ancient Greece and medieval Europe, and in the Voodoo and Santeria religions. It should not be confused with deadly nightshade, or belladonna.

**Effects:** Hallucinations.

**Precautions:** Contains the alkaloid solanine—also present in green potatoes—which is somewhat toxic, and can cause headaches, fever, and hallucinations.

**Dosage:** None established.

## N-METHYLTRYPTAMINE

**AKA:** Dipterine; N-methyl-1H-indole-3-ethanamine, NMT.

A naturally occurring tryptamine metabolized directly from L-tryptophan or indirectly from serotonin (Schmid and Bohn, 2010).

**Effects:** While derivatives have psychoactive properties, NMT is apparently metabolized too quickly in the body to have any effect (Nagai et al., 2007; Shen et al., 2010).

**Precautions:** None known.

**Dosage:** None established.

## N, N-DIMETHYLTRYPTAMINE

**AKA:** N,N-dimethyl-1H-indole-3-ethanamine.

**Effects:** A hallucinogenic tryptamine.

**Precautions:** None known.

**Dosage:** None established.

## NOSCAPINE

**AKA:** Anarcotine; Narcotine; Nectodon; Nospen.

An alkaloid derived from opium, it is mainly used for its cough-suppressing effect. It is a cell toxin, and currently being investigated as a cancer treatment.

**Effects:** Similar to dextromethorphan (hallucinations with dissociative aspects, stimulation, feelings of dissociation, visual distortions, distortions of bodily perception, excitement, euphoria, and loss of time perception).

**Precautions:** Side effects include loss of coordination, loss of sex drive, swollen prostate, loss of appetite, dilated pupils, increased heart rate, tremors, muscle spasms, chest pain, sleeplessness, and loss of stereoscopic vision. It is non-addictive.

It could be fatal when combined with MAO inhibitors. When combined with warfarin, a serious and potentially fatal thinning of the blood could occur.

**Dosage:** None established.

## NUTMEG

**AKA:** Made shaunda; *Myristica fragrans*.

Called a pseudo-hallucinogen because its primary effect is delirium, one aspect of which is a form of hallucination. It contains the psychoactive element myristicin, which can be converted by the body into an amphetamine-like psychedelic. Its hallucinogenic properties

were known to Christian mystic Hildegard of Bingen nearly a thousand years ago, it was considered an aphrodisiac in Arab cultures, was thought to have had magical properties in medieval Europe, and is considered a medicine throughout Asia. The spice mace also comes from the nutmeg tree.

**Effects:** The high can range from mild euphoria to full-blown delirium that lasts four to twelve hours. It is also said to be an aphrodisiac. The oil has been used as a marijuana substitute, and it was used as a cheap, legal high by Malcolm X and jazz saxophonist Charlie Parker.

**Precautions:** It should be avoided by anyone with liver problems.

Nutmeg has an extremely bitter taste which is difficult to get rid of and may stimulate the gag reflex and trigger vomiting. Common side effects include severe nausea, diarrhea, headache, dizziness, severe dryness of the mucous membranes (mouth, nose, eyes), difficulty concentrating on complex tasks, difficulty in performing complex motor functions. Overdose symptoms (above 5 grams) include dizziness, nausea, vomiting, a flushing of the skin, dry mouth and throat (which, unlike the dry mouth from marijuana use, cannot be relieved by chewing gum or drinking fluids), headache, rapid heartbeat, bloodshot eyes, dilated pupils, constipation, difficulty urinating, agitation, vertigo, and panic. The dose needed to get high is close to the toxic level, resulting in a washed-out feeling and strong hangover that can last for up to three or four days, aching muscles, and possible liver failure. There is one case of an 8-year-old boy who died after eating two nuts.

**Dosage:** One level teaspoon is said to produce euphoric effects.

## NUX VOMICA

**AKA:** *Strychnos nux-vomica*.

**Effects:** Mind-altering.

**Precautions:** Considered extremely poisonous due to its strychnine content. Side ef-

fects include anxiety, pain, intense sensitivity to sensations of light, odors, and sound, severe spasms, convulsions, lockjaw, and death from asphyxiation that can occur anywhere from a few minutes to a few hours.

**Dosage:** None established. It is used as a treatment for numerous ailments in homeopathic medicine, but the prescribed dosages are so small as to be considered harmless and ineffectual by scientific standards.

## OPIUM

**AKA:** *Papaver somniferum*.

**Effects:** Hallucinations.

**Precautions:** Side effects include slow and irregular breathing, muscle relaxation, vomiting, slow pulse rate, a reddening of the face, constipation, dizziness, vertigo, contracted pupils, and death from respiratory arrest. It is highly addictive, especially the isolated alkaloid morphine, which can be chemically converted into heroin. The alkaloid noscapine is a cell toxin.

**Dosage:** Varies considerably depending on the morphine content.

## OSTEOPHLOEUM

**AKA:** Huapa; *Osteophloeum platyspermum* (*Osteophloeum platyphyllum*).

**Effects:** Though it was not known as a hallucinogen when Jonathan Ott's *Pharmacothemon* was published (1993), subsequent research has shown that it is used as a hallucinogen by the Quichua tribe of Ecuador.

**Precautions:** An overdose can be fatal.

**Dosage:** The tree sap is heated with pieces of bark, then drunk after it has cooled.

## OXI

Oxi is nothing more than cocaine paste and, despite claims by drug dealers, does not contain significant amounts of kerosene, quicklime, or gasoline.

**Effects:** The same as cocaine.

**Precautions:** Contains up to 85 percent cocaine, far more than crack (29–47 percent), making it much more addictive. There are reports that users generally die within a year.

**Dosage:** None established.

## PAGAMEA MACROPHYLLA

**Effects:** The powdered leaves are used as a snuff and are reportedly psychoactive.

**Precautions:** None known.

**Dosage:** None established.

## PANDANUS

**Effects:** The Wopkaimin people of New Guinea induce an altered state of consciousness, called the “Karuka madness,” by eating the fruit of this as yet unidentified plant. This altered state can last up to 12 hours, its primary manifestations being excitability, restlessness, and violent behavior. Several species of Pandanus have been found to contain DMT.

**Precautions:** None known.

**Dosage:** None established.

## PARSLEY

**AKA:** Common parsley; garden parsley; *Petroselinum crispum*; *Petroselinum sativum*; rock parsley.

**Effects:** The oil, when taken orally, can induce hallucinations.

**Precautions:** Side effects include epileptic-like convulsions and severe damage to the liver and kidneys.

**Dosage:** According to Ratsch (1998), there is no reliable information.

## PASSION FLOWER

**AKA:** Maypops; *Passiflora incarnata*; passion vine; purple passion flower.

**Effects:** A mild marijuana-like high when smoked; it even smells like marijuana. The tea produces feelings of tranquility and sedation.



Contains the psychoactive alkaloids harmine and harmaline.

**Precautions:** The psychoactive alkaloids are MAO inhibitors, and when combined with other MAO inhibitors, vomiting and headaches will result.

**Dosage:** According to Ratsch (1998), 4 to 8g of the dried herb, or 2.5g per cup of tea.

## PEYOTE

**AKA:** *Lophophora diffusa* (*Anhalonium williamsii*), *Lophophora williamsii* (*Anhalonium lewinii*, *Echinocactus williamsii*, *Peyotl zacatecensis*), mescal, mescal buttons, peyotl.

Peyote is a small cactus with white tufts of hair and no spines; mescaline is its chief psychoactive alkaloid (its principal alkaloid is peyotline, which is not psychoactive), though it contains more than forty other drugs or compounds. Contrary to popular opinion, the white hairs do not contain strychnine (they are cellulose, or plant fiber). In fact, no hallucinogenic cactus contains strychnine. It is the subject of Aldous Huxley's book *The Doors of Perception*, and has inspired a number of synthetic amphetamines, including ecstasy. It should not be confused with mescal beans (*Sophora secundiflora*).

**Effects:** It produces a complex high of spectacular hallucinations involving all senses that begins one to three hours after ingestion and lasts up to 12 hours. A peyote high is much different from a mescaline high. Users claim it has cured illnesses and alcoholism, and has been used to help cure personal problems.

**Precautions:** It has an extremely bitter taste that makes it hard to swallow and invariably induces vomiting and an hour or two of nausea. The vomiting and nausea can usually be minimized by fasting or taking Dramamine beforehand and remaining perfectly still during the visions. Side effects include lowered blood pressure, changes in pulse rate, dilated pupils, non-specific body pain, lowered respiration, dilation of the blood vessels, weakness,

liver damage, and vomiting. Higher doses or higher potency doses can cause paralysis. John Halpern and other researchers at the Harvard-affiliated McLean Hospital have found that Native Americans who regularly use peyote in religious rituals show no evidence of detrimental neurocognitive effects, including brain damage or psychological problems; in fact, peyote users score just as well as or better than non-users on tests of mental health.

**Dosage:** The usual dose is 6 to 12 dried buttons, which are moistened just before eating or, less commonly, chewed dry. Some Indians eat 4 to 30, or more. They can also be soaked in water (they dissolve quite readily) and the liquid consumed as a tea, or used as an enema.

## PHENETHYLAMINE

**AKA:** Beta-phenethylamine; PEA; phenylethan-2-amine; phenylethylamine.

A neurotransmitter synthesized from phenylalanine, it is also found in chocolate and other foods.

**Effects:** Though it was widely touted as chocolate's "love chemical" in the 1980s, it is metabolized too quickly after oral ingestion to reach the brain in any significant amounts. The concentrations found in chocolate are in the order of micrograms per gram, or parts per million, too small to have any psychoactive effect even before metabolization. It has been found that those suffering from attention-deficit hyperactivity disorder have lower than normal concentrations (Baker et al., 1991), while schizophrenics have been found to have higher than normal concentrations (Potkin et al., 1979).

**Precautions:** Levels in the brain can be increased significantly with MAO inhibitors (Sabelli et al., 1978).

**Dosage:** None established.

## PICHI

**AKA:** Chilean false heath; *Fabiana imbricate*; pichi-pichi.

**Effects:** Euphoria, intoxication, enhanced sex drive. South American Indians smoke the dried twigs in combination with *Latua pubiflora*.

**Precautions:** None known, though toxicity appears to be low.

**Dosage:** None established.

## PISHICOL

**AKA:** *Armatocereus laetus*.

**Effects:** A Peruvian cactus with possible psychoactive properties.

**Precautions:** No research has been done on this plant.

**Dosage:** None established.

## PITURI

**AKA:** Bedgery; *Duboisia hopwoodii*; *Duboisia myoporoides*; pedgery; pitchery.

**Effects:** Used by Australian Aborigines to endure long journeys without suffering fatigue, hunger, or thirst. It contains the alkaloids nicotine, d-nor-nicotine (which is four times as toxic as nicotine) and, in the roots, hyoscyamine and scopolamine as well, the latter of which can cause excitement and hallucinations, even in small doses. Its effects have been compared by various researchers to tobacco, marijuana, and coca.

**Precautions:** Larger doses are fatal. The level of alkaloids varies widely from plant to plant.

**Dosage:** The leaves are roasted, moistened, and rolled into a “quid,” which is then smoked. The leaves and stems are also said to be ground or chewed up, and then mixed with an alkaline plant to release the nicotine. Generally, only a tablespoon of leaves and stems are needed to achieve its effects.

## PIULE

**AKA:** *Rhynchosia longiraceomosa*; *Rhynchosia phaseolides*; *Rhynchosia pyramidalis*.

**Effects:** A narcotic and intoxicant which natives say cause “imbecility” and “madness.”

**Precautions:** Psychoactive alkaloids have yet to be identified. The seeds differ from mescal beans and colorines only in the fact that they have a touch of black on the end. The term piule is also used to refer to morning-glory seeds, mushrooms, and other psychoactive plants.

**Dosage:** In Mexican entheogenic rituals, twelve untreated seeds eaten with six pairs of the Mexican magic mushroom.

## POPPY SEEDS

**AKA:** *Papaver somniferum*.

**Effects:** Though there is a potential to get high on poppy seeds as they contain trace amounts of the opium alkaloids morphine and codeine, the amount needed would be prohibitively large. A tea known as doda may contain psychoactive amounts of opiates, as it is made from other parts of the opium plant as well as the seeds.

**Precautions:** Consumption of even small amounts can cause a false positive for opiates in drug tests, depending on the morphine level in the seeds.

**Dosage:** Normal dietary amounts should not cause any problems. In fact, they are highly nutritious and used as a spice in many cultures of the world.

## PSYCHOTRIA

**AKA:** Batsikawa; kawa kui; matsi kawa; pishikawa; *Psychotria nitida*; *Psychotria viridis* (amirucapanga, chacruna, sami ruca).

A member of the coffee family that grows along the Amazon.

**Effects:** Contains the potent hallucinogen DMT. There are numerous species of *Psychotria*, some of which are as yet unidentified (e.g., batsikawa, chacruna, matsi kawa) and some which may be devoid of psychoactive alkaloids.

**Precautions:** It does not appear to have the negative side effects of Ipecac (*Psychotria ipecacuanha*).

**Dosage:** One milliliter of juice may contain 100 mg of DMT. According to writer Alex Bellos, followers of the religion Santo Daime in the Brazilian rainforest boil the *Psychotria viridis* leaf with ayahuasca (*The Economist*, May/June 2012).

## PUCHURI

**AKA:** *Licaria puchury-major*, pixuri.

**Effects:** The seeds are used in Brazil as a sedative and tranquilizer, and have been found to contain safrole, eugenol, and methyleugenol, all of which are psychoactive.

**Precautions:** None known.

**Dosage:** None established.

## PUFFBALLS

**AKA:** *Lycoperdon marginatum* (gi-i-sa-wa); *Lycoperdon mixtecorum* (gii-wa).

**Effects:** A Mexican fungi that may have narcotic and dream-inducing effects; *Lycoperdon mixtecorum* is the more powerful of the two species.

**Precautions:** They smell like fecal matter. Experiments by Jonathan Ott and others on eleven species of the *Lycoperdon* failed to discover any psychoactive effects or compounds.

**Dosage:** None established.

## RAPE DO INDIOS

**AKA:** *Maquira sclerophylla* (*Olmedioperebea sclerophylla*).

A member of the fig family found along the Brazilian Amazon.

**Effects:** The fruits of this plant were once prepared and used as a snuff by Indians in the Pariana region of Brazil. The exact method of preparation has apparently been lost over time, and, though no psychoactive property has yet been isolated from it, it has been found to have

an amphetamine-like stimulation on the central nervous system of rats.

**Precautions:** Very little research on this plant has been conducted.

**Dosage:** None established.

## RHODODENDRON

**AKA:** *Rhododendron caucasicum*; *Rhododendron cinnabarinum*; *Rhododendron lepidotum*; *Rhododendron ponticum* (*Azalea pontica*, *Heraclea pontica*).

**Effects:** Was once used as a narcotic and hallucinogen by people in the northern Caucasus, who used it to induce prophetic dreams. This may be the same plant referred to by the Greek historian Herodotus, who stated that the burning smoke of the plant was as intoxicating as wine. Psychoactive effects, if any, may be subtle.

**Precautions:** The nectar may be toxic. Another Greek historian, Xenophon, relates how an entire army was poisoned from the honey of this plant.

**Dosage:** Usually used as an incense, though Nepal natives mix it with tobacco for smoking, and the leaves of other species were brewed by the Tartars as a tea.

## ROSEMARY

**AKA:** *Ledum palustre ssp. groenlandicum*; *Ledum hypoleucum*; *Ledum palustre* (European wild rosemary, marsh cistus, marsh tea, moth herb, narrow-leaved Labrador tea, swamp tea, wild rosemary).

**Effects:** The smoke from the burning leaves is said to be a narcotic. The Tungus people of Siberia preferred this over the fly agaric mushroom, and another species is used by the Kwaiutl Indians of British Columbia as an inebriant.

**Precautions:** It is believed to be at least partly responsible for the berserker frenzies of the Vikings, as one component, ledol, can cause aggression. Ledol can also cause spasms

and induce abortions. It is known that at least one species, *Ledum palustre*, produces a honey that is toxic (this plant can be used as a tea, though excessive use may cause toxicity).

**Dosage:** None established. When used as a tea or incense, it has little or no psychoactive effects; the essential oil can induce inebriation and narcosis.

### SAFFRON

**AKA:** Autumn crocus; *Crocus sativus*; Spanish saffron.

**Effects:** Mind-altering. Saffron oil, or saffrol(e), can be processed to make the narcotic MDA.

**Precautions:** It contains a poison that can affect the central nervous system and damage the kidneys. Side effects include bloody diarrhea, blood in the urine, bleeding from the nostrils and eyelids, excitation and laughter, rapid heartbeat, headaches, vertigo, loss of appetite, vomiting, delirium, distorted vision, lethargy, paralysis, and death. The skin and mucous membranes may also turn yellow. Doses above 1.5g/day can be dangerous, 5g may cause vomiting and bleeding, 10g will induce abortion and cause uterine bleeding, and around 20g will result in death.

**Dosage:** It is perfectly safe in the amounts used as a spice in foods.

### SALVIA DIVINORUM

**AKA:** Diviner's sage; Hojas de la Maria Pastora; Hojas de la Pastora; Hojas de Maria Pastora; Magic Mint; Mexican sage; pipilzintzintl; sage; Sage Goddess Emerald Essence; sage of the seers; Sally D; shka-Pastora; Ska Maria Pastora; Ska Pastora.

A member of the mint family, it has been used in shamanistic rituals and for healing by the Mazatec people of Mexico for centuries.

**Effects:** An effect similar to sacred mushrooms, but not as intense or as long (up to about two hours, but usually lasting 5 to 30

minutes). A distillation of the plant's juices produces white needle-shaped crystals (dubbed Salvinorin A by ethnobotanist Daniel Siebert), a tiny crumb of which can produce an intense out-of-body experience. Derivates may yet hold promise as a treatment for sleep disorders, heart disease, cocaine addiction, Alzheimer's, depression, schizophrenia, and chronic pain.

**Precautions:** According to Bryan Roth, former director of the National Institute of Mental Health's psychoactive drug screening program at Case Western Reserve University in Cleveland, Ohio, "[S]ome of the experiences people have on salvia may be similar to the psychosis that occurs in late-stage Alzheimer's. There is an increase in the number of kappa [opioid] receptors in the brains of people with late-stage Alzheimer's." He found that, gram for gram, salvia's active compound (Salvinorin A) was the strongest hallucinogen found in nature (it stimulates a single receptor in the brain, as opposed to LSD, which stimulates fifty).

The extremely bitter taste can trigger vomiting. Side effects include dizziness, nausea, lack of coordination, slurred speech, slowed heart rate, and chills. It does not appear to be addictive; in fact, anecdotal evidence seems to indicate individuals become more sensitive to salvia after several exposures. Though a few users have committed suicide while on the drug, its role in these deaths is still unknown and open to question. Smoking the leaves causes lung irritation (it must be smoked hotter than tobacco to get the full effect) and may carry the same health risks as tobacco smoke (bronchitis, emphysema, cardiovascular disease, cancer). Its long-term effects are not known.

There is one anecdotal case of difficulty breathing after salvia was combined with GABA.

**Dosage:** Though common doses are said to range between 20 and 80 pairs of leaves (approximately 50 to 200 grams), one researcher

experienced hallucinations after only 3 pairs of leaves. Smoking requires only one to two crushed leaves (about one-quarter to one-half gram). The leaves can be nibbled and held in the mouth, or the plants can be ground up, soaked in water for an hour, then filtered for use as a drink. Vaporization of the leaves can produce smoke that is dangerously strong. Recent experiments with smoking the leaves has shown that this can also produce a short-term trip, and that the leaves can retain their potency even when dry, despite a commonly held belief to the contrary.

### SALVIA SPLENDENS

**Effects:** Reportedly has psychoactive properties.

**Precautions:** There is no reliable evidence of any psychoactive effect or ingredient. No mention is made of this plant in either Ratsch (1998) or Wink and van Wyk (2008).

**Dosage:** None established.

### SAN PEDRO

**AKA:** Aguacolla; cardo; cuchuma; giganteon; hermoso; huando; *Trichocereus pachanoi* (*Opuntia cylindrica*); *Trichocereus peruvianus*.

**Effects:** Contains the alkaloid mescaline, which is a hallucinogen. Though, like peyote, it is a cactus, the two are not related, and San Pedro produces a less stimulating, more tranquil high, reportedly without the nausea. The high, which begins in about an hour and lasts for about six hours, includes mental clarity, more intense auditory and visual perceptions, and brilliantly colored visions.

Some medicine men use it for folk healing and divination, and it is probably used in the hallucinogenic drink cimora.

**Precautions:** Considerable preparation is needed to make the mescaline available, and the cactus has an extremely bitter taste. It is usually consumed over a 45-minute period to avoid sudden overstimulation. Side effects in-

clude nausea, chills, anxiety, gastrointestinal disorder, hypotension, bradycardia, respiratory depression, vasodilation, paralysis, and feelings of terror may occur. It is not addictive, but psychological dependence may occur with habitual use.

**Dosage:** None established. Ratsch (1998) experienced almost no hallucinogenic effects, even at doses as high as 10g.

### SASSAFRAS

**AKA:** Ague tree; cinnamon wood; gumbo; mitten tree; *Sassafras albidum*; *Sassifras variifolium*; saxifrax.

**Effects:** There is one report of a "visionary experience" after an ingestion of 10 ml of Brazilian oil of sassafras.

**Precautions:** Ingesting the oil of any herb in any dose is potentially toxic. Side effects of just one teaspoon include vomiting, dilated pupils, stupor, and collapse. Overdose symptoms include kidney irritation. The safrole in the oil may be carcinogenic.

**Dosage:** 100 to 200 mg of the oil.

### SCIRPUS

**AKA:** Bakana; bakanoa; bakanawa; simse.

**Effects:** A deep sleep accompanied by vivid hallucinations and bright colors. Said to induce psychic visions.

**Precautions:** No psychoactive alkaloids have as yet been identified.

**Dosage:** None established.

### SCOPOLAMINE

**AKA:** Hyoscine.

An alkaloid found in belladonna, datura, henbane, and mandrake. In the early 1900s, it was used as an analgesic for childbirth until it was found to cause an abnormally high infant mortality rate. It was tested as a truth serum by the Germans and U.S. in World War II, both of whom found it unreliable. Neverthe-

less, the Soviets, according to William Burroughs, experimented with it and found that, even though the subject may have been willing to give up secrets, he oftentimes could not remember them. It is still used in some sleeping medications, and cold and allergy remedies, and can also be used to treat asthma, gastrointestinal spasms, and motion sickness.

**Effects:** Hallucinations.

**Precautions:** Common side effects include dry mouth, abnormal thirst, hot dry skin, fever, dilated eyes, inability to focus vision, rapid heart rate, constipation, difficult urination, difficult ejaculation, restlessness, disorientation, delirium, and amnesia. It has been found to impair serial learning at doses of 0.5 mg. In high doses it can cause poisoning. The roots of plants contain the lowest amount of scopolamine, the seeds the highest.

**Dosage:** The roots, seeds, leaves, and flowers can be smoked, eaten, brewed into a tea, or ground up and rubbed on the skin with fat.

## SCOPOLIA

**AKA:** *Scopolia carniolica*.

**Effects:** Euphoria and hallucinations, comparable to henbane (see entry). In Central Europe, it was used as an aphrodisiac, narcotic, stimulant, and hallucinogen.

**Precautions:** Side effects include a reddening of the face, dry mucous membranes, enhanced pulse, dilated pupils, depression, and sedation. Side effects of high doses are similar to those of belladonna (see entry), and include confusion, insomnia, and death from respiratory arrest.

**Dosage:** None established.

## SCOTCH BROOM

**AKA:** Broom; *Cytisus canariensis*; *Cytisus scoparius* (Scotch broom); dyer's broom; dyer's greenweed; dyer's whin; furze; *Genista canariensis* (Canary Island broom, *Cytisus canariensis*, *Teline canariensis*); *Genista tinctoria*; green broom; greenweed; *Spartium junceum*

(Spanish broom); waxen woad; woad waxen; wood waxen.

Teline, a very similar genus, is usually categorized with the *Genista* genus; other similar plants include the *Ulex* genus and *Spartium junceum*.

**Effects:** Intoxication, relaxation, euphoria, intellectual clarity, and a heightened sense of color for about two hours. It may also produce intense hypnagogic imagery (hypnagogia is the half-awake, half asleep state that can occur just before or after sleep), but not hallucinations. In Europe, it has been used as an ingredient in aphrodisiac drinks. It is used by the Yacqui medicine men of northern Mexico as a supposed hallucinogen, even though its cytisine alkaloid has not been proven to have psychoactive properties. There is one reported instance where a tea produced from the flowers of *Spartium junceum* (chemically similar to the *Genista* species) resulted in vivid, colorful dreams.

**Precautions:** Cytisine is known to be toxic (it is related to nicotine), and to cause overexcitement, a heavy drunken feeling, headaches, nausea, diarrhea, vomiting, severe gastroenteritis, heart problems, convulsions, unconsciousness, and death through respiratory failure when it is eaten, though no adverse side effects have been reported when the plant is properly prepared and smoked. Spanish broom contains the toxic alkaloid spartenine.

**Dosage:** Up to one joint of dried leaves is said to produce a relaxed feeling with no subsequent depression; several joints may produce the effects mentioned above. The blossoms of the plant are aged for about 10 days in a sealed jar until they are dry and moldy, then ground up and rolled into a joint. All 3 varieties (*Cytisus* and *Genista*) have about the same potency.

## SENECIOS

**AKA:** Peyote; *Senecio canicida*; *Senecio cardophyllus*; *Senecio cervarifolia*; *Senecio*

*grayanus*; *Senecio hartwegii* (peyote de Tepic); *Senecio jacobaea*; *Senecio praecox*; *Senecio tolu-canus*.

**Effects:** A peyote-like high.

**Precautions:** This species is extremely dangerous, as it contains several chemicals that are toxic to the liver.

**Dosage:** None established.

## SHANIN

**AKA:** *Petunia violacea*.

A species of petunia, it is a member of the nightshade family and a close relative to tobacco.

**Effects:** Hallucinations, the main aspect of which appears to be the sensation of flight. The main psychoactive ingredient appears to be an as-yet-unidentified alkaloid.

**Precautions:** None known.

**Dosage:** None established.

## SHANSHI

**AKA:** *Coriaria thymifolia*, pinan.

A shrub in the Ecuadorian Andes that is toxic to animals.

**Effects:** Intoxication and hallucinations—including the sensation of flight—which are due to some as-yet-unidentified glycoside.

**Precautions:** There are cases on record of poisonings from related species *Coriaria arborea* and *Coriaria ruscifolia*.

**Dosage:** None established.

## SINICUICHI

**AKA:** *Heimia salicifolia*, herva da vida, sinicuiche, sinicuitl, sun-opener.

*Heimia myrtifolia* and *Heimia syphilitica* are geographical variants.

**Effects:** Hallucinations, including the following effects: giddiness, a darkening and shrinking of the surroundings, drowsiness or euphoria, and deafness or auditory hallucinations.

**Precautions:** Its supposed hallucinogenic effects are weak, and may be due to the fact that this plant has been traditionally mixed with other plants with higher levels of alkaloids. Side effects include chills, dizziness, deafness, disorientation, loss of coordination and difficulty in moving, the need to urinate, nightmares, body pains, and headaches. High doses may be toxic, and ingestion of extracts from 20 to 30 g of leaves can result in severely unpleasant experiences and symptoms of poisoning lasting as long as three days. Sinicuichi can also refer to other, unrelated plants.

**Dosage:** None established.

## SPLIT FIBRECAP

**AKA:** *Inocybe fastigiata*.

The *Clitocybe* species is similar, in that the main psychoactive alkaloid is muscarine.

**Effects:** Mind-altering.

**Precautions:** It is poisonous and inedible. Side effects (which can occur within 15 to 20 minutes after ingestion) include excessive perspiration, salivation, tearing of the eyes, vomiting, abdominal spasms with severe pain, diarrhea, intense nausea, small pupils and visual problems, lowered blood pressure, slowed pulse rate, bronchial spasms, difficulty breathing, and death from cardiac arrest.

**Dosage:** None established.

## STRESS HORMONES

**AKA:** Adrenalin, cortisol, norepinephrine.

**Effects:** According to author Amanda Ripley in *The Unthinkable* (Crown Publishers, 2008), stress hormones can act like hallucinogenic drugs in crisis situations. The most common effects are extreme tunnel vision (being able to focus intensely on relevant details while completely blocking out irrelevant ones), heightened and/or selective perceptual awareness, including increased visual acuity (she cites the case of U.S. ambassador Diego Asencio, whose vision remained stronger several

months after being the victim of a hostage situation, and of a police officer caught in a gun battle, who was able to read the words on the bottom of the spent shell casings ejected from his partner's gun), and tachypsychia (the perception that time has slowed down).

**Precautions:** Repeated stress can cause a variety of physical and psychological problems.

**Dosage:** None established.

## SYRIAN RUE

**AKA:** African rue; harmel; hurmur; *Peganum harmala*; rue; spand; spend; techepak; wild rue.

Native to India, Mongolia, Manchuria, the Middle East, and Spain, it is unrelated to American or European rue.

**Effects:** Contains the hallucinogenic alkaloids harmine and harmaline, among others. The seeds are commonly used as a spice, and the oil, sold in Egypt as zit-el-harmel, is reputed to be an aphrodisiac. Doses of 20 to 25 mg are mildly stimulating, but can result in drowsiness and dreaminess for an hour or two; doses of 300 to 750 mg may cause hallucinations.

**Precautions:** Severe toxic side effects can occur at doses of around 20g of powdered seeds. The alkaloids are MAO inhibitors and if mixed with any other drug or food contraindicated for this substance, may result in headaches, heart troubles, and death.

**Dosage:** Starting dose should be one-third ounce of seeds (or 250 mg)—no more—chewed thoroughly and swallowed. If dosage is increased, it should not exceed 1 ounce of seeds.

## TAGLLI

**AKA:** Peat myrtle; *Pernettya parvifolia*.

**Effects:** Said to induce hallucinations, though it contains andromedotoxin and arbutin as its active ingredients, neither of which is hallucinogenic.

**Precautions:** It is toxic and may adversely affect the motor nerves. Other species are possibly toxic (*Pernettya mucronata*, *Pernettya prostrate* var. *purpurea*). (see also entry Hierba loca)

**Dosage:** None established.

## TAIQUE

**AKA:** Borrachero de paramo, chapico, *Desfontainia hookeri*, *Desfontainia spinosa*, michai blanco, trautrau.

**Effects:** Used as a folk medicine and narcotic in southern Chile. Smoking the leaves can produce a mild high with visual hallucinations.

**Precautions:** It is related to a family of South American plants from which arrow poisons are made.

**Dosage:** None established. The leaves can be smoked or brewed as a tea, and the fruits prepared as a decoction.

## TAKINI

**AKA:** *Helicostylis pedunculata*.

**Effects:** The sap and fumes of the latex from this tree are said to be psychoactive. Some Indians of South America use it along with tobacco in shamanistic rituals. The inner bark of *Helicostylis tomentosa* (misho chaqui) is also said to be hallucinogenic.

**Precautions:** None known.

**Dosage:** None established.

## TANSY

**AKA:** Bitter buttons, *Chrysanthemum vulgare*, hindheal, parsley fern, *Tanacetum vulgare*.

**Effects:** Mind-altering.

**Precautions:** The oil (which can contain up to 95 percent of the active compound thujone, a neurotoxin) can cause vomiting, abdominal pain, severe gastroenteritis (inflammation of the stomach and small intestine)



rapid breathing, convulsions, abnormal dilation of the pupils, rapid and/or irregular heartbeat, kidney and liver damage, loss of consciousness, and death. Long-term use can cause serious problems due to the cumulative effects of its toxic compounds. Native Americans have traditionally used it to induce abortion.

**Dosage:** None established.

## THCV

**AKA:** Delta-9-tetrahydrocannabivarin; tetrahydrocannabivarin; THV.

A homologue of THC that is also found in *Cannabis sativa*.

**Effects:** Aside from blocking the effects of THC, its effects are not well known.

**Precautions:** None known.

**Dosage:** None established.

## TOAD

**AKA:** *Bufo alvarius*, *Bufo marinus*, Colorado River toad, Sonoran Desert toad.

**Effects:** The Sonoran Desert toad of Arizona produces large amounts of 5-MeO-DMT in its venom glands—which can induce a gentle high when dried or smoked—along with small amounts of the narcotic bufotenine, an alkaloid that is also found in some mushrooms and plants and which produces an LSD-like high. The effects, which include auditory and visual hallucinations, take hold in about five minutes and lasts for approximately an hour.

**Precautions:** Jonathan Ott and others have concluded that 5-MeO-DMT has “little recreational value,” essentially agreeing with a colleague who compared it to “having a large elephant sitting on one’s head,” though health guru Andrew Weil and journalist Larry Gallagher have reported very positive experiences. It should be noted that, since most types of toad venom are toxic, licking toads can be dangerous, causing seizures and resulting in hospitalization, and getting the venom in the eyes or mouth can cause severe poisoning or even

death. The venom must be dried and smoked to inactivate the toxins.

Wade Davis has reported that *Bufo marinus* was one ingredient of the Haitian zombi potion.

**Dosage:** Unless combined with MAO inhibitors at a 10 mg dose, 5-MeO-DMT is not active when taken orally. When smoked, it is four times as potent as DMT—experiments have found that smoking 6 to 10 mg of the free base can result in a high that begins within a minute, peaks after two, and lasts twenty. Parenteral injections of 5 to 10 mg were also found to produce results. The venom can remain potent for two years.

## TSICTA

**AKA:** Sikta; *Tabernaemontana sananho*; uch pa huasca sanango; yacu zanango.

**Effects:** Bark extracts of this Ecuadorian tree are used by hunters to sharpen the senses; there is good evidence to suggest that it contains psychoactive alkaloids. It is also said to enhance memory.

**Precautions:** Some initial unpleasant effects.

**Dosage:** None established.

## TUPA

**AKA:** *Lobelia tupa*; tabaco del diablo.

**Effects:** The dried leaves are smoked by the Mapuche Indians of Chile as a narcotic, and by some North American Indians as an ingredient in love magic. None of the chemicals known to exist in tupa are hallucinogenic, though they may have a nicotine-like effect.

**Precautions:** None known. In Chile, tupa and tabaco del Diablo could refer to other species, as well, some of which have toxic effects.

**Dosage:** None established.

## TURKESTAN MINT

**AKA:** Intoxicating mint; *Lagochilus inebrians*.

**Effects:** Sedation and euphoria. Used as a folk medicine and intoxicant by various peoples of Turkestan. The full extent of its effect is not yet known.

**Precautions:** It has a very bitter taste.

**Dosage:** None established. The leaves and stems are boiled in water to make a tea.

### UVA-URSI

**AKA:** *Arctostaphylos uva-ursi*; bearberry; kinnikinnik; kinnikinnick.

**Effects:** An intoxication similar to opium. The dried leaves are used as a tobacco substitute.

**Precautions:** Side effects of ingestion include dark green urine and stomach upset. The arbutin in uva ursi is converted in the urinary tract to the antiseptic hydroquinone, which can be toxic in high doses (a 1949 study reported serious side effects of ringing in the ears, nausea, and convulsions). It is not known if these same effects occur as a result of inhalation. The term kinnikinnick can also refer to other plants and to mixtures of these plants.

It should not be taken by pregnant women, as it can trigger uterine contractions, and it should not be taken for more than seven to ten days by children unless under the guidance of a qualified healthcare practitioner.

It should not be taken with acidic foods such as fruit juices, sauerkraut, and vitamin C. When combined with other herbs, it is recommended that a lower dosage be taken.

**Dosage:** None established.

### VEPRIS AMPODY

**Effects:** One of the richest sources of DMT (up to 0.22 percent).

**Precautions:** None known.

**Dosage:** None established.

### WATER LILY

**AKA:** *Nymphaea ampla* (white water lily); *nymphaea caerulea* (blue lotus flower).

**Effects:** Hallucinations and narcosis.

**Precautions:** *N. ampla* can induce vomiting, and reportedly cause psychosis in higher doses. *N. caerulea* can cause muscle tremors and nausea.

**Dosage:** For *N. ampla*, smoking two dried buds or drinking tea made from buds is said to cause psychoactive effects; the flowers are also said to be psychoactive, but dosage is unknown. For *N. caerulea*, three to six buds prepared as a tea may induce hypnotic effects and hallucinations.

### WHITE CEDAR

**AKA:** American arbor-vitae; *Thuja occidentalis*.

**Effects:** Visual and aural hallucinations.

**Precautions:** Side effects include dilation of the pupils, fever, visual disturbances, headache, gastroenteritis, severe vomiting, diarrhea, rapid heartbeat, convulsions, damage to the kidney, heart, and liver, and death from circulatory and respiratory arrest. Side effects of chronic use include severe depression, epileptic seizures, and loss of personality; any harmful effects may be cumulative.

**Dosage:** None established. According to Wink and van Wyk, “[i]nternal use is ... not recommended.”

### WILD DAGGA

**AKA:** Dacha; *Leonotis leonurus*; lion’s ear; lion’s tail.

A South African member of the mint species.

**Effects:** Used as an inebriant by the Hotentots.

**Precautions:** Research is lacking.

**Dosage:** None established. Users have smoked the leaves, flowers, and resin.

### WILD FENNEL

**AKA:** *Foeniculum vulgare*.

**Effects:** The oil, when taken orally, is said

to induce hallucinations. Some claim that smoking the leaves has the same effect.

**Precautions:** Research on its psychoactive effects is lacking. Side effects include epileptic-like convulsions and severe damage to the liver and kidneys.

**Dosage:** 5 to 20 drops.

## WILD ROSEMARY

**AKA:** *Rhododendron tomentosum* (*Ledum palustre*, marsh cistus, marsh tea, moth herb, narrow-leaved Labrador tea, rosemary, swamp tea).

It should not be confused with rosemary (*Rosmarinus officinalis*).

**Effects:** The smoke from the burning leaves is said to be a narcotic. The Tungus people of Siberia preferred this over the fly agaric mushroom, and another species is used by the Kwaiikutl Indians of British Columbia as an inebriant.

**Precautions:** Believed to be at least partly responsible for the berserker frenzies of the Vikings. It is known that at least one species, *Rhododendron tomentosum*, produces a honey that is toxic (this plant can be used as a tea, though excessive use may cause toxicity). The essential oil causes irritation of the gastrointestinal tract, vomiting, diarrhea, kidney damage, and urinary tract damage. Other side effects include perspiration, muscle pain, joint pain, and paralysis.

**Dosage:** None established.

## WORMSEED

**AKA:** *Artemisia cina*.

Not to be confused with *Chenopodium ambrosioides* (American wormseed, feather geranium, goosefoot, Jerusalem oak, Jesuit tea, Mexican tea), also known as wormseed.

**Effects:** Hallucinations.

**Precautions:** Side effects include distorted vision, jaundice, abdominal pain, diarrhea, nausea, vomiting, coldness, salivation, a tear-

ing of the eyes, dilated pupils, difficulty breathing, kidney damage leading to blood in the urine, severe facial tics, paralysis of the legs, lowered body temperature, delirium, epileptic seizures, loss of consciousness, and death due to respiratory arrest. Other side effects may include hallucinations, dizziness, and vertigo.

**Dosage:** None established. Approximately 10 g of dried flower heads, or 15 mg per kg of body weight of the active compound santonin, is lethal.

## WORMWOOD

**AKA:** Absinthe; *Artemisia absinthium*.

**Effects:** Consuming the essential oil—which is one of the main ingredients of the alcoholic drink absinthe—produces hallucinations (the compound thujone has effects that are very similar to THC). Smoking the herb produces only a mild euphoria. It has also been traditionally used as a medicine for a variety of stomach ailments.

**Precautions:** Side effects include vomiting, diarrhea, dizziness, headache, cramps, and neurotoxicity. High doses can cause coma and death. Chronic use can lead to hallucinations, delirium, seizures, mental disturbances, and even suicide. *Artemisia abronatum* (lad's love, southernwood) is a related species which does not appear to be hallucinogenic.

The thujone in the essential oil increases the effects of alcohol.

**Dosage:** None established.

## XENON

**AKA:** Atomic Number 54; Xe.

A colorless, odorless gaseous element that is used in some types of thermionic valves, fluorescent tubes, and light bulbs. It is also used as a general anesthetic; unlike other NMDA receptor antagonists, it is not neurotoxic, and due to its inhibition of serotonin 5HT<sub>3</sub>, has a lower risk of post-anesthesia nausea and vomiting.

**Effects:** Supposedly produces a high similar to nitrous oxide, or laughing gas, though without the headaches or weird auditory hallucinations. It appears to be neuroprotective when administered as a treatment for ischemic events in pigs and rats (Schmidt et al., 2005; Dingley et al., 2006). Inhalation of a mixture of xenon and oxygen can result in an increase in the production of erythropoietin (see entry).

**Precautions:** Can displace oxygen in the lungs, inducing unconsciousness.

**Dosage:** None established.

## XIWIT

An unclassified salvia species used by the Nahuatl people of Sierra de Puebla.

**Effects:** Induces vivid dreams.

## YOHIMBE AND YOHIMBINE

**AKA:** Actibine; Aphrodyne; Baron-X; *Corynanthe johimbi*; *Corynanthe yohimbe*; *Corynanthe johimbi*; Dayto Himbin; lizard tail; *Pausinystalia yohimbe*; Prohim; Thybine; yerba del pasmo; yerba mansa; Yocon; Yohimar; yohimbine hydrochloride; Yohimex; Yoman; Yovital.

**Effects:** Yohimbe is said to produce a tingling feeling along the spine, followed by a mild, pleasant, and euphoric high lasting four to six hours. In high enough doses, it can produce mild hallucinogenic-like effects. It contains a number of psychoactive alkaloids, including yohimbine, and has shown positive results in treating both psychological and physiological impotence; it even increases the sex drive of men with normal libido. It may have the same effects on women, with the added benefit of helping them lose weight. According to Ward Dean, M.D., it "is the only substance with a specific FDA-approved indication as an aphrodisiac." The active compound, called yohimbine or yohimbine hydrochloride, is isolated and sold as a pre-

scription medication, and is much safer. One study has found that it enhances the recall of material involving strong emotional content (O'Carroll et al., 1999).

Works synergistically with 500 to 1000 mg of vitamin C, which quickens its effects and reduces the nausea.

**Precautions:** It should not be used by those with an allergy to yohimbine or any of the Rauwolfia alkaloids, angina pectoris, hepatitis, hypoglycemia, blood pressure disorders, ulcers, diabetes, kidney disease, liver disease, heart disease, panic attacks, bipolar disorder, or schizophrenia. Those suffering from or being treated for depression, any psychiatric disorder, any other allergy, or those taking any drugs that interfere with norepinephrine's neuronal uptake or metabolism (including Selegiline) should use yohimbe only under a physician's guidance; in fact, many herbalists caution that the potent herb should never be used without the advice of a physician or herbalist.

According to James A. Duke, Ph.D., using the herb in its natural form (dried bark) is dangerous. The amount of yohimbine in herbal products can vary considerably.

There are no known life-threatening or common side effects. Less common side effects include anxiety, high blood pressure, rapid heart rate, lack of coordination, overstimulation, dizziness, salivation, insomnia, hallucinations, panic attacks, and headache. Rare side effects include nausea, vomiting, flushed skin, sweating, and tremors. High doses can result in severe low blood pressure, heart problems, and death. The doses needed to produce the hallucinogen-like effects are very high and potentially toxic. It is not physically addictive, but can create a psychological dependence. The whole herb is a complex combination of adrenergics, cholinergics, yohimbine alkaloids, and reserpine alkaloids, substances which act counter to each other and which could cause serious health risks.

While yohimbine is not an MAO inhibitor,

yohimbe is, and so should not be combined with tyramine-rich foods (e.g., cheese, red wine, liver) or MAO inhibitors. The effects of yohimbe can be decreased by alcohol. Yohimbe can decrease the effects of antidepressant and antihypertensive drugs. It should also not be combined with antihistamines, tranquilizers, diet pills, narcotics, amphetamines, cocaine, marijuana, or any mood-altering drug. W. Nathaniel Phillips does not recommend taking it with meals.

Some supplements may contain little or no active yohimbine. A 2010 *Consumer Reports* study rated it as one of the twelve most dangerous supplements on the market.

**Dosage:** Six to ten teaspoons of shaved bark boiled in a pint of water for five minutes. Mark Mayell recommends 15 to 20 drops of tincture, 250 to 500 mg of the dried herb in capsules, or one cup of tea a day. Sheldon Saul Hendler,

M.D., Ph.D. recommends one 5.4 mg tablet three times a day for up to ten weeks, with the dosage cut in half and gradually built up to a full dose if side effects occur. It may take two to three weeks for any effects to occur. James Nestor, author of *Get High Now*, sampled it with friends, and found that even at the recommended dose, the effects were far stronger and lasted much longer than anticipated; he advises avoiding it altogether.

### YUN-SHIH

**AKA:** *Caesalpinia decapetala*; *Caesalpinia sepiaria*.

**Effects:** A Chinese vine said to induce visions and “communication with spirits.”

**Precautions:** None known.

**Dosage:** None established.

## *Medical Drugs*

Pharmaceutical drugs whose use as cognitive enhancers is “off-label,” or non-prescription, are listed in this section. For most of them, a safe and effective dose for mind-enhancement has not been established.

**PLEASE NOTE:** Precautions are too extensive to be listed here. Readers are sternly advised to consult with a physician and reputable medical sources before using any of these drugs, especially women who are pregnant or breastfeeding, the elderly, those with pre-existing medical conditions, those taking drugs (legal or illegal) or herbal supplements, or those consuming alcohol or certain foods.

### ACE INHIBITORS

**AKA:** Angiotensin-converting enzyme inhibitors.

A class of drugs prescribed for various heart- and kidney-related problems.

**Effects:** A Bulgarian study found that the ACE inhibitors captopril andtrandolapril improved learning and memory in rats comparable to the drug oxiracetam (Nikolova et al., 2000), and a Japanese study found that brain-penetrating ACE inhibitors such as perindopril and captopril were able to slow the decline in thinking and memory skills in elderly patients with mild to moderate Alzheimer’s disease (Ohru, 2004).

**Precautions:** Captopril has a short half-life.

**Dosage:** None established.

### ACETAMINOPHEN

**AKA:** Tylenol.

Taken for the relief of pain and fever by those who cannot or will not take aspirin or a nonsteroidal anti-inflammatory drug (NSAID).

**Effects:** A 2010 University of Florida study found that subjects who took a 500 mg pill of acetaminophen upon waking and another 500 mg pill just before going to bed over a three week period reported less emotional suffering due to social rejection than those who took a placebo. Researchers said it may also curb antisocial behavior, as such rejection can also trigger aggressive acts. Research at the University of British Columbia indicates it may relieve existential-related anxiety and fear resulting from thoughts of death and the human condition (Randles et al., 2013).

**Precautions:** As these were small preliminary studies, more research is needed to determine its effectiveness.

**Dosage:** None established.

### ADDERALL

**AKA:** Adderall XR.

Prescribed for attention-deficit hyperactivity disorder (ADHD) and narcolepsy.

**Effects:** According to Healthland’s Maia Szalavitz, it can increase alertness and focus, and improve learning and some types of memory.

**Precautions:** Results may be inconsistent—some users report no performance boost at all. A University of Pennsylvania study conducted in 2010 found no improvement in tests of cognitive function, even though participants thought they did better, which the researchers attributed to the fact that Adderall releases dopamine, a “feel-good” neurotransmitter. Maia Szalavitz states that the cognitive benefits decrease with a person’s intelligence, with the smartest individuals actually experiencing a reduction in cognitive performance.

**Dosage:** About 15 mg/day, or 30 mg/day of the “extended-release” capsule.

### ADRAFINIL

**AKA:** CRL-40028; Olmifon.

A mild central nervous system stimulant drug used to treat narcolepsy. As of 2011, the manufacturer Cephalon has ceased making this drug after reassessing its risks versus benefits.

**Effects:** Similar to Modafinil, but milder and gentler in effect. Has been found to increase learning in discrimination tasks in aging beagles (Milgram et al., 2000). Non-prescription users report increased energy, cognitive function, focus, concentration, and memory, and socially inhibited individuals become more open and talkative. Unlike other stimulants, its effect gradually increase over a period lasting anywhere from a few days to a few months.

**Dosage:** For cognitive enhancement, the general dose is two to four 300 mg tablets per day, though many report lower doses work just as well.

### A-412997

**AKA:** 2-(3',4',5',6'-tetrahydro-2'H-[2,4'] bipyridinyl-1'-yl)-N-m-tolyl-acetamide; N-(3-methylphenyl)-2-(4-pyridin-2-ylpiperidin-1-yl)acetamide.

A selective agonist for the dopamine D4 receptor.

**Effects:** In rats, it has been found to improve cognitive performance and promote

motor activity on par with methylphenidate (Browman et al., 2005; Woolley et al., 2008).

**Precautions:** Does not appear to have the side effects of psychostimulants currently in use for attention deficit hyperactivity disorder, which include sedation, nausea, insomnia, anorexia, headache, stomach problems, and possible drug abuse.

**Dosage:** None established.

### AF267B

**Effects:** May help in the treatment of Alzheimer’s by reducing extracellular amyloid plaque lesions and intracellular neurofibrillary tangles in the areas of the brain associated with learning and memory; it has also reversed loss of memory and learning in mice genetically altered to mimic Alzheimer’s disease (LaFerla et al., 2006).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### ALENDRONATE

**AKA:** Alendronate sodium, Fosamax.

A drug used for the treatment of osteoporosis.

**Effects:** There are two anecdotal cases of patients who have had improved memory and mental functioning after taking it. As yet, this has not been supported by clinical evidence.

**Dosage:** None established.

### ALMITRINE

**AKA:** Almitrine bismesylate; almitrine dimesylate; almitrine mesylate; Doxil; Duxil; Vectarion.

A respiratory stimulant used for the treatment of chronic obstructive pulmonary disease.

**Effects:** Studies indicate that, in combination with raubasine, it could be a possible treatment for age-related cognitive disorders or stroke (Allain and Bentue-Ferrer, 1998).

**Dosage:** 2 tablets per day.

### ALPRAZOLAM

**AKA:** Alprax; Alprocontin; Anzilum; Apo-Alpraz; Kalma; Niravam; Novo-Alprazol; Nu-Alpraz; Pacyl; Restyl; Tranax; Xanax; Xanax XR; Xycalm; Zolam.

Prescribed for anxiety disorders and panic disorders; occasionally prescribed for depression or agoraphobia.

**Effects:** Decreases excitement in the brain, making an individual more tranquil or sleepier. Anecdotal reports of recreational use indicate a feeling of relaxation, a mild enhancement of the senses, a feeling of being mildly drunk, and/or a mild euphoria, lasting about an hour.

**Dosage:** Recreational dosage appears to be about 1 to 2 mg. The medically prescribed dosage starts at 0.25 to 0.5 mg three times a day, with gradual increases to 4 mg or even 6 mg, if necessary.

### AMINO GUANIDINE

**AKA:** Aminoguanidine hydrochloride; guanyl hydrazine; hydrazinecarboximide; imino semicarbazide; monoamino-guanidine; pimagedine.

A drug developed for the treatment of diabetic nephropathy, kidney diseases, and end stage renal disease. Since its failure as a medical drug, it has been developed for numerous industrial applications.

**Effects:** Said to be anti-aging by inhibiting advanced glycation end products. Cross-linking of proteins, or glycosylation, results in oxygen coming into contact with glucose and protein, and is thought to be the main catalyst for many age-related conditions, such as Alzheimer's disease, glaucoma and cataracts, thickening of the arteries, enlargement of the heart, aging skin, osteoarthritis, various cancers, and weakened immune system function; animal studies have shown that aminoguanidine can prevent some of these conditions.

**Precautions:** Its use as a medical drug was discontinued due to risk of side effects and

lack of efficacy as a treatment for the targeted conditions, though these were seen at the 300 mg/day level and not the 150 mg/day level. Since it has not been adequately tested on humans, it should only be taken under the guidance of a physician. The biocarbonate version may be less bio-available than the hydrochloride (HCL) derivative

**Dosage:** One tablet (150 mg) one to three times a day (It has a half-life of four hours, so doses should be spread out over the course of the day).

### AMPHETAMINE

**AKA:** Adderall; Benzedrine; d-amphetamine; Desoxyn; Dexedrine; dextroamphetamine; Dextrostat; greenies; l-amphetamine; ProCentra; speed; Vyvanse.

Amphetamines were widely used by Allied soldiers in World War II to stay active and alert.

**Effects:** Euphoria, along with increased libido, alertness, concentration, energy, self-esteem, self-confidence, and sociability. One study found that l-amphetamine and l-methamphetamine improved the memory of rats (Wiig et al., 2009), while another study found that l-amphetamine improved the memory of multiple sclerosis patients by almost 50 percent (Sumowski et al., 2011).

**Dosage:** None established.

### ARECOLINE

A toxic alkaloid found in betel nuts that is used as a veterinary drug to destroy parasitic worms.

**Effects:** One small study of nine patients with possible Alzheimer's disease found that verbal ability showed improvement with low doses of intravenous injections of arecoline, while attention and visuospatial ability showed improvement at higher doses (Raffaele et al., 1996).

**Precautions:** More research is needed to determine efficacy. Side effects include brachy-



cardia and tremors, and 8 to 10g of betel palm seeds can result in death from cardiac or respiratory paralysis.

**Dosage:** The doses given in the study were 1, 4, 16, 28, and 40 mg/day.

## ASPIRIN

**AKA:** Arthritis Pain Formula; A.S.A.; Ascriptin A/D; Ascriptin Extra Strength; Aspergum; Bayer; Bufferin; Cama Arthritis Pain Reliever; Ecotrin; Ecotrin Maximum Strength; Empirin; Maximum Bayer; Measurin; Norwich Extra-Strength; ZORprin.

**Effects:** It has proven effective against multi-infarct dementia (MID), a form of senility in which small blood clots form in the brain, which is believed to comprise about 20 percent of all cases of senile dementia. Some suggest that aspirin may be helpful in preventing Alzheimer's, though studies have yet to be done to confirm this. Aspirin can also help prevent migraines, heart attacks and strokes.

**Dosage:** One tablet a day. The U.S. Preventive Services Task Force recommends 75 mg/day, or slightly less than that of a low-dose, or "baby" aspirin, for men 45 to 79 years of age with elevated heart disease risk and women 55 to 79 years of age at risk of ischemic stroke. If taken on a regular basis, caution must be exercised, as aspirin can accumulate in the body over time, making overdosing much more likely. Some medical health practitioners recommend adopting good health habits (e.g., exercising and eating better) rather than relying on a quick fix such as a pill in an attempt to compensate for an unhealthy lifestyle.

## BENACTYZINE

**AKA:** Lucidil.

An anti-cholinergic drug once prescribed for depression with related anxiety.

**Effects:** According to Pearson and Shaw,

it can block phobic memories and projections.

**Precautions:** Side effects include dry mouth and nausea. High doses can cause delirium and hallucinations. It is mainly used for research purposes.

**Dosage:** None established.

## BETA BLOCKERS

A group of drugs used to treat high blood pressure and heart conditions.

**Effects:** A Dutch study involving sixty people found that it can decrease the severity of bad memories related to traumatic events (Kindt et al., 2009).

**Precautions:** It does not erase traumatic memories from the mind. Ethical concerns have been raised, such as the use of medical drugs for common psychological problems such as phobias and anxiety that may be better treated with therapy. Medical ethics expert Dr. Daniel Sokol warns that such an approach may also alter good memories, and that removing bad memories may alter our personality or prevent individuals from learning from their mistakes. Study leader Dr. Merel Kindt says it is too early to use it for more complex conditions such as post-traumatic stress disorder.

**Dosage:** None established.

## BEXAROTENE

A drug used for the treatment of cancer.

**Effects:** A study using mice found that bexarotene reversed the behavioral, cognitive, and memory deficits of Alzheimer's by increasing the expression of Apolipoprotein E, the primary cholesterol carrier in the brain, which in turn helps clear amyloid-beta plaques from the brain. Plaques were reduced by 25 percent within six hours, and the effects lasted up to three days, ultimately clearing 75 percent of the plaques (Landreth et al., 2012).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## BROMOCRIPTINE

**AKA:** CB-154; Parlodel; 2-bromo-alpha-ergokryptine.

An ergot derivative like LSD and Hydergine, bromocriptine is prescribed for the treatment of certain symptoms of Parkinson's disease such as muscle rigidity, tremors, and problems with walking. It is also used for the treatment of infertility (both male and female), acromegaly, and some pituitary tumors.

**Effects:** It is an antioxidant and antidepressant, and may play roles in enhancing memory and extending life span. It activates dopamine in the brain and, as a side effect, increases the libido.

**Dosage:** None established for mind enhancement.

## BRYOSTATIN-1

**Effects:** A 2005 study found that this drug significantly enhanced learning, memory, and mood in rats, supporting the theory that memory processing and mood regulation have similar neural mechanisms. Research by Dr. Daniel Alkon and others at the Blanchette Rockefeller Neurosciences Institute (BRNI) found that cognitive deficits in mice with Alzheimer's occurred five months before plaques and tangles appeared, indicating that something else was at the root of the disease. This turned out to be the loss of synapses, and that administration of Bryostatin halted the decrease of PKCepsilon—which regulates the formation of new synapses—eliminating all signs of the disease (Hongpaisan et al., 2011). It is believed this drug and others developed by Dr. Alkon could be used to treat traumatic brain injury, as well.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## CARBENOXOLONE

A drug derived from a licorice extract once used to treat stomach ulcers.

**Effects:** A 2004 study at the University of Edinburgh found that it improved the verbal memories of men aged 55 to 75 after a few weeks, which it accomplished by preventing a brain enzyme from boosting the level of cortisol, a stress hormone that may contribute significantly to damage in the hippocampus, leading to age-related memory decline.

**Precautions:** Licorice will not have the same effect, as the active component carbenoxolone had been modified in the study to enhance its effects.

**Dosage:** None established.

## CLIOQUINOL

**AKA:** PBT-1.

A drug used to treat such gastrointestinal disorders as diarrhea and shigella.

**Effects:** Animal studies have shown that it can slow the progression of such unrelated neurodegenerative disorders as Alzheimer's, Parkinson's, and Huntington's diseases. One small study has found that it slowed the progression of cognitive decline in patients with moderate to severe Alzheimer's disease (Ritchie et al., 2003). Researchers at McGill University have found that it could slow the aging process, possibly by its action on the protein CLK-1 ("clock-1").

**Precautions:** It was withdrawn after being linked to an outbreak of subacute myelo-optic neuropathy (SMON) in Japan in the 1960s, though some researchers now think that this connection is unproven.

**Dosage:** None established.

## CNI-1493

An anti-inflammatory drug.

**Effects:** Has been found to protect nerve cells against damage from beta amyloid plaques

in cultures, and to decrease brain inflammation and improve memory and cognitive function in mice. It appears to be faster and more effective in reducing brain lesions than ibuprofen and other Alzheimer's therapies.

**Precautions:** Has not yet been tested in humans.

**Dosage:** None established.

## COX-2 INHIBITORS

**Effects:** Research headed by Lawrence Marnett, Ph.D., and Sachin Patel, M.D., Ph.D., of the Vanderbilt Institute of Chemical Biology at Vanderbilt University have found that COX-2 inhibitors relieve anxiety in mice through the activation of endocannabinoids (see entry), apparently without the attendant gastrointestinal and cardiovascular side effects that occur with NSAIDs.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## CYCLOSERINE

**AKA:** DCS, D-cycloserine; (/R/)-4-amino-1, 2-oxazolidin-3-one; Seromycin.

An antibiotic drug used for the treatment of tuberculosis.

**Effects:** An analysis of the literature indicates that it may enhance the learning process in the brain, indicating it may be used as an effective biologically based warm-up to cognitive behavioral therapy aimed at reducing fear and anxiety in cases related to obsessive-compulsive disorder, panic disorder, and post-traumatic stress disorder (Norberg et al., 2008; Rothbaum, 2008). Studies have found that 50 mg administered before a therapy session provided some benefit to patients suffering from social anxiety disorder (Hofmann et al., 2006) and PTSD and other traumas (de Kleine et al., 2012), but that 250 mg as an

adjuvant to prevention therapy for obsessive-compulsive disorder provided no benefits (Storch et al., 2007). Instead of acting on serotonin receptors like other drugs, cycloserine interferes with the glutamate receptor NMDA in the amygdala, stimulating it to unlearn fear responses. It is also being considered as a treatment for neurocognitive deficits associated with schizophrenia and Alzheimer's disease.

**Precautions:** Some researchers suggest that the drug be used before therapy, as daily use may lead to tolerance, reducing its effectiveness. Also, the effect appears to decrease over time, indicating it may not be suitable for long-term therapy. It appears that the timing of the dosing is crucial to efficacy, as is frequency (once a day or more is ineffective), and that lower doses are more effective than higher doses. It should be noted that the effective dose is much lower than that used for the treatment of tuberculosis.

**Dosage:** The most effective dose appears to be about 100 mg.

## CYCLOSPORINE

**AKA:** Neoral; Sandimmune.

An immune-suppressing drug used to prevent transplanted organs from being rejected.

**Effects:** It has been found to cause neurons to grow new fibers that connect to other brain cells, which could possibly overcome brain damage caused by strokes, Alzheimer's disease, and Parkinson's disease.

**Dosage:** None established.

## CYPROHEPTADINE

**AKA:** Periactin.

An antihistamine.

**Effects:** Has been shown to be effective in the treatment of nightmares, including those related to post-traumatic stress disorder (Gupta et al., 1998; Rijnders et al., 2000).

**Dosage:** None established.

## DARAPLADIB

An anti-atherosclerosis drug.

**Effects:** A study using pigs has found that it can significantly reduce leaks in the blood-brain barrier and decrease the density of amyloid-positive neurons in the cerebral cortices, possibly leading to new ways to prevent, or halt the progression of, Alzheimer's disease (Acharya et al., 2013).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## DIMEBON

**AKA:** Latrepirdine.

A drug originally developed as an antihistamine.

**Effects:** Improved thinking and functioning in Alzheimer's patients over a twelve month period, possibly by stabilizing mitochondria and preventing brain cell death (Doody et al., 2008).

**Precautions:** The drug failed a clinical trial for Alzheimer's disease in 2010.

**Dosage:** None established.

## DMSO

**AKA:** Dimethyl sulfoxide; RIMSO-50.

Legally, it is only prescribed (infrequently) for interstitial cystitis and bladder inflammation, and is not recommended for any other use, though many use it to treat arthritis and sports injuries. It appears to be an all-purpose industrial solvent, and has been used as a degreaser, paint thinner, and anti-freeze.

**Effects:** It works, not by lubricating joints or by deadening pain, but by scavenging free radicals. It has been shown to increase circulation; protect against the effects of radiation and freezing; reduce keloids, scars, and the effects of burns; help protect against fungus, bacteria, and viruses; be a beneficial supplement to cancer therapy; stimulate immunity;

stimulate wound healing; and useful in treating such eye problems as cataracts, macular degeneration, and glaucoma, among others.

It has been found to reduce the severity of paraplegia in cats subjected to crushing spinal cord injuries, and the San Francisco General Hospital Brain Trauma and Edema Center has used it to treat brain injuries. Anecdotal evidence indicates it may provide benefits to those with Down's syndrome, learning disabilities, and senile dementia, as well as those with other forms of brain damage and dysfunction. Because it has so many benefits, proponents tout it as the wonder drug of the 21st century.

**Precautions:** As it can immediately penetrate the skin and enter the bloodstream, anything on the skin or in the solvent itself, including germs, chemicals, and contaminants, will enter with it. Concentrations of 40 percent or more may prolong bleeding, and concentrations greater than 50 percent are not applied to the face and neck, as they are more sensitive to DMSO than the rest of the body. It should be dabbed on, not rubbed in, and any excess wiped off after half an hour; toxicity may occur if it is inhaled, as it evaporates slowly. It may exacerbate the effects of some allergens. Injections should only be administered by a physician.

Because it is easily identified by taste and smell, it is difficult to perform double-blind studies on DMSO.

Most of the industrial grade, or solvent grade, solutions contain acetone, which is readily carried into the blood by DMSO, and which can cause liver damage and death. According to Pearson and Shaw, much of the DMSO sold over the counter or by mail order contains unwanted impurities such as dimethylsulfone, dimethylsulfide, nitrogen oxides, and benzene. In addition, after it has scavenged the hydroxyl radicals from the body, it converts to a sulfoxide free radical. While this new free radical is less damaging than the one removed and can be counteracted with the various vitamin, mineral, and amino acid

antioxidants, impurities can be carried directly into the bloodstream.

**Dosage:** The typical oral dose is 1 to 2 teaspoons a day, mixed with tomato or grape juice to mask its foul taste. The effects appear to be cumulative, so that the dosage can be reduced over a period of time.

The drug appears crystal clear and has a very distinct sulfur or garlic odor; a cloudy or discolored appearance indicates impurities. It is not used for more than 30 days at a time, with a 30-day interval between periods of use. It is dabbed on, never rubbed in, and it is always stored in its pure state, with the bottle securely capped to prevent the absorption of moisture which might deteriorate the solution. The amount needed is mixed at the time of application.

## ENOXAPARIN

**AKA:** Clexane; Lovenox.

A heparin, or drug administered during vascular surgery and for the treatment of postoperative thrombosis and embolism, which extends the clotting time of blood.

**Effects:** Has been found to have neuroprotective qualities in rats with ischemia and brain trauma due to its anticoagulant action; other effects, such as antioxidant, anti-inflammatory, and reduction of intracellular Ca<sup>2+</sup> release, may play a synergistic role. Specifically, it reduces edema, lesion size, cognitive impairment, and secondary ischemia resulting from edema-induced compression of blood vessels, with some benefits occurring even when the drug was administered up to two weeks after the event (Stutzmann et al., 2002).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## ERLOTINIB

**AKA:** Tarceva.

A drug used in the treatment of cancer.

**Effects:** Epidermal growth factor receptor production, which promotes tumor growth, may also play a role in amyloid-beta plaques-associated memory loss in Alzheimer's disease. Research has shown that erlotinib can reverse Alzheimer's-like memory loss in fruit flies and mice (Zhong et al., 2012).

**Precautions:** This is just a preliminary study, and the exact mechanism by which it works is still not understood.

**Dosage:** None established.

## ERYTHROPOIETIN

**AKA:** EPO.

A drug used in medical treatments to increase blood production. It has been used by athletes to illegally boost their performance.

**Effects:** It appears to improve memory by directly affecting the neurons in the brain. According to researchers at the Max Planck Institute of Experimental Medicine, "[t]reatment with EPO seems to increase the number of inhibitory circuits, which actually increases the efficiency of transmission of excitatory nerve impulses in specific neurons, resulting in greater short-term and long-term plasticity in memory pathways in the hippocampus." It has been found to improve spatial learning in rats with mechanically induced lesions in the brain (Mogensen et al., 2008). Mice given a dose every other day for three weeks maintained their improved memory for three weeks after the last dose (Adamcio et al., 2008); a follow-up study found that the drug lead to long-term improvement in cognitive functioning in healthy mice (El-Kordi et al., 2009). It has also been shown to improve cognition in those with schizophrenia and multiple sclerosis.

**Precautions:** The memory improvements in mice disappeared four weeks after the last dose. As this was a preliminary study, more research is needed.

**Dosage:** None established.

## ETANERCEPT

**AKA:** Enbrel.

A drug used to treat inflammation and auto-immune diseases such as arthritis.

**Effects:** Alzheimer's patients injected with this drug showed cognitive improvement in memory and language ability within minutes, with benefits lasting up to six months. Edward Tobinick, who conducted the research at the Institute for Neurological Research in California, believes that Alzheimer's is primarily caused by inflammation in the brain which, in turn, disrupts synaptic transmission, whereas the general view is that Alzheimer's is caused by plaques forming in the brain, resulting in the death of brain cells (Tobinick and Gross, 2008).

**Precautions:** The effects of the drug even out after three months. As this was a preliminary study, more research is needed. Because it is still experimental, it is not approved for the treatment of Alzheimer's in the United States or England.

**Dosage:** None established. For prescribed treatment of auto-immune disorders, the usual dose is 25 mg twice a week or 50 mg once a week.

## FEXOFENADINE

**AKA:** Allegra.

An antihistamine.

**Effects:** Unlike most antihistamines, fexofenadine has a stimulating effect, though it is not known why this is so. A small study found that a single large dose of 360 mg had some cognitive-enhancing ability (Theunissen et al., 2006).

**Dosage:** The usual dose is 60 to 180 mg/day.

## FK506

**AKA:** Prograf; Tacrolimus.

An immune-suppressing drug used to prevent transplanted organs from being rejected.

