

# Nutritional Lithium

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There are numerous minerals that are critical to the human body. Are there vital elements that are also necessary for the optimal functioning of the human brain? Is lithium one of these essential minerals in the central nervous system?

Lithium is a natural salt. Drinking water is the most common source of nutritional lithium although it also occurs naturally in some plant-derived foods. Although a lithium deficiency syndrome has not been identified, people who are deficient in lithium intake can exhibit unstable moods, increased agitation, and increased rates of homicide, violent crimes, and

suicide. No other medication has demonstrated a comparable effect on suicide prevention, including antidepressants. It appears that exposure to low doses of lithium exert anti-aging properties and promote longevity in humans further supporting its role as a nutritionally essential mineral.

Lithium is the oldest, and still one of the most effective, psychotropic medications. Most of the studies cited in this article describe the effects of lithium at micro-doses that can be hundreds of times lower than what is typically prescribed for the prevention of mania. Ultra-low dose lithium is not to be confused with pharmaceutical lithium. This is lithium as a nutrient, not a drug.

**Key Words:** Drinking water; Lithium; Antidepressants

## INTRODUCTION

There are numerous minerals that are critical to the human body. It is a well-established fact that we could not live without them. Are there vital elements that are also necessary for the optimal functioning of the human brain? Is lithium one of the essential minerals in the central nervous system?

Lithium is a natural salt. Drinking water is the most common source of nutritional lithium although it also occurs naturally in some plant-derived foods. Although a lithium deficiency syndrome has not been identified, people who are deficient in lithium intake can exhibit unstable moods, increased agitation, and increased rates of suicide, homicide, and violent crimes [1].

In a seminal study conducted in Texas, communities that had naturally occurring lithium in the drinking water were associated with lower rates of suicide, homicide, burglary, rape, drug-related arrests, and drug dependency compared to communities with little to no lithium in the water supply [2].

Many studies have confirmed lithium's ability to reduce pathological aggression, hostility, and violence [3-5] and it is one of the only agents approved for hyper-aggression. Lithium's ability to reduce impulsivity and aggression may be responsible for its significant anti-suicidal properties [6].

No other medication has demonstrated a comparable effect on suicide prevention – including antidepressants [3]. Naturally occurring lithium in drinking water is associated with a substantial reduction in suicide rates [7]. Community water supplies with natural low-dose lithium have a risk reduction to suicide as high as 60 to 80% [8,9].

It is not impractical to suggest lithium supplementation for people living in lithium-deficient regions [8]. When one considers that suicide is one of the leading causes of death in the industrialized world, there might be a public health rationale for fortifying public water supplies that are deficient [2]. Here in Alaska, this notion has particularly profound implications. Some of our Northern and Southwestern regions suffer suicide at rates that are almost double countries with the world's highest suicide rates [10].

In addition to mitigating suicide, the effect on reducing general crime, homicide, rape, and drug-dependency with trace lithium is compelling [8].

Lithiation of drinking water would certainly have a more dramatic effect on public well-being than fluoridation of drinking water.

Low dose lithium has also demonstrated an ability to prevent and delay relapse in people suffering from alcoholism as well as stabilize and improve mood in drug users [11].

The neuroprotective properties of lithium have popularized over-the-counter ultra-low-dose organic lithium products. Lithium ions not only prevent cognitive loss but also enhance the growth of neurons and increase grey matter volume. This disease-modifying effect has important implications for Alzheimer's disease [12]. Microdose lithium not only slows the progression of dementia but also exhibits some therapeutic improvement on cognitive scales in just three months after starting treatment [13,14]. Exposure to microlevels of lithium on learning and memory were confirmed in a recent nation-wide population-based study that revealed an inverse association between incidence of dementias and trace lithium in drinking water [15].

An interesting and unexpected finding of lithium's effects has been its anti-aging properties. Populations who consume low-dose lithium in their drinking water are associated with reduced mortality from all causes [16]. The reduction in mortality is independent of lithium's effect on suicide prevention. It appears that exposure to trace doses of lithium exert anti-aging properties and promote longevity in humans further supporting its role as a nutritionally essential mineral.

There are several mechanisms by which lithium yields its effect on human physiology. By upregulating neurotrophins, brain-derived neurotrophic factor (BDNF), and nerve growth factors, lithium has the ability to enhance the growth of neurons. This accounts for its potential as a treatment for traumatic brain injury, spinal cord injuries, and stroke as well as for Alzheimer's, Huntington's, and Parkinson's diseases [17].

Lithium ions induce stem cell production and can therefore stimulate blood cell proliferation as well as formation of neural stem cells. Increasing the density of grey matter, enlargement of the hippocampus, and cortical thickening as well as inhibition of the amyloid promoting enzyme, glycogen synthase kinase-3 beta, contribute to lithium's disease modifying actions in the pathophysiology of dementia [1].

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In addition, lithium ions affect neurotransmission by modifying synaptic concentrations of serotonin, dopamine, GABA, and glutamate. Lithium has inherent anti-inflammatory and antioxidant actions. Its ability to inhibit the production of free radicals and reduce inflammation likely account for lithium's anti-aging and longevity promoting effects [14].

By promoting neurogenesis, lithium can augment and potentiate the actions of antidepressant medications. Lithium is an effective adjunct to psychotropic medications with modest evidence for accelerating the actions of antidepressants [18]. Depressed patients that do not respond or partially respond to antidepressant medications have also exhibited improvement and remission with adjunctive lithium [19]. Even in trace doses, lithium ions exert anti-depressive and mood stabilizing properties [5].

Lithium is the oldest, and still one of the most effective, psychotropic medications. Most of the studies cited above describe the effects of lithium at micro-doses that can be hundreds of times lower than what is typically prescribed for the prevention of mania. Ultra-low dose lithium is not to be confused with pharmaceutical lithium. This is lithium as a nutrient, not a drug.

The pharmaceutical doses used to prevent mania are up to 20-50 milligrams per kilogram of body weight corresponding to as much as 1,800 milligrams of lithium carbonate per day. At these dosages, patients must be monitored for gastrointestinal symptoms, neurological signs, cardiac arrhythmias, and renal function.

Lithium's side effects are dose-related. At the trace levels described in these studies, adverse effects were nearly non-existent. Nutritional lithium, consumed through drinking water, plant-based foods, or low-dose supplementation, is a well-tolerated naturally occurring nutrient. The World Health Organization recognizes lithium as a nutritionally essential trace element. A recommended dietary allowance has been suggested for as little as 1 milligram per day [20].

Organic lithium, such as lithium orotate or lithium ore, is a stable form of lithium as it occurs in nature and is used in over-the-counter supplements. The inorganic metal used in psychiatry, lithium carbonate, is less stable and ionizes quickly and is therefore less bioavailable. This suggests that an equivalent dose to the naturally occurring salt that could be prescribed in the clinical setting might be around 150-300 milligrams of lithium carbonate per day.

The studies cited above are the pooled results from observations of over several million subjects. The evidence for the role of trace lithium is compelling. Low-dose lithium is a well-tolerated and inexpensive remedy. This nutritionally essential trace mineral has the potential to contribute significantly to the well-being of our patients.

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