

LITHIUM: THE ESSENTIAL BRAIN NUTRIENT

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The natural anti-stress nutrient which can boost mood, reduce stress, improve sleep, and protect you against environmental toxins.

Lithium:
The Essential Brain Nutrient

Boost brain function and reduce stress
naturally.

By Timothy M. Marshall, Ph.D.



Timothy M. Marshall, Ph.D. – using the principles of functional medicine – consults with patients on optimizing health through diet and lifestyle practices, environmental health influences, and the judicious use of high-quality nutritional supplements.

In his own personal pursuit to find a solution to some nagging health problems, he earned his B.S. degree in Biochemistry – with a focus on human health and nutrition, and a Master’s in Medicinal Chemistry. After a few years in Big Pharma, and a few more years as a college chemistry professor, he went on to get his doctorate in Neuropharmacology from the University of Arizona, College of Medicine. His passions include organic living, long walks in the fresh outdoor air, green technology, yoga, eastern philosophy, and helping others achieve greater levels of health and happiness in their lives.

For up-to-date information on current topics in health and nutrition – follow Dr. Tim on Facebook and Twitter:

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Introduction

In this special report, the essential trace mineral lithium will be addressed, and the consequences of lithium deficiency in our society.

Lithium is one of the most misunderstood trace minerals and “brain nutrients” (YES, brain nutrients) of our time. Its medicinal use goes back at least 150 years, where in the late 1800s, lithium was used to treat both mania and depression, but due to the lack of knowledge regarding proper dosing, people were often given too much which led to

improper use and unintentional overdoses.

Though, this didn't deter those who sought to make use of this newly discovered therapeutic mineral. During this time, a number of patented lithium beverages sprung up, as a healthier and legal alternative to alcoholic beverages banned during prohibition (1920-1933). **One of the most famous is "7-Up"**. In an attempt to create an energizing medicinal elixir - to relieve a variety of ailments such as hangovers and upset stomach – Charles Leiper Grigg created (1929) a beverage he called, "7 Up Lithiated Lemon-Lime", presumably because of the mysterious ability of lithium to elevate the mood. (The "7" in the name 7-Up came from the atomic weight of lithium.) The lithium was eventually removed from the formula, but the name remained the same. **7-Up was one of several patent medicine products popular in the late-19th and early-20th centuries.** *In addition to 7-Up, Coca-Cola and Dr. Pepper were two other medicinal beverages (the latter tasting a bit like cough syrup) that gained a lot of popularity – in the late 1800s / early 1900s with a little caffeine (or coca-leaf extract in the case of Coke) and a good helping of sugar to ease headaches, elevate mood, and as an energy tonic.*



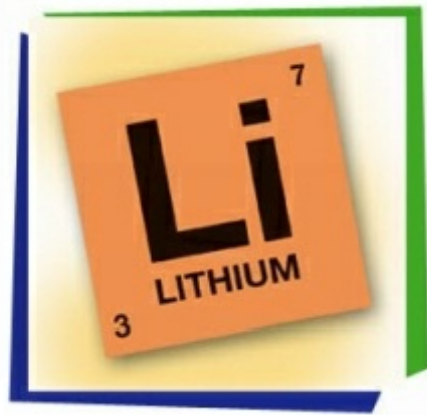
Every so many years, scientists “discover” what they regard as a trace-nutrient previously unrecognized by the medical and science community as a requirement for

human health. It is well-documented that humans require the following trace minerals for general health and well-being, and the prevention of disease: iron, zinc, copper, manganese, molybdenum, selenium, iodine, arsenic, chromium, vanadium, nickel, boron, and now lithium.