**Effects:** It has been found to cause neurons to grow new fibers that connect to other brain cells, which could possibly overcome brain damage caused by strokes, Alzheimer's disease, and Parkinson's disease.

**Dosage:** For its use in transplant surgery, the usual dose is 0.075 to 0.15 mg per pound of body weight a day in 2 divided doses, often adjusted to the lowest effective level to reduce side effects.

## FLUMAZENIL

**Effects:** One study found that a daily dose of flumazenil for ten months increased the lifespan of rats and protected them from loss of cognitive functions due to ageing (Marczynski et al., 1994).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## FLURBIPROFEN

**AKA:** R-flurbiprofen; tarenflurbil.

A drug prescribed for pain and inflammation.

**Effects:** A study has found that it reduces amyloid-beta-42 plaques (associated with Alzheimer's) in mice, improving spatial learning (Kukar et al., 2007).

**Precautions:** This is a preliminary study, and it is not known whether it has the same effects on humans.

**Dosage:** None established.

## FRAX486

An experimental anti-cancer drug.

**Effects:** Has been found to reverse symptoms of schizophrenia and recover some lost brain function in adolescent mice by restoring connections between neurons. In animal studies, this and other PAK inhibitor drugs have been found to provide some protection against brain damage due to Fragile X syndrome, an

inherited disorder that affects males and is distinguished by moderate to severe mental retardation and enlarged facial features and testes. It has also been looked at as a potential treatment for Alzheimer's disease.

**Precautions:** Study leader and professor of psychiatry and behavioral sciences at Johns Hopkins University School of Medicine Akira Sawa has stated that, in humans, there has not been a proven link between high PAK levels in the brain and schizophrenia.

**Dosage:** None established.

## GEFITINIB

**AKA:** Iressa.

A drug used in the treatment of cancer.

**Effects:** Epidermal growth factor receptor production, which promotes tumor growth, may also play a role in amyloid-beta plaques-associated memory loss in Alzheimer's disease. Research has shown that gefitinib can reverse Alzheimer's-like memory loss in fruit flies and mice (Zhong et al., 2012).

**Precautions:** This is just a preliminary study, and the exact mechanism by which it works is still not understood.

**Dosage:** None established.

## GM-1 GANGLIOSIDE

**AKA:** AsialoGM1; Monosialoganglioside GM1; Sygen.

A form of lipid in cell membranes that exists throughout the body but found most abundantly in the brain and nervous system, and which does not act like other lipids. It is also an experimental drug used to treat acute injuries, including stroke and spinal cord injury.

**Effects:** Has antioxidant and neuroprotective qualities, and may also induce vasodilation. It has been found to reverse memory deficits in aging rats (Silva et al., 1996), as well as rats with genetic and lesion-induced memory deficits. It also binds with amyloid-

beta in a way which may prevent beta-sheet formation (Mandal and Pettegrew, 2004), and it appears to be a promising method of treatment for Parkinson's, Alzheimer's, and stroke.

**Precautions:** Its effects are not fully understood, though it is known that both an excess and a deficiency can result in neurodegenerative problems. GM-1 may also facilitate the conversion of nontoxic amyloid-beta protein into toxic aggregates through the expression of apolipoprotein E4 (Yanagisawa, 2005).

## HYDROXYFASUDIL

**AKA:** Fasudil.

A drug used to treat vascular problems in the brain.

**Effects:** One study has found that a daily injection can improve spatial learning and working memory in middle-aged rats (Huentelman et al., 2009). It may have an as-yet unknown effect on the hippocampus, which plays an important role in both functions, though the parent drug, Fasudil, is a commonly used vasodilator. According to co-author Heather Bimonte-Nelson, PhD in a PSYCHORG.com article, "Fasudil shows great promise as a cognitive enhancer during aging. The effects in our aging animal model were robust, showing enhancements in both learning and two measures of memory. The possibility that these findings may translate to benefits to human brain health and function is very exciting."

**Precautions:** Has not yet been tested on humans for its cognitive-enhancing effects. The rats in the study were injected with the drug, whereas humans are given it in pill form, which may be a factor in its effectiveness.

**Dosage:** None established.

## IBUDILAST

**AKA:** 2-methyl-1-(2-propan-2-ylpyrazolo[1,5-a]pyridin-3-yl)propan-1-one; AV-411; MN-166.

An anti-inflammatory drug used for the treatment of asthma, stroke, and neuropathic pain.

**Effects:** Has been found to have neuroprotective effects (Mizuno et al., 2004).

**Precautions:** None known.

**Dosage:** None established.

### IBUPROFEN

**AKA:** Advil; Bayer Select Pain Relief Formula; Cap-Profen; Ibuprohm; Ibu-Tab; Medipren; Menadol; Motrin; Motrin IB; Motrin Migraine Pain; Profen; Tab-Profen.

**Effects:** A UCLA study found that ibuprofen binds to beta-amyloid plaques, dissolving them, and possibly preventing the formation of new ones (Barrio et al., 2003). A long-term study found that those who used ibuprofen for more than five years were at least 40 percent less likely to develop Alzheimer's disease, and that the longer the pain-killer was used, the lower the risk of dementia (Vlad et al., 2008).

**Precautions:** Critics maintain that the fact that some NSAIDs lower dementia but others do not indicates that some factor other than the drug may be involved.

**Dosage:** None established.

### INFLUENZA VACCINE

**Effects:** Researchers at Tel Aviv University have developed a nasal spray based on an influenza vaccine that could offer protection against stroke and Alzheimer's disease. This spray would trigger an immune response against amyloid-beta proteins by activating macrophages, or large proteins in the body, that would consume the foreign antigens and repair vascular damage to the brain (Frenkel et al., 2011).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### INSULIN

**Effects:** A small preliminary study found that a twice-daily administration of insulin via

a nasal spray prevented, or even slightly reversed, the decline in memory, cognitive abilities, and day-to-day functioning of individuals with Alzheimer's (Reger et al., 2008).

**Precautions:** This was a small, short-term study (four months); long-term results are unknown. Results were mainly dependent on the individual's genetic risk for Alzheimer's, as only those without the APOE epsilon4 allele showed improvement.

**Dosage:** The optimal dose appears to be 20 IU.

### INTERFERON BETA

**AKA:** Betaseron, Interferon beta-1b.

A drug used in multiple sclerosis therapy.

**Effects:** A preliminary study has shown that interferon beta can counteract the memory loss that often occurs with multiple sclerosis.

**Precautions:** Nothing is known about the effects it might have on those without MS.

**Dosage:** A subcutaneous injection of 8 million units every other day.

### ISPRONICLINE

**AKA:** (2/S/,4/E/)-5-(5-isopropoxy-pyridin-3-yl)-/N/-methylpent-4-en-2-amine; (2/S/,4/E/)-/N/-Methyl-5-[5-(1-methyl-ethoxy)-3-pyridinyl]-4-penten-2-amine; AZD-3480; RJR-1734; TC-1734.

**Effects:** Known to have antidepressant, nootropic, and neuroprotective effects (Gatto et al., 2004; Lippiello et al., 2006). One small study on individuals with an average age of 76 found that it improved the cognitive abilities of those suffering from age-associated memory impairment (Dunbar et al., 2007). It works similar to nicotine, but without most of the side effects.

**Dosage:** The optimal dose appears to be 50 mg.

### LAMOTRIGINE

**AKA:** 6-(2,3-dichlorophenyl)-1,2,4-triazine-3,5-diamine; Lamictal.



An anticonvulsant drug used in the treatment of epilepsy and other seizure disorders.

**Effects:** Used in the treatment of bipolar disorder, as it is also a mood stabilizer. It is said to help treat depression, though this is not a prescribed use.

**Dosage:** Normal maintenance dose for bipolar disorder is 200 mg/day, though higher or lower doses may be more effective depending on the patient's need.

## LEVODOPA

**AKA:** L-3,4 dihydroxyphenylalanine; L-odopa; L-dopa; Lopar.

A precursor of the neurotransmitter dopamine, L-dopa is an amino acid found naturally in the body, even though it is classified as a prescription drug. It is metabolized from tyrosine, which in turn is converted from phenylalanine. It is used to treat Parkinson's disease, restless leg syndrome, and the pain resulting from herpes zoster (shingles).

**Food Sources:** Velvet beans.

**Effects:** It may reverse or even prevent the deterioration of the body generally associated with aging by fully restoring the hypothalamus' ability to maintain the body's biochemical homeostasis; it may increase energy without the addiction and depressive aftermath associated with amphetamines; it can aid in weight loss by suppressing the appetite and stimulating the release of growth hormone; it is a powerful antioxidant; and it may act as a sexual aid by increasing the levels of the neurotransmitters norepinephrine and dopamine in the brain, stimulating the release of growth hormone, decreasing the levels of prolactin, and reducing the levels of serotonin.

Taking vitamin C may maintain the levels of norepinephrine and dopamine in the body, while taking one or more of such antioxidants as vitamins B-1, B-5, B-6, and E, the minerals selenium and zinc, and the drug Hydergine may prevent free-radical damage caused by dopamine byproducts. It is sometimes administered with

Carbidopa, which allows it to cross the blood/brain barrier much more easily and allows the dosage to be reduced by as much as 75 percent, reducing side effects considerably.

**Dosage:** For Parkinson's patients, 0.5 to 8 grams/day according to a person's individual needs. For life-extension and cognitive enhancement purposes, it is generally suggested that 125 to 500 mg/day be taken, or 35 to 125 mg/day in combination with Carbidopa. Taking it just before sleep is probably the best strategy for stimulating the release of growth hormone.

## LOSARTAN

**AKA:** Cozaar; losartan potassium. Also used in combination medication Hyzaar.

A medication used to treat high blood pressure and decrease the risk of stroke.

**Effects:** Found to improve cognitive function in elderly hypertensive patients, specifically word list memory and word list recall tests (Fogari et al., 2003). It is not known if this would be any benefit to individuals suffering from dementia.

**Precautions:** A 2011 study by eHealthMe found that 1 percent of individuals taking this drug reported mild memory impairment within the first six months of taking it, most of them women over age fifty.

**Dosage:** In the Fogari study, patients were given 50 mg/day.

## MDA7

A compound used to treat neuropathic pain.

**Effects:** A study found that it triggered beneficial anti-inflammatory immune responses in an animal model, restoring cognition, memory, and synaptic plasticity, which helped to prevent Alzheimer's disease. These immune responses acted on the CB2 receptor similar to cannabinoid compounds, but without the side effects associated with the latter (Wu et al., 2012).

**Precautions:** None known.

**Dosage:** None established.

### MEPERIDINE

**AKA:** Algil; Alodan; Centralgin; Demerol; Dispadol; Dolantin; isonipecaine; lidol; Mepergan; pethanol; pethidine; piridosal.

A synthetic opioid analgesic prescribed for moderate to severe pain.

**Effects:** Euphoria and hallucinations.

**Dosage:** None established. When taken for recreational purposes, the potential for side effects is very high.

### METFORMIN

**AKA:** Fortamet; Glucophage; Glucophage XR; Glumetza; Riomet.

A drug used to treat type-2 diabetes.

**Effects:** One study found that it protects the activity of PP2A against degradation, so that it can counteract alterations of the cell structure protein Tau in mice nerve cells by removing phosphate groups, one of the primary causes of Alzheimer's disease (Kickstein et al., 2010). A review of nearly 15,000 type-2 diabetes patients aged 55 or older found that those on metformin had a 20 percent less chance of developing dementia than those on other medications. It is theorized that the drug may be a factor in neurogenesis (the formation of new brain cells), as well as reducing inflammation (Whitmer et al., 2013). Another study found that it can slow the aging process in *C. elegans* worms similar to the effects of a calorie-restricted diet (Cabriero et al., 2013).

**Dosage:** For type-2 diabetes, the usual initial dosage is 850–1000 mg/day, which may be increased to a maximum of 2550 mg/day.

### METHYLENE BLUE

**AKA:** Methylthionium chloride; rember.

A drug used to treat the blood disorder methemoglobinemia.

**Effects:** Has been found to slow the decline of the enzyme known as complex IV, which plays an important role in mitochondrial function (Atamna et al., 2008). Said to halt or reverse the progress of Alzheimer's disease in 81 percent of those with mild to moderate symptoms (Wischik et al., 2008). It prevents tau fibers from becoming tangled (which leads to the destruction of nerve cells and the loss of memory) and dissolves those already tangled. Since it slows cellular aging, it could be a possible treatment, or even a cure, for Alzheimer's and Parkinson's disease.

**Precautions:** Studies so far have only been conducted on mice. Methylene blue enters the brain only with some difficulty, and high concentrations damage the brain.

**Dosage:** None established.

### METHYLPHENIDATE

**AKA:** Concerta, methylphenidate hydrochloride, MPH, Ritalin, vitamin R.

A drug prescribed for the treatment of attention deficit hyperactivity disorder (ADHD).

**Effects:** In adults, it can result in increased mental alertness, reduced fatigue, improved mood, and mild euphoria. It is popularly used as a cognitive-enhancing drug by college students, especially those preparing for exams ("steroids for SATs"), and professionals, who take it to improve intellectual performance, help focus attention, or just to stay awake. Although its effects are not completely understood, it appears to have similar psychotropic effects and use similar pharmacological pathways as amphetamines and cocaine. An Australian study found that doses between 5 and 45 mg resulted in quicker reaction time and a reduced number of errors in healthy male volunteers aged 18 to 25 years (Cooper et al., 2007).

**Dosage:** For the treatment of various disorders in adults, 20 to 30 mg/day in two to three divided doses, though dosage is always adjusted according to the individual.

## METOPRINE

**Effects:** One study found that it prevented scopolamine-induced memory impairment in mice similar to Piracetam (Malmberg-Aiello et al., 2000).

**Precautions:** None known.

**Dosage:** None established.

## METRIFONATE

An acetylcholinesterase inhibitor.

**Effects:** A study of 395 patients concluded that a six week regimen of metrifonate reduced the symptoms of Alzheimer's disease, based on several assessment tests (Jann et al., 1999). A previous study of 408 patients over a 26-week period using similar doses found that metrifonate enhanced cognitive, global, and behavioral functions of patients with mild to moderate Alzheimer's disease with minimal side effects (Morris et al., 1998).

**Precautions:** Though patients experienced the most improvements with the higher doses, the occurrence of side effects in the 1999 study led the researchers to recommend the lower dosage regimen.

**Dosage:** In the 1999 study, the loading-dose group received a daily dose of 100–150 mg for two weeks, then a daily maintenance dose of 50 mg for four weeks, while the no-loading-dose group received just the daily maintenance dose of 50 mg for the entire six weeks.

## METYRAPONE

**AKA:** Metopirone.

A drug used to diagnosis adrenal insufficiency.

**Effects:** Has been found to inhibit glucocorticoid secretion which then impairs the retrieval of emotional memories over the long term, even after cortisol levels had returned to normal (Marin et al., 2011). This could be helpful in dealing with post-traumatic stress

disorder, as cortisol is a stress hormone important to memory recall. It has also been found to reduce depression in rats (Healy et al., 1999).

**Dosage:** In the study, subjects were given either one or two 750 mg doses.

## MIDAZOLAM

A sedative. It was used in combination with hydromorphone in a 2014 Ohio execution of a convict, which took 26 minutes from the time of injection.

**Effects:** One study found that it enhances intuition (Frank et al., 2006).

**Precautions:** The same study also found that the drug interferes with memory. The reason for this seemingly contradictory finding is the theory that there are two pathways to learning, one via the hippocampus (explicit) and the other based on the brain's reward system (intuitive).

**Dosage:** None established.

## MILNACIPRAN

**AKA:** Dalcipran, Ixel, Savella, Toledomin.

A serotonin and norepinephrine reuptake inhibitor (SNRI) drug used in the treatment of fibromyalgia which differs in significant ways from other SNRIs.

**Effects:** Approved for the treatment of depression in many countries, but not the U.S.

**Precautions:** A review of milnacipran versus other antidepressants concluded that there was insufficient evidence to conclude where milnacipran stood with regard to these other drugs in terms of efficacy, acceptability, and tolerability in treating acute major depression, though there was slim evidence of fewer side effects (Nakagawa et al., 2009). A 2010 petition by The Public Citizen Group sought to get this drug banned because there is no long-term data on side effects, clinical trials showed that the drug only helped 7–9 percent of patients, and it could increase the risk of suicide for patients with severe depression.

**Dosage:** Varies depending on the patient.

## MINOCYCLINE

**AKA:** Minocin.

An antibiotic used to treat acne and other skin infections, such as MRSA and Lyme disease.

**Effects:** May improve rational decision-making by removing distractions (Motoki et al., 2013). It has also been shown to help people focus on social cues and relieve symptoms of schizophrenia (Miyaoaka, 2012) and depression. In rats, it has been found to be neuroprotective in cases of cerebral ischemia when administered intravenously (Xu et al., 2004).

**Dosage:** Varies depending on the condition being treated.

## MOCLOBEMIDE

An antidepressant.

**Effects:** It has been found to enhance learning and memory in rats (Getova et al., 2003).

**Precautions:** Research is needed to determine its nootropic effects on humans.

**Dosage:** None established.

## MODAFINIL

**AKA:** Provigil, Sparlon.

A drug used to treat narcolepsy, obstructive sleep apnea, and ADHD in children and adolescents.

**Effects:** A 2001 Cambridge University study found that subjects given modafinil performed better at spatial, visual, and memory tasks than those given a placebo. A subsequent study at Cambridge found that it can improve short-term memory and mental flexibility in patients with schizophrenia, restoring the two main factors necessary for these individuals to hold down jobs and lead independent lives (Turner et al., 2004). It is one of the more popular “smart drugs” (a study by the University of California, San Francisco, found that pre-

scriptions in the United States had increased ten-fold from 2003 to 2013) as it is said to improve attention and focus, allowing individuals to work for hours without a break. It is also thought to be the model for the drug in the movie *Limitless*.

**Dosage:** None established. For mind enhancement, the usual dose appears to be 100–200 mg/day.

## MOLSIDOMINE

A vasodilator used to treat heart conditions.

**Effects:** Found to reverse scopolamine-induced amnesia and nitric oxide synthase inhibitor L-NAME-induced memory task performance deficits, and counter age-related memory deficits in rats due to it being a nitric oxide donor (nitric oxide is a regulator of various biological processes, particularly in the cardiovascular and nervous systems) (Pitsikas et al., 2001; Pitsikas et al., 2002; Pitsikas et al., 2003; Pitsikas et al., 2004).

**Precautions:** None known.

**Dosage:** None established.

## NAFTIDROFURYL

**AKA:** Dusodril; INN; nafronyl; nafronyl oxalate; naftidrofuryl oxalate.

A drug used for hearing problems and the management of vascular disorders.

**Effects:** A metabolic brain-enhancer.

**Precautions:** None known.

**Dosage:** None established.

## NALTREXONE

**AKA:** Depade, ReVia.

A drug prescribed for narcotic or alcohol addiction.

**Effects:** Has been found to prevent impairment of memories acquired during times of stress (e.g., crimes, traumatic accidents) by blocking opioid neuropeptides (Katzen-Perez et al., 2001). It has also been found to reverse

age-related cognitive deficits in rats (Rodefer and Nguyen, 2006).

**Precautions:** Subjects in the Katzen-Perez study given naltrexone performed worse on memory tests than those given a placebo under conditions involving emotionally neutral stimuli.

**Dosage:** None established.

## NAPROXEN

**AKA:** An ingredient found in Aleve, Anaprox, Anaprox DS, EC-Naprosyn, Midol Extended Relief, Naprelan, and Naprosyn.

A pain killing medication.

**Effects:** A UCLA study found that naproxen binds to beta-amyloid plaques, dissolving them, and possibly preventing the formation of new ones (Barrio et al., 2003).

**Dosage:** None established.

## NILVADIPINE

A calcium channel blocker prescribed for the treatment of high blood pressure.

**Effects:** Animal studies have shown that it prevents the formation of amyloid-beta plaques. Trials on Alzheimer's patients have begun in 2014.

**Precautions:** None known.

**Dosage:** None established.

## NIMODIPINE

**AKA:** Nimotop, Periplum.

A calcium channel blocker prescribed for loss of function following a stroke, and for migraine and cluster headaches.

**Effects:** Prevents the constriction of blood vessels, which increases the flow of blood in the brain and decreases the chance of oxygen deprivation to the brain cells. It accumulates in the highest concentrations in the brain and spinal fluid, and is usually prescribed for strokes and migraine headaches. In fact, it is the only calcium-channel blocker known to improve

neurological function after a stroke; however, it is probably the only calcium-channel blocker not used for angina or high blood pressure. It may also increase acetylcholine levels.

One study has found that 90 mg in three divided doses over a 12-week period had a significantly positive effect on memory, depression, and general mood, though further research has been unable to replicate these results (it is still not fully known how the drug works). It is considered a possible treatment for Alzheimer's, dementia, age-related degenerative diseases, epilepsy, and ethanol intoxication, and may have some anti-stress and anti-aging properties.

**Dosage:** For migraine headaches, the usual dosage is 120 mg/day in three divided doses; for cognitive enhancement, the recommended dosage is 60 mg in two divided doses.

## NUVIGIL

**AKA:** Armodafinil.

A longer-lasting variant of Provigil, it is prescribed for the treatment of narcolepsy, shift work sleep disorder, and obstructive sleep apnea. Armodafinil is the active form (the R-enantiomer) of the racemic modafinil.

**Effects:** Improved alertness and long-term memory as well as reducing fatigue and sleepiness in patients with narcolepsy (Harsh et al., 2006) and obstructive sleep apnea/hypopnea syndrome (Hirshkowitz et al., 2006). It is being considered as a treatment for bipolar depression and cognitive problems associated with schizophrenia. It was once considered a treatment for jet lag, but the FDA would not approve it for this use.

**Dosage:** The dosage used was 150 mg/day in the Hirshkowitz study, and 150–250 mg/day in the Harsh study.

## ONDANSETRON

**AKA:** Emeset; Emetron; Emodan; Ondavell; Ondemet; Setronax; Zofran; Zofran ODT; Zuplenz.

An antiemetic drug used to prevent nausea and vomiting during chemotherapy, radiation therapy, and surgery.

**Effects:** It is also prescribed for psychosis and social anxiety disorder; it may also be useful for the treatment of obsessive-compulsive disorder (OCD) (Hewlett et al., 2003), schizophrenia (Zhang et al., 2006), and Parkinson's-related psychosis (Zoldan et al., 1995). It has been found to improve memory in scopolamine-treated mice (Roychoudhury and Kulkarni, 1997).

**Dosage:** For treatment of psychological disorders, dosage may vary depending on the individual and other relevant factors.

### ORPHENADRINE

**AKA:** Banflex; Biorphen; Brocasipal; Disipal; Dolan; Flexon; Invagesic; Mephenamin; Norflex; Norgesic; OrfenAce.

A derivative of diphenhydramine (Benadryl, Somnexam, Nytol) prescribed for pain and muscle spasms in patients with lumbago, sciatica, and other conditions; it is also effective against allergic symptoms from hay fever and other allergies.

**Effects:** Anecdotal reports indicate that euphoria is a common side effect, and it has been investigated as a treatment for depression (Robitscher and Pulver, 1958).

**Dosage:** None established.

### OXPRENOLOL

**AKA:** Captol; Corbeton; Coretal; Slow-Pren; Slow-Trasacor; Tevacor; Trasacor; Trasacor; Trasidex; Trasitensin.

A beta-adrenergic blocking agent prescribed to reduce angina attacks, stabilize an irregular heartbeat, lower blood pressure, and reduce the occurrence of vascular headaches.

**Effects:** It has been shown to reduce phobias and eliminate anxiety.

**Dosage:** None established.

### PEMOLINE

**AKA:** Cylert; magnesium pemoline.

An amphetamine derivative and central nervous system stimulant prescribed for attention deficit disorders in children and daytime sleepiness.

**Effects:** Increases the level of norepinephrine in the synapses of the brain, creating greater nerve stimulation and possible improvements in learning, memory, and concentration. A UK study found that a 20 mg dose was optimal for increasing performance in overnight workers, though more than that interfered with recovery sleep (Nicholson and Turner, 1998).

**Dosage:** For therapeutic uses, 37.5 to 75 mg/day, not to exceed 112.5 mg/day; for brain-boosting effects, 18.75 to 75 mg/day is said to provide 6 to 12 hours of mental stimulation accompanied by physical relaxation.

### PENICILLAMINE

**AKA:** Cuprimine, Depen.

A drug modified from an amino acid in penicillin; it is prescribed to treat rheumatoid arthritis, prevent kidney stones, and treat heavy metal poisoning.

**Effects:** Removes heavy metals from the body.

**Dosage:** John Mann recommends 250 mg/day to start, increasing to 1000 to 2000 mg/day in four divided doses.

### PENTYLENETETRAZOL

**AKA:** Cardiazol; metrazol; pentamethylenetetrazol; pentetrazol; pentylenetetrazole; PTZ.

A drug used as a circulatory and respiratory stimulant.

**Effects:** Stimulates theta rhythms in the brain, which are associated with periods of creative thinking, and may increase learning ability and slow the advance of senility.

**Dosage:** None established.

## PHENYTOIN

**AKA:** Dilantin (extended action); Diphenylan (prompt acting); Diphenylhydantoin (DPH); Ditan (prompt acting); Ethotoin; Mephenytoin; Mesantoin; Peganone; Phenytext; PHT.

The most commonly prescribed drug for epilepsy, it has been the subject of at least 8000 papers. The exact mechanism by which it works is still not understood, but it is believed to influence the electromagnetic fields, polarizing the electrically charged elements of the cells.

**Effects:** Though it is mainly used as a treatment for epilepsy, it has a number of other various effects: it can normalize electrical activity in the cell membranes; it can stabilize behavior by suppressing obsessive thoughts, fear, anger, violent behavior, and passivity; it can supposedly improve intelligence, concentration, learning, long-term memory, comprehension, and speed of visual-motor coordination; it has some anti-aging effects, including restoring the homeostasis of the neuroendocrine system; in small doses, it increases the “good” form of cholesterol, called high density lipoprotein (HDL).

**Dosage:** Adult epileptics are generally given doses of 200 to 400 mg/day in two to four divided doses. About an eighth of that, or 25 to 50 mg/day are given for cognitive-enhancing effects, though some recommend as much as 100 mg/day in two to four divided doses.

## PIOGLITAZONE HCl

**AKA:** Actos, Pioglitazone Hydrochloride.

A generic ingredient prescribed by itself or in drugs used to treat type 2 diabetes, including ACTOplus Met and Duetact.

**Effects:** A 2006 study at the University of Virginia Health System and Case Western Reserve University found that it slowed the rate of Alzheimer’s in individuals with mild to moderate symptoms, possibly by either reducing the inflammation resulting from the build-

up of beta-amyloid plaques or by helping the brain cells function.

**Precautions:** The preliminary study was small, and more research needs to be done to adequately assess its effects.

**Dosage:** None established.

## PIRIBEDIL

**AKA:** Pronoran; Trastal; Trivastan; Trivastal Retard.

A drug prescribed for the treatment of Parkinson’s disease, sometimes in combination with L-dopa.

**Effects:** One study found that it improved cognitive skill learning abilities in older adults by reversing age-related dopamine decline (Peretti et al., 2004). Other studies found that it improved memory, attention, learning, thinking, and reaction times in elderly patients with mild cognitive impairments; side effects were minimal (Hastak, 2003; Mikhaïlova et al., 2004; Bochkarev et al., 2005). The Mikhaïlova study also found mild anti-depressive and anti-anxiety effects. In healthy males in their early twenties, a 3 mg intravenous injection slightly improved alertness, reaction time, and recall of information (Schuck et al., 2002).

**Dosage:** In the Peretti studies, subjects were given 50 mg/day for two months; in the Bochkarev study, 50 mg/day for one and three months; in the Mikhaïlova study, 50–100 mg/day for three months.

## PLAVIX

**AKA:** Clopidogrel: super aspirin.

A pain-killing drug similar to aspirin, ibuprofen, and naproxen.

**Effects:** Targets cyclooxygenase-2 or cox-2, an enzyme thought to be the cause of the pain and inflammation in many ailments. Cox-2 is also thought to play a role in Alzheimer’s disease.

**Dosage:** None known.

### PRAMIPEXOLE

**AKA:** Mirapex; Mirapexin; Sifrol.

A drug prescribed for the treatment of Parkinson's disease and restless leg syndrome.

**Effects:** Initial studies have shown it may be a useful treatment for depression and bipolar disorder.

**Dosage:** None established.

### PRAVASTATIN

**AKA:** Pravachol.

A cholesterol-lowering drug.

**Effects:** Has been found to have neuroprotective and neuroregenerative effects in rats with cerebral ischemia, particularly in the dentate gyrus (DG), subventricular zone (SVZ) and striatum (Zheng and Chen, 2007; Berger et al., 2008). A University of Washington analysis of the brains of elderly people who have died indicated that those who took statins were less likely to have neurofibrillary tangles, a sign of Alzheimer's disease (Li, 2007). Another study found that simvastatin and pravastatin help glial progenitor cells—reserve cells throughout the brain that are similar to stem cells and which repair damage from such causes as infection, hemorrhage, inflammation, or concussion—specialize in becoming oligodendrocytes, a particular type of cell (Goldman et al., 2008).

**Dosage:** None established.

### PRODINE

**AKA:** Nisentil; Prisolidine.

An opioid analgesic with two isomers, alphaprodine and betaprodine. The latter is much more potent and metabolized more rapidly, but alphaprodine has proven more suitable for medical use.

**Effects:** Euphoria.

**Dosage:** None established.

### PROLINTANE

**AKA:** Catovit.

A stimulant similar in structure to pyrovalerone and MDPV.

**Effects:** It may have some effect in reversing the effects of senile dementia and age-related cognitive decline.

**Precautions:** None known.

**Dosage:** None established.

### PROPRANOLOL

**AKA:** Inderal, Inderal LA (long acting), propranolol hydrochloride.

A beta-andrenergic blocking agent medication prescribed for high blood pressure patients and used in the treatment of angina, hypertension, specific tremors, and certain cardiac arrhythmias.

**Effects:** Reduces fear and stress by blocking the muscle's receptor sites for adrenaline; it also reduces the oxygen requirements of the heart and reduces the contractions of the blood vessels in the heart, scalp, and other areas. Taking it a half hour before an anxiety- or fear-inducing event may help an individual overcome his or her aversion to that situation. Those suffering from incidents from the past (e.g., child abuse, battlefield trauma) can reduce the trauma of the incident, but not erase it. A Dutch study (Kindt et al., 2006), along with research performed by Roger Pitman, a psychiatrist at Harvard University, found that it reduces the emotional distress following a traumatic event, but critics contend that the studies merely showed that the drug reduced the "startle response" when a person was re-introduced to the stressful situation, that stress induced by bad memories was important in helping people learn from their mistakes, and that such an approach may also alter good memories as well as bad.

It has also been found to improve language skills and social functioning in individuals



with Autism Spectrum Disorder (ASD), and possibly working memories as well.

**Precautions:** Most studies have been short term (six weeks or so), and more recent evidence does not support the claim that it works consistently over the long run. There is also evidence that it controls the physical symptoms of anxiety, but not the psychological ones. Any improvements seen in autistic individuals do not mean non-autistic individuals will see similar benefits. A British study found that it had an adverse affect on mood and energy levels, significantly increasing anxiety, depression, confusion, fatigue, and “total mood disturbance,” though exercise was able to counteract the anxiety and depression produced by the drug (Head et al., 1996).

**Dosage:** Some recommend 10 to 30 mg a half hour before the trauma-inducing event, though the usual prescribed dosage is 5 to 10 mg. Propranolol will have a greater effect if taken with meals.

## RAPAMYCIN

**AKA:** Rapamune; Sirolimus.

An immune-suppressing drug developed from bacteria in the soil of Easter Island used to prevent transplanted organs from being rejected.

**Effects:** It has been found to cause neurons to grow new fibers that connect to other brain cells, which could possibly overcome damage caused by strokes, Alzheimer’s disease, and Parkinson’s disease. A study by UCLA researchers using mice found that it can reverse the learning deficits resulting from tuberous sclerosis complex (TSC), a genetic disorder related to autism (Silva et al., 2008). The results were so encouraging that testing is now being done on human subjects. Studies done at the University of Texas Health Science Center at San Antonio have found that it can extend the youthful lifespan of mice, as well as improve learning and memory in mice engineered to develop Alzheimer’s by lowering levels of amyloid-beta-42, suggesting that it could be

an effective treatment for Alzheimer’s in humans.

**Precautions:** As these are preliminary studies, more research is needed.

**Dosage:** None established.

## RASAGILINE

**AKA:** Azilect.

A drug used to treat Parkinson’s disease.

**Effects:** Israeli studies with cell cultures and rats indicate that not only can it stop the deterioration of nerve cells and protect them from further damage, but that it can help neurons recover from damage due to Parkinson’s disease and aging, something no other drug is able to do.

**Dosage:** None established.

## RISPERIDONE

**AKA:** Risperdal.

A drug used in the treatment of schizophrenia and psychotic disorders.

**Effects:** It is believed to improve short-term memory by about 20 percent in patients taking the drug.

**Precautions:** Its memory-enhancing effects on non-schizophrenics are still unknown.

**Dosage:** None established.

## ROFLUMILAST

**AKA:** Daxas; Daliresp.

A drug used for the treatment of asthma and chronic obstructive pulmonary disease (COPD).

**Effects:** A PDE4 enzyme inhibitor, indicating it could be a possible memory enhancer.

**Precautions:** There have been no studies to determine its efficacy as a memory enhancer.

**Dosage:** None established.

## ROLIPRAM

An MAO inhibitor drug prescribed for the treatment of depression that is being tested for

use in the treatment of rheumatoid arthritis and multiple sclerosis.

**Effects:** A study found that it prevents some of the detrimental effects that sleep deprivation has on memory by blocking the effects of the enzyme PDE4 (Vecsey et al., 2009). Previous studies have shown that it improves memory impairment in rats (Barad et al., 1998; Zhang et al., 2000; Rutten et al., 2007). Its development as an antidepressant was abandoned because of its side effects and lack of efficacy. It is being investigated as a possible treatment for Alzheimer’s disease (Smith et al., 2009).

**Precautions:** The researchers caution that memory impairment is just one of many problems associated with sleep deprivation.

**Dosage:** None established.

## ROTIGOTINE

**AKA:** Neupro.

A drug prescribed for the treatment of Parkinson’s disease and restless leg syndrome (RLS).

**Effects:** Has been shown to have antidepressant effects (Bertaina-Anglade et al., 2006).

**Dosage:** None established.

## SELEGILINE

**AKA:** Deprenyl; Eldepryl; Jumex; Jumexal; Juprenil; L-deprenyl; Movergan; Procythol; SD Deprenyl; selegiline hydrochloride.

A standard prescription drug used in the treatment of Parkinson’s disease in combination with levodopa and Carbidopa, and mental depression when taken by itself. The molecular structure is similar to phenylethylamine (PEA), which exists in both plants and animals (and is the so-called “love chemical” in chocolate), and also resembles such compounds as amphetamine, norepinephrine, dopamine, phenylalanine, tyrosine, L-dopa, and tyramine.

**Effects:** It can help slow the progress of Alzheimer’s to a moderate degree by protect-

ing the brain cells from the damaging effects of oxygen. It also benefits memory, attention, and reaction times in those with Parkinson’s, and may also increase concentration, alertness, and mental stamina. In doses of 15 to 60 mg a day, it has relieved depression in 50 percent of those who suffered severely from this illness; one study has shown that it may work synergistically with vitamin B-6 and phenylalanine in this regard (5 mg of selegiline, 100 mg of vitamin B-6, and 1 to 6 grams of phenylalanine). It has increased the life span of rats by an average of 30 percent, and, more significantly, many of them lived beyond the maximum life expectancy for that species. Anecdotal evidence indicates it may be an aphrodisiac.

**Precautions:** While some studies show dramatic improvements in those with Alzheimer’s, others have shown no significant increase for several types of memory tasks.

**Dosage:** Smart drug users prefer the liquid form to the pill because it is easier to calibrate into smaller doses and is more readily absorbed into the body. For Parkinson’s, the usual dose is 5 mg with breakfast and lunch, which may be enough to produce feelings of well-being and increased energy in the average person. Dr. Jozsef Knoll, who developed selegiline, recommends 10 to 15 mg/ week for the average healthy person age 45 and over. Even less may be effective, especially if taken with vitamin B-6 and phenylalanine. Ward Dean, M.D., *et al.*, state that some individuals have taken up to 60 mg for three weeks with no significant side effects. Discovery Experimental and Development, one manufacturer of selegiline, recommends the following dosages:

Age	Dosage
30–35	1 mg twice a week
35–40	1 mg every other day
40–45	1 mg/day
45–50	2 mg/day
50–55	3 mg/day
55–60	4 mg/day
60–65	5 mg/day
65–70	6 mg/day

70–75	8 mg/day
75–80	9 mg/day
80+	10 mg/day

### SILDENAFIL

**AKA:** Revatio; sildenafil citrate; Viagra.

A drug prescribed for the treatment of erectile dysfunction.

**Effects:** One study has shown that it can improve memory retention in mice (Baratti and Boccia, 1999).

**Precautions:** Research is needed to determine any memory-enhancing effects on humans. Sildenafil appears to have no benefits for those with proper erectile function or for those using it to benefit athletic performance. Non-medical vendors of products purportedly containing sildenafil may, in fact, be using analogs of the drug, the effects of which are unknown.

**Dosage:** None established.

### SR141716

**AKA:** Acomplia; Bethin; Monaslim; Remonabant; Rimonabant; Rimoslim; Riobant; Riomont; Slimona; and Zimulti.

An antiobesity drug that reduces appetite. It has also been shown to be an effective aid for quitting smoking.

**Effects:** Its anti-cannabis effects have led to speculation that it may improve short-term memory, a hypothesis bolstered by studies on rats (Deadwyler et al., 2007).

**Precautions:** This drug has been withdrawn from the market because it was determined that the risks far outweighed its benefits.

**Dosage:** None established.

### SR 95070B

**Effects:** A study using rats has shown that, with minaprine, it could be a possible future treatment for senile dementias and cognitive impairment in the elderly.

**Precautions:** Research is needed to determine its effects on humans.

**Dosage:** None established.

### STATINS

**AKA:** 3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase inhibitors.

A class of drugs used to treat high cholesterol and heart disease.

**Effects:** A University of Washington analysis of the brains of elderly people who have died indicated that those who took statins were less likely to have neurofibrillary tangles, a sign of Alzheimer's disease (Li, 2007). Another study found that simvastatin and pravastatin help glial progenitor cells—reserve cells throughout the brain that are similar to stem cells and which repair damage from such causes as infection, hemorrhage, inflammation, or concussion—specialize in becoming oligodendrocytes, a particular type of cell (Goldman et al., 2008).

**Precautions:** The role of statins in preventing Alzheimer's and other forms of dementia is still uncertain, as overall research is contradictory, and long-term effects are not known. The fact that statins use the progenitor cells—which make up about three percent of the brain—may mean that they may not be available when needed to repair damage, leading to cognitive impairment.

Diabetes medications such as Avandia and Actos have the same effect on progenitor cells, and this effect may be increased in individuals also taking statins.

**Dosage:** None established. Professor Nicholas Wald, of the Wolfson Institute of Preventive Medicine, said in 2004 that, because of their broad range of health benefits, anyone over age 55 should consider taking statins.

### T-588

**AKA:** (1R)-1-benzo [b] thiophen-5-yl-2-[2-(diethylamino) ethoxy] ethan-1-ol hydrochloride.

**Effects:** It may help alleviate learning and memory dysfunction related to dementia.

**Precautions:** Research is needed to determine its effects on humans.

**Dosage:** None established.

### THIETHYLPERAZINE

A drug used to relieve nausea and vomiting.

**Effects:** Has been found to decrease beta-amyloid in mice with Alzheimer's disease by activating the transport protein ABCC1 (see entry) (Krohn et al., 2011).

**Precautions:** None known.

**Dosage:** None established.

### TOLCAPONE

**AKA:** Tasmar.

A drug used to treat the symptoms of Parkinson's disease.

**Effects:** One small study found that it can improve information processing and verbal memory in humans (Apud et al., 2007), another that it improved working memory (Roussos et al., 2009).

**Precautions:** Some subjects in the Apud study performed worse when on the drug, while some subjects in the Roussos study experienced deterioration in mood; the effects of both studies are possibly related to the specific genotypes of the individuals tested.

**Dosage:** None established.

### TROPISETRON

**AKA:** Navoban, Setrovel.

A serotonin receptor agonist used to treat the side effects of chemotherapy.

**Effects:** One small study found it has some benefit in treating anxiety disorder (Lecrubier et al., 1993). Another small study found that it could be an effective treatment for cognitive deficits in schizophrenics (Shiina et al., 2010). It has also been found to counteract scopolamine-induced learning and memory impairment (Pitsikas et al., 1997).

**Precautions:** More research is needed to

determine its benefits and risks regarding the above disorders.

**Dosage:** None established.

### TSPO LIGANDS

**Effects:** Have been found to significantly reduce Alzheimer's-related pathology and improve memory in mice (Pike et al., 2013).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### VALPROIC ACID

**AKA:** Depakene, Depakote, Epilim, sodium valproate, valproate, VPA.

Valproic acid was initially developed to treat epileptic seizures and bipolar disorder.

**Effects:** A study by researchers at the University of British Columbia and Vancouver Coastal Health Research Institute found that it can reverse the effects of memory impairment in the early stages of Alzheimer's disease in mice, which it accomplishes by inhibiting the enzyme activity that leads to the production of beta-amyloid plaques (Song et al., 2008). In a 2013 study, Takao Hensch, professor of cellular biology at Harvard University, found that tone-deaf adults were able to identify music notes with better accuracy than men with no musical experience after being given valproate.

**Precautions:** Nafissa Ismail, an assistant professor in psychology at the University of Ottawa, cautions that restoring the neuroplasticity of youth could make individuals more vulnerable to social and environmental stressors, leading to long-term negative effects.

**Dosage:** None established.

### ZOLPIDEM

**AKA:** Ambien; Ambien CR.

A drug prescribed for insomnia.

**Effects:** Sleep spindles, or bursts of brain activity in Stage 2 sleep lasting a second or less,

play an important role in converting short-term memory into long-term memory in the hippocampus. Two studies found that zolpidem increased the density of the sleep spindles as well as improved verbal memory consolidation (Mednick et al., 2013).

**Precautions:** The mechanism of action is not yet known. The use of sleeping pills is associated with a higher risk of death.

**Dosage:** None established.

## *Nootropics*

Nootropics is a term used by proponents of smart drugs to describe medical drugs and nutritional supplements that have a positive effect on brain function.

### A20

**Effects:** A compound derived from P7C3 which has been found to be much more powerful in its neuroprotective effect.

**Precautions:** No known side effects.

**Dosage:** None established.

### AFOBAZOLE

**Effects:** An anti-anxiety and neuroprotective drug developed in Russia that does not have the sedative and muscle relaxant effects found in similar drugs.

**Precautions:** There appear to be no significant side effects, though its mechanism of action is still unclear.

**Dosage:** None established.

### AGOMELATINE

**AKA:** Melitor; Thymanax; Valdoxan.

**Effects:** An antidepressant and melatonin analogue that also improves the quality of sleep and does not affect the re-uptake of serotonin, norepinephrine, or dopamine. According to researchers Hickie and Rogers (2011),

“[i]n the short-term, agomelatine has similar antidepressant efficacy to venlafaxine, fluoxetine, and sertraline and, in the longer term, fewer patients on agomelatine relapse (24 percent) than do those receiving placebo (50 percent). Patients with depression treated with agomelatine report improved sleep quality and reduced waking after sleep onset.” It has a faster onset of action and far fewer side effects than other antidepressants.

**Precautions:** Side effects appear to be minimal (unlike SSRIs, which typically cause nausea and sexual dysfunction, among other side effects), with reports of dizziness, gastrointestinal problems, and skin disorders, though it is likely hepatotoxic and it may increase the risk of suicidal thoughts. High doses have caused tumors in animal studies.

It should be used with caution by the elderly or those with severe kidney or liver disease (this last condition could cause a toxic buildup of the drug in the body). Anecdotal reports seem to indicate that it may only work for specific types of depression, and several studies have shown that it is no more effective than a placebo.

**Dosage:** The generally prescribed dose is 25 mg/day.

### AIT-082

**AKA:** Neotrofin.

**Effects:** Preliminary research indicates that

it has memory-enhancing properties, as well as other beneficial cognitive effects which may make it an effective treatment for Alzheimer's disease and other neurological disorders. Unlike piracetam and tacrine, its memory-enhancing properties are not nullified by adrenal hormones, though they may be modulated by them, and they are not inhibited by corticosterone, which may make it a better treatment for Alzheimer's than piracetam or tacrine (Yan et al., 2003).

**Precautions:** No significant side effects were reported, even in doses as high as 2000 mg/day (Grundman et al., 2003). However, only 36 Alzheimer's patients were tested, and more research needs to be done to determine its safety.

**Dosage:** None established.

### ALAGEBRIUM

**AKA:** Alagebrium chloride; ALT-711; DMPTB; PMTB; PTB; thiazolium chloride.

**Effects:** According to Bakris et al. (2004), alagebrium "is the first drug in a new class of thiazolium therapeutic agents that break established AGE cross-links between proteins." Advanced glycation end products (AGEs) are thought to be one of the main contributing factors to cellular aging, aging in particular, and age-related chronic diseases; they are found in many foods processed at high temperatures (Semba et al., 2010).

**Precautions:** It is no longer in development, possibly because the promising results seen in rats were not replicated in human trials, due to the fact that the types of AGEs affected were more important in rats than humans. Since it is an easy compound to synthesize, black market versions have been available—needless to say, there is no independent testing for quality control for these products, and they should be avoided. Some companies may be passing off similar compounds as alagebrium.

Side effects may include a small increase in

serum triglyceride levels. Rare side effects include atrial fibrillation, noncardiac chest pain, and dizziness.

**Dosage:** None established.

### ALNESPIRONE

**AKA:** S 20499.

**Effects:** A selective 5-HT<sub>1A</sub> receptor agonist found to have antidepressant effects in rats (MacSweeney et al., 1998).

**Precautions:** None known.

**Dosage:** None established.

### ALZHEMED

**Effects:** A drug currently being studied for use in the treatment of Alzheimer's disease. Unlike other medications, which treat only the symptoms, it stops the development of beta-amyloid plaques, one of the basic features of the disease.

**Precautions:** No significant side effects were reported, even in doses as high as 2000 mg/day (Grundman et al., 2003). However, only 36 Alzheimer's patients were tested, and more research needs to be done to determine its safety.

**Dosage:** None established.

### AMINEPTINE

**AKA:** Survector.

**Effects:** Is a mild, but short-lived, mood enhancer that doesn't have the side effects (such as reduced libido) of SSRIs. It may also improve the quality of sleep.

**Precautions:** It is useful in treating chronic dysthymia, or "low-grade" depression, but not more severe types of depression. Side effects may include spontaneous orgasms. It is not currently available in the U.S. or Europe, and may no longer be manufactured; caution is strongly advised in any attempts to purchase this drug.

**Dosage:** Optimal dosage is thought to be 100 to 200 mg/day.

## AMISULPRIDE

**AKA:** Amazeo, Amazeo OD, Amitrex, Deniban, Solian, Soltus, Sulpitac.

**Effects:** A drug used to treat clinical depression and dysthymia (low doses) and psychosis (high doses). It is apparently more effective at treating depression than sertraline and imipramine, and at least as effective as amitriptyline and amineptine.

**Precautions:** It may take months to take effect. Common side effects include prolactin induction (with attendant amenorrhea and galactorrhea) in women, nausea, vomiting, constipation, dry mouth, slow heart rate, abnormally low blood pressure, insomnia, anxiety, agitation, restlessness, tremors, rigidity, dystonia, excessive salivation, dyskinesia, weight gain, sexual dysfunction. Less common side effects include QT interval prolongation leading to serious heart arrhythmia. Overdose symptoms include torsades de pointes (ventricular tachycardia). Anecdotal reports indicate that loss of personality, dissociation, apathy, and anhedonia may also occur (Social Anxiety Forum website).

**Dosage:** 25–50 mg/day depending on the condition being treated.

## AMPAKINES

**AKA:** CX516; CX614; CX717; CX546.

**Effects:** A class of drugs developed from ampakines, a class of biochemicals, has been found to enhance communication between brain cells. They do this by increasing the activity of glutamate, an important neurotransmitter related to learning and memory, and by enhancing long-term potentiation (when two neurons communicate, they strengthen their bond, and when this link lasts for days or years, this is known as long-term potentiation [LTP], which is the foundation for memory). Ampakines also help create BDNF (see entry). Neuroscientist Gary Lynch has found that a single injection of an ampakine can reverse memory decline in rats. Subjects have been

shown to have enhanced performance on memory tests and improved wakefulness when sleep-deprived, and it may show promise in helping those with such disorders as narcolepsy and attention deficit hyperactivity disorder, as well as Alzheimer's disease and schizophrenia, in which the high-speed electrical signals that link the brain's complex neural circuits are failing. A 1997 study found that it boosted the cognitive function of Swedish medical students.

**Precautions:** The few studies that have been done are small, and nothing is known about long-term side effects. It has a half-life of only a few hours.

**Dosage:** One study at the University of Surrey found that doses between 100 mg and 1000 mg produced cognitive benefits without any apparent side effects.

## ANIRACETAM

**AKA:** Draganon; Ro 13–5057; Sarpul.

Chemically similar to piracetam, but is about ten times stronger and treats more symptoms. How it works is still unknown.

**Effects:** Has been shown to protect the brains of lab animals, and has been used to treat the behavioral and psychological symptoms of stroke and Alzheimer's disease.

**Precautions:** Toxicity and side effects seem minimal, but it has not been adequately tested on humans as yet.

Its memory-enhancing effects are inhibited by the steroid hormones aldosterone and corticosterone, though learning is unaffected (Mondadori et al., 1992).

**Dosage:** The most effective cognitive-enhancing dose is 1000 mg/day, though this is based on only one study.

## AN-1792

**Effects:** A vaccine that targets beta-amyloid.

**Precautions:** Inflammation of the brain.

**Dosage:** None established.



ANTALARMIN

**Effects:** Blocks the release of corticotrophin, believed to be the main cause of stress-related health problems, including depression. It shows potential as a treatment for anxiety and stress-induced hypertension.

**Precautions:** In studies on rats, it is not as effective as current antidepressant drugs, though it may work synergistically with SSRIs. A study using rhesus monkeys indicates its effects may diminish over time (Broadbear et al., 2004).

**Dosage:** None established.

ANTIBODIES

**Effects:** Researchers at Rensselaer Polytechnic Institute have developed antibodies that are five to ten times as effective at binding to toxic protein particles as conventional antibodies, providing a potentially new treatment for Alzheimer's disease, Parkinson's disease, and Type 2 diabetes (Tessier et al., 2012). Other researchers have discovered specific antibodies that block the functioning of Dkk1, a protein produced by amyloid-beta which attacks the synapses of the brain (Salinas et al., 2012).

**Precautions:** None known.

**Dosage:** None established.

AS-19

**Effects:** Reverses scopolamine- and dizocilpine-induced amnesia, as well as improving long-term memory (Meneses et al., 2008; Perez-García et al., 2008).

**Precautions:** Inhibits short-term memory formation.

**Dosage:** None established.

BAPINEUZUMAB

**Effects:** A drug under development for the treatment of Alzheimer's disease. It was de-

signed to bind and remove beta-amyloid plaques.

**Precautions:** It is effective only in individuals lacking the ApoE4 allele, which triggers early onset Alzheimer's disease.

**Dosage:** None established.

BCI-540

**Effects:** Has been found to boost brain cell growth by 20 percent.

**Precautions:** Has not been shown to have the side effects of other anti-depressants, though the drug is still experimental.

**Dosage:** None established.

BCI-632

**Effects:** Has been found to have cognitive-enhancing properties. According to James Schoeneck, chief executive officer of Brain-Cells, it is "the most neurogenic compound we've seen."

**Precautions:** It has yet to be tested in humans.

**Dosage:** None established.

BD

**AKA:** 1,4 butanediol; Enliven; GHRE; NRG3; Revitalize Plus; Serenity; Somatopro; Thunder Nectar; Weight Belt Cleaner.

**Effects:** Increases energy and promotes sleep. When taken orally, it is converted by the body into GHB.

**Precautions:** May contain the designer drug stimulant pentylone. Products containing BD have been associated with over 120 cases of adverse side effects, including three deaths. Side effects include dangerously low heart rate and breathing, vomiting, seizures, unconsciousness, and coma.

**Dosage:** None established.

BEFLOXATONE

**Effects:** An MAO inhibitor that does not appear to have the side effects of tricyclic an-

tidepressants (e.g., impairment of cognitive and psychomotor performance) (Rosenzweig et al., 1998).

**Precautions:** None known.

**Dosage:** In the above study, a single dose of 10 mg was used.

### BEMEGRIDE

**AKA:** Megimide.

**Effects:** May increase learning ability and slow the advance of senility.

**Precautions:** Causes convulsions.

**Dosage:** None established.

### BIFEMELANE

**AKA:** Alnert, Celeport.

**Effects:** A drug prescribed for the treatment of senile dementia in Japan, it has nootropic, neuroprotective, and antidepressant effects (Moryl et al., 1993).

**Precautions:** None known.

**Dosage:** Unknown.

### BILOBALIDE

**Effects:** A component of ginkgo biloba, it has neuroprotective effects (Kennedy et al., 2000; Stough et al., 2001; Bastianetto and Quirion, 2002; Defeudis, 2002; Kiewert et al., 2008; Shi et al., 2010)

**Precautions:** None known.

**Dosage:** None established.

### BIS-THA

**Effects:** A potent analogue of tacrine, it could be an effective treatment for Alzheimer's disease without the serious side effects of tacrine (Patani et al., 2005).

**Precautions:** None known.

**Dosage:** None established.

### BROMAZEPAM

**AKA:** Brazepam; Bromaze; Lectopam; Lexaurin; Lexilium; Lexotan; Lexotanil; Rekotnil.

**Effects:** An anti-anxiety drug.

**Precautions:** Bromazepam should not be used by pregnant women, as it could harm the fetus, or by women who are breastfeeding, as it has been linked to at least one death due to sudden infant death syndrome. It should be used with caution by the elderly, children, individuals who are alcohol- or drug-dependent, and individuals who suffer from psychiatric disorders along with any unrelated medical conditions.

Common side effects include impairment of learning ability, reduced memory functions, loss of attention span, slower reaction time, impairment of psychomotor function, drowsiness, loss of libido, dependence with withdrawal symptoms, abnormally low white blood cell count, liver damage, and jaundice. Less common side effects include anterograde amnesia and amnesic automatism. Rare side effects include dystonia. Overdose symptoms include coma.

When combined with alcohol, learning impairments are increased. When combined with cimetidine, fluvoxamine, or propranolol, it could lead to a buildup of bromazepam in the body. When combined with central nervous system depressants (e.g., alcohol, sedative drugs), the overdose symptoms of bromazepam are increased.

**Dosage:** Unknown.

### CAD-106

**Effects:** A vaccine developed for the treatment of mild to moderate Alzheimer's disease, it was found that 80 percent of the subjects involved in the studies developed their own protective antibodies against the amyloid-beta peptide (Winblad et al., 2012).

**Precautions:** No side effects were experienced by the subjects over the three-year span of the study. A previous vaccine, AN1792, activated T cells which triggered inflammation of the brain and its membranes.

## CALAMARINE

**Effects:** A deep-sea omega-3 fatty acid that provides 85 percent more DHA omega-3s to the various organs of the body, and is said to provide protection from fatigue, poor memory, mood swings, and depression, among other things.

**Precautions:** None known.

**Dosage:** None established.

## CALPAIN INHIBITORS

**Effects:** Calpains are proteins that have been found to be overactive in patients with Alzheimer's disease. In studies on tissue samples from mouse brains at Columbia University, researchers have found that inhibiting these calpains can restore normal signaling between nerve cells and improve memory (Aranzio et al., 2008).

**Precautions:** None known.

**Dosage:** None established.

## CASPASE-8

**Effects:** One theory of aging postulates that some cells in our body, instead of repairing themselves or dying off, enter a senescent state in which they still secrete chemicals, causing many of the health problems associated with old age. Researchers at the Mayo Clinic College of Medicine have found that, by killing off these senescent cells in middle-aged mice with a protein called caspase-8, they stayed younger longer. Since these cells rely on a protein called p16-Ink4a, they could be specifically targeted (Baker et al., 2011).

**Precautions:** Caspase-8 didn't work on senescent cells that don't rely on p16-Ink4a, and the mice suffered from various coronary problems (finding the right chemicals to target out of the hundreds known may prove challenging). It is not known if caspase-8 will offer similar benefits to humans. Senescent cells also keep cancer in check, and there is a

small possibility that killing off these cells will allow tumors to grow, or could cause other, unseen, problems.

**Dosage:** None established.

## CEREBROLYSIN

**AKA:** Cere, EO21, N-PEP-12.

A peptide mixture isolated from pig brain.

**Effects:** Cerebrolysin has high concentrations of magnesium, potassium, phosphorus, and selenium, along with some antioxidants. It is neuroprotective, neurotrophic, promotes neurogenesis, and may reduce the rate of apoptosis (genetically programmed cell death). One study found that it decreases the production and deposition of amyloid-beta plaques in mice (Rockenstein et al., 2002). Over 176 studies since 1973 have found improvements against memory loss, stroke, cognitive impairment, mood changes, and neurodegenerative diseases (Wise Young, Ph.D., M.D., "Cerebrolysin Review," April 1, 2006 [revised February 10, 2009], wiseyoung.wordpress.com).

**Precautions:** Its exact mechanism of action is not known. It should not be used by those sensitive to any of its ingredients, or individuals with epilepsy or severe renal impairment. It should be used with caution by women who are pregnant or breast-feeding.

Side effects include allergic reaction, loss of appetite, indigestion, diarrhea, constipation, nausea, vomiting, hyperemia (excess of blood in the skin), itching and burning at the site of injection, changes in blood pressure, lethargy, tremors, depression, apathy, dizziness, headache, shortness of breath. Rare side effects include excitement, aggressive behavior, confusion, insomnia, seizures, convulsions.

When combined with antidepressants and MAO inhibitors, it could enhance the effects of the latter drugs. It should not be combined with solutions containing lipids, solutions which change pH, or amino acid solutions.

**Dosage:** Dependent on the condition and the individual being treated.

## CI-988

A CCK-B antagonist.

**Effects:** A study of 88 patients with generalized anxiety disorder (GAD) found that three 300 mg doses a day for four weeks provide no significant benefits compared with a placebo (Adams et al., 1995).

**Precautions:** Side effects included diarrhea, dyspepsia, flatulence, and nausea.

**Dosage:** None known; the authors of the study suggested that higher doses may provide some benefit.

## CITALOPRAM

**AKA:** Celexa.

**Effects:** A SSRI prescribed for the treatment of major depression. It is used off-label for, among other things, anxiety and panic disorder. It can affect moral behavior by increasing a person's reluctance to harm others through its enhancement of serotonin (Crockett et al., 2010), and is currently being studied at the University of Pennsylvania Perelman School of Medicine, in Philadelphia as an anti-Alzheimer's drug.

**Precautions:** Like other antidepressants, it may take at least three or four weeks to take effect. A 2006 study involving nearly 300 patients concluded that half experienced significant improvement, but only about one-third achieved remission. It does not appear to be effective in treating repetitive behavior in autistic children. Though it reduces beta amyloid protein, it does not seem to prevent Alzheimer's. The 60 mg dose used in the studies is far above the 20 to 40 mg typically used in older people, and could cause dangerous disruptions in heartbeat. Long-term effects are unknown.

Common side effects include headache, nausea, dry mouth, sexual dysfunction, loss of appetite, drowsiness, insomnia, sweating, and blurred vision. Serious side effects include tremors, easy bruising or bleeding, severe dizziness, nausea, vomiting, diarrhea, fainting,

fever, fast or irregular heartbeat, unusual restlessness, black stools, vomit that has the appearance of coffee grounds, and seizures.

**Dosage:** None established.

## CITICOLINE

**AKA:** CDP Choline; Cytidine diphosphate choline.

A naturally occurring brain chemical.

**Effects:** It is prescribed for the treatment of mild to moderate Alzheimer's disease and other dementias, head trauma, stroke, and age-related memory loss; it may also be useful in the treatment of attention deficit disorder (ADD). It appears to work by increasing phosphatidylcholine in the brain.

**Precautions:** Short-term use (up to 90 days) appears to be safe; the effects of long-term use are unknown. It should not be used by women who are pregnant or breast-feeding.

Common side effects may include insomnia, headache, diarrhea, changes in blood pressure, nausea, blurred vision, changes in heartbeat, and chest pains. Less common side effects include allergic reactions and a physical dependency.

There are no known interactions with other drugs, though caution is advised, and a doctor should be informed of any smoking, regular alcohol or caffeine consumption, or any other medications, drugs, nutritional supplements, or herbal supplements being taken.

**Dosage:** Dependent on the condition being treated.

## CLAUSENAMIDE

**Effects:** A nootropic that has been found to be 50 to 100 times more powerful than piracetam.

**Precautions:** No known side effects.

**Dosage:** None established.

## CNB-001

A drug derived from curcumin, a component of turmeric.

**Effects:** Unlike curcumin, it can pass through the blood-brain barrier. Research on rabbits indicates it could be effective for up to three hours after a stroke. According to Dr. Paul Lapchak, it seems to repair four pathways in the brain, preventing the widespread destruction of brain cells.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## CX717

A drug developed from ampakines, a class of biochemicals, which has been found to enhance communication between brain cells.

**Effects:** Has been found to improve cognitive functions in sleep-deprived individuals (Boyle et al., 2005).

**Precautions:** No known side effects.

**Dosage:** None established.

## CYCLOPROLYLGLYCINE

An analogue of piracetam.

**Effects:** A nootropic similar in effect to piracetam that has also been found to have anti-anxiety properties in rats (Gudashev et al., 2001).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## DAPT

An experimental gamma secretase inhibitor.

**Effects:** Prevents neuronal cell death, providing protection against both cognitive and motor deficits from Alzheimer's and damage from traumatic brain injury (someone suffering a brain injury has a 400 percent greater chance of developing Alzheimer's) (Burns et al., 2009).

**Precautions:** None known.

**Dosage:** None established.

## DERAMCICLANE

**Effects:** An anti-anxiety drug derived from camphor, it appears to be an effective treatment for generalized anxiety disorder (GAD) (Naukkarinen et al., 2005).

**Precautions:** Common side effects include headache.

**Dosage:** The dosages used were effective in the 30 and 60 mg range.

## DESVENLAFAXINE

**AKA:** Desvenlafaxine succinate.

**Effects:** Provided short-term relief from major depressive disorder (MDD) (Liebowitz et al., 2008; Thase et al., 2009; Tourian, 2009; Reddy et al., 2010) along with physical pain associated with the disorder, as well as relief from other forms of depression (Liebowitz et al., 2007).

**Precautions:** Common side effects include nausea, dizziness, dry mouth, constipation, loss of appetite, anorexia, somnolence, insomnia, and nervousness.

**Dosage:** Doses used were between 50–200 mg/day, with no apparent significant improvement over 50 mg/day.

## DG071

A PDE4 modulator.

**Effects:** In animal tests, it significantly improved learning and long- and short-term memory, making it a potential treatment for Alzheimer's disease, Huntington's disease, schizophrenia, anxiety, ADHD, and depression.

**Precautions:** It did not cause the significant side effects of PDE4 inhibitors such as rolipram, cilomilast, and roflumilast by bypassing cAMP activity.

**Dosage:** None established.

## DIAZADAMANTOL

**Effects:** May increase learning ability and slow the advance of senility.

**Precautions:** Causes convulsions.

**Dosage:** None established.

### DIHYDREXIDINE

**AKA:** DHX.

**Effects:** Has improved cognition in individuals with Parkinson's disease, and is being investigated as a means of improving cognitive deficits in individuals with schizotypal personality disorder (SPD), a form of schizophrenia that may differ with regards to subcortical dopaminergic activity.

**Precautions:** Early trials using intravenous injections produced abnormally low blood pressure, though since it mainly acts on the dopamine D1 receptor, it did not produce the serious side effects of dopaminergic agents that mainly activate the D2 receptors.

**Dosage:** None established.

### DIPYRIDOPHENAZINE RUTHENIUM MOLECULES

**Effects:** Researchers at Rice University and the University of Miami have developed synthetic metallic molecules that bind to the amyloid peptide fibrils believed to cause Alzheimer's disease. These molecules luminesce when excited under a spectroscope, allowing researchers to track the fibrils, which may help guide chemists into designing molecules to keep the amyloid fibrils from forming Alzheimer plaques.

**Precautions:** These molecules do not inhibit the formation of fibrils, as they don't bind to all the possible sites on the fibrils, though they could be used to prevent the formation of toxic oligomers.

### DITOLYLGUANIDINE

**AKA:** 1,2-bis(2-methylphenyl)guanidine.

**Effects:** A sigma receptor agonist that has been found to have neuroprotective effects in vitro (Katnik et al., 2006) and antidepressant

effects in rats (Skuza and Rogóz, 2003). It also increases the effects of NMDA antagonists (Monnet et al., 2003).

**Precautions:** None known.

**Dosage:** None established.

### DOET

**AKA:** 2,5-Dimethoxy-4-ethylamphetamine; DOE; Hecate.

A designer drug and amphetamine substitute.

**Effects:** Hallucinations. Said to greatly increase the creativity in people who are already creative, it contributes nothing to people who are not so inclined.

**Precautions:** Side effects are said to be rare, though evidence is lacking.

**Dosage:** According to Alexander Shulgin, between 2 and 7 mg.

### DONEPEZIL

**AKA:** Aricept; donepezil hydrochloride; E-2020; Eisai.

**Effects:** Increases the availability of acetylcholine in the brain, improving memory in Alzheimer's patients for up to twelve months. Donepezil can slow the rate of cognitive impairment in Alzheimer's disease for up to a year (Petersen et al., 2005), and has even been shown to stabilize or improve cognitive function in those with severe Alzheimer's (Black, 2007). A review of 23 studies involving over 5000 subjects found that Alzheimer's patients treated for up to a year experienced significant improvements in cognitive functioning and behavior (Birks et al., 2006). Similar improvements were found in patients with dementia with Lewy bodies over a period of twelve weeks (Mori et al., 2012).

Takao Hensch, professor of cellular biology at Harvard University, has found that donepezil and similar drugs restore the neuroplasticity of the brain it experienced during early childhood, and he sees it as a useful tool in

overcoming developmental disorders. A study using young healthy subjects found that donepezil “improved long-term recall of prose, objects recall, recall of spatial locations, and integration of objects with their locations, some effects having been related to self-reported mood enhancement” at both 90 minutes and 210 minutes after ingestion, with the effects reaching their maximum at the latter testing time, when the drug’s concentration in the blood was at its peak (Zaninotto et al., 2009). A 2002 study put eighteen pilots with an average age of 52 through thirty days of training, including tests on a flight simulator; those who took donepezil performed significantly better on re-testing (including complicated flight maneuvers and in-flight emergencies) than those who took a placebo (Yesavage et al., 2002). And a UCLA study conducted in 2008 suggests it may prevent mild age-related memory impairment, though improvements were seen in PET brain scans rather than actual testing conditions. It may also be beneficial to those with vascular, or stroke-related, dementia.

Donepezil shows increased efficacy when combined with memantine. When combined with FK960, it improved natural and artificially induced memory deficits in rats (Tokita et al., 2002).

**Precautions:** Nafissa Ismail, an assistant professor in psychology at the University of Ottawa, cautions that restoring the neuroplasticity of youth could make individuals more vulnerable to social and environmental stressors, leading to long-term negative effects.

A 2011 study conducted by scientists from Trinity College Dublin found that healthy older individuals performed worse on a memory task after taking donepezil.

Common side effects include nausea, vomiting, diarrhea, constipation, muscle cramps, fatigue, and anorexia. Less common side effects include headache, dizziness, and sleep disturbances. Donepezil cannot prevent Alzheimer’s, and critics of some studies say it

masks the symptoms of cognitive decline, rather than stopping or reversing them.

**Dosage:** 5 to 10 mg/day provides significant improvement in cognitive function and behavior within three to six months and up to a period of one year, with the lower dose appearing to be the better option in terms of tolerability versus benefits.

## DULOXETINE

**AKA:** Cymbalta.

**Effects:** A serotonin and noradrenaline reuptake inhibitor (SNRI) prescribed for the treatment of generalized anxiety disorder (GAD).

**Precautions:** It is not yet known how duloxetine compares to other SNRIs.

Common side effects include nausea, dry mouth, headache, constipation, dizziness and fatigue. Rare side effects may include suicidal attempts (Carter et al., 2009).

