Lithium: Under-Appreciated Brain Nutrient & Protector
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How Lithium Came to be Feared
The trace element lithium has an odd history in human nutrition and therapy. Discovered decades ago to have anti-mania, anti-bipolar effects by the psychiatrist Cade, lithium became the classic treatment for this mental disease. The anti-manic doses were, however, very high and close to the level at which the thyroid, kidneys, and other organs can be seriously damaged. Many lithium users over the years have in fact been injured by it. Using high-dose lithium as monotherapy ("magic bullet" therapy), especially absent an appropriate integrative and nutritional context, is risky business. This history, sadly, has tarnished the reputation of a wonderful trace element with great preventive and healing potential, pigeon-holing it as a "toxic drug". But as this article will describe, small amounts of lithium — nutritional amounts — protect the brain, improve mood and behavior, and may (surprisingly!) help resolve the crime problem. Small amounts are present in most of our foods, and lithium is likely to be an essential nutrient.

Natural Occurrence of Lithium
Lithium occurs naturally in many common foods and drinking waters. Everyone is exposed to small quantities of lithium. The U.S. Environmental Protection Agency (EPA) estimates that the average daily lithium intake of Americans ranges from 650 to 3100 mcgs (micrograms).

Common vegetables and spices such as coriander seeds and leaves, nutmeg, cummin seeds, tomato and garlic, are rich in lithium. Lesser amounts are found in onions, green chillies, and cauliflower. Millet, and some varieties of lentils, are also rich in lithium, though rice and wheat contain little. Some rock salts, and crude sea salts, are rich in lithium, as are seafoods and sea vegetation. Seaweeds can be very rich in lithium.

Lithium Waters & Soft Drinks
High levels of lithium are present in some of the world's famous "spa" waters with claimed healing properties. In the late 19th century, the Lithia Springs Sanitarium, in Georgia, was built next to a natural source of lithium water. Rich in naturally-occurring lithium, the water was said to be useful in the treatment of alcoholism, opium addiction, compulsive behavior, and many other conditions. It was described as "eminently tonic in its effects", assisting in recovery from debilitating infections.

The popular soft drink 7-Up was created by Charles Leiper Grigg two weeks before the Crash of 1929. The lithium-laced drink was originally named "Lithiated Lemon Soda" before the name was changed to 7-Up. The soda was marketed as a hangover cure and general tonic that "neutralizes the acid blood... [and] soothes and smooths the ragged nerves." As we will see, these claims are not without some basis in reality.
Many products of that era were lithiated, lithium-rich waters from various wells and spas were widely promoted, and lithium was touted as a sort of panacea. Lithia water was recommended by medical men for the treatment of numerous conditions. The Londonderry Lithia Water company sponsored the first female round-the-world cyclist.

Clearly, small background amounts of lithium have been with us forever, and they pose no risk. Even considerably higher amounts of lithium — though still shy of the huge doses conventionally used to treat bipolar illness — also appear to be harmless and even beneficial.

An Essential Nutrient?

After decades of research, it appears that lithium is an essential nutrient. Lithium is normally present in all organs and tissues of both humans and animals. Lithium-deficient goats develop mammary cysts and inflammation, enlarged salivary glands, adrenal gland abnormalities, and ovarian cysts. One net effect of this deficiency state is to impair lactation and reproduction.

Gerhard Schrauzer, one of the world's top lithium authorities, 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. In humans...lithium deficiency diseases have not 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."

Regarding the likelihood of a human requirement for lithium, Schrauzer further writes (based on an exhaustive review of the scientific literature):

"For humans, the available evidence suggests that assuring adequate lithium intakes for the general population could provide substantial health and societal benefits... Based on lithium intake data in different countries, a provisional RDA of 1 mg lithium/day for a 70 kg adult can be proposed... which can be reached by diet alone in lithium-adequate regions."

It is true that that level of intake "can be reached by diet alone in lithium-adequate regions". A problem, however, is that some regions are not lithium-adequate. Another problem is that such a conservative amount may not (probably does not) confer all of the benefit of which the element is capable. See the section below on "Finding the Right Dose."

Lithium, Crime & Mood

In the early 1970s researchers in Texas found a negative association between drinking water lithium levels and state mental hospital admissions for psychoses, neuroses, and various personality disorders: the higher the lithium, the fewer the admissions. They also found that homicide rates were negatively associated, as well: higher lithium, fewer homicides. These findings were later confirmed and extended by researchers in California and Venezuela. The incidence of suicide, homicide, rape, robbery and burglary was found to be much higher in countries where drinking water supplies contained little or no lithium, as opposed to countries with water lithium levels of 70 to 170 micrograms per liter. There was also a negative association of water lithium levels with heroin- and cocaine-related arrests and, in youngsters, with running away from home. They also found that hair lithium levels of

![Crime reduction](image)
imprisoned violent offenders were drastically lower than non-violent controls.

The authors of these studies suggest a general lithium dose level of about two milligrams per day, commenting that:

"lithium at low dosage levels has a generally beneficial effect on human behavior, which may be associated with the functions of lithium as a nutritionally-essential trace element. Subject to confirmation by controlled experiments with high-risk populations, increasing human lithium intakes by supplementation, or the lithiation of drinking water, is suggested as a possible means of crime, suicide, and drug-dependency reduction at the individual and community level."

L F Saugstad, of the University of Oslo, concurs. He writes that "lithium is a robust neurotropic agent, and lithiation of the drinking water could be a way of reducing suicide, homicide, violent behaviour, and drug abuse".

