

Vitamin Research News

Dedicated to the Scientific Pursuit of Better Health

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The President's Desk
Fight for Your Supplement Freedom

Sound the alarm—your freedom to enjoy natural, safe and inexpensive supplements is in unprecedented jeopardy. You must act now to preserve it.

Proposed legislation and current events have started an ominous trend. The FDA's ban of Ephedra takes effect this month. A similar fate is now foreseen for prohormone supplements.

The FDA's regulation of these safe supplements is ironic given that it also has decreed that people should consume canned tuna no more than once a week, due to its high mercury content. The FDA is banning safe supplements while doing little to prevent the contamination of our food supply.

On Capitol Hill, anti-supplement, anti-freedom legislation is taking shape at an increasing pace. For example:

- S. 1538 would give the FDA \$105 million to enforce its anti-supplement view of DSHEA (Dietary Supplement Health and Education Act), the adequate, balanced legislation passed in 1994.
- HR. 3377, "Son of Durbin," would alter the original intent of DSHEA, subjecting all non-vitamin/mineral supplements to prescription drug-like FDA approval, costly post-market surveillance and adverse-event reporting.
- HR. 207 and S. 1780 would amend the Controlled Substances Act. HR. 207 would open the door for banning and criminalization of healthful dietary supplements. S. 1780 would classify a long list of prohormones, including androstenedione/diol, into anabolic steroids, establishing harsher penalties for possession and use.



Robert Watson
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United States Senator Harry Reid
528 Hart Senate Office Building
Washington, D.C. 20510-2803

Dear Senator Reid,

As a nutritional supplement consumer and a voter in your district, I am gravely concerned about three bills: H.R. 207, Sen. Durbin's S. 722, and Sen. Biden's S. 1780. All three bills would circumvent the protections of the Dietary Supplements Health and Education Act (DSHEA) and infringe upon the nutritional freedoms of Americans.

The bills would remove dietary supplement products from the market without a scientific basis and without demonstrating any legitimate public health concerns. The Biden bill, in particular, would reclassify a variety of popular over-the-counter prohormone supplements into the Controlled Substances Act – bringing the War on Drugs into our health food stores by authorizing the arrest and imprisonment of health-conscious American citizens for unlawfully possessing these products.

As an informed adult, I demand preservation of my right to make my own dietary supplement decisions. I believe that adolescents must be protected from age-inappropriate products, but without banning products for adults. I support the availability of prohormone supplements and other popular, health-affirming nutritional products for adults.

My signature below indicates my membership in the non-profit United Supplement Freedom Association, Inc., a coalition dedicated to responsibility and free choice in safe dietary supplements. Please support my supplement freedoms by opposing these bills.

Sincerely,

Robert Watson
President/CEO
Vitamin Research Products

Time is of the Essence

With events rapidly unfolding, write your U.S. senators and representatives today. You may

wish to use wording similar to that in my letter to Sen. Reid shown here.

Or, send an electronic letter by visiting www.USFA.biz, the website of the United Supplement Freedom Association. Registration in the USFA is free. You can easily contact your specific elected representatives in just minutes.

Don't delay. Let your voice be heard on Capital Hill today!

Robert Watson
President/CEO

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Strontium: Breakthrough Against Osteoporosis by Ward Dean, MD

Mention strontium to most people, and they will almost always immediately think of strontium-90, a highly dangerous, radioactive component of nuclear fallout produced during atmospheric testing of nuclear weapons in the 1950s. As a result of above-ground nuclear testing, radioactive strontium spread throughout the environment and contaminated dairy products and other foods, and subsequently accumulated in the bones of both children and adults.

The media made us well aware that strontium-90 could cause our bones to become radioactive, causing cancer or some other horrible disease as a result. So, in the minds of many, strontium is a poison to be avoided, just like other toxic metals such as lead, mercury, cadmium and aluminum.

However, stable strontium—meaning nonradioactive—is nontoxic, even when administered in large doses for prolonged periods. It also appears to be one of the most effective substances yet found for the prevention and treatment of osteoporosis and other bone-related conditions.

Furthermore, repeatedly administering stable strontium can even gradually eliminate radioactive strontium from the body. The stable form slowly replaces the radioactive form in bone, and radioactive strontium is excreted in the urine.

Strontium is element number 38 of the periodic table of elements. It was discovered in 1808 and was named after Strontian, a town in Scotland. Strontium is one of the most abundant elements on earth, comprising about 0.04 percent of the earth's crust. At a concentration of 400 parts per million, there is more strontium in the earth's crust than carbon. Strontium is also the most abundant trace element in seawater, at a concentration of 8.1 parts per million. The human body contains about 320 mg of strontium, nearly all of which is in bone and connective tissue.

Strontium is in row IIa of the periodic table, just below calcium. Like calcium, strontium has two positive charges in its ionic form. Because of its chemical similarity to calcium, strontium can replace calcium to some extent in various biochemical processes in the body,

including replacing a small proportion of the calcium in hydroxyapatite crystals of calcified tissues such as bones and teeth. Strontium in these crystals imparts additional strength to these tissues. Strontium also appears to draw extra calcium into bones. When rats or guinea pigs are fed increased amounts of strontium, their bones and teeth became thicker and stronger.