**Dosage:** 60–120 mg/day.

## EBIRATIDE

**AKA:** Hoe-427.

An ACTH4–9 analogue.

**Effects:** Found to produce improvements in attention and mood in patients with mild cognitive impairment, but was otherwise disappointing (Siegfried, 1991), though a later study on rats indicates it may have benefits for those with Alzheimer’s and other CNS degenerative disorders (Matsumoto et al., 1995).

**Precautions:** None known.

**Dosage:** None established.

## EBSELEN

**Effects:** Has been found to have modest neuroprotective qualities in rats with acute ischemic stroke (Green and Ashwood, 2005).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

EDARAVONE

**AKA:** Radicut.

**Effects:** A free radical scavenger used to treat acute ischemic stroke in Japan.

**Precautions:** For significant improvements, it must be administered within 24 hours of an attack (Tanaka, 2002; Lapchak, 2010).

Side effects include acute renal failure.

**Dosage:** Unknown.

EPITHILONE D

**AKA:** Epo D.

**Effects:** Targets the tau proteins thought to be associated with Alzheimer's disease. It has been found to prevent the progress of Alzheimer's disease in animal models, improving neural function and cognition (Brunden et al., 2010).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

ESCITALOPRAM

**AKA:** Ciprallex; Lexam; Lexamil; Lexapro; Seroplex.

Escitalopram is the therapeutically active (and, therefore, more potent) S-enantiomer of the SSRI drug RS-citalopram.

**Effects:** An SSRI prescribed for the treatment of depression, generalized anxiety disorder (GAD), social anxiety disorder (SAD), panic disorder, and obsessive-compulsive disorder (OCD).

**Precautions:** It should not be taken by anyone who is allergic or sensitive to the drug, any of its ingredients, or similar drugs (e.g., citalopram). It should be used with caution by those 24 years of age or younger, as they could develop suicidal thoughts. A doctor should be informed if any of the following conditions apply: pregnancy or breastfeeding, recent heart attack, seizures, or liver, kidney, thyroid, or heart disease.

Common side effects include nausea, diarrhea, constipation, frequent urination, changes in libido or sexual function, drowsiness, increased sweating, dizziness, blurred vision, taste alterations, heartburn, stomach pain, unusual tiredness, dry mouth, increased appetite, flu-like symptoms, runny nose, and sneezing. Serious side effects include fever, sweating, confusion, fast or irregular heartbeat, extreme muscle stiffness, depression or worsening of depression, thoughts about self-harm or planning self-harm, excessive worrying, agitation, panic attacks, sleeping problems, aggressive behavior, irritability, impulsive acts, severe restlessness, mania (excitement that is frenzied or abnormal), and visual or auditory hallucinations. Overdose symptoms include dizziness, sweating, nausea, vomiting, tremor, drowsiness, fast or pounding heartbeat, seizure, confusion, forgetfulness, rapid breathing, and coma. Withdrawal symptoms include mood changes, irritability, agitation, dizziness, numbness or tingling in the hands or feet, anxiety, confusion, headache, tiredness, and sleeping problems.

There should be at least a 14-day window between taking escitalopram and pimozide or any MAO inhibitor. When combined with alcohol, it could increase drowsiness. It should not be combined with similar drugs, such as citalopram. A doctor should be informed if any other drugs are being taken, including (but not restricted to): anticoagulants, antihistamines, aspirin, NSAIDs, sedatives, sleeping pills, tranquilizers, migraine headache medications, anxiety medications, seizure medications, drugs for any mental condition including other antidepressants. A doctor should also be informed if any nutritional or herbal supplements are being taken, especially those containing St. John's wort or tryptophan.

**Dosage:** 10–20 mg/day.

ETIRACETAM

**AKA:** Levetiracetam.

A nootropic drug similar to piracetam.



**Precautions:** None known.

**Dosage:** None established.

## FIPEXIDE

**AKA:** Attentil; BP 662; Vigilor.

**Effects:** Can enhance dopamine to a certain degree. In one study, forty older people with advanced cognitive disorders improved their scores on a number of various tests for cognitive functioning after taking it (Bompani and Scali, 1986). It may improve learning, but not recall; improved learning may be attributed to the higher levels of dopamine, which can improve motor coordination, strengthen the immune system, and promote a sense of well-being, thus providing a better atmosphere for learning to take place.

**Precautions:** No side effects, toxicity, or contraindications known, though more research is needed.

**Dosage:** Studies to date have used 600 mg/day in three divided doses.

## 5-CARBOXAMIDOTRYPTAMINE

**AKA:** 3-(2-aminoethyl)-1H-indole-5-carboxamide; 5-CT.

**Effects:** A derivative of tryptamine that is related to serotonin, making it a possible mood enhancer.

**Precautions:** None known.

**Dosage:** None established.

## FK960

**Effects:** Improved scopolamine-induced memory impairments in rats (Yamazaki et al., 1996) and visual recognition memory in rhesus monkeys (Matsuoka and Aigner, 1997). Further research with rhesus monkeys indicates it could be an effective treatment for cognitive impairment in Alzheimer's disease (Doggrell, 2004).

When combined with donepezil, it improved natural and artificially induced memory deficits in rats (Tokita et al., 2002).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## FK962

A derivative of FK960 that is "a member of a novel class of compounds that promote somatostatin production in the brain." (McCarthy, 2010).

**Effects:** A drug developed for the treatment of Alzheimer's disease. Research was discontinued in 2006 due to its lack of efficacy, however it has since been found to be an effective treatment for improving cognition in rats when combined with donepezil (McCarthy et al., 2010). Further research has found that it stimulates neurite elongation and regeneration of cultured rat trigeminal ganglion cells (Kishimoto et al., 2012).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## FLUORAFINIL

**AKA:** (2-[bis(4-fluorophenyl)methylsulfanyl]acetamide).

**Effects:** May have nootropic effects similar to Modafinil.

**Precautions:** None known.

**Dosage:** None established.

## FLUOXETINE

**AKA:** Fluoxetine hydrochloride; Prozac; Sarafem.

**Effects:** An antidepressant selective serotonin reuptake inhibitor (SSRI). It may counter depression by triggering the growth of stem cells into neurons in the brain, which may explain why it takes three or four weeks to start working (Enikolopov et al., 2006).

**Precautions:** The question of how new neurons change mood and decrease depression is still unanswered.

**Dosage:** 20 to 80 mg/day.

### FLURIZAN

A drug similar to ibuprofen.

**Effects:** Developed to inhibit gamma secretase enzymes that produced amyloid beta 42, a form of amyloid plaque.

**Precautions:** Research was abandoned in 2008 because it did not improve the cognitive functioning or daily behavior of patients with Alzheimer's disease, weakening the prevailing theory that preventing amyloid plaques is an effective treatment for this disease.

**Dosage:** None established.

### FLUVOXAMINE

**AKA:** Fluvoxamine maleate; Luvox.

**Effects:** Has been found to decrease the severity of delirium in two patients with Alzheimer's disease (Furuse and Hashimoto, 2010). It has been suggested that SSRIs with sigma-1 receptor agonism such as fluvoxamine may prevent schizophrenia when administered at the onset of symptoms that may be early warning signs (e.g., depression, cognitive deficits) (Hashimoto et al., 2007; Hashimoto, 2009).

**Precautions:** More research is needed to determine side effects and their severity.

**Dosage:** The dosages used on the two subjects in the 2010 study were between 25–100 mg/day.

### GALANTAMINE

**AKA:** Galanthamine; Lycoremine; Nivalin; Razadyne; Razadyne ER; Razadyne IR; Reminyl.

A cholinesterase inhibitor prescribed for the treatment of Alzheimer's disease and vascular dementia that was first synthesized from various plants, including daffodils.

**Effects:** According to Corey-Bloom (2003) “[g]alantamine is the only acetylcholinesterase

inhibitor that exhibits a dual mechanism of action—inhibition of acetylcholinesterase and nicotinic receptor modulation.” In a review of the literature, Olin and Schneider (2001) said “there is evidence demonstrating efficacy for galantamine on global ratings, cognitive tests, assessments of ADLs and behavior. This magnitude for the cognitive effect is similar to other cholinesterase inhibitors including donepezil, rivastigmine, and tacrine. Galantamine's safety profile is similar to other cholinesterase inhibitors with respect to cholinergically mediated gastrointestinal symptoms.”

**Precautions:** It should not be taken by those who are allergic to it, any of its ingredients, or daffodil plants. It should be used with caution by women who are pregnant or breastfeeding. A doctor should be informed beforehand if there is any kidney or liver problems, stomach or intestinal problems, heart problems, lung problems, urination problems, or seizures.

Common side effects include dizziness, nausea, vomiting, diarrhea, anorexia, and weight loss. Rare but serious side effects include fainting, unusually slow heartbeat, urination difficulties, seizures, black or bloody stools, vomit that is bloody or looks like coffee grounds, intense stomach or abdominal pains, and irregular heartbeat.

Galantamine interacts with a wide range of drugs, including aspirin, and a doctor should be informed beforehand of any medications being taken.

**Dosage:** For Alzheimer's disease, the generally prescribed dose is 4–8 mg twice a day.

### GAMMA SECRETASE INHIBITORS

A class of drugs used to treat Alzheimer's disease.

**Effects:** May have potential to prevent long-term, or secondary, damage from apoptosis following traumatic brain injury, as amyloid plaques have been found in individuals

who have died from severe brain trauma, and brain injury increases the risk of developing Alzheimer's by 400 percent. Tests on animals appear promising (Burns et al., 2009). See also the entry under DAPT.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## GANTENERUMAB

**Effects:** An anti-Alzheimer's drug currently being tested.

**Precautions:** Shows promise, but has not yet been fully tested.

**Dosage:** None established.

## GEROVITAL

**AKA:** Gerovital H3; GH-3; KH3.

Gerovital is a chemical mixture of procaine hydrochloride, potassium metabisulfate, disodium phosphate, and benzoic acid. In the body, procaine breaks down into the B vitamin paraminobenzoic acid (PABA) and diethylaminoethanol (DEAE), a chemical relative to DMAE that is, in turn, converted into choline by the cells. While the work of Dr. Ana Aslan has made it a very famous and popular anti-aging drug, it is also very controversial—its promoters claim that it can cure over 200 diseases and ailments associated with premature aging.

**Effects:** May improve memory by promoting better utilization of oxygen in the brain. It is an anti-depressant as a result of its being an MAO inhibitor.

The Gerovital product PABA helps in forming blood cells, metabolizing protein, and performing the various functions of the skin. It also aids the intestinal bacteria in producing the vitamins folic acid, pantothenic acid, biotin, and vitamin K. Symptoms of deficiency include constipation, depression, digestive disorders, fatigue, gray hair, headaches, infertility, and irritability. By itself, it is not very effective,

but produces good results when taken with procaine hydrochloride.

Composed of choline and acetylcholine, the Gerovital product DEAE is an anti-depressant.

**Precautions:** Other researchers have been unable to duplicate discoverer Ana Aslan's positive results; some claim it is because they used straight procaine rather than GH-3, but there is much evidence to suggest that they are virtually identical. Additionally, Dr. Aslan's research has been attacked for not being well-designed and controlled, and critics assert that most of the improvements are merely the result of its anti-depressant properties. A review of the scientific literature seems to back these criticisms. Dr. Stuart Berger states that PABA is not a vitamin, but a sunblock, and that it can severely deplete the body's white blood cells, and create adverse fatty changes in the heart, liver, and kidneys if taken internally in significant amounts. According to *Prevention* magazine and Dr. Ronald Klatz, the "active ingredient" is evidently the anesthetic novacaine, which begins to break down as soon as it enters the blood. Side effects, though not common, are life-threatening: allergic reactions, a sudden drop in blood pressure, respiratory problems, and convulsions.

Because it is a weak MAO inhibitor, it does not elicit the side effects normally associated with these types of substances. There are rare allergic reactions, but otherwise no adverse effects have been reported, mainly because PABA and DEAE are quickly excreted by the body.

Use of GH-3 and related formulations is avoided by anyone on MAO inhibitors, sulfa drugs, sulfonamide drugs, or combinations like cotrimoxazole.

**Dosage:** One tablet/day for 25 days, followed by a 5 day period of abstinence.

## GHB

**AKA:** 4-hydroxybutanoic acid; 4-hydroxybutyrate; Alcover; G; gamma hydrate; gamma-

hydroxybutyrate; gamma-hydroxybutyrate sodium; Gamma OH; Juice; Liquid Ecstasy; Liquid X; sodium oxybate; sodium oxybutyrate; Somatomax PM; Xyrem.

A natural component of every cell in the body, GHB is found in the greatest concentrations in the kidneys, heart, skeletal muscles, brown fat, hypothalamus, and basal ganglia. It is a precursor to the neurotransmitter GABA and, possibly, glutamate, and may be a neurotransmitter itself. Unlike GABA, it can cross the blood/brain barrier. It rapidly metabolizes to carbon dioxide and water.

**Food Sources:** Meat, wine, small citrus fruits.

**Effects:** Used for the treatment of insomnia and anxiety in Europe, as well as to protect babies from hypoxia during childbirth. It produces a mild high, with feelings of bliss, placidity, euphoria, and sensuality. It stimulates the release of growth hormone in the body and, unlike drugs with a similar effect, GHB also increases levels of prolactin. Other physiological effects include a slight elevation of blood sugar, a significant decrease in cholesterol, a mild slowing of the heart, a slight lowering of body temperature, and a stimulation of the release of acetylcholine in the brain (which may improve memory and cognition, though this is, as yet, unproven). Sleep induced by GHB tends to be slightly deeper and somewhat shorter than sleep attained without the use of drugs; unlike other remedies for insomnia, it often does not produce grogginess upon waking. At low doses, it stimulates the release of dopamine, yet inhibits dopamine at higher concentrations. This is why it has both stimulatory and sedative properties, and why users may awake abruptly from a deep sleep.

**Precautions:** It should not be used by anyone suffering from epilepsy, convulsions, slowed heartbeat arising from conduction problems, Cushing's syndrome, severe cardiovascular disease, severe hypertension, hyperprolactinemia, or any kind of severe illness.

Before it was banned by the FDA in 1990,

it had been studied for 25 years, with the result that it has shown extremely low toxicity. Of 10 known cases of individuals who had suffered side effects, the dosages taken were not known; four of those cases involved combining it with alcohol, two involved individuals with a history of epilepsy or grand mal seizures, and two involved combining it with tranquilizers or such central nervous system depressants as Vicodin and diphenhydramine hydrochloride. Bodybuilders who had taken GHB switched to GABA after the ban. It remains a popular "rave" drug, with many deaths attributed to it, though how many of these are due to impurities, misidentification, and combining with other drugs is unknown. It has also been used as a date rape drug. Claims that it can cause sexual arousal, build muscle, reduce weight by burning fat, or have life-extending properties are unfounded. There are conflicting claims on whether it causes euphoria.

Common side effects include abrupt sedation, loss of coordination, sleepwalking, unarousability, and decreased inhibition in those taking 2 to 6 teaspoons (approximately 5 to 15 grams) twice nightly over a period of several years. Mild side effects include a numbness of the legs, headache, lethargy, dizziness, tightness in the chest, extreme ebullience, intense drowsiness, breathing difficulties, and uncontrollable muscle twitches. Severe side effects include confusion, nausea, diarrhea, incontinence, temporary amnesia, sleepwalking, uncontrollable shaking, vomiting, seizures, and brief (one to two hours) non-toxic coma. Overdose symptoms include nausea, dizziness, drowsiness, agitation, visual disturbances, depressed breathing, amnesia, unconsciousness, and death. There have also been reported instances of delirium and severe respiratory depression (Li et al., 1998). There is some research that indicates long-term use could cause seizures, though this effect remains unconfirmed. Withdrawal symptoms of high-frequency users may include anxiety, agitation, tremors, delirium, and psychosis. Complete

recovery from even the most severe side effects, however, appears to occur within a few hours and with no apparent long-term side effects. In a 1992 report, epidemiologist Ming-Yan Chin and Richard A. Kreutzer, M.D., both working for the California Department of Health Services, concluded, “there are no documented reports of long-term [adverse] effects. Nor is there any evidence for physiological addiction.” Others report that there has been one documented case of addiction, though there is no evidence of withdrawal symptoms.

Because it may deplete levels of potassium in the body, GHB is often administered with a potassium supplement in which the elemental form is equal to 10 percent of the weight of the GHB consumed. It should not be combined with central nervous system depressants such as benzodiazepines (e.g., Valium, Xanax), phenothiazines (e.g., Thorazine, Stelazine), various painkillers (e.g., opiates, barbiturates), alcohol, over-the-counter allergy and sleep remedies, or other illegal drugs, as it could lead to serious, even fatal, side effects (actor River Phoenix died of a combination of GHB, alcohol, and possibly other drugs). Food can dissipate or delay its effects, and caffeine can block its dopamine-related effects.

**Dosage:** In various studies doses of 6 to 8 g/day for eight to ten days, 20 to 30 g/day for a week, and 2.5 g/day for several years produced no adverse side effects, though anything over the recreational dose range of 500 to 3000 mg could lead to serious side effects. The initial dosage is small—an eighth to a fourth of a gram—and dissolved in water, increasing gradually to the desired dose (one level teaspoon equals approximately 2.5 grams). The dosage is adjusted according to body weight, though Ward Dean, M.D., *et al.*, published the following general dose-related expectations: less than 1 gram gives rise to mild relaxation, reduced anxiety, and increased sociability; 1 to 2 grams, strong relaxation; 2 to 4 grams, sleep of three to four hours; 4 to 8 grams—

very deep sleep of three to four hours; 10 to 30+ grams, a prolonged, very deep sleep of up to 24 hours. It is taken on an empty stomach (preferably three to four hours after the last meal) to avoid nausea, vomiting, and a delayed onset of effects. About three-quarters to one and a half grams produces a high, while 2.5 grams induces sleep.

Illicit GHB invariably contains dangerous—even toxic—impurities. Pure GHB powder has a salty/licorice taste, turns from a chalky texture to a greasy one when rubbed between the fingers, will fully dissolve in water, and will easily absorb water and turn liquid overnight.

### GILATIDE

**Effects:** A substance found in the saliva of Gila monsters that is believed to improve memory and learning, and may be beneficial to individuals suffering from Alzheimer’s, depression, schizophrenia, stroke, Parkinson’s, and AIDS.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### GRISEOLIC ACID

Derivatives are known metabolic brain-enhancers.

**Precautions:** None known.

**Dosage:** None established.

### GVS-111

**AKA:** DVD-111; Noopept.

An analog of Piracetam.

**Effects:** Experimental tests have shown it may be much more effective in enhancing various aspects of memory (formation, consolidation, and retrieval) than piracetam, both in the level of potency and range of effects. It also has anti-anxiety properties. According to researchers Ostrowskaia *et al.* (2002), “[t]he drug

action is based on the antioxidant effect, the anti-inflammatory action, and the ability to inhibit the neurotoxicity of excess calcium and glutamate, and to improve the blood rheology." In vitro tests indicate that its antioxidant action exhibits higher neuroprotective qualities against oxidative damage than piracetam, vitamin E, propyl gallate, or N-tert-butyl-2-sulpho-phenylnitron (s-PBN), which may mean it could be a potential treatment for mental retardation and chronic neurodegenerative disorders (Pelsman et al., 2003).

**Precautions:** Has yet to be fully tested on humans.

**Dosage:** In studies, between 5 to 10 mg for the treatment of cognitive deficiency resulting from cerebrovascular or post-traumatic conditions.

## HISTONE DEACETYLASE INHIBITORS

**AKA:** HDAC inhibitors, HDIs.

A class of drugs used as mood stabilizers.

**Effects:** Enhances learning and memory in mice much in the same way as environmental enrichment (Tsai et al., 2007). Tsai's research suggests that even when there is a significant loss of neurons, learning and memory can still be improved, and that recovery of long-term memory indicates that memories are not destroyed, just made inaccessible. Autopsies of mouse brains revealed that, rather than growing or forming new neurons, these drugs promoted the connections among existing neurons, indicating they may be useful in the treatment of neurodegenerative diseases and stroke.

**Precautions:** Effects have not yet been studied in humans.

**Dosage:** None established.

## HOE 065

A compound similar to inhibitors of angiotensin converting enzyme.

**Effects:** Has been found to prevent scopolamine-induced memory deficits in mice and rats (Hock et al., 1989).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## HT-0712

**Effects:** An experimental drug being developed as a memory enhancer. It works by accelerating and strengthening the process involved in taking short-term memories and storing them as long-term memories. It shows promise in helping those suffering from stroke damage or age-related memory impairment.

**Precautions:** It appears to have no effect on short-term memory, and only has a statistically significant effect on long-term memory of word recall at one specific dose.

**Dosage:** None established.

## HU210

**Effects:** An experimental drug that stimulates CB1 (cannabinoid 1) receptors in the hippocampus (the area of the brain responsible for learning and memory) with 100 times the potency of marijuana, resulting in neurogenesis, or the development of new brain cells. Though these results may not indicate an increase in intelligence, they could have anti-anxiety or anti-depressant effects.

**Precautions:** The drug has yet to be tested on humans, and long-term effects are not yet known.

**Dosage:** None established.

## HUPERZINE A

**Effects:** A nootropic alkaloid that has been isolated from a Chinese herb, it is being investigated as a treatment for Alzheimer's disease (Xu et al., 1995; Xu et al., 1999).

**Precautions:** Though it seems to offer some benefits for Alzheimer's patients, results

have been mixed, and most studies were too small (fewer than a hundred subjects) and short-term (two to three months) to come to any firm conclusions (Li et al., 2008).

Side effects may include mild to moderate nausea.

**Dosage:** None established.

## HYDERGINE

**AKA:** Circanol; Deapril-ST; dihydroergotoxine; ergoloid mesylates; ergot alkaloids dihydrogenated; Hydroloid; Niloric.

Hydergine is one of a class of drugs called ergoloid mesylates, which are a combination of three substances produced by the ergot fungus. It was discovered by Albert Hofmann, the chemist who discovered a more famous ergot derivative, LSD-25. The exact method by which it works is unknown, as ergot—a deadly poisonous dark purple or black fungus which thrives on wet grains such as rye—generally causes hallucinations, convulsions, gangrene, and death. Similar in chemistry to LSD, but non-hallucinogenic, it is—paradoxically—one of the easiest smart drugs to obtain. It is also one of the most widely researched and prescribed. It is generally prescribed to slow age-related memory loss and impaired concentration. In Europe, it is used routinely on accident victims—those suffering from shock, hemorrhage, strokes, heart attacks, drowning, electrocution, and drug overdose can sometimes be revived by intravenous injection—and on hospital patients just before standard surgeries (it gives doctors more time to handle any medical emergencies should they arise in the course of the operation).

**Effects:** Has been claimed to be an “all-purpose brain booster,” as it improves blood flow to the brain, improves the oxygen supply to the brain, increases brain cell metabolism, protects the brain from hypoxia, decreases the development of age pigment (lipofuscin) in the brain, protects brain cells from free-radical damage, keeps a proper balance of several

major neurotransmitters in the brain, normalizes systolic blood pressure, and decreases cholesterol levels. It is believed to improve memory, learning, intelligence, and recall. It may also increase the levels of some transmitters in the brain and may promote the growth of some dendrite nerve fibers. Its effectiveness as a treatment for Alzheimer’s and other age-related dementias is still in doubt.

Works synergistically with piracetam.

**Precautions:** It should not be taken by individuals who are allergic to ergot or any of its derivatives, who suffer from any kind of psychosis, whose heartbeat is less than 60 beats per minute, or whose systolic blood pressure is below 100. It may be dangerous to individuals with low blood pressure, liver disease, or psychosis.

It could result in a reduced ability of the body to adjust to cold temperatures. Common symptoms include runny nose, skin flushing, and headache. Less common symptoms are a slow heartbeat, tingling fingers, and blurred vision. Rare symptoms include fainting, rash, nausea, vomiting, stomach cramps, dizziness when arising, drowsiness, soreness under the tongue, and loss of appetite. Overdosing can cause agitation, headaches, flushing in the face, nasal congestion, nausea, vomiting, a drop in blood pressure, blurred vision, weakness, collapse, coma, and amnesia. Many doctors are not convinced of its efficacy. It is rather expensive.

When combined with other ergot preparations or sympathomimetics, it may result in decreased circulation to the limbs, which could be serious.

It could greatly intensify the effect of caffeine, cause an excessive drop in blood pressure when combined with alcohol, lead to overstimulation when combined with cocaine, and decrease the ergoloid effect when combined with marijuana or tobacco.

**Dosage:** The recommended dosage in the U.S. is 3 mg/day; in Europe, it is 9 mg/day in three divided doses, but 4.5 to 6 mg/day ap-

pears to produce good results. Sublingual tablets are ineffective if swallowed intact. It may take at least half a year before the effects are noticeable, but one study has shown that healthy young people taking 12 mg/day saw greater alertness and mental abilities after only two weeks. It works synergistically with piracetam; when the two are combined, smaller doses of each are just as effective as a larger dose of one.

### IDRA-21

An ampakine drug derived from aniracetam.

**Effects:** Has been found to improve learning and memory in animals with alprazolam and scopolamine-induced cognitive deficits (Thompson et al., 1995; Zivkovic et al., 1995).

**Precautions:** It may worsen neuronal damage after stroke or seizures.

**Dosage:** None established.

### IGMESINE

**AKA:** JO-1784.

**Effects:** A sigma receptor agonist that has been found to have neuroprotective effects in gerbils with global cerebral ischemia (O'Neill et al., 1995), beneficial effects on mice with age-related cognitive decline (Maurice et al., 1996), and antidepressant effects (Akunne et al., 2001). It has tested well in one trial on patients with depression, but further research was cancelled for marketing reasons (Volz and Stoll, 2004).

**Precautions:** None known.

**Dosage:** None established.

### IRX4204

**Effects:** Has been shown to prevent plaques related to cognitive decline associated with Alzheimer's disease in mice (Pasinetti et al., 2012).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### ISOPRINOSINE

**AKA:** Methisprinol.

Two of the ingredients in isoprinosine are inosine, which is used by the body to make RNA, and dimethylaminoethanol (DMAE), which assists the inosine in penetrating the blood-brain barrier. It is chemically similar to DMAE.

**Effects:** Assists the brain in certain key functions relating to memory formation and promotes RNA synthesis in brain cells. It promotes RNA synthesis in brain cells; is an immune stimulator which may have antiviral properties; and has been shown to increase the effectiveness of Interferon, render some herpes viruses inactive, and reduce the severity of some AIDS symptoms. It has been found to improve cognitive functions in elderly patients with age-associated memory impairment (Dunbar et al., 2007).

**Precautions:** It should not be used by those with gout or who are predisposed to developing it.

Common side effects include lightheadedness and dizziness.

**Dosage:** The dosage range use in the Dunbar study was 50–150 mg/day, with benefits seen even at the low end (50 mg/day).

### KD501

A partially purified extract of *Scrophulariae buergeriana*.

**Effects:** Has been shown to have neuroprotective, memory-enhancing, and antioxidant properties in the treatment of stroke and degenerated neuronal diseases (Jeong et al., 2009).

**Precautions:** So far, it has only been tested in vitro and in scopolamine-treated mice.

**Dosage:** None established.

### K.H.3

A procaine formula similar to Gerovital and Vitacel, it comes in gelatin capsule form, where



it is coupled with hematoporphyrin, which increases the effectiveness of procaine.

**Effects:** Allegedly improves alertness, concentration, and recall, along with a host of physical disorders.

**Precautions:** It is not taken by those allergic to procaine or who are taking sulfa drugs or MAO inhibitors. The precautions that apply to Gerovital also apply to K.H.3.

**Dosage:** 1 or 2 capsules a day with meals for five months, followed by a period of two to four weeks of no K.H.3.

## LADOSTIGIL

**AKA:** TV3326.

**Effects:** A combination of components from rasagiline and rivastigmine that is being developed to treat depression and anxiety resulting from Parkinson's and Alzheimer's disease (Weinstock et al., 2000; Weinstock et al., 2002; Maruyama et al., 2003; Sagi et al., 2003; Yogev-Falach et al., 2006).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## LANICEMINE

**AKA:** AZD6765.

An NMDA antagonist.

**Effects:** Has the rapid anti-depressant effects of ketamine without the hallucinogenic side effects (Zarate et al., 2012).

**Precautions:** None known.

**Dosage:** None established.

## LENALIDOMIDE

**Effects:** A drug being developed at the University of California, it is said to be a "fountain of youth" drug that extends lifespan by stimulating the immune system and increasing the levels of beneficial cytokines, which decrease with old age. Since very small amounts of the drug are needed, it could be almost side-effect free.

**Precautions:** It is structurally similar to thalidomide, a morning sickness drug linked to birth defects, though whether this could be a potential source of problems is unknown at this time.

**Dosage:** None established.

## LITHIUM

**AKA:** Li.

A naturally occurring mineral (listed third on the periodic table of elements), it is found in many foods and may or may not be a required nutrient.

**Effects:** A drug prescribed for the treatment of bipolar and unipolar disorders that acts on the receptors for the neurotransmitter glutamate, helping to keep the level of glutamate stable (it is believed that too much may cause mania and too little may cause depression). Studies on natural levels in water in Japan and Austria concluded that its occurrence was inversely proportional to the levels of suicides. Dr. Gerhard Schrauzer, in a 1989 paper, concluded from a study of 27 Texas counties that a high levels of lithium were associated with low levels of suicide, violent crime, and rape, and vice versa. He has called for the mineral to be added to drinking water, much like fluoride has been, claiming it will not only reduce crime and suicide, but hard drug use and dementia, as well (a preliminary study by Dr. Schrauzer has found that just 400 micrograms could improve the personalities of recovering drug addicts). Studies on mice indicate it may be a neuroprotective treatment for brain damage resulting from Parkinson's disease (Andersen et al., 2011). High concentrations are found in the fetus, indicating that it may play an important role in brain development.

**Precautions:** It is not clear at this point exactly how it works, whether lithium is more effective than other treatments, or whether suicide rates are lower on lithium compared to other drugs, which regulate the amount of

serotonin and dopamine neurotransmitters. In the 1940s, there were claims of toxicity and death when it was used as a substitute for table salt.

**Dosage:** Nutritional requirements have not been established. The average person may consume about 2 mg/day from foods; treatments with lithium can range from 10–30 mg/day up to 1000–1500 mg/day.

### LOMETRALINE

**AKA:** CP-14, 368.

**Effects:** Patented as an anti-psychotic, it was later studied as an antidepressant and anti-anxiety drug.

**Precautions:** It was found to have no potential worth, but alterations in its chemical structure led to the development of the antidepressant SSRI sertraline (Zoloft).

**Dosage:** None established.

### LP-44

**Effects:** A selective agonist of the 5HT7 serotonin receptor used in research to study various aspects of 5HT7 receptors in brain functioning, including stress, memory, learning, and the sleep-wake cycle (Monti et al., 2008; Xu et al., 2011; Monti, 2011; Costa et al., 2011).

**Precautions:** None known.

**Dosage:** None established.

### LY2886721

**Effects:** A drug developed for the treatment of Alzheimer's disease.

**Precautions:** Testing was stopped in 2013 due to potential for liver problems.

**Dosage:** None established.

### M30

**Effects:** Research indicates it may have neuroprotective and anti-depressant activities in

cases of Parkinson's disease, by regulating and processing amyloid precursor protein (APP) through increased iron chelation and by inhibiting MAO activity (Gal et al., 2006; Youdim, 2006).

**Precautions:** None known.

**Dosage:** None established.

### MARINE-D3

**Effects:** A combination of Seanol, Calamarene, and high doses of Vitamin D3, which is said to protect against age-related illnesses.

**Precautions:** None known.

**Dosage:** None established.

### MECLOFENOXATE

**AKA:** Brenal; Cellative; centrophenoxine; Clocece; CPH; Helfergen; Lucidril; Marucotol; Methoxynal; MF; Proserout.

It is very similar structurally to the important neurotransmitter acetylcholine. In the bloodstream, it breaks down into DMAE and supplies the same basic building blocks as DMAE for manufacturing acetylcholine and speeding nerve transmissions across synapses.

**Effects:** A nootropic drug, in combination with a ginkgo biloba extract (EGb-761) or zinc, has been found to reduce malondialdehyde (MDA) production and free radical oxidative damage in aged rats (al-Zuhair et al., 1998). It is used to treat the symptoms of senile dementia and Alzheimer's disease.

**Precautions:** Centrophenoxine may be dangerous to those who suffer from severe hypertension (high blood pressure), convulsions or involuntary musculoskeletal movements, hyperexcitability, insomnia, tremors, motion sickness, paradoxical drowsiness, and depression. Toxicity is uncommon in therapeutic doses; side effects are also rare, but include depression, dizziness, headaches, hyperexcitability, insomnia (especially if taken later in the day), motion sickness, sleepiness, and tremors.

**Dosage:** Some say 1000 to 3000 mg/day,

though others say that such doses are unnecessarily high, and that 80 mg/kg of body weight (the dosage most often used in clinical trials) is sufficient. It takes effect very fast.

## MEMANTINE

**AKA:** Abixa; Akatinol; Axura; Ebixa; memantine hydrochloride; Memox; Namenda.

The first in a class of drugs called NMDA receptor antagonists.

**Effects:** Prescribed for the treatment of moderate to severe Alzheimer's disease in patients who cannot tolerate ACE inhibitors, it can produce small benefits in cognition, mood, behavior, and performance in daily activities. Some studies indicate it may be beneficial for those with vascular dementia. It is also being tested as a treatment for, among other conditions, generalized anxiety disorder, depression, obsessive-compulsive disorder, attention-deficit hyperactivity disorder, HIV-associated dementia, and autism. Physician and neuroscientist Dr. Alberto Costa believes it may be an effective treatment for those with Down's syndrome.

Donepezil shows increased efficacy when combined with memantine.

**Precautions:** It does not cure or stop the progression of the disease, even in those with mild Alzheimer's. Its benefits for those with mild Alzheimer's are minimal (Schneider et al., 2011), due to the fact that the positively charged drug is repelled by a positive charge inside its target, the diseased neuron.

It should not be taken by those who are allergic to it or any of its ingredients. Exiba oral drops should not be taken by those with hereditary fructose intolerance, and Exiba tablets should not be taken by those with hereditary galactose intolerance, Lapp lactase deficiency or glucose-galactose malabsorption. A doctor should be informed first if there is any history of asthma, heart failure or heart attack, high blood pressure, kidney disease, seizures or convulsions, or urinary tract infections. A doctor

should also be informed first if a woman is pregnant or breastfeeding, or if an individual is vegetarian or eats large amounts of fruits, vegetables, and legumes.

Common and potentially serious side effects include extreme tiredness, dizziness, fever, confusion, headache, sleepiness, constipation, increased blood pressure, fatigue, vomiting, tightness in the chest, chest pain, back pain, pain anywhere else in the body, abnormal gait, fungal infections, abnormal blood clots in the veins, fainting, seizures, coughing, inflammation of the pancreas, confusion, sudden numbness or weakness (particularly on one side of the body), and depression. Rare but serious side effects include shortness of breath and visual or auditory hallucinations. Overdose symptoms include restlessness, visual or auditory hallucinations, sleepiness, and loss of consciousness.

Tobacco use may reduce the effectiveness of memantine. When combined with amantadine, dextromethorphan, or ketamine, the effects of memantine can be increased. When combined with levodopa or other dopamine agonists, anticholinergic medicines for movement disorders, barbiturates, antipsychotic medicines, baclofen, cimetidine, dantrolene, hydrochlorothiazide, nicotine, procainamide, quinidine, quinine, or ranitidine, it can change the effectiveness of the other drug. Memantine can also interact with the following medications: acetazolamide, brinzolamide, dichlorophenamide, dorzolamide, methazolamide, potassium citrate and citric acid, sodium bicarbonate, sodium citrate and citric acid.

**Dosage:** The generally prescribed dose for Alzheimer's is 5–20 mg/day.

## MEM 1003

**Effects:** Repairs some of the damage to the brain caused by Alzheimer's, mild cognitive impairment, and vascular dementia.

**Precautions:** No known side effects, but it may prove to be no more effective than caffeine.

**Dosage:** None established.

### MEM 1414 AND MEM 1917

**Effects:** MEM 1414 is an experimental drug that may help convert short-term experiences and learning into long-term memory and restore age-related memory deficits by activating a gene and protein involved in memory formation. MEM 1917 may have similar properties.

**Precautions:** No known side effects, but it may prove to be no more effective than caffeine.

**Dosage:** None established.

### MESEMBRINE

**AKA:** (3a*S*,7a*R*)-3a-(3,4-dimethoxyphenyl)-1-methyl-2,3,4,5,7,7a-hexahydroindol-6-one.

**Effects:** An alkaloid found in kanna (*Sceletium tortuosum*) (see entry) that may play a role in the plant's antidepressant effects. It acts as a serotonin reuptake inhibitor and PDE4 inhibitor.

**Precautions:** None known, though possibly some of the precautions that apply to kanna may also apply to mesembrine, such as not combining with SSRIs or MAO inhibitors.

**Dosage:** None established.

### MILACEMIDE

**AKA:** 2-n-pentylaminoacetamide.

**Effects:** A few studies have shown it to improve performance in word retrieval tasks, while having no effect on memory on those afflicted with Alzheimer's or schizophrenia.

**Precautions:** Possible side effects include elevated liver enzymes, nausea, diarrhea, and disorientation.

It is not combined with any MAO-B inhibitor drug, such as deprenyl, as it may have a negative effect on memory and brain function.

**Dosage:** The optimal dosage seems to be

400 to 1200 mg/day. Since it apparently has an inverted U-shaped dose-response curve, smaller doses (unless used in combination with other smart drugs) and larger doses may have insignificant, or even negative, results.

### MINAPRINE

An antidepressant.

**Effects:** A study using rats has shown that, with SR 95070B, it could be a possible future treatment for senile dementias and cognitive impairment in the elderly (Worms et al., 1989), and one study involving 35 subjects age 45–69 with subjective memory loss found that it had a positive effect on word recall over a two-month period (Allain et al., 1996).

**Precautions:** None known.

**Dosage:** The subjects in the 1996 study were given 200 mg/day.

### MINOCYCLINE

**Effects:** When combined with N-acetylcysteine, it was found to improve cognition and memory in rats with traumatic brain injury (Abdel Baki et al., 2010).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### MK-8931

**Effects:** A drug that may halt the progression of Alzheimer's disease by blocking beta secretase, an enzyme that helps produce amyloid-beta proteins. Early trials show nearly 100 percent efficacy in preventing the formation of these proteins.

**Precautions:** Has yet to be fully tested on humans. It is widely believed that treatment must be begun before signs of dementia occur, or the progression of the disease is inevitable. A side effect of blocking beta secretase may be the inhibition of production of myelin sheaths in peripheral nerve cells.

**Dosage:** None established.

### MW01-5-188WH

**Effects:** A novel approach to fighting Alzheimer's disease that targets glial cells. According to Ranaivo et al. (2006), "[a] corollary of the neuroinflammation hypothesis is that selective suppression of neurotoxic products produced by excessive glial activation will result in neuroprotection. We report here that daily oral administration to mice of the brain-penetrant compound 4,6-diphenyl-3-(4-(pyrimidin-2-yl)piperazin-1-yl)pyridazine (MW01-5-188WH), a selective inhibitor of proinflammatory cytokine production by activated glia, suppressed the human amyloid-beta (Abeta) 1-42-induced upregulation of interleukin-1beta, tumor necrosis factor-alpha, and S100B in the hippocampus."

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### MW151 AND MW189

**Effects:** Two examples of a new class of drugs developed at Northwestern University Feinberg School of Medicine that reduce brain inflammation, possibly leading to a blanket treatment for a variety of conditions, including Alzheimer's disease, Parkinson's disease, multiple sclerosis and traumatic brain injury. Preliminary trials on mice have been promising.

**Precautions:** The establishment of a specific time window may be crucial to the effectiveness of these drugs. They have not yet been tested on humans.

**Dosage:** None established.

### NC-1900

An arginine-vasopressin derivative.

**Effects:** Has been found to reduce spatial memory learning impairments due to hippocampal lesions (Hori et al., 2002) and

scopolamine (Mishima et al., 2003), possibly assisted by glutamate receptors (Sato et al., 2005).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### ND1251

**Effects:** Studies have shown it to have antidepressant, anti-inflammatory, and memory-enhancing effects. It appears not to have the severe side effects (e.g., nausea, vomiting) of other PDE4 inhibitors.

**Precautions:** None known.

**Dosage:** None established.

### NDD-094

**Effects:** A compound said to stop, and even reverse, memory loss, apparently by regrowing nerve cells that create acetylcholine. Patients taking NDD-094 have registered improved brain activity levels on PET scans.

**Precautions:** There may be side effects, including nausea. Much more research needs to be done.

**Dosage:** None established.

### NEBRACETAM

**Effects:** A nootropic and antidepressant.

**Precautions:** None known.

**Dosage:** None established.

### NEFAZODONE

**AKA:** Nefadar, Serzone.

**Effects:** An antidepressant that is unique in that it disrupts the ability of nerve endings within the brain from taking on serotonin and norepinephrine

**Precautions:** Since 2004, sale of this drug has been largely discontinued due to liver damage or liver failure, a rare side effect which could necessitate liver transplant or cause death. Generic versions may still be available.

**Dosage:** None established.

### NEFIRACETAM

**Effects:** Like piracetam, it is derived from pyrrolidone, which is believed to enhance the nervous system's ability to utilize acetylcholine as a neurotransmitter. One study found that it significantly increased the ability of aging rabbits to relearn a specific task (Woodruff-Pak et al., 2002).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### NICERGOLINE

**AKA:** Sermion.

**Effects:** An ergot derivative used in the treatment of cognitive, affective, and behavioral disorders in the elderly. Research indicates it also may be helpful in the treatment of various dementias, including Alzheimer's (Fioravanti and Flicker, 1997).

**Precautions:** Side effects may include insomnia, feeling hot, mild gastric upset, low blood pressure, and dizziness.

**Dosage:** Unknown.

### NIC5-15

**Effects:** A compound that may help prevent the decline in cognitive performance in patients with mild to moderate Alzheimer's disease by stopping the formation of amyloid-beta plaques (Pasinetti and Grossman, 2009).

**Precautions:** Has not been fully tested.

**Dosage:** None established.

### NICOTINICS

**Effects:** A class of drugs derived from nicotine which increase neurotransmitter activity and, it is believed, can control pain, increase attention spans, and restore memory in Alzheimer's patients. They may also improve

memory and cognitive function in healthy people.

**Precautions:** They are still in development.

**Dosage:** None established.

### NITROMEMANTINE

A synthesis of nitroglycerin and memantine.

**Effects:** Restores brain synapses lost to Alzheimer's disease, raising the possibility of regaining some functions well into the progression of the disease, even after amyloid-beta plaques and neurofibrillary tangles have formed. Researchers at the Sanford-Burnham Medical Research Institute have found, through in vitro and in vivo studies, that amyloid-beta peptides don't damage synapses directly, as was previously thought, but induce the release of too much glutamate, which eventually leads to loss of synaptic function. Unlike the positively charged memantine, which is repelled by the positive charge of the diseased neuron, NitroMemantine can bind to additional eNMDA receptors through the nitroglycerin fragment. Studies with mice have shown that it starts working within hours, and that full functioning can be restored within months.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### NOMIFENSINE

**AKA:** Merital.

**Effects:** A mood enhancer.

**Precautions:** It was withdrawn from use in 1986 because it had the rare side effect of triggering a serious blood disorder.

**Dosage:** Unknown.

### N-PEP-12

**AKA:** MemoProve.

A derivative of cerebrolysin, it is comprised of neuropeptides and amino acids.

**Effects:** A drug prescribed for the treatment of Alzheimer's disease; it is not nearly as potent as the parent drug, but it has the advantage of being administered orally, whereas cerebrolysin can only be administered intravenously. Studies indicate it may be a treatment for "normal" age-related memory loss in healthy older adults (Alvarez et al., 2005; Crook et al., 2005). An in vitro study indicates it could have neuroprotective qualities in cases of ischemic stroke, hypoxia, brain trauma, and Alzheimer's disease (Windisch et al., 2005).

**Precautions:** More testing is needed to determine its effectiveness in both healthy adults and those with neurological disorders.

**Dosage:** None established.

## NT219

**Effects:** Protects the brain from neurodegenerative diseases by inhibiting the activity of the insulin/IGF1 signaling pathway (El-Ami et al., 2013).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## NXY-059

**Effects:** Has been found to be a very effective neuroprotective agent in certain cases of acute ischemic stroke in rats and other animal models, even when administered 4–5 hours after the event (Green et al., 2003; Maples et al., 2004; Green and Ashwood, 2005).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## OPB-9195

**Effects:** Inhibits the formation of advanced glycation end products, which are implicated in age-related degenerative diseases, possibly making it useful as a treatment for Alzheimer's

disease (Miyata et al., 2000; Dukic-Stefanovic et al., 2001).

**Precautions:** Its effectiveness as a treatment for Alzheimer's is, as yet, unproven. It is usually studied as a treatment for diabetic neuropathy and nephropathy.

**Dosage:** None established.

## OPIPRAMOL

**AKA:** Ensidon; Insidon; Oprimol; Pramolan.

**Effects:** An antidepressant and anti-anxiety drug. Unlike most tricyclic antidepressants, it is not a reuptake inhibitor, but a sigma receptor agonist.

**Precautions:** Side effects include mild sedation.

It should not be taken by those with benign prostatic hyperplasia or glaucoma.

It should not be combined with alcohol.

**Dosage:** Unknown.

## ORG 12,962

**Effects:** An anti-anxiety drug that was never marketed due to side effects. It was a potent and selective agonist for the 5HT<sub>2</sub> receptor family.

**Precautions:** Side effects included dizziness and a disconnected, "spaced-out" feeling.

**Dosage:** None established.

## OXIRACETAM

**AKA:** CT-848; hydroxypiracetam; ISF-2522; Neuractiv; Neuromet.

**Effects:** An analogue of piracetam that is about two to three times more potent. One study found that 800 mg given twice daily over a period of twelve weeks improved the quality of life in individuals with dementia (Bottini et al., 1992).

**Precautions:** It appears to be non-toxic, with no ill effects in doses as high as 2400 mg/day. Little research has been done on healthy individuals, however.

Its memory-enhancing effects are inhibited by the steroid hormones aldosterone and corticosterone, though learning is unaffected (Mondadori et al., 1992).

**Dosage:** Doses of 1200 to 2400 mg/day seem to produce the greatest improvement in cognitive function, though some recommend 800 to 2400 mg/day.

## PBT2

**Effects:** An anti-Alzheimer's drug that acts as an ionophore (aiding in the transport of ions through lipid barriers such as cell membranes) in removing metals such as copper and zinc from the amyloid protein, preventing it from forming plaques, and moving them to neurons which are deficient in these metals, restoring normal neuronal functioning (Lannfelt et al., 2008; Crouch et al., 2011). It also encourages neuronal growth in the hippocampus, significantly improving executive function in just a few months.

**Precautions:** It seems to provide benefits only in patients with mild Alzheimer's disease. There appear to be no significant side effects.

**Dosage:** One study found that 250 mg/day provided the most benefits (Faux et al., 2010).

## PEXACERFONT

**Effects:** A corticotropin releasing factor (CRF) antagonist being tested for the treatment of anxiety disorders. It may also be useful for the treatment of depression.

**Precautions:** One study in which 100 mg/day were given to subjects proved disappointing (Coric et al., 2010), indicating that blocking the CRF-1 receptor may not be a viable means of treatment for anxiety.

**Dosage:** None established.

## PHENSERINE

An Alzheimer's drug that is a potent and highly selective acetylcholinesterase (AChE) inhibitor.

**Effects:** In trials using rats, it has been found to have cognitive-enhancing effects (Greig et al., 2000).

**Precautions:** It apparently has fewer side effects than either physostigmine or tacrine.

**Dosage:** None established.

## PHENYLPIRACETAM

**AKA:** Carphedon; Phenotropil.

A version of piracetam that is thirty to sixty times more potent.

**Effects:** According to Wikipedia, it has been shown to have "antipsychotic, antidepressant, anti-amnesic, anxiolytic, performance enhancing, and memory enhancing effects." It may also provide benefits in cases of traumatic brain injury, other ischemic events, and glioma.

**Precautions:** Due to its performance-enhancing effects, athletes testing positive for this drug are disqualified from competition.

**Dosage:** None established.

## PICROTOXINE

**Effects:** May increase learning ability and slow the advance of senility.

**Precautions:** Causes convulsions. This may be a misspelling of picrotoxin (aka cocculin), a poisonous plant compound that actually inhibits learning and memory (Paul et al., 2003).

## PIRACETAM

**AKA:** Cerebroforte; Dinagen; Gabacet; Lucetam; Nootropil; nootropyl; Normabrain.

A derivative of the neurotransmitter GABA, its chemical structure is very close to the amino acid pyroglutamate, a substance found in meat, vegetables, fruits, and dairy products.

**Effects:** Piracetam may facilitate communication between the two hemispheres of the brain, as well as increase the activity of the corpus callosum, which connects the hemispheres



(Giurgea and Moyersoons, 1972; Buresová and Bures, 1976). It also increases blood flow and oxygen consumption in some parts of the brain (possibly a side effect of increased brain activity) (Jordaan et al., 1996), modulates a variety of neurotransmitter systems involved in learning and memory (Winnicka et al., 2005), increases neuroplasticity, is neuroprotective during coronary bypass surgery, and an effective anti-anxiety drug, as well as an antidepressant and anticonvulsant. It is an effective treatment for, among other conditions, cognitive disorders, cognitive deficits due to Alzheimer's (Croisile et al., 1993), dementia, post-stroke aphasia, and cognitive deficits resulting from heart or brain surgery (Winblad, 2005; Waegemans et al., 2006). It has also been found to limit brain damage due to chronic alcohol consumption and hypoxia, among other things (Buranji et al., 1990; Vaglenova and Vesselinov Petkov, 2001; Gabryel et al., 2002; Kalmar, 2003). It may also reverse age-related deficits in the brains of aging mice (Pilch and Müller, 1988; Stoll et al., 1992).

It was found to improve verbal memory in college students after two weeks (Dimond and Brouwer, 1976).

Works synergistically with centrophenoxine, choline, DMAE, ginkgo biloba, Hydergine, or lecithin; for improving memory, the combination of Piracetam and choline is particularly effective.

**Precautions:** Though piracetam is derived from pyrrolidone, its full mechanism of action still remains largely a mystery. Data regarding its effects on healthy individuals is virtually non-existent, and a committee of the British Academy of Medical Sciences concluded in 2008 that most of the clinical trials for dementia were methodologically flawed. Its memory-enhancing effects may be inhibited by adrenal hormones, particularly corticosterone, or an adrenalectomy (Yan et al., 2003). It is ineffective as a long-term treatment for mild cognitive impairments (Malykh and Sadaie, 2010),

and its use as a treatment for autism and dyslexia are only partially supported by the evidence (Akhondzadeh et al., 2008).

It should be avoided by those with severe kidney failure and those taking anticoagulant drugs.

Side effects may include excitability, anxiety, irritability, headache, agitation, nervousness, and tremors. Rare side effects may include gastrointestinal distress, diarrhea, headaches, insomnia, nausea, and psychomotor agitation. It may result in acetylcholine's being used up more rapidly in the body, so a choline supplement may be needed.

It may also increase the effects of such drugs as amphetamines, psychotropics, and hydergine. It is not believed to be toxic or addictive, and has no contraindications.

**Dosage:** 800 to 1600 mg/day after an initial daily dose of 1200 to 2400 mg/day taken in the morning for the first two days. Others recommend 2400 to 4800 mg/day in three divided doses, while still others a more modest dose of 500 to 600 mg/day for a healthy person and 1000 to 2000 mg/day for an elderly person with mild to moderate memory impairment.

## PRAMIRACETAM

**AKA:** CI-879; Neupramir; Pramistar.

**Effects:** A variant of piracetam, it stimulates the functioning of the cholinergic system, but at much lower doses (it is approximately 15 times stronger than piracetam). It is not as fully tested and researched as piracetam. It can improve symptoms of memory disorders in individuals suffering from insufficient blood flow to the brain or stroke (Dziak et al., 2003), partially ameliorate scopolamine-induced amnesia in humans (Sinforiani et al., 1994), and reportedly has improved cognitive benefits following traumatic brain injury and anoxia (McLean et al., 1991; Malykh and Sadaie, 2010).

**Precautions:** Toxicity is rare, and known

side effects are few. Its memory-enhancing effects are inhibited by the steroid hormones aldosterone and corticosterone, though learning is unaffected (Mondadori et al., 1992). One study found that doses of up to 4000 mg do not provide any relief from symptoms of Alzheimer's disease (Claus et al., 1991).

**Dosage:** Examine.com recommends 1200 mg/day in two or three divided doses.

### PRE-084

**Effects:** A sigma receptor agonist that has been found to have nootropic and antidepressant properties in animal studies (Maurice et al., 1994; Maurice, 2001; Skuza and Rogoz, 2009).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### PRL-8-53

**Effects:** An experimental drug that has been shown to increase recall of word lists by as much as 150 percent (Hansl et al., 1978). Visual reaction time and fine motor control also improved to a significant degree.

**Precautions:** Its mechanism of action remains unknown. No side effects were reported.

**Dosage:** The study used an oral administration of 5 mg.

### PROPANIRACETAM

A nootropic drug similar to piracetam.

**Precautions:** No other information is available, and it could be a misidentification of pramiracetam.

### P7C3

An experimental Alzheimer's drug similar to Dimebon.

**Effects:** A compound developed by Steven

McKnight, Ph.D., and Andrew Pieper, M.D., Ph.D., of the University of Texas Southwestern Medical Center that has been found to restore the ability to form new memories in aging rats by allowing more of the baby cells in the dentate gyrus to survive and grow to become functioning brain cells. Studies show that it may be neuroprotective in cases of Parkinson's disease, amyotrophic lateral sclerosis (ALS), and traumatic brain injury. It also has an antidepressant effect through its actions on the appetite stimulant hormone ghrelin, possibly leading to a new class of drugs to treat this condition.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### RASAGILINE

**Effects:** A drug under development for the treatment of Parkinson's and Alzheimer's which may not only halt cell deterioration and protect them from additional damage, but actually repair existing damage.

**Precautions:** No known side effects.

**Dosage:** None established.

### RIBAMOL

**AKA:** 2-hydroxytriethylammonium ribonucleate.

**Effects:** May enhance memory and learning.

**Precautions:** No other information available.

### RITANSERIN

**AKA:** R 55667; Tisterton.

**Effects:** One small study found that it may have antidepressant qualities (Strauss and Klieser, 1991), and another that it may provide some benefit for those suffering from dysthymia (Reyntjens et al., 1986). It also helped improve sleep, especially in poor sleepers of

middle age (Adam and Oswald, 1989; Idzikowski et al., 1991). A preliminary study found that it could be part of a treatment strategy for the symptoms of schizophrenia, especially when combined with risperidone (Akhondzadeh et al., 2008).

**Precautions:** In the studies involving sleep, there was a rebound effect when subjects were taken off the drug.

**Dosage:** None established.

## RIVASTIGMINE

**AKA:** Exelon (rivastigmine tartrate).

The first in a new class of drugs known as acetylcholinesterase inhibitors.

**Effects:** It may be beneficial in the treatment of individuals with mild to moderate Alzheimer's disease (Finkel, 2004; Birks et al., 2009) as well as those with vascular, or stroke-related, dementia.

**Precautions:** The most effective dose range in the Birks study (6–12 mg/day) was also associated with statistically significant incidents of side effects, such as nausea, vomiting, diarrhea, anorexia, headache, fainting, abdominal pain, and dizziness. The use of a patch instead of capsules ameliorated many of these side effects.

**Dosage:** None established.

## RN-13

**AKA:** Regeneresen.

Developed by Hans J. Kugler, it is a mixture of RNA from twelve organs (placenta, testes, ovaries, hypothalamus, adrenal cortices, pituitary, thalamus, spleen, vascular walls, cerebral cortex, liver, and kidneys), along with yeast-derived nucleic acid.

**Effects:** Said to double the life span of dwarf mice, have a rejuvenating influence on the human body, and improve learning, memory, and general brain function.

**Precautions:** No other information available.

## ROLZIRACETAM

**AKA:** CI-911.

**Effects:** Like piracetam, it is derived from pyrrolidone, which is believed to enhance the nervous system's ability to utilize acetylcholine as a neurotransmitter. It has been found to improve task performance in aged rhesus monkeys.

**Precautions:** It does not appear to have been tested on humans.

**Dosage:** None established.

## SA 4503

**AKA:** Cutamesine dihydrochloride.

A sigma-1 receptor agonist.

**Effects:** A possible antidepressant that has been shown to have a rapid onset of action (Lucas et al., 2008) and to prevent neuronal cell death from oxidative stress (Tuerxun et al., 2010).

**Precautions:** None known.

**Dosage:** None established.

## SABELUZOLE

**AKA:** R-58,735.

**Effects:** Preliminary evidence indicates that it may prevent Alzheimer's from progressing (Mohr et al., 1997), mainly by stabilizing the neuronal cytoskeleton (Geerts et al., 1996) and preventing damage from tau expression (Uberty et al., 1997), and may improve memory and learning in normal individuals (Clincke et al., 1988), as well as have anti-ischemic properties.

**Precautions:** None known.

**Dosage:** None established.

## SALVIANOLIC ACID B

**Effects:** A strong antioxidant which could be a potential treatment for dementia.

**Precautions:** No known side effects.

**Dosage:** None established.

SAPUNIFIRAM**AKA:** MN19.**Effects:** Said to have nootropic properties.**Precautions:** No other information available.**Dosage:** None established.SB-224289**Effects:** Reverses 5-HT<sub>1B</sub> agonist, cholinergic antagonist, and glutamatergic antagonist learning deficits, as well as enhances learning consolidation (Meneses, 2001).**Precautions:** Has not yet been tested on humans.**Dosage:** None established.SB-271046-A**AKA:** SB-271046.**Effects:** A 5-HT<sub>6</sub> antagonist that is being developed as a treatment for cognitive dysfunction (Miguel-Hidalgo, 2001). When combined with SB-357134-A, it has been found to improve learning and memory in rats (Rogers and Hagan, 2001).**Precautions:** Has not yet been tested on humans.**Dosage:** None established.SB-357134-A**Effects:** A 5-HT<sub>6</sub> antagonist that, when combined with SB-271046-A, has been found to improve learning and memory in rats (Rogers and Hagan, 2001).**Precautions:** Has not yet been tested on humans.**Dosage:** None established.SEANOL**Effects:** According to biochemist Dr. Haengwoo Lee, a polyphenol antioxidant seaweed extract from *Ecklonia Cava* that is 40 percent fat soluble, stays in the body for twelve

hours, and is one hundred times stronger than any current antioxidant.

**Precautions:** None known.**Dosage:** None established.SGS742**AKA:** CGP36742; DVD-742.

A GABA(B) receptor antagonist.

**Effects:** In one study of 110 patients with mild cognitive impairment, it has been found to significantly improve attention and working memory (Froestl et al., 2004).**Precautions:** It should not be used by individuals with impaired renal function.

Side effects include dizziness, headache, and fatigue.

**Dosage:** The dosage used in the study was 600 mg three times a day for eight weeks.SIRAMESINE**AKA:** Lu 28-179.**Effects:** Has been shown to have antidepressant and anti-anxiety properties in animal studies.**Precautions:** Human trials failed to show similar benefits.**Dosage:** None established.6-NITROQUIPAZINE**AKA:** 6-nitro-2-piperazin-1-yl-quinoline; DU-24,565.**Effects:** A selective serotonin reuptake inhibitor used in research, it is a possible mood enhancer.**Precautions:** None known.**Dosage:** None established.SKULACHEV'S IONS**Effects:** An antioxidant created by Professor Vladimir Skulachev that he claims can prevent age-related illnesses and extend a person's lifespan by years, or even decades.

**Precautions:** The drug has yet to be tested on humans, though animal tests so far appear promising.

**Dosage:** None established.

### SOLANEZUMAB

**Effects:** An anti-Alzheimer's drug delivered by intravenous infusion which removes existing amyloid-beta plaques from the brain. Early trials have shown it to slow cognitive decline in patients in the very early stages of the disease.

**Precautions:** It did not delay cognitive and physical decline in cases of mild-to-moderate Alzheimer's.

**Dosage:** None established.

### S 12024-2

**Effects:** Has cognitive-enhancing properties. One study has shown that it improved sleep and memory in rats (de Saint Hilaire, 1995).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### S 18986

**AKA:** S18986-1.

An experimental ampakine drug that is related to cyclothiazide.

**Effects:** May enhance synaptic plasticity and the induction of long-term potentiation, one of the processes behind learning and memory. It has been found to have memory-enhancing effects in rats (Lebrun et al., 2000; Danober et al., 2002; Bertaina-Anglade et al., 2007).

**Precautions:** The memory enhancement was much more pronounced in the middle-aged rats than the older ones (Bernard et al., 2010). Has not yet been tested on humans.

**Dosage:** None established.

### SRT501

**Effects:** A drug derived from resveratrol that is 1000 more potent and designed to slow

aging and increase lifespan. It improves the functioning of a family of genes called sirtuins, making it a possible treatment for such conditions as obesity, diabetes, Alzheimer's disease, and cancer.

**Precautions:** Preliminary trials are promising, though more testing needs to be done to determine its full effects.

**Dosage:** None established.

### SRT1720

**Effects:** A drug that affects the body similar to resveratrol by burning fat and increasing stamina. Like resveratrol, it activates a protein called SIRT1, which regulates the body's energy supply. In tests on mice, it has been found to promote health, but not a longer lifespan.

**Precautions:** Has not yet been tested on humans. Independent testing by researchers at Pfizer has cast doubt on the efficacy of this and similar compounds derived from resveratrol by highlighting flaws in previous research, specifically skewed results caused by fluorogenic peptides.

**Dosage:** None established.

### STELLATE GANGLION BLOCK

**AKA:** SGB.

**Effects:** A local anesthetic injected into the stellate ganglion, a bundle of nerves found in the neck, which blocks the level of nerve growth factor and prevents the release of nor-epinephrine. According to Dr. Eugene Lipov, medical director of Advanced Pain Centers in Chicago, director of pain research at Northwest Community Hospital and medical director of Chicago Medical Innovations, a single administration can relieve symptoms of post-traumatic stress disorder (PTSD) in as little as thirty minutes. Of the sixty-plus patients treated so far, Dr. Lipov says that there is a 70 percent success rate where there is an improvement in symptoms of at least 50 percent.

**Precautions:** More testing needs to be done

to determine its true efficacy and what side effects, if any, may occur.

**Dosage:** Some patients may require as many as five or six injections.

### S33005

**Effects:** Similar to venlafaxine, but more potent (Millan et al., 2001). It has been found to have antidepressant qualities in rats (Pei et al., 2003; Cespuglio et al., 2005).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### SUNIFIRAM

**AKA:** DM235.

**Effects:** A cognitive enhancer that is four orders of magnitude stronger than piracetam (Romanelli et al., 2006).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### TACRINE

**AKA:** Cognex; tacrine hydrochloride; Tetrahydroaminoacridine; THA.

**Effects:** Has a good track record for improving memory in Alzheimer's patients, especially when taken with deprenyl and lecithin, though it does not help other damage caused by this disease. It is most effective for those whose memory problems are the result of too little acetylcholine, as it is the only drug proven to raise levels of acetylcholine in the brain.

When combined with silymarin, the gastrointestinal and cholinergic side effects are decreased (Allain et al., 1999).

**Precautions:** Not to be taken by those allergic or sensitive to Tacrine or acridine derivatives. A doctor should be consulted first if any one of the following conditions are present: heart rhythm problems, ulcers, liver disease, bladder disease, seizure disorders, asthma, or

a previous reaction to tacrine that has caused jaundice or elevated bilirubin. Women are likely to retain more of this drug in their blood and suffer side effects. Its memory-enhancing effects may be inhibited by adrenal hormones, particularly corticosterone (Yan et al., 2003).

It could be hepatotoxic (toxic to the liver) and should only be taken under a physician's guidance. It is used as a "smart drug" only by those with Alzheimer's, and even then it loses its effectiveness after only a few months.

Common side effects include headaches, sore throat, dizziness, fainting, chills, sweating, fever, stomach gas, skin rash, lack of coordination, diarrhea, nausea, vomiting, swelling in the legs and feet, a tingling in the hands and feet, difficulty urinating, joint pain and inflammation, spasticity, hyperactivity, nervousness, sinus inflammation, bronchitis, pneumonia, difficulty breathing, convulsions, liver inflammation, conjunctivitis, blood pressure changes, and broken bones. Less common side effects include loss of appetite, changes in taste, drowsiness, eyes that are dry or itching, eye pain, sties, double vision or other vision problems, glaucoma, cataracts, earache, ringing or buzzing in the ears, deafness, infections of the middle or inner ear, a flushing in the face, facial swelling, a sickly appearance, indigestion, insomnia, muscle aches, runny nose, rash, stomach pain, heavy sweating, dehydration, greater chance of tiredness or weakness, and weight gain, heart failure, heart attack, angina pains, stroke, vein irritation, cardiac insufficiency, heart palpitations, abnormal heart rhythms, migraines, slow heart rate, blood clots in the lung, elevated blood cholesterol, inflamed tongue swollen gums, dry mouth and throat, mouth sores, upset stomach, excess saliva, difficulty swallowing, esophagus and stomach irritation, bleeding or ulcers in the stomach or intestines, hemorrhoids, hiatal hernia, bloody stools, diverticulitis, loss of bowel control, impacted colon, gallbladder irritation or stones, increased appetite, diabetes, anemia, osteoporosis, tendinitis, bursitis, abnormal

dreams, speaking difficulties, loss of memory, twitching, delirium, paralysis, slow muscle movements, nerve inflammation or disease, Parkinson's-type movements, apathy, heightened sex drive, neurosis, paranoia, nosebleeds, chest congestion, asthma, rapid breathing, respiratory infection, acne, hair loss, skin rash, eczema, dry skin, herpes zoster (shingles), psoriasis, skin inflammation, cysts, furuncles, cold sores, herpes infections, blood and puss in the urine, kidney stones and infections, sugar in the urine, frequent urination, urinating at night, cystitis, vaginal bleeding, genital itching, breast pain, impotence, and prostate cancer. Rare side effects include heat exhaustion, blood infection, very abnormal heart rhythms, bowel obstruction, duodenal ulcer, convulsions, lack of coordination, thyroid changes, a reduction in white blood cell and platelet counts, muscle disease, some loss of the senses (particularly touch), severe uncontrolled movements of the face, loss of muscle tone, changes in liver function (resulting in yellow skin or eyes, changes in stool color), inflammation of the brain and possibly the central nervous system, Bell's palsy, suicidal thoughts, hysteria, psychosis, vomiting blood, fluid in the lungs, lung cancer, sudden choking, skin peeling, oily skin, skin ulcers, skin cancer, melanoma, bladder or kidney tumors, kidney failure, urinary obstruction, breast cancer, ovarian cancer, inflammation of the male reproductive tract, blindness, drooping or inflamed eyelids, and disturbances or inflammation of the inner ear. Overdose symptoms include a decrease in blood pressure, collapse, convulsions, decreased heart-beat, muscle weakness (leading to respiratory failure and death), severe nausea and vomiting, increased salivation, and heavy sweating.

Cimetidine can increase the amount of Tacrine in the blood, and tobacco can increase the rate at which it is broken down in the liver. Theophylline could intensify the effect of this drug, and anticholinergics could diminish the effect of this drug. It could also strengthen the effects of muscle relaxants during surgery.

Tacrine is taken at least one hour before or two hours after eating.

**Dosage:** Subjects with Alzheimer's showed the best improvement when given doses of 120 to 160 mg/day, but improvements in memory and the ability to think and reason lasted for only 24 weeks, after which the decline in mental abilities resumed.

### TAMOLARIZINE

**Effects:** Has been shown to protect the hippocampus from induced ischemia and improve learning in rats (Tamura et al., 2000).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### TARENFLURBIL

**AKA:** R-flurbiprofen.

Tarenflurbil is the R-enantiomer in flurbiprofen.

**Effects:** In a 2005 study, it has been found to reduce the decline in cognitive function in patients with mild Alzheimer's disease over a period of twenty-four months.

**Precautions:** A larger study following patients for eighteen months concluded that it did not slow cognitive decline or loss of daily functioning in patients with mild Alzheimer's disease (Green et al., 2009). This poor result was possibly due to its weak action against amyloid-beta and its low rate of brain penetration; as an anti-inflammatory, it is also thought to worsen the symptoms of the disease (Imbimbo, 2009). As a result, this drug is no longer being developed.