Essential Mineral in Human Nutrition

In a recent review published in 2002 by Pérez-Granados and Vaquero in the *Journal of Nutrition, Health, and Aging*, the researchers looked at silicon, aluminum, arsenic and lithium and their effect in human health and disease. The purpose of this scientific review was to take all of the research-to-date on these “ultra-trace minerals” and determine their overall nutritional significance and impact on health -taking into account their possible toxic effects. **The researchers concluded that silicon and lithium have protective roles in human nutrition, while aluminum and arsenic have notably toxic effects.**

We’ve known for years that animals need lithium for reproductive health, and the maintenance of general health and well-being. According to Schrauzer, in his paper (2002) *Lithium: occurrence, dietary intakes, nutritional essentiality*, he states, “ In studies conducted from the 1970s to the 1990s, rats and goats maintained on low-lithium rations were shown to exhibit higher mortalities as well as reproductive and behavioral abnormalities.”



I am lithium.
I am the lightest
of all metals

Li

As someone who has spent the greater part of my life researching and teaching biochemistry, chemistry, and pharmacology – I can say with **zero** degree of uncertainty – that lithium is an absolute requirement in human nutrition. No different than our requirement for zinc, copper, and iron – **if we are low in ANY of these nutrients, we suffer.** The fact is in our modern age of conventional agriculture with its mineral-depleted soils, and the overconsumption of processed foods - most people are chronically deficient in essential trace minerals such as lithium – and are suffering from compromised health as a result.

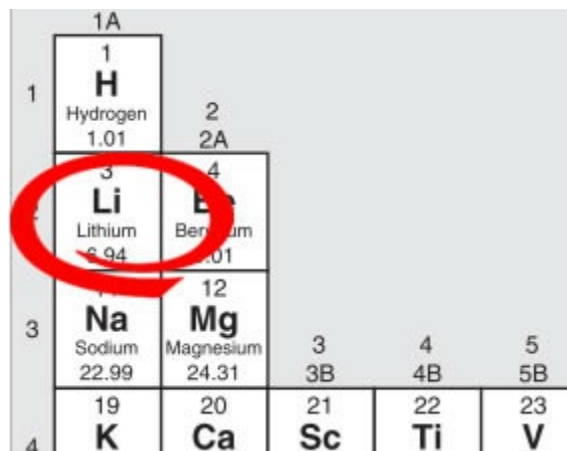
The Minimum Amount Needed (RDA)

In the same 2002 paper, Schrauzer goes on to say, “The available experimental evidence now appears to be sufficient to accept lithium as essential; a provisional RDA for a 70 kg adult of 1,000 µg/day is suggested.”

*Lithium is found in variable amounts in foods; primary food sources are grains and vegetables; in some areas, the drinking water also provides significant amounts of the element. In humans, defined lithium deficiency diseases have not (yet) been characterized, but **low lithium intakes from water supplies were associated with increased rates of suicides, homicides and the arrest rates for drug use and other crimes.** Lithium appears to play an especially important role during the early fetal*

development as evidenced by the high lithium contents of the embryo during the early gestational period. The biochemical mechanisms of action of lithium appear to be multifactorial...with the functions of several enzymes, hormones and vitamins, as well as with growth and transforming factors.

It appears that when people have deficient lithium intakes that they are simply less content and potentially more agitated (reactive) – as seen with increased rates of suicide, homicides, and violent crimes in areas with low lithium in their water supply.



	1A				
1	1 H Hydrogen 1.01	2			
		2A			
	3	4			
	Li Lithium 6.94	Be Beryllium 9.01			
3	7	12			
	Na Sodium 22.99	Mg Magnesium 24.31	3	4	5
			3B	4B	5B
4	19	20	21	22	23
	K	Ca	Sc	Ti	V

Necessary for the Utilization of Folate and B12

With respect to two other critically important brain nutrients, lithium has been shown to enhance folate and B12 transport into cells. The transport of these factors is inhibited in Li deficiency and can be restored by lithium supplementation. In the review article, *Lithium: Occurrence, Dietary Intakes, Nutritional Essentiality*, Schrauzer concluded,

“Since vitamin B12 and folate also affect mood-associated parameters, the stimulation of the transport of these vitamins into brain cells by Li may be cited as yet another mechanism of the antidepressive, mood-elevating and antiaggressive actions of Li at nutritional dosage levels.”