Strontium has been safely used as a medicinal substance for more than a hundred years. It was first listed in Squire's Companion to the British Pharma-copoiea in 1884. Subsequently, strontium was used therapeutically in the United States and Europe. As late as 1955, strontium compounds were still listed in the Dispensatory of the United States of America. For decades in the first half of the twentieth century, strontium salts were administered in dosages of 200 to 400 mg/day without toxic effects.

Strontium and Osteoporosis

Strontium tends to accumulate in bone—especially where active remodeling is taking place. In 1959, researchers at the Mayo Clinic investigated the effect of strontium in 32 individuals suffering from osteoporosis.¹

Each patient received 1.7 grams of strontium per day as strontium lactate. Eighty-four percent of the patients reported marked relief of bone pain, and the remaining 16 percent experienced moderate improvement. No significant side effects were seen, even with prolonged (up to three years) administration of strontium. X-rays taken at the beginning and end of the study showed “probable” increased bone mass in 78 percent of the cases. This is not surprising, considering the symptomatic improvement reported by the patients. Unfortunately, measurement of bone mass in 1959 was pretty crude, leading the researchers to qualify their interpretation of the X-rays. Sophisticated tests such as dual photon absorptiometry and CT scanning as used today were not available at the time this study was conducted.

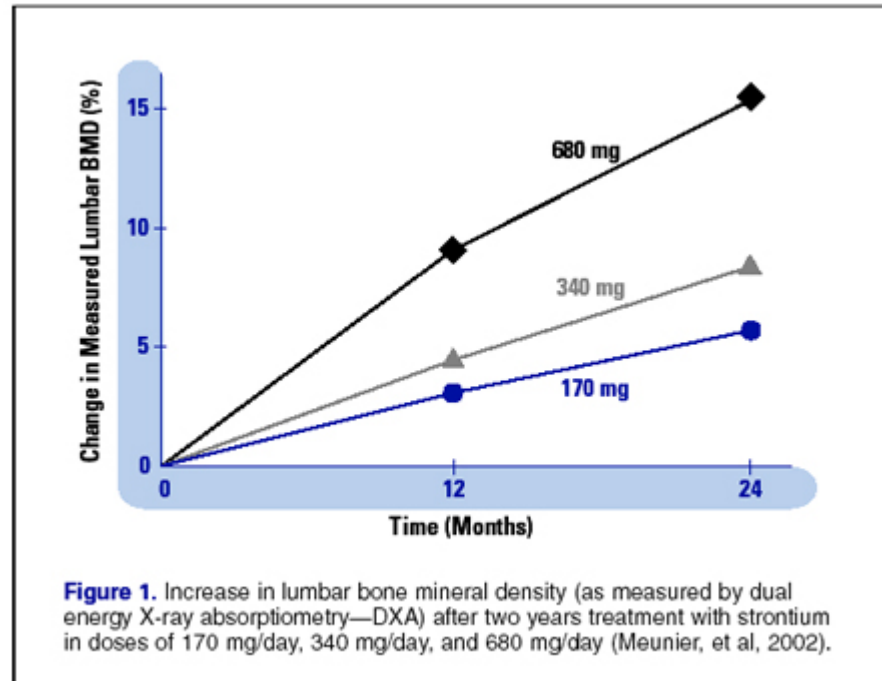
Nevertheless, because of the “strontium scare” of the 1950s, little follow-up was conducted until nearly 30 years later. In 1986, scientists administered 0.27 percent strontium to mice in their drinking water. This resulted in an increased rate of bone formation and decreased rate of bone resorption.² In another study, rats given extra strontium showed increased bone formation and greater bone density than rats fed a control diet. These reports suggested that the amount of strontium we ingest may reduce our risk of developing osteoporosis, and that strontium may play a role in the prevention of osteoporosis.⁷

In 1985, Dr. Stanley C. Skoryna of McGill University in Montreal conducted a small-scale study that pointed to a potential role for strontium in the treatment of humans.³ Three men and three women with osteoporosis were each given 600 to 700 mg/day of strontium in the form of strontium carbonate. Bone biopsies were taken in each patient at the iliac crest (hip bone), before and after six months of treatment with strontium. Biopsy samples showed a 172 percent increase in the rate of bone formation after strontium therapy, with no change in bone resorption. The patients receiving strontium remarked that the pains in their bones had diminished and their ability to move around had improved.

Recently, interest in strontium has been rekindled by a number of studies using the strontium salt of ranelic acid (strontium ranelate). A large multi-center trial known as the strontium

ranelate (SR) for treatment of osteoporosis (STRATOS) trial was designed to investigate the efficacy and safety of different doses of strontium in the treatment of postmenopausal osteoporosis.⁴

The study included 353 osteoporotic women with at least one previous vertebral fracture and low scores of lumbar bone density. Patients received placebo or strontium in doses of 170, 340 or 680 mg/day for two years. The scientists evaluated lumbar and hip bone mineral density (BMD) using dual-energy X-ray absorptiometry (DXA). They also determined the incidence of new



vertebral fractures, as well as several biochemical markers of bone metabolism. Lumbar BMD increased in a dose-dependent manner as shown in Figure 1.