Common side effects include diarrhea, nausea, constipation, and dizziness. Rare side effects include anemia and infections.

**Dosage:** None established.

### TA-65 AND TAT2

**AKA:** Cycloastragenol.

A molecule found in the herb astragalus (*Astragalus membranaceus*).

**Effects:** Purported to be a telomerase activator, restoring the length of telomeres and prolonging youth. Individuals taking this extract are said to regrow hair, have a restored sex life, increased energy, improved vision, healthier-looking skin, and a lower incidence of degenerative diseases. A study using middle-aged mice found that, after three months, those fed food with TA-65 had lower insulin levels, regrew hair, and increased skin plumping (Blasco et al., 2011). In 2010, Intertek/AAC Labs found that the major component of TA-65 was cycloastragenol, which can activate telomerase in CD8+ T lymphocytes in human immune cells, enhancing antiviral function.

**Precautions:** Astragalus herb and extracts contain little or no TA-65; tons of plant material must be processed to obtain a small amount of the molecule. Beyond one or two studies, there appears to be no scientific evidence for its claims. An article by Thea Singer in *The Daily Beast*, “New Anti-Aging Pill Under Fire,” has raised several concerns. For instance, in the Blasco study, the youthful changes were only temporary, their lifespan was not increased, and the average length of their telomeres was not changed. Also, Carol Greider, who won a Nobel along with Elizabeth Blackburn and Jack Szostak for their discovery of telomeres and their protective properties, said a similar study on humans (*Rejuvenation Research*, Sept 2010) showed equally disappointing results, and that oral administration of TA-65 (or the drug-in-progress version TAT2) would not reach its target area without chemical modification (a study by Zhu et al., *Journal of Drug Metabolism and Pharmacokinetics*, 25 (5) 477–486, 2010, seems to confirm this). Not only that, cellular aging researcher Judith Campisi has concerns that this extract may increase the risk of cancer, as cancer cells are rich in telomeres (and, in fact, Blasco’s mice experienced an increase in liver cancer, albeit a statistically insignificant one).

**Dosage:** None established.

## TEMAZEPAM

**AKA:** Normison; Restoril.

**Effects:** A hypnotic drug prescribed for the treatment of insomnia that also has anti-anxiety properties. It is often used by members of the United States Air Force to ensure proper sleep before important missions, and is one of the most commonly abused prescription drugs outside the U.S.

**Precautions:** It should not be used by individuals with ataxia, severe hypoventilation, acute narrow-angle glaucoma, severe hepatic deficiencies, severe renal deficiencies, sleep apnea or other lung problems, severe depression or mood problems, myasthenia gravis, seizures, a personal or family history of drug or alcohol abuse, or those who are allergic or sensitive to benzodiazepines. It should not be used by women who are nursing or pregnant, as it may harm the fetus (birth defects) or child (withdrawal symptoms), or by anyone under 18 years of age (unless specially prescribed by a physician). The effects may be prolonged in obese individuals.

Side effects include headache, dizziness, fatigue, weakness, coordination problems, impaired reaction time, slurred speech, nervousness, lethargy, daytime drowsiness, blurred vision, hangover, anxiety, depression, confusion, forgetfulness, learning and memory impairments, dry mouth, diarrhea, abdominal discomfort, changes in sleep patterns, nightmares, and vertigo. Rare side effects include anorexia, ataxia, loss of equilibrium, tremors, an increase in dreaming, changes in sex drive, difficult or labored breathing, palpitations, vomiting, backache, hyperhidrosis, burning eyes, amnesia, euphoria, hallucinations, horizontal nystagmus, restlessness, overstimulation, and agitation. Serious side effects include weak or shallow breathing, fast or pounding heartbeat, nausea, rash, stomach pain, loss of appetite, confusion, slurred speech, unusual weakness, difficulty in breathing or swallowing, flu-like symptoms, urination problems,



unusual thoughts or behavior, hallucinations, agitation, aggression, thoughts of self-harm or suicide, restless movements in the eyes, mouth, or neck, easy bruising or bleeding, dark urine, clay-colored stools, and pale or yellow skin. Overdose symptoms include somnolence, confusion, impaired reflexes, respiratory depression, hypotension, and coma. Withdrawal symptoms include convulsions, tremors, abdominal and muscle cramps, vomiting, and sweating. Long-term use is not recommended, as tolerance may develop. Some evidence indicates that it has the highest rate of overdose, intoxication, coma, and death of all the prescribed benzodiazepines.

Temazepam should not be combined with alcohol, narcotics, or other psychoactive drugs, especially those with central nervous system-depressant effects. In addition to increasing the more common side effects, alcohol, in particular, raises the risk of sleep-driving and other behaviors (e.g., eating, making phone calls, having sex) with attendant amnesia of these events. It can also interact with aspirin, omega-3 fatty acids, vitamin B12, and vitamin D.

**Dosage:** For the treatment of insomnia, the generally prescribed dose is 15 mg/day for seven to ten days, though for some individuals 30 mg may be required, and for others 7.5 mg may be sufficient, especially with elderly patients.

## TENILSETAM

**AKA:** CAS 997.

**Effects:** A nootropic that has been found to improve cognition and memory in Alzheimer's patients. It has also been found to interfere with protein crosslinking of advanced glycation end-products (AGEs) in vitro (Munch et al., 1994).

**Precautions:** It appeared to be well tolerated in elderly subjects (Saletu et al., 2004).

**Dosage:** In the Saletu study, the best results were seen in the 75 to 150 mg range.

## THIAMET-G

**Effects:** Prevents the enzyme O-GlcNAcase from robbing the Tau protein of sugar molecules. Tau proteins stabilize microtubules in cells which, among other things, allow the cells to move material around and allows for the movement of organelles; it has previously been found that patients suffering from Alzheimer's have clumps of Tau with almost no sugar molecules attached, and the number of clumps is correlated with the progression of the disease (Vocadlo et al., 2012).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## 3-N-BUTYLPHTHALIDE

**Effects:** A drug isolated from celery seeds that has been shown to increase blood flow to the brain.

**Precautions:** No known side effects.

**Dosage:** None established.

## TIANEPTINE

**AKA:** Coaxil; Stablon; Tatinol.

A novel antidepressant whose method of action differs from tricyclic antidepressants (TCAs), MAO inhibitors, and selective serotonin reuptake inhibitors (SSRIs), in part in that it is non-sedating and a selective serotonin reuptake enhancer (*The Good Drug Guide*), though Peter Kramer, author of *Against Depression*, disagrees, stating that it affects the serotonin and norepinephrine pathways like all other antidepressants. It is chemically related to amineptine, but does not have the latter's dopamine uptake inhibitory properties.

**Effects:** A neuroprotective antidepressant that reduces or prevents stress-induced impairments on synaptic plasticity in the brain and memory by modulating increases in glutamate in the hippocampus and amygdala (Zoladz et al., 2008). It is said to have some success in

treating Attention Deficit Hyperactivity Disorder (ADHD) and post-traumatic stress disorder (PTSD), irritability in autistic children (Niederhofer et al., 2003), and alcohol withdrawal. It may also be useful in treating cognitive impairment related to dementia (McEwen et al., 1997).

**Precautions:** It should be used with caution by those with impaired renal function and women who are pregnant or breastfeeding. Elderly patients should take a reduced dose.

Common side effects may include dry mouth, abdominal pain, constipation, nausea, vomiting, headaches, dizziness, drowsiness, postural hypotension, insomnia, and vivid and complex dreams (Preskorn, 2004). Intravenous injection can lead to thrombosis and severe necrosis, as the tablets do not fully dissolve in the blood and particles can lodge in blood vessels. Overdose and withdrawal symptoms are rare and often mild (Preskorn, 2004).

**Dosage:** Doses in clinical trials have generally been between 25–50 mg/day.

## TRAZODONE

**AKA:** Beneficat; Deprax; Desirel; Desyrel; Desyrel Dividose; Mesyrel; Molipaxin; Olep-to; Thombran; Trazorel; Trialodine; Trittico.

A drug classified as a serotonin antagonist and reuptake inhibitor (SARI).

**Effects:** An antidepressant that also has anti-anxiety and sleep-inducing properties. It is also combined with other drugs for the treatment of panic attacks, aggressive behavior, agoraphobia, and cocaine withdrawal. It has fewer side effects than most of the tricyclic antidepressants.

**Precautions:** According to *Consumer Reports*, there is very little evidence for its efficacy as a sleep aid in cases with no accompanying depression, and only some evidence for its effectiveness as a sleep aid in patients with depression.

It should not be used by individuals who are allergic or sensitive to trazodone or nefa-

zodone, who have had a recent heart attack, or by women who are pregnant or breastfeeding (unless under the guidance of a physician). It should not be taken by children under 18 who suffer from depression or other psychiatric disorders unless under the guidance of a physician, as it could cause suicidal thinking and behavior. Patients suffering from bipolar disorder, heart disease, Long QT syndrome, kidney or liver disease, a history of drug abuse, or suicidal thoughts should inform their doctor first before taking this drug.

Side effects include headache, nausea, vomiting, a bad taste in the mouth, dry mouth, diarrhea, constipation, changes in weight or appetite, weakness, tiredness, nervousness, changes in libido, loss of concentration, memory lapses, confusion, brain fog, nightmares, muscle aches or pain, sweating, blurred vision, eyes that are tired, red, or itchy, tinnitus, stuffy nose, and restless leg syndrome. Rare serious side effects include an allergic reaction, fever, persistent sore throat, shortness of breath, stomach or abdominal pain, a painful erection lasting four hours or more, any worsening of mood or behavior, and suicide. Serious side effects requiring immediate medical attention include pain in the chest, jaw or left arm, fainting, heartbeat that is fast or irregular, severe dizziness, and seizures. Overdose symptoms include suicide. According to *Consumer Reports*, it can cause abnormally low blood pressure, dizziness, and fainting, especially in the elderly, and might weaken the immune system, as well. There is insufficient evidence to determine whether it can cause dependency or cause a rebound effect with insomnia when discontinued.

It should not be combined with MAO inhibitors or selegiline, as it could cause confusion, high blood pressure, and tremors. When combined with digoxin or phenytoin, it could cause increased blood concentrations of these drugs due to a reduction in the breakdown and elimination of them. Carbamazepine could speed up the elimination of trazodone from

the body, while ketoconazole, ritonavir, and indinavir inhibit its breakdown, which could lead to increased side effects. When combined with grapefruit juice, it could inhibit the effectiveness of trazodone. When combined with anti-seizure medication, it could cause seizures. Combined with central nervous system depressants such as alcohol and barbiturates, it could increase the effects of these other substances.

**Dosage:** For the treatment of depression, the prescribed dose is 150–600 mg/day; for insomnia, 25–75 mg/day.

## TSA

**Effects:** A chemical that removes the methyl groups that attach themselves to the DNA of a particular gene if a baby rat is not licked, groomed, or nursed by its mother after it is born. These methyl groups cause higher levels of stress hormones to be produced, resulting in abnormal behavior. A team of researchers at McGill University led by Moshe Szyf has found that, by removing them, they can lower stress and normalize behavior.

**Precautions:** It could have unintended consequences by demethylating other genes, as well.

**Dosage:** None established.

## TSG

**AKA:** tetrahydroxystilbene glucoside.

A compound in the Chinese herbal medicine *Polygonum multiflorum Thunb.*

**Effects:** According to Beijing researchers Lan Zhang, MD, PhD and Lin Li, MD, PhD, it has been found to improve learning and memory in aged rats and mice with an Alzheimer's mutation. It has also been found to reverse over-expression of the protein alpha-synuclein in the mouse brain. Accumulation and aggregation of this protein in the hippocampus may play an important role in the development of some neurodegenerative diseases, including Parkinson's, dementia with Lewy bodies, and Alzheimer's disease.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## 2-AMINO-1,2-DIHYDRONAPHTHALEN

**AKA:** 1,2-dihydronaphthalen-2-amine; 2-AD; 2-ADN; 2-aminodilin.

**Effects:** A stimulant drug with one-fourth the potency of amphetamine, it is often used as a substitute for the latter drug in animal tests (Hathaway et al., 1982).

**Precautions:** None known.

**Dosage:** None established.

## 2-AMINOTETRALIN

**AKA:** 1,2,3,4-tetrahydronaphthalen-2-amine; 2-AT; THN.

**Effects:** A stimulant drug with one-eighth the potency of amphetamine, it is often used as a substitute for the latter drug in animal tests.

**Precautions:** None known.

**Dosage:** None established.

## 2-MEA

**AKA:** Cysteamine; 2-mercaptoethylamine.

**Effects:** An antioxidant. It bolsters the immune system and may increase life span. It is used as a treatment for radiation sickness in the former Soviet Union, and can remove heavy metals such as cadmium, lead, and mercury from the body.

**Precautions:** May actually shorten the life span if a very high dosage is combined with a very high dosage of vitamin E.

**Dosage:** John Mann recommends 200 mg/day for life extension.

## UNIFIRAM

**AKA:** DM232.

**Effects:** A cognitive enhancer that is four

orders of magnitude stronger than piracetam (Romanelli et al., 2006).

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## URB597

**Effects:** An antidepressant drug that works by raising the level of endocannabinoids—cannabis-like chemicals—in the brain.

**Precautions:** No known side effects. According to lead researcher Dr. Gabriella Gobbi, it appears to be “a safer, non-addictive, non-psychotropic alternative to cannabis for the treatment of pain and depression and provides hope for the development of an alternate line of antidepressants, with a wider range of effectiveness.”

**Dosage:** None established.

## VENLAFAXINE

**AKA:** Efexor; Effexor.

**Effects:** An antidepressant of the serotonin-norepinephrine reuptake inhibitor (SNRI) class that is prescribed for major depressive disorder, generalized anxiety disorder, social phobia, panic disorder, and anxiety disorders accompanying depression.

**Precautions:** It should not be taken by those who are allergic or sensitive to its ingredients, or by women who are pregnant or nursing. Patients suffering from bipolar disorder, liver or kidney disease, high blood pressure, glaucoma, seizures or epilepsy, bleeding or clotting disorder, or high cholesterol should inform their physician first before taking this drug.

Side effects include drowsiness, dizziness, nervousness, strange dreams, increased sweating, blurred vision, dry mouth, changes in weight or appetite, mild nausea, constipation, loss of sex drive, impotence. Serious side effects include mood or behavior changes, sleep problems, and thoughts of suicide (especially

in individuals under 24 years of age). Serious side effects requiring immediate medical attention include convulsions or seizures, very stiff or rigid muscles, high fever, confusion, fast or irregular heartbeat, tremors, a sensation of almost passing out, agitation, hallucinations, overactive reflexes, nausea, vomiting, diarrhea, loss of coordination, headache, concentration problems, memory problems, weakness, loss of balance, fainting, shallow breathing or breathing problems, cessation of breathing, coughing, tightness in the chest, easy bruising.

It should not be combined with MAO inhibitors or desvenlafaxine (Pristiq). When combined with alcohol, it could increase the effects of venlafaxine. When combined with other drugs that induce sleep (cold or allergy medicine, sedatives, narcotic pain medicine, sleeping pills, muscle relaxers, and medicine for seizures or anxiety), there could be a synergistic effect. When combined with any medication for pain, fever, arthritis, or swelling, it could lead to an increased risk of bruising or bleeding.

**Dosage:** Dosage for depression can be between 75 to 375 mg/day; for other disorders, 75 to 225 mg/day.

## VINBURNINE

**AKA:** Eburnamonine; vincamone.

A metabolite of vincamine.

**Effects:** Said to be a nootropic.

**Precautions:** No other information available.

**Dosage:** None established.

## VINCAMINE

**AKA:** Oxicebral.

Made from an extract of the periwinkle plant.

**Effects:** A vasodilator (improves blood flow to the brain and enhances the brain's utilization of oxygen). It has been found to provide some benefits to patients with degenera-

tive and vascular dementia (Fischhof et al., 1996). Users claim it improves memory and cognition, but sufficient scientific research is lacking for normal, healthy people.

**Precautions:** It may cause a reduction in white corpuscles and a degeneration of muscle tissue. In rare cases, it causes gastrointestinal problems.

**Dosage:** 60 mg/day in two divided doses.

### VINPOCETINE

**AKA:** 14-ethoxycarbonyl-(3alpha,16alpha-ethyl)-14,15-eburnamine; Cavinton.

A close relative of vincamine believed to elicit more benefits and fewer side effects.

**Effects:** Reportedly a strong enhancer of memory and concentration. It improves the brain's metabolism by increasing the blood flow, speeding up the rate at which ATP is produced by the brain cells, and improving the use of glucose and oxygen in the brain. It is particularly effective for disorders caused by poor or impaired circulation, such as stroke, headaches, recurring dizziness, macular degeneration, and certain ear problems.

**Precautions:** No toxicity or contraindications. Side effects, which include dry mouth, hypotension, tachycardia, and weakness, are rare.

**Dosage:** 5 to 10 mg/day. It takes a year for the drug to reach its peak efficiency.

### VITACEL 3

The tablet form of GH-3, it has the active PBN ingredient as Gerovital. Vitacel 4 has the addition of bee propolis for its antibacterial and antiviral qualities, and royal jelly for its high levels of vitamins B-5, B-6, and C. Vitacel 7 has replaced the bisulfite and benzoic acid with vitamin-complexing agents to prevent allergy problems; according to creator Dr. Robert Koch, this last formulation helps the procaine hydrochloride stay active in the body for several hours.

**Precautions:** See the entries under Gerovital and Royal jelly.

### VK-28

A brain-permeable iron chelator.

**Effects:** Offers neuroprotection by removing iron from the brain in cases of neurodegenerative diseases such as Parkinson's disease, Alzheimer's disease, Friedreich's ataxia, and Huntington's disease (Shachar et al., 2004; Youdim et al., 2004). Excess iron accumulation in the brain is believed to have some involvement in the degeneration associated with these diseases.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

### WIN-55212-2

**AKA:** (R)-(+)-[2,3-Dihydro-5-methyl-3-(4-morpholinylmethyl)pyrrolo [1,2,3-de]-1,4-benzoxazin-6-yl]-1-naphthalenylmethanone.

A synthetic THC-like drug.

**Effects:** Ohio State University researchers have found that, when injected into rats, it preserved short-term memory by reducing inflammation in the hippocampus, and led to the generation of new brain cells (neurogenesis) by acting on the CB1 and CB2 receptors, improving memory. It has also been found to have neuroprotective properties, preventing the inflammation caused by beta amyloid proteins, among other effects (Ramirez et al., 2005).

**Precautions:** It is not used on humans due to its high potency. It must be used before memory impairment is evident, as it does not reverse the damage caused by chronic inflammation of the brain, and the results do not necessarily imply that smoking marijuana can have the same benefits.

**Dosage:** None established.

YM872

**Effects:** In vitro and in vivo studies involving rats and cats with induced focal cerebral ischemia indicates it has neuroprotective effects even when administered two hours after

the induced ischemia, making it a potential treatment for stroke victims (Takahashi et al., 2002).

**Precautions:** None known.

**Dosage:** None established.

## *Neurobiology and Neurochemistry*

### AGE-1

**AKA:** DAF-23; Phosphatidylinositol 3-kinase age-1; PI3-kinase age-1.

**Effects:** A recessive mutation in the AGE-1 gene in *C. elegans* has been found to increase its lifespan by 40 to 110 percent (Freidman and Johnson, 1988), and is dependent on the activities of DAF-16 and DAF-18. *C. elegans* with both AGE-1 and DAF-2 mutations did not live much longer than those with just the DAF-2 mutation, suggesting they both work along the same pathway and trigger similar or identical processes (Dorman et al., 1995).

### ALPHA4-BETA-DELTA

**Effects:** A brain receptor in the hippocampus that appears to slow down learning and memory at the onset of puberty. Researchers at the SUNY Downstate Medical Centre in Brooklyn believe that they can develop a pill which can reverse this process, and that mild stress may be able to partially counteract this decline.

### AMPA RECEPTORS

**AKA:** Alpha-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptors.

**Effects:** According to G. Lynch of the University of California's Department of Psychi-

atry and Human Behavior, in *Current Opinions in Pharmacology* (February 2004), "AMPA-type glutamate receptors mediate fast excitatory transmission throughout the central nervous system. Positive modulation of these receptors can potentially enhance cognition by, firstly, offsetting losses of glutamatergic synapses; secondly, promoting synaptic plasticity; and thirdly, increasing the production of trophic factors. The advent of small molecules that selectively enhance AMPA receptors in the brain made it possible to test these hypotheses. Preclinical experiments indicate that the compounds accelerate the encoding of memory and have positive effects on models of cognitive dysfunction. Initial results with human subjects are also positive. AMPA receptor modulators thus represent an entirely new approach to cognitive enhancement and the treatment of diverse brain disorders."

### APOE E2 ALLELE

**AKA:** Apolipoprotein E2 allele.

**Effects:** Helps protect against Alzheimer's disease. One study found that it was far more common in individuals aged 90 and older who still retained their mental clarity than in those aged 18 to 25 (Zubenko et al., 2005). In contrast, "APOE-e4 (or genetic markers highly correlated with it) remains by a margin the single most important genetic risk factor for AD

[Alzheimer's disease], both in terms of effect size and statistical significance" (Brady et al., *Basic Neurochemistry*, Oxford, UK: Academic Press, 2012). A 2014 study by neurologist Michael Greicius of Stanford University Medical Center in California has found that women with the APOE-ε4 (also known as APOE4 or APOE-epsilon4) variant are twice as likely to develop mild cognitive impairment or Alzheimer's disease than those with the more common normal gene, while men had only a slightly elevated risk (a 1997 study found that women with the variant were four times as likely to get Alzheimer's).

### ASTROCYTES

**AKA:** Astrocytic glial cells, astroglia.

**Effects:** Large star-shaped glial cells found in the brain and spinal cord that, among other important roles, maintain neural homeostasis and brain function by removing toxins produced by other cells. They may also play a significant role in learning and memory functions in the hippocampus, and may be a factor in diabetic-related depression. They are believed to be at the root of the cause of HIV-related dementia, as the HIV virus has been found to hide out in these cells and kill them off (Churchill et al., 2009).

**Precautions:** Since the brain is not protected by the immune system, and astrocytes do not regenerate, this finding poses new problems for fighting HIV and AIDS. The THC in marijuana impairs memory through its effects on the cannabinoid type-1 receptors (CB1R) in astrocytes (Han et al., 2012).

### ATG8A

A gene that triggers the process whereby misfolded proteins are cleared from muscle fibers, known as autophagy.

**Effects:** Researchers at Brown University have found that, by blocking the activity of dawdle (a protein complex analogous to the

mammalian protein complex activin), they were able to increase the activity of Atg8a in muscle tissue, which increased the lifespan of a fruit fly by ten days, or 20 percent (Bai et al., 2013). A similar process may also hold true for humans.

**Precautions:** The exact mechanism by which degradation of muscle tissue due to dawdle influences lifespan is still unknown.

### ATP7A

**AKA:** Copper pump 1; copper-transporting ATPase 1; Menkes disease-associated protein.

A protein in cells that regulates copper levels in the body.

**Effects:** Transports copper ions to neural synapses, facilitating communication between neurons which, in turn, promotes learning and memory. Jonathan Gitlin, M.D., the Helene B. Roberson Professor of Pediatrics at the Washington University School of Medicine in St. Louis, who leads research in this area, believes that by controlling these copper levels, we can significantly improve the way the human brain thinks.

### AUTOPHAGY GENES

**AKA:** Has been found in *C. elegans* worms and fruit flies to play an important role in regulating and lengthening lifespan (Tóth et al., 2008).

### BAF53B

**AKA:** Actin-like 6B; ACTL6B.

A gene involved in long-term memory formation that is part of the molecular complex nBAF. Mutations in the proteins of nBAF have been implicated in various intellectual disability disorders (e.g., Coffin-Siris syndrome, Nicolaides-Baraitser syndrome, sporadic autism).

**Effects:** The discovery of this gene is an important step in understanding how memory works, and may offer new ways in treating the above disorders (Vogel-Ciernia et al., 2013).



## “BENJAMIN BUTTON” GENE

**Effects:** According to medical researcher Richard F. Walker at the All Children’s Hospital in St. Petersburg, Florida, a still-undiscovered regulatory gene on the second female X chromosome that slows the rate of human physical development almost completely.

## BHB

**AKA:** Beta-hydroxybutyrate.

**Effects:** BHB is a ketone body produced during ketosis, which can be induced by fasting or a low-carbohydrate diet. It is also an isomer of GHB, and there is one hypothesis that it is at least partly responsible for the sense of well-being and feeling of euphoria associated with fasting and low-carbohydrate diets.

**Precautions:** Fasting individuals may develop a fruity odor to their breath and urine.

**Dosage:** None established.

## BRADYKININ B1

**AKA:** B1R.

A receptor in the brain involved with inflammation.

**Effects:** Overactivity of this receptor is associated with amyloid-beta plaques and loss of cognitive function. By using a molecule to block the activity of this receptor, researchers have been able to restore memory, learning, and cerebrovascular function in mice, as well as reduce amyloid-beta by over 50 percent (Hamel et al., 2013).

**Precautions:** Has not yet been tested on humans.

## BRCA1

A gene that keeps breast and ovarian tumors in check by producing proteins that mend damaged DNA.

**Effects:** It may also play a role in the development of the brain, as it prevents DNA from breaking down during cell division. Without this gene, the ATM kinase molecule is activated by all the damage, killing off the defective cells. Mice that were bred with the BRCA1 gene in neural stem cells disabled were born with brains only a third their normal size, especially affecting learning, memory, and muscle control and balance (Verma et al., 2014).

**Precautions:** The gene may not work in humans in the same way it does in mice.

## CA3 AND CA1

Subregions of the hippocampus, an area of the brain that converts short-term memories into long-term memories.

**Effects:** Researchers have found that by blocking the interactions between these two subregions in rats, they could prevent long-term memories from being formed, and by inserting a prosthetic device with electrodes in a normally functioning hippocampus to mimic these interactions, they could strengthen long-term memory consolidation. This could provide important benefits to those suffering from Alzheimer’s, stroke, or brain trauma (Berger et al., 2011).

**Precautions:** Has not yet been tested on humans.

## CCR2

**AKA:** CC-Chemokine Receptor 2.

A gene associated with the immune system that may be involved in memory.

**Effects:** Research has found that augmenting this part of the immune system in the blood boosted memory and cognitive functioning in Alzheimer-prone mice (Harries et al., 2012).

**Precautions:** Has not yet been tested on humans.

## CETP

**AKA:** CETP VV; cholesteryl ester transfer protein gene.

A gene that forms the cholesterol ester protein, which then determines the size of the high-density lipoprotein (HDL) and low-density lipoprotein (LDL) particles in the blood.

**Effects:** An Israeli study of Ashkenazi Jews found that a variant of this gene (CETP VV) has been linked to a long lifespan (individuals living into their nineties or older) and mental lucidity in their old age (Barzilai et al., 2003). It is believed that this gene produces large particles of HDL and LDL, which are more beneficial than smaller ones, as they are less likely to clog the arteries, and therefore less likely to result in a variety of coronary problems and some types of dementia and cognitive decline.

## CMA

**AKA:** Chaperone-mediated autophagy.

**Effects:** A system within cells whereby molecules find and transport damaged proteins to lysosomes, membraneous sacs filled with enzymes that digest and destroy these proteins. A breakdown of this clean-up system leads to an accumulation of proteins, which then results in age-related degenerative diseases. Researchers at the Albert Einstein College of Medicine at Yeshiva University in New York City have found that, by genetically modifying mice so that they continued to dispose of these proteins efficiently even into old age, they were able to stop the aging of mouse livers (Cuervo et al., 2008). This could mean that organisms could not only live healthier longer, but live longer lives, as well.

**Precautions:** Has not yet been tested on humans.

## CpG DNA

**Effects:** Macrophages, or immune cells in the central nervous system, called microglia, clear the brain and spinal cord of any damaged

neurons, plaques, and infectious agents. According to Dr. Yukiko Doi and others at Nagoya University, “microglial activation with unmethylated CpG DNA, which binds to an immune receptor on microglia, prevented toxicity and enhanced peptide clearance in culture. Furthermore, injection of CpG DNA directly into the brain mitigated both cognitive impairment and learning defects in a mouse model of Alzheimer disease” (Doi et al., 2009).

**Precautions:** Has not yet been tested on humans.

## DAF GENES

**Effects:** Mutations in the DAF-1 gene have been found to increase the lifespan of organisms ranging from yeast to mice. Harvard researcher Gary Ruvkun found that the DAF-2 gene, when disabled in the nerve cells of the *C. elegans* worm, doubled their lifespan. A recessive mutation in the DAF-2 gene can also significantly increase the lifespan of *C. elegans* (Dorman et al., 1995). Insulin growth factor 1 signaling in *C. elegans* affects DAF-16 which, in turn, influences the expression of genes that regulate the aging process (Murphy et al., 2003). Longevity in *C. elegans* with AGE-1 and DAF-2 mutations is also dependent on the activities of DAF-16 and DAF-18 (Dorman et al., 1995).

**Precautions:** The longer-lived worms with the disabled DAF-2 gene were fat and lazy, but this side effect was easily overcome when the gene was switched on in muscle cells.

## DAT1

A dopamine transporter gene.

**Effects:** A study of 1674 high school students who were tracked for nearly a decade and a half found that this gene, along with DRD2 and DRD4, is associated with specific behaviors such as attention regulation, motivation, violence, cognitive skills, and intelligence.

Those with certain alleles were found to have a greater level of academic achievement than their peers (Beaver et al., 2012).

**Precautions:** These genes alone did not guarantee academic success; environmental and other genetic factors are equally important.

## DOUBLE-STRAND BREAK

**AKA:** DSB.

A type of DNA damage.

**Effects:** Once thought to be solely detrimental to the brain, DSBs have been found to be a part of learning and other functions. The crucial difference is that they must be repaired within a specific time, and amyloid-beta proteins delay this process, possibly contributing to age-related illnesses (Mucke et al., 2013).

**Precautions:** Has not yet been tested on humans.

## DRD2 AND DRD4

Dopamine receptor genes.

**Effects:** A study of 1674 high school students who were tracked for nearly a decade and a half found that these genes, along with DAT1, are associated with specific behaviors such as attention regulation, motivation, violence, cognitive skills, and intelligence. Those with certain alleles were found to have a greater level of academic achievement than their peers (Beaver et al., 2012).

**Precautions:** These genes alone did not guarantee academic success; environmental as well as other genetic factors are equally important.

## DRD4 7R ALLELE

A variant of the DRD4 gene that controls dopamine which, in turn, plays an important role in attention and reward-driven learning.

**Effects:** Has been linked to personality

traits associated with social, intellectual, and physical activities. It has also been found to increase the lifespan of mice, and has been found in significantly higher rates in individuals who have lived past ninety years of age (Moyzis et al., 2013). It is found in approximately 20 percent of all humans, and may be unique to homo sapiens, as Neanderthals never migrated around the world despite having existed for hundreds of thousands of years. Studies have found that it is seen more often in migratory cultures than settled ones and, along with another variant—2R—found more often in cultures whose ancestors migrated the longest after leaving Africa (Chen et al., 1999; 2011). According to a study of Arian people in Africa, those carrying the 7R variant thrived in nomadic tribes, but were less healthy when living a settled existence in villages.

**Precautions:** The gene variant is also associated with attention-deficit hyperactivity disorder, addictions, and risky behaviors. In an article by David Dobbs for National Geographic magazine, Yale University geneticist Kenneth Kidd, who discovered the 7R variant, disputes the claims that it is an “explorer’s gene” or “adventure gene,” asserting that the evidence linking a single gene to a specific behavior is weak; not only that, there are other studies contradicting these claims (some evidence of this is the migration of the Austronesians out of Taiwan 3500 years ago, a people who were less likely to carry the 7R and 2R variants than neighboring cultures). Other experts, such as developmental and evolutionary geneticist Jim Noonan and child development psychologist Alison Gopnik, make the case that other factors could be involved, such as the increased range of abilities of our limbs and hands and a longer childhood that encourages exploration (especially of hypothetical scenarios) while still under the care of parents, traits which are lacking in other species, and possibly Neanderthals, as well. Not only that, but there is the interplay of culture and genes, with certain cultures favoring certain genes,

rather than the other way around. Other traits, such as intelligence, may play a role, too; the Austronesians, for example, could explore much farther than the Near Oceanians because they had much better boats.

### DYS389 AND DYS390

**Effects:** “Genetic regions” associated with longer, healthier lifespans (Zubenko et al., 2013).

### E4

**Effects:** A region of DNA that enhances development of the corticospinal system (Shim et al., 2012).

### “FATHER TIME” GENES

**Effects:** Aging genes that regulate health and longevity and which can be switched on or off by environmental and lifestyle factors. Professor Tim Spector, director of the Department of Twin Research at King’s College, London, and other researchers believe that this could lead to new anti-aging therapies and drugs.

### 5-HT RECEPTORS

**AKA:** 5-hydroxytryptamine 1a receptor (5-HT<sub>1a</sub> receptor).

**AKA:** 5-hydroxytryptamine 1b receptor (5-HT<sub>1b</sub> receptor).

**AKA:** 5-hydroxytryptamine(6) receptor (5-HT(6) receptor).

Serotonin pathways in the brain that may be linked to learning and memory.

**Effects:** University of Michigan scientists, led by John Traynor, Ph.D., professor of pharmacology at the U-M Medical School and director of the U-M Substance Abuse Research Center, found that increasing the signaling of this receptor in mice could result in anti-depressive behavior and an increased receptiv-

ity to SSRIs (Traynor et al., 2010). By targeting this one receptor, drug-based therapies could avoid the side effects associated with triggering other 5-HT receptors (It was the activation of 5-HT<sub>2b</sub> receptors in the heart valve that led to the development of heart valve disease in individuals taking the now-banned weight-loss drugs fenfluramine and dexfenfluramine.).

The 5-HT<sub>1b</sub> and 5-HT(6) receptors may be involved in learning and memory, though their role is still unknown (Meneses, 2001; Rogers and Hagan, 2001).

### GENES

**Effects:** It has been found that normal cognitive decline with age is ultimately caused by genetic factors; a different set of genes is linked to the decline of white matter integrity in the brain (Glahn et al., 2013).

### GLUN2B

**Effects:** A molecular subunit associated with cognitive performance.

### GPR56

Mutations in this gene have been linked to bilateral frontoparietal polymicrogyria (BFPP), a recently discovered genetic disorder responsible for a form of mental retardation.

**Effects:** Has been found to play a major role in the development of the frontal lobes of the cerebral cortex (Piao et al., 2004). The cerebral cortex is more evolved in the higher orders of mammals, and seen in its most highly developed form in humans; it is involved with the coordination and integration of voluntary motor and sensory information, and the frontal lobes of the cortex control the higher thought processes, such as memory, language, social functions, cognition, and intellect. The gene exists only in higher mammals with a frontal lobe, suggesting it may be a prime factor in evolution.

HCF-1

**AKA:** Host cell factor 1.

A longevity modulator in *Caenorhabditis elegans*, a worm used for genetic research.

**Effects:** Inactivation increases lifespan by as much as 40 percent and increases resistance to some stressors, possibly due to its regulation of transcription factor DAF-16 (Li et al., 2008).

**Precautions:** It is not known if a similar process occurs in humans.

HGMA2 GENE

**Effects:** Individuals with a cytosine base in the DNA as opposed to a thymine base at this gene had larger brains and an average IQ test score that was 1.3 points higher than normal, the first evidence linking genes to brain size and intelligence (Thompson et al., 2012).

**Precautions:** According to Dr. Tom Hartley of the University of York in England, it is too simplistic to link a specific gene with brain size and IQ. And Professor Paul Thompson has stated that exercise, improved diet, and education could each provide bigger boosts in IQ than altering a single gene.

HYPOTHALAMUS

An almond-sized organ in the brain that regulates physiological processes in the body related to growth, development, reproduction, and metabolism.

**Effects:** It may control overall aging of the body. Researchers have found that by activating the NF-kB (nuclear factor kappa-light-chain-enhancer of activated B cells) protein complex, they increased hypothalamic inflammation and decreased levels of gonadotropin-releasing hormone (GnRH), both of which accelerated aging in mice; blocking this pathway, on the other hand, slowed aging and increased lifespan approximately 20 percent (Cai et al., 2013).

**Precautions:** It is not known if a similar effect can occur in humans.

INDY GENE

**AKA:** I'm Not Dead Yet gene.

The name is presumably taken from a line in the film *Monty Python and the Holy Grail*.

**Effects:** A longevity gene in the fruit fly (*Drosophila melanogaster*). Mutations have been found to nearly double the lifespan of fruit flies (Helfanda et al., 2009).

**Precautions:** This finding appears to be somewhat controversial.

INSULIN SIGNALING PATHWAY

**AKA:** IIS; Insulin/IGF-1 signaling.

**Effects:** Responsible for a 30 percent increase in lifespan in round worms (*Caenorhabditis elegans*). Genetic mutations targeting this and the TOR pathway have created a synergistic feedback loop that increased the lifespan of these worms five-fold, the equivalent in humans of another three or four centuries of life (Kapahi et al., 2013).

**Precautions:** Has not yet been tested on humans.

INTERNEURONS

**Effects:** Interneurons are inhibitory neurons that prevent unpleasant memories from forming in the hippocampus, sending them to another part of the brain so that information can be processed and stored without being associated with a specific traumatic context or event. When these neurons were deactivated, the mice in the study no longer felt fear, indicating that interneurons were crucial for encoding fearful memories (Losonczy et al., 2014). This could lead to the development of treatment for anxiety attacks and post-traumatic stress disorder.

**Precautions:** Has not yet been tested on humans.

## KCC2

**Effects:** A molecule known as a neuronal membrane transporter that governs brain cell growth and connectivity, it has been found to protect brain cells following head trauma, from both oxidative damage and excitotoxicity (in which neurotransmitters falsely send signals for cells to die) (Pellegrino et al., 2011). This could lead to new ways of treating brain injuries, stroke, epilepsy, Parkinson's, and Alzheimer's.

## KL-VS

**Effects:** A version of the KL gene being studied by Dena Dubal of the University of California, San Francisco, and Lennart Mucke of the Gladstone Institutes that extends lifespan, partly by preventing age-related heart disease, and increases cognitive ability by about six IQ points, or 3 percent of the variation in IQ (at least, in white Americans), much higher than the one-half percent attributed to the HGMA2 and NPTN genes each. It does this by increasing klotho protein levels which, in turn, adds more GluN2B subunits in the NMDA receptors of the brain, boosting memory and learning.

**Precautions:** It may not prevent age-related cognitive decline.

## KYNURENIC ACID

A brain compound metabolized in glial cells from tryptophan.

**Effects:** Increased levels in humans have been associated with schizophrenia, HIV-related illnesses, certain metabolic disorders, and other conditions. Mice that have been genetically engineered to have 70 percent lower kynurenic acid levels in the brain have exhibited greatly improved memory and spatial navigation, abilities arising from the hippocampus, as well as increased hippocampal plasticity (Schwarcz, 2010). This discovery could lead to treatments for schizophrenia, Alzheimer's, and other brain diseases.

**Precautions:** Has not yet been tested on

humans. COX-2 inhibitors, which reduce levels of kynurenic acid, also produce cardiovascular problems.

## LIN28A

**Effects:** A gene that enhances tissue repair that is active in embryos and young organisms. When reactivated in adult mice, it regained its abilities to promote the repair of damaged tissue, among other actions (Shyh-Chang et al., 2013).

## LR11

**AKA:** SORL1; SorLA; SORLA1.

A low-density lipoprotein receptor.

**Effects:** Expression of LR11 reduces levels of extracellular amyloid beta and total cellular amyloid precursor protein in Alzheimer's disease; loss of LR11 in vulnerable neurons leads to an increase in amyloid precursor protein and amyloid beta (Scherzer et al., 2004; Offe et al., 2006).

## MGLUR5

**AKA:** Metabotropic glutamate receptor 5.

**Effects:** A glutamate receptor involved in various forms of behavioral learning. It has also been found to be involved in inhibitory learning, believed to be a parallel learning mechanism that necessitates the suppression of prior experiences in order to adjust to new situations or environments. This could lead to the development of treatments for post-traumatic stress disorder and other anxiety disorders (Xu et al., 2009). Drugs are also being developed that block this receptor, possibly leading to treatment for certain forms of autism.

## MICROBIOTA

**AKA:** Gut bacteria; psychobiotics.

The human digestive system is host to at least half a dozen phyla of microbes that breaks down into roughly one thousand different species that number around 100 trillion bac-

teria in each individual, the cells outnumbering our own by 10 to 1 and their weight equal to that of the human brain. They help digest food and help develop the immune system. Each person has a unique mixture of these microbes, and that mixture may change over a lifetime. See also the entry Probiotics.

**Effects:** They play an important role in the body's response to stress, and are believed to be a factor in anxiety and mood disorders, as well, such as altering the level of serotonin, causing depression (Foster and Neufeld, 2013). The presence or absence of gut bacteria during brain development may have profound and permanent effects on serotonin levels in adulthood, affecting men more than women (Clarke et al., 2012). A 2011 Canadian study found that anxious mice and calm mice had different microbiota, and that transplanting the gut bacteria from one to the other changed their behavior in accordance with the new microbes. It has even been suggested that microbiota may affect learning and memory.

**Precautions:** Information about microbiota is based almost exclusively on mouse studies (one study found that implanting intestinal bacteria from a lean mouse into an obese mouse triggered weight loss, though a change in diet was necessary), and may not accurately reflect human conditions. A small 2013 UCLA study found that women who ate yogurt had increased connectivity in the periaqueductal gray region and the pre-frontal cortex, areas dealing with cognitive function, but decreased activity in the area associated with bodily sensations.

## MICRORNA

**Effects:** MicroRNA are molecules within cells that help BDNF (see entry) in the hippocampus regulate the expression of protein-coding genes, and which have been associated with brain cell survival, learning, and memory. Researcher Mollie Meffert, M.D., Ph.D., associate professor of biological chemistry and neuroscience at the Johns Hopkins University

School of Medicine, believes this could lead to new treatments for mental disorders and Alzheimer's disease.

MicroRNA-574-5p helps in the production of new neurons in the brain. Researchers have discovered that amyloid precursor protein (APP) can control the growth and development of these new neurons by regulating microRNA-574-5p, possibly leading to treatments for Alzheimer's, as well as autism and schizophrenia (Zhang et al., 2014). Another molecule, miR-29, has been discovered to prevent neuronal cell death, even from multiple factors, by interacting with five members of the BH3 gene family instead of one, ensuring backup protection. Researcher Mohanish Deshmukh, associate professor of cell and developmental biology at the University of North Carolina at Chapel Hill, hopes this can eventually prevent neurodegeneration seen in Alzheimer's, Parkinson's, and ALS.

## MW108

**Effects:** An experimental molecule that appears to prevent early memory loss and repair damaged communication between brain cells in mice with Alzheimer's disease by targeting a brain enzyme, the protein kinase p38alpha MAPK. This could lead to drugs that treat Alzheimer's and other neurological diseases in their early stages (Watterson et al., 2013).

**Precautions:** Has not yet been tested on humans.

## MYELIN

A sheath of lipid and protein that surrounds axons, much like insulation covering an electrical wire.

**Effects:** The myelin sheath helps speed electrical impulses, but at the price of flexibility. Takao Hensch of the Boston Children's Hospital and colleagues have found that, by removing this sheath, they could restore neuroplasticity in mice.

## NDT80 AND P63

**Effects:** Human cells divide a finite number of times before they die (the Hayflick limit), but this limit is reset in reproductive cells, so that a child of middle-aged parents can expect to have the same lifespan as a child of parents in their late teens. When researchers turned on a gene, NDT80, that triggers a similar process in aging yeast (*Saccharomyces cerevisiae*) cells, it removed nucleolar damage and doubled the lifespan of the cells (Ünal et al., 2011). After studying the NDT80 gene, the researchers plan to investigate p63, a corresponding gene in mice and humans.

**Precautions:** The NDT80 gene produces a transcription factor, which activates other genes. These genes have yet to be identified.

## NF1

**Effects:** Removing this gene in mice enhanced neurogenesis and made them more sensitive to antidepressants; it may also result in lasting anti-depressive and anti-anxiety effects by itself (Li et al., 2012).

## NHR-8 AND NHR-62

Hormone receptors in the cell nuclei of the *Caenorhabditis elegans* worm.

**Effects:** NHR-8 affects the development of the worm and determines its maximum lifespan; if caloric intake is restricted, NHR-62 extends lifespan by 20 percent. Of the 20,000 genes in the *C. elegans* worm, 600 are dependent on NHR-62 (Bree et al., 2013). Similar receptors, the HNF-4alpha receptors, are found in humans.

## NICOTINAMIDE ADENINE DINUCLEOTIDE

**AKA:** NAD.

**Effects:** A naturally occurring chemical in cells that declines with age, which sets off a

chain of events that result in the loss of a cell's ability to make energy, contributing to the aging process. Dr. Charles Brenner, associate professor of genetics and biochemistry, has found that both caloric restriction and a natural vitamin found in milk, nicotinamide riboside (NR) can increase levels of NAD, activating the Sir2 protein, which then silences specific genes and extends the lifespan of yeast; he also found that NR works independently of resveratrol. NMN, A compound developed jointly by Harvard University and the University of New South Wales that produces NAD has been shown to reverse the loss of communication between mitochondria and the cell nucleus, reversing the aging process in mice within a week, so that a two-year-old mouse appeared to be as young as a six-month-old mouse—equivalent, say the researchers, to making a 60-year-old as young and energetic as a twenty-year-old (Sinclair et al., 2013).

**Precautions:** The human anti-aging process is much more complex.

## NITRIC OXIDE

**AKA:** Nitrogen monoxide, NO.

A cellular signaling molecule free radical gas synthesized as needed from arginine that plays a number of roles in the body. It should not be confused with the anesthetic, nitrous oxide, or the toxic air pollutant, nitrogen dioxide.

**Effects:** Regulates neurotransmitter release and neuronal function (Prast and Philippu, 2001). In the thalamus, nitric oxide helps the brain process and organize sensory information before it can move on to more complex tasks (Godwin et al., 2006). Research on rats suggests that an imbalance in the nitric oxide system in the brain may be at the root of memory and social functioning problems in schizophrenics. It can be neuroprotective following cases of brain ischemia, but only under the right circumstances (Iadecola, 1998). Flavonoids in chocolate and vegetables can boost levels in the blood, increasing blood flow.



**Precautions:** Nitric oxide can also act as a neurotoxin, with chronic expression linked to various cancers and inflammatory conditions (Nakamura et al., 2010).

## NMDA RECEPTOR

**AKA:** NMDA-R, N-methyl-D-aspartate receptor.

**Effects:** Receptors in the hippocampus that regulate synaptic plasticity and long-term memory associated with fear conditioning (Shiflett et al., 2004; Laurent et al., 2008; Liu et al., 2009; Gao et al., 2010). They work in conjunction with the Ca/calmodulin-dependent protein kinase II (CaMKII) molecule, which regulates synaptic strength (Lisman et al., 2011).

**Precautions:** Alcohol can inhibit memory via these receptors (Hicklin et al., 2011).

## NPAS4

**Effects:** A “master controller of memory” gene and transcription factor that switches on many other genes, particularly in the CA3 region of the hippocampus, which in turn adjusts the strength of the synapses, allowing new memories to be formed. This finding may aid in pinpointing the specific locations of memories in the brain (Ramamoorthi et al., 2011).

**Precautions:** It may regulate hundreds of other genes.

## NPTN

**Effects:** A gene that correlates the thickness of the cerebral cortex with intelligence; it also activates a synaptic protein affecting brain cell communication. A study of nearly 1600 teenagers found that those carrying a certain variant of the gene had a thinner cerebral cortex in the left hemisphere of the brain, most notably in the frontal and temporal lobes, and scored lower on tests measuring intelligence. Though the measured effect was small, the gene may provide important inroads in understand-

ing the mechanisms behind psychiatric disorders involving impaired cognitive function (e.g., schizophrenia, autism) (Desrivieres et al., 2014).

**Precautions:** The genetic variation accounts for approximately half a percent difference in intelligence.

## NURR1

**Effects:** A gene necessary for the survival of neurons relative to synaptic connectivity, it has been found to play a key role in neurodegeneration and cognitive deficits in Alzheimer’s disease (Barneda-Zahonero et al., 2012).

## PARKIN

A gene implicated in Parkinson’s disease.

**Effects:** Has been found to regulate the aging process in fruit flies. Boosting parkin levels in cells, researchers increased the healthy lifespan of flies at least 25 percent. It does this in two ways, by flagging damaged proteins so that cells can dispose of them before they turn toxic, and by helping remove damaged mitochondria (Rana et al., 2013).

**Precautions:** An excess of parkin (thirty times the normal amount) eliminates healthy proteins as well, and the flies die young. The optimal level of parkin in humans is not yet known.

## PBRM1

**Effects:** A genetic region on chromosome 3p21.1 linked to a risk for bipolar disorder. There is conflicting research on whether it is associated with schizophrenia and other disorders, due to the fact that risk genes for various disorders may overlap (Vassos et al., 2012; Fink, 2012).

## PERINEURONAL NETS

**Effects:** A mesh-like sheath that surrounds a nerve cell in the brain and spinal cord, limiting the formation of new connections. While

this makes the brain more efficient, it does so at the cost of flexibility, so that adults are unable to learn new information as easily as a newborn child. Neuroscientist James Fawcett and Difei Wang of the University of Cambridge in England believe that, by manipulating these nets, people can learn as rapidly as children or recover lost cognitive abilities (Wang and Fawcett, 2012).

### PGC-1

A gene that promotes mitochondrial activity.

**Effects:** When PGC-1 activity was increased in the fruit fly's digestive tract, it slowed the aging of the intestine and increased the lifespan of the fly by up to 50 percent (Rera et al., 2011).

### p66

A gene that triggers apoptosis, or genetically programmed cell death.

**Effects:** Italian researchers have found that, when mice were genetically engineered to lack this gene, their lifespan was extended.

### R55

**Effects:** Research led by Dagmar Ringe and Gregory Petsko, professors in the departments of biochemistry and chemistry at Brandeis University, has found that R55, a compound known as a pharmacological chaperone, attaches to and reinforces retromers in neurons. Retromers help keep the brain functioning efficiently by transporting faulty gene products (such as beta-amyloid) to where they can be destroyed or recycled. This could lead to treatment that slows the progression of Alzheimer's disease.

**Precautions:** It does not stop or cure Alzheimer's.

### RNF123

A gene which aids in the growth of nerve cells.

**Effects:** A gene linked to psychotic depression and changes in the hippocampus; the expression of this gene in the blood can be a risk marker at least a decade before an actual diagnosis of depression is made, as low levels are associated with a high risk for depression (Glahn et al., 2012).

**Precautions:** It is not known how RNF123 can lead to depression. A later study failed to link RNF123 with depression, but it was probably too small to have statistically significant results (Teysier et al., 2013).

### RS4950

**AKA:** The leadership gene.

**Effects:** An inherited DNA sequence linked to individuals who have risen to positions in supervisory roles in the workplace (De Neve et al., 2013).

**Precautions:** Though at least a quarter of observed leadership traits can be linked to genetics, it is uncertain how much of a role rs4950 plays in shaping a person's leadership ability. This ability is also independent of ethics and morality, so that a bad leader (Adolf Hitler, Joseph Stalin) could just as likely have the gene as a good leader (Martin Luther King, Jr., Nelson Mandela).

### SAT1

A gene linked to cellular damage and stress.

**Effects:** A study involving patients with bipolar disorder and blood samples from individuals who have committed suicide have found that a protein in the blood expressed by this gene can identify those with suicidal ideation (which can range from feelings of worthlessness to actual attempts at suicide) with up to 80 percent accuracy (Niculescu et al., 2013). This study corroborates previous work done by Gustavo Turecki, a psychiatrist at McGill University in Montreal, Canada.

**Precautions:** The study authors warn that, for better predictive accuracy, this biomarker

should be just one factor in determining a person's suicide risk. The study has been criticized as being too small and not representative of the general population.

## SENESCENT CELLS

**Effects:** Senescent cells are old dead cells that increase with age, eventually comprising up to 15 percent of tissues. Researchers at the Mayo Clinic College of Medicine in Minnesota have found that, by removing these worn-out cells from age-accelerated mice at periodic intervals starting from when they were young, they were able to reduce the incidence of cataracts, loss of muscle tissue, and wrinkled skin.

**Precautions:** It did not reverse damage that had already been done, and did not extend the lifespan of the mice, which is probably regulated through different pathways.

## SEROTONIN 2C RECEPTORS

**Effects:** Researchers have found that, by blocking these receptors in mice, they were able to reduce depression-like behaviors in mice within five days (Opal et al., 2013)

## SIRT GENES

**AKA:** Silent Information Regulators.

**Effects:** Leonard P. Guarente of M.I.T. and David A. Sinclair of Harvard Medical School have found that the genes SIRT3 and SIRT4 produce sirtuin, a protein that can determine the energy levels in cells and modulate the effects of caloric restriction. Sinclair and his colleagues have also found that SIRT1, when stimulated into greater activity by resveratrol, can extend the lifespan of yeast, *C. elegans* worms, bees, flies, and mice. SIRT1 in mice also provides protection against neurodegenerative diseases such as Alzheimer's, as well as promoting neuroplasticity, learning, and memory (Tsai et al., 2010). Researchers from the University of California, Berkeley have

found that, by infusing blood-generating stem cells in mice with a gene that produces the protein SIRT3, the mice could produce more new blood cells, reversing age-related degeneration (Chen et al., 2013). And researchers at Bar-Ilan University in Israel have found that, by manipulating SIRT6 in mice, they were able to increase their lifespans by up to 15 percent (Cohen et al., 2012).

**Precautions:** Research on *C. elegans* worms and fruit flies by Dr. David Gems and colleagues at the Institute of Healthy Aging at University College London refutes the claims that resveratrol activates sirtuins and that sirtuins increases lifespans in animals. Their conclusion was that the life-extending benefits of caloric restriction worked through other channels independent of sirtuins (Burnett et al., 2011). Sinclair has since published research validating his findings.

Nicotinamide, a component of vitamin B3, inhibits the activity of sirtuins (Sanders et al., 2007).

## SMK-1

**Effects:** A newly discovered part of the insulin signaling pathway, it is necessary for some functions of DAF-16-regulated longevity in the *C. elegans* worm (innate immune, UV, and oxidative stress), but not others (thermal stress) (Wolff et al., 2006).

## SONIC HEDGEHOG PATHWAY AGONIST

**Effects:** Molecule, or compound, that allows the cerebellum of mice with a Down's syndrome-like condition to fully grow to a size found in normal mice, boosting learning and memory (Das et al, 2013).

**Precautions:** The compound was injected as soon as the mice were born, and it is uncertain how it works, because cells in the hippocampus linked to learning and Down's syndrome appeared to be unaffected. Has not yet

been tested on humans because it may have unforeseen effects, such as spurring the growth of cancer cells.

### SOX4 AND SOX11

**Effects:** Transcription factors, or groups of proteins that form parts of DNA, that regulate the expression of genes and help an embryo develop properly. Sox4 and Sox11 are necessary for the development of the neocortex, which is essential for the organization of the complex brain in mammals. This allows mammals, humans especially, to develop fine motor skills, as well as cognitive and emotional abilities (Sestan et al, 2012).

### SRC KINASE INHIBITORS

**Effects:** Two SRC kinase inhibitors, SKI-606 and SKS-927, have been found to be neuroprotective in ischemia-induced middle cerebral artery occlusions in rats when administered up to six hours after the event, reducing vascular leakage and neurological impairments. In cases of permanent ischemia-induced occlusions, it has significantly aided recovery of physical deficits during a three-week period following the induced strokes (Liang et al., 2009).

### SRPX2

A gene linked to human speech disorders and epilepsy.

**Effects:** When this gene was inserted into mouse brain cells and its function increased, the cells grew new synapses; when this gene was blocked in fetal mice, they had fewer synapses, even as adults, and as pups lacked vocal expression under stress, indicating adverse effects on language ability (Sia et al., 2013). Previous research at the Institut de Neurobiologie de la Méditerranée in France has shown that SRPX2 works with FoxP2, a gene necessary for language ability, as well as other

functions. Understanding this gene may help in the treatment of autism.

### STEM CELLS

**Effects:** Ulrich Mueller and colleagues at The Scripps Research Institute in California have identified the stem cells responsible for producing neurons in the upper layer of the cortex, a region of the brain that deals with higher functions such as memory, language, self-awareness, and problem-solving, as well as being implicated in such disorders as schizophrenia and autism. In a 2013 study, Su-Chun Zhang, professor of neuroscience and neurology at the University of Wisconsin-Madison, has healed neurological defects in mice using human stem cells; after damaging the medial septum (a part of the brain involved with learning and memory), the stem cells were transplanted into the hippocampus (also involved in memory), where they changed and reconnected the memory circuits between the two areas, resulting in significant improvements in learning and memory. Researchers at Lund University in Sweden have rejuvenated the blood of old mice by reprogramming blood-producing stem cells, reversing epigenetic changes (Wahlestedt et al., 2013).

Examination of the blood and tissues from the body of one of the oldest living women, Hendrikje van Andel-Schipper, headed by Henne Holstege of the VU University Medical Center in Amsterdam, suggests that human lifespan may be limited by the ability of stem cells to regenerate vital tissues in the body, though she says this also raises the possibility that the elderly could be rejuvenated by injections of stem cells taken from the individual at birth or early in life. Millionaire fashion designer Peter Nygard already claims to be making himself younger through such a treatment, and hopes to build a research center in the Bahamas to continue this research.

**Precautions:** Any real-world applications of these studies are still years away.

## STONIN2

**AKA:** The “stoned” gene.

**Effects:** A gene that, when mutated in fruit flies, results in difficulties in walking and flying, making it appear as if they are “stoned,” or under the influence of drugs. Researchers at the University of Liverpool have found that, when not functioning properly, it cannot acquire the “packets” of chemicals necessary for nerve cells to communicate with each other.

**Precautions:** It is not known what effect a similar mutation would have on the human brain.

## SYNCAM 1

**Effects:** According to research by Thomas Biederer, associate professor of molecular biophysics and biochemistry at Yale University, an adhesion molecule that encourages the growth of new synapses, as well as helping to maintain them and aid in their functioning.

**Precautions:** Too much SynCAM 1 can be a hindrance to learning, as it inhibits synaptic function. Research has only been done on mice, though the molecule is almost identical to the one in humans.

## T CELLS

**AKA:** Helper T cells, T lymphocytes.

**Effects:** Lymphocytes that cluster in the lining surrounding the brain and protect it from inflammation when a person gets the flu. Mild inflammation may explain why a person feels mentally foggy when infected with a virus. According to neuroscientist Jonathan Kipnis, T cells also aid in learning by keeping inflammation in check when waste molecules are disposed of as old connections in the brain are replaced with new ones (to the immune system, these waste molecules are indistinguishable from a virus or infection). This process, set in motion by learning, reinforces itself when T cells produce more interleukin-

4 (IL-4), which further suppresses inflammation and enhances learning.

## TARGET OF RAPAMYCIN PATHWAY

**AKA:** Mammalian TOR (mTOR); TOR.

**Effects:** Responsible for a 20 percent increase in lifespan in round worms (*Caenorhabditis elegans*). Genetic mutations targeting this and the insulin signaling pathway have created a synergistic feedback loop that increased the lifespan of these worms five-fold, the equivalent in humans of another three or four centuries of life (Kapahi et al., 2013).

**Precautions:** Has not yet been tested on humans.

## TAU

**Effects:** Yee Lian Chew and colleagues at Sydney University have found that proteins from this gene play an important role in age-related degeneration and lifespan of the *Caenorhabditis elegans* worm. This discovery could lead to new forms of treatment for Alzheimer’s disease.

**Precautions:** The optimum level of tau in humans is unknown, though it is known that too little or too much can lead to dementia.

## TERC

**Effects:** Researchers, led by Professor Nilesh Samani of the University of Leicester and Professor Tim Spector from King’s College London, have found a gene that sets the length of telomeres when a person is born and the rate at which they shorten during a person’s lifetime. Individuals with a particular variant aged a few years faster than others.

## TESC

**Effects:** A gene linked to the size of the hippocampus, a region of the brain involved in memory. A genetic variant speeds up the

shrinkage of this region by as much as five years, making those with the mutation more susceptible to developing Alzheimer's disease (Thompson et al., 2012).

### TFP5

**Effects:** A molecule that reverses Alzheimer's-like symptoms and restores memory when injected into mice (Shukla et al., 2013).

**Precautions:** No obvious side effects. Has not yet been tested on humans.

### TP53

A gene that controls cell death.

**Effects:** Of the two variants of this gene, R and P, individuals with the R variant will experience more disability following a stroke, as their neurons are more vulnerable to death by oxygen deprivation (Gomez-Sanchez et al., 2011).

### TREM2

**AKA:** Triggering receptor expressed on myeloid cells 2.

**Effects:** A gene mutation in the immune system that severely hinders white blood cells from attacking amyloid beta protein, significantly increasing a person's risk for developing Alzheimer's disease. Researcher John Hardy of University College London calls the unmutated gene a "safety net," and those without it are three to five times as likely to develop Alzheimer's (Guerreiro et al., 2013; Jonsson et al., 2013).

### URINE CELLS

**Effects:** Stem-cell biologist Duanqing Pei and others at China's Guangzhou Institutes of Biomedicine and Health have been able to

turn discarded cells in human urine into neurons, a process that not only sidesteps the problems associated with similar research involving stem cells, but is faster.

**Precautions:** It has only been tested on newborn rat brains.

### VMAT2

**AKA:** "The God gene."

**Effects:** In his 2004 book *The God Gene: How Faith Is Hardwired Into Our Genes*, behavioral geneticist Dean Hamer postulates that spirituality and the search for transcendence is an intrinsic part of human nature. He has found that brain chemicals associated with various emotions also play a role in the deep meditative states found in Zen practitioners, the prayers of Roman Catholic nuns, and the mystical trances induced by psychedelic drugs; the gene VMAT2 regulates the flow of these chemicals to the brain.

**Precautions:** Hamer's methodology has been criticized, as well as his belief that there is empirical proof for religious experience. His conclusions have been dismissed as simplistic and speculative (linking a specific gene with a specific personality trait), and based too heavily on anecdotal evidence. Bishop Adam Richardson, Jr., of the Washington area district of the African Methodist Episcopal Church states that this theory also implies that criminals may be hardwired to be bad, making rehabilitation futile, and that people may believe that there are genetic limits to personal growth. Hamer himself admits that the term "God gene" is a misnomer, and that there may be many more genes involved in the feeling of transcendence.

## Other

### APOAEQUORIN

**AKA:** Aequorin, Prevacen.

A recombinant calcium binding protein that is a component of aequorin, a photoprotein found in luminescent jellyfish and other marine organisms. Aequorin is used in molecular biology research, as its luminosity makes it easy to detect, among other advantages.

**Effects:** Replaces the body's calcium-binding proteins, which prevent the death of cells that play a role in learning and memory; aging causes the loss of the body's ability to make these proteins. One study found that apoaequorin prevented age-related declines in learning and memory in elderly dogs (Milgram et al., 2010).

**Precautions:** Studies have not yet been done on humans, and its claims have not been scientifically validated. Anecdotal reports indicate it may take up to three months to experience benefits (though some report they feel increased focus and clarity within a week).

**Dosage:** None established.

### BACTERIA

**AKA:** *Mycobacterium vaccae*.

An innocuous bug, related to the bacteria that cause tuberculosis and leprosy, that has been heat-killed.

**Effects:** Oncologist Mary O'Brien of the Royal Marsden Hospital in London found that,

after inoculating lung cancer patients with an experimental treatment using *Mycobacterium vaccae*, their emotional health, energy, and overall cognitive function improved. Chris Lowry of Bristol University believes this bacterium creates a reaction in the body that eventually leads to the release of the neurotransmitter serotonin, and that it could eventually be used as a treatment for clinical depression. This may be one explanation of why depression is becoming more common, as lack of childhood exposure to even harmless bacteria due to an increased overemphasis on hygiene has led to immune systems that cannot distinguish between real threats and normal bodily functions (Raison et al., 2010). This may also be an explanation for the alarming rise in asthma and allergies in recent years. Dr. Molly Fox, of Cambridge University's Biological Anthropology division, conducted a worldwide study in 2013 which found that there is a correlation between sanitation, clean drinking water, and rates of infectious diseases with higher rates of Alzheimer's disease.

Research by Dorothy Matthews and Susan Jenks of The Sage Colleges in Troy, New York, found that mice that were fed this live bacteria ran a maze twice as fast as those who weren't, though this improvement leveled off after a few weeks.

**Precautions:** This theory has not yet been adequately tested.

**Dosage:** None established.

## BENJAMIN BUTTON JELLYFISH

**AKA:** *Turritopsis dohrnii*.

Named after a character in an F. Scott Fitzgerald story who ages in reverse.

**Effects:** The jellyfish grows younger and younger until it turns back into a polyp. It is being studied in hopes that it has some practical applications for human aging.

## BHA

**AKA:** Butylated hydroxyanisole.

A food preservative added to prevent oxidation and reduce rancidity in oil-containing foods.

**Effects:** An antioxidant. According to nutritionist Jane Brody, it has been proven to protect the body against certain carcinogens. It is more quickly metabolized by the body and less likely to cause kidney problems than BHT.

**Precautions:** It is considered a possible carcinogen and, for that reason, most nutritionists warn that it should be avoided. Side effects include hives, hay fever, headache, wheezing, fatigue, and asthma. Mild dermatitis, resulting from an allergic reaction, may be avoided if nutrition is adequate, particularly vitamins A and C. According to Bill Statham in *Eat Safe*, it may affect the kidneys, thyroid, stomach, endocrine system, liver, respiratory and gastrointestinal tracts, and reproduction. Its use as a food additive is banned in some countries.

Statham does not recommend it for infants and children.

It works synergistically with most other antioxidants, but some research suggests that, when both BHA and vitamin E are taken together in very high doses, their life-extension properties are severely curtailed.

**Dosage:** John Mann recommends 200 mg/day. When taken in gelatin form, it may not be fully assimilated by the body and could irritate the stomach. Mann recommends lightly warming 16 ounces of safflower oil in a pan and stirring in 2 level teaspoons until all the

crystals have dissolved. After cooling for a few minutes, the oil should be put back in the fridge until needed. The oil is used within a week or two so that it does not become oxidized. It is not used for frying.

## BHT

**AKA:** Butylated hydroxytoluene.

A food preservative added to prevent oxidation and reduce rancidity in oil-containing foods.

**Effects:** An antioxidant. According to nutritionist Jane Brody, BHT has been proven to protect the body against certain carcinogens, to inactivate some viruses, and provide some protection against carbon tetrachloride poisoning. According to Pearson and Shaw, it can also extend life and be used as a treatment for herpes.

**Precautions:** The few studies conducted have yielded contradictory results or have had flaws. It is considered a possible carcinogen and, for that reason, most nutritionists warn that it should be avoided. It is not to be taken by those with a diseased or damaged liver, or who have had a liver test that is abnormal. Those taking it have follow-up tests for liver function, serum lipids, and a complete blood count. According to Bill Statham in *Eat Safe*, it may affect the kidneys, stomach, liver, and reproduction. Its use as a food additive is banned in some countries.

According to Statham, side effects include chronic hives, dermatitis, fatigue, asthma, aggressive behavior, and bronchospasms. An initial side effect is hypotension and lightheadedness when getting out of bed in the morning, which goes away after a few days. This problem can usually be avoided if a quarter gram is taken at bedtime, with the dosage slowly increased over time. It may cause a mild dermatitis due to an allergic reaction, which may be avoided if nutrition is adequate, particularly vitamins A and C.

Statham does not recommend it for infants and children.

It can intensify the effects of barbiturates,



other downers, or alcohol when combined with these drugs. There may be possible harmful interactions with steroid hormones or oral contraceptives. It works synergistically with most other antioxidants, but some research suggests that when BHT and vitamin E are taken together in very high doses, their life extension properties are severely curtailed.

**Dosage:** Pearson and Shaw take 2 to 6 g/day for its free radical-fighting and life-extending properties, though Joseph G. Llauro, M.D., Ph.D., of the Nuclear Medicine Service at the Jerry L. Pettis Memorial Veterans Hospital and the Loma Linda University School of Medicine asserts that 2 grams is very close to the lethal dose. John Mann recommends 200 mg/day. When taken in gelatin form, it may not be fully assimilated by the body and could irritate the stomach. Mann recommends lightly warming 16 ounces of safflower oil in a pan and stirring in 2 level teaspoons until all the crystals have dissolved. After cooling for a few minutes, the oil is returned to the refrigerator until needed. The oil is used within a week or two so that it does not become oxidized. It is not used for frying.