Neuroprotective Effects

Lithium has also been shown to have neuroprotective effects in cerebral ischemia, and may offer significant benefits to those with elevated mercury levels due to mercury exposure from fish and dental amalgams. Symptoms of mercury toxicity include irritability, depression, anxiety, sensitivity to stress, and emotional lability, which interestingly enough are similar to the proposed symptoms of lithium insufficiency in humans. The basis for this similarity, most likely lies in the fact that mercury increases levels of the excitatory neurotransmitter, glutamate, in the brain – and lithium is known to have a modulatory and opposing action on glutamate receptors.

In addition to its neuro-protective effects, lithium is also thought to possess immune boosting activity, most likely through its effect on folate and B12 metabolism – which are both required for nucleic acid biosynthesis, cellular repair and healing, and a strong immune system. Deficiencies in either folate or B12 (essential methyl-donors in numerous biochemical reactions and neurotransmitter biosynthesis) can result in increased susceptibility to infections, slow wound healing, sleep and mood disorders, problems with learning, memory, and concentration – and decreased energy and stamina.

As an essential trace-mineral, lithium is NO different than copper, zinc or any other nutrient we require in sufficient amounts for optimal health.

Safety of Nutritional Doses of Lithium

Multi-vitamins typically contain 0.5-2 mg of copper and 10-30 mg of zinc, which are safe and beneficial amounts for both minerals. If you take too much of either one – you'll have adverse side-effects, and eventual poisoning if the excessive intake is maintained. Like copper and zinc, lithium operates within a range of safety and effectiveness.

In fact, if you compare the relative safety of the two (lithium vs copper), lithium due to its greater water solubility and ease of excretion is actually safer to take than copper, which tends to accumulate in the body – especially with low zinc intakes.

As a neuropharmacologist, and someone who has spent the greater part of my life studying nutritional biochemistry and pharmacology – it is obvious that low-level lithium supplementation (as lithium orotate, the most beneficial supplemental form of the nutrient) – via basic multi-vitamins and nutritional supplements – offers wide-ranging benefits, especially in individuals suffering from depression, anxiety, mood disorders, chronic stress, and exposure to food and environmental toxins such as aspartame and mercury.

The take home message here is simply this – all nutrients operate within a safe-range of intake – for lithium, a safe and beneficial “nutritional” amount for most people is around 1-5 mg per day, though higher amounts (10-30 mg) of organic lithium (orotate) can be safely used (for short-term use) under the supervision of an experienced healthcare professional.

Uses in Clinical Practice

One of the most visible proponents for the use of low-dose (nutritional) lithium is Dr. John Gray – clinical psychologist, and author of *Men are from Mars, Women are from Venus*. Dr. Gray uses lithium (orotate) in his own line of nutritional supplements (Men's and Women's Multivitamins), and has used it extensively in his counseling practice for many years. On his website, www.marsvenus.com, he states the following about lithium: “Lithium orotate is a natural dietary supplement that can be used in small doses to manage stress and treat conditions like depression, ADHD, PTSD and even Alzheimer's Disease.” <http://www.marsvenus.com/p/lithium-orotate>

Dr. Gray states that like other water-soluble nutrients such as the B-vitamins, lithium is lost during times of increased mental and physical activity, and we need higher intakes during these times to maintain optimal health and functioning. He goes on to say that it is of particular use in children and adults with ADD/ADHD, helping to calm the brain, decrease hyperactivity and restlessness, and promote greater attention and focus. In essence, it's balancing an individual's brain chemistry, and simply promoting normal neuronal function (as nature intended) – just like magnesium, zinc, selenium, iron, copper, omega-3 fatty acids, and the entire spectrum of B-vitamins do, as well.

Nutritional doses of lithium have been used with great success by functional medicine practitioners for many years now to treat depression/anxiety, alcoholism, migraines, and neurological conditions -- beginning in the 1960s with German physician, Dr. Hans Nieper in Germany, and continued in therapeutic, nutritional supplements such as Dr. David A. Steenblock's STEMGEVITY (used at excellent neurology clinics such as Dr. Carol Henricks, NorthStar Neurology and Hyperbarics, Tucson, AZ) containing 12 mg of organic lithium. I have no affiliation with Dr. Steenblock's company, other than the use of his product at NorthStar Neurology, and am simply vouching for a well-designed and executed product. In addition to its ability to treat depression/anxiety, headaches, migraines, PTSD, and other neurological conditions – lithium also has

powerful neuroprotective effects. Lithium promotes stem cell production, which is required for all healing processes in the body, including neuronal repair and regeneration.