Also, there was a significant reduction in the number of patients with new vertebral fractures in the second year of the group receiving the 680 mg/day dose. In the 680 mg/day group, there was also a significant positive change in markers of bone metabolism. The authors concluded that the 680 mg/day dose offered the best combination of efficacy and safety, and stated without equivocation that strontium ranelate therapy increased vertebral BMD and reduced the incidence of vertebral fractures.

A much larger trial by the same research team included 1,649 osteoporotic postmenopausal women. These subjects received 2 gm/day of strontium ranelate (providing 680 mg strontium) or placebo for three years.⁵ Calcium and vitamin D supplements were also given to both groups before and during the study. In addition to suffering fewer fractures, patients in the strontium group noted a risk reduction of 49 percent in the first year of treatment and 41 percent during the three-year study period. Patients in the strontium group increased lumbar bone mineral density by an average of 14.4 percent and femoral neck BMD an average of 8.3 percent. The authors concluded that “treatment of postmenopausal osteoporosis with strontium ranelate leads to early and sustained reductions in the risk of vertebral fractures.”

Strontium and Metastatic Bone Cancer

Dr. Skoryna (1981) also tested the effect of strontium in patients with breast or prostate cancer that had spread to the bones.⁶ Metastatic bone cancer is usually a tragic condition with

a poor prognosis, in which the cancer cells are multiplying out of control and gradually eat away the bone tissue. In addition to causing severe pain, metastatic bone cancer can make bones so weak that they break after only minimal trauma, or simply collapse under the body's weight. Deforming and disabling fractures may culminate in loss of mobility and intolerable pain. Metastatic cancer is difficult to treat and usually becomes progressively worse, although successful treatment of the cancer will occasionally cause the bone lesions to regress.

Notwithstanding this rather dim prognosis, Dr. Skoryna administered strontium (in the form of strontium gluconate) for at least three months. The dosage of strontium was only 274 mg/day—much lower than the 600 to 700 mg/day he used in his osteoporosis study. However, since strontium gluconate is absorbed more efficiently than strontium carbonate, less strontium was needed to achieve the same blood level. In many cases, the results were clear-cut and dramatic. X-rays taken before and after strontium therapy demonstrated new mineral deposits in areas of bone that had been eroded by the cancer. In one patient, a vertebra that appeared to be on the verge of collapse showed extensive remineralization. Although much of this newly deposited mineral was no doubt made up of calcium crystals, the presence of strontium was clearly evident by its characteristic appearance on the X-rays. These strontium deposits were still visible on X-rays taken several months after strontium therapy had been discontinued. Many of the cancer patients reported subjective improvements and gained weight while receiving strontium.

Strontium and Cavities

Strontium also has been shown to reduce the incidence of cavities. In a 10-year study, the United States Navy Dental Service examined the teeth of about 270,000 naval recruits. Of those, only 360 were found to be completely free of cavities. Curiously, 10 percent of those 360 individuals came from a small area around Rossburg, Ohio, where the water contains unusually high concentrations of strontium. Epidemiologic studies have shown that strontium concentrations of 6 to 10 mg/liter in the water supply are associated with a reduced incidence of cavities. Administering these levels of strontium also reduced the incidence of cavities in animal studies.⁷

Strontium and Arthritis

Based on the studies showing that strontium improves bone density in osteoporosis, scientists at the Bone and Cartilage Metabolism Research Unit, University Hospital, Liege, Belgium, hypothesized that strontium might also improve cartilage metabolism in osteoarthritis (OA).⁸ They performed an in vitro investigation using cartilage-forming cells (chondrocytes) obtained from normal adults and patients with osteoarthritis. Chondrocytes were cultured for 24 to 72 hours with strontium, and Proteoglycan (PG) content was determined—i.e., structural components of cartilage, including hyaluronic acid, glucosamine and chondroitin sulfate. These substances—Proteoglycans, also known as Glycosaminoglycans—are known to decline dramatically with age⁹ (Fig. 2). The researchers found that strontium strongly stimulated PG production. This suggests a cartilage-growth-promoting effect of strontium, and provides a sound basis for clinical testing of strontium in osteo- and other forms of arthritis.

Conclusion

Strontium in doses up



to 1.7 g/day appears to offer a safe, effective and inexpensive approach to preventing and reversing osteoporosis and may be of benefit in patients with osteoarthritis and cancer with bone metastases, as well as possibly helping to prevent dental cavities. Doses of 680 mg/day appear to be the optimum dose, although lower doses are clinically effective.

Dr. J.Y. Reginster (2002), one of the principal strontium researchers, cautions that co-administration of strontium with calcium appears to impair strontium absorption,¹⁰ so I recommend that strontium be taken on an empty stomach, and that it especially not be taken with other multi-minerals that usually include calcium.

Although the more recent studies used strontium ranelate, earlier studies used other salts of strontium, including strontium carbonate, strontium lactate, and strontium gluconate. It appears that the active ingredient is strontium, and whatever salt of strontium used is less important than the amount of strontium consumed.

Also, although the studies cited above used only strontium, plus calcium and vitamin D, I believe that even better results would be achieved by including other potential anti-osteoporotic substances such as a broad-spectrum mineral replacement that includes magnesium, vitamin K and boron, plus Xylitol, ipriflavone, calcium hydroxyapatite, progesterone cream (and in some cases, estrogen), and DHEA. A comprehensive regimen of synergistic bone-enhancing substances should provide the optimum regimen for preventing and treating osteoporosis.