## BLOOD

**Effects:** Researchers at Stanford University have found that older mice experienced an increase in stem cells and neural connections, leading to improvements in learning and memory, when they received the blood of younger mice (Villeda et al., 2011).

**Precautions:** The exact factors which cause this effect have not yet been established, though it may be due to the protein GDF11 (see entry). Evidence for this comes from the fact that heating the blood, which denatures proteins, cancels out any benefits. It has not yet been tested on humans, though it was rumored that the late North Korean dictator Kim Jong-il used to inject himself with the blood of young virgins.

**Dosage:** None established.

## CALORIC RESTRICTION

**Effects:** Researchers have found that significantly reducing caloric intake can lower core body temperature and lengthen lifespan in mice and rats (Huffman et al., 2008; Soare et al., 2011). Research at Harvard University has also shown that caloric restriction and exercise can rejuvenate neuromuscular synapses in mice (Sanes and Lichtman, 2010). A long-term (20 year) study of monkeys found that those on a restricted diet had significantly less incidence of age-related diseases (e.g., cancer, cardiovascular disease, diabetes) and had a greater chance of living to an old age; more importantly, there was less age-related deterioration of the brain, specifically in areas governing motor functions, working memory, and problem solving (Weindruch, 2009). It is important to note that the lifespan of monkeys was increased by reducing their intake of proteins and sugars, while maintaining adequate levels of vitamins and minerals. Italian researchers have found that caloric restriction activates the CREB1 molecule, which triggers many of the genes linked to longevity and brain function (Pani et al., 2011). Caloric restriction also causes the body to increase production of Srx1, an enzyme in cells that repairs peroxiredoxin 1 (Prx1), helping to prevent aging and age-related disorders (such as Alzheimer's), as peroxiredoxin breaks down hydrogen peroxide within cells.

**Precautions:** It is not yet known how effective this is in humans. Some research indicates that this only benefits mice (or humans) with a tendency toward obesity, or that there might be a genetic factor involved (Ross et al., 1976; Sohal et al., 2009). To avoid malnutrition, practitioners must carefully monitor their daily intake of vitamins and other nutrients. Side effects include feeling hungry, lethargic, and cold. Practitioners can appear unnaturally thin, and susceptible

individuals may risk anorexia. Periodic fasting may have entirely different effects on the body. Raj Sohal, professor at the University of Southern California's School of Pharmacy, recommends that individuals of normal weight not practice caloric restriction, as there is some evidence it may actually shorten lifespan.

**Dosage:** Those practicing caloric restriction reduce their intake by roughly 25 to 30 percent.

## CARBON DIOXIDE

**AKA:** CO<sub>2</sub>.

**Effects:** According to Win Wenger, PhD, swimming underwater while holding your breath for a total of twenty hours over a period of three weeks can result in an increase often IQ points and greater awareness and attention span. The reasoning is that, due to the increased carbon dioxide in the blood, the arteries dilate, delivering more oxygen-rich blood to the brain and other organs. This is known as the mammalian dive response. This method is also endorsed by Yoshiro Nakamatsu ("Dr. Nakamats"), the "Thomas Edison of Japan," who claims to get his ideas by sitting underwater. Wenger has also developed a similar technique called "masking," where a person puts their face in a paper bag to accomplish the same thing.

**Precautions:** His techniques have not been scientifically verified. Any exercise—especially aerobic exercise—accomplishes the same thing. A 2009 study at the University of Iowa has found that breathing carbon dioxide can activate the brain protein ASIC 1a in the amygdala, which can trigger fear and panic attacks. Carbon dioxide can also be lethal at high doses. Hyperventilating, or taking deep breaths, before breath-hold dives or swimming laps can cause cerebral hypoxia, leading to shallow water blackout and drowning. Even healthy, experienced swimmers can succumb

to it, and can exhibit no visible signs of distress to anyone nearby.

## CARMUSTINE

Chemically related to mustard gas, it is used in the treatment of some types of brain cancer.

**Effects:** According to a 2013 study, it has been found to decrease beta-amyloid and amyloid plaques in mice by 60 to 75 percent. Lead researcher Dr. Madepalli Lakshmana says that the dosage needed for effective treatment is much lower than that used to treat brain cancer, and it does not produce side effects by activating microglia or blocking secretases as other Alzheimer's drugs do.

**Precautions:** Has not yet been tested on humans.

**Dosage:** None established.

## C-4

A plastic explosive.

**AKA:** Cyclonite plastic explosive.

**Effects:** Ingestion is said to produce a high.

**Precautions:** A Marine Corps training manual warns that any explosive material should not be ingested.

**Dosage:** None established.

## CLITORIA TERNATEA

**AKA:** Aparajita, bunga telang, butterfly pea, blue pea, cordofan-pea, dok anchan, kulhadhirimaa, mussel-shell climber, pigeon wings, sangu pu, sankhupushpam.

**Effects:** An extract of this plant has shown nootropic, anti-anxiety, antidepressant, anti-convulsant, and anti-stress effects in animal tests (Jain et al., 2003). The flowers are used as food in various Asian cultures and apparently are high in nutritional value.

**Precautions:** The seeds are reported to have a strong purgative effect.

**Dosage:** None established.

## DDC

**AKA:** Ammonium diethyl-dithiocarbamate.

**Effects:** An antioxidant.

**Precautions:** No other information available.

**Dosage:** None established.

## DREAMS

**Effects:** Dreams can be used not only for creative inspiration (Tartini's "The Devil's Sonata," Robert Louis Stevenson's "brownies"), but scientific inspiration, as well—Kekulé and the benzene ring, Louis Agassiz and his reconstruction of a fossil fish, William Watts and his technique for forming lead shot, Loewi and his theory of chemical transmission of nerve impulses, Hilprecht and his deciphering of a Babylonian inscription, William Blake and the process of copper engraving (the story of Elias Howe being inspired to place a hole in the end of his sewing machine's needle by dreaming of a warrior with a hole in the end of his spear is, apparently, apocryphal). Even taking a nap can lead to an increase of creativity upon waking, as long as the person enters the REM (Rapid Eye Movement), or dream, state, according to a 2009 study led by Professor Sara Mednick, a psychiatrist at the University of California.

Psychiatrist and sleep researcher Dr. John Allan Hobson of Harvard University has found that, when subjects were zapped with a 40 hertz current for thirty seconds, gamma wave activity (linked to concentration, transcendental mental states, and unity of consciousness) of the brain was increased and more than three-quarters of them reported having lucid dreams (dreams in which you are consciously aware that you are dreaming and can actually control the events taking place within that dream).

**Precautions:** Dream research is still very controversial and not fully accepted by mainstream science. To be most effective, the problem to be solved must be reviewed just before going to sleep, and it may take a lot of practice

before adequate results are achieved. A means of recording any insights (e.g., pen and paper, tape recorder) should be nearby. It should be noted that flashes of insight can occur just as easily while daydreaming or engaged in a simple task unrelated to the problem.

External stimuli during sleep, such as smells and sounds, may be incorporated into dreams, altering them. According to the personal experiences of psychologist Darren Lipnicki, the Earth's magnetic field can influence dreams, with low geomagnetic activity causing weird dreams and high geomagnetic activity resulting in more normal dreams. A study by the British Cheese Board concluded that the tryptophan in cheese helps reduce stress and stabilize sleep patterns, and that different cheeses were associated with different types of dreams.

## ELECTRICITY

**Effects:** One study found that a mild shock to the brain (called transcranial direct-current-stimulation, or tDCS) caused subjects to view others as more attractive than they did before, which could lead to new ways to treat depression and other illnesses, as it caused increased activity in the prefrontal lobe and higher levels of dopamine (Chib et al., 2013). Dr. Mégevand at the Feinstein Institute in New York, while attempting to locate the origin of a patient's epilepsy, electrically stimulated the area around the hippocampus, triggering vivid hallucinations of experiences from the man's past; it is believed that findings such as this could help treat individuals with autism and Alzheimer's disease. Other research at the University of Michigan has shown that tDCS can significantly reduce pain by releasing the body's natural opioids when the electrodes are situated above the motor cortex. Research involving stroke victims by Professor Heidi Johansen-Berg of the University of Oxford suggests it could be used to help recover lost motor functions. Researchers at Bonn University Hospital in Germany have achieved sub-

stantial improvements in mood within days in patients suffering from major depression by implanting electrodes in the medial forebrain bundle; previously, they had inserted electrodes in the nucleus accumbens, resulting in significant improvements, but not as dramatic, even with higher voltage levels (Schlaepfer et al., 2013). Electric brain stimulation (tDCS) has also been used by Steven Laureys of the University of Liège in Belgium to temporarily bring severely brain-damaged people out of their minimally conscious or vegetative state, though consciousness was mainly limited to eye and hand movements for a few hours (however, two patients were able to answer questions or respond to simple commands briefly before slipping back into their previous state); some of the patients had spent years in a minimally conscious state and, according to medical science, should not have responded at all to the treatment.

Researchers at the University of Toronto, by using deep brain stimulation on the fornix—a part of the brain that integrates the hippocampus with other brain regions—have increased the size of the hippocampus in a few Alzheimer's patients by 5 to 8 percent over the course of a year (normally the hippocampus shrinks by 5 percent in this time period) (Lozano et al., 2011). Dr. Alvaro Pascual-Leone has used electromagnetic stimulation of the brain as an aid to treating symptoms of Alzheimer's disease (see entry under Neuro AD).

Transcranial direct-current-stimulation to the inferior frontal cortex can also speed up reaction time and learning time, which Michael Weisend and DARPA have utilized to shorten the training time for military snipers. One study at the University of Oxford found that transcranial random-noise stimulation (TRNS) of the prefrontal cortex improved subjects' ability to learn math (Snowball et al., 2013). A 2006 study led by Jan Born of the University of Luebeck in Germany has found that a mild electric current applied to

the brain during sleep improved performance on a verbal memory task by 8 percent; Felipe Fregni at the Harvard Center for Non-invasive Brain Stimulation has said similar improvements can be seen with non-sleep-type currents, as well. Robert Reinhart and Geoffrey Woodman of Vanderbilt University have shown that they can use tDCS to facilitate learning by manipulating the brain's electrophysiological response to mistakes, the effects of which can last for up to five hours after a twenty-minute session (this also has the potential to treat such conditions as schizophrenia and ADHD). Michael Kahana, PhD, and Gordon Baltuch, MD, PhD, of the University of Pennsylvania have found that deep brain stimulation (DBS) of the dopaminergic neurons in the substantia nigra can improve reward-based learning. And a study conducted by economics professor Christian Ruff of the University of Zurich concluded that tDCS to the right lateral prefrontal cortex—which had previously been shown to activate when people adhere to social norms to prevent being punished—caused subjects who had been given money to divide it up more equally among others if there was a threat of retribution than they otherwise would have, yet stimulation to this same area without fear of consequences caused subjects to give away less money than they would have under normal conditions. This would seem to indicate that context, and one brain area's connection to other areas of the brain, must also be taken into account when trying to influence someone else's behavior.

Psychiatrist and sleep researcher Dr. John Allan Hobson of Harvard University has found that, when subjects were zapped with a 40 hertz current for thirty seconds, gamma wave activity of the brain (linked to concentration, transcendental mental states, and unity of consciousness) was increased and more than three-quarters of them reported having lucid dreams (dreams in which you are consciously aware that you are dreaming and

can actually control the events taking place within that dream). This could lead to a new method of treatment for nightmares and PTSD.

Orrin Devinsky, director of the epilepsy center at New York University, states that at least some of the most famous religious figures of the past—Paul, Moses, Joan of Arc, and Joseph Smith, for example—may have been epileptics, as seizures in the temporal lobes have been associated with voices and mystic visions. The theory is that, with so many neurons firing at once, the limbic system pulls up memories, emotions, and sensory data, which the person then interprets as a religious experience. Neuroscientist Michael Persinger of Laurentian University has found that he can trigger such mystic experiences by electrically stimulating the temporal lobes. Swiss researchers have found that, by stimulating the right angular gyrus, they could trigger out-of-body experiences in an epileptic patient.

Former cable TV installer Clint Ober believes that, just like TVs, people need to be grounded to the earth. His theory is that shoes insulate us from the electrical surface charge of the earth and that this, along with electromagnetic radiation generated from appliances and electronic devices, causes a variety of health problems, including sleep disruptions and cancer. Based on his research, he claims that grounding, or “Earthing,” as he calls it, can relieve insomnia, chronic pain, and many other illnesses.

**Precautions:** How electricity improves the brain is still not fully understood, though it has been found that the benefits of transcranial magnetic stimulation (TMS) may be partly due to its modulation of Nrf2 expression, protecting the brain from oxidation and cell damage (Tasset et al., 2013). Weisend believes that electrical stimulation speeds the formation of new neural pathways, and triggers what Mihaly Csikszentmihalyi at Claremont Graduate University calls the “flow state,” possibly by reducing activity in the prefrontal cortex (this

“flow state” is best characterized by athletes or musicians who find themselves “in the zone.”). In virtually all the studies mentioned, the sample size was very small (a half-dozen subjects or so), and there may be serious side effects that have not yet been uncovered. Research is still in its infancy, with factors such as duration of stimulation, number of stimulations, level of current, and effectiveness over various populations still unresolved. Whether such treatments result in permanent change is still unknown.

There are other problems with research, as well. Vincent Walsh, cognitive neuroscientist at University College London, points out numerous flaws, even those in his own studies, including guesswork about specific effects on the brain and extrapolations about whether modest results in the lab have any real-world significance. Some studies may not rule out placebo or practice effects. To remain effective, the treatments described in the Chib study need to be repeated indefinitely. The Lozano study only achieved positive results in those with the mildest cases of Alzheimer’s. In the research by Johansen-Berg, it was found that if the electricity was applied too early before a training session, or if the electricity traveled in the wrong direction, or if the wrong part of the mind is stimulated, the subject did worse, not better; positive results only lasted a half-hour. And Weisend lost a dime-sized chunk of skin when the square-shaped electrode he was using concentrated the current at the corners, liquefying the tissue.

Subjects in the Snowball study were still slightly faster at problem-solving (by little more than a second) six months later, but were no better at learning new material. In the Laureys research, there appeared to be no side effects. Vince Clark, director of the Psychology Clinical Neuroscience Center at the University of New Mexico in Albuquerque, says it is crucial in any experiment or treatment to image the brain first, to know what area you are targeting. Persinger claims that his electri-

cal stimulation does not work on skeptics; others have been unable to replicate his success. Ober's theory is still in the realm of fringe science, despite his having published a few studies in some obscure journals; Nathanael Johnson, author of *All Natural*, has found Ober's research methods to be sloppy, and the studies that did show positive results were tainted by the fact that the researchers had a financial interest in the company selling Ober's products.

**Dosage:** Most studies used a nine-volt battery. Do-it-yourself experimentation is not recommended, as it could cause cardiac and neurological problems—there is one case on record of a person who was left temporarily blind.

### ETHOXYQUIN

**AKA:** Santoquin.

A food preservative.

**Effects:** An antioxidant. Laboratory rats fed ethoxyquin had a longer life span, fewer tumors, and a lower incidence of obesity than rats in the control group. It has been shown to prevent vitamin E deficiency in the diets of animals (the metabolic activity of the two are identical). It is said to improve memory.

**Precautions:** Albino rats given 1000 to 4000 mg of ethoxyquin per kg of food showed signs of kidney fibrosis, kidney disease, changes in the structure of liver cells, and possible damage to the thyroid. It has also been linked to liver tumors in mice. According to Bill Statham in *Eat Safe*, animal studies have also shown it to cause skin, thyroid, and reproductive problems.

**Dosage:** John Mann recommends no more than 100 mg per meal. Individuals have taken as much as 1000 to 3000 mg/day, though any long-term effects are not known.

### GLUCOSAMINE

A food supplement made from the shells of crustaceans.

**Effects:** Has been found by Dr. Michael

Ristow, a biochemist at the Swiss Federal Institute of Technology in Zurich, to increase the lifespan of aging mice nearly 10 percent. A 2012 study of more than 77,000 people followed over eight years found that they had a 20 percent less chance of dying prematurely, a 13 percent less chance of dying from cancer, and a 41 percent less chance of dying from respiratory disease. Other studies have found that in skin creams it can reverse the damage to skin cells from sunburn, and keep skin young-looking by stimulating the production of hyaluronic acid and collagen.

**Precautions:** It could cause a reaction in individuals allergic to shellfish. Some glucosamine supplements are made from plant fungus or other sources.

It is not known how it works. Some suggest an anti-inflammatory effect, while others think it promotes autophagy, a process whereby cells dispose of toxic waste.

When combined with Warfarin, it could increase the effects of the drug to a dangerous degree.

**Dosage:** None established.

### GUM

**Effects:** One study found that chewing gum improved the recall of words immediately afterwards (Wilkinson et al., 2002), other studies that it increased alertness and attention, and improved mood and intellectual performance, but not memory (Smith, 2009; Smith, 2010). Chewing gum twice a day for two weeks has also been found to reduce anxiety and fatigue, and improve mood and concentration (Sasaki-Otomaru et al., 2011). It has even been found that eighth-grade math students who chewed gum were able to maintain higher grades and improve their scores on standardized tests over those who didn't chew gum (Johnston et al., 2012). Andrew Scholey of the University of Northumbria suggests that benefits in mood and cognition are due to the fact that chewing triggers the release of insulin,

increases the heart rate, and delivers more oxygen to the brain. Flavor and sugar content of the gum may also be relevant, though most studies did not control for these factors.

**Precautions:** Other studies have shown that chewing gum alone is not enough to boost test scores right after context-dependent learning (Baker et al., 2004; Miles and Johnson, 2007). One study concluded that the benefits were time-dependent, with positive results when gum was chewed five minutes before a cognitive test but no benefits when gum was chewed during testing (Onyper et al., 2011). These benefits lasted for only 15 to 20 minutes, and it is believed that chewing induced an arousal state that benefitted performance, but that chewing gum during testing competed for, and interfered with, cognitive performance (in other words, you can't think and chew gum at the same time). Effects were not expected to last beyond the gum-chewing period in the long run (Sasaki-Otomaru et al., 2011).

## HEAVY WATER

**AKA:** D2O.

**Effects:** According to former Oxford University scientist Mikhail Shchepinov, heavy water fortified with a rare form of hydrogen known as deuterium could increase human lifespan by up to a decade. The theory is that heavy isotopes such as deuterium can slow down the effects of free radicals by forming stronger covalent bonds. He claims he has been able to increase the lifespan of worms by 10 percent and fruit flies by 30 percent. In one experiment, humans showed no adverse effects after ten weeks of a heavy-water diet in which their body levels of heavy water were increased to 2.5 percent of body water.

**Precautions:** His theory has yet to be proven, and it is based on the free-radical theory of aging, which may not account for other factors in the aging process. Toxic effects in mammals begin to occur at about 20 percent of body water and are lethal at about 35 percent.

## HYPNOSIS

**Effects:** Lawrence Casler, Ph.D., professor emeritus at the State University of New York at Geneseo, has hypnotized 100 students, telling half of them that they would live to be at least 120 years old (the others were given no longevity-related suggestion). He has also conducted a similar experiment on fifteen residents of an old-age home whose mean age was 83.8 years, giving them positive verbal suggestions regarding health and longevity, with the results that the hypnotized subjects lived an average of six years longer than the non-hypnotized ones, and with one-quarter fewer days of hospitalization (Casler, 1985).

**Precautions:** It may be three-quarters of a century more before the results regarding students are known. How hypnosis works is still a mystery, its results can be variable and dependent on the skill of the hypnotizer, and there are nearly a dozen different theories to explain it.

## INCENSE

**Effects:** Researchers from Johns Hopkins University and the Hebrew University in Jerusalem have found that burning frankincense can relieve anxiety and depression by activating areas of the brain associated with emotions, nerve circuits that are targeted by anxiety and depression drugs, and a protein in the brain called TRPV3 (Moussaieff et al., 2008). The effective compound in incense was found to be incensole acetate.

**Precautions:** It is not known if this is true for other incense as well. Some incense may be carcinogenic.

**Dosage:** None established.

## KNOWLEDGE PILL

**Effects:** In 2014, Nicholas Negroponte, founder of the MIT Media Lab, predicted that within thirty years there will be a knowledge

pill, and that people will be able to literally consume information. He gave no specific details, though a *Business Insider* article by Dylan Love suggested that one possibility could involve a link between quantum physics and human consciousness (for a good discussion on this topic, see Steven Volk, *Fringe-ology*, HarperCollins, 2011).

**Precautions:** His prediction can be seen as too materialistic or too mystical, depending on your point of view.

## LIGHT

**Effects:** Bright light makes people feel emotions more intensely. One obvious example is how bright sunlight makes people feel happier and more optimistic, whereas lack of it can trigger seasonal affective disorder (SAD). Yet Alison Jing Xu, assistant professor of management at the University of Toronto Scarborough, and others have found that depression-prone individuals can become more depressed on sunny days, citing as evidence the spike in suicides in late spring and early summer. Another study by Xu and Aparna Labroo of Northwestern University found that subjects exposed to bright lights wanted hotter chicken wing sauce, rated a fictional character as more aggressive, and thought women were more attractive than those who were exposed to less intense lighting. Savvy retailers may use this strategy when trying to sell emotion-laden products such as engagement rings. She suggests that the body perceives light as heat, triggering our emotions, and recommends turning down the lights when making rational decisions. This may be only part of the reason, as another photoreceptor, a melanopsin, has recently been discovered, which transfers light information to non-visual areas in the brain; disruption of the body clock and other effects are seen when this function is suppressed in animals (Chellappa et al., 2014).

The color of light is also important. Sub-

jects exposed to blue light over the course of a day rated themselves as less sleepy, had faster reaction times, and were more attentive than those exposed to green light (Rahman et al., 2014). The researchers had previously found a similar effect on nighttime workers. Part of the reason may be that it suppresses melatonin, altering the body clock. Other research has shown that those exposed to blue light did better on cognitive tests when there was a distraction than did those who had caffeine, and research from the University of Montreal indicates that even the blind can benefit from exposure. The Chellappa study indicates things get even trickier—previous exposure to an orange light enhanced the effect of a test light during cognitive tests, while previous exposure to a blue light had the opposite effect, indicating humans may have a photic memory similar to that found in plants and invertebrates.

Sunlight is also needed to synthesize vitamin D (see entry).

**Precautions:** Smartphones and other devices with lights or displays can disrupt sleep.

**Dosage:** Changes in brain function can occur with just fifty seconds of exposure.

## MAGNETICS

**Effects:** Transcranial magnetic stimulation (TMS) has been shown to achieve the same neuroprotective results as transcranial direct-current-stimulation (see Electricity), and has been used experimentally to treat depression, schizophrenia, and the aftereffects of a stroke. In mice, it has been found to stimulate the growth of new neurons in areas of the brain that deal with learning and memory, and study leader Fortunato Battaglia at the City University of New York believes that this could lead to new treatments of memory decline due to age or Alzheimer's. Dr. Alvaro Pascual-Leone has used electromagnetic stimulation of the brain as an aid to treating symptoms of Alzheimer's disease (see entry under Neuro AD).



**Precautions:** How it works is still unknown.

According to the personal experiences of psychologist Darren Lipnicki, the Earth's magnetic field can influence dreams, with low geomagnetic activity causing weird dreams and high geomagnetic activity resulting in more normal dreams.

## MEDITATION

**Effects:** Strengthens brain circuits and increases neuroplasticity, producing calmness and clarity of thought, improving mood and task performance, enhancing empathy and creativity, increasing attention, focus, and awareness, boosting immune function, and rejuvenating the body. It can also reduce stress, lower blood pressure, and improve sleep. A few studies have found that it can help smokers reduce their cravings for cigarettes. It has been suggested that meditation may be helpful in cases of depression and post-traumatic stress disorder, but evidence is lacking.

One study utilizing fMRI scans has shown that experienced meditators have actually rewired the way their brains work (Davidson et al., 2007); others, that it increased the thickness of the brain in the areas responsible for sensory, cognitive and emotional processing (Lazar et al., 2005; Luders et al., 2009). Andrew Newberg, formerly of the University of Pennsylvania, has shown that brain scans of meditators reveal that the prefrontal cortex becomes very active, while the superior parietal lobe becomes dormant. Other researchers have discovered that monks could produce gamma waves—brain waves indicating intense, focused thought—that were thirty times stronger than non-meditators', and that brain waves from the cortex were synchronized. It has even been shown to lower electrical activity and blood flow in the amygdala, an area of the brain mostly associated with linking strong emotional content and stimuli.

**Precautions:** According to researchers

Maria Ospina and Kenneth Bond of the University of Alberta/Capital Health Evidence-based Practice Centre, in Edmonton, Canada, who did a comprehensive review of 813 studies in 2007, there is no clear evidence that meditation relieves hypertension, stress, and chronic pain. There are a number of different methods of meditation, and it is not known how they compare to each other in terms of benefits and drawbacks. The few studies conducted so far have been small, and much more research needs to be done to assess its full and long-term effects. Critics of Newberg say that he has over-interpreted his brain scans and neglected to specify which type of meditation was used in the studies, and Northwestern University professor of neurology Yi Rao has called the work of Richard Davidson of the University of Wisconsin "substandard" and his motivations "questionable" (Davidson is a close friend of the Dalai Lama).

Since it forces the individual to focus inward and may allow suppressed traumatic memories to emerge, it may worsen the conditions of those with severe psychological disorders. Jared Lindahl of Warren Wilson College in Asheville, North Carolina, has reported that meditators can often "see" visions of light mentally when meditating, similar to what is experienced by those undergoing sensory deprivation. There are many references to this in Buddhist literature, and he believes that meditators are experiencing a mild form of sensory deprivation when they are intently focused.

**Dosage:** Start at 20 to 30 minutes a day, increasing the time to 30 to 45 minutes a day.

## MUSIC

**Effects:** Music can ease anxiety, be used to treat insomnia, and lower blood pressure. It has been used to treat children with learning disabilities such as dyslexia and autism, and help the elderly with dementia feel more connected to everyday life.

According to Daniel Levitin, associate pro-

fessor at McGill University in Montreal, former rock producer, and author of the book *This Is Your Brain on Music*, musical ability is an umbrella term that covers a dozen or more abilities. It has been shown that listening to music may improve the spatial abilities of children, even if only for a short period of time, and music lessons at a young age may improve the sensitivity of the brain to subtleties of human speech, improve memory and attention, and boost IQ levels to some degree (about three points). According to Harvard University researcher Gottfried Schlaug, early music lessons can also enhance motor and auditory skills, boost verbal skills and nonverbal reasoning, and singing can activate different areas of the brain than playing an instrument. Don Campbell and Alex Doman, authors of *Healing at the Speed of Sound*, say singing and dancing helps coordinate the senses, speaking in rhythm and rhyme connects the part of the brain that deals with speech with other parts of the brain, and music education integrates the social, emotional, and real context of what's being learned. And Nina Kraus, the Hugh Knowles Professor of Communication Sciences and Neurobiology at Northwestern University and director of the Auditory Neuroscience Laboratory, says music training enhances neuroplasticity, as well as giving the nervous system a stable framework of meaningful patterns that form the foundation for learning; playing music is a complex task in which a person has to read or remember a music score, keep time, and coordinate his or her playing with the other musicians. There is even an area in the frontal lobe called BA47, which helps complete sequences. According to research by Dr. Jan Born of the University of Tübingen in Germany and colleagues, both the quality of sleep and memory of the previous day's learning can be improved by playing music that is synchronized to the rhythm of slow oscillations in brain activity.

Brains of musicians have larger motor cortices, cerebella, and corpus callosa than those

of non-musicians, and jazz musicians skilled at improvising use areas of the brain that deal with language (Donnay et al., 2014). Satoshi Kanazawa of the London School of Economics and Political Science has suggested in one published paper that highly intelligent people (based on tests of verbal intelligence) are more likely to have evolutionarily novel preferences and values, and this includes classical music and jazz, since purely instrumental music is relatively new and the human voice has a wider appeal than any instrument.

**Precautions:** The so-called “Mozart Effect,” in which classical music improved spatial and mathematical abilities in listeners, has been largely disproven, as any boost in intellectual abilities is very limited in both time and actual performance, and most likely attributed to preference and engagement (i.e., any music will boost performance if the listener is enjoying it). And a 2013 study by Harvard University concluded that music training in pre-schoolers did not lead to any intellectual benefits over those who had no training, though study author Samuel Mehr stressed that learning music is still an important part in what it means to be human. Kanazawa's findings are controversial, due in part to the fact that it has nothing to do with the complexity of music (easy listening over opera?). One negative aspect of music is “earworms,” or annoying songs that get stuck in your head.

## NANOTECHNOLOGY

**Effects:** Aubrey de Grey, a transhumanist advocate and scientist, believes medical nanotechnology can be used to develop microbots that will travel the bloodstream, repairing and replacing old or damaged cells.

## NDGA

**AKA:** Nordihydroguaiaretic acid.

A resinous substance extracted from a variety of plants (such as the creosote bush and

Guaiac gum trees) that was once used as a preservative in pie crusts, candy, lard, butter, ice cream, and canned whipped cream.

**Effects:** An antioxidant which may have some life-extension properties.

**Precautions:** It was banned by the FDA in 1968 when high doses were found to cause kidney damage in rats; since rat urine is much more concentrated than human urine and rats urinate infrequently, this problem may not extend to humans.

**Dosage:** None established.

## NEURO AD

**Effects:** A treatment for Alzheimer's symptoms that involves having a person solve a problem after a brain region necessary for solving that problem is noninvasively stimulated with electromagnetic energy. Lead researcher Dr. Alvaro Pascual-Leone, professor of neurology at Harvard Medical School, has said it has led to significant improvements in cognitive abilities needed for everyday tasks.

**Precautions:** Side effects include mild headaches. Though it improves symptoms for up to three months, it does not cure Alzheimer's. So far, the trials have been small and short-term, and Dr. Pascual-Leone would like to see more research done to assess long-term effects. There is some controversy over the long-term health effects of electromagnetic fields, including whether they cause cancer and Alzheimer's disease.

**Dosage:** Treatment has consisted of one hour a day for six weeks.

## NEUROPROSTHETICS

**Effects:** Some envision a future where brain implants could increase your sensory awareness, give you perfect recall or instant mastery over any subject, or connect your thoughts directly to the internet. Theodore Berger, biomedical engineer and neuroscientist at the University of Southern California in Los An-

geles, believes that someday implants can restore lost memory in patients suffering from stroke or Alzheimer's, and he has been working for more than twenty years to design silicon chips that can mimic the way neurons communicate in order to achieve this goal. The cochlear and retinal implants in use today, as well as electrodes inserted into the brain to control the tremors of Parkinson's disease, are seen as the first step in the new form of mental enhancement. Development is also underway for a brainwave-reading skull cap. Researchers at DARPA believe neural implants could help overcome traumatic brain injury.

**Precautions:** According to a 2014 *Wall Street Journal* article by Gary Marcus and Christof Koch, there are many problems to surmount. The procedure now used—drilling holes into the skull and inserting electrodes—could cause infection or bleeding in the brain, each of which could result in serious medical complications, even death. There are other problems to consider as well: keeping an implant anchored to the same place in the spongy, sloshing brain matter; keeping it non-toxic and biocompatible to prevent triggering an immune reaction; making it small enough to be inserted into the skull; making it energy-efficient enough so that it can be easily recharged; engineering them so that they can be easily upgraded; and having them be able to decipher the flurries of detailed information from 100 billion nerve cells (even functional MRIs can only focus in on an area that contains at least half-a-million neurons). In the words of Marcus and Koch, “How many advances in material science, battery chemistry, molecular biology, tissue engineering and neuroscience will we need? Will those advances take one decade, two decades, three or more?” Non-invasive devices like the brainwave-reading skull cap are too far away to read individual neurons (Marcus and Koch compared it to the “Keystone Kops trying to eavesdrop on a single conversation from outside a giant football stadium.”). Arthur Caplan, medical

ethicist at New York University's Langone Medical Center, feels that such implants could alter or destroy a person's sense of self, changing personality for the worse. There is also the fear that someone can hack directly into a person's brain and control them, or that this technology could create a permanent underclass of complacent zombies. But perhaps the biggest obstacle is that there is still very little understanding of how the brain accomplishes even basic tasks.

### OPTOGENETICS

**Effects:** By implanting light-sensitive proteins into brain cells, Karl Deisseroth, Ph.D., of Stanford University can turn these cells on or off with flashes of light from different-colored lasers, controlling neural pathways in ways that can change behavior. In one test, he was able to stop cocaine addiction in mice. He hopes it could one day be used to treat a variety of physical and psychological disorders.

**Precautions:** Has not yet been tested on humans, and locating specific areas of the brain in order to target certain disorders may prove difficult.

**Dosage:** None established.

### PARAQUAT

**Effects:** Researchers at McGill University's Department of Biology have found that *C. elegans* worms treated with the herbicide Paraquat lived longer than normal, possibly due to the effect of free radicals triggering certain protective and repair processes at specific times (Yang and Hekimi, 2010).

**Precautions:** Paraquat is considered so toxic to humans and animals that it is banned or restricted in many parts of the world.

### PHOTO ACOUSTIC THERAPY

**Effects:** Researchers at Chalmers University of Technology in Sweden and the Polish

Wroclaw University of Technology have used multi-photon lasers to identify protein aggregates in the brain, and they believe that by utilizing photo acoustic therapy used in tomography, they can identify and remove these malfunctioning proteins without toxic chemicals and without harming adjacent tissue, possibly leading to treatment for Alzheimer's, Parkinson's, and Creutzfeldt-Jakob disease (Hanczyc et al., 2013).

**Precautions:** Has not yet been tested on humans.

### POTATO VIRUS

**Effects:** A common potato virus which very closely resembles one of the main proteins that causes Alzheimer's may be used to develop a vaccine that could slow or prevent the onset of that disease by promoting the destruction of amyloid-beta plaques (Friedland et al., 2008).

**Precautions:** Early trials on humans with a similar vaccine had to be stopped because of the risk of autoimmune encephalitis, though the potato virus does not seem to pose this risk.

### PROPYL GALLATE

A food preservative similar to BHA and BHT.

**Effects:** An antioxidant.

**Precautions:** It is a suspected carcinogen. Side effects may include allergic reactions, asthma, and contact dermatitis. More studies are needed to evaluate the safety of this substance.

Individuals allergic to aspirin should exercise caution.

### SEMEN

**AKA:** Seminal plasma.

**Effects:** When absorbed vaginally, it is believed to have mood-enhancing effects on

women. Among the fifty or more compounds in semen—which include hormones, neurotransmitters, endorphins, and immunosuppressants—are such anxiolytic (anxiety-reducing) chemicals as cortisol, estrone, prolactin, oxytocin, thyrotropin-releasing hormone, melatonin, and serotonin. These can be readily absorbed into the body, as the vagina is surrounded by arteries and other blood vessels. A 2002 study by Gordon Gallup, Rebecca Burch, and Steven Platek found that, among 293 women, those who had unprotected sex exhibited significantly fewer symptoms of depression than those who usually or always used condoms, or who abstained from sex completely. More recently, Gallup has found that women exposed to the most semen perform better on concentration and cognitive tasks. And a 2005 report in the journal *Nursing Inquiry* by David Holmes and Dan Warner found that gay males who engaged in “barebacking” (unprotected anal sex) experienced a greater sense of connectedness with their partners than those who didn’t.

Semen also contains a protein called ovulation-inducing factor (OIF), which professor of veterinary biomedicine Gregg Adams has found to be molecularly similar to nerve growth factor (NGF), though what this means as far as human female psychology is concerned is still unknown (in other mammalian species, it causes the release of other hormones, triggering ovulation). In addition, semen—which provides nutrition and protection to spermatozoa—contains trace amounts of many nutrients, including protein, carbohydrates, fats, and minerals such as potassium, magnesium, selenium, copper, and zinc.

**Precautions:** The authors of the study warn that “[i]t is important to acknowledge that these data are preliminary and correlational in nature, and as such are only suggestive. More definitive evidence for antidepressant effects of semen would require

more direct manipulation of the presence of semen in the reproductive tract and, ideally, the measurement of seminal components in the recipient’s blood.” In addition, there is a significant chance of catching at least one of the many sexual diseases that exist, some of which may show no symptoms, are antibiotic-resistant, and/or may be fatal. In rare cases, there may be an allergic reaction to seminal fluid.

### SHILAJIT

**AKA:** Asphaltum punjabianum; black asphaltum; girij; mineral pitch; mineral wax; momia; mumijo, ozokerite; shilajitu; silajit

A thick, dark, paste-like resin that seeps from the rocks in the Himalayan mountains. It may be a mixture of humus and plant and microbial metabolites, possibly from *Styrax officinalis* Linn and other plants, though some say it is the excreta from squirrels and rodents such as the Afghan pika.

**Effects:** In Ayurvedic medicine, it is said to increase strength and stamina, relieve stress, improve brain functioning, and prevent aging, among many other claims.

**Precautions:** There is no scientific research regarding the health properties or medicinal benefits of this substance beyond the fact that some animal studies have shown it to have analgesic, anti-inflammatory, and anti-anxiety properties. The products sold in native regions and online may contain dangerous levels of heavy metals and be adulterated with herbs, spices, or harmful ingredients such as rock dust. Ayurvedic medicines are not intended for long-term use, and side effects are possible.

It may increase the production of uric acid, aggravating gout.

It is high in iron, and may cause an overdose if taken with supplements containing iron.

**Dosage:** None established.

### SODIUM BISULFATE

A food additive that prevents discoloration and inhibits the growth of bacteria. It should not be confused with sodium bisulfite.

**Effects:** An antioxidant.

**Precautions:** It destroys vitamin B-1. It is generally regarded as safe by the FDA.

### SODIUM HYPHOSPHITE

A food additive used as an emulsifier or stabilizer. It should not be confused with sodium hypophosphate.

**Effects:** An antioxidant.

**Precautions:** It is generally regarded as safe by the FDA.

**Dosage:** None established.

### SOUND

**Effects:** By targeting specific areas of the brain with ultrasound, neuroscientist William Tyler of Virginia Tech Carilion Research Institute has been able to increase discrimination in tactile perception in subjects, possibly by altering the brain's balance of excitation and inhibition between communicating cells.

Engineer Sarah Angliss has conducted research indicating that infrasound (10 to 20 Hz) can induce various feelings in people, including shivering in parts of the body, increased heart rate, coldness, anxiety, and sorrow. It is believed that the extreme bass produced by organs in churches and cathedrals could create sensations that could lead people to feel that they have been instilled with a sense of spirituality; conversely, these same effects may be the explanation for the sense of fear experienced during hauntings.

### STRYCHNINE

**AKA:** Strychnine sulfate.

An alkaloid found naturally in various

plants, though contrary to popular opinion, not in most hallucinogenic ones.

**Effects:** In rats, it produces definite improvements in maze learning and visual and spatial discrimination (Nehlig et al., 1977). In humans, it has a stimulating effect on the spinal cord.

**Precautions:** It is a neurotoxin, and side effects include agitation, apprehension or fear, enhanced startle response, restlessness, intense pain (consciousness is maintained until death), extreme nausea, vomiting, frothing at the mouth, a dangerously high heart rate, excessive body heat, profuse sweating, convulsions, difficulty breathing, opisthotonus (a condition where the head is bent back as far as it will go), and death from respiratory paralysis.

**Dosage:** Doses high enough to result in measureable improvements in brain functioning (2 mg or more) run the risk of the side effects mentioned above; doses small enough to avoid these risks do not produce any measureable improvements, though it has been used as a performance-enhancer by athletes, most notably by Thomas Hicks in the 1904 Olympics and Wu Dan in the 1992 Olympics.

### TBHQ

**AKA:** 2-tertiary butyl hydroquinone; monotertiary butyl hydroquinone; tertiary butyl hydroquinone.

A food preservative.

**Effects:** An antioxidant.

**Precautions:** According to Bill Statham in *Eat Safe*, it may cause skin, gastrointestinal, liver, reproductive, immune system, cardiovascular, and neurological problems. Side effects include birth defects, delirium, and allergic contact dermatitis. It is also a suspected carcinogen and mutagen. According to Ruth Winter, M.S., in *A Consumer's Dictionary of Food Additives*, "[d]eath has occurred from ingestion of as little as 5 grams. Ingestion of a single gram (a thirtieth of an ounce) has caused nausea, vomiting, ringing

in the ears, delirium, a sense of suffocation, and collapse.”

**Dosage:** None established.

### THIODIPROPIONIC ACID AND DILAURYL THIODIPROPIONATE

A food preservative and its dilauryl derivative.

**Effects:** Both are antioxidants. They are highly synergistic with antioxidant vitamins, especially in combination with citric acid.

**Precautions:** They are generally regarded as safe by the FDA.

**Dosage:** John Mann recommends 200 mg/day.

### THIOFLAVIN T

A common dye used to identify amyloid-beta protein.

**Effects:** Has been found by Gordon Lithgow and colleagues at the Buck Institute for Research on Aging in Novato, California, to increase the lifespan of *C. elegans* worms by 30 to 70 percent, possibly by maintaining the environment surrounding proteins and preventing their misfolding.

# Bibliography

## Books and Articles

- Bailey, Ronald. "The Battle for Your Brain." *Reason*, February 2003.
- Begley, Ronald. "Memory Drugs Create New Ethical Minefield." *The Wall Street Journal*, October 1, 2004.
- Belluck, Pam. "As Minds Age, What's Next? Brain Calisthenics." *The New York Times*, December 27, 2006.
- Bloomfield, Harold H., M.D. *Healing Anxiety with Herbs*. New York: HarperCollins, 1998.
- "Brain-Boosting Drugs 'Not to Be Feared.'" *New Scientist*, 2686. December 14, 2008.
- Brown, Judith E. *The Science of Human Nutrition*. New York: Harcourt Brace Jovanovich, 1990.
- Callahan, Maureen. *DHEA: The Miracle Hormone*. New York: Signet, 1997.
- Candela, Marissa. "Staying Sharp." *Energy Times*, April 2007.
- Carey, Benedict. "Smartening Up: Brain Enhancement Is Wrong, Right?" *The New York Times*, March 9, 2008.
- Carr, Nicholas. "A Prescription for Smart Pills." [www.nicholasgarr.com](http://www.nicholasgarr.com). December 8, 2008.
- Chaitow, Leon, N.D.O. *The Healing Power of Amino Acids*. Wellingborough, England: Thorsons, 1989.
- Cherniske, Stephen. *The DHEA Breakthrough*. New York: Ballantine, 1996.
- "Cognitive Enhancement: All on the Mind." *The Economist*, May 22, 2008.
- Cohen, Patricia. "A Sharper Mind, Middle Age and Beyond." *The New York Times*, January 19, 2012.
- Collins, Nick. "Pill for Health Ageing 'Available Within a Generation.'" *The Telegraph*, September 29, 2012.
- Crook, Thomas H. III, and Brenda Adderly. *The Memory Cure*. New York: Pocket, 1998.
- "Dangerous Supplements." *Consumer Reports*, September 2010, p. 16.
- Davis, Patricia. *Aromatherapy: An A-Z*. Saffron Walden, England: C.W. Daniel, 1991.
- Dean, Ward, M.D. *GHB: The Natural Mood Enhancer*. Petaluma, CA: Smart, 1997.
- \_\_\_\_\_. and John Morgenthaler. *Smart Drugs and Nutrients*. Santa Cruz, CA: B & J, 1990.
- \_\_\_\_\_, et al. *Smart Drugs II: The Next Generation*. Menlo Park, CA: Health Freedom, 1993.
- Dembling, Sophia. "Melatonin: The Latest Wonder Pill." *Health and Fitness News Service*. October 31, 1995.
- DeNoon, Daniel J. "Brain Boosting FAQ: What You Must Know." [www.webmd.com](http://www.webmd.com). December 14, 2008.
- Di Cyan, Erwin. *Vitamins in Your Life*. New York: Fireside-Simon&Schuster, 1974.
- Dobkin de Rios, Marlene. *Visionary Vine: Hallucinogenic Healing in the Peruvian Amazon*. Prospect Heights: Waveland, 1972.
- The Drug and Natural Medicine Advisor*, Alexandria, VA: Time-Life, 1997.
- Duke, James A. *The Green Pharmacy*. New York: St. Martin's, 1997.
- Duncan, David Ewing. "The Ultimate Cure." *Conde Nast Portfolio*, May 2008.
- Elkins, Rita. *Wild Yam: Nature's Progesterone*. Pleasant Grove, UT: Woodland, 1996.
- Emboden, William. *Narcotic Plants, revised and enlarged*. New York: Macmillan, 1979.
- "Ethics of Boosting Brainpower Debated by Researchers." Stanford University Medical Center, April 20, 2004.
- Fillit, H.M., et al. "Achieving and Maintaining Cognitive Vitality with Aging." *Mayo Clinic Proceedings*, vol. 77, no 7 (July 2002): 681-96.
- Forstl, Hans. "Neuro-Enhancement. Brain Doping." *Nervenarzt*, vol. 80, Issue 7 (July 2009): 840-6.
- Graedon, Joe, and Teresa Graedon. *Graedon's Best Medicine*. New York: Bantam, 1991.



- \_\_\_\_\_. *The People's Pharmacy*. New York: St. Martin's, 1997.
- \_\_\_\_\_. "The People's Pharmacy." Syndicated newspaper column.
- Graham, Sarah. "Among Fruits, Cranberries Are Richest in Potent Group of Antioxidants." *Scientific American*, November 21, 2001.
- Greely, Henry, et al. "Towards Responsible Use of Cognitive-Enhancing Drugs by the Healthy." [www.nature.com](http://www.nature.com), December 7, 2008.
- Griffith, H. Winter. *Complete Guide to Prescription and Nonprescription Drugs*. New York: Body Press-Perigee, 1996.
- Haas, Robert. *Eat Smart, Think Smart*. New York: HarperCollins, 1994.
- Hall, Stephen S. "The Quest for a Smart Pill." *Scientific American*, September, 2003.
- Hambrick, David Z. "I.Q. Points for Sale, Cheap." *New York Times*, May 5, 2012.
- Harris, Ben Charles. *The Compleat Herbal*. Atlanta: Larchmont, 1972.
- Hart, Carol. *Secrets of Serotonin*. New York: St. Martin's, 1996.
- Healy, Melissa. "Sharper Minds." *The Los Angeles Times*, December 20, 2004.
- Henderson, Mark. "Academy of Medical Sciences Suggest Urine Tests to Detect Smart Drugs." *London Times*, May 22, 2008.
- Hendler, Sheldon Saul, M.D. *The Doctor's Vitamin and Mineral Encyclopedia*. New York: Simon & Schuster, 1990.
- Hill, Amelia. "Manipulating Morals: Scientists Target Drugs That Improve Behavior." *The Guardian*, April 4, 2011.
- Hirschler, Ben. "Brain-Boosting Drugs Spark Ethical Debate in UK." *Reuters*, November 8, 2007. [www.alertnet.org/thenews/newdesk/L08643609.htm](http://www.alertnet.org/thenews/newdesk/L08643609.htm)
- Hoffer, Dr. Abram, and Dr. Morton Walker. *Smart Nutrients*. New York: Avery, 1994.
- Hruby, Patrick. "Brainpower Drugs Coming for Sports." *The Washington Times*, April 24, 2005.
- Husain, M., and Mehta, M.A. "Cognitive Enhancement by Drugs in Health and Disease." *Trends in Cognitive Sciences*, vol. 15, no. 1 (January 2011): 28–36.
- Hutchinson, Michael. *Mega Brain Power*. New York: Hyperion, 1994.
- Irvine, Martha, and Lindsey Tanner. "Staying Young Forever." Associated Press, December 15, 2008.
- Iverson, Leslie L., et al. *Introduction to Neuropsychopharmacology*. New York: Oxford University Press, 2009.
- Jacobson, Michael F., et al. *Safe Food: Eating Wisely in a Risky World*. Los Angeles: Living Planet, 1991.
- Johnson, Steve. "Pop-Quiz: Why Are IQ Test Scores Rising Around the Globe?" [www.wired.com](http://www.wired.com), 2005.
- Joyce, Helen. "The World is Getting Smarter." *Inteligent Life*, Autumn 2007.
- Katzenstein, Larry. *Secrets of St. John's Wort*. New York: St. Martin's, 1998.
- Keim, Brandon. "Brain-Enhancing Drugs: Legalize 'Em, Scientists Say." [www.wired.com](http://www.wired.com), December 10, 2008.
- \_\_\_\_\_. "Smarts in a Bottle: UK Government Evaluates Cognition Enhancers." [www.wired.com](http://www.wired.com), April 16, 2007.
- Khalsa, Dharma Singh, M.D. *Brain Longevity*. New York: Warner, 1997.
- Kick, Russ. *The Disinformation Book of Lists*. New York: Disinformation, 2004.
- Kilham, Chris. *OPC: The Miracle Antioxidant*. New Canaan, CT: Keats, 1997.
- Kinsley, Michael. "Reflections: Mine Is Longer Than Yours." *The New Yorker*, April 7, 2008.
- Klatz, Dr. Ronald, with Carol Kahn. *Grow Young with HGH*. New York: HarperCollins, 1997.
- Lanni, C., et al. "Cognition Enhancers Between Treating and Doping the Mind." *Pharmacological Research*, March 2008.
- Larson, Christine. "Keeping Your Brain Fit." *U.S. News and World Report*, April 6, 2008.
- Laurance, Jeremy. "Messing with Our Minds." *The Independent*, January 18, 2005.
- Lieberman, Shari, and Nancy Bruning. *The Real Vitamin and Mineral Book*, 2d ed. New York: Avery, 1997.
- Lilly, John C. *The Scientist: A Novel Autobiography*. New York: Bantam, 1978.
- Lust, John. *The Herb Book*. New York: Bantam, 1974.
- Madrigril, Alexis. "Wired.com Readers' Brain-Enhancing Drug Regiments." [www.wired.com](http://www.wired.com), April 24, 2008.
- Maher, Brendan. "Poll Results: Look Who's Doping." *Nature* 452 (April 2008): 674–75.
- Malcom, Andrew I. *The Pursuit of Intoxication*. New York: Pocket, Washington Square, 1971.
- Mann, John A. *Secrets of Life Extension*. New York: Bantam, 1980.
- Marriott, Alice, and Carol K. Rachlin. *Peyote*. New York: Mentor, 1971.
- Masline, Selagh Ryan, and Barbara Close. *Aromatherapy*. New York: Dell, 1997.
- Matthews, Robert. "Alcohol Sharpens Your Brain, Say Researchers." *Sunday Telegraph*, August 1, 2004.
- Mayell, Mark. *Natural Energy*. New York: Three Rivers, 1998.
- Mindell, Earl. *Earl Mindell's Anti-Aging Bible*. New York: Fireside-Simon & Schuster, 1996.
- \_\_\_\_\_. *Earl Mindell's Herb Bible*. New York: Fireside-Simon & Schuster, 1992.
- Morganthaler, John, and Dan Joy. *Better Sex Through Chemistry*. Petaluma, CA: Smart, 1994.
- Munger, Dave and Greta. "Is It 'Cheating' to Take Brain-Enhancing Drugs?" [www.cognitivedaily.com](http://www.cognitivedaily.com) December 20, 2007.
- Murray, Dr. Michael. *Grape Seed Extract and Other Sources of PCOs*. Vital, 1998.

- Nestor, James. *Get High Now*. San Francisco: Chronicle, 2009.
- Newport, Mary, M.D. *Energy Times*, November/December 2008.
- Ott, Jonathan. *Pharmacothoeon: Entrogenic Drugs, Their Plant Sources and History*. Natural Products, 1993.
- Paton, Graeme. "Smart Drugs 'Should Be Allowed.'" [www.telegraph.co.uk](http://www.telegraph.co.uk), October 1, 2009.
- Pearson, Durk, and Sandy Shaw. *Life Extension: A Practical Scientific Approach*. New York: Warner, 1982.
- \_\_\_\_\_, and \_\_\_\_\_. *The Life Extension Companion*. New York: Warner, 1984.
- Pelton, Ross, with Taffy Clarke Pelton. *Mind Food and Smart Pills*. New York: Doubleday, 1989.
- Peterson, Lee Allen. *A Field Guide to Edible Wild Plants*. New York: Houghton Mifflin, 1977.
- Postrel, Virginia. "Live Longer and Prosper." [www.bigquestionsonline.com/columns/virginia-postrel/live-longer-and-prosper](http://www.bigquestionsonline.com/columns/virginia-postrel/live-longer-and-prosper).
- Potter, Beverly, and Sebastian Orfali. *Brain Boosters*. Berkeley, CA: Ronin, 1993.
- Pressman, Alan H., with Sheila Buff. *The GSH Phenomenon*. New York: St. Martin's, 1997.
- Prevention Magazine*. *Future Youth: How to Reverse the Aging Process*. Emmaus, PA: Rodale, 1987.
- \_\_\_\_\_. *The Prevention How-To Dictionary of Healing Remedies and Techniques*. New York: Berkley, 1992.
- Ratsch, Christian. *The Encyclopedia of Psychoactive Plants*. Rochester, VT: Park Street, 1998.
- Reavley, Nicola. *The New Encyclopedia of Vitamins, Minerals, Supplements and Herbs*. New York: M. Evans, 1998.
- Regelson, William, M.D., and Carol Colman. *The Superhormone Promise*. New York: Pocket, 1996.
- "Regenerate Your Brain? The Science Says It's Possible." [www.thedailygalaxy.com](http://www.thedailygalaxy.com), December 24, 2008.
- Reiter, Russel J., and Jo Robinson. *Melatonin: Your Body's Natural Wonder Drug*. New York: Bantam, 1995.
- Riis, Jason, et al. "Preferences for Enhancement Pharmaceuticals: The Reluctance to Enhance Fundamental Traits." *Journal of Consumer Research*, 2008.
- Rosenbaum, Michael, E., M.D., and Dominick Bosco. *Super Supplements*. New York: Signet, 1987.
- Rosenfeld, Dr. Isadore. "A Doctor's Guide to Herbs." *Parade Magazine*, May 31, 1998.
- Rudgley, Richard. *The Encyclopedia of Psychoactive Substances*. New York: St. Martin's, 1998.
- Rudin, Donald O., M.D., and Clara Felix. *The Omega-3 Phenomenon*. New York: Rawson Associates-Macmillan, 1987.
- Russo, Eugene. "Seeking Smart Drugs." *The Scientist*, vol. 16, no. 21 (October 28, 2002).
- Rutherford, Adam. "If You Could Pop a Pill to Raise Your IQ, Would You?" *The Guardian*, December 12, 2008.
- Ryman, Daniele. *Aromatherapy: The Complete Guide to Plant and Flower Essences for Health and Beauty*. New York: Bantam, 1991.
- Sahakian, Barbara, and Sharon Morein-Zamir. "Professor's Little Helper." *Nature*, 450 (December 20, 2007): 1157-59.
- Sahelian, Ray, M.D. *5-HTP: Nature's Serotonin Solution*. Garden City Park, NY: Avery, 1998.
- \_\_\_\_\_. *Kava: The Miracle Antianxiety Herb*. New York: St. Martin's, 1998.
- \_\_\_\_\_. *Melatonin: Nature's Sleeping Pill*. Marina del Rey, CA: Be Happier, 1995.
- Saletan, William. "Geeks, Jocks, and Doping." [www.slate.com](http://www.slate.com), April 10, 2008.
- Schultes, Richard Evans. *Hallucinogenic Plants*. New York: Golden, 1976.
- Shakocius, Sandy, and Durk Pearson. "Mind Food." *Omni* vol. 1, no. 8 (May 1979): 55.
- Shamsuddin, AbulKalam M., M.D. *IP6: Nature's Revolutionary Cancer-Fighter*. New York: Kensington, 1998.
- Shields, David. *The Thing About Life Is That One Day You'll Be Dead*. New York: Knopf, 2008.
- Siegel, Ronald K. *Intoxication*. New York: Pocket, 1989.
- Silverman, Harold M., et al. *The Pill Book*, 13th ed. New York: Bantam, 2008.
- Sizer, Frances, and Eleanor Whitney. *Nutrition: Concepts and Controversies*. Belmont, CA: Wadsworth, 1997.
- Sosin, Allan, M.D. and Beth Ley Jacobs. *Alpha Lipoic Acid: Nature's Ultimate Antioxidant*. New York: Kensington, 1998.
- Soyka, Michael. "Neuro-enhancement from an Addicition Specialist's Viewpoint." *Nervenarzt* vol. 80, issue 7 (July 2009): 837-9.
- Stein, Rob. "Is Every Memory Worth Keeping?" *The Washington Post*. October 19, 2004.
- Talbot, Margaret. "Can a Daily Pill Really Boost Your Brain Power?" *The Observer*, September 20, 2009.
- \_\_\_\_\_. "The Underground World of 'Neuroenhancing' Drugs." *The New Yorker*, April 27, 2009.
- Thompson, Andrea. "5 Ways to Beef Up Your Brain." [www.livescience.com](http://www.livescience.com), August 15, 2008.
- Tomlin, Sarah. "Would You Boost Your Brain Power?" [www.nature.com](http://www.nature.com), December 12, 2007.
- Tuller, David. "Race Is on for a Pill to Save the Memory." *The New York Times*, July 29, 2003.
- Vlaho, James. "Will Drugs Make Us Smarter and Happier?" *Popular Science*, September 2005.
- Walker, Dr. Morton. *DMSO: Nature's Healer*. New York: Avery, 1993.
- Weil, Andrew. *Eating Well for Optimum Health*. New York: Alfred A. Knopf, 2000.
- \_\_\_\_\_, and Winifred Rosen. *From Chocolate to Morphine*. New York: Houghton Mifflin, 1993.
- Welsh, Jennifer. "Brain Games: Is 'Limitless' a Glimpse

- of Our Future” [www.livescience.com](http://www.livescience.com), March 17, 2011.
- Wink, Michael, and Ben-Erik van Wyk. *Mind-Altering and Poisonous Plants of the World*. Portland, OR: Timber, 2008.
- Wolchover, Natalie. “What If Humans Could Be Made Twice as Intelligent?” [www.LifesLittleMysteries.com](http://www.LifesLittleMysteries.com), January 14, 2012.
- Young, Lawrence A., et al. *Recreational Drugs*. New York: Berkley, 1977.

### Primary Websites

[medicalexpress.com](http://medicalexpress.com)  
[scienceblog.com](http://scienceblog.com)

[www.aaas.org](http://www.aaas.org)  
[www.drugs.com](http://www.drugs.com)  
[www.drugs-forum.com](http://www.drugs-forum.com)  
[www.erowid.org](http://www.erowid.org)  
[www.esciencenews.com](http://www.esciencenews.com)  
[www.ncbi.nlm.nih.gov/pubmed](http://www.ncbi.nlm.nih.gov/pubmed)  
[www.ncbi.nlm.nih.gov/pubmedhealth](http://www.ncbi.nlm.nih.gov/pubmedhealth)  
[www.newscientist.com](http://www.newscientist.com)  
[www.nlm.nih.gov/medlineplus](http://www.nlm.nih.gov/medlineplus)  
[www.rxlist.com](http://www.rxlist.com)  
[www.sciencecodex.com](http://www.sciencecodex.com)  
[www.sciencedaily.com](http://www.sciencedaily.com)  
[www.sciencenews.org](http://www.sciencenews.org)  
[www.webmd.com](http://www.webmd.com)  
[www.wikipedia.org](http://www.wikipedia.org)

# Index

Numbers in **bold** indicate main entries.