Stem Cell Mobilizing Formula™

STEM CELLS migrate to damaged and oxygen starved tissues where they help repair, restore and regenerate. This is their normal function. The more healthy stem cells you have circulating, the healthier you are in general.*

Stemgevity™ is a unique formulation of natural, synergistic herbs, vitamins, minerals, and plant extracts that many consider to be helpful for the support of the normal structure and function of your body's stem cells.*

* These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent disease.

STEMGEVITY™
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Dietary Supplement

90 Capsules

Supplement Facts
Serving Size: 3 Capsules Servings Per Container: 30

	Amount/Serving	% Daily Value
Zinc (Amino Acid Chelate)	3 mg	25%
Lithium (Aspartate)	12 mg	*
Inositol	1 mcg	*

Stemgevity™ Proprietary Blend 1476mg *
Atlantic Kelp, Velvet Deer Antler, Pacific Kelp, Blue/Green Algae, Irish Moss, Cinnamon Bark Powder, Ginkgo Biloba Powder, Licorice Root Powder, Alpha Lipoic Acid, Acai Berry Extract (4:1), Goji Berry Extract (20% Polysaccharides), Ginger Root Powder, Nons Fruit Powder, Nettle Root Extract (4:1), Green Tea Extract (45% EGCG).

*Daily Value Not Established
Other Ingredients: Gelatin (capsule), Microcrystalline Cellulose, Silicon Dioxide

Suggested Use: Take three (3) capsules per day, ideally before bed or as directed by your health care practitioner. Typical dose varies from one to 12 capsules per day or as advised by your physician. **Warning:** Persons taking prescription anticoagulants (coumadin) should be monitored closely when taking this blood thinning supplement.

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Low-Dose vs. High-Dose (Pharmaceutical) Lithium

This is a topic of confusion for many, as most people associate lithium, with its use in very high, pharmaceutical doses to treat psychiatric disorders such as manic depression and schizophrenia. The doses in these cases (300+ mg/d) are typically 20-100 times greater than what we get in our diet, and that are used in nutritional therapeutics (5-10 mg/d).

It's important not to confuse less bioavailable forms of lithium (ie. lithium carbonate, citrate), which require high doses to achieve the desired therapeutic endpoint (accompanied with numerous side-effects due to the high doses used) – with that of the highly bioavailable, well-absorbed organic chelates (ie. orotate, aspartate) which require much lower doses. With lower doses, come markedly reduced side-effect potential, and that goes for all chemical agents, whether it be a nutrient, drug, preservative, etc.

In the case of lithium (orotate), it has virtually NO side-effects at the low doses (5-10

mg/d) recommended. There's the possibility for a little sedation, as is the case with nutritional doses of magnesium, which also has a calming effect on the nervous system. Since, both are readily excreted, water-soluble nutrients, this can be quickly remedied with a little caffeine in the form of tea, coffee, or chocolate, which will not only perk you up and give you a little energy boost, but are also good diuretics that promote the excretion of all things water soluble.

In comparing the doses of lithium carbonate (600-1800mg/day of Li carbonate, 114-342 mg of elemental Li) used to treat bipolar disorder to that of low-dose (5-10 mg/day) lithium, the amount of elemental lithium given pharmaceutically is approximately 23 to 69 times greater (114-342 mg vs 5 mg) – than the standard 5 mg “nutritional dose” of lithium – and rests against the toxicity threshold for lithium, which is why there are numerous side-effects seen at such high-doses.

Dose is the defining aspect in pharmacology and all of medicine. If an individual suddenly went from taking 15 mg of elemental zinc per day (the RDA for Zn) to a twenty times greater dose – 300 mg of zinc per day – they would immediately begin to suffer from numerous side-effects and zinc toxicity.