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L-Tryptophan: Nature's Answer to Prozac®

by James South, M.A.

The “serotonin deficiency syndrome” is one of the most common and widespread disorders of human psychobiology in the modern world. Prozac® allegedly increases the amount of serotonin in the synaptic gap that slightly separates nerve cells from each other. (For more on the “allegedly” see the excellent book, *Talking Back to Prozac*, by psychiatrist Peter Breggin).

Greater amounts of serotonin in the synaptic gap increases communication between serotonin-using neurons, allowing the brain's multiple and critically important serotonin neural circuits to function more reliably, powerfully and effectively.

Tryptophan and Serotonin Action

Studies with humans and animals conducted over the past 30 years show that serotonin nerve circuits promote feelings of well being, calm, personal security, relaxation, confidence and concentration.

Serotonin neural circuits also help counterbalance the tendency of brain dopamine and noradrenaline circuits to encourage over-arousal, fear, anger, tension, aggression, violence, obsessive-compulsive actions, over-eating (especially carbohydrates), anxiety and sleep disturbances.

A broad array of emotional and behavioral problems, including depression, PMS, anxiety, alcoholism, insomnia, violence, aggression, suicide and compulsive gambling, has been designated the serotonin deficiency syndrome. The serotonin deficiency syndrome is caused by a chronic deficit of serotonin in the nerves that use it as their neurotransmitter. This deficit in turn derives from various problems relating to the nutritional biochemistry of tryptophan.

Tryptophan: The Essential Amino Acid

Tryptophan is one of the eight essential amino acids found in the human diet. Essential amino acids must be obtained preformed from food or supplements. Non-essential aminos (there are 14) can be made from the essential aminos, or other non-essential amino acids.

In any normal diet, tryptophan is the least plentiful of all 22 amino acids. A typical diet provides only 1 to 1.5 grams of tryptophan per day. To compound the problem, there is much competition in the body for this scarce amino acid. Tryptophan is used to make various proteins, and in people with low to moderate intakes of vitamin B3 (niacin/niacinamide),

tryptophan may be used by the liver to make B3 at the expensive ratio of 60 mg tryptophan to 1 to 2 mg B3.

In people who are even marginally vitamin B6 deficient, tryptophan may be rapidly degraded into mildly toxic metabolites such as hydroxykynurenine, xanthurenic acid and hydroxyanthranilic acid.

The brain typically receives less than one percent of ingested tryptophan. However, getting even this meager share of tryptophan (the only normal dietary raw material for serotonin manufacture) is a difficult task for the brain, due to the blood brain barrier (BBB).

The BBB serves as a protection to prevent toxins (and even excessive levels of nutrients which might temporarily overwhelm and dysregulate brain function) from entering the brain. Thus, the BBB makes it hard even for brain essential nutrients to enter the brain. Serotonin by itself cannot penetrate the BBB, but its precursor, tryptophan, can. Nutrients must be ferried through the BBB by transport molecules, like passengers on a bus. Unfortunately for the serotonin-using nerves, tryptophan must share its “transport bus” with five other amino acids: tyrosine, phenylalanine, valine, leucine and isoleucine. Thus, tryptophan is typically out-numbered about 8 to 1 in the competition to secure its transport through the BBB into the brain.

Tryptophan’s Effects on Carbohydrates and Obesity

Eating a high protein diet to provide more tryptophan only worsens the problem by increasing the intake of the five competing aminos even more. Ironically, the only dietary strategy that increases brain tryptophan supply is to eat a high carbohydrate diet.

When large amounts of carbohydrates are eaten, the body secretes large amounts of the hormone insulin to lower the ensuing high blood sugar. The insulin also clears from the blood most of the five amino acids that compete with tryptophan for a ride to the brain. Tryptophan then has the “bus” all to itself, allowing more tryptophan to reach the brain.

This strategy is instinctively known and practiced by many people who consume large amounts of carbohydrates such as bread, cakes, pies, ice cream, chips, pizza and candy—especially when they are feeling depressed, stressed or anxious.

The increased brain serotonin produced by this practice lowers arousal and anxiety, promoting a (temporary) sense of well-being and security. However, this strategy comes at a price. The same insulin that enhances brain serotonin also enhances the conversion of the fats, carbohydrates and amino acids cleared from the blood into stored body fat!

Hence the carbohydrate addiction/ obesity/serotonin connection.

Taking tryptophan as a supplement is the most natural way to defeat the brain’s serotonin production problems. Unlike ingesting a high protein diet, isolated supplemental tryptophan intake will not increase blood levels of its five amino competitors. Since the normal dietary intake is only 1 to 1.5 grams per day, even a modest amount of tryptophan supplementation (500 mg to 3,000 mg) will have a significant effect in boosting blood and brain tryptophan levels.

Under normal conditions, the brain enzyme tryptophan hydroxylase (TH) is only 50 percent saturated. This means the serotonin production machinery is 50 percent idle. Thus, an increase in raw material (tryptophan) will tend to automatically increase brain serotonin production.