- A-412997 **270**  
A20 **293**  
Aaron's Rod *see* goldenroot  
ABCC1 **123**, 291  
Abixa *see* memantine  
absinthe *see* wormwood  
*Acacia* species **202**; *see also* cohoba  
acai **9–10**  
*Acanthurus sandvicensis* *see* animals  
ACBP *see* DBI  
ACE inhibitors 35, **269**, 314  
acetaminophen 70, 253, **269**  
acetylcholinesterase inhibitor 319, 322  
acetyl-L-carnitine 12, **165–166**, 169  
acetylsergic acid diethylamide *see* LSD  
ache *see* celery  
*Achillea millefolium* *see* yarrow  
acid *see* LSD  
Acomplia *see* SR141716  
Acon *see* vitamin A  
aconite 45, **202–203**  
*Aconitum ferox* *see* aconite  
*aconitum napellus* *see* aconite  
*Acorus calamus* *see* calamus; sweet flag  
acrid lettuce *see* lettuce  
AcSDKP **123**  
ACTH analogs *see* adrenocorticotrophic hormone analogs  
ACTH4–9 185  
ACTH 4–10 *see* adrenocorticotrophic hormone analogs  
Acti-B-12 *see* vitamin B-12  
actibine *see* yohimbe  
actin-like 6B *see* Baf53b  
Activin *see* grape seed extract  
ACTL6B *see* Baf53b  
ACTOplus Met 286  
Actos *see* Pioglitazone HCl  
acuja *see* cohoba  
Acumen *see* DMAE  
Adderall **269–270**; *see also* amphetamine  
Adderall XR *see* Adderall  
adder's mouth *see* chickweed  
Ademetionine *see* SAME  
Adenocard *see* adenosine  
adenosine 74, 168, **174**, 212, 332  
adenosine diphosphate *see* adenosine  
adenosine triphosphate *see* adenosine  
ADH *see* vasopressin  
ADHD *see* Attention Deficit Hyperactivity Disorder  
A-Dione *see* androstenedione  
Adiuretin SD *see* vasopressin  
Adjuvant *see* pyroglutamate  
ADP *see* adenosine  
Adrafinil **270**  
adrenalin 128, 138, 184, 212, 287; *see also* stress hormones  
adrenocorticotrophic hormone analogs **174**, 187, 302  
advanced glycation end-products (AGEs) 318, 328  
Advil *see* Ibuprofen  
aequorin *see* apoaequorin  
AF267B **270**  
Afaxin *see* vitamin A  
Afobazole **293**  
Africa pepper *see* cayenne  
African ginger *see* ginger  
African mango *see* irvingia  
African myrrh *see* guggul  
African rue **203**; *see also* Syrian rue  
African sea lily *see* kwashi  
African wild yam **203**  
agara 229  
*Agave* species *see* mescal plant  
Agbono *see* irvingia  
AGE-1 **334**, 337  
age-related cognitive decline, protection against 108, 109, 132, 134, 158, 178, 186, 190, 252, 270, 273, 277, 278, 279, 280, 283, 284, 285, 286, 287, 290, 297, 298, 299, 300, 302, 304, 309, 310, 311, 315, 317, 318, 319, 320, 323, 337, 339, 341, 348, 350, 352  
Agomelatine **293**  
Aguacolla *see* san pedro  
ague tree *see* sassafras  
aimpa *see* cebil  
aimpa-kid *see* cebil  
Ait-082 **293–294**  
ai'yuku *see* cohoba  
ajuca *see* jurema  
akar pining hitam 209  
akatinol *see* memantine  
akurjua *see* epena  
AL721 151  
alagebrium **294**  
alagebrium chloride *see* alagebrium  
ALC *see* acetyl-L-carnitine  
Alcar *see* acetyl-L-carnitine  
*Alchornea floribunda* *see* niando  
alcohol **10–12**, 22, 27, 29, 49, 65, 66, 68, 70, 77, 83, 92, 94, 97, 103, 105, 106, 107, 109, 113, 120, 121, 127, 131, 132, 139, 153, 170–172, 175, 176, 179, 183, 184, 186, 187, 190, 191, 195, 204, 207, 209, 211, 214, 218, 223, 224, 225, 233, 235, 247, 249, 266, 268, 269, 297, 299, 303, 307, 308, 310, 318, 320, 327–328, 329, 330, 331, 344, 352  
Alcover *see* GHB  
ALD-52 *see* LSD  
Alena *see* alpha-linolenic acid  
Alendronate **270**  
Alendronate sodium *see* Alendronate  
alertness *see* cognitive enhancement  
Aleve *see* Naproxen  
alfalfa and alfalfa sprouts 169, 178  
algarobo *see* cebil  
*algarroba de yupa* *see* cohoba  
Algil *see* Meperidine  
all-heal *see* fragrant valerian; valerian  
All-Inclusive Great Tonifying Pills *see* shi quan dab u wan  
Allegra *see* Fexofenadine  
*Allium canadense* *see* garlic  
*Allium cepa* *see* onion  
*Allium sativum* *see* garlic  
Almitrine **270**  
Almitrine bismesylate *see* Almitrine  
Almitrine dimesylate *see* Almitrine  
Almitrine mesylate *see* Almitrine  
almond **12**, 44, 90, 94, 95, 141, 185  
Alnert *see* Bifemelane  
Alnespirone **294**  
Alodan *see* Meperidine

- aloe 92  
*Aloysia citrodora* see verbena  
 alpha-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptors see AMPA receptors  
 alpha-aminoglutaric acid lactam see pyroglutamate  
 alpha4-beta-delta 334  
 Alpha LA see alpha-lipoic acid  
 alpha-lactalbumin 123  
 alpha-linolenic acid 43, 44, 155  
 alpha-lipoic acid 133, 166, 166–167, 169  
 Alpha Lipotene see alpha-lipoic acid  
 alpha-methyltryptamine see DMT  
 Alpha Redisol see vitamin B-12  
 Alphalin see vitamin A  
 Alphamin see vitamin B-12  
 Alphaprodine 287  
 Alprax see Alprazolam  
 Alprazolam 271, 311  
 Alprocontin see Alprazolam  
*Alstonia scholaris* see dita tree  
*Alstonia theaeiformis* 224  
 ALT-711 see Alagebrium  
 altered states of consciousness 66, 202–268, 349, 353, 354, 355, 360, 365  
 Alzheimer's disease 2, 3, 7, 10, 12, 13, 16, 17, 18, 20, 24, 25, 28, 33, 35, 36, 37, 42, 51, 52, 53, 55, 56, 58, 59, 62, 65, 69, 72, 79, 81, 88, 89, 90, 92, 93, 94, 96, 97, 104, 107, 108, 109, 110, 113, 116, 123, 124, 125, 129, 130, 131, 132, 133, 134, 135, 136, 137, 139, 140, 141, 143, 144, 145, 146, 149, 152, 154, 155, 157, 160, 161, 165, 167, 168, 171, 172, 173, 175, 176, 177, 178, 182, 183, 185, 188, 189, 209, 212, 213, 227, 244, 252, 259, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 284, 286, 287, 288, 289, 290, 291, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 324, 325–326, 328, 330, 332, 334–335, 336, 337, 341, 342, 344, 345, 346, 348, 350, 352, 353, 354, 355, 356, 359, 362, 363, 366; see also dementia  
 Alzhemed 294  
*Amanita muscaria* see Amanita mushrooms  
 Amanita mushrooms 70, 203–204, 233; see also mushrooms  
*Amanita pantherina* see Amanita mushrooms  
*Amanita phalloides* 204  
*Amanita verna* 204  
 Amazeo see Amisulpride  
 Amazeo OD see Amisulpride  
 amber see St. John's wort  
 Ambien see Zolpidem  
 Ambien CR see Zolpidem  
 ambrosia see bee pollen  
 American arbor-vitae see white cedar  
 American ephedra see ephedra and ma-huang  
 American gentian see gentian  
 American ginseng see ginseng  
 American horsemint see horsebalm  
 American mandrake see mandrake  
 American mint see peppermint  
 American pepper see cayenne  
 American rue 263  
 American wormseed 266  
 Amineptine 294, 295, 318  
 amino acids 33, 34, 39, 40, 122–150, 317  
 Amino Mass see pyroglutamate  
 aminoguanidine 271  
 aminoguanidine hydrochloride see aminoguanidine  
 Aminotrophic see protein powder  
 amirucapanga see psychotria  
 Amisulpride 295  
 Amitrex see Amisulpride  
 Amitriptyline 295  
 AMK see atracylodes (white)  
 ammonium diethyl-dithiocarbamate see DDC  
*Anomum cardamomum* see cardamom  
 AMPA receptors 334  
 Ampakines 295, 311, 324  
 amphetamines 5, 27, 190, 207, 215, 225, 238, 256, 268, 271, 285, 289, 301, 320, 330  
 Ampligen see ribonucleic acid  
 AMT see DMT  
 amygdala 192, 328, 353, 360  
 amyloid-beta see Alzheimer's disease  
 amyloid precursor protein 342  
 AN-1792 295, 297  
*Anadenanthera colubrine* see cebil  
*Anadenanthera excelsa* see cebil  
*Anadenanthera macrocarpa* see cebil  
*Anadenanthera peregrina* 217, 231; see also cohoba  
 anandamide 204–205, 218; see also endocannabinoids  
 Anaprox see Naproxen  
 Anaprox DS see Naproxen  
 anarcotine see noscapine  
*Anathum graveolens* see dill  
 anchovies 30, 89  
 Andri see *Bacopa monniera*  
 Androgeron see xanthinol nicotinate  
*Andropogon muricatus* see vetiver  
 androstanolone see dihydrotestosterone  
 androstenedione 174–175  
*Anemarrhena asphodeloides* see zhi mu  
 angelica 55, 193, 194, 195  
*Angelica archangelica* see angelica  
*Angelica sinensis* see dong quai  
 angels' trumpet see brugmansia  
 angico see cebil; cohoba  
 Angiomanin see xanthinol nicotinate  
 Angiomim see xanthinol nicotinate  
 angiotensin-converting enzyme inhibitors see ACE inhibitors  
*Anhalonium lewinii* see peyote  
*Anhalonium williamsii* see peyote  
 animals 205–206  
 Aniracetam 295, 311  
 anise 46, 69  
 aniseed see anise  
 Anocobin see vitamin B-12  
 Antalarmin 296  
*Anthemis nobilis* see chamomile  
 anti-aging 35, 39, 41, 43, 55, 69, 89, 99, 108, 113, 116, 124, 125, 128, 132, 133, 134, 135, 145, 152, 163, 170, 177, 180, 182, 183, 189, 190, 271, 273, 280, 281, 284, 286, 294, 298, 306, 322, 324, 327, 336, 337, 339, 340, 343, 346, 347, 352, 358, 364; see also lifespan, increased  
 antibodies 296  
 antidiuretic hormone see vasopressin  
 antioxidants 7–9, 12, 13, 14, 15, 16, 17, 18, 21, 22, 23, 27, 28, 31, 33, 35, 36, 37, 39–40, 42, 43, 44, 47, 48, 50, 51, 52, 54, 55, 56, 57, 63, 70, 71, 72, 73, 74, 75, 76, 78, 79, 81, 87, 91, 92, 96, 97, 99, 101, 102, 106, 111, 116, 119, 124, 125, 127, 137, 138, 147, 165, 166, 167, 168, 169, 172, 173, 182, 200, 215, 218, 219, 273, 275, 276, 278, 280, 309, 311, 313, 322, 323, 330, 351, 354, 357, 362, 363, 365, 366  
 ants see animals  
 anxiety attacks see anxiety; anxiety disorders  
 anxiety disorders 72, 77, 184, 252, 291, 331, 341; see also Generalized Anxiety Disorder  
 anxiety reduction 25, 26, 38, 46, 47, 48, 49, 54, 57, 64, 65, 66, 70, 71, 72, 73, 74, 78, 79, 80, 82, 93, 94, 95, 100, 106, 107, 111, 123, 128, 130, 132, 133, 138, 144, 145, 148, 156, 161, 163, 175, 176, 177, 178, 180, 184, 185, 186, 193, 194, 196, 197, 198, 199, 200, 201, 212, 222, 235, 269, 271, 272, 274, 285, 286, 288, 293, 296, 297, 299, 300, 307, 308, 309, 312, 313, 318, 319, 320, 323, 327, 329, 342, 343, 353, 357, 358, 364; see also stress reduction  
 anxiolytic see anxiety  
 Anzilmil see Alprazolam  
 aparajita see *Clitoria ternatea*  
*Aphanizomenon flos-aquae* see microalgae and seaweed  
 aphrodisiacs 22, 53, 64, 65, 66, 68, 71, 72, 83, 104, 141, 142, 175, 177, 180, 190, 193, 194, 195, 196, 201, 206, 207, 209, 220, 222, 224, 234, 235, 238, 242, 252, 254, 257, 261, 263, 267, 273, 280, 289, 327  
 Aphrodyne see yohimbe  
*Apium graveolens* see celery  
 Apo-Alpraz see Alprazolam  
 apoaequorin 350  
 APOE E2 allele 334–335  
 APOE-e4 1, 278, 279, 296, 334  
 APOE-epsilon4 see APOE-e4  
 APOE4 see APOE-e4

- Apolipoprotein E2 allele *see* APOE E2 allele  
 APP 342  
 apple 8, **12–13**, 89, 94, 185  
 apples of Sodom *see* belladonna  
 apples of the fool *see* mandrake  
 apples of the genie *see* mandrake  
 apricots 90, 94  
 Aquasol A *see* vitamin A  
 Aquasol E *see* vitamin E  
 Arabian myrrh *see* guggul  
*arachidonoyl ethanolamine see* endo-cannabinoids  
*Aralia hispida see* sarsaparilla  
*Aralia nudicaulis see* sarsaparilla  
*Aralia racemosa see* sarsaparilla  
*arbol de los brujo* **206**, 257  
 Arcaloin *see* Sulbutiamine  
*Archontophoenix cunninghamiana* **206–207**  
 arctic root *see* *Rhodiola rosea*  
*Arctostaphylos uva-ursi see* uva-ursi  
*Areca catechu see* betel  
*Areca catechu L. var. nigra* 209  
 areca nut *see* betel  
 Arecoline **271–272**  
*Argemone Mexicana see* Mexican poppy  
*Argemone ochroleuca see* Mexican poppy  
 arginine 39, **123–124**, 125, 126, 181, 316, 343  
 arginine pidolate *see* pyroglutamate  
 arginine pyroglutamate *see* pyroglutamate  
 arginine-vasopressin *see* vasopressin  
 argipressin *see* vasopressin  
*Argyrea acuta* 233  
*Argyrea aggregate* 233  
*Argyrea barnesii* 233  
*Argyrea capitata* 233  
*Argyrea hainanensis* 233  
*Argyrea nervosa see* Hawaiian baby wood rose  
*Argyrea obtusifolia* 233  
*Argyrea osyrensis* 233  
*Argyrea pseudorubicunda* 233  
*Argyrea speciosa* 233  
*Argyrea splendens* 233  
*Argyrea wallichii* 233  
 Aricept *see* Donepezil  
*Ariocarpus fissuratus see* false peyote  
 Arizona walnut *see* walnut  
*Armatocereus laetus see* pishicol  
 Armodafinil *see* Nuvigil  
 arsenate *see* arsenic  
 arsenic **207**  
 arsenic pentoxide *see* arsenic  
 arsenic trichloride *see* arsenic  
*Artemisia abronatum* 266  
*Artemisia absinthium see* wormwood  
*Artemisia argyi see* mugwort  
*Artemisia cina see* wormseed  
*Artemisia dracunculus see* tarragon  
*Artemisia mexicana see* Mexican wormwood  
*Artemisia vulgaris see* mugwort  
 arthritis pain formula *see* aspirin  
 artichoke 80  
*Arundo donax see* giant reed  
 AS-19 **296**  
 A.S.A. *see* aspirin  
*Asarum canadense see* ginger  
 ascorbic acid *see* vitamin C  
 Ascorbicap *see* vitamin C  
 ascorbyl palmitate *see* vitamin C  
 Ascriptin A/D *see* aspirin  
 Ascriptin Extra Strength *see* aspirin  
 ashwaganda *see* ashwagandha  
 ashwagandha **46**  
 AsialoGM1 *see* GM-1 ganglioside  
 Asian marsh pennywort *see* polygonum  
 Asiatic ginseng 53; *see also* ginseng  
 asparagus 49, 90, 99, 102, 116, 133, 172  
 aspartame 141  
 Aspergum *see* aspirin  
*Asphaltum punjabianum see* shilajit  
 aspirin 11, 25, 81, 92, 102, 105, 112, 113, 117, 158, 160, 177, 183, 213, **272**, 303, 305, 363  
 astaxanthin 157  
 Astenile *see* DHEA  
 asthma weed *see* lobelia  
 astragalus **46–47**, 55, 69, 78, 326–327  
*Astragalus boantchy see* astragalus  
*Astragalus membranaceus see* astragalus  
 astrocytes 245, 246, **335**  
 astrocytic glial cells *see* astrocytes  
 astroglia *see* astrocytes  
 ATF1 *see* GDNF  
 ATF2 *see* GDNF  
 Arg8a **335**  
 Atomic Number 54 *see* xenon  
 ATP *see* adenosine  
 Atp7a **335**  
 ATR *see* atractylodes (white)  
 Atractylenolide *see* atractylodes (white)  
*Atractylis lancea see* atractylodes (white)  
*Atractylis ovate see* atractylodes (white)  
 atractylodes (white) **47**, 78  
*Atractylodes chinensis see* atractylodes (white)  
*Atractylodes japonica see* atractylodes (white)  
*Atractylodes lancea see* atractylodes (white)  
*Atractylodes macrocephala see* atractylodes (white)  
*Atractylodes ovate see* atractylodes (white)  
*Atractylodis Radix see* atractylodes (white)  
 Atrol *see* DMAE  
*Atropa belladonna see* belladonna  
 Attentil *see* Fipexide  
 Attention Deficit Hyperactivity Disorder 18, 30, 77, 92, 93, 94, 128, 130, 133, 142, 148, 149, 157, 158–159, 161, 184, 237, 252, 256, 269, 270, 281, 285, 295, 299, 300, 314, 328, 355  
 autism 93, 124, 157, 182, 185, 237, 288, 299, 314, 320, 328, 335, 341, 342, 344, 347, 354, 360  
 Autism Spectrum Disorder (ASD) 157, 288  
 autophagy 131, 135, 335, 337, 357  
 autophagy genes **335**  
 autumn crocus *see* saffron  
 AV-411 *see* Ibudilast  
 ava *see* kava and kawain  
 Avan *see* idebenone  
 Avandia 290  
*Avena sativa se* oat  
 avocado 90, 94, 96, 104, 106, 133, 165, 185, 207, 225  
 AVP *see* vasopressin  
 awa *see* kava and kawain  
 axura *see* memantine  
 ayahuasca **207–208**, 211, 224, 227, 234, 258  
 ayahuasca analogues 207  
*Ayahuasca borealis* 207  
*Azalea pontica see* rhododendron  
 AZD6765 *see* lanicemine  
 AZD-3480 *see* isopronidine  
 Azilect *see* rasagiline  
  
 B vitamins 12, 14, 18, 19, 23, 26, 60, 92, 100, 102, 103, 119, 125, 153, 220; *see also* specific vitamins  
 baby Hawaiian woodrose *see* Hawaiian baby wood rose  
 bacopa *see* *Bacopa monniera*  
*Bacopa monniera* **47**  
*Bacopa monnieri see* *Bacopa monniera*  
 bacteria **350**  
 badian anise *see* star anise  
 badoh negro seeds *see* morning glory  
 Baf53b **335**  
 Bai Dou Kou *see* cardamom  
 Bai Zhu *see* atractylodes (white)  
 Bai-Zhu Atractylodes *see* atractylodes (white)  
 baibai **208**  
 bakana *see* scirpus  
 bakanawa *see* scirpus  
 bakanoa *see* scirpus  
 bala *see* country mallow  
 balm *see* melissa  
 Balm of Gilead **47–48**  
*Balsam poplar see* Balm of Gilead  
 bamboo grub *see* animals  
 banana **13**, 21, 94, 96, 106, 123, 148, 170, 182, 185, 207, 225, 240  
 banana peels **208**  
 bancha tea *see* green tea  
 banewort *see* belladonna  
 Banflex *see* Orphenadrine  
 bang *see* henbane  
 bangu *see* henbane  
*Banisteriopsis caapi see* ayahuasca and caapi  
*Banisteriopsis inebrians see* ayahuasca and caapi  
*Banisteriopsis martiniana see* ayahuasca and caapi  
*Banisteriopsis muricata see* ayahuasca and caapi

- Banisteriopsis quitensis* see ayahuasca and caapi  
*Banisteriopsis rusbyana* see ayahuasca and caapi  
 Bapineuzumab **296**  
 bariar see country mallow  
 barley 92, 93, 99, 182, 239  
 barley grass see grass, wheat and barley  
 Baron-X see yohimbe  
 basil 45, **193**  
 bastard cardamom see cardamom  
 bastard Ginseng see codonopsis root  
 batsikawa see psychotria  
 baumdatura see brugmansia  
 bay **193**  
 bay leaf see bay  
 Bayer see aspirin  
 Bayer Select Pain Relief Formula see ibuprofen  
 BCAAs see branched chain amino acids  
 BCI-540 **296**  
 BCI-632 **296**  
 BD **296**  
 BDNF 44, **124**, 126, 175, 295, 342  
 B-DPNH see NADH  
 beach morning glory see morning glory  
 beach mulberry see noni  
 bean sprouts 110, 172  
 beans see legumes  
 bearberry see uva-ursi  
 bearded darnel see darnel  
 beautiful lady see belladonna  
 bebai see baibai; budzamar  
 bedgery see pituri  
 Bedoc see vitamin B-12  
 bee balm see horsebalm; melissa  
 bee bread see bee pollen  
 bee pollen **13–14**, 39  
 bee propolis 332  
 beef 87, 88, 100, 101, 106, 108, 119, 141, 156, 167  
 beer see alcohol  
 bees 205  
 Beesix see vitamin B-6  
 beet **14**, 43, 90  
 beetroot see beet  
 beetroot juice 14  
 Befloxatone **296–297**  
 bejuco de oro see ayahuasca and caapi  
 bell peppers 252  
 bella union see brunfelsia  
 belladonna 205, **208–209**, 253, 260, 261  
 bellflower see codonopsis root  
 Bemegrade **297**  
 Benactyzine 89, **272**  
 Benadryl 285  
 Beneficat see Trazodone  
 Benfotiamine 103  
 bengi see henbane  
 Benjamin Button gene **336**  
 Benjamin Button jellyfish **351**  
 Benzedrine see amphetamine  
 Benzoin **193**, 196, 200  
 bergamot **193–194**, 194, 195, 196, 197, 201  
 Bermuda thistle see Mexican poppy  
 Berubigen see vitamin B-12  
 beta-amyloid see Alzheimer's disease  
 beta-arrestin **124**  
 beta blockers **272**  
 beta-carotene 8, 55, **100–102**, 111, 125, 159  
 beta-hydroxybutyrate see BHB  
*Beta vulgaris* see beet  
 Betalin 12 see vitamin B-12  
 Betalin S see vitamin B-1  
 beta-phenethylamine see phenethylamine  
 Betaprodine 287  
 Betaseron see Interferon beta  
 Betaxin see vitamin B-1  
 betel **209–210**, 271  
 betel nut see betel  
 betel nut tree see betel  
 betel palm see betel  
 Bethin see SR141716  
 Bewon see vitamin B-1  
 Bexarotene **272–273**  
 BH3 gene family 342  
 BHA 118, **351**, 351, 363  
 bhang see marijuana  
 BHB **336**  
 BHD see FLCN  
 BHO see marijuana  
 BHT 118, **351–352**, 363  
 Biamine see vitamin B-1  
 bicho de taquara see animals  
 Bifemelane 169, **297**  
*Bifidobacterium animalis subsp Lactis* see probiotics  
*Bifidobacterium infantis* see probiotics  
*Bifidobacterium longum* see probiotics  
 bilberry **14–15**, **48**  
 Bilobalide **297**  
 Bimanol see DMAE  
 bioflavonoids **110–113**, 343  
 Biorphen see Orphenadrine  
 bipolar disorder 152, 154, 161, 236, 280, 284, 287, 312, 344, 345; see also depressives, anti-  
 Biral see valerian  
 bird pepper see cayenne  
 birds see animals  
 Bis-THA **297**  
 bissu nut see kola nut  
 bitter buttons see tansy  
 bitter grass see calea  
 bitter leaf see calea  
 bitter lettuce see lettuce  
 bitter root see gentian  
 bitterwort see gentian  
 black asphaltum see shilajit  
 black cardamom see cardamom  
 black cherry **15**; see also belladonna  
 black cohosh **48**  
 black drink plant see yaupon  
 black ginger see ginger  
 black henbane see henbane  
 black nightshade see nightshade  
 black parica see cohoba  
 black pepper 45, 53, 87; see also pepper  
 black raspberry **15–16**  
 black rice **16**  
 black snakeroot see black cohosh  
 black tea 61, 215  
 black walnut see walnut  
 black whortleberry see bilberry  
 black willow see willow  
 blackstrap molasses 94, 106, 119  
 bladderpod see lobelia  
 blackberry see bilberry  
 blessed thistle **48**  
 blood **210**, **352**  
 blood sugar see glucose  
 bloom of the lent see brunfelsia  
 blowball see dandelion  
 blue aconite see aconite  
 blue balm see horsebalm  
 blue cohosh 175  
 blue flag 215  
 blue gentian see gentian  
 blue-green algae see microalgae and seaweed  
 blue lotus flower see water lily  
 blue morning glory see morning glory  
 blue pea see *Clitoria ternatea*  
 blue pimpernel see skullcap  
 blue rocket see aconite  
 blue skullcap see skullcap  
 blueberry 7, **16–17**, 21, 24, 34, 40, 97, 169; see also bilberry  
 bluefish 113, 154  
 BNADH see NADH  
 boas noites see brunfelsia  
 bog bilberry 204  
 bogota tea 224  
 bois ca-ca 236  
 bois ecorce see cohoba  
 bois rouge see cohoba  
 bok choy see cabbage  
 bole-hena see masha-hari  
 bolond gomba see amanita mushrooms  
 B1R see bradykinin B1  
 Bonifen see Pyritinol  
 bonnet Bellflower see codonopsis root  
 book fungus **210**  
*Boophone disticha* see *Boophone disticha*  
*Boophone disticha* **210**  
 Borachuela see darnel  
 borage oil 155  
 borage seed 155  
 boron 72, 86  
 borrachera **210**; see also brugmansia; brunfelsia, darnel; iochroma  
 borrachero **210**; see also brugmansia; brunfelsia  
 borrachero de paramo see taique  
*Boswellia carteri* see frankincense  
*Boswellia sacra* see frankincense tree  
*Boswellia thurifera* see frankincense  
 box holly see butcher's broom  
 BP 662 see Fipexide  
 Bradykinin B1 **336**  
 Brahma **48**; see also *Bacopa monniera*; gotu-kola

- brain damage, injury, trauma 16, 22, 38, 84, 95, 98, 123, 124, 126, 127, 134, 140, 145, 154, 161, 174, 178, 185, 187, 190, 227, 244, 267, 273, 274, 275, 276, 277, 278, 283, 287, 300, 305, 311, 312, 315, 316, 318, 319, 320, 321, 322, 326, 333, 336, 341, 342, 343, 346, 355; *see also* neuroprotection; strokes
- brain-derived neurotrophic factor *see* BDNF
- brain development 336, 339, 344, 347; *see also* mind enhancement
- bran 87, 96, 102, 106, 119
- branched chain amino acids 124–125
- brandy mint *see* peppermint
- Brassica oleracea* *see* broccoli; cabbage
- Brazepam *see* Bromazepam
- Brazil nuts 94, 99, 151
- Brazilian chocolate *see* guarana
- Brazilian cocoa *see* guarana
- BRCA1 181, 336
- bread tree *see* Irvingia
- breakfast cereals, fortified *see* cereals
- breast milk 17, 34, 146, 151, 156, 172, 185, 213, 230, 240
- Brenal *see* Maclofenoxate
- brewer's yeast 18, 87, 88, 90, 99, 104, 106, 108, 151, 163, 343
- Brigham Young weed *see* ephedra and ma-huang
- bristly sarsaparilla *see* sarsaparilla
- broad beans 207, 225
- Brocasipal *see* Orphenadrine
- broccoli 18, 85, 99, 102, 106, 116, 133, 166, 173
- Bromaze *see* Bromazepam
- Bromazepam 297
- Bromocriptine 273
- broom *see* scotch broom
- brown rice *see* rice
- brugmansia 210, 210–211, 220, 223
- Brugmansia arborea* *see* brugmansia
- Brugmansia aurea* *see* brugmansia
- Brugmansia sanguinea* *see* brugmansia
- Brugmansia suaveolens* *see* brugmansia
- Brugmansia versicolor* *see* brugmansia
- Brugmansia vulcanicola* *see* brugmansia
- Brugmansia* × *candida* *see* brugmansia
- Brugmansia* × *insignis* *see* brugmansia
- brunfelsia 207, 211–212
- Brunfelsia Americana* *see* brunfelsia
- Brunfelsia australis* *see* brunfelsia
- Brunfelsia chiricaspis* *see* brunfelsia
- Brunfelsia grandiflora* *see* brunfelsia
- Brunfelsia hopeana* *see* brunfelsia
- Brunfelsia maritime* *see* brunfelsia
- Brunfelsia pauciflora* *see* brunfelsia
- Brunfelsia uniflora* *see* brunfelsia
- brussels sprouts 100, 103, 116, 173
- Bryostatins-1 273
- bubbia *see* kikisira
- buckwheat 123
- budder *see* marijuana
- budzamar 208
- Bufferin *see* aspirin
- Bufo alvarius* *see* toad
- Bufo marinus* *see* toad
- bufotenine *see* DMT
- bugbane *see* black cohosh
- bugwort *see* black cohosh
- bulb onion *see* onion
- bunga telang *see* *Clitoria ternatea*
- buplerum 49, 82
- Buplerum Sedative Pills 82
- burren myrtle *see* bilberry
- bush mango *see* Irvingia
- bushman poison bulb *see* *Boophone disticha*
- businessman's trip *see* cebil
- butane hash oil *see* marijuana
- butane honey oil *see* marijuana
- butcher's broom 49
- butt hash *see* jenkem
- butter 101
- butterfly pea *see* *Clitoria ternatea*
- butylated hydroxyanisole *see* BHA
- butylated hydroxytoluene *see* BHT
- Byaki-jutsu *see* atractylodes (white)
- C-4 333
- C-Span *see* vitamin C
- Ca *see* calcium
- Ca/calmodulin-dependent protein kinase II (CaMKII) molecule 344
- CA1 336; *see also* hippocampus
- CA3 336, 344; *see also* hippocampus
- caapi 207–208
- caapi-pinima 207
- caatinga *see* jurema
- cabbage 19, 85, 99, 100, 103, 106, 116, 133, 151, 152, 152, 173
- cabbage rose *see* rose
- cabium *see* cebil
- CAD-106 297
- cadana *see* ayhuasca and caapi
- cadavre gate 236
- Caesalpinia decapetala* *see* yun-shih
- Caesalpinia sepiaria* *see* yun-shih
- Cafardil *see* xanthinol nicotinate
- caffeine 21, 23, 24–27, 29, 61, 62, 68, 82, 83, 93, 103, 106, 126, 146, 147, 153, 174, 177, 183, 207, 209, 212–215, 218, 220, 225, 228–229, 238, 247, 253, 299, 308, 310, 314, 315, 359
- caffeine nut *see* kola nut
- cajoba *see* cohoba
- Calamarine 156, 298, 313
- calamus 215, 232; *see also* giant reed; sweet flag
- calamus root 60, 74
- calciferol *see* vitamin D
- calcineurin 125
- calcium 14, 22, 2326, 40, 52, 55, 60, 74, 86–87, 94, 95, 102, 109, 121, 128, 146, 154, 179, 182, 183, 207, 215, 218, 220
- calcium ascorbate *see* vitamin C
- calcium carbonate *see* calcium
- calcium-dependent serine-threonine phosphatase *see* calcineurin
- calcium pangamate *see* vitamin B-15
- calcium pantothenate *see* vitamin B-5
- calea 216
- Calea ternifolia* *see* calea
- Calea zacatechichi* *see* calea
- calf's liver 92, 152
- California buckthorn *see* coffee-berry
- California poppy 49, 216
- calmness *see* relaxant
- caloric restriction 145, 343, 346, 352–353
- calpain inhibitors 298
- Cama Arthritis Pain Reliever *see* aspirin
- Camellia sinensis* *see* green tea
- camgaba *see* brunfelsia
- CamkII molecule 344
- camomile *see* chamomile
- cAMP *see* adenosine
- cAMP (Cyclic adenosine monophosphate) response element binding protein *see* CREB
- campachu *see* brugmansia
- campanilla *see* brugmansia
- Campanumaea pilosula* *see* don sen
- camphor 194
- Camphora officinarum* *see* camphor
- Canaalia ensiformis* 216
- Canada balsam 47
- Canada snakeroot *see* ginger
- Cananga 201
- Cananga macrophylla* 201
- Cananga odorata* *see* ylang ylang
- Canary Island broom *see* scotch broom
- Canavalia maritima* 216
- candelabra flower *see* *Boophone disticha*
- candelon *see* cohoba
- cane sticks *see* giant reed
- cang zhu *see* atractylodes (white)
- cangzhu *see* atractylodes (white)
- canterwort *see* dandelion
- cannabinoid 1 receptors *see* HU210
- cannabis *see* marijuana
- Cannabis indica* *see* marijuana
- Cannabis ruderalis* *see* marijuana
- Cannabis sativa* *see* marijuana
- canola oil 156; *see also* vegetable oil
- cantaloupe 90, 92, 94, 106
- cantharides *see* animals
- Cantharis vesicatoria* *see* animals
- caobo *see* cohoba
- Cap-Profen *see* ibuprofen
- capparis *see* kara
- Capparis indica* 236
- capsicum *see* cayenne
- Capsicum anuum* *see* cayenne
- Capsicum frutescens* *see* cayenne
- Capsicum* genus *see* pepper
- Captol *see* Oxprenolol
- Captopril *see* ACE inhibitors
- caraway 194, 216
- Carbamazepine 174, 176, 179, 329
- Carbenoxolone 273
- carbidopa 280, 289



- carbogen 216–217  
 carbohydrates 19–20, 25, 38, 87,  
 103, 119, 126, 131, 169, 213, 364  
 carbon dioxide 216–217, 230–231,  
 353  
*Cardamine concatenata* 217  
 cardamom 49, 53  
 Cardamom Essential Oil *see* car-  
 damom  
 cardamomo *see* cardamom  
 Cardiazol *see* pentylenetetrazol  
 cardinal flower *see* lobelia  
 cardo *see* san pedro  
 cardomom *see* cardamom  
*Cardomomi fructus* *see* cardamom  
*Carduus marianus* *see* milk thistle  
 carmustine 353  
 carnitine *see* acetyl-L-carnitine  
 Carnitor *see* acetyl-L-carnitine  
 carnosine 125, 169  
 carob 23, 123, 181, 220  
 carotene *see* vitamin A  
 carotenoids 100–102  
 Carphedon *see* phenylpiracetam  
 carrots 9, 20, 43, 90, 94, 102, 106,  
 166  
*Carum carvi* *see* caraway  
*Caryophyllus aromaticus* *see* clove  
 CAS 997 *see* tenilsetam  
 Caspase-8 298  
 cassene *see* yaupon  
 cassia *see* cinnamon  
 cassina *see* yaupon  
*Castanopsis acuminatissima* *see*  
 kawang  
 castilago *see* henbane  
 caterpillar fungus *see* cordyceps  
 caterpillar mushroom *see* cordyceps  
*Catha edulis* *see* khat  
 catkins willow *see* willow  
 catmint *see* catnip  
 catnep *see* catnip  
 catnip 49–50  
 Catovit *see* Prolintane  
 catrup *see* catnip  
 cat's claw 50; *see also* cebil  
 catswort *see* catnip  
 Caucasian snowdrop *see* galan-  
 thamine  
 cauliflower 110, 133, 151, 152, 153  
 Cavendish banana *see* banana  
 Cavinton *see* vinpocetine  
 cawe 217  
 cayenne 50  
 cayenne red pepper 53  
 CBI receptors 227, 332, 335  
 CB-154 *see* bromocriptine  
 CBP 125  
 CC-Chemokine Receptor 2 *see*  
 CCR2  
 CCK-8 *see* cholecystokinin-8  
 CCR2 336  
 CDP-choline *see* citicoline; cy-  
 tidinediphosphocholine  
 cebil 217  
 cebil blanco *see* cebil  
 Cecon *see* vitamin C  
*Cecropia mexicana* *see* guaruma  
*Cecropia obtusifolia* *see* guaruma  
 cedar 194, 194, 196, 197, 199, 201  
 cedarwood *see* cedar  
*Cedrus atlantica* *see* cedar  
*Cedrus deodora* *see* cedar  
*Cedrus libani* *see* cedar  
 Cehobba *see* cohoba  
 Celeport *see* Bifemalane  
 celery 20–21, 50, 90, 94, 99, 194  
 celery seeds 328  
 Celexa *see* citalopram  
 Cell Guard *see* superoxide dismu-  
 tase  
 Cellative *see* Meclofenoxate  
 Cemill *see* vitamin C  
 Cenolate *see* vitamin C  
*Centella asiatica* *see* gotu-kola  
 Centralgin *see* Meperidine  
 Centrophenoxine *see* Meclofenox-  
 ate  
 century plant *see* mescal plant  
 CEppt 167  
*Cerastium vulgatum* *see* chickweed  
*Cerberia benedicta* *see* blessed this-  
 tle  
 Cerbon 6 *see* pyritinol  
 Cere *see* Cerebrolysin  
 cereals 127; breakfast, fortified 90,  
 113; whole-grain 87, 94, 102, 123  
 Cerebroforte *see* piracetam  
 Cerebrolysin 298, 317, 318; *see also*  
 N-PEP-12  
 Cervoxan *see* DMAE  
*Cestrum aurantiacum* *see* green ces-  
 trum  
*Cestrum elegans* *see* green cestrum  
*Cestrum laevigatum* *see* dama de  
 noite; green cestrum  
*Cestrum parqui* *see* green cestrum  
 Cetane *see* vitamin C  
 CETP 336–337  
 CETP VV *see* CETP  
 Cevalin *see* vitamin C  
 Cevi-Bid *see* vitamin C  
 cevil *see* cebil  
 cevil blanco *see* cebil  
 cevil Colorado *see* cebil  
 Ce-Vi-Sol *see* vitamin C  
 Cevita *see* vitamin C  
 cevitamin acid *see* vitamin C  
 CGP36742 *see* SGS742  
 chacruna *see* ayahuasca and caapi;  
 psychotria  
 chagropanga *see* ayahuasca and  
 caapi  
 ch'ai hu *see* buplerum  
 chalice vine *see* kieri  
*Chamaemelum nobile* *see*  
 chamomile  
 chamico *see* brugmansia  
 chamomile 51, 67, 94, 194, 196, 197  
 chang zhe *see* attractyloides (white)  
 channa *see* kanna  
 chaparral 51, 361  
 chaperone-mediated autophagy *see*  
 CMA  
 chapico *see* taique  
 charas *see* marijuana  
 chase-devil *see* St. John's wort  
 chat *see* khat  
 chatian *see* dita tree  
 chawe *see* cawe  
 cheddar cheese 218  
 cheech *see* calca  
 cheese 87, 108, 113, 119, 148, 151,  
 185, 207, 217–218, 225, 268, 354  
 cheese fruit *see* noni  
 chelated zinc *see* zinc  
*Chenopodium ambrosioides* 266  
 cherry 7, 97; *see also* black cherry  
 Chew-E *see* vitamin E  
 chia seeds 21  
 chichiquilitl *see* nightshade  
 chick peas 92, 152, 172, 178  
 chicken and chicken liver 38, 87, 88,  
 101, 106, 123, 141, 144, 148, 157,  
 167, 182, 207, 225  
 chickweed 51  
 Chilean false heath *see* pichi  
 chili pepper *see* cayenne  
 chimarrao *see* yerba mate  
 Chinese angelica *see* dong quai  
 Chinese anise *see* star anise  
 Chinese club moss 51, 220  
 Chinese dandelion *see* dandelion  
 Chinese dates 82  
 Chinese ephedra *see* ephedra and  
 ma-huang  
 Chinese Foxglove *see* Chinese fox-  
 glove root  
 Chinese foxglove root 51–52, 78  
 Chinese ginseng *see* ginseng  
 Chinese Rehmanniae Radix *see*  
 Chinese foxglove root  
 Chinese root *see* sarsaparilla  
 Chinese RR *see* Chinese foxglove  
 root  
 Chinese skullcap *see* skullcap  
 Chinese water snake 156  
 Chinese yam 52, 53  
 chiri-sanango *see* brunfelsia  
 chiritacapi *see* brunfelsia  
 chlorella *see* microalgae and sea-  
 weed  
 Chlorpropamide 176  
 chocolate 21–23, 26, 61, 77, 123,  
 148, 168, 183, 188, 205, 207, 212,  
 213, 214, 218–220, 225, 227, 256,  
 289, 343  
 chocolatl *see* chocolate  
 cholecalciferol *see* vitamin D  
 cholecystokinin-8 175  
 cholesteryl ester transfer protein  
 gene *see* CETP  
 choline 14, 54, 55, 89, 90, 95, 102,  
 106, 108, 118, 138, 144, 151–154,  
 154, 155, 160, 161, 165, 172, 253,  
 299, 306, 320; *see also* citicoline  
 choline bitartate *see* choline  
 choline chloride *see* choline  
 Christmas bloom *see* brunfelsia  
 Christmas tree *see* brunfelsia  
 Chrome-Mate *see* chromium  
 chromium 18, 87–88, 176  
 chromium picolinate 87–88  
*Chrysanthemum vulgare* *see* tansy  
 chuan dang *see* codonopsis root  
 chupalla *see* mescal plant  
 CI-879 *see* pramiracetam  
 CI-911 *see* rolziracetam  
 CI-988 299  
 cibil *see* cebil

- Cimetidine 214, 297, 314, 326  
 cimicifuga *see* black cohosh  
*Cimicifuga racemosa* *see* black cohosh  
 cimora 220, 260; *see also* brugmansia  
 Cincofarm *see* 5-HTP  
*Cinnamomum camphora* *see* camphor  
*Cinnamomum cassia* *see* cinnamon  
*Cinnamomum ceylanicum* *see* cinnamon  
*Cinnamomum zeylanicum* *see* cinnamon  
 cinnamon 7, 52, 53, 78, 167, 194–195, 198  
 cinnamon wood *see* saffras  
 Cipralax *see* escitalopram  
 Cipro 214  
 Ciprofloxacin 214  
 Circanol *see* Hydergine  
 Circulan *see* xanthinol nicotinate  
 Citalopram 299, 303  
 citicoline 299; *see also* cytidinediphosphocholine  
 citrulline 125–126  
*Citrus aurantium* *see* neroli; orange  
*Citrus aurantium bergamia* *see* bergamot  
*Citrus aurantium bigaradia* *see* neroli; petitgrain  
*Citrus aurantium bugardia* *see* neroli  
*Citrus aurantium sinensis* *see* orange  
*Citrus bigaradia* *see* neroli  
 citrus fruits *see* fruit  
*Citrus limetta* *see* lime  
*Citrus limon* *see* lemon  
*Citrus paradissi* *see* grapefruit  
*Citrus reticulata* *see* tangerine  
 cizana *see* darnel  
 c-Jun N-terminal kinase *see* JNK  
 CLA *see* linoleic acid  
 clams 87, 100, 103  
 clary sage 195, 196, 197, 200, 201  
 Clausenamide 299  
*Claviceps purpurea* *see* ergot  
*Clematis virginiana* 220  
 Clexane *see* Enoxaparin  
 Climara *see* estradiol  
 clioquinol 273  
 Clitocybe species 262  
*Clitoria ternatea* 353  
 CLK-1 273  
 Clocete *see* Meclofenoxate  
 Clofamin *see* xanthinol nicotinate  
 Clopidogrel *see* Plavix  
 clove 52, 53, 198  
 club moss *see* Chinese club moss  
 CMA 337  
 CNB-001 299–300  
 CNI-1493 273–274  
 CO<sub>2</sub> *see* carbon dioxide  
 coast coral tree 220  
 coaxhuil *see* morning glory  
 Coaxil *see* Tianeptine  
 cobalamin *see* vitamin B-12  
 cobalt 60  
 cobra *see* animals  
 coca 217, 220–221, 240  
 cocaine 27, 65, 83, 84, 105, 127, 128, 187, 188, 190, 215, 217, 220–221, 255, 268, 310  
 cocculin 319  
 cockspur pepper *see* cayenne  
 cockspur rye *see* ergot  
 cocoa 21–23, 95, 97, 207, 212, 218–220, 225  
 coconut oil 23  
*Cocos nucifera* *see* coconut oil  
 cod 154  
 cod liver oil 113, 157, 158  
*Codonopsis Modestae* *see* codonopsis root  
*Codonopsis pilosula* *see* codonopsis root  
*Codonopsis pilosula modesta* *see* codonopsis root  
 codonopsis root 52–53, 78  
*Codonopsis tangshen* *see* codonopsis root  
*Codonopsis tubulosa* *see* codonopsis root  
 Codroxomin *see* vitamin B-12  
 Coenzyme I *see* NADH  
 Coenzyme Q10 111, 167–168, 169  
*Coffea arabica* *see* coffee  
 coffee 5, 21, 23–27, 61, 77, 93, 94, 95, 97, 109, 147, 153, 183, 212, 214, 215, 238, 257  
 coffee cherry *see* coffeeberry  
 coffeeberry 27  
 COG1410 126  
 Cognex *see* Tacrine  
 cognitive enhancement 2–5, 7, 10, 17–18, 29, 30, 33, 40, 41, 43, 46, 47, 48, 51, 52, 59, 60, 61, 64, 68, 70, 71, 73, 75, 79, 89, 90, 93, 94, 95, 98, 99, 100, 101, 104, 111, 123, 124, 126, 128, 131, 132, 136, 137, 138, 140, 141, 143, 144, 146, 147, 151, 152, 155, 156, 157, 161, 166, 169, 172, 174, 175, 176, 177, 178, 180, 181, 183, 184, 186, 188, 189, 190, 193, 194, 197, 199, 200, 201, 212, 213, 218–219, 221, 236, 237, 241, 243, 252, 269, 270, 271, 273, 274, 276, 277, 278, 279, 280, 281, 282, 283, 285, 286, 289, 291, 295, 296, 297, 300, 301, 302, 304, 308, 309, 310, 311, 312, 318, 319, 321, 322, 323, 324, 325, 326, 330, 332, 334, 335, 337, 338, 339, 341, 342, 346, 350, 352, 353, 355, 356, 357, 359, 360, 361, 364, 365; *see also* mind enhancement; neuroplasticity  
 cohoba 217, 221  
 cojones del Diablo *see* brugmansia  
 cola 61, 183; *see also* kola  
*Cola acuminata* *see* kola nut  
*Cola nitida* *see* kola  
*Cola nitida* *see* kola nut  
 cola nut *see* kola nut  
*Cola vera* *see* kola; kola nut  
 coleus 221  
*Coleus blumei* *see* calcus  
*Coleus pumilus* *see* calcus  
 collard greens 43, 90, 101  
 Colorado River toad *see* toad  
 colorin 222  
 colorines 221–222, 236, 248, 257  
 comfrey 45, 92  
*Commiphora meccanensis* 47  
*Commiphora molmol* *see* myrrh  
*Commiphora mukul* *see* guggul  
*Commiphora myrrha* *see* myrrh  
*Commiphora wightii* *see* guggul  
 common anise *see* anise  
 common chickweed *see* chickweed  
 common club moss *see* club moss  
 common cobra *see* animals  
 common jasmine *see* jasmine  
 common lettuce *see* lettuce  
 common morning glory *see* morning glory  
 common mugwort *see* mugwort  
 common nettle *see* nettle  
 common onion *see* onion  
 common parsley *see* parsley  
 common St. John's wort *see* St. John's wort  
 common snowdrop *see* galanthamine  
 common stinging nettle *see* nettle  
 compass plant *see* rosemary  
 Complamex *see* xanthinol nicotinate  
 Complamin *see* xanthinol nicotinate  
 compulsive behaviors 127, 160, 176  
 concentration *see* cognitive enhancement  
 Concerta *see* methylphenidate  
*Concombre zombi* *see* datura  
 conjugated estrogens *see* estrogen  
 conjugated linoleic acid *see* linoleic acid  
*Conocybe cyanopus* *see* mushrooms  
*Convolvulus microphyllus* *see* shankapuspi  
*Copelandia bispora* *see* mushrooms  
*Copelandia cyanescens* *see* mushrooms  
 copper 14, 55, 88, 112, 113, 118, 120, 125, 319, 364  
 copper pump 1 *see* Atp7a  
 copper-transporting ATPase 1 *see* Atp7a  
 copper/zinc SOD *see* superoxide dismutase  
 CoQ10 *see* Coenzyme Q10  
 coralillo *see* mescal bean  
 Corbeton *see* oxprenolol  
 cordofan-pea *see* *Clitoria ternatea*  
 cordyceps 53  
*Cordyceps sinensis* *see* cordyceps  
 Coretal *see* oxprenolol  
 coriander 45, 53, 195, 222  
*Coriandrum sativum* *see* coriander  
*Coriaria arborea* 262  
*Coriaria ruscifolia* 262  
*Coriaria thymifolia* *see* shanshi  
*Corkwood duboisia* 222  
 corn 9, 37, 93, 94, 123, 152, 182; *see also* popcorn  
 corn oil 87, 227; *see also* vegetable oil  
 Corticoliberin *see* corticotropin-releasing hormone  
 corticotropin-releasing factor *see* corticotropin-releasing hormone

- corticotropin-releasing hormone **175, 319**  
cortisol **26, 175, 176, 177, 205, 214, 282**; *see also* stress hormones  
*Corynanthe johimbi* *see* yohimbe  
*Corynanthe yohimbe* *see* yohimbe  
*Corynanthe yohimbi* *see* yohimbe  
*Coryphantha macromeris* *see* dona ana  
cottage cheese **141, 148, 182**  
country mallow **53**  
covi-tsontinba-ko *see* brunfelsia  
cowbane *see* *Boophone disticha*  
cowboy tea *see* ephedra and ma-huang  
COX-2 inhibitors **274, 341**  
Cozaar *see* Losartan  
CP-14,368 *see* Lometraline  
CpG DNA **337**  
CPH *see* Meclofenoxate  
CPH4 **240**  
cranberry **7, 28, 97**  
*Crataegus laevigata* *see* hawthorn  
*Crataegus oxyacantha* *see* hawthorn  
creatine **126, 178**  
creativity *see* cognitive enhancement  
CREB **125, 126**  
CREB binding protein *see* CBP  
CREB1 molecule **352**  
creosote bush *see* chaparral  
CRF *see* corticotropin-releasing hormone  
CRF1 **126, 319**  
CRH *see* corticotropin-releasing hormone  
Crinone *see* progesterone  
Crinum species *see* daffodil  
CRL-40028 *see* Adrafinil  
*Crocus sativus* *see* saffron  
*crypthecodinium cohnii* *see* Calamantine  
Crytanthus species *see* daffodil  
Cs-4 *see* cordyceps  
CT-848 *see* oxiracetam  
Cu *see* copper  
Cu/ZnSOD *see* superoxide dismutase  
cuchuma *see* san pedro  
cucumbers **99**  
“cuddle hormone” *see* oxytocin  
culebra borrachero *see* brugmansia  
cumin **53**  
cup-of-gold *see* kieri  
*Cupressus sempervirens* *see* cyprus  
Cuprimine *see* Penicillamine  
curcuma *see* turmeric  
*Curcuma aromatic* *see* turmeric  
*Curcuma domestica* *see* turmeric  
*Curcuma longa* *see* turmeric  
*Curcuma longae rhizome* *see* turmeric  
curcumin **79–80, 299**  
curcumine *see* turmeric  
curcuminoid *see* turmeric  
curcuminoids *see* turmeric  
curia *see* masha-hari  
curry **53**  
curuba *see* cohoba  
curubu'y *see* cebil  
curupai *see* cebil  
cutametine dihydrochloride *see* SA **4503**  
CX516 *see* ampakines  
CX546 *see* ampakines  
CX614 *see* ampakines  
CX717 **300**; *see also* ampakines  
Cyanabin *see* vitamin B-12  
cyanobacteria *see* microalgae and seaweed  
cyanocobalamin *see* vitamin B-12  
*Cycas circinalis* *see* baibai and budzamar  
cyclic adenosine monophosphate *see* adenosine  
Cycloastragenol *see* TA-65 and TAT2  
cyclonite plastic explosive *see* C-4  
cyclophilin **125**  
cyclopropylglycine **300**  
cycloserine **274**  
Cyclosporine **57, 63, 125, 179, 274**  
Cylert *see* Pemoline  
Cymbalta *see* Duloxetine  
*Cymbopogon citratus* *see* lemongrass  
*Cymbopogon flexuosus* *see* lemongrass  
*Cymbopogon martini* *see* palmarosa  
cyperus **53–54**  
*Cyperus rotundus* *see* cyperus  
Cypin **127**  
cypress **195, 195, 201**  
*Cypripedium pubescens* **72**  
cyproheptadine **274**  
cysteamine *see* 2-MEA  
cysteine **103, 112, 125, 127, 128, 133, 138, 146**  
cysteine hydrochloride monohydrate *see* cysteine  
cystine **127, 128, 133**  
cytidine diphosphate choline *see* citicoline; cytidinediphosphocholine  
cytidinediphosphocholine **154, 161**  
*Cytisus canariensis* *see* scotch broom  
*Cytisus scoparius* *see* scotch broom  
cytochrome-C *see* cytochromes  
cytochromes **168**  
cytokines **312**  
Cytomel *see* thyroid hormones  
D *see* MHC class I D and HLA  
D20 *see* heavy water  
d-alpha-tocopherol *see* vitamin E  
d-alpha-tocopheryl acid succinate *see* vitamin E  
d-amphetamine *see* amphetamine  
D-carnitine *see* acetyl-L-carnitine  
D-cycloserine *see* cycloserine  
d-lysergic acid beta-propranolamide *see* ergometrine  
D-phenylalanine *see* phenylalanine  
DA *see* dopamine  
da t'sao **54**  
dabs *see* marijuana  
dacha *see* wild dagga  
Dacilin *see* xanthinol nicotinate  
DAF-1 **337**  
DAF-2 **334, 337**  
DAF-16 **136, 337, 340, 346**  
DAF-18 **334, 337**  
DAF-23 *see* AGE-1  
DAF genes **337**  
daffodil **54, 305**  
daime *see* ayahuasca and caapi  
dairy products **94, 99, 103, 106, 1008, 109, 123, 127, 134, 141, 144, 150, 165, 207, 319**; *see also* cheese; eggs; milk  
daivappala *see* dita tree  
Dalcipran *see* Milnacipran  
Daliresp *see* Roflumilast  
dama de noite **222**  
damask rose *see* rose  
damiana **54, 72**  
dancing mushroom **204**  
dandelion **8, 54, 94, 98, 151**  
dandelion root **80**  
dang gui **78**  
dang quai *see* dong quai  
dangshen *see* codonopsis root  
dapa *see* ayahuasca and caapi  
DAPK-1 **128**  
DAPT **300**  
Darapladib **275**  
darnel **222–223**  
DAT *see* DMT  
DAT1 **337–338, 338**  
dates **104**  
datura **211, 220, 223–224, 249, 260**  
*Datura alba* *see* datura  
*Datura arborea* *see* datura  
*Datura aurea* *see* datura  
*Datura candida* *see* datura  
*Datura ceratocaula* *see* datura  
*Datura discolor* *see* datura  
*Datura dolichocarpa* *see* datura  
*Datura fastuosa* *see* datura  
*Datura ferox* *see* datura  
*Datura innoxia* *see* datura  
*Datura metel* *see* datura  
*Datura meteloides* *see* datura  
*Datura sanguinea* *see* datura  
*Datura stramonium* *see* datura  
*Datura suaveolens* *see* datura  
*Datura versicolor* *see* datura  
*Datura volcarnicola* *see* datura  
*Datura wrightii* *see* datura  
*Daucus carota* *see* carrot  
DAV Ritter *see* vasopressin  
Daxas *see* Roflumilast  
Dayto Himbin *see* yohimbe  
DBI **128**  
DBS *see* electricity  
DBT *see* DMT  
DCS *see* cycloserine  
DDAVP *see* vasopressin  
DDC **354**  
DDT **224**  
dead flesh proteins *see* polyamines  
deadly nightshade *see* belladonna  
Deandros *see* DHEA  
Deaner *see* DMAE  
Deanol *see* DMAE  
Deapril-ST *see* Hydergine  
Death-Associated Protein Kinase 1 *see* DAPK-1  
death, reduced risk of **8, 9, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 27, 28,**

- 31, 32, 34, 35, 36, 37, 41, 42, 43, 44, 69, 116–117
- death's herb *see* belladonna
- deep brain stimulation *see* electricity
- Deep Thought *see* pyroglutamate
- dehydroepiandrosterone *see* DHEA
- dehydroepiandrosterone sulfate *see* DHEA
- dehydroisoandrosterone *see* DHEA
- dekuba *see* datura
- delirium grass *see* darnel
- Delta-9-tetrahydrocannabivarin *see* THCv
- Delysid *see* LSD
- dementia, protection against 1, 3, 10, 19, 22, 23, 24, 54, 57, 58, 62, 98, 103, 110–111, 113, 116, 137, 138, 139, 144, 145, 152, 178, 182, 212, 218, 227, 272, 275, 281, 284, 287, 290, 301, 302, 305, 310, 312, 313, 314, 315, 317, 318, 320, 322, 328, 332, 335, 337, 348, 360; *see also* Alzheimer's disease
- Demerol *see* Meperidine
- Deniban *see* Amisulpride
- Depade *see* Naltrexone
- Depakene *see* valproic acid
- Depakote *see* valproic acid
- Depen *see* penicillamine
- Deprax *see* Trazodone
- Deprenyl *see* selegiline
- Depression, anti- 1, 3, 7, 19, 20, 23, 24, 26, 28, 35, 38, 46, 50, 53, 54, 57, 60, 68, 69, 70, 72, 73, 74, 75, 76, 79, 84, 87, 88, 90, 93, 94, 95, 98, 103, 104, 106, 107, 108, 109, 110, 114, 120, 124, 126, 128, 129, 130, 133, 135, 136, 138, 139, 141, 148, 149, 150, 154, 160, 161, 162, 170, 175, 176, 178, 180, 182, 183, 184, 186, 188, 190, 193, 194, 195, 196, 197, 198, 199, 200, 201, 222, 236, 251, 259, 271, 272, 273, 279, 280, 282, 283, 285, 286, 287, 288, 289, 293, 294, 295, 296, 297, 298, 299, 300, 301, 303, 304, 306, 308, 309, 311, 312, 313, 314, 315, 316, 318, 319, 320, 321, 322, 323, 328, 329, 331, 335, 339, 342, 343, 345, 346, 350, 353, 354, 355, 358, 359, 360, 364; *see also* bipolar disorder; mood enhancement
- Deramciclane **300**
- desert herb *see* ephedra and ma-huang
- desert tea *see* ephedra and ma-huang
- Desfontainia hookeri* *see* taique
- Desfontainia spinosa* *see* taique
- Desirel *see* Trazodone
- Desmopressin *see* vasopressin
- Desmospray *see* vasopressin
- Desoxyn *see* amphetamine
- desvenlafaxine **300**, 331
- desvenlafaxine succinate *see* desvenlafaxine
- Desyrel *see* Trazodone
- Desyrel Dividose *see* Trazodone
- DET *see* DMT
- deuterium **358**
- devadhupa *see* guggul
- devil tree *see* dita tree
- devil's apple *see* datura
- devil's claw **54–55**; *see also* club moss
- devil's eye *see* henbane
- devil's herb *see* belladonna
- devil's snare *see* datura
- devil's testicle *see* mandrake
- devil's trumpet *see* datura
- devil's weed *see* datura
- Dexedrine *see* amphetamine
- Dexol T.D. *see* vitamin B-5
- dextroamphetamine *see* amphetamine
- dextrose *see* glucose
- Dextrostat *see* amphetamine
- dextrothyroxine
- DG071 **300**
- DHA 14, 152, **154–155**, 156, 157, 159, 160, 172, 298
- dhatura *see* datura
- DHEA 26, 70, 117, 174–175, **176–177**, 179, 180, 186, 188–189, 214
- DHEAS *see* DHEA
- DHT *see* dihydrotestosterone; DMT
- DHX *see* dihydroxidine
- di huang *see* Chinese foxglove root
- Diandron *see* DHEA
- Diapid *see* vasopressin
- Diazadamantol **300–301**
- diazepam binding inhibitor *see* DBI
- dichlorodiphenyltrichloroethane *see* DDT
- dickkopf-1 **128**
- Diforene *see* DMAE
- Digitoflavone *see* luteolin
- dihuang *see* Chinese foxglove root
- dihydroxidine **301**
- dihydroergotoxine *see* Hydergine
- dihydrotestosterone **177–178**, 186
- dika nut *see* irvingia
- dikanut *see* irvingia
- dikka *see* irvingia
- Dilantin *see* phenytoin
- dilauryl thiodipropionate **366**
- dill 170, **224**
- dill oil 207, 225
- Dimebon **275**, 321
- Dimethaen *see* DMAE
- dimethyl sulfoxide *see* DMSO
- dimethylaminoethanol *see* DMAE
- dimethylaminoethanol cyclohexyl carboxylate fumurate *see* DMAE
- dimethylaminoethanol p-acetamidobenzoate *see* DMAE
- dimethylglycine **110**
- dimethyltryptamine *see* DMT
- Dinagen *see* piracetam
- dinh lang **55**
- Dioscorea barbasco* *see* Mexican wild yam
- Dioscorea composita* *see* Mexican wild yam
- Dioscorea dregeana* *see* African wild yam
- Dioscorea mexicana* *see* Mexican wild yam
- Dioscorea opposita* *see* Chinese yam
- Dioscorea villosa* *see* Mexican wild yam
- diosmin **88–89**
- Diospyros species *see* kubilgum
- diphenhydramine **285**
- Diphenylan *see* phenytoin
- Diphenylhydantoin *see* phenytoin
- Diplopterys cabrerana* *see* ayahuasca and caapi
- dipterine *see* N-methyltryptamine
- dipyridophenazine ruthenium molecules **301**
- dirita *see* dita tree
- Disipal *see* Orphenadrine
- Dispadol *see* Meperidine
- Dispatabs *see* vitamin A
- disulfiram 214
- DIT *see* DMT
- dita tree **224**
- Ditan *see* phenytoin
- ditolyguanidine **301**
- diviner's sage *see* *Salvia divinorum* Dkk1 296
- dl-alpha-tocopherol *see* vitamin E
- dl-alpha-tocopheryl *see* vitamin E
- DL-carnitine *see* acetyl-L-carnitine
- DL-phenylalanine *see* phenylalanine
- DLPA *see* phenylalanine
- DM232 *see* sunifiram
- DM235 *see* sunifiram
- DMA *see* DMT
- DMAE **89**, 144, 154, 306, 311, 313, 320
- DMAE-H3 *see* DMAE
- DMAE II *see* DMAE
- DMG *see* dimethylglycine
- DMPTB *see* alagebrium
- DMSO 182, **275–276**
- DMT 205–206, 206, 208, 210, **224–226**, 227, 231, 232, 235, 255, 257, 258, 264, 265
- DOB *see* DMT
- docosahexaenoic acid *see* DHA
- docosapentaenoic acid *see* DPA
- doda 257
- DOE *see* DOET
- DOET **301**
- dogbane family 234
- dog's grass *see* calea
- dok anchan *see* *Clitoria ternatea*
- Dolan *see* Orphenadrine
- Dolantin *see* Meperidine
- dolo 202
- don sen **55**
- don shen *see* don sen
- dona ana **226**
- Donepezil 116, **301–302**, 304, 314
- donepezil hydrochloride *see* Donepezil
- Donepezil *see* Donepezil
- dong chong xia cao *see* cordyceps
- dong chong zia cao *see* cordyceps
- dong quai 178
- dong seng *see* codonopsis root
- donkey thistle *see* Mexican poppy
- dopa *see* cohoba
- dopamine 106, 122, **128–129**, 130, 138, 141, 147, 149, 183, 184, 185, 205, 212, 218, 244, 252, 270, 273,

- 280, 286, 289, 293, 304, 307, 308, 312, 328, 338, 354  
dopamine receptor genes *see* DRD2; DRD4  
dopamine transporter gene 337  
dope *see* marijuana  
dormilona *see* jurema  
Double-strand break **338**  
Doxil *see* almatrine  
DPA 155  
DPH *see* phenytoin  
DPT *see* DMT  
Draganon *see* amiracetam  
DRD2 337, **338**  
DRD4 337, **338**  
DRD4 2R allele 338  
DRD4 7R allele **338–339**  
dream fish *see* animals  
dream herb *see* calea  
dream tea *see* henbane  
dreams (vivid, lucid) 66, 108, 182, 195, 203, 206, 208, 216, 217–218, 220, 235, **354**, 355–356, 360  
Droxomin *see* vitamin B-12  
Druid's foot *see* club moss  
DS *see* Naproxen  
DSB *see* double-strand break  
*Duboisia hopwoodii* *see* pituri  
*Duboisia myoporoides* *see* corkwood  
duboisia; pituri  
duck's foot *see* mandrake  
duermidillo *see* jurema  
Duetact 286  
duiker nut *see* irvingia  
Duloxetine **302**  
Dusodril *see* Naftidrofuryl  
dutra *see* datura  
DU-24,565 *see* 6-Nitroquipazine  
Duxil *see* Almatrine  
DVD-III *see* GVS-III  
DVD-742 *see* SGS742  
dwale *see* belladonna  
dwarf ginseng *see* ginseng  
dwarf nettle *see* nettle  
dyeberry *see* bilberry  
dyer's broom *see* scotch broom  
dyer's greenweed *see* scotch broom  
dyer's whin *see* scotch broom  
Dymetadrine 25 *see* ephedra and ma-huang  
dynorphins **129**  
DYS389 **339**  
DYS390 **339**
- E4 **339**  
E-2020 *see* Donepezil  
"Earthing" 356, 357  
earwax *see* marijuana  
ebena *see* cohoba  
ebene *see* epena  
Ebiratide **178, 302**  
Ebixa *see* Memantine  
eboga *see* iboga  
eboka *see* iboga  
Ebselen **302**  
Eburnamonine *see* vinburnine  
EC-Naprosyn *see* Naproxen  
echinacea **226–227**  
*Echinacea angustifolia* *see* echinacea  
*Echinacea purpurea* *see* echinacea  
*Echinocactus williamsii* *see* peyote  
*Ecklonia cava* 323  
Ecotrin *see* aspirin  
Ecotrin Maximum Strength *see* aspirin  
Ecstasy *see* MDMA  
Edamame **28–29**, 40; *see also* soy  
Edaravone **303**  
EDTA 120, 121, **129**  
eel 156  
EFAs *see* essential fatty acids  
Efexor *see* venlafaxine  
Effexor *see* venlafaxine  
EGb 761 **57–58**, 313  
egg lecithin *see* AL721  
egg yolk 90, 101, 106, 1008, 113, 119, 151, 153  
eggplant 46, 252  
eggs 38, 99, 100, 103, 104, 106, 112, 116, 122, 125, 127, 138, 141, 146, 148, 151, 152, 153, 156, 161; *see also* protein-rich foods  
EggsACT *see* AL721  
Egozinc *see* zinc  
eicosapentaenoic acid 155, 157, 159, 160  
Eisai *see* Donepezil  
ela *see* cardamom  
Eldepryl *see* selegiline  
electricity 354, **354–357**  
electromagnetic fields 183  
elephant creeper *see* Hawaiian baby wood rose  
*Elettaria cardamomum* *see* cardamom  
*Eleutherococcus senticosus* *see* ginseng  
Elevan *see* DMAE  
elilampala *see* dita tree  
elk root *see* echinacea  
Eltroxin *see* thyroid hormones  
Emeset *see* Ondansetron  
emetic herb *see* lobelia  
emetic holly *see* yaupon  
emetic weed *see* lobelia  
Emetron *see* Ondansetron  
Emodan *see* Ondansetron  
Emodinamin *see* xanthinol nicotinate  
empathy 185, 360, 364; *see also* sociability  
Empirin *see* aspirin  
Enada *see* NADH  
Enbrel *see* Etanercept  
Encefabol *see* pyritinol  
Encepan *see* pyritinol  
Encephabol *see* pyritinol  
Endocannabinoids **227**, 274, 331  
Endometrin *see* progesterone  
energy, improved 13, 24, 46, 52, 53, 55, 57, 62, 63, 66, 71, 76, 78, 79, 82, 94, 96, 106, 110, 136, 137, 141, 143, 146, 149, 150, 167, 168, 169, 170, 175, 177, 178, 180, 183, 193, 194, 196, 197, 198, 209, 220, 232, 234, 237, 238, 249, 251, 261, 270, 271, 280, 296, 330, 350, 364; *see also* fatigue  
energy drinks **29**, 212  
Energy Elixir *see* guarana  
English hawthorn *see* hawthorn  
English horsemint *see* horsebalm  
English valerian *see* fragrant valerian  
English walnut *see* walnut  
Enliven *see* BD  
Enoxaparin **276**  
Ensidon *see* opipramal  
EQ21 *see* cerebrolysin  
EPA *see* eicosapentaenoic acid  
epena 207, **227–228**  
ephedra 45, 177, **228–229**  
*Ephedra gerardiana* *see* ephedra and ma-huang  
*Ephedra nevadensis* *see* ephedra and ma-huang  
*Ephedra sinica* *see* ephedra and ma-huang  
Ephrin-B3 **129**  
epicatechin 22, **168**, 219  
Epilim *see* valproic acid  
Epithilone D **303**  
Epitonin *see* ephedra and ma-huang  
Epo *see* erythropoietin  
Epo D *see* erythropoietin  
Eprolin *see* vitamin E  
Epsilan-M *see* vitamin E  
Erabu sea snake *see* Chinese water snake  
ereriba **229**  
ergocalciferol *see* vitamin D  
ergoloid mesylates *see* Hydergine  
Ergometrine **229**, **229**  
ergometrine maleate *see* ergometrine  
ergonovine *see* ergometrine  
ergot **229–230**, 239, 241, 273, 310, 317  
ergot alkaloids dehydrogenated *see* Hydergine  
Erlotinib **276**  
*Erythrina caffra* *see* coast coral tree  
*Erythrina flabelliformis* *see* colorines  
Erythropoietin **178**, 267, **276**  
*Erythroxyllum coca* *see* coca and cocaine  
*Eschscholtzia californica* *see* California poppy  
escitalopram **303**  
*espina dormilona* *see* jurema  
essential fatty acids 155  
Ester C *see* vitamin C  
Estrace *see* estradiol  
Estraderm *see* estradiol  
estradiol 146, **178–180**  
estragon *see* tarragon  
Estring *see* estradiol  
Estrogen 46, 63, 70, 83, 86, 103, 104, 105, 106, 107, 109, 118, 153, 175, 176, 177, **178–180**, 186, 187, 189  
Estropipate *see* estrogen  
ET **230**  
Etanercept **277**  
ethinyl estradiol *see* estradiol  
Ethotoin *see* phenytoin  
Ethoxyquin **357**  
ethylene **230–231**  
ethylene diamine tetraacetic acid *see* EDTA

- etima *see* irvingia  
 etiracetam **303–304**  
 etryptamine *see* ET  
 eucalyptus **195**, 197  
*Eucalyptus citriodora* *see* eucalyptus  
*Eucalyptus globulus* *see* eucalyptus  
*Eucalyptus radiata* *see* eucalyptus  
*Eugenia aromatica* *see* clove  
 euphoria (as main effect) **21**, 33, 66, 129, 186, 195, 196, 198, 203, 205, 215, 218, 220, 222, 230, 231, 234, 235, 237, 239, 240, 243, 250, 254, 257, 261, 262, 265, 266, 271, 281, 285, 287, 307, 336  
 European bilberry *see* bilberry  
 European blueberry *see* bilberry  
 European mandrake *see* mandrake  
 European rue **263**  
 European wild rosemary *see* rosemary  
*Euterpe oleracea* *see* acai  
 Euthroid *see* thyroid hormones  
 Euvegal *see* valerian  
 evening primrose seeds **148**  
 Exelon *see* rivastigmine  
 Extrait de Rhodiola *see* *Rhodiola rosea*  
  
*Fabiana imbricate* *see* pichi  
 false peyote **231**  
 fan lily *see* *Boophone disticha*  
 fasting *see* caloric restriction  
 Fasudil *see* Hydroxyfasudil  
 Father Time genes **339**  
 fatigue, reduction of **13**, 18, 25, 26, 46, 47, 48, 51, 52, 54, 55, 60, 69, 73, 74, 75, 78, 81, 82, 89, 94, 100, 108, 152, 186, 193, 195, 197, 198, 199, 200, 201, 212, 222, 237, 281, 298, 357; *see also* energy, improved  
 fats **102**, **155–160**, 364  
 fatty foods **29**, 168  
 feather geranium **266**  
 felon herb *see* mugwort  
 Fenibut *see* Phenibut  
 fennel and fennel oil **53**, 56, **195–196**, 197, 207, 225  
 fenugreek **53**, **55**, 151  
 fetid nightshade *see* henbane  
 Fexofenadine **277**  
 FGF2 **129**  
 fibroblast growth factor 2 *see* FGF2  
 field balm *see* catnip  
 field mint **55**  
 figs **94**, 104, 207, 225, 258  
 filberts **94**  
 Fipexide **304**  
 Fisetin **89–90**  
 fish **29–31**, 38, 90, 100, 101, 102, 103, 104, 106, 108, 113, 119, 125, 134, 138, 141, 146, 148, 149, 151, 154, 157, 161, 168, 183, 185; *see also* animals; seafood; specific names of fish  
 fish liver and fish liver oils **101**  
 5 $\alpha$ -androstan-17 $\beta$ -ol-3-one *see* dihydrotestosterone  
 5 $\alpha$ -DHT *see* dihydrotestosterone  
 5 $\alpha$ -dihydrotestosterone *see* dihydrotestosterone  
 5-carboxamidotryptamine **304**  
 5-CT *see* 5-carboxamidotryptamine  
 five fingers *see* ginseng  
 5-Hour Energy *see* energy drinks  
 5-HT **77**  
 5-HT1a receptor *see* 5-HT receptors  
 5-HT1b receptor *see* 5-HT receptors  
 5-HT receptors **318**, **339**  
 5-HTP **77**, **129–131**, 188, 228  
 5-HT2b receptors **339**  
 5-HT(6) receptor *see* 5-HT receptors  
 5HT7 serotonin receptor **313**  
 5-hydroxy-L-tryptophan *see* 5-HTP  
 5-hydroxy-N,N-dimethyltryptamine *see* DMT  
 5-hydroxytryptamine *see* serotonin  
 5-hydroxytryptamine 1a receptor *see* 5-HT receptors  
 5-hydroxytryptamine 1b receptor *see* 5-HT receptors  
 5-hydroxytryptamine(6) receptor *see* 5-HT receptors  
 5-hydroxytryptophan *see* 5-HTP  
 five-leafed ginseng *see* ginseng  
 5-MeO-DMT **231**; *see also* DMT  
 5-MeO-MIPT *see* DMT  
 5-MeO-MMT *see* DMT  
 5-methoxy-N-methyl-N-isopropyltryptamine *see* DMT  
 5-methoxy-N-monomethyltryptamine *see* DMT  
 5-methoxy-N,N-dimethyltryptamine *see* DMT; 5-MeO-DMT  
 5-OH-DMT *see* DMT  
 5-OHT *see* 5-HTP  
 5-OP *see* pyroglutamate  
 5-oxoproline *see* pyroglutamate  
 5-oxopyrrolidine-2-carboxylic acid *see* pyroglutamate  
 FK506 **125**, **277**  
 FK960 **302**, **304**  
 FK962 **304**  
 FKBP12 **125**  
 FKBP52 **131**  
 Flacitran *see* luteolin  
 flag root *see* calamus; sweet flag  
 Flavan *see* Landes pine bark  
 flavonoids *see* bioflavonoids  
 Flavorcee *see* vitamin C  
 flaxseed **178**  
 flaxseed oil **156**, 159–160  
 FLCL *see* FLCN  
 FLCN **131**  
 FLCN\_HUMAN *see* FLCN  
 fleecflower *see* polygonum  
 Flexon *see* Orphenadrine  
 flor de natal *see* brunfelsia  
 floripondio *see* brugmansia  
 flounder **154**  
 flour, enriched **104**; whole grain **90**, 92, 94, 119  
 flowering thistle *see* Mexican poppy  
 Flumazenil **277**  
 Fluorafinil **304**  
 Fluoxetine **79**, 293, **304–305**  
 Fluoxetine hydrochloride *see* Fluoxetine  
 Flurbiprofen **277**, 326  
 Flurizan **305**  
 Fluvoxamine **297**, **305**  
 Fluvoxamine maleate *see* Fluvoxamine  
 fly agaric *see* amanita mushrooms  
 Flying Saucers *see* morning glory  
*Foeniculum vulgare* *see* fennel; wild fennel  
 Folic acid *see* folic acid  
 Folate **43**, 74; *see also* folic acid  
 Folic acid **90–91**, 103, 107, 108, 109, 111, 112, 121, 151, 160, 179, 306  
 Folliculin *see* FLCN  
 forbidden rice *see* black rice  
 Fortamet *see* Metformin  
 Fosamax *see* Alendronate  
 fo-ti *see* polygonum  
 fo-ti-tieng *see* polygonum  
 4-aminopiperidine analogues **131**  
 4-androstenedione *see* androstenedione  
 4-bromo-2,5-dimethoxyamphetamine *see* DMT  
 4x100 *see* kratom  
 4-hydroxybutanoic acid *see* GHB  
 4-hydroxybutyrate *see* GHB  
 4-methoxyamphetamine *see* DMT  
 4-[(1/R)-2-amino-1-hydroxyethyl]benzene-1,2-diol *see* nor-epinephrine  
 4,6-diphenyl-3-(4-(pyrimidin-2-yl)piperazin-1-yl)pyridazine *see* MW01-5-188WH  
 4-(2-aminoethyl)benzene-1,2-diol *see* dopamine  
 14-ethoxycarbonyl-(3 $\alpha$ ,16 $\alpha$ -ethyl)-14,15-eburnamine *see* Vinpocetine  
 FOXN1 **131–132**  
 FoxP2 **347**  
 foxtail *see* Chinese club moss  
*Fragaria*  $\times$  *ananassa* *see* strawberry  
 fragrant valerian **231–232**  
*Frangula californica* *see* coffeeberry  
 frankincense **55**, **196**, 200, 201, 358  
 frankincense tree **232**  
 fraughan *see* bilberry  
 FRAX486 **277–278**  
 French maritime pine bark extract **91–92**, 96  
 friar's cap *see* aconite  
 frijolillo *see* *Canavalia maritima*  
 frijolitos *see* mescal bean  
 fringed gentian *see* gentian  
 fruit **7**, 9–10, 12–13, 14, 15, 16, 17, 18, 19, 20, 21, 27, 28, 31, 32, 34, 35, 36, 37, 41, 42, 43, 48, 86, 88, 90, 92, 94, 96, 97, 98, 101, 110, 112, 113, 118, 142, 144, 170, 172, 183, 188, 265, 307, 314, 319; *see also* specific names of fruit  
 fu ling **55–56**  
 Furosemide **253**  
 furze *see* scotch broom  
  