In a placebo-controlled trial with former drug users (heroin and amphetamines), 24 subjects were divided into two groups, one receiving 400 mcg of lithium per day, the other placebo, for four weeks. In the lithium group, positive mood test scores increased throughout the study, especially in the areas of "happiness", "friendliness" and "energy". There were no positive changes in the no-lithium controls.

It is intriguing that the reported behavioral and emotional benefits of low-dose lithium reflect the experience with lithium water (above) in the 1880s: useful, they said, in alcoholism, opium addiction, compulsive behavior, and many other conditions, with an action that is "eminently tonic".

Significantly, lithium enhances cellular folic acid and B12 uptake. These two vitamins are crucial for normal mood and cognitive function, and prevention of brain disease, among many other roles. In Schrauzer's words: "the stimulation of the transport of these vitamins into brain cells by lithium may be cited as yet another mechanism of the anti-depressive, mood-elevating and anti-aggressive actions of lithium at nutritional dosage levels."

In sum, the evidence suggests that low-dose lithium is a gentle mood-brightener, an inhibitor of violent, aggressive and anti-social behaviors, and an aid in impulse control problems, including alcoholism and addictions. All this is consistent with a possible serotonergenic (serotonin-enhancing) action of lithium, and there is in fact some direct evidence for this.

**Lithium & The Brain**

Exciting recent scientific work suggests that lithium can protect the brain from neurotoxic chemicals, and — very likely — delay the development of neurodegenerative diseases such as Alzheimer's. Lithium has neuroprotective effects, and stimulates the newly-discovered process of neurogenesis, or growth of new neurons, in the brain.

Researchers at the U.S. NIH, led by Dr Husseini Manji, have found that lithium can protect the brain from the steady tissue loss that occurs, over years, in bipolar illness and depression. Some sufferers can have up to a 40% reduction in the amount of gray matter in the frontal cortex of the brain! However, in patients treated with lithium for a long time, this brain shrinkage either does not occur, or occurs to a much lesser extent.

Further, administration of lithium actually induces partial re-growth of the brain in the areas that had been most affected. In an interview, Dr Manji remarked that "Our working hypothesis...is that lithium is turning on some of these growth signaling pathways and reversing the damage. It seems that the cells are shrunken, not dead... [lithium seems to be] turning on the signaling pathways that produce growth factors..."
in the brain, such as brain-derived neurotrophic factor”.

Regarding dose, Dr Manji further commented: "We've done a number of animal studies with low-dose lithium. We found that in animals, with a dose of lithium that is 1/2 or 1/3 of a usual dose, you still get a large increase in bcl-2, a neuroprotective protein. This suggests that it is quite possible that even low-dose lithium will exert these effects."

**Finding the Right Dose**

Lithium carbonate used in psychiatry, in the treatment of bipolar, has about 20% elemental lithium in it (the 80% is the "carbonate" part, not lithium). Hence, the typical dose of 900-1800 milligrams per day of lithium carbonate supplies about 180-360 milligrams of elemental lithium. *This* is the range that has potential long-term toxicity to the thyroid and other organs. The much smaller "nutritional" amounts in the low milligram range — say, 2-20 milligrams per day — are harmless and almost certainly beneficial.

Aforementioned studies showed that a lower incidence of terrible events like suicide, homicide, rape, and robbery were associated with very modest amounts of lithium in the drinking water: in the scores or low hundreds of micrograms per liter. It would seem that these very low levels were adequate for prevention of the worst symptoms of "lithium deficiency". But what would be an *optimum* lithium level — a level that not only prevents serious symptoms, but that fosters robust good health and positive mental and emotional status? No one knows, for sure. But the orthomolecular principle of seeking an optimal level makes more sense than being satisfied with mere survival — settling for an amount that only prevents some terrible deficiency disease or symptom (such as, in this case, homocidal mania). Being free from florid disease or insanity is good, but being *fully well* is better.

Based on everything now known, and on the orthomolecular principle of seeking a truly optimal level of exposure, it is reasonable to suggest that a prudent preventive dose of lithium for most people is in the range of 2-20 milligrams per day — still within the range of possible intake from whole lithium-rich foods such as fish and seaweed, or lithium-rich waters. Larger amounts, in the 25-100 mgs/day range might be considered *experimental* orthomolecular doses — *to be used only under the supervision of a doctor* — for neuroprotection and neuro-restoration after injury, prolonged depression or stress, long-time alcoholism or drug addiction, or other conditions causing brain atrophy. Such doses would be on the order of the "one-half or one-third of a usual dose" (above), as indicated by Dr Manji, for stimulating production of neuro-restorative proteins (BDNF and bcl-2). Such doses were also approached by imbibers of the famous Lithia Springs lithium waters: at about 150 mgs per liter of lithium bicarb (see figure 1), each liter would supply about 15 mgs of elemental lithium (lithium bicarb being about 10% elemental). Consumers might drink 1-2 liters per day, or more, in addition to bathing or soaking in it.

**Lithium In Pacific BioLogic Products**

Pacific BioLogic's *Grounded®* contains 125 milligrams of lithium orotate per 9.4 gram serving. This supplies slightly less than 5 milligrams of elemental lithium — a modest nutritional amount, far below any level that would be a cause for concern. Multiple doses of *Grounded®* can be used, daily, with benefit and without risk.

Lithium orotate has also been added to Pacific BioLogic's *Limbic Balance Evening Formula* — a popular serotonergic mood-booster — in the amount of 25 milligrams per capsule, for an
elemental lithium value of slightly under one milligram per capsule. Since lithium is a serotonin-boosting nutrient, and generally has properties that are consistent with the intent of the Evening Formula, it is the perfect new ingredient.

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