TH converts tryptophan to 5-hydroxytryptophan (5-HTP). A vitamin B6-dependant carboxylase enzyme then converts 5-HTP to serotonin, and more serotonin more effectively activates the calming, mood-elevating, impulse and appetite-controlling serotonin neural circuits.

Tryptophan—When Less is More!

In the case of tryptophan supplements, more is not always better. In the many human clinical studies using tryptophan to treat depression, published since the 1970s, studies using moderate tryptophan doses (1 to 3 gm daily) have frequently shown better results than high doses (6 to 9 grams daily). This is due to a liver enzyme called tryptophan pyrrolase (TP). TP is a key enzyme in the normal pathways for liver-tryptophan breakdown.

TP is known to be activated by at least two factors. The first is the stress hormone cortisol. Cortisol, produced by the adrenal glands, is the “state of siege” stress hormone. It is released in response to unremitting chronic stress, which we can neither fight against nor flee from. Cortisol is known to be frequently elevated in the very conditions, such as depression, insomnia and obesity, for which tryptophan/serotonin might be helpful.

Thus, taking tryptophan while under elevated cortisol-stress conditions might supply little extra to the brain, because of cortisol’s activation of TP.

The other factor known to elevate liver TP activity is, ironically, increased intake of tryptophan. Since the TP-using kynurenine pathway is the major tryptophan degradation pathway, significantly elevated tryptophan intake automatically induces higher TP activity. Again, if liver TP activity seriously increases, more supplemental tryptophan will not necessarily translate into increased brain serotonin.

Thus, the lowest tryptophan dose that successfully alleviates serotonin-deficiency symptoms is the most efficacious (i.e., more is not always better).

Fortunately, clinical and anecdotal evidence shows that even 500 mg to 1,500 mg of supplemental tryptophan, taken at bedtime on a regular basis, is frequently sufficient to ease serotonin-deficiency problems.

This low dose will usually not seriously elevate tryptophan-destroying TP activity. Niacinamide (vitamin B3) is known to inhibit liver TP; it is also the vitamin that activates the enzyme that converts tryptophan to 5-HTP. Thus, taking 100 mg B3 several times daily with meals will also serve to enhance the effectiveness of low-moderate tryptophan doses.

Taking 25 mg to 50 mg of vitamin B6 once or twice daily with meals will also augment tryptophan-serotonin conversion, since B6 activates the decarboxylase enzyme that converts 5-HTP to serotonin.

Tryptophan: The Natural Antidepressant

The published research of S.N. Young and H.M. van Praag (two of the world's chief experts on tryptophan-serotonin metabolism and psychobiology), suggest that tryptophan will likely be of most benefit to people suffering from depression of the type that Young refers to as "anxious-agitated." Young notes that increased brain production of serotonin through tryptophan supplementation does not automatically increase serotonin nerve activity.

Young's research indicates that at low levels of psychobiologic arousal, there will be adequate neuronal serotonin to support the correlative low-level serotonin nerve activity, even when nerve serotonin levels are low. At higher levels of arousal, however, the more rapid turnover of serotonin in the synaptic gap will require higher levels of serotonin production to adequately maintain the greater activity of serotonin circuits. Young refers to those suffering depression of a more vegetative, passive, quiescent variety to as the "apathetic inhibited" type.

Given that serotonin neural circuits frequently serve to counterbalance the arousing activating dopamine/noradrenaline circuits (the neural circuits activated by cocaine and amphetamine, and to a lesser extent, coffee), Young's observations make perfect sense.

Anxious, agitated depression occurs when a person's dopamine/noradrenaline activating arousal circuits (Yang) are functioning strongly, without the calming, relaxing, mellowing serotonin circuits (Yin) functioning strongly as a complementary counterbalance.

Tryptophan provides the anxious agitated depressive with that needed "Yin" counterbalance, thereby restoring a sense of well being and behavioral self-control.

Van Praag's research has shown that for many people suffering depression, combining the amino-acid tyrosine with tryptophan works much better than taking tryptophan alone. These would be Young's "apathetic inhibited" types, where both the serotonin tranquility/well-being circuits and the "get up and go" (vigorous action) dopamine/noradrenaline circuits are underactive.

Tyrosine is the precursor for both dopamine and noradrenaline. The enzyme that converts tyrosine to its next step on the dopamine/noradrenaline pathway is tyrosine hydroxylase. Tyrosine hydroxylase is normally at least 25 percent unsaturated (i.e., 25 percent "idle"), so that providing supplemental tyrosine (100 to 500 mg with meals) increases brain dopamine/noradrenaline production and nerve activity.

The increased dopamine/noradrenaline neural activity then requires greater complementary serotonin neural activity, which is provided by the tryptophan supplementation.

Tryptophan's General Uses

Research has shown that tryptophan/ serotonin is effective for more than depression. Various forms of defective impulse control and obsessive compulsive disorders are also strongly affected by serotonin nerve activity. Suicidal behavior, compulsive gambling, irrationally dangerous thrill seeking behavior and pyromania (compulsive fire-starting), have been shown to be correlated with low serotonin neural activity, combined with excessive

dopaminergic/noradrenergic activity.

Chronic alcoholism may also have a serotonin component. Research with animals and humans has shown that alcohol initially increases serotonin nerve activity; yet chronic alcohol use impairs tryptophan entry into the brain. Thus, chronic alcoholism may involve a vicious spiral of a brief alcohol-induced increase of serotonin neural activity, with consequent sense of well-being, combined with an ever-worsening baseline state of serotonin nerve activity due to alcohol's impairment of brain tryptophan transport.