 G *see* GHB  
 G9a **221**

- GABA 80, 106, 128, **132**, 147, 231, 259, 307, 319  
 GABA Calm *see* GABA  
 GABA Plus *see* GABA  
 Gaba-tol *see* GABA  
 Gabacet *see* piracetam  
 Gabatrol *see* GABA  
 gag root *see* lobelia  
 galanga *see* kaempferia  
 galantamine 56, **305**  
 galanthamine **56**; *see also* galantamine  
 galanthamine hydrobromide *see* galanthamine  
 galanthamine  
*Galanthus caucasicus* *see* galanthamine  
*Galanthus nivalis* *see* galanthamine  
*Galbulimima belgraveana* *see* agara  
*Galerina steglichii* *see* mushrooms  
 gallweed *see* gentian  
 gamma-aminobutyric acid *see* GABA  
 gamma-ethylamino-L-glutamic acid *see* theanine  
 gamma hydrate *see* GHB  
 gamma-hydroxybutyrate *see* GHB  
 gamma-hydroxybutyrate sodium *see* GHB  
 gamma-linolenic acid 155  
 Gamma OH *see* GHB  
 gamma secretase inhibitors **305–306**  
 gan cao *see* licorice  
 gan jiang *see* ginger  
 ganja *see* marijuana  
 ganoderma *see* reishi  
*Ganoderma lucidum* *see* reishi  
 gantenerumab **306**  
 garden beet *see* beet  
 garden celery *see* celery  
 garden lettuce *see* lettuce  
 garden parsley *see* parsley  
 garden sage *see* sage  
 garlic **56–57**, 63, 74, 92, 99, 100, 160, 170  
 Gas6 **132**  
 gauwgoed *see* kanna  
 gay gee **57**  
 GDF11 **132**, 352  
 GDNF **132–133**  
 GE-132 *see* germanium  
 gefitinib **278**  
 gelatin desserts 123  
 gelbe baumdatura *see* brugmansia  
 generalized anxiety disorder (GAD) 187, 299, 300, 302, 303, 314, 331; *see also* anxiety disorders  
 genes **339**  
*Genista canariensis* *see* scotch broom  
*Genista tinctoria* *see* scotch broom  
 gentian **57**  
 gentian root *see* gentian  
 Gentiana 57  
*Gentiana catesbaei* *see* gentian  
*Gentiana crinita* *see* gentian  
*Gentiana lutea* *see* gentian  
*Gentiana officinalis* *see* gentian  
*Gentiana quinquefolia* *see* gentian  
*Gentiana scabra* *see* gentian  
 geranium 195, **196**, 197, 198, 199  
 gerataca *see* brunfelsia  
 German chamomile *see* chamomile  
 German valerian *see* fragrant valerian  
 germanium **92**, 194  
 Germanium sesquioxide *see* germanium  
 Gerovital **306**, 311, 312, 332  
 Gerovital H3 *see* Gerovital  
 ghat *see* khat  
 GHB 28, 132, 296, **306–308**, 336  
 GHRE *see* BD  
 ghrelin **180**, 321  
 GH-3 *see* Gerovital  
 gi-i-sa-wa *see* puffballs  
 giant reed **215**, **232**  
 giganton *see* san pedro  
 gii-wa *see* puffballs  
 gilatide **308**  
 ginger 53, **57**, 182, **196**, 235  
 ginger root 82  
 ginkgo *see* ginkgo biloba  
 ginkgo biloba **57–58**, 63, 160, 161, 297, 320  
 Ginkgold *see* ginkgo biloba  
 ginseng 46, 55, **58–60**, 82, 92, 113, 172, 188  
 giraffe *see* animals  
 girij *see* shilajit  
 gisol *see* kaempferia  
 glial cell derived neurotrophic factor *see* GDNF  
 glial cells 316, 341  
 gluckspilz *see* amanita mushrooms  
 Glucophage *see* Metformin  
 Glucophage XR *see* Metformin  
 glucosamine **357**  
 glucose **169**, 332  
 Glumetza *see* Metformin  
 GluN2B **339**, 341  
 glutamate 127, 134, 136, 137, 146, 150, 174, 175, 307, 312, 317, 328  
 glutamate-oxaloacetate transaminase *see* GOT  
 glutamate receptor subunit epsilon-2 *see* NR2B  
 glutamic acid lactam *see* pyroglutamate  
 glutamine **133**, 181  
 Glutaplex *see* glutathione  
 Glutathione 74, **133–134**, 134, 166  
 glutimic acid *see* pyroglutamate  
 glutimic acid *see* pyroglutamate  
 Glycine 133, **134**  
 Glycine max 28, 40, 42; *see also* soy; tofu  
*Glycyrrhiza glabra* *see* licorice  
 GLYX-13 **236–237**  
 GLYX-13 ((S)-N-[(2S,3R)-1-amino-3-hydroxy-1-oxobutan-2-yl]-1-[(S)-1-((2S,3R)-2-amino-3-hydroxybuta-noyl) pyrrolidine-2-carbonyl] pyrrolide-2-carboxamide *see* GLYX-13  
 GM-1 ganglioside **278**  
 GMM2 *see* adrenocorticotrophic hormone analogs  
 GnRH **134**, 340  
 goat killer *see* borrachero  
 goat willow *see* willow  
 goatfish *see* animals  
 goat's joy *see* henbane  
 goat's pepper *see* cayenne  
 goatweed *see* St. John's wort  
 "God gene" *see* VMA2  
 gold thistle of Peru *see* Mexican poppy  
 golden angel's trumpet *see* brugmansia  
 golden beet *see* beet  
 golden poppy *see* California poppy  
 golden tree datura *see* brugmansia  
 goldenroot **60**; *see also* *Rhodiola rosea*  
 gomortega keule *see* keule  
 gonadotropin-releasing hormone *see* GnRH  
 good night *see* brunfelsia  
 goosefoot 266  
 GOT **134**  
 gota-kola *see* gotu-kola  
 gotu-kola 46, **60**, 73, 212  
 GPR56 **339**  
 gra-tom *see* kratom  
 grape **31**, 89, 97, 106  
 grape seed extract 91, **92**, 96  
 grape sugar *see* glucose  
 grapefruit and grapefruit juice 7, 94, 101, 133, 180, **196**, 214, 330  
 grass *see* marijuana  
 grass myrtle *see* calamus; sweet flag  
 grass, wheat and barley **60–61**, 173  
 great morinda *see* noni  
 great reed *see* giant reed  
 great stinging nettle *see* nettle  
 great wild valerian *see* fragrant valerian  
 Greek hayseed *see* fenugreek  
 green *see* ketamine  
 green beans 152  
 green broom *see* scotch broom  
 green cardamom *see* cardamom  
 green cestrum **232**  
 Green Kamut *see* grass, wheat  
 Green Magma *see* grass, wheat; microalgae and seaweed  
 green pepper 94  
 green soybeans 28  
 green tea **61–62**, 147, 169, 170, 183, 215  
 greenies *see* amphetamines  
 greenshell mussel *see* New Zealand green-lipped mussel  
 greenweed *see* scotch broom  
 griffe du chat *see* cat's claw  
 GRIN2B *see* NR2B  
 griseolic acid **308**  
 ground lemon *see* mandrake  
 growth hormone 280, 307  
 GSH *see* glutathione  
 GSH 250 Master Glutathione Formula *see* glutathione  
 guaiaac gum trees 362  
 quantu *see* brugmansia  
 guanyl hydrazine *see* aminoguanidine  
 guarana 26, 61, **62–63**, 172, 209, 212, 214  
 guarana tai *see* guarana

- guaring *see* jurema  
 guaruma 232  
 guava 170  
 guayacan *see* cebil  
 guayusa 63, 82  
 guggul 63–64  
 guggulu *see* guggul  
 gugulipid *see* guggul  
 gum 357–358  
 gum guggul *see* guggul  
 gum myrrh tree *see* myrrh  
 gum *see* sassafras  
 gun-ji-whang *see* Chinese foxglove root  
 gunpowder tea *see* green tea  
 guru nut *see* kola nut  
 gusano de mescal *see* animals  
 gut bacteria *see* microbiota  
 GVS-III 308–309  
*Gymnopilus (Pholiota) spectabilis* 204  
*Gymnopilus aeruginosus* *see* mushrooms  
 ha ma chun *see* amanita mushrooms  
 hagthorn *see* hawthorn  
 hakudufha *see* cohoba; epena  
 halada *see* turmeric  
 haldi *see* turmeric  
 hallucinations (as main effect) 66, 82, 83, 202–268, 301, 310, 354  
 hamartin 134  
 hard water 94  
 haridra *see* turmeric  
 harmala *see* African rue  
 harmel *see* Syrian rue  
*Harpagophytum procumbens* *see* devil's claw  
 hasheesh *see* marijuana  
 hashish *see* marijuana  
 hataj *see* cebil  
 hatax *see* cebil  
 Hawaiian baby wood rose 64, 232–233  
 Hawaiian wood rose *see* Hawaiian baby wood rose  
 hawthorn 64  
 Hayflick limit 147, 343  
 Hazelnuts 156  
 HCF-1 340  
 HDAC inhibitors *see* histone deacetylase inhibitors  
 HDAC2 134  
 HDIs *see* histone deacetylase inhibitors  
 heart 101, 166, 167  
 heartleaf *see* country mallow  
 Heat shock protein 70 *see* HSP70  
 Heavenly Blue *see* morning glory  
 heavenly blue morning glory *see* morning glory  
 heavy water 358  
 Hecate *see* DOET  
*Heimia myrtifolia* *see* sinicuichi  
*Heimia salicifolia* *see* sinicuichi  
*Heimia syphilitica* *see* sinicuichi  
 Helfergen *see* Meclofenoxate  
*Helicostylis pedunculata* *see* takini  
*Helicostylis tomentosa* 263  
 heliotrope *see* fragrant valerian  
*Heliotropium arborescens* 231  
 helmet flower *see* skullcap  
 helper T cells *see* T cells  
 hemlock spruce 47  
 hemp *see* marijuana  
 henbane 233, 260, 261  
 henbell *see* henbane  
 henequen *see* mescal plant  
 henquale *see* henbane  
*Heraclea pontica* *see* rhododendron  
 herb of grace *see* bacopa monniera  
 hermoso *see* san pedro  
 herpesis herb *see* bacopa monniera  
*Herpestis monniera* *see* bacopa monniera  
 herring 30, 89, 99, 119, 154, 156, 207, 225  
 herva da vida *see* sinicuichi  
 hesperidin 110, 113  
 Hexa-Betalin *see* vitamin B-6  
 HFBI-GDNF *see* GDNF  
 HGH *see* human growth hormone  
 HGMA2 gene 340, 341  
*Hibiscus tiliaceus* 222  
 hierba loca 233, 263; *see also* darnel; Mexican poppy  
 hierba mora *see* nightshade  
 HIF-1 134–135  
 high balm *see* horsebalm  
*Himantandra belgraeveana* 233  
 hindheal *see* tansy  
 hippocampus 95, 127, 128, 129, 134, 136, 139, 144, 145, 154, 156, 174, 178, 180, 192, 237, 245, 246, 273, 276, 278, 282, 292, 309, 316, 319, 326, 328, 330, 332, 334, 335, 336, 340, 341, 342, 344, 345, 347, 348, 354, 355; *see also* CA1; CA3  
 hisioma *see* cohoba  
 histidine 122, 135  
 histone deacetylase inhibitors 309  
 Hit Energy *see* guarana  
 HLA 139  
 HLH-30 135  
 HNF-4alpha receptors 343  
 ho shou wu *see* polygonum  
 Hoe 065 309  
 Hoe-427 *see* ebratide  
 hog apple *see* mandrake  
 hog bean *see* henbane  
 Hojas de la Maria Pastora *see* *Salia divinorum*  
 Hojas de la Pastora *see* *Salia divinorum*  
 Hojas de Maria Pastora *see* *Salia divinorum*  
 holly 63  
 holy fire *see* ergot  
 holy thistle *see* milk thistle  
*Homalomena belgraeveana* *see* ereriba  
*Homalomena cordata* 229  
*Homalomena ereriba* *see* ereriba  
*Homalomena rubescens* 229  
*Homalomena versteegii* 229  
 homo- $\gamma$ -linolenylethanolamine *see* endocannabinoids  
 honey 13–14, 31–32, 39  
 honey oil *see* marijuana  
 hong jing tian *see* goldenroot; *Rhodiola rosea*  
 hoodwort *see* skullcap  
 hops 64–65, 67, 70, 78, 178, 233, 233–234  
 horcocebil *see* cebil  
 hornseed *see* ergot  
 horsebalm 65  
 horsemint *see* horsebalm  
 host cell factor 1 *see* HCF-1  
 hot pepper *see* cayenne  
 hou po *see* magnolia  
 hound's berries *see* belladonna  
 HSCR3 *see* GDNF  
 Hsia Ts'ao Tung Ch'Ung *see* cordyceps  
 Hsiao Yao Wan 82  
 HSP70 135  
 HT-0712 309  
 HU210 309  
 hu suan *see* garlic  
 hualhual *see* keule  
 huandauj *see* brugmansia  
 huando *see* san pedro  
 Huang bò *see* phellodendron  
 Huang chi *see* astragalus  
 Huang qi *see* astragalus  
 huantac *see* brugmansia  
 huanto *see* brugmansia  
 huantuc *see* brugmansia  
 huapa *see* osteophloem  
 huarhuar *see* brugmansia  
 huckleberry *see* bilberry  
 huedhued *see* hierba loca  
 hueipatl *see* kieri  
 huilca *see* cebil  
 human growth hormone 180–181, 181  
 Humatrope *see* human growth hormone  
 hummingbird's flower *see* iochroma  
*Humulus lupulus* *see* hops  
*Huperzia serrata* *see* Chinese club moss  
 huperzine A 309–310  
 hurmur *see* Syrian rue  
 hurtleberry *see* bilberry  
 hydergine 89, 100, 273, 280, 310–311, 320  
 hydrangea 234  
*Hydrangea arborescens* *see* hydrangea  
*hydrangea paniculata grandiflora* *see* hydrangea  
 hydrazinecarboximidamide *see* aminoguanadine  
*Hydrocotyle asiatica* *see* brahmi  
*Hydrocotyle asiatica minor* *see* polygonum  
 Hydrolloid *see* hydergine  
 hydrolyzed soy protein *see* soy  
 hydrolyzed vegetable protein *see* soy  
 hydroxocobalamin *see* vitamin B-12  
 Hydroxyfasudil 278  
 Hydroxypiracetam *see* oxiracetam  
 hyoscine *see* scopolomine  
*Hyoscyamus niger* *see* henbane  
 hypericum *see* St. John's wort  
*Hypericum perforatum* *see* St. John's wort  
 hypnosis 358  
 hyporetin 135



- hypothalamus 129, 192, 280, 307, 322, **340**  
hypoxanthine riboside *see* inosinic acid  
hypoxia-inducible factor 1 *see* HIF-1  
hyssop **65**, 195, 201  
*Hyssopus officinalis* *see* hyssop  
Hyzaar 280
- iboga **234**  
ibudilast **278–279**  
Ibuprofen 79, **279**, 305  
Ibuprofen *see* Ibuprofen  
Ibu-Tab *see* Ibuprofen  
ICSM 18 **135**  
ICSM 35 **135**  
idebenone **169**  
IDRA-21 **311**  
IGF-1 180, **181**  
Igmesine **311**  
ignis sacer *see* ergot  
IGOB131 *see* irvingia  
IIS *see* insulin signaling pathway  
IL-4 *see* interleukin 4  
*Ilex guayusa* *see* guayusa  
*Ilex paraguayensis* *see* yerbe mate  
*Ilex paraguayensis* *see* yerbe mate  
*Ilex vomitoria* *see* yaupon  
*Illicium lanceolatum* 46  
*Illicium verum* *see* star anise  
I'm Not Dead Yet gene *see* INDY gene  
imino semicarbazide *see* aminoguanidine  
Imipramine 75, 112, 141, 253, 295  
Imperial tea *see* green tea  
incense **358**; *see also* kratom  
incensier *see* rosemary  
Inderal *see* propranolol  
Inderal LA *see* propranolol  
Indian apple *see* mandrake  
Indian Bdellium *see* guggul  
Indian black drink *see* yaupon  
Indian Black Tea *see* yaupon  
Indian Cardamom *see* cardamom  
Indian chickweed *see* chickweed  
Indian chikana *see* country mallow  
Indian ginger *see* ginger  
Indian ginseng *see* ashwagandha; ginseng  
Indian hemp *see* marijuana  
Indian mulberry *see* noni  
Indian pennywort *see* *Bocopa monniera*; gotu-kola  
Indian saffron *see* turmeric  
Indian snakeroot **65–66**  
Indian tobacco *see* lobelia  
Indonesian black rice *see* black rice  
Indy gene **340**  
influenza vaccine **279**  
infrasound 365  
Inga niopa *see* cohoba  
INN *see* Naftidrofuryl  
*Inocybe aeruginascens* *see* mushrooms  
*Inocybe coelestium* *see* mushrooms  
*Inocybe fastigiata* *see* split fibrecap  
inosine *see* inosinic acid  
inosinic acid **163**, 311  
inositol 23, 90, **92–93**, 106, 118, 120, 121, 151, 152, 153, 220  
inositol hexaniacinate *see* vitamin B-3  
inositol hexaphosphate *see* IP6  
inositol nicotinate *see* inositol  
insana *see* henbane  
insect larva *see* animals  
Insidon *see* opipramol  
insomnia, relief from 25, 26, 49, 51, 52, 54, 55, 59, 64, 65, 68, 69, 70, 71, 72, 73, 74, 75, 78, 79, 80, 82, 84, 90, 93, 94, 95, 98, 104, 130, 132, 133, 152, 176, 182, 186, 195, 196, 197, 198, 199, 200, 201, 222, 249, 291, 307, 327, 356, 360; *see also* sleep, improved  
InsP6 *see* IP6  
insulin 119, 127, 129, 133, 146, 149, 155, 158, 177, 179, 181, 190, 225, 253, **279**, 357  
insulin/IGF-1 signaling pathway *see* insulin signaling pathway  
insulin-like growth factor 1 *see* IGF-1  
insulin signaling pathway 318, **340**, 346, 348  
intelligence *see* cognitive enhancement  
Interferon beta **279**  
Interferon beta-1b *see* Interferon beta  
interleukin 4 **136**  
interneurons **340**  
intoxicating mint *see* Turkestan mint  
intropin *see* dopamine  
intuition *see* cognitive enhancement  
Invagesic *see* Orphenadrine  
iochroma **234**  
*Iochroma fuchsoides* *see* iochroma  
iodine **93**  
Ilopo *see* cohoba  
IP6 **92–93**  
ipecac **234–235**, 258  
ipoh 229  
*Ipomoea carnea* *see* borrachero; morning glory  
*Ipomoea nil* *see* morning glory  
*Ipomoea pes-caprae* *see* morning glory  
*Ipomoea purpurea* *see* morning glory  
*Ipomoea sidaefolia* *see* morning glory  
*Ipomoea tricolor* *see* morning glory  
*Ipomoea tuberosa* 64, 232  
*Ipomoea violacea* *see* morning glory  
IQ *see* cognitive enhancement  
Iressa *see* gefitinib  
iron 8, 14, 19, 22, 26, 40, 48, 52, 54, 60, 70, 73, 76, 77, 80, 81, **93–94**, 96, 102, 111, 112, 118, 120, 121, 129, 165, 214, 218, 313, 332, 364  
irvingia **32**  
*Irvingia barteri* *see* irvingia  
*Irvingia excels* *see* irvingia  
*Irvingia gabonensis* *see* irvingia  
*Irvingia grandifolia* *see* irvingia  
*Irvingia malayana* *see* irvingia  
*Irvingia robur* *see* irvingia  
*Irvingia smithii* *see* irvingia  
*Irvingia wombolu* *see* irvingia  
IRX4204 **311**  
ischemia *see* brain damage; stroke  
ISF-2522 *see* oxiracetam  
isoleucine 122, **136**, 137, 143, 150  
Isoniazid 214  
Isonipeccaine *see* Meperidine  
Isoprinosine **311**  
Isoproterenol 253  
Ispronicline **279**  
isshiona *see* brugmansia  
IT-290 *see* DMT  
iusquiamus *see* henbane  
ivraie *see* darnel  
Ixel *see* Milnacipran
- jaad *see* khat  
jack bean 216  
jalanimba *see* *Bocopa monniera*  
jal-Brahmi *see* *Bocopa monniera*  
jalnaveri *see* *Bocopa monniera*  
Jamaican thistle *see* Mexican poppy  
James Town Weed *see* datura  
Japanese anise 46  
Japanese radish 182  
Japanese Rehmanniae Radix *see* Chinese foxglove root  
Japanese RR *see* Chinese foxglove root  
jasmine **66**, 194, 195, **196**, 198, 199, 200, 201  
Jasmine absolute *see* jasmine  
*Jasminum grandiflorum* *see* jasmine  
*Jasminum officinale* *see* jasmine  
jataj *see* cebil  
jatoba bark **66**  
jenkem **235**  
jerataca *see* brunfelsia  
Jerusalem oak 266  
Jesuit tea 266  
Jesuit's tea *see* yerba mate  
jet *see* ketamine  
jimson weed *see* datura  
jio *see* Chinese foxglove root  
JNK **136**  
JO-1784 *see* igmesine  
Johnswort *see* St. John's wort  
jop *see* cohoba  
Josta *see* guarana  
jouzmathel *see* datura  
*Juglans cinerea* *see* walnut  
*Juglans major* *see* walnut  
*Juglans nigra* *see* walnut  
*Juglans regia* *see* walnut  
juice *see* GHB  
jube date *see* da t'sao  
Juku-Jio *see* Chinese foxglove root  
Jumex *see* selegiline  
Jumexal *see* selegiline  
juniper 194, 195, **196–197**, 197, 201  
*Juniperus communis* *see* juniper  
Jupal *see* xanthinol nicotinate  
Jupiter's bean *see* henbane  
Juprenil *see* selegiline  
jurema **235**  
*jurema branca* *see* jurema  
*Justicia pectoralis* var. *stenophylla* *see* masha hari  
Juvonon **169**

- K (ketamine) *see* ketamine  
 K (potassium) *see* potassium  
 KA1 **136**  
 kaempferia **235**  
*Kaempferia galangal* *see* kaempferia  
 kahi *see* ayahuasca and caapi  
 kainate receptor 1 *see* KA1  
 kaka *see* irvingia  
 kale 43, 90  
 kalirin-7 **136**  
 Kalma *see* Alprazolam  
 kamillosan *see* chamomile  
 Kan-Jio *see* Chinese foxglove root  
 kan-sui root 52  
 Kanna **66, 235–236, 315**  
 kara **236**  
 kasa *see* kava and kawain  
 kat *see* khat  
 kaugod *see* kanna  
 kauwgod *see* kanna  
 kava **66–68, 76, 223**  
 kava kava *see* kava and kawain  
 Kavaform *see* kava and kawain  
 Kaviase *see* kava and kawain  
 kawa *see* kava and kawain  
 kawa kawa *see* kava and kawain  
 kawa kui *see* psychotria  
 kawain **66–68**  
 kawang **236**  
 Kaybovite *see* vitamin B-12  
 Kaybovite-1000 *see* vitamin B-12  
 KCC2 **341**  
 KD501 **311**  
 KDI **137**  
 KDI tripeptide *see* KDI  
 kecubong *see* brugmansia  
 Keenmind *see* *Bacopa monniera*  
 kefir 38  
 kelp 102, 207  
 Ketaject *see* ketamine  
 Ketalor *see* ketamine  
 ketamine 141, **236–237, 312, 314**  
 ketamine hydrochloride *see* ketamine  
 keu *see* kava and kawain  
 keule **237**  
 khareti *see* country mallow  
 khas-khas *see* vetiver  
 khat **237–238**  
 K.H.3 *see* Geroyal; KH3  
 KH3 **311–312**; *see also* Gerovital  
 khoba *see* cohoba  
 khus-khus *see* vetiver  
 kiddie smack *see* ketamine  
 kidney 90, 99, 101, 106, 108, 167, 185  
 kieli *see* kieri  
 kieri *see* brugmansia  
 kieri-nanari *see* brugmansia  
 kif *see* marijuana  
 KIF17 **137**  
 kikisira **238**  
 kimchi 38  
 kinesin family member 17 *see* KIF17  
 kinesin superfamily motor protein 17 *see* KIF17  
 king cobra *see* animals  
 king palm *see* *Archontophoenix cunningghamiana*  
 King's Crown *see* *Rhodiola rosea*  
 kinnikinnik *see* uva-ursi  
 kinnikinnick *see* uva-ursi  
 kira *see* St. John's wort  
 Kir4.1 **137**  
 kit kat *see* ketamine  
 kiwi fruit 89, 156  
 KL-VS **341**  
 klamath weed St. John's wort  
 knee holly *see* butcher's broom  
 knotted marjoram *see* marjoram  
 knowledge pill **358–359**  
 koboku *see* magnolia  
 kola **68, 72**  
 kola nut 26, 61, 212, 214, **238**  
 kombucha 38  
 Korean black raspberry *see* black raspberry  
 koribo **238**  
 kougod *see* kanna  
 kratom **238–239**  
 krill oil 156, 158, 159, 160  
 kubilgim **239**  
 kukicha tea *see* green tea  
 kuku *see* New Zealand green-lipped mussel  
 kulhadhirimaa *see* *Clitoria ternatea*  
 kurupa *see* cebil  
 kutai *see* New Zealand green-lipped mussel  
 kutum *see* kratom  
 kwashi **239**  
 kykeon **239**  
 kynurenic acid **341**  
 Kyphosus *see* animals  
*Kyphosus cinerascens* *see* animals  
*Kyphosus fuscus* *see* animals  
*Kyphosus vaigiensis* *see* animals  
 L-3,4 dihydroxyphenylalanine *see* levodopa  
 L-acetylcarnitine *see* acetyl-L-carnitine  
 l-amphetamine *see* amphetamine  
 l-arginine *see* arginine  
 l-carnitine *see* acetyl-L-carnitine  
 l-carnosine *see* carnosine  
 l-cysteine *see* cysteine  
 L-deprenyl *see* selegiline  
 l-desamino-8-D-arginine *see* vasopressin  
 l-dopa *see* levodopa  
 l-glutamine *see* glutamine  
 l-glycine *see* glycine  
 l-histidine *see* histidine  
 l-isoleucine *see* isoleucine  
 l-leucine *see* leucine  
 l-methamphetamine 271  
 l-methionine *see* methionine  
 l-phenylalanine *see* phenylalanine  
 l-prolyl L-leucyl glycine amide **138**  
 l-selenomethione *see* selenium  
 l-aurine *see* taurine  
 l-theanine *see* l-glutamylethylamide *see* theanine  
 l-tryptophan *see* tryptophan  
 l-tyrosine *see* tyrosine  
 l-valine *see* valine  
 LA *see* alpha-lipoic acid  
*Lactobacillus bulgaricus* *see* probiotics  
*Lactobacillus helveticus* *see* probiotics  
*Lactobacillus rhamnosus* *see* probiotics  
*Lactococcus lactis* subsp *Lactis* *see* probiotics  
*Lactuca sativa* *see* lettuce  
*Lactuca virosa* *see* lettuce  
 ladostigil **312**  
 lad's love 266  
 lady's-slipper 72  
*Lagochilus inebrians* *see* Turkestan mint  
 laitan *see* kava and kawain  
 lamb 88, 106, 119, 146  
 lamb mint *see* peppermint; spearmint  
 Lambarene *see* iboga  
 Lamictal *see* lamotrigine  
 lamotrigine **279–280**  
 Lancashire cheese 218  
 Landes pine bark 96  
 Landrina *see* xanthinol nicotinate  
 lanicemine **312**  
 Larodopa *see* levodopa  
*Larrea divaricata* *see* chaparral  
*Larrea tridentata* *see* chaparral  
 Larreastat *see* chaparral  
 Latrepirdine *see* Dimebon  
*Latua pubiflora* *see* arbol de los brujos  
*Latua venenosa* *see* arbol de los brujos  
 latue *see* arbol de los brujos  
 latuy *see* arbol de los brujos  
 laughing mushroom 204  
*Laurus camphora* *see* camphor  
 lavandin **197, 197**  
*Lavandula angustifolia* *see* lavender  
*Lavandula delphinensis* *see* lavandin  
*Lavandula fragrans* *see* lavandin  
*Lavandula latifolia* *see* lavender  
*Lavandula officinalis* *see* lavender  
*Lavandula vera* *see* lavender  
 lavender **68, 194, 195, 196, 197, 197, 198, 199, 201**  
 lavandin *see* lavandin  
 LCN2 *see* lipocalin-2  
 leadership gene *see* rs4950  
 leaf of God *see* calea  
 learning, improved *see* cognitive enhancement  
 LECI-PS *see* phosphatidylserine  
 lecithin 22, 40, 54, 89, 97, 138, **151–154, 161, 320, 325**  
 Lectopam *see* Bromazepam  
*Ledum hypoleucum* *see* rosemary  
*Ledum palustre* *see* rosemary  
*Ledum palustre* ssp. *groenlandicum* *see* rosemary  
 legumes 90, 92, 96, 97, 98, 100, 102, 119, 122, 123, 141, 150, 151, 172, 314  
 lemon 92, 94, 194, 195, **197, 198, 200, 201**  
 lemon balm **68–69**; *see also* melissa  
 lemon-scented eucalyptus *see* eucalyptus

- lemon verbena *see* verbena  
 lemongrass 196, **197**, 197  
 Lenalidomide **312**  
 lentils 92, 106, 123, 148, 152  
*Leonotis leonurus* *see* wild dagga  
*Leonurus cardiaca* *see* motherwort  
*Leonurus sibiricus* *see* marihuaniilla  
 leptin **181**  
 lesser Cardamom *see* cardamom  
 lettuce **69**, 90, **239–240**  
 leucine 122, 136, **137**, 143, 150  
 Levarterenol *see* norepinephrine  
 levetiracetam *see* etiracetam  
 levocarnitine *see* acetyl-L-carnitine  
 levodopa 65, 94, 96, 106, 108, 112, 129, 142, 149, 162, **280**, 286, 289, 314  
 Levodip *see* thyroid hormones  
 Levophed *see* norepinephrine  
 Levophed Bitartrate *see* norepinephrine  
 Levothroid *see* thyroid hormones  
 Levothym *see* 5-HTP  
 Levothyroxine 88, 94; *see also* thyroid hormones  
 Levotonine *see* 5-HTP  
 Levoxyl *see* thyroid hormones  
 Lewena *see* kava and kawain  
 Lexam *see* escitalopram  
 Lexamil *see* escitalopram  
 Lexapro *see* escitalopram  
 Lexaurin *see* Bromazepam  
 Lexilium *see* Bromazepam  
 Lexotan *see* Bromazepam  
 Lexotanil *see* Bromazepam  
 Li *see* lithium  
 LI-160 *see* St. John's wort  
 liberty caps *see* mushrooms  
*Licaria puchury-major* *see* pichuri  
 Lichens **240**  
 licorice 67, **69**, 78, 80, 82, 178, 207, 225, 273  
 licorice root *see* licorice  
 lidol *see* Meperidine  
 life-giving vine of Peru *see* cat's claw  
 life-of-man *see* sarsaparilla  
 lifespan, increased 11, 22, 24, 32, 38, 46, 55, 57, 60, 74, 80, 89, 90, 125, 127, 131, 132, 134, 136, 137, 139, 141, 143, 147, 150, 163, 167, 171, 176, 177, 180, 181, 182, 186, 195, 200, 219, 221, 273, 277, 280, 288, 289, 312, 322, 323, 324, 330, 334, 335, 337, 338, 339, 340, 341, 343, 344, 345, 346, 347, 348, 351, 352–353, 357, 358, 363, 366; *see also* anti-aging  
 light 113, 183, **359**; *see also* optogenetics; sunlight  
*Lignum Rhodium* *see* *Rhodiola rosea*  
 ligusticum 78  
 ligustrum **69**  
*Ligustrum lucidum* *see* ligustrum  
 lima beans 102, 104, 141  
 lime **197**, 197, 201  
 lime blossoms *see* linden  
 lime flowers *see* linden  
 Lin28a **341**  
 linden **70**  
 linden flowers *see* linden  
 ling-chih-tsoo *see* reishi  
 ling-zhi *see* reishi  
 linoleic acid 151, 155, 157–160; *see also* vegetable oils  
 linseed oil 156  
 lion's ear *see* wild dagga  
 lion's tail *see* wild dagga  
 lion's tooth *see* dandelion  
 Liothyronine *see* thyroid hormones  
 Liotrix *see* thyroid hormones  
 lipocalin-2 **137–138**  
 lipoic acid *see* alpha-lipoic acid  
 liposomal superoxide dismutase *see* superoxide dismutase  
 lipothropes **160–161**  
*Lippia citriodora* *see* verbena  
 LIPSOD *see* superoxide dismutase  
 Liquid Ecstasy *see* GHB  
 Liquid X *see* GHB  
 lithium 74, 83, 152, 188, 214, **312–313**  
 liver 87, 88, 90, 99, 101, 102, 104, 106, 108, 110, 113, 119, 138, 151, 1661, 167, 182, 268  
 living rock *see* false peyote  
 lizard tail *see* yohimbe  
 lobelia **240**  
*Lobelia cardinalis* *see* lobelia  
*Lobelia inflata* *see* lobelia  
*Lobelia tupa* *see* tupa  
*Lochroma fuchsoides* *see* borrachera  
 loco weed *see* datura  
*Lolium temulentum* *see* darnel  
 Lometraline **313**  
 Lopar *see* levodopa  
 lophophine **240**  
*Lophophora diffusa* *see* peyote  
*Lophophora williamsii* *see* peyote  
 Losartan **280**  
 losartan potassium *see* Losartan  
 lovastatin 63, 70  
 love apple *see* mandrake  
 “love chemical” *see* phenethylamine  
 love hormone *see* oxytocin  
 Lovenox *see* Enoxaparin  
 low balm *see* horsebalm  
 LP-44 **313**  
 LR11 155, 157, **341**  
 LSD 188, 190, 215, 217, 225, 229, 232, 234, **240–242**, 251, 310  
 LSD-25 *see* LSD  
 LSD-tartrate *see* LSD  
 Lu 28–179 *see* Siramesine  
 Lucetam *see* piracetam  
 lucid dreams *see* dreams (vivid, lucid)  
 Lucidil *see* Benactyzine  
 Lucidril *see* Meclofenoxate  
 luteolin **94**  
 luteoline *see* luteolin  
 luteolol *see* luteolin  
 Luvox *see* Fluvoxamine  
 LVP *see* vasopressin  
 LY2886721 **313**  
 Lycii *see* gay gee  
*Lycioplesium pubiflorum* *see* arbol de los brujos  
*Lycium chinenses* *see* gay gee  
 lycium Chinese *see* gay gee  
*Lycoperdon marginatum* *see* puffballs  
*Lycoperdon mixtecorum* *see* puffballs  
 Lycopod *see* Chinese club moss  
*Lycopodium calvatum* *see* Chinese club moss  
*Lycopodium clavatum* *see* club moss  
*Lycopodium complanatum* *see* club moss  
*Lycopodium selago* *see* club moss  
 Lycoremine *see* galantamine  
 Lynx1 **138**  
 Lypressin *see* vasopressin  
 lysergic acid beta-propranolamide *see* ergometrine  
 lysergic acid diethylamide *see* LSD  
 lysine-vasopressin *see* vasopressin  
 M30 **313**  
 ma-huang **228–229**  
 Mac Black *see* black raspberry  
 Mace **242**, 254  
 mackerel 113, 167  
 Maconha *see* dama de noite  
 Maconha brava **242**  
 macrophages *see* CpG DNA  
 Madagascar periwinkle *see* rosy periwinkle  
 maddale *see* dita tree  
 maddog-weed *see* skullcap  
 made shaunda *see* nutmeg  
 maeng da *see* kratom  
 Magic Mint *see* *Salvia divinorum*  
 magic mushrooms *see* mushrooms  
 magnesium 14, 22, 26, 55, 74, 85, 86, 88, 94, **94–96**, 107, 108, 112, 135, 139, 149, 182, 183, 218, 298, 364  
 magnesium ascorbate *see* magnesium; vitamin C  
 magnesium chloride *see* magnesium; vitamin C  
 magnesium gluconate *see* magnesium  
 magnesium-L-threonate *see* magnesium  
 magnesium lactate *see* magnesium  
 magnesium orotate *see* magnesium  
 magnesium oxide *see* magnesium  
 magnesium pemoline *see* pemoline  
 magnetics 354, **359–360**  
 magnolia **70**  
*Magnolia officinalis* *see* magnolia  
 maguey *see* mescal plant  
 mai ko *see* brugmansia  
 mai ko' mo *see* brugmansia  
 maicoma *see* brugmansia  
 maidenhair tree *see* ginkgo biloba  
 maitake 204  
 maize *see* popcorn  
 majun *see* marijuana  
 malabar cardamom *see* cardamom  
 malgif *see* *Boophone disticha*  
*Malus domestica* *see* apple  
 Malva Blanca *see* country mallow  
 Malva-Branca *see* country mallow  
 Malva-Branca-Sedosa *see* country mallow  
 mambog *see* kratom  
 mammalian TOR *see* target of rapamycin pathway  
 man-t'o-lo *see* datura  
 manaca *see* brunfelsia

- mandragon *see* mandrake  
mandragora *see* mandrake  
*Mandragora officinarum* *see* mandrake  
mandrake **242–243**, 260  
manganese 52, 86, **96**, 103, 120, 173  
manganese gluconate *see* manganese  
manganese SOD *see* superoxide dismutase  
manganese sulfate *see* manganese  
*Mangifera gabonensis* *see* irvingia  
mangiferin **169**  
mango 169  
manguier sauvage *see* irvingia  
*Maquira sclerophylla* *see* rape do indios  
maraba *see* agara; kaempferia  
marihuana **243**  
marijuana 5, 21, 22, 27, 49, 65, 66, 84, 180, 183, 187, 190, 205, 211, 215, 216, 218, 224, 226, 232, 233, 234, 235, 238, **243–248**, 248, 264, 268, 309, 310, 332, 335  
Marine-D3 **313**  
marionberry 89  
marjoram 72, 197, **197–198**; *see also* oregano  
marsh cistus *see* rosemary  
marsh tea *see* rosemary  
Marucotol *see* Meclofenoxate  
marythistle *see* milk thistle  
masha-hari **248**  
matabra *see* borrachero  
mataperro *see* brugmansia  
matcha tea *see* green tea  
mate *see* yerbe mate  
mate de coca *see* coca and cocaine  
mate yerba *see* yerbe mate  
*Matricaria chamomile* *see* chamomile  
*Matricaria chamomilla* *see* chamomile  
*Matricaria recutita* *see* chamomile  
matsi kawa *see* psychotria  
Maximum Bayer *see* aspirin  
may apple *see* mandrake  
may bush *see* hawthorn  
may tree *see* hawthorn  
maypops *see* passion flower  
MCH *see* melanin concentrating hormone  
MDA 75, 259  
MDA7 **280–281**  
MDMA 27, 82, 130, 131, 215, 247, 256  
MDPV 287  
Measurin *see* aspirin  
meat 87, 93, 98, 99, 103, 104, 106, 109, 119, 122, 123, 125, 126, 127, 133, 134, 138, 144, 146, 148, 150, 151, 152, 153, 156, 165, 166, 183, 185, 307, 319; *see also* protein-rich foods  
Meclofenoxate 98, **313–314**, 320  
Medipren *see* ibuprofen  
meditation 183, 197, 198, 200, 349, **360**  
Meduna's Mixture *see* carbogen  
MegaNatural-AZ *see* grape seed extract
- Megimide *see* Bemegride  
melanin concentrating hormone **181**  
melanocyte-stimulating hormone release inhibiting factor-1 *see* l-prolyl L-leucyl glycine amide  
melatonin 43, 72, 130, 157, **181–183**, 244, 293, 359  
melissa 196, **198**, 201  
melissa grass *see* lemongrass  
*Melissa officinalis* *see* lemon balm; melissa  
Melitor *see* agomelatine  
mellow yellow *see* banana peels  
MEM 1003 **314–315**  
MEM 1414 **315**  
MEM 1917 **315**  
memantine 116, 141, 302, **314**, 317  
memantine hydrochloride *see* memantine  
MemoProve *see* N-PEP-12  
memory, enhanced 7, 10, 12, 17, 18, 20, 22, 24, 34, 35, 38, 40, 41, 43, 46, 47, 52, 54, 57, 59, 60, 62, 71, 72, 74, 75, 76, 79, 83, 89, 90, 94, 100, 101, 104, 106, 108, 113, 119, 123, 124, 125, 126, 128, 134, 136, 137, 138, 140, 141, 142–143, 143, 144, 144–145, 145, 146, 147, 151, 152, 163, 166, 169, 172, 175, 176, 177, 178, 180, 181, 183, 184, 186, 188, 189, 191, 194, 195, 197, 200, 212, 218, 219, 236, 244, 252, 264, 267, 269, 270, 271, 272, 273, 274, 276, 278, 282, 283, 285, 286, 287, 288, 289, 290, 291, 292, 294, 295, 296, 298, 302, 306, 308, 309, 310, 311, 312, 315, 316, 317, 319, 320, 321, 322, 323, 324, 332, 334, 335, 336, 339, 340, 341, 342, 344, 346, 347, 348, 352, 355, 356, 357, 361  
Memox *see* memantine  
Menadol *see* ibuprofen  
Menkes disease-associated protein *see* Atp7a  
mental clarity *see* cognitive enhancement  
Mental Edge *see* pyroglutamate  
*Mentha arvensis* *see* field mint  
*Mentha haplocalyx* *see* field mint  
*Mentha piperita* *see* peppermint  
*Mentha pulegium* *see* pennyroyal  
*mentha spicata* *see* spearmint  
*Mentha sylvestris* *see* horsebalm  
*Mentha × piperita* *see* peppermint  
Mepergan *see* meperidine  
meperidine 131, 162, **281**  
Mephenamin *see* Orphenadrine  
Mephenytoin *see* phenytoin  
mercurio dos pobres *see* brunfelsia  
Merital *see* Nomifensine  
Mesantoin *see* phenytoin  
mescal *see* peyote  
mescal bean 222, **248**, 256, 257  
mescal buttons *see* mescaline; peyote  
mescal plant 206, **248**  
mescal worm *see* animals  
mescaline 207, 215, 217, 225, 226, 240, **248–249**, 249, 256, 260  
mesembrine **315**
- Mesembryanthemum expansum* *see* kanna  
*Mesembryanthemum tortuosum* *see* kanna  
meskalpflanze *see* mescal plant  
mestranol *see* estrogen and estradiol  
Mesyrel *see* Trazodone  
Met-Glu-His-Phe- Pro-Gly-Pro *see* Semax  
metabotropic glutamate receptor 1 124  
metabotropic glutamate receptor 5 *see* mGluR5  
Metformin **281**  
Methergin *see* ergometrine  
methionine 90, 108, 122, 125, 127, 135, **138–139**, 150, 151, 160, 161, 165, 167  
Methisprinol *see* isoprinosine  
Methoxynal *see* Meclofenoxate  
Methylropa 94  
methylene blue **281**  
Methylenedioxyamphetamine 75  
methylsergic acid diethylamide *see* LSD  
Methylphenidate 1, 190, 225, 270, **281**  
methylphenidate hydrochloride *see* Methylphenidate  
Methylthionium chloride *see* methylene blue  
*Methysticodendron amesianum* *see* brugmansia  
metl *see* mescal plant  
metopirone *see* metyrapone  
metoprine **282**  
Metrazol *see* pentylene tetrazol  
Metrifonate **282**  
Metyrapone **282**  
Mexican calea *see* calea  
Mexican marigold **244**  
Mexican morning glory *see* morning glory  
Mexican poppy **249–250**  
Mexican prickly poppy *see* Mexican poppy  
Mexican sage *see* *Salvia divinorum*  
Mexican tea 266  
Mexican thistle *see* Mexican poppy  
Mexican thorn poppy *see* Mexican poppy  
Mexican wild yam 70, 177, 203  
Mexican wormwood **250**  
mezcal plant *see* mescal plant  
MF *see* Meclofenoxate  
Mg2+ *see* magnesium  
MGC17998 *see* FLCN  
MGC23445 *see* FLCN  
MgCl<sub>2</sub> *see* magnesium  
mGlu 1 receptors *see* metabotropic glutamate receptor 1  
mGluR5 **341**  
MgT *see* magnesium  
MHC Class 1 D **139**  
mi die xiang *see* rosemary  
michai blanco *see* taique  
Mickey Slim *see* DDT  
microalgae **32–33**, 92, 102, 182, 185  
microbiota **341–342**  
microbots 361

- microglia 337, 353  
microphytes *see* microalgae and seaweed  
microRNA **342**  
microRNA-574–5p *see* microRNA  
Midazolam **282**  
Midol Extended Relief *see* Naproxen  
MIF-1 *see* 1-prolyl L-leucyl glycine amide  
mihī *see* ayahuasca and caapi  
mii *see* ayahuasca and caapi  
Milacemide **315**  
mile-a-minute *see* Hawaiian baby wood rose  
milk 26, **33–34**, 56, 62, 88, 90, 94, 95, 96, 101, 102, 104, 106, 108, 113, 114, 119, 120, 122, 123, 125, 138, 141, 146, 148, 153, 165, 187, 207, 215, 225; *see also* breast milk; protein-rich foods  
milk thistle **70–71**, 80  
milk-velch root *see* astragalus  
milky pine *see* dita tree  
Milnacipran **282–283**  
*Mimosa hostilis* *see* jurema  
*Mimosa jurema* *see* jurema  
*Mimosa nigra* *see* jurema  
*Mimosa pudica* *see* jurema  
*Mimosa somnians* *see* jurema  
*Mimosa* species *see* cohoba  
*Mimosa tenuiflora* *see* jurema  
*Mimosa verrucosa* *see* jurema  
Minaprine 290, **315**  
mind enhancement 14, 24, 28, 29, 39, 46, 57, 59, 60, 73, 78, 81, 92, 94, 100, 102, 106, 108, 110, 116, 123, 129, 139, 163, 172, 186, 193, 218, 283, 286, 295, 308, 310, 312, 320, 322, 323, 328, 331, 343, 344, 345, 347, 360; *see also* cognitive enhancement  
mineral pitch *see* shilajit  
mineral water **34**  
mineral wax *see* shilajit  
miniature wood rose *see* Hawaiian baby wood rose  
Minirin *see* vasopressin  
Minocin *see* Minocycline  
Minocycline 127, **283**, **315**  
Minor Buplerum Pills *see* xiao chai hu wan  
mint 21, 49, 259, 265; *see also* peppermint  
miR-29 **342**  
miraa *see* khat  
Mirapex *see* Pramipexole  
Mirapexin *see* Pramipexole  
misha huarhuar *see* brugmansia  
misha rastrera blanca *see* brugmansia  
misho chaqui 263  
miso 38, 40; *see also* soy  
*Mitragyna speciosa* *see* kratom  
mitskway borrachero *see* brugmansia  
mitten tree *see* sassafras  
MK-8931 **315–316**  
MLD-41 *see* LSD  
MMT *see* DMT  
Mn *see* manganese  
MN19 *see* sapunifiram  
MN-166 *see* ibudilast  
MnSOD *see* superoxide dismutase  
Moclobemide **282**  
Modafinil 1, 270, **283**, 284, 304  
Molipaxin *see* Trazodone  
Molsidomine **283**  
molasses 116; *see also* blackstrap molasses  
momia *see* shilajit  
Monarda *see* horsebalm  
*Monarda didyma* *see* horsebalm  
*Monarda fistulosa* *see* horsebalm  
*Monarda punctata* *see* horsebalm  
Monaslim *see* SR141716  
*Moniera cuneifolia* *see* *Bacopa monniera*  
monkey rose *see* Hawaiian baby wood rose  
monkshood *see* aconite  
monoaminoguanidine *see* aminoguanidine  
monosialoganglioside GM1 *see* GM1 ganglioside  
monotertiary butyl hydroquinone *see* TBHQ  
monounsaturated fat 156  
Monster Energy *see* energy drinks  
mood enhancement 9, 12, 13, 14, 17, 18, 28, 29, 31, 32, 35, 36, 37, 38, 41, 42, 43, 46, 52, 53, 54, 55, 57, 60, 66, 68, 70, 72, 73, 76, 89, 94, 99, 102, 103, 107, 110, 133, 138, 141, 148, 149, 175, 176, 177, 180, 186, 188, 193, 194, 195, 196, 197, 198, 199, 200, 201, 209, 238, 240, 273, 280, 281, 294, 298, 302, 304, 309, 317, 323, 342, 350, 355, 357, 359, 360, 363–364; *see also* depression  
mood stabilizers *see* mood enhancement  
moon root *see* valerian  
*Morinda citrifolia* *see* noni  
*Morinda officinalis* 35  
mormon tea *see* ephedra and mahuang  
morning glory 64, 232, **250**  
morning glory bush *see* morning glory  
Morning Thunder *see* yerbe mate  
morrel *see* belladonna  
Morus genus *see* mulberry  
*Morus rubra* *see* mulberry  
moth herb *see* rosemary  
moth larva *see* animals  
mother of rye *see* ergot  
motherwort **71**  
Motrin *see* ibuprofen  
Motrin IB *see* ibuprofen  
Motrin Migraine Pain *see* ibuprofen  
mountain balm *see* horsebalm  
mountain black cherry *see* black cherry  
mountain mint *see* oregano  
mouse-ear chickweed *see* chickweed  
mousebane *see* aconite  
Movergan *see* selegiline  
Mozart Effect 361  
MPH *see* methylphenidate  
MTC proteins **139**  
mTOR *see* target of rapamycin pathway  
mucapari *see* brunfelsia  
Mucho Mate *see* yerbe mate  
*Mugil cephalus* *see* animals  
mugwort **71**, 72  
muigin *see* jurema  
muk sheng *see* fu ling  
mukhomor *see* amanita mushrooms  
mulberry **34**, **250**  
mullet *see* animals  
*Mulloidichthys flavolineatus* *see* animals  
*Mulloidichthys samoensis* *see* animals  
mumijo *see* shilajit  
murderer's berry *see* belladonna  
muria puama **71**  
*Musa acuminata* *see* banana  
*Musa balbisiana* *see* banana  
*Musa cultivars* *see* banana  
*Musa × paradisiaca* *see* banana  
mushrooms 87, 90, 92, 99, 104, 113, **250–252**, 257; *see also* amanita mushrooms  
music **360–361**  
mussel-shell climber *see* *Clitoria ternatea*  
mustard 7, 119  
MW01–5–188WH **316**  
MW108 **342**  
MW151 **316**  
MW189 **316**  
*Mycobacterium vaccae* *see* bacteria  
myelin 108, 129, 132, 137, 315, **342**  
myelin sheath 135, 245, 315  
*Myelobia smerintha* *see* animals  
myo-inositol *see* inositol  
myo-inositol hexakisphosphate *see* IP6  
*Myristica fragrans* *see* nutmeg  
myrrh 63, **71**, **198**  
myrtle **198**, 198, 201  
myrtle blueberry *see* bilberry  
myrtle flag *see* calamus; sweet flag  
*Myrtus communis* *see* myrtle  
N-(3-methylphenyl)-2-(4-pyridin-2-ylpiperidin-1-yl)acetamide *see* A-412997  
N-acetyl-5-methoxytryptamine *see* melatonin  
N-acetyl-cysteine **127**, 133, 315  
N-acetyl-L-carnitine *see* acetyl-L-carnitine  
N-acetyl-L-cysteine *see* N-acetyl-cysteine  
N-acetyl-LSD *see* LSD  
N-Acetyl-Seryl-Aspartyl-Lysyl-Proline *see* AcSDKP  
N-acetylneuraminic acid *see* sialic acid  
N-arachidonoyl-dopamine *see* endocannabinoids  
N-glycolylneuraminic acid 172  
N-methyl-1H-indole-3-ethanamine *see* N-methyltryptamine  
N-methyl-D-aspartate receptor *see* NR2B

- N-methyl D-aspartate receptor sub-type 2B *see* NMDA receptor
- N-methyltryptamine **253–254**
- N-monomethyltryptamine *see* DMT
- N-PEP-12 **317–318**; *see also* cerebrolysin
- NAC *see* N-acetyl-cysteine
- NAD *see* nicotinamide adenine dinucleotide
- NAD-dependent deacetylase sir-tuin-1 *see* SIRT1
- NADA *see* endocannabinoids
- NADH **183–184**
- Nafronyl *see* Naftidrofuryl
- nafronyl oxalate *see* Naftidrofuryl
- Naftidrofuryl **283**
- naftidrofuryl oxalate *see* Naftidrofuryl
- naja naja *see* animals
- naltrexone **283–284**
- Namenda *see* memantine
- Nandani *see* dita tree
- nanotechnology **361**
- Napreelan *see* naproxen
- Naprosyn *see* naproxen
- naproxen **284**
- Narcotine *see* noscaphine
- narrenschwamm *see* amanita mushrooms
- narrow-leaved Labrador tea *see* rosemary
- natema *see* ayahuasca and caapi
- natto *see* soy
- naughty man's cherry *see* belladonna
- Navoban *see* Tropicsetron
- nBAF 335
- NC-1900 **316**
- ND1251 **316**
- NDD-094 **316**
- NDGA **361–362**
- NDT80 **343**
- nebracetam **169, 316**
- Nectodon *see* Noscaphine
- Nefadar *see* Nefazodone
- Nefazodone **316–317, 329**
- Nefiracetam **317**
- Neomyxus chaptalli* *see* animals
- Neoral *see* cyclosporine
- Neotrofin *see* AIT-082
- Nepeta cataria* *see* catnip
- neroli 194, 197, **198, 198, 199, 201**
- nerve growth factor 124, **139–140, 364**
- nervous tension 195, 198, 199, 201
- nettle 72
- Neu5Ac *see* sialic acid
- Neu5Gc 172
- Neupramir *see* pramiracetam
- Neupro *see* rotigotine
- Neuractiv *see* oxiracetam
- neural implants *see* neuroprosthetics
- neurite outgrowth inhibitor *see* nogo
- Neuro AD 355, 359, **362**
- neurogenesis and neuroregeneration 139, 156, 251, 274, 277, 281, 287, 288, 296, 298, 300, 309, 319, 321, 332, 341, 343, 347, 352, 356, 359
- Neuromet *see* oxiracetam
- Neuron-Restrictive Silencer Factor *see* REST
- neuropeptide Y 180, **184**
- neuroplasticity 126, 129, 134, 137, 138, 140, 146, 178, 180, 237, 301, 320, 324, 334, 341, 342, 344, 345, 346, 360, 361
- neuroprosthetics **362–363**
- neuroprotection 133, 135, 136, 138, 140, 145, 155, 187, 227, 267, 276, 278, 279, 283, 287, 288, 293, 297, 298, 300, 301, 302, 309, 311, 312, 313, 318, 320, 321, 322, 328, 332, 333, 335, 343, 347; *see also* brain damage; stroke
- New Zealand green-lipped mussel **34**
- NF-kB (nuclear factor kappa-light-chain-enhancer of activated B cells) protein complex 340
- Nf1 **343**
- NGF *see* nerve growth factor
- NHR-8 **343**
- NHR-62 **343**
- niacin *see* vitamin B-3
- niacin analogues 105
- niacinamide *see* vitamin B-3
- niacinamide adenine dinucleotide *see* NADH
- niando **252**
- NIC5-15 **317**
- Nicergoline **317**
- Niconicol *see* xanthinol nicotinate
- Nicotiana attenuata* *see* nicotine
- Nicotiana benthamiana* *see* nicotine
- Nicotiana bigelovii* *see* nicotine
- Nicotiana glauca* *see* nicotine
- Nicotiana gossei* *see* nicotine
- Nicotiana ingulba* *see* nicotine
- Nicotiana megalosiphon* *see* nicotine
- Nicotiana rustica* *see* nicotine
- Nicotiana tabacum* *see* nicotine
- Nicotiana trigonophylla* *see* nicotine
- Nicotiana velutina* *see* nicotine
- nicotinamide *see* vitamin B-3
- nicotinamide adenine dinucleotide 96, 104, 167, **343**
- nicotinamide adenine dinucleotide + hydrogen *see* NADH
- nicotinamide riboside **96, 343**
- nicotine 72, 93, 153, 187, 208, 220, 222, 247, **252–253, 257, 261, 314**; *see also* tobacco
- nicotinic acid *see* vitamin B-3
- nicotinic analogues 105
- nicotinics **317**
- nightmare fish *see* animals
- nightshade 46, 206, 210, 211, 223, 233, 242, **253, 262**
- Niloric *see* hydergine
- Nilvadipine **284**
- Nimodipine **284**
- Nimotop *see* Nimodipine
- niopa *see* cohoba
- niopo 217
- nira-brahmi *see* *Bocopa monniera*
- Niravam *see* Alprazolam
- Nisentil *see* Prodrine
- nisha *see* turmeric
- nitric oxide 22, 39, 219, **343–344**
- nitrogen dioxide 343
- nitrogen monoxide *see* nitric oxide
- NitroMemantine **317**
- nitrous oxide 141, 231, 267, 343
- Nivalin *see* galantamine
- NMDA-R *see* NMDA receptor
- NMDA receptor 128, 274, 317, 341, **344**
- NMDA receptor antagonists 301, 312, 314
- NMDAR2B *see* NR2B
- NMN 343
- NmR *see* nicotinamide riboside
- NMT *see* N-methyltryptamine
- N,N-diallyltryptamine *see* DMT
- N,N-dibutyltryptamine *see* DMT
- N,N-diethyltryptamine *see* DMT
- N,N-diethyltryptamine *see* DMT
- N,N-diisopropyltryptamine *see* DMT
- N,N-dimethyl-1H-indole-3-ethanamine *see* N,N-dimethyltryptamine
- N,N-dimethyl-4-hydroxytryptamine *see* psilocybin
- N,N-dimethyltryptamine 202, 234, **254**; *see also* DMT
- N,N-dipropyltryptamine *see* DMT
- NO *see* nitric oxide
- nogo **140**
- nogo receptor 129, 140
- Nogo receptor 1 140
- Nogo-66 Receptor 140
- noladin ether *see* endocannabinoids
- Nomifensine **317**
- noni **35, 170**
- Noofen *see* phenibut
- Noopept *see* GVS-III
- nootropic *see* cognitive enhancement; mind enhancement
- Nootropil *see* piracetam
- nootropyl *see* piracetam
- noradrenaline 128, 132, 183, 212, 213, 302; *see also* norepinephrine
- nordihydroguaiaretic acid *see* NDGA
- norepinephrine 106, 123, 130, 141, 142, 149, **184–185, 212, 249, 267, 280, 282, 289, 293, 316, 324, 328**; *see also* stress hormones
- norepinephrine bitartrate *see* norepinephrine
- Norflex *see* Orphenadrine
- Norgesic *see* Orphenadrine
- nori *see* microalgae and seaweed
- Normabrain *see* piracetam
- Normison *see* temazepam
- Norwich Extra-Strength *see* aspirin
- noscaphine **254, 255**
- Nospen *see* noscaphine
- Novo-Alprazol *see* Aprazolam
- Npas4 **344**
- NP1N 341
- NPY *see* neuropeptide Y
- NR *see* nicotinamide riboside
- NR2A 141
- NR2B 137, **140–141**
- Nrf2 **140, 168, 356**
- NRG3 *see* BD

- NRSF *see* REST  
 NT-020 **169**  
 NT219 **318**  
 nti-si-tho *see* mushrooms  
 Nu-Alpraz *see* Alprazolam  
 nurr1 **344**  
 nutmeg 53, **198**, 198, 207, 225, 227, 237, 242, **254**  
 Nutrasleep *see* valerian  
 NutraStem *see* NT-020  
 nuts 23, 90, 92, 94, 96, 97, 102, 104, 106, 116, 119, 122, 123, 141, 157, 181, 185  
 Nuvigil **284**  
*Nux vomica* **254–255**  
 NXY-059 **318**  
 nyakwana *see* epena  
*Nymphaea ampla* *see* water lily  
*Nymphaea caerulea* *see* water lily  
 Nytol 285  
 NZT-48 283
- O-arachidonoyl-ethanolamine *see* endocannabinoids  
 OAE *see* endocannabinoids  
 oat 72  
 oatmeal 92, 102  
 oats 40, 93, 106, 123, 172, 182  
 obsessive-compulsive disorder (OCD) 93, 130, 148, 188, 251, 274, 285, 286, 303, 314; *see also* compulsive behaviors  
*Ocimum Americanum* *see* basil  
*Ocimum basilicum* *see* basil  
*Ocimum canum* *see* basil  
*Ocimum gratissimum* *see* basil  
 oco-yaje *see* ayahuasca and caapi  
 oconenel *see* animals  
 octacosanol **169–170**  
 odika *see* irvingia  
 ogbono *see* irvingia  
 Ogen *see* estrogen and estradiol  
 oils **155–160**, 167  
*Olea europaea* *see* olive oil  
 oleic acid 155  
 Olepto *see* Trazodone  
 olibanum *see* frankincense; frankincense tree  
 oligomeric proanthocyanidins *see* OPCs  
 oligomeric procyanidolic complexes *see* OPCs  
 olive oil **35**, 94, 156, 159  
*Olmédioperebea sclerophylla* *see* rape do indios  
 Olmifon *see* Adrafinil  
 ololiuqui *see* morning glory  
 omega-3 19, 21, 29–30, 34, 43, 74, 151, 155–160, 298; *see also* alpha-linolenic acid; fats and oils  
 omega-6 *see* linoleic acid  
 omega-9 fatty acids 155  
 oncogene 24p3 *see* lipocalin-2  
 Ondansetron **284–285**  
 Ondavell *see* Ondansetron  
 Ondemet *see* Ondansetron  
 1,2-bis(2-methylphenyl)guanidine *see* Ditolylguanidine  
 1,2-dihydronaphthalen-2-amine *see* 2-amino-1,2-dihydronaphthalen  
 1,2-dithiolane-3-pentanoic acid *see* alpha-lipoic acid  
 1,2,3,4-tetrahydronaphthalen-2-amine *see* 2-aminotetralin  
 1,3,7-trimethyl-2,6-dioxapurine *see* caffeine  
 1,3,7-trimethylxanthine *see* caffeine  
 1,4-butanediol *see* BD  
 1H-Purine-2,6-diione,3,7- trimethyl *see* caffeine  
 1-hydroxymethylethylamide lysergic acid *see* ergometrine  
 (1R)-1-benzo [b] thiophen-5-yl-2-[2-(diethylamino) ethoxy] ethan-1-ol hydrochloride *see* T-588  
 onion 9, **35–36**, 74, 89, 92, 99, 100, 170  
 oolong tea 61  
 OPB-9195 **318**  
 OPCs 91, 92  
*Ophiophagus Hannab* *see* animals  
 opioid receptors **141**  
 Opiamol **318**  
 opium 207, 240, 249, 254, **255**  
 opium lettuce *see* lettuce  
 Oprimol *see* Opiamol  
 optogenetics **363**  
*Opuntia cylindrica* *see* san pedro  
 orange 89, 96, 101, 133, 192, **198**, 201  
 orange juice 90, 113  
 Orange Sunshine *see* LSD  
 Orazinc *see* zinc  
 oregano 7, 45, **72**, 94, 192, 198; *see also* marjoram  
 OrfenAce *see* Orphenadrine  
 Org 12,962 **318**  
 ORG 2766 **185**  
 Organ meats 96; *see also* meat  
*Origanum majorana* *see* oregano  
*Origanum marjorana* *see* marjoram  
*Origanum vulgare* *see* oregano  
 otrotic acid **163**  
 Orphenadrine **285**  
 Orpin Rose *see* *Rhodiola rosea*  
 osteophloeum **255**  
*Osteophloeum platyphyllum* *see* osteophloeum  
*Osteophloeum platyspermum* *see* osteophloeum  
 Oswego tea *see* horsebalm  
 Our Lady's mint *see* spearmint  
 oxi **255**  
 Oxicebral *see* vincamine  
 Oxiracetam 144, 169, 269, **318–319**  
 Oxitriptan *see* 5-HTP  
 Oxprenolol **285**  
 Oxyfan *see* 5-HTP  
 oxytocin 178, **185–186**  
 Oxytyramine *see* dopamine  
 oysters 88, 119  
 ozokerite *see* shilajit
- P4 *see* progesterone  
 P7C3 293, **321**  
 p38alpha MAPK 342  
 p63 **343**  
 p66 **345**  
 paan *see* betel  
 Pabenol *see* DMAE
- Pachycreus pecten-aboriginum* *see* cawe  
 pacyl *see* Alprazolam  
 Paekch'ul *see* atracylodes (white)  
*Pagamea macrophylla* **255**  
 painted caapi 207  
 Pakistani ephedra *see* ephedra and ma-huang  
 pala *see* dita tree  
 pale gentian *see* gentian  
 palimara *see* dita tree  
 palmarosa **199**, 199  
 palqui 222; *see also* green cestrum  
*Panaeolina foenicicii* *see* mushrooms  
*Panaeolus cyanescens* *see* mushrooms  
*Panax ginseng* *see* ginseng  
*Panax notoginseng* *see* ginseng  
*Panax quinquefolium* *see* ginseng  
*Panax schin-seng* *see* ginseng  
*Panax trifolius* *see* ginseng  
 pancrat lily *see* kwashi  
*Pancreatium trianthum* *see* kwashi  
 Pancreozymin *see* cholecystokinin-8  
 pandanus **255**  
*Panaeolus papilionaceus* 204  
 pangamic acid *see* vitamin B-15  
 panic disorder 25, 93, 130, 148, 175, 185, 271, 274, 299, 303, 329, 331  
 panthenol *see* vitamin B-5  
 panther mushroom *see* amanita mushrooms  
 pantothenic acid *see* vitamin B-5  
*Papaver somniferum* *see* opium; poppy seeds  
 pappelknospfen *see* Balm of Gilead  
 Para todo *see* suma  
 Paraguay jasmine *see* brunfelsia  
 Paraguay tea *see* yerbe mate  
*Parapiptadenia excelsa* *see* cebil  
 paraquat **363**  
 parica 217; *see also* cohoba; epena  
 parica rana *see* cohoba  
 paricachi *see* cohoba  
 paricarama *see* cohoba  
 paricauva *see* cohoba  
 parkin **344**  
 Parlodel *see* Bromocriptine  
 parsley and parsley oil 101, 207, 225, 226, **255**  
 parsley fern *see* tansy  
*Passiflora caerulea* 72  
*Passiflora incarnata* *see* passion flower  
 passion flower 72–73, **255–256**  
 passion vine *see* passion flower  
 patchouli 196, **199**  
*Paullinia cupana* *see* guarana  
*Paullinia pachycarpa* *see* guarana  
*Paullinia yoco* *see* guarana  
*Pausinystalia yohimbe* *see* yohimbe  
 Paxanol *see* DMAE  
 PBRM1 **344**  
 PBT-1 *see* clioquinol  
 PBT2 **319**  
 PC *see* choline  
 PCA *see* pyroglutamate  
 PCAGeO *see* germanium  
 PCAGeS *see* germanium  
 PCOs *see* OPCs