Lithium is no different. It's the dose that dictates the effect, and if you can achieve that with less drug (or nutraceutical), in the case of lithium (orotate), you will have the nutritional and therapeutic benefits of lithium - without the nasty side-effects seen with high-dose conventional lithium therapy (carbonate or citrate).



Natural Sources of Lithium

Lithium is found in a variety of foods, and is highest in seafood, fish, pastured egg yolks, organic tomatoes, mushrooms, organic dairy products, and mineral-rich foods such as nuts, seeds, and cacao. The level of lithium in fruits and vegetables depends on the soil on which the plant is grown – thus nutrient-rich, “organic” (using sound agricultural practices) soils will have higher concentrations of this mineral.

A Few Final Words

Holistic medical professionals have been using lithium orotate and aspartate for over two decades now – usually in combination with other anti-stress nutrients such as organic magnesium (6-800 mg per day), selenium (200 mcg per day), zinc (15-30 mg per day), and the B-complex vitamins for their stress-reducing benefits. Together, these nutrients work together to calm, balance, and nourish the brain and nervous system.

In our modern age, we are continually confronted with challenges in both our food and environment. **Excitotoxins such as aspartame, MSG, sucralose, mercury, and artificial colors (e.g. Red #40) and preservatives (e.g. BHT, tBHQ)** activate and stress the nervous system, and can produce a number of adverse effects such as depression, anxiety, hyperactivity, irritability, sensitivity to stress, sleep disturbances, insomnia, and chronic fatigue.

As the research shows, lithium positively effects virtually all body systems – from the immune system, to the heart, to reproductive health, to blood sugar regulation, to its neuroprotective effects (protecting against mercury toxicity), and positively contributing to one's emotional health and resistance to stress. Much like a magnesium deficiency makes the body more reactive to stress and can compromise one's health on many levels - as does an insufficient intake of lithium in the diet.

I truly believe this information has the capacity to transform many lives for the better, and change the way we look at "mental illness". Just as deficiencies of vitamin D and magnesium in the body can predispose an individual to depression and other symptoms of psychological distress such as anxiety and poor stress tolerance, so can a lithium deficiency. **Lithium has been shown to promote the cellular uptake of two important brain nutrients, folic acid and B12.** This in and of itself, has major implications for lithium's use in treating depression – as its well-known that folic acid and B12, as functional methyl-donors, play a major role in neurotransmitter biosynthesis – and deficiencies (or poor uptake) of either can lead to symptoms of depression, mental illness, memory problems, and poor cognitive performance.

Like many nutrients, including magnesium, selenium, zinc, vitamin C and the B-vitamins – extra amounts of organic lithium (through supplements, or natural mineral-rich sources of lithium such as dark chocolate, eggs, oatmeal, etc) can be beneficial during times of increased physical and emotional stress.

As someone who has spent the greater part of my life studying chemistry, nutritional biochemistry, pharmacology, and functional medicine – from the published research and available clinical information, it is obvious that low-level lithium

supplementation (ie. lithium orotate or aspartate) – via basic multi-vitamins, and nutritional supplements – have the potential to offer wide-ranging benefits to the health and well-being of our society at large.

It's my hope that this information will benefit and serve you and the ones you care for – with greater health and resilience for years to come.

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Hashimoto states, “Taken together, our results provide a new insight into the molecular mechanisms involved in lithium neuroprotection against glutamate excitotoxicity. To elucidate molecular mechanisms underlying the neuroprotective and neurotrophic actions of lithium, we employed a preparation of cultured cortical neurons prepared from embryonic rats. We found that treatment with therapeutic doses (0.2-1.2 mM) of lithium robustly protects cortical neurons from multiple insults, notably glutamate-induced excitotoxicity. The neuroprotection against glutamate excitotoxicity is time-dependent, requiring treatment for 5-6 days for maximal effect, and is associated with a reduction in NMDA receptor-mediated Ca²⁺ influx.” **An excess body burden**

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