Tryptophan and Sleep

In recent years, melatonin has gained the reputation as the natural answer to insomnia. Yet the fact that melatonin is made in the pineal gland from serotonin is frequently overlooked.

Thus, supplemental tryptophan may induce one's pineal gland to naturally increase its melatonin production. Also, important sleep-regulating nerve circuits in the brainstem (the raphe nuclei) use serotonin as their neurotransmitter, so it is unreasonable to expect melatonin alone to provide optimal insomnia relief.

Low dose melatonin (0.5 mg to 1 mg) plus tryptophan (500 mg to 1, 500 mg) may prove more effective for many people with serious insomnia.

Tryptophan's Role in Dementia

Recent research has shown that the depression that frequently accompanies and even predates the movement disorders of Parkinson's disease is primarily due to the hypofunction of serotonin nerves. Consequently, tryptophan may be a useful adjunct to L-Dopa/deprenyl treatment of Parkinson's.

In the latter stages of Alzheimer's disease, heightened irritability and unprovoked aggression frequently accompany the mental decline. Recent research has shown partial destruction of key serotonergic neural circuits to be involved. Supplemental tryptophan may optimize the activity of remaining serotonergic.

Tryptophan and 5-HTP

Supplemental 5-Hydroxytryptophan (5-HTP), the intermediary between tryptophan and serotonin, is also available as a natural remedy for the serotonin deficiency syndrome, yet tryptophan offers a major advantage over 5-HTP for many people.

There are nerves that line the intestinal tract that use serotonin as their neurotransmitter. These nerves contain the carboxylase enzyme that converts

5-HTP to serotonin, but not the hydroxylase enzyme that converts tryptophan to 5-HTP. Thus, when 5-HTP is swallowed, large amounts of 5-HTP may be picked up by these intestinal serotonergic neurons and quickly converted to serotonin, leading to hyperactivity of these nerves.

This in turn may lead to nausea, vomiting, cramping, constipation and/or diarrhea. Indeed, the research published on 5-HTP since the 1970s has consistently shown various forms of intestinal discomfort to be the main side effect of 5-HTP use. Because these intestinal

neurons cannot convert tryptophan to 5-HTP, tryptophan does not cause intestinal distress.

Tryptophan: Its Synergistic Combinations

A practical program to relieve the many forms of serotonin deficiency syndrome will ideally combine moderate amounts of tryptophan (500 mg to 1,500 mg), 5-HTP at 33 mg to 100 mg (if well tolerated) and melatonin (0.5 mg to 1 mg) taken at bedtime.

Melatonin actually promotes increased brain serotonin through its ability to reduce cortisol levels. Reduced cortisol levels will lessen the activity of liver pyrrolase, the enzyme that degrades tryptophan.

GH3/KH3, Dilantin (phenytoin) and magnesium may also lower cortisol activity. Standardized extracts of St. John's Wort (0.3 percent hypericin) may also synergize with tryptophan to optimize serotonin levels. Research summarized in *Hypericum and Depression* by H. Bloomfield and colleagues suggests three complementary mechanisms of action whereby St. John's Wort may increase serotonin.

St. John's Wort seems to be a weak serotonin reuptake inhibitor (and thus a more natural and safer equivalent of Prozac), a weak MAO inhibitor (MAO enzymes break down neuronal serotonin), and a cortisol inhibitor. The standard St. John's Wort dosage is 300 mg three times daily—however, less may be needed when combined with tryptophan.

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by James South, M.A.

Garlic (*Allium sativum*) has been used as a medicine and health-promoter for 5,000 years. It was widely used in ancient Assyria, Egypt, India, Greece and China.¹ Garlic was used in medieval and Renaissance Europe to treat poisons, bites, edema, ulcers, toothaches, plague and smallpox.¹ Albert Schweitzer used garlic in Africa to cure cholera and typhoid in the early 20th century.¹ Garlic was widely used in Europe, especially England, to treat war wounds and dysentery during World War I.¹ In modern Europe and the U.S. garlic supplements are widely used. There were at least 1,200 pharmacologic studies done on garlic by mid-1997, as well as many hundreds of studies on the chemistry of garlic.¹

The chemistry of garlic is extremely complex, but research has shown that it is the unusual organosulfur compounds relatively unique to garlic that promote its broad range of lipid-lowering, antithrombotic, anti-blood coagulation, anti-hypertension, anticancer, antioxidant, and antimicrobial effects.¹ The most well-known and widely studied garlic compound is allicin, yet ironically allicin does not exist in fresh, undamaged garlic cloves.¹ The predominant garlic sulfur compound is alliin.¹ Garlic also contains high levels of an enzyme called “allinase.”¹

When fresh garlic cloves are crushed or chopped, or garlic powder that has been carefully dried to preserve its alliin/allinase content is added to water, allicin is produced in seconds by the action of allinase on alliin.¹ Allicin and other thiosulfonates are somewhat unstable, but dilution and dissolving in water “greatly improve their stability.”¹ Allicin can decompose into a broad range of compounds, including S-allylmercaptocysteine, allylmercaptan, diallyl disulfide, allylmethyl disulfide, vinylidithiols, ajoene, and possibly allylsulfinic and allylsulfonic acid.¹