- PCP 236, 237  
PDE4 288, 289, 300, 315, 316  
PEA *see* phenethylamine  
peach 89, 94, 133  
peanuts and peanut oil 44, 90, 93, 100, 104, 119, 141, 148, 151, 156, 167, 181  
pear 7  
Pearly Gates *see* morning glory  
peas 90, 93, 96, 100, 102, 106, 122, 151  
peat myrtle *see* taglli  
pecans 44  
pedgery *see* pituri  
Peganone *see* phenytoin  
*Peganum harmala* *see* African rue; Syrian rue  
*Pelargonium graveolens* *see* germanium  
*Pelargonium odoratissimum* *see* geranium  
Pemoline 285  
Penicillamine 94, 285  
pennyroyal 45, 73, 239  
Pentamethylenetetrazol *see* Pentylenetetrazol  
Pentazocine 161, 253  
Penttetrazol *see* Pentylenetetrazol  
Pentylenetetrazol 285  
Pentylenetetrazole *see* Pentylenetetrazol  
Pentylone 296  
pepper 23, 36, 199, 219; *see also* black pepper  
pepper root *see* *Cardamine concatanata*  
peppermint 73, 94, 199  
Periactin *see* Cyproheptadine  
Perindopril *see* ACE inhibitors  
perineuronal nets 344–345  
Periplum *see* Nimodipine  
periwinkle 331  
Perkamillon *see* chamomile  
*Perna canalicula* *see* New Zealand green-lipped mussel  
*Pernettya furens* *see* hierba loca  
*Pernettya mucronata* 263  
*Pernettya parvifolia* *see* taglli  
*Pernettya prostrate* var. *purpurea* 263  
peroxiredoxin 1 141, 145, 352  
Persian walnut *see* walnut  
Persimmons 89  
Pethanol *see* Meperidine  
Pethidine *see* Meperidine  
petitgrain 198, 199  
*Petroselinum crispum* *see* parsley  
*Petroselinum sativum* *see* parsley  
petty-morrel *see* belladonna  
*Petunia violacea* *see* shanin  
Pexacerfont 319  
peyote 240, 249, 256; *see also* senecios  
peyote de Tepic; *see* senecios  
peyotl *see* peyote  
*Peyotl zacatecensis* *see* peyote  
*Pfaffia paniculata* *see* suma  
PGC-1 345  
phellodendron 73  
*Phellodendron amurense* *see* phellodendron  
phenethylamine 21, 142, 218, 256, 289  
phenibut 186  
Phenotropil *see* Phenylpiracetam  
Phenserine 319  
phenybut *see* phenibut  
Phenyl-GABA *see* phenibut  
phenylalanine 12, 122, 141–142, 150, 185, 218, 256, 280, 289  
phenylephrine 253  
phenylethan–2-amine *see* phenethylamine  
phenylethylamine *see* phenethylamine  
Phenylpiracetam 319  
Phenylpropranolamine 215  
Phenytx *see* Phenytoin  
Phenytoin 108, 109, 115, 179, 189, 286, 329  
Pheryl-E *see* vitamin E  
phobias 124, 132, 138, 185, 285, 331  
*Pholiota spectabilis* 204  
*Pholiotina cyanopus* *see* mushrooms  
phosphatidylcholine *see* choline  
phosphatidylinositol 93  
phosphatidylinositol 3-kinase age–1 *see* AGE-1  
phosphatidylserine 161  
phosphorus 60, 94, 120, 151, 154, 298  
photo acoustic therapy 363  
PHT *see* Phenytoin  
phu *see* fragrant valerian; valerian  
phytate *see* inositol and IP6  
phytic acid *see* inositol and IP6  
PI3-kinase age–1 *see* AGE-1  
Pian Jiang Huang *see* turmeric  
Picea sp. 47  
pichi 256–257  
pichi-pichi *see* pichi  
Picrotoxin *see* Picrotoxine  
Picrotoxine 319  
pidolic acid *see* pyroglutamate  
pigeon wings *see* *Clitoria ternatea*  
pilde *see* ayahuasca and caapi  
pimagedine *see* aminoguanidine  
pimecrolimus 125  
*Pimenta acris* *see* bay  
pimp grade kratom *see* kratom  
*Pimpinella anisum* *see* anise  
pinahuihuitztlil *see* jurema  
pinan *see* shanshi  
pinde *see* ayahuasca and caapi  
pine 195, 197, 198, 199  
pine bark extract *see* French maritime pine bark extract  
pineapple 148, 170, 185, 225  
pinellia 82  
ping lang *see* betel  
pining hitam 209  
pining-mabok 209  
*Pinus maritima* *see* French maritime pine bark extract  
*Pinus pinaster* *see* French maritime pine bark extract  
*Pinus sylvestris* *see* pine  
Pinyin *see* phellodendron  
Pioglitazone HCl 286, 290  
Pioglitazone Hydrochloride *see* Pioglitazone HCl
- Piper Betel 209  
*Piper methysticum* *see* kava and kawain  
*Piper nigrum* *see* pepper  
*Piper wichmannii* *see* kava and kawain  
Piperaceae family 209  
pipilzintzintli *see* *Salvia divinorum*  
Piptadenia species *see* cebil; cohoba  
Piracetam 89, 144, 282, 294, 295, 299, 300, 303, 308, 310, 311, 318, 319, 319–320, 320, 321, 322, 325, 330  
pirglutargine *see* pyroglutamate  
Piribedil 286  
Piridosal *see* Meperidine  
pishicol 257  
pishikawa *see* psychotria  
pistachio 36, 44  
*Pistacia vera* *see* pistachio  
pita *see* mesclan plant  
Pitchery *see* pituri  
Pitohui genus *see* animals  
Pitressin *see* vasopressin  
pituri 257  
piule 257; *see also* morning glory  
piule seeds 222  
pixuri *see* puchuri  
PKC2 *see* PKMzeta  
PKCzeta *see* PKMzeta  
PKMzeta 142–143  
plantain *see* banana  
Plavix 286  
PLG *see* l-prolyl L-leucyl glycine amide  
*Pluteus cyanopus* *see* mushrooms  
PMA *see* DMT  
PMS Egozinc *see* zinc  
PMTB *see* Alagebrium  
pod pepper *see* cayenne  
*Podophyllum peltatum* *see* mandrake  
*Pogostemon patchouli* *see* patchouli  
poison black cherry *see* belladonna  
poison lettuce *see* lettuce  
poison tobacco *see* henbane  
pollen ball *see* bee pollen  
Poly (A)/Poly (U) *see* ribonucleic acid  
Poly (I,C) *see* ribonucleic acid  
polyamines 143, 170  
polygonum 60, 73  
*Polygonum multiflorum* *see* polygonum  
*Polygonum multiflorum* Thunb 330  
polyhydroxyphenols *see* polyphenols  
polyphenols 97–98, 323  
polyunsaturated fat 156  
pomegranate 36–37, 40, 170  
popcorn 37, 123  
poplar *see* Balm of Gilead  
Poppy seeds 49, 151, 257  
*Populi Gemma* *see* Balm of Gilead  
*Populus balsamifera* *see* Balm of Gilead  
*Populus candicans* *see* Balm of Gilead  
*Populus gileadensis* *see* Balm of Gilead  
*Populus tacamahaca* *see* Balm of Gilead



- Poria 78  
 Poria cocos *see* fu ling  
 pork 92, 102, 106, 108, 119, 146  
 portulaca *see* purslane  
*Portulaca oleracea* *see* purslane  
 Post-Traumatic Stress Disorder 124, 132, 138, 142, 175, 184, 186, 205, 243, 244, 251, 272, 274, 282, 287, 324, 328, 340, 341, 356, 360  
 Postacton *see* vasopressin  
 pot *see* marijuana  
 potassium 14, 21, 22, 23, 26, 60, 74, 98, 109, 146, 218, 220, 298, 308, 364  
 potato 8, 9, 46, 98, 106, 110, 133, 149, 166, 172, 208, 253  
 potato virus 363  
 poultry 87, 99, 102, 104, 106, 119, 122, 123, 138, 183, 185, 188, 207  
 PP2B *see* calcineurin  
 PPA *see* phenylpropranolamine  
 PPP3 *see* calcineurin  
 PPP3CA *see* calcineurin  
 PPP2B *see* calcineurin  
 pramipexole 287  
 Pramiracetam 320–321  
 Pramistar *see* Pramiracetam  
 Pramolan *see* Opipramol  
 Prasterone *see* DHEA  
 Pravachol *see* Pravastatin  
 Pravastatin 287, 290  
 PRE-084 321  
 prefrontal cortex 355, 356, 360  
 PREG-S *see* pregnenolone  
 pregnenolone 186–187  
 Pregnenolone sulfate *see* pregnenolone  
 Premarin *see* estrogen and estradiol  
 Prempro *see* estrogen and estradiol  
 presentilins 143  
 Pressyn *see* vasopressin  
 Prevagen *see* apoaequorin  
 pre-vitamin D *see* vitamin D  
 prickly lettuce *see* lettuce  
 prickly pepper *see* Mexican poppy  
 prickly poppy *see* Mexican poppy  
 priest's crown *see* dandelion  
 primrose oil 155, 156  
 prion diseases 143  
 Prisolidine *see* Prodine  
 PRKCZ *see* PKMzeta  
 PRL-8-53 321  
 Pro-Leu-Gly *see* l-prolyl L-leucyl glycine amide  
 Pro-Leu-Gly-NH<sub>2</sub> *see* l-prolyl L-leucyl glycine amide  
 proanthocyanidins *see* OPCs  
 probiotics 38, 341  
 ProCentra *see* amphetamine  
 procyanidins *see* OPCs  
 procyanidolic oligomers *see* OPCs  
 Procythol *see* selegiline  
 Prodine 287  
 Profen *see* ibuprofen  
 progesterone 22, 70, 187, 218  
 Progestin *see* progesterone  
 Prograf *see* FK506  
 Prohim *see* yohimbe  
 Prolintane 287  
 Proloid *see* thyroid hormones  
 Pronoran *see* Piribedil  
 Propaniracetam 321  
 Propranolol 63, 253, 287–288, 297  
 propranolol hydrochloride *see* Propranolol  
 propyl gallate 309, 363  
 Proserout *see* Meclofenoxate  
 protein-enriched foods *see* protein-rich foods  
 protein kinase C zeta *see* PKMzeta  
 protein kinase M zeta *see* PKMzeta  
 protein kinase p38alpha MAPK 342  
 protein peptide 143  
 Protein Phosphatase 3 *see* calcineurin  
 Protein Phosphatase 2B *see* calcineurin  
 protein powder 143–144  
 protein-rich foods 18, 38–39, 123, 134  
 protein shakes *see* protein-rich foods  
 protein supplements *see* protein-rich foods  
 Protirelin *see* thyrotropin-releasing hormone  
 Provence rose *see* rose  
 Provigil *see* Modafinil  
 pro-vitamin A *see* vitamin A  
 ProXeed *see* acetyl-L-carnitine  
 Proxenal *see* noni  
 proxeronine 170; *see also* noni  
 Prozac *see* Fluoxetine  
 Prunes 104, 106  
*Prunus amygdalus* *see* almond  
*Prunus serotina* *see* black cherry  
 Prx1 *see* Peroxiredoxin 1  
 Prx6 144  
 PS *see* phosphatidylserine  
 pseudoephedrine 27, 215, 228  
 Psicosterone *see* DHEA  
*Psilocybe azurescens* *see* mushrooms  
*Psilocybe cubensis* *see* mushrooms  
*Psilocybe Mexicana* *see* mushrooms  
 psilocybin 250–252  
 psychic awareness 193  
 psychobiotics *see* microbiota  
 psychosis 175  
 Psychotria 257–258  
*Psychotria ipecacuanha* *see* ipecac  
*Psychotria nitida* *see* psychotria  
*Psychotria poeppigiana* 234  
*Psychotria psychotriaefolia* 234  
*Psychotria viridis* 207, 234; *see also* psychotria  
 PTB *see* alagebrium  
 PTSD *see* Post-Traumatic Stress Disorder  
*Ptychopetalum olacoides* *see* muria puama  
*Ptychosperma cunninghamiana* *see* *Archontophoenix cunninghamiana*  
 PTZ *see* pentylenetetrazol  
 pu gong ying *see* dandelion  
 puchuri 258  
 puffball *see* dandelion  
 puffballs 258  
 puffer fish *see* animals  
 pukeweed *see* lobelia  
 pulai *see* dita tree  
 pulque 202  
 pumpkin 90  
 pumpkin seeds 119, 141, 148, 182  
*Punica granatum* *see* pomegranate  
 pura *see* guggul  
 purple osier *see* willow  
 purple passion flower *see* passion flower  
 purple rice *see* black rice  
 purple willow *see* willow  
 purslane 74, 133  
 pussley *see* purslane  
 pussywillow *see* willow  
 pVHL *see* VHL1  
 Pycnogenol *see* French maritime pine bark extract  
 Pyridoxal *see* vitamin B-6  
 Pyridoxamine *see* vitamin B-6  
 Pyridoxine *see* vitamin B-6  
 pyridoxine disulfide *see* Pyritinol  
 pyriethoxine *see* Pyritinol  
 pyriethoxine hydrochloride *see* Pyritinol  
 Pyritinol 98  
 pyritinol hydrochloride *see* Pyritinol  
 pyroGA *see* pyroglutamate  
 pyroGlu *see* pyroglutamate  
 pyroglutamate 144, 319, 320, 322  
 pyroglutamic acid *see* pyroglutamate  
 pyrovaleronone 287  
 Pyroxine *see* vitamin B-6  
 pyrrolidone *see* pyroglutamate  
 pyrrolidone carboxylic acid *see* pyroglutamate  
 qaat *see* khat  
 qat *see* khat  
 qotu *see* brugmansia  
 quat *see* khat  
 quebracho *see* cebil  
 queen thistle *see* Mexican poppy  
 qui-qui-sa-waal *see* datura  
 quickset *see* hawthorn  
 (R)-(+)-[2,3-Dihydro-5-methyl-3-(4-morpholinylmethyl)pyrrolo [1,2,3-de]-1,4-benzoxazin-6-yl]-1-naphthalenylmethanone *see* WIN-55212-2  
 (/R/)-4-amino-1,2-oxazolidin-3-one *see* Cycloserine  
 R55 345  
 R 55667 *see* Ritanserlin  
 R-58,735 *see* Sabeluzole  
 R-flurbiprofen *see* Flurbiprofen; Tarenflurbil  
 R. *Glutinosa* *see* Chinese foxglove root  
 rabbitfish *see* animals  
 raccoon berry *see* mandrake  
 race ginger *see* ginger  
 Racine de Rhodiola *see* *Rhodiola rosea*  
 Racine d'Or *see* *Rhodiola rosea*  
 Racine Dorée *see* *Rhodiola rosea*  
 Radicut *see* Edavarone  
 radishes 99

- Radix codonopsis* see codonopsis root  
*Radix codonopsis Pilosulae* see codonopsis root  
*Radix curcumae* see turmeric  
 raisin 123, 181; see also grape  
 rajani see turmeric  
 Rambling Powder Pills 82  
 Rap-1 144  
 Rapamune see Rapamycin  
 Rapamycin 288  
 rape de indios 258  
 Rasagiline 23, 219, 288, 312, 321  
 raspberry 7, 24, 97  
 rat root see calamus; sweet flag  
 rattleroot see black cohosh  
 rattweed black cohosh  
 Raubasine 270  
*Rauwolfia serpentina* see Indian snakeroot  
*Rauwolfia* see Indian snakeroot  
*Rauwolfia* alkaloids 83, 267  
*Rauwolfia serpentina* see Indian snakeroot  
*Rauwolfia serpentina* see Indian snakeroot  
 Razadyne see Galantamine  
 Razadyne ER see Galantamine  
 Razadyne IR see Galantamine  
 RbAp48 144–145  
 RE1-Silencing Transcription factor see REST  
 red atractylodes see atractylodes (white)  
 red bean see mescal bean  
 red beet see beet  
 Red Bull Energy see energy drinks  
 red cabbage see cabbage  
 red fu ling see fu ling  
 Red Leicester cheese 218  
 red lobelia see lobelia  
 red mulberry see mulberry  
 red palm oil 101  
 red pepper see cayenne  
 red tea 61  
 redberry see ginseng  
 Redisol see vitamin B-12  
 Redoxon see vitamin C  
 Regeneresen see RN-13  
 Rehmannia see Chinese foxglove root  
*Rehmannia glutinosa* see Chinese foxglove root  
*Rehmannia Glutinosa* Oligosaccharide see Chinese foxglove root  
*Rehmannia Radac* see Chinese foxglove root  
*Rehmannia Steamed Root* see Chinese foxglove root  
*Rehmanniae* see Chinese foxglove root  
*Rehmanniae Radix* see Chinese foxglove root  
*Rehmanniae Root* see Chinese foxglove root  
 reishi 74  
 Rekotnil see Bromazepam  
 relaxant effect 22, 54, 64, 65, 67, 72, 84, 130, 147, 166, 196, 197, 198, 216, 218, 222, 235, 255, 261, 308  
 Relora see magnolia; phellodendron  
 Rember see methylene blue  
 Remifemin see black cohosh  
 Reminyl see Galantamine  
 Remonabent see SR141716  
 ren shen see ginseng  
 Resivit see grape seed extract  
 REST 145  
 Restoril see Temazepam  
 Restyl see Alprazolam  
 resveratrol 10–11, 12, 31, 170–172, 324, 343, 346  
 Reticulon-4 see nogo  
 retin A see vitamin A  
 retinaldehyde vitamin A  
 retinoic acid vitamin A  
 retinol vitamin A  
 Revatio see Sildenafil  
 ReVia see Naltrexone  
 Revitalize Plus see BD  
 Revivan see dopamine  
 RGAE see Chinese foxglove root  
 RGS-14 145  
 RGX see Chinese foxglove root  
*Rhamnus californica* see coffeeberry  
 Rhemannia Root see Chinese foxglove root  
*Rhizoma Atractylodis* see atractylodes (white)  
*Rhizoma Atractylodis Macroce* see atractylodes (white)  
*Rhizoma Atractylodis Macrocephalae* see atractylodes (white)  
*Rhizoma Cucurmae Longae* see turmeric  
 Rhodaxon see *Rhodiola rosea*  
*Rhodiola rosea* 74–75; see also goldenroot  
 Rhodiola Rougeâtre see *Rhodiola rosea*  
 rhododendron 258  
*Rhododendron caucasicum* see rhododendron  
*Rhododendron cinnabarinum* see rhododendron  
*Rhododendron lepidotum* see rhododendron  
*Rhododendron ponticum* see rhododendron  
*Rhododendron tomentosum* 75  
 Rhoziva see *Rhodiola rosea*  
*Rhynchosia longiraceomosa* see piule  
*Rhynchosia phaseolides* see piule  
*Rhynchosia pyramidalis* see piule  
 Rhynchosia species 222  
 Ribamol 321  
 riboflavin see vitamin B-2  
 ribonucleic acid 90, 94, 96, 108, 119, 146, 163–164, 311, 322; see also microRNA  
 rice 40, 92, 93, 104, 161, 178, 182; rice (brown) 92, 94, 96, 99, 102, 106, 123  
 richweed see black cohosh  
 Rimonabant see SR141716  
 Rimoslim see SR141716  
 RIMSO-50 see DMSO  
 rinder-pressin see vasopressin  
 Riobant see SR141716  
 Riomet see Metformin  
 Riomont see SR141716  
 Risatarun see DMAE  
 Risperdal see Risperidone  
 Risperidone 288, 322  
 Ritalin see Methylphenidate  
 Ritanserin 321–322  
 Rivastigmine 312, 322  
 rivastigmine tartrate see Rivastigmine  
*Rivea corymbosa* see morning glory  
 RJR-1734 see Isoproclonine  
 RN-13 322  
 RNA see ribonucleic acid  
 RNF123 345  
 Ro 13–5057 see Aniracetam  
 rock parsley see parsley  
 Rockstar Energy see energy drinks  
 Rodex see vitamin B-6  
 rodia riza see *Rhodiola rosea*  
 Roflumilast 288, 300  
 Rokan see ginkgo biloba  
 Rolipram 288–289, 300  
 Rolziracetam 322  
 Roman chamomile see chamomile  
 Roquefort cheese 39  
 ROS see Chinese foxglove root  
*Rosa centifolia* see rose  
*Rosa damascena* see rose  
*Rosa gallica* see rose  
 Rosavin see *Rhodiola rosea*  
 rose 194, 197, 198, 199–200, 201  
 rosemary 75, 94, 197, 200, 258–259, 266  
 rosenroot see *Rhodiola rosea*  
 roseroot see goldenroot; *Rhodiola rosea*  
 rosewort see *Rhodiola rosea*  
*Rosmarinus officinalis* see rosemary  
*Rosmarinus officinalis* 266  
 rosy periwinkle 75  
 Rotigotine 289  
 royal jasmine see jasmine  
 royal jelly 39, 332  
 RR see Chinese foxglove root  
 rs4950 345  
 RS-citalopram 303  
 RTN4R 140  
 Rubion see vitamin B-12  
 Rubiscolin-6 145  
 Rubramin see vitamin B-12  
 Rubramin-PC see vitamin B-12  
*Rubus coreanus* see black raspberry  
*Rubus leucodermis* see black raspberry  
*Rubus occidentalis* see black raspberry  
 rudder fish see animals  
 rue see Syrian rue  
 rum cherry see black cherry  
*Ruscus aculeatus* see butcher's broom  
 rutabaga 43  
 rutin 110, 113  
 S 12024–2 324  
 S 18986 324  
 S 18986–1 see S 18986  
 S 20499 see Alnespiron  
 S33005 325  
 S-adenosyl-L-methionine see SAMe

- S-adenosylmethionine *see* SAMe  
 SA 4503 **322**  
 Sabeluzole **322**  
*Saccharomyces cerevisiae* *see* brewer's yeast  
 sacha ayahuasca *see* ayahuasca and caapi  
 sacha cebil *see* cebil  
 sacred mushrooms *see* mushrooms  
 Saramin *see* xanthinol nicotinate  
 saeng-ji-whang *see* Chinese foxglove root  
 safflower oil 156, 351, 352  
 saffron 5, 75–76, **259**  
 sage **76**, 192, 195, **200**; *see also* *Salvia divinorum*  
 Sage Goddess Emerald Essence *see* *Salvia divinorum*  
 sage of Bethlehem *see* spearmint  
 sage of the seers *see* *Salvia divinorum*  
 saharo *see* brugmansia  
 sailor's tobacco *see* mugwort  
 Saint Anthony's Fire *see* ergot  
 St. Bartholomew's tea *see* yerbe mate  
 St. John's wort **76–78**, 131, 148, 149, 188, 303  
 St. Mary's thistle *see* milk thistle  
 saittan ka jat *see* dita tree  
 sakau *see* kava and kawain  
 sakiru *see* henbane  
 sakrona *see* henbane  
 salad lettuce *see* lettuce  
 salamander *see* animals  
 salamander brandy *see* animals  
 salemo porgy *see* animals  
 salicin willow *see* willow  
*Salix alba* *see* willow  
*Salix caprea* *see* willow  
*Salix nigra* *see* willow  
*Salix purpurea* *see* willow  
 sallow *see* willow  
 Sally D *see* *Salvia divinorum*  
 salmon 30, 90, 113, 154, 156, 159  
 salt 22, 40, 93, **98–99**, 218  
 salt-inducible kinase 2 *see* SIK2  
 Salvia *see* *Salvia divinorum*; xiwit  
*Salvia divinorum* 132, 141, 221, **259–260**  
*Salvia hispanica* *see* chia seeds  
*Salvia lavandulaefolia* *see* sage  
*Salvia officinalis* *see* sage  
*Salvia sclarea* *see* clary sage  
*Salvia splendens* **260**  
 Salvianolic acid B **322**  
 SAM *see* SAMe  
 Sambrani chettu *see* *Bacopa monniera*  
 SAMe 131, 161, **161–162**  
 samento *see* cat's claw  
 sami ruca *see* psychotria  
 sampson root *see* echinacea  
 San Pedro 217, 220, 240, **249**, **260**  
 sanango *see* brunfelsia  
 sandalwood 195, 199, **200**, 201  
 Sandimmune *see* cyclosporine  
 sangu pu *see* *Clitorea ternatea*  
 sankhupushpam *see* *Clitorea ternatea*  
 Santa Maria *see* brunfelsia  
 santalum album *see* sandalwood  
 Santoquin *see* Ethoxyquin  
 saponins 40, **172**  
 saptachadah *see* dita tree  
 saptaparna *see* dita tree  
 Sapunifiram **323**  
 Sarafem *see* Fluoxetine  
 sardines 30, 89, 99, 156, 163, 167  
 sarpa salpa *see* animals  
 Sarpul *see* Aniracetam  
 sarsaparilla **78**  
 sassafras **260**  
*Sassafras albidum* *see* sassafras  
*Sassifras variifolium* *see* sassafras  
 SAT1 **345–346**  
 Satan's apple *see* mandrake  
 Satan's testicles *see* mandrake  
 satin flower *see* chickweed  
 saturated fat 156  
 satvin *see* dita tree  
 sauerkraut 38, 207, 225, 265  
 savanna yoke *see* cohoba  
 Savella *see* Milnacipran  
 savoy cabbage *see* cabbage  
 saxifrax *see* sassafras  
 Saynt Johannes Wort *see* St. John's wort  
 SB-224289 **323**  
 SB-271046 *see* SB-271046-A  
 SB-271046-A **323**  
 SB-357134-A **323**  
 SBGA *see* microalgae and seaweed  
*Sceletium expansum* *see* kanna  
*Sceletium tortuosum* *see* kanna  
 Schisandra *see* schizandra berry  
*Schisandra chinensis* *see* schizandra berry  
 schizandra berry 46, **78**  
*Schizandra chinensis* *see* schizandra berry  
*Schizandra fructus* *see* schizandra berry  
 schizophrenia 83, 88, 93, 104, 124, 125, 128, 134, 135, 136, 138, 139, 140, 144, 149, 152, 153, 158, 167, 176, 178, 186, 188, 237, 241, 252, 256, 259, 274, 276, 277, 283, 284, 285, 288, 291, 295, 300, 301, 305, 308, 315, 322, 341, 342, 343, 344, 347, 355, 359  
 schulholzbaum *see* dita tree  
 Scirpus **260**  
*Sclerocarya caffra* *see* kanna  
*Sclerocarya schweinfurthii* *see* kanna  
 scopolamine 206, 208, 211, 222, 223, 243, 257, **260–261**  
 scopolia **261**  
*Scopolia carniolica* *see* scopolia  
 scorpion *see* animals  
 scotch broom **261**  
*Scrophulariae buergeriana* 311  
 scullcap *see* skullcap  
*Scutellaria baikalensis* *see* skullcap  
*Scutellaria bicalensis* *see* skullcap  
*Scutellaria lateriflora* *see* skullcap  
*Scutellaria laterifolia* *see* skullcap  
 SD Deprenyl *see* Selegiline  
 sea bream *see* animals  
 sea mussel *see* New Zealand green-lipped mussel  
 seafood 89, 93, 94, 101, 119, 122, 123, 167, 207; *see also* fish  
*Seafortia elegans* *see* *Archon-tophoenix cunninghamiana*  
 Seanol 313, **323**  
 Seasonal Affective Disorder (SAD) 76, 77, 148, 157, 359  
 seaweed **32–33**, 92, 93, 102, 108, 148  
 sebil *see* cebil  
 sedation 65, 80, 81, 94, 231, 234, 235, 239, 248, 255, 258, 265  
 Sedum rhodiola *see* *Rhodiola rosea*  
 Sedum rosea *see* *Rhodiola rosea*  
 seed oils 151  
 seeds 90, 94, 96, 116, 122, 156, 181  
 seka *see* kava and kawain  
 selank **187**  
 Selegiline 23, 89, 142, 219, **289–290**, 315, 325, 329  
 selegiline hydrochloride *see* Selegiline  
 selenum **99–100**, 116, 120, 125, 127, 133, 155, 159, 280, 298, 364  
 selenium ascorbate *see* selenium  
 selenium citrate 100  
 selenium picolinate 100  
 selenocystine *see* selenium  
 selenomethionine 138; *see also* selenium  
 Semax **187–188**  
 semen 99, 123, **363–364**  
 seminal plasma *see* semen  
 sencha tea *see* green tea  
*Senecio canicida* *see* senecios  
*Senecio cardiophyllus* *see* senecios  
*Senecio cervarifolia* *see* senecios  
*Senecio grayanus* *see* senecios  
*Senecio hartwegii* *see* senecios  
*Senecio jacobaea* *see* senecios  
*Senecio praecox* *see* senecios  
*Senecio toluccanus* *see* senecios  
 senecios **261–262**  
 senescent cells **346**  
 Serenity *see* BD  
 Sermon *see* Nicergoline  
 Sermycin *see* cycloserine  
 Seroplex *see* Escitalopram  
 serotonin 77, 80, 92, 106, 123, 129, 130, 131, 147, 148, 158, 182, 183, 187, **188**, 241, 253, 266, 280, 282, 293, 299, 302, 304, 312, 315, 316, 328, 339, 342, 350  
 serotonin 2C receptors **346**  
 serpentwood *see* Indian snakeroot  
 Sertraline 293, 295, 313  
 Serzone *see* Nefazodone  
 sesame oil 156  
 sesame seed **39**, 93, 123, 141  
*Sesamum indicum* *see* sesame seed  
 Setronax *see* Ondansetron  
 Setrovel *see* Tropicsetron  
 setwall *see* fragrant valerian; valerian  
 seven barks *see* hydrangea  
 7-keto **188–189**  
 7-Keto-DHEA *see* 7-keto  
 7-Keto-DHEA acetate *see* 7-keto  
 7-ketodehydroepiandrosterone *see* 7-keto

- 7-oxodehydroepiandrosterone *see* 7-keto
- 7,10,13,16-docosate-traenoylethanolamide *see* endocannabinoids
- 17-ketotestosterone *see* androstenedione
- 17 $\beta$ -hydroxy-5 $\alpha$ -androstan-3-one *see* dihydrotestosterone
- sevil *see* cebil
- sex enhancement *see* aphrodisiac
- SGB *see* stellate ganglion block
- SGS742 **323**
- shaitan *see* dita tree
- shakhrona *see* henbane
- shანი **262**
- shanka puspi **78**
- shanshi **262**
- shatter *see* marijuana
- shellfish 87, 96, 99, 101, 119, 146, 148, 149; *see also* fish; seafood
- shi quan da bu wan **78**
- shih chuan ta bu wan *see* shi quan da bu wan
- shiitake mushrooms 92
- shilajit **364**
- shilajitu *see* shilajit
- shka-Pastora *see* *Salvia divinorum*
- sho-jio *see* Chinese foxglove root
- SHR-5 *see* *Rhodiola rosea*
- Shrimp 154
- shu di huang *see* Chinese foxglove root
- sia *see* sialic acid
- sia-glycoconjugates *see* sialic acid
- sialic acid 17, 172
- Siberian ginseng *see* ginseng
- Siberian Golden Root *see* *Rhodiola rosea*
- Siberian motherwort *see* marihuanilla
- Siberian *Rhodiola Rosea* *see* *Rhodiola rosea*
- Sida cordifolia* *see* country mallow
- side-flowering skullcap *see* skullcap
- Sifrol *see* Pramipexole
- Siganus spinus* *see* animals
- SIK2 **145**
- sikta *see* tsicta
- silajit *see* shilajit
- Sildenafil **290**
- sildenafil citrate *see* Sildenafil
- silent information regulators *see* SIRT genes
- Silky White Mallow *see* country mallow
- silver morning glory *see* Hawaiian baby wood rose
- Silybum marianum* *see* milk thistle
- silymarin 70, 71, 325
- simse *see* scirpus
- simvastatin 70, 287, 290
- sinicuiche *see* sinicuichi
- sinicuichi **262**
- sinicuilit *see* sinicuichi
- sinsemilla *see* marijuana
- Sir2 protein 343
- Siramisine **323**
- Sirolimus *see* Rapamycin
- SIRT genes **346**
- SIRT1 11, 136, 137, **145**, 150, 171, 324, 346
- SIRT3 346
- SIRT4 346
- SIRT6 346
- sirtuin1 *see* SIRT1
- sirtuins 324, 346
- 6-(2,3-dichlorophenyl)-1,2,4-triazine-3,5-diamine *see* lamotrigine
- 6,6-dimethyl-3-(2-hydroxyethyl)thio-1-(thiazol-2-yl)-6,7-dihydro-2-benzothio-phen-4(5H)-one(43) 132
- (6a/R/9/R/)-/N/-((/S/)-1-hydroxypropan-2-yl)-7-methyl-4,6,6a,7,8,9-hexahydroindolo[4,3-fg/]quinoline-9-carboxamide *see* ergometrine
- 6-nitro-2-piperazin-1-yl-quinoline *see* 6-nitroquipazine
- 6-nitroquipazine **323**
- SJW *see* St. John's wort
- SK 331 A *see* xanthinol nicotinate
- Ska Maria Pastora *see* *Salvia divinorum*
- Ska Pastora *see* *Salvia divinorum*
- SKI-606 *see* SRC kinase inhibitors
- SKS-927 *see* SRC kinase inhibitors
- Skulachev's ions **323-324**
- skullcap 64, 72, **78-79**
- skunk *see* marijuana
- sleep disorders 130, 135, 181, 188, 259, 284
- sleep, improved 15, 64, 70, 72, 76, 89, 106, 111, 128, 148, 157, 169, 174, 180, 182, 186, 193, 194, 197, 218, 222, 223, 260, 293, 294, 296, 307-308, 321-322, 324, 327, 329, 360, 361; *see also* insomnia
- Slimona *see* SR141716
- Slow-Pren *see* Oxprenolol
- Slow-Trasicor *see* Oxprenolol
- small spikenard *see* sarsaparilla
- smallage *see* celery
- Smilax officinalis* *see* sarsaparilla
- SMK-1 **346**
- smoking *see* nicotine; tobacco
- smut rye *see* ergot
- snake moss *see* club moss
- Snowdown Rose *see* *Rhodiola rosea*
- sociability, increased 235, 237, 269, 270, 271, 308, 355; *see also* empathy
- social anxiety disorder (SAD) 285, 303
- SOD *see* superoxide dismutase
- sodium *see* salt
- sodium ascorbate *see* vitamin C
- sodium bisulfate **365**
- sodium bisulfite 365
- sodium chloride *see* salt
- sodium hypophosphite **365**
- sodium hypophosphate 365
- sodium oxybate *see* GHB
- sodium oxybutyrate *see* GHB
- sodium selenate *see* selenium
- sodium selenite *see* selenium
- sodium valproate *see* valproic acid
- so-jutsu *see* atractylodes (white)
- Solandra brevicalyx* *see* kieri
- Solandra guerrerensis* *see* kieri
- Solandra maxima* *see* kieri
- Solanezumab **324**
- Solanum nigrum* *see* nightshade
- Solian *see* Amisulpride
- Soltus *see* Amisulpride
- Somatomax PM *see* GHB
- Somatopro *see* BD
- Somatostatin 304
- somatotrophin *see* human growth hormone
- Sominex 285
- Sonic Hedgehog Pathway Agonist **346**
- Sonoran Desert toad *see* toad
- sook-ji-whang *see* Chinese foxglove root
- Sophora secundiflora* *see* mescal bean
- sorcerer's cherry *see* belladonna
- sorcerers' tree *see* arbol de los brujos
- sorcerer's violet *see* rosy periwinkle
- sorghum bran **39-40**
- Sorghum genus *see* sorghum bran
- SORL1 *see* LR11
- SorLA *see* LR11
- SORLA1 *see* LR11
- sound **365**
- South American holly *see* yerbe mate
- southernwood 266
- Souvenaid **172**
- SOX4 **347**
- SOX11 **347**
- soy 29, **40-41**, 94, 108, 116, 150, 161, 182
- soy bean curd *see* soy; tofu
- soy flour *see* soy
- soy milk *see* soy
- soy oil 156, 227; *see also* soy; vegetable oil
- soy protein concentrate *see* soy
- soy protein isolate *see* soy
- soy sauce 98; *see also* soy
- soya bean *see* soy
- soybeans 93, 102, 108, 116, 119, 141, 148, 151, 152, 153, 156, 172, 178; *see also* soy
- SP *see* substance P
- Spand *see* Syrian rue
- Spanish broom *see* scotch broom
- Spanish cane *see* giant reed
- Spanish fly *see* animals
- Spanish jasmine *see* jasmine
- Spanish lavender 68
- Spanish pepper *see* cayenne
- Spanish reed *see* giant reed
- Spanish saffron *see* saffron
- Spanish sage *see* sage
- Spardon *see* Modafinil
- Spartium junceum* *see* scotch broom
- spearmint **79**
- special K *see* ketamine
- speed *see* amphetamine
- spend *see* Syrian rue
- SPI *see* soy
- spikenard *see* sarsaparilla
- spinach 8, **41-42**, 43, 90, 95, 101, 148, 166, 167
- Spinacia oleracea* *see* spinach

- spirituality 194, 196  
 spirulina *see* microalgae and seaweed  
 split fibre cap 262  
 spurred rye *see* ergot  
 squaw tea *see* ephedra and ma-huang  
 squawroot *see* black cohosh  
 SR 95070B 290, 315  
 SR141716 290  
 SRC kinase inhibitors 347  
 SRPX2 347  
 SRT501 324  
 SRT1720 324  
 Srx-1 145, 352  
 Stablon *see* Tianeptine  
 Staghorn *see* Chinese club moss  
 stamina *see* energy  
 star anise 200  
 star chickweed *see* chickweed  
 starweed *see* chickweed  
 starwort *see* chickweed  
 statins 290  
*Stellaria media* *see* chickweed  
*Stellaria pubera* *see* chickweed  
 stellate ganglion block 320  
 stem cells 347, 349, 352  
 STH *see* human growth hormone  
 stiff gentian *see* gentian  
 Stilton cheese 218  
 Stimate *see* Desmopressin  
 stimulation *see* energy  
 stinging nettle *see* nettle  
 stinking nightshade *see* henbane  
 stinking Roger *see* henbane  
 stinking thistle *see* Mexican poppy  
 stinkweed *see* datura  
 stitchwort *see* chickweed  
 Stoned gene *see* Stonin2  
 Stonin2 348  
 strawberry 7, 9, 17, 42, 89, 90, 96, 133  
*Streptococcus thermophiles* *see* probiotics  
 stress hormones 262–263, 330  
 stress reduction 13, 14, 38, 44, 46, 48, 49, 50, 51, 59, 60, 61, 66, 68, 70, 74, 78, 79, 100, 104, 106, 108, 136, 138, 145, 147, 149, 169, 172, 175, 184, 193, 194, 195, 196, 197, 198, 199, 200, 201, 222, 235, 252, 296, 330, 342, 353, 354, 360, 364; *see also* anxiety reduction  
 stroke 124, 125, 127, 134, 136, 140, 166, 168, 174, 178, 187, 219, 227, 272, 274, 277, 278, 279, 283, 284, 287, 288, 295, 298, 300, 302, 303, 308, 309, 310, 311, 318, 320, 322, 332, 333, 336, 341, 347, 349, 354, 359; *see also* brain damage  
*Stropharia cubensis* *see* mushrooms  
 strychnine 64, 232, 233, 254, 256, 365  
 strychnine sulfate *see* strychnine  
*Strychnos nux-vomica* *see* nux-vomica  
*Styrax benzoin* *see* benzoin  
*Styrax officinalis* Linn 364  
 substance P 145–146  
 succinates 146  
 sulbutiamine 100  
 sulfur 60, 100, 103, 112, 127, 138  
 sulphur *see* sulfur  
 Sulpitac *see* Amisulpride  
 suma 79, 92  
 sun-opener *see* sinicuichi  
 sunflower oil 156  
 sunflower seeds 93, 94, 102, 119, 123, 141, 148  
 Sunifiram 325  
 Sunkist *see* vitamin C  
 sunlight 114, 115, 146, 179, 183  
 supari *see* betel  
 super aspirin *see* Plavix  
 Super Blue Green Algae *see* microalgae and seaweed  
 super C *see* ketamine  
 super K *see* ketamine  
 Super Pep *see* guarana  
 superoxide dismutase 61, 119, 173  
 surgeonfish *see* animals  
 Survector *see* Amineptine  
 Sust-A *see* vitamin A  
 swamp tea *see* rosemary  
 sweet balm *see* melissa  
 sweet broom *see* butcher's broom  
 sweet calomel *see* calamus; sweet flag  
 sweet cinnamon *see* calamus; sweet flag  
 sweet flag 79; *see also* calamus  
 sweet grass *see* calamus; sweet flag  
 sweet licorice *see* licorice  
 sweet marjoram *see* marjoram  
 sweet myrtle *see* calamus; sweet flag  
 sweet potatoes 10, 116  
 sweet root *see* calamus; sweet flag  
 sweet rush *see* calamus; sweet flag  
 sweet wood *see* licorice  
 swine snout *see* dandelion  
 swordfish 30, 31, 153, 154  
 Sygen *see* GM-1 ganglioside  
 synaptic plasticity *see* cognitive enhancement; memory; neuroplasticity  
 Synaptotagmin-IV 146  
 SynCAM 1 348  
 Synthroid *see* thyroid hormones  
 Syntopressin *see* vasopressin  
 Syrian rue 263  
 Syt-IV *see* Synaptotagmin-IV  
*Syzygium aromaticum* *see* clove  
 T-9 *see* DMT  
 T-588 290–291  
 T cells 348  
 T lymphocytes *see* T cells  
 TA-65 326–327  
 Tab-Profen *see* Ibuprofen  
 tabaco del Diablo *see* tupa  
 tabaco-rape *see* cohoba  
*Tabernaemontana sananho* *see* tsicta  
*Tabernanthe iboga* *see* iboga  
 table beet *see* beet  
 table salt *see* salt  
 Tacrine 294, 297, 319, 325–326  
 tacrine hydrochloride *see* Tacrine  
 tacrolimus *see* FK506  
*Tagetes lucida* *see* Mexican marigold  
 taglli 263  
 tahini 39  
 taïque 263  
 takini 263  
 tamari *see* soy  
 Tamolarizine 326  
 tan bark *see* cohoba  
*Tanacetum vulgare* *see* tansy  
*Tanaecium nocturnum* *see* koribo  
 Tanakan *see* ginkgo biloba  
 tang keui *see* dong quai  
 tang kwei *see* dong quai  
 tang shen *see* don sen  
 tangerine 200  
 tangs *see* animals  
 tanitan *see* dita tree  
 tansy 263–264  
 tara huilca *see* cebil  
*Taraxacum mongolicum* *see* dandelion  
*Taraxacum officinale* *see* dandelion  
 Tarceva *see* Erlotinib  
 Tarenflurbil 326; *see also* Flurbiprofen  
 tares *see* darnel  
 Target of Rapamycin Pathway 340, 348  
 tarragon 79, 170, 200  
 Tasmar *see* Tolcapone  
 TAT2 46, 326–327  
 Tatinal *see* Tianeptine  
 tau 328, 348  
 taumelloch *see* darnel  
 taurine 25, 29, 146, 2113  
 TBHQ 365–366  
 TC-1734 *see* Isopronidine  
 tchat *see* khat  
 tDCS *see* electricity  
 tea 26, 93, 94, 95, 97, 147, 153, 212, 214; *see also* black tea; green tea  
 teamster's tea *see* ephedra and ma-huang  
 tebonin *see* ginkgo biloba  
 techepak *see* Syrian rue  
 tecomaxochitl *see* brugmansia; kieri  
 teek *see* cebil  
 tek *see* cebil  
 telesol *see* 5-HTP  
*Teline canariensis* *see* scotch broom  
 Teline genus *see* scotch broom  
 telomerase 146–147, 327  
 telomeres 111, 117, 327, 348  
 Temazepam 327–328  
 Tempeh 38, 40, 165; *see also* soy  
 Tenilsetam 328  
 Teonanacatl *see* mushrooms  
 Tepescohuite *see* jurema  
 TERC 348  
 tertiary butyl hydroquinone *see* TBHQ  
 TESC 348–349  
 testosterone 39, 175, 176, 189  
 tetrahydroaminoacridine *see* Tacrine  
 tetrahydrocannabinol *see* THC  
 tetrahydrocannabivarin *see* THCv  
 tetrahydroxystilbene glucoside *see* TSG  
*Tetrapteris methystica* 207  
 Tevacor *see* Oxprenolol  
 Texas mountain laurel *see* mescal bean

- textured vegetable protein *see* soy  
tehuintli *see* mushrooms  
TFEB **135**  
TFP5 **349**  
THA *see* Tacrine  
Thai jasmine black rice *see* black rice  
THC 179, 187, 205, 232, 243, 244, 247, 248, 264, 332, 335  
THCV **264**  
theanine **147–148**  
theine *see* caffeine  
*Theobroma cacao* *see* chocolate  
theophylline 179, 326  
Thiamet-G **328**  
thiamin *see* vitamin B-1  
thiamine *see* vitamin B-1  
thiazolium chloride *see* Alagebrium  
Thiethylperazine **291**  
thiodipropionic acid **366**  
thioflavin T **366**  
thiotic acid *see* alpha-lipoic acid  
thistle *see* Mexican poppy  
thistley-bush *see* Mexican poppy  
thle-pela-kano *see* calea  
THN *see* 2-aminotetralin  
Thombran *see* Trazodone  
thorn apple *see* datura  
thorn-apple tree *see* hawthorn  
3-(2-amino-butyl)indole *see* ET  
3-(2-aminoethyl)-1H-indole-5-carboxamide *see* 5-carboxamidotryptamine  
3,4-dihydroxyphenethylamine *see* dopamine  
3,4,5-trimethoxyamphetamine *see* DMT  
3,4,5-trimethoxyphenylethylamine *see* mescaline  
3,7-dihydro-1,3,7-trimethyl-1H-purine-2,6-dione *see* caffeine  
(3aS,7aR)-3a-(3,4-dimethoxyphenyl)-1-methyl-2,3,4,5,7,7a-hexahydroindol-6-one *see* Mesembrine  
3-hydroxy-3-methylglutaryl coenzyme A (HMG CoA) reductase inhibitors *see* statins  
3-hydroxy-4-(trimethylazaniumyl)butanoate *see* acetyl-L-carnitine  
3-hydroxytyramine *see* dopamine  
3-methoxy-4,5-methylenedioxyphenethylamine *see* lophophine  
3-N-butylphthalide **328**  
*Thuja occidentalis* *see* white cedar  
Thunder Nectar *see* BD  
THV *see* THCv  
thybine *see* yohimbe  
Thymanax *see* agomelatine  
thyme 87, 94, 192, 195, **200–201**  
Thyme-Leave Gratiola *see* *Bacopa monniera*  
*Thymus vulgaris* *see* thyme  
thyroglobulin *see* thyroid hormones  
thyroid *see* thyroid hormones  
thyroid hormones **189–190**, 214  
Thyrolar *see* thyroid hormones  
Thyroliberin *see* thyrotropin-releasing hormone  
thyrotropin-releasing factor *see* thyrotropin-releasing hormone  
thyrotropin-releasing hormone 190  
Thyroxine *see* thyroid hormones  
Tianeptine **328–329**  
tienchi ginseng *see* ginseng  
tiger drug *see* ayahuaasca and caapitilia *see* linden  
*Tilia x europaea* *see* linden  
Tipton weed *see* St. John's wort  
Tipton's weed *see* St. John's wort  
Tisterton *see* Ritanserin  
ditiltzin *see* morning glory  
TMA *see* DMT  
TMS *see* electricity; magnetics  
to-byun *see* Chinese foxglove root  
toad 205, 225, 231, **264**  
tobacco 5, 27, 91, 102, 103, 106, 107, 109, 111, 121, 147, 180, 183, 209, 210, 211, 215, 224, 226, 233, 238, 244–245, 247, 248, 252, 258, 262, 299, 310, 314, 326; *see also* nicotine  
tochukaso *see* cordyceps  
tocopherol *see* vitamin E  
tocotrienol *see* vitamin E  
tofu 40, **42**, 123, 156, 185; *see also* soy  
Tolcapone **291**  
Toledomin *see* Milnacipran  
toloache *see* datura  
toloatzin *see* datura  
tolouaxihuitl *see* datura  
tomato 9, 46, 89, 99, 101, 110, 133, 166, 172, 182, 252  
tongue-grass *see* chickweed  
Tonibril *see* DMAE  
Tooth root *see* *Cardamine concatanata*  
TOR *see* target of rapamycin pathway  
TOR pathway *see* target of rapamycin pathway  
torna-loco *see* datura  
tounge-noo 209  
Tp53 **349**  
Tranax *see* Alprazolam  
trandolapril *see* ACE inhibitors  
transcranial direct-current-stimulation *see* electricity; magnetics  
transcranial magnetic stimulation (TMS) *see* electricity; magnetics  
transcranial random-noise stimulation *see* electricity  
trans-dehydroandrosterone *see* DHEA  
Trasacor *see* Oxprenolol  
Trasicor *see* Oxprenolol  
Trasidex *see* Oxprenolol  
Trasitensin *see* Oxprenolol  
Trastal *see* Piribedil  
trautrau *see* taique  
Trazodone **329–330**  
Trazorel *see* Trazodone  
tree stramonium *see* brugmansia  
TREM2 **349**  
TRH *see* thyrotropin-releasing hormone  
Trialodine *see* Trazodone  
*Trichocereus pachanoi* *see* san pedro  
*Trichocereus peruvianus* *see* san pedro  
triggering receptor expressed on myeloid cells 2 *see* TREM2  
*Trigonella foenum-graecum* *see* fenugreek  
Tript-OH *see* 5-HTP  
Triptum *see* 5-HTP  
triterpene glycosides *see* saponins  
Triticco *see* Trazodone  
Trivastal Retard *see* Piribedil  
Trivastan *see* Piribedil  
TRNS *see* electricity  
trombeteiro *see* brugmansia  
Tropisetron **291**  
Trout 156  
TRPV3 358  
tryptamines 225, 304  
tryptophan 77, 104, 122, 123, 130, 131, **148–149**, 149, 150, 181, 182, 188, 218, 253, 303, 341, 354  
TSA **330**  
tschat *see* khat  
TSG **330**  
tsicta **264**  
TSPO ligands **291**  
tu ying hsin *see* amanita mushrooms  
tumtalsi *see* Mexican marigold  
tuna 30, 99, 113, 148, 153, 154, 156, 159, 167  
tupa 240, **264**  
*Turbina corymbosa* *see* morning glory  
Turkestan mint **264–265**  
turkey 119, 148, 182  
turmeric 7, 53, **79–80**, 299  
turmeric root *see* turmeric  
*Turnera aphrodisiaca* *see* damiana  
*Turnera diffusa* *see* damiana  
turnips 43  
turnsole *see* fragrant valerian  
*Turritopsis dohrnii* *see* Benjamin Button jellyfish  
TVP *see* soy  
TV3326 *see* Ladostigil  
2-(1H-indol-3-yl)-N,N-dimethylethylamine *see* DMT  
2-(3,4-dihydroxyphenyl)ethylamine *see* dopamine  
2-(3,4,5,6'-tetrahydro-2'H-[2,4']bipyridinyl-1'-yl)-N-m-tolylacetamide *see* A-412997  
2,5-Dimethoxy-4-ethylamphetamine *see* DOET  
2,5-dimethoxyamphetamine *see* DMT  
2-(5-methoxy-1H-indol-3-yl)-N,N-dimethylethylamine *see* 5-MeO-DMT  
2-(7-methoxy-1,3-benzodioxol-5-yl)ethanamine *see* lophophine  
2-AD *see* 2-amino-1,2-dihydronaphthalen  
2-ADN *see* 2-amino-1,2-dihydronaphthalen  
2-AG *see* endocannabinoids  
2-amino-1,2-dihydronaphthalen **330**  
2-amino-3-(5-hydroxy-1H-indol-3-yl)propanoic acid *see* 5-HTP  
2-aminodilin *see* 2-amino-1,2-dihydronaphthalen

- 2-aminotetralin **330**  
 2-arachidonoyl glycerol *see* endocannabinoids  
 2-arachidonoyl glyceryl ether *see* endocannabinoids  
 2-AT *see* 2-aminotetralin  
 (2-[bis(4-fluorophenyl)methylsulfanyl]acetamide) *see* Fluoraminil  
 2-bromo-alpha-ergokryptine *see* bromocriptine  
 2-hydroxytriethylammonium ribonucleate *see* ribamol  
 2-MEA **118, 330**  
 2-mercaptoethylamine *see* 2-MEA  
 2-methyl-1-(2-propan-2-ylpyrazolo[1,5-a]pyridin-3-yl)propan-1-one *see* Ibudilast  
 2-n-pentylaminoacetamide *see* milacemide  
 2-oxo-pyrrolidone carboxylic acid *see* pyroglutamate  
 (2S)-1-[2-[[[(2S)-1-[[[(2S)-2-[[[(2S)-2-[[[(2S)-2-amino-4-methylsulfanylbutanoyl]amino]-5-hydroxy-5-oxopentanoyl]amino]-3-(1H-imidazol-5-yl)propanoyl]amino]-3-phenylpropanoyl]pyrrolidine-2-carbonyl]amino]acetyl]pyrrolidine-2-carboxylic acid *see* Semax  
 (2/S,4/E/)-5-(5-isopropoxy)pyridin-3-yl)-N/methylpent-4-en-2-amine *see* Isopronieline  
 (2/S,4/E/)-N/Methyl-5-[5-(1-methylethoxy)-3-pyridinyl]-4-penten-2-amine *see* Isopronieline  
 2-tertiary butyl hydroquinone *see* TBHQ  
 Tylenol *see* acetaminophen  
 Tyr-Pro-Leu-Asp-Leu-Phe *see* Rubiscolin-6  
 tyrosine **77, 123, 142, 149–150, 167, 185, 280, 289**  
  
 uataj *see* cebil  
 Ubiquinone *see* coenzyme Q10  
 uch pa huasca sanango *see* tsicta  
 uilla *see* cebil  
 Ulex genus **261**  
 ultrasound **365**  
 umburapuama *see* brunfelsia  
 umganu *see* kanna  
 umm nyolokh *see* animals  
 Uña De Gato *see* cat's claw; cebil  
*Uncaria guianensis* *see* cat's claw  
*Uncaria tomentosa* *see* cat's claw  
 undine's herb *see* valerian  
 Unifiram **330–331**  
*Upeneus arge* *see* animals  
 URB597 **331**  
 uridine **172**  
 uridine monophosphate **152, 155**  
 urine cells **349**  
*Urtica dioica* *see* nettle  
*Urtica urens* *see* nettle  
 Uva-ursi **265**  
  
*Vaccinium corybosum* *see* bilberry  
*Vaccinium cyanococcus* *see* blueberry  
*Vaccinium erythrocarpum* *see* cranberry  
*Vaccinium macrocarpon* *see* cranberry  
*Vaccinium microcarpum* *see* cranberry  
*Vaccinium myrtillus* *see* bilberry  
*Vaccinium oxycoccus* *see* cranberry  
*Vaccinium uliginosum* **204**  
 vacha *see* calamus; sweet flag  
 Valdispert forte *see* valerian  
 Valdoxan *see* Agomelatine  
 Valerian **49, 67, 80–81**; *see also* fragrant valerian  
*Valeriana officinalis* *see* fragrant valerian; valerian  
 valine **122, 136, 137, 143, 150**  
 Valmane *see* valerian  
 valproate *see* Valproic acid  
 valproic acid **166, 291**  
 vandal root *see* fragrant valerian  
 vanilla **22, 23, 81, 192, 201, 219**  
*Vanilla planifolia* *see* vanilla  
 Varesal *see* DMAE  
 Vasopressin **89, 175–176, 190–191, 316**  
 Vasoprin *see* xanthinol nicotinate  
 Vatia *see* country mallow  
 veal **92**  
 Vectarian *see* Almitrine  
 Vedrin *see* xanthinol nicotinate  
 vegetable caterpillar *see* cordyceps  
 vegetable mercury *see* brunfelsia  
 vegetable oil **120, 156, 159, 162, 227**  
 vegetable sulfur *see* Chinese club moss  
 vegetables **7, 9–10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 27, 28, 31, 32, 34, 35, 36, 37, 41, 42–43, 86, 90, 93, 94, 96, 97, 98, 101, 102, 103, 106, 109, 110, 112, 113, 116, 118, 119, 144, 151, 153, 156, 161, 183, 185, 188, 314, 319, 343**; *see also* specific vegetables  
 velvet beans **280**  
 Venlafaxine **293, 325, 331**  
 vepris ampody **265**  
 Verazinc *see* zinc  
 verbena **197, 200, 201, 201**  
*Verbena officinalis* **201**  
*Verbena triphylla* *see* verbena  
 Vermont valerian *see* fragrant valerian  
 vervein **201**  
 Vetalar *see* ketamine  
 vetiver **196, 201**  
*Vetiveria zizanioides* *see* vetiver  
 Vetivert *see* vetiver  
 VHL1 **150**  
 Viagra *see* Sildenafil  
 Vigilor *see* Fipexide  
 vilca *see* cebil  
 vilcas *see* cebil  
 villa *see* cebil  
 Vinburnine **331**  
*Vinca rosea* *see* rosy periwinkle  
 Vincamine **331, 331–332, 332**  
 Vincamone *see* Vinburnine  
 vinho de jurema *see* jurema  
 Vinpocetine **332**  
  
 Virginia skullcap *see* skullcap  
 virodhamine *see* endocannabinoids  
*Virola calophylla* *see* epena  
*Virola calophylloidea* *see* epena  
*Virola carinata* *see* epena  
*Virola cuspidate* *see* epena  
*Virola divergens* *see* epena  
*Virola elongate* *see* epena  
*Virola lorentensis* *see* epena  
*Virola melinonii* *see* epena  
*Virola multinervia* *see* epena  
*Virola pavonis* *see* epena  
*Virola peruviana* *see* epena  
*Virola rufula* *see* epena  
*Virola sebifera* *see* epena  
 Virola species **207, 231**  
*Virola surinamensis* *see* epena  
*Virola theiodora* *see* epena  
*Virola venosa* *see* epena  
 Visions *see* hallucinations  
 Vitabec **6** *see* vitamin B-6  
 VitaCarn *see* acetyl-L-carnitine  
 Vitacel **3, 311, 332**  
 Vitacel **4, 311, 332**  
 Vitacel **7, 311, 332**  
 vitamin A **8, 22, 33, 50, 60, 72, 74, 95, 100–102, 113, 117, 118, 120, 121, 158, 159, 218, 351**  
 vitamin A acetate *see* vitamin A  
 vitamin A acid *see* vitamin A  
 vitamin A palmitate *see* vitamin A  
 vitamin Bc *see* folic acid  
 vitamin B-1 **22, 23, 96, 100, 102–103, 104, 106, 107, 108, 112, 127, 133, 209, 218, 220, 221, 280, 365**  
 vitamin B-2 **22, 86, 103, 103–104, 104, 107, 108, 133, 218, 221**  
 vitamin B-3 **22, 87, 90, 93, 103, 104–106, 107, 108, 132, 149, 153, 165, 182, 183, 218, 306**  
 vitamin B-5 **39, 89, 106, 151, 154, 280, 332**  
 vitamin B-6 **50, 90, 94, 98, 103, 104, 106–108, 108, 120, 121, 127, 130, 131, 132, 135, 139, 141, 142, 148, 149, 150, 153, 165, 179, 182, 183, 280, 289, 332**  
 vitamin B-9 **108**; *see also* folic acid  
 vitamin B-12 **33, 90, 91, 103, 107, 108–110, 113, 138, 151, 160, 183, 209**  
 vitamin B-15 **110**  
 vitamin BT *see* acetyl-L-carnitine  
 vitamin C **14, 19, 33, 49, 51, 60, 61, 72, 74, 81, 83, 91, 92, 94, 95, 96, 101, 102, 103, 108, 109, 110–113, 117, 118, 125, 127, 133, 135, 142, 149, 150, 159, 165, 166, 168, 179, 221, 237, 265, 267, 280, 332, 351**  
 vitamin D **87, 95, 102, 113–115, 158, 159, 169, 187, 209, 313, 359**  
 vitamin D2 *see* vitamin D  
 vitamin D3 *see* vitamin D  
 vitamin E **8, 12, 16, 33, 43, 44, 50, 60, 61, 72, 74, 91, 92, 95, 96, 99, 102, 103, 111, 115–119, 125, 127, 133, 152, 155, 159, 165, 166, 167, 168, 170, 176, 179, 192, 280, 309, 330, 351, 352, 357**

- vitamin K 19, 50, 62, 117, 306; *see also* ketamine  
 vitamin M *see* folic acid  
 vitamin O *see* germanium  
 vitamin P *see* bioflavonoids  
 vitamin R *see* Methylphenidate  
 vitamin U *see* folic acid  
 Viterra E *see* vitamin E  
*Vitis labrusca* *see* grape  
*Vitis vinifera* *see* grape  
 VK-28 332  
 VMAT2 349  
 vomitroot *see* lobelia  
 vomitwort *see* lobelia  
 Von Hippel–Lindau tumor suppressor *see* VHL1  
 Voronov's snowdrop *see* galanthamine  
 VP *see* vasopressin  
 VPA *see* valproic acid  
 Vyvanse *see* amphetamine
- waka *see* kava and kawain  
 walnut 43–44, 156, 167, 170  
 waraitake 204  
 wasps *see* animals  
 water hyssop *see* *Bacopa monniera*  
 water lily 265  
 watercress 141  
 watermelon 125, 133  
 wati *see* kava and kawain  
 waxen woad *see* scotch broom  
 Wedding Bells *see* morning glory  
 weed *see* marijuana  
 Weight Belt Cleaner *see* BD  
 Weissquirbaum *see* dita tree  
 western angelica 55  
 wheat 40, 104, 123; *see also* cereals; flour; whole grains  
 wheat beans 93  
 wheat bran 104, 106  
 wheat germ 87, 92, 96, 99, 100, 102, 104, 106, 116, 119, 151, 169  
 wheat grass *see* grass, wheat and barley  
 whinberry *see* bilberry  
 whineberry *see* bilberry  
 white *Atractylodes* *see* *atractylodes* (white)  
 white *Atractylodis* *see* *attractylodes* (white)  
 white cabbage *see* cabbage  
 white cedar 265  
 white endive *see* dandelion  
 white mallow *see* country mallow  
 white man's plant *see* datura  
 white peony root 78  
 white pepper 53  
 white tree *see* brunfelsia  
 white water lily *see* water lily  
 white willow *see* willow  
 whitethorn *see* hawthorn  
 whole-grain cereals *see* cereals  
 whole-grain flour *see* flour  
 whole grains 94, 96, 97, 98, 99, 103, 104, 106, 116, 120, 122, 123, 149, 167, 172, 181, 185, 188, 207; *see also* cereals; flour; wheat  
 whorehouse tea *see* ephedra and ma-huang
- whortleberry *see* bilberry  
 wichri *see* datura  
 wild artichoke *see* milk thistle  
 wild bergamot *see* horsebalm  
 wild black cherry *see* black cherry  
 wild celery *see* celery  
 wild dagga 265  
 wild endive *see* dandelion  
 wild fennel 265–266  
 wild ginger *see* ginger  
 wild hydrangea *see* hydrangea  
 wild lemon *see* mandrake  
 wild lettuce *see* lettuce  
 wild mandrake *see* mandrake  
 wild mango *see* irvingia  
 wild marjoram *see* oregano  
 wild rosemary *see* rosemary  
 wild rue *see* Syrian rue  
 wild sarsaparilla *see* sarsaparilla  
 wild tobacco *see* lobelia  
 wild valerian *see* fragrant valerian  
 wilka *see* cebil  
 willow 81  
 willow-leafed Jessamine 222; *see also* green cestrum  
 wimberry *see* bilberry  
 WIN-55212–2 332  
 winberry *see* bilberry  
 windberry *see* bilberry  
 wine *see* alcohol  
 wineberry *see* bilberry  
 winter cherry *see* ashwagandha  
 winter marjoram *see* oregano  
 wintersweet *see* oregano  
 winterweed *see* chickweed  
 witches' berry *see* belladonna  
 witches' plant *see* club moss  
*Withania somnifera* *see* ashwagandha  
 withe *see* willow  
 withy *see* willow  
 Wnt 150  
 woad waxen *see* scotch broom  
 wolf claw *see* Chinese club moss  
 wolf-tooth *see* ergot  
 wolfberry *see* gay gee  
 wolf's foot *see* club moss  
 wolfsbane *see* aconite  
 wolfszahn *see* ergot  
 wonder-of-the-world *see* ginseng  
 wood waxen *see* scotch broom  
 woodrose *see* Hawaiian baby wood rose  
 woolly morning glory *see* Hawaiian baby wood rose  
 wormseed 266  
 wormwood 81, 250, 266  
 wu-ling-chih *see* reishi  
 wysocean *see* datura
- Xanax *see* Alprazolam  
 Xanax XR *see* Alprazolam  
 Xanidil *see* xanthinol nicotinate  
 xanthinol nicotinate 119; *see also* vitamin B-3  
 xatax *see* cebil  
 Xavin *see* xanthinol nicotinate  
 Xe *see* Xenon  
 Xenon 141, 266–267  
 xiao chai hu wan 81–82
- xiwit 267  
 xpuhuc *see* Mexican marigold  
 Xycalm *see* Alprazolam  
 Xyrem *see* GHB
- Yacoana *see* cohoba  
 yacu zanango *see* tsicta  
 yage *see* ayahuasca and caapi  
 yagona *see* kava and kawain  
 yahutli *see* Mexican marigold  
 yai uhaihai *see* brunfelsia  
 yaje *see* ayahuasca and caapi  
 yaje-uco *see* ayahuasca and caapi  
 yake *see* ayahuasca and caapi  
 yakee *see* epena  
 yaksippala *see* dita tree  
 yam 166, 178, 187  
 Yamashire tea *see* green tea  
 Yaqona *see* kava and kawain  
 yarrow 82, 201  
 yarupi *see* cohoba  
 yas *see* iochroma  
 ya-to *see* epena  
 yaupon 63, 82  
 yaupon holly *see* yaupon  
 ye-tumutsali *see* Mexican marigold  
 yeast 102, 106, 108, 120, 343, 346  
 yeast cells 343  
 yeast extract 207  
 yellow gentian *see* gentian  
 yellow tea 61  
 yellow thistle *see* Mexican poppy  
 yellow tree datura *see* brugmansia  
 yerba *see* yerbe mate  
 yerba del Diablo *see* datura  
 yerba del pasmo *see* yohimbe  
 yerba mansa *see* yohimbe  
 yerbe mate 26, 61, 63, 82–83, 212, 214  
 yesterday, today and tomorrow *see* brunfelsia  
 yia *see* Mexican marigold  
 ylang ylang 194, 197, 201, 201  
 YM872 333  
 yoco *see* cohoba  
 yocon *see* yohimbe  
 yocoyoco *see* nightshade  
 yogurt 21, 38, 77, 108, 148, 153, 342  
 Yohimar *see* yohimbe  
 yohimbe 65, 83–84, 177, 240, 267–268  
 yohimbine 65, 83–84, 240, 267–268  
 yohimbine hydrochloride *see* Mexican marigold  
 Yohimex *see* Mexican marigold  
 Yoman *see* Mexican marigold  
 yopo 217; *see also* cohoba; epena  
 yoto *see* cohoba  
 Yovital *see* yohimbe  
 yu jin *see* turmeric  
*Yucca whipplei* 248  
 yun-shih 268  
 yupa *see* cohoba
- zacatechichi *see* calea  
 Zanzibar pepper *see* cayenne  
 zea mays everta *see* popcorn  
 Zhi mu 84  
 Zimulti *see* SR141716



zinc 23, 40, 55, 60, 94, 99, **119–121**,  
173, 178, 220, 280, 313, 319, 364  
Zinc 220 *see* zinc  
zinc acetate *see* zinc  
zinc ascorbate *see* zinc  
zinc chloride *see* zinc  
zinc gluconate *see* zinc  
zinc pyrithione *see* zinc  
zinc sulfate *see* zinc

Zincate *see* zinc  
*Zingiber officinale* *see* ginger  
*Zingiber officinalis* *see* ginger  
*Zingiberis officianalis* *see* ginger  
Zinkaps-220 *see* zinc  
zit-el-harmel 263  
zizyphus **84**  
Zn *see* zinc  
Zofran *see* Ondansetron

Zofran ODT *see* Ondansetron  
Zolam *see* Alprazolam  
Zolpidem **291–292**  
zombi's cucumber *see* datura  
Zoom *see* guarana  
*Zornia latifolia* *see* maconha brava  
ZORprin *see* aspirin  
Zumaque *see* cohoba  
Zuplenz *see* Ondansetron