Cavallito and Bailey first reported in 1944 that allicin is the garlic compound chiefly responsible for the broad-spectrum antibacterial action of garlic.² Lawson has noted that various actions of garlic, such as its cholesterol-lowering and antibacterial effect, are primarily due to its allicin content, since removal of alliin from garlic, or inactivation of allinase by microwave cooking, eliminates these effects, while adding allicin back into garlic powders so treated restores such garlic’s anticholesterol/antibacterial activity.¹

Allicin is apparently well-absorbed. An animal study with radioactive-labeled allicin showed 79 percent absorption within 30-60 minutes after oral intake, with 65 percent excretion of radioactive allicin metabolites within 72 hours.¹ Four animal and five human studies have shown that orally consumed crushed garlic and allicin-related compounds have systemic antimicrobial effects in the lungs, kidney, brain, blood and cerebrospinal fluid, further showing absorption and activity of allicin and its metabolites.¹

Allicin: The Gold Standard of Garlic

Because of the centrality of allicin and its metabolites to the health benefits of garlic, many garlic supplements are standardized to yield a certain “allicin potential,” for example, “allicin potential: 10,000 ppm.”

When garlic cloves are properly prepared and dried, the alliin and allinase activity of fresh whole garlic are preserved. When such dried garlic powder is added to water, the alliin and

allinase quickly react and allicin is produced. This is how “allicin potential” is measured.³ However, the situation is completely different when such garlic supplements are swallowed. Allinase enzyme is rapidly and completely destroyed by stomach acid.³

Many garlic supplements are coated with a special coating that protects the garlic from stomach acid, but dissolves in the alkaline conditions of the small intestine, where the allicin should then theoretically be produced. Unfortunately such supplements usually don't work as designed. Lawson and Wang reported the results of testing 23 coated, U.S. garlic supplements in 2001.³ Twenty of 23 failed to release even 15 percent of their claimed “allicin potential” when placed in simulated intestinal fluid. Lawson and Wang concluded that allicin potential is an extremely poor measure of garlic supplement activity in the human body.

AlliTru: True Allicin Garlic Extract

Peter Josling and collaborators have recently come up with a completely new, patented approach to producing a garlic supplement containing real, preformed allicin. This approach makes tablet coatings and carefully controlled tablet dissolvability irrelevant.

According to Josling, AlliTru™ is produced through a carefully temperature/pressure-controlled process, using water to continually flush allicin from the reaction vessel as soon as it's formed. This yields a dilute water solution of allicin, which is further diluted and spray-dried onto a maltodextrin-gum acacia matrix to produce a 300 ppm allicin powder.

The diluting and dissolving in water, as well as spray drying onto a slightly acid powder, stabilizes the allicin, even without refrigeration.^{1,4} AlliTru is available in 180 mg capsules, which provide 55-60 mcg allicin/cap as well as a powder, which provides approximately 300 mcg allicin per gram.

The Benefits of Allicin

In his comprehensive 1998 review of garlic and its medicinal compounds (with 207 references), Lawson provides a “summary of the main compounds essential to the pharmacological effects of garlic cloves at normal levels of consumption.”¹

Allicin is the chief thiosulfinate (about 75 percent of total) formed when fresh raw garlic is crushed, chopped or chewed.¹ Lawson reports there is “good evidence” that allicin and possibly other thiosulfinites are the main compounds essential to garlic's antimicrobial, lipid-lowering, antithrombotic, fibrinolytic, antioxidant, anticancer and pro-immune effects.¹ He notes: “This does not mean that all of the effects of garlic are due solely to the thiosulfinites, but no other compound has yet been identified with significant activity at levels present in whole or crushed garlic.”¹

Perhaps allicin's most important power in our modern age of antibiotic-resistant germs and ever-new microbial diseases (SARS, flesh-eating *Streptococcus*, West Nile encephalitis virus, AIDS, etc.) is its amazingly broad-spectrum antimicrobial activity. In their 1999 review of allicin's antimicrobial activities, Ankri and Mirelman report on the antibacterial, antifungal, antiparasite, antiviral activity of allicin.⁵

They note that a broad range of bacteria, including *E. coli*, *Staphylococcus Aureus*, *Streptococcus pyogenes*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Acetobacter baumannii*,

Klebsiella pneumoniae, *Enterococcus faecium*, *Mycobacterium tuberculosis*, *H. pylori*, *Salmonella*, *Clostridium* and *Shigella* are allicin-sensitive.⁵

Some of the bacteria listed are killed by allicin concentrations as low as 3-15 ppm (3-15 mcg/ml).⁵ Fortunately, friendly bacteria such as *Lactobacillus*, *Enterococcus* and *Pediococcus* are fairly resistant to allicin.^{1,9} They also note that allicin synergizes with antibiotics, and that most bacteria are unable to develop resistance to allicin.⁵ They also report from their own research that various multi-drug resistant bacteria are also effectively killed by allicin, some at doses as low as 15-30 ppm (15-30 mcg/ml).⁵ Allicin has a powerful antifungal effect, with a minimum inhibitory concentration (MIC) against various *Candida* species of only 0.15 to 0.8 mcg/ml, and is effective against other fungal species of *Cryptococcus*, *Trichophyton*, *Epidermophyton* and *Microsporum* at MIC of 1.57-6.25 mcg/ml.⁵

Allicin has shown antiparasite activity at 30 mcg/ml against *Entamoeba histolytica*, *Giardia lamblia*, and *Leshmania*.⁵ Allicin has in vitro and in vivo activity against human cytomegalovirus, influenza B, herpes simplex virus 1 and 2, parainfluenza virus type 3, vaccinia virus, vesicular stomatitis virus and human rhinovirus type 2.⁵

AlliTru vs. The Common Cold

Peter Josling published results of a double-blind, placebo-controlled clinical trial of AlliTru in 2001.⁶

Seventy active treatment patients and 72 placebo patients completed the 12-week study. Study participants took one capsule daily of AlliTru or placebo. Volunteers recorded their general well-being daily for 12 weeks, using a five-point scale on which 5 = well, no problems; 4 = well, with occasional sneeze, not disruptive to normal routine; 3 = can feel a cold coming on, some minor symptoms; 2 = feeling low and beginning to exhibit symptoms; 1 = full cold symptoms such as headache, sneezing, runny nose, tiredness.

“If a cold occurred, volunteers noted the number and variety of symptoms, the day recovery began, and the day they felt completely better.”⁶ The study defined a cold as a score of 3 that went on to 2 or 1, with appropriate symptoms. The duration of symptoms was defined as the number of days with a score of 2 or 1. Recovery time was the number of days it took to return to a score of 4 or 5.

The results were impressive. The placebo group had 65 colds during the study. The AlliTru group had 24 colds. The average duration of symptoms (score 1 or 2) was 5.01 days for the placebo group, 1.52 days for the AlliTru group. The placebo group required an average of 5.63 days to recover, the AlliTru group 4.63 days. The total for days of infection was 366 for the placebo group, 111 for the AlliTru group. During the trial, 16 placebo group members had more than one cold, while only two of the AlliTru group had more than one cold. The “accelerated relief, reduction in the severity of troublesome symptoms ... and recovery to full fitness” as well as “reduced likelihood of becoming reinfected with other viral strains” clearly demonstrated the effectiveness of AlliTru against the common cold.

AlliTru vs. MRSA

A fact of life in the modern world is the problem of drug-resistant bacteria. With the

widespread overuse of antibiotics for the past 60 years, more and more bacteria are becoming resistant to more and more antibiotics.

Bacteria may become partly (requiring ever higher doses for longer periods of time) or completely resistant to a given antibiotic. A common strain in hospitals (and also spreading to the general population) is MRSA: methicillin-resistant *Staphylococcus aureus*.⁷ The MRSA may cause serious illness, even death in hospital patients.

They may also cause less serious infections, which are not cleared up by traditional antibiotics, even after long periods of treatment. Josling reports on one case of MRSA infection of spinal surgical wounds that had not healed after several years, even with intravenous, oral and topical antibiotic usage. Amazingly, combined use of oral and topical AlliTru cleared the wound infections in a short period of time.⁷ AlliTru is so effective against MRSA that each new production batch of AlliTru is tested against MRSA to establish its antimicrobial efficacy.⁷

AlliTru: Possible Contraindications

Allicin at high concentrations has been reported to be a potentially toxic substance.⁸ The LD50 (lethal dose for 50 percent of test subjects) for mice is 309 mg (309,000 mcg)/kg of body weight for male mice, 369 mg (369,000 mcg)/kg of body weight for female mice.⁸

Assuming humans have roughly the same sensitivity to allicin as mice, a 70 kg (154 pound) person would have to ingest at least 21,630 mg (21,630,000 mcg) of pure allicin to have a 50 percent chance of dying. It would take approximately 360,000 capsules of AlliTru to yield that much pure allicin. Allicin at high concentrations might damage the intestinal lining,⁸ yet Ankri and Mirelman note that no damage was seen to cultured mammalian cells at high concentrations of allicin (100 micromoles, or 162 mcg/ml) if there were unfriendly microbes for the allicin to attack, “suggesting that the affinity of the allicin molecules is towards the parasite targets.”⁵ Since we all have intestines filled with trillions of unfriendly microbes, allicin will have plenty to attack other than our intestinal linings.

A Chinese study found consumption of 20 grams daily of raw garlic reduced stomach cancer incidence 92 percent, while an American study found three or more servings of garlic weekly reduced pre-cancerous colorectal polyps 37 percent, clear indications that allicin at real-world doses is not harmful to the gastrointestinal tract.¹

The main thing to watch for with garlic or allicin supplements is an allergy to garlic/allicin. Such allergies will usually trigger a tell-tale rash which goes away upon discontinuing garlic/allicin.¹⁰

AlliTru: The Garlic Revolution

AlliTru represents the first major breakthrough in delivering the health benefits of garlic in decades. It is the only product that can guarantee the delivery of pre-formed allicin to the body.

And as Larry Lawson, one of the world’s premier experts on garlic has noted, it is primarily allicin and its metabolites that account for most of the amazing health benefits of garlic that have been discovered during 5,000 years of garlic use.¹ AlliTru is effective when taken orally

