Natural Sources of Lithium

There are several natural sources of lithium. Your lithium intake may depend on the foods you eat and the soil where these foods are grown. A study in the "Journal of the American College of Nutrition" states that lithium may be important for early fetal development, and for the proper functioning of enzymes, hormones and vitamins. This study states that a tentative RDA is set at 1,000 mcg per day for an adult who weighs 70 kilograms, or about 154 pounds. Lithium is also used as a medication to manage bipolar disorder. It decreases abnormal brain activity, according to Medline Plus.

Grains and Vegetables

Lithium is naturally present in many grains and vegetables. According to a study published in the "Journal of the American College of Nutrition," grains and vegetables may comprise 66 to 90 percent of a person's lithium intake. If you eat 0.85 kilograms of fruits and vegetables, the lithium level is 0.5 to 3.4 milligrams/kilograms. The study states that a diet rich in vegetables and grains may provide you with more lithium than a diet rich in animal products. However, the amount of lithium varies, depending on the amount in the soil where the plants grow.

Animal Products

Although the majority of lithium is found in plant sources, some lithium may also be obtained from animal food sources. The study in the "Journal of the American College of Nutrition" reports that a food intake of 0.44 kilograms of dairy foods per day has a lithium content of 0.50 milligrams/kilograms. Meat also contains lithium. If you eat 0.21 kilograms of meat per day, you'll get a lithium content of 0.012 milligrams/kilograms.

Soil and Water

Lithium occurs naturally in soil. From the soil, plants take up lithium, and when you consume plant foods you receive this lithium content. Lithium can also be obtained from water sources. The "Journal of the American College
The discovery of lithium (Li) in 1817 is attributed to J.A. Arfwedson. Bervzelius proposed the name for the element based on the Greek word *lithos*, meaning stone (2). Lithium is widely distributed in relatively small quantities throughout the earth’s crust. A number of studies have involved the determination of total Li in soils. Steinkoenig (3) sampled soils in the United States and found 10 to 100 ppm Li. Subsequently, Soviet investigators reported lower levels ranging from 10 to 50 ppm Li (4,5,6), while Swaine (7) found wide variation in mineral-rich soils with 8 to 400 ppm Li. However, it is improbable that the total Li in soils is available for uptake by plants. The Li that can be extracted from soils in California ranged from 0.1 to 0.9 ppm (8), while higher levels, 0.4 to 2.5 ppm, were contained in saline Indian soils (9). Insufficient information is available concerning the relationship between Li which can be extracted from the soil, and the quantity of Li absorbed by plants. Aldrich et al. (10) found increases of Li concentrations in lemon leaves with decreasing soil pH in greenhouse studies.

**Herbs**

Another good food source for lithium is in herbs. Adding herbs to food for flavor is an excellent way to get lithium while seasoning food. Some herbs like chamomile can be used in tea.

**Vegetables**

The vegetables that are highest in lithium content are the nightshade vegetables—potatoes, peppers and tomatoes. Any vegetables, however, contain lithium to some degree because they take up the lithium from the soil.
LITHIUM OROTATE DOSAGES HAVE A HIDDEN DANGER

It’s true, the original recipe for Coca-Cola included cocaine as a pick-me-up. Dr Pepper had prune juice in it to keep your bowls moving.

But where did the “up” in 7 UP come from?

Not cocaine, but lithium citrate.

Before being shortened to just 7 UP, its full name was Bib-Label Lithiated Lemon-Lime Soda. It was marketed as being a mood-stabilizing beverage and conveniently, the timing of its launch was just right – two weeks prior to the stock market crash of 1929.

After that, people definitely wanted some mood stabilizing! It propelled Charles Leiper Grigg’s invention to become one of the bestselling beverages of all time.

Apparently... somehow... all of that sugar is supposed to be “slenderizing” and help hangovers, too. For the low down on the scandalous history behind 7 UP, Coke, and others, see Fizz: How Soda Shook Up the World.
By 1948, lithium citrate was banned and ever since then, 7 UP has been without it. However the reason it was banned was not because of the purported mood boosting benefit. It was because people were using it as a salt substitute on food, in hopes of combating cardiovascular disease. That’s actually what doctors were advising back then.

You see on a molecular basis, lithium is almost the same as sodium. Both have the same number of electrons.

But the subbing of salt with lithium on food led to other health problems – major kidney and thyroid dysfunction. Hence, its use was banned in food and beverages and that meant the 7 Up recipe had to be changed.

How the mineral is used today

Today it’s not lithium citrate, but rather lithium carbonate that’s used for a class of prescription drugs known as antimanic agents. The first was approved by the FDA in 1970.

As with almost all psychiatric medications, scientists can’t say precisely how it works.

The theory is that neurons can’t tell the difference between it and sodium. As a result, when a little gets inside the brain, it changes the overall sodium gradient. This helps to stabilize overexcited nerve cell membranes, which are believed to be more common in people with bipolar disorder and manic depression. (1)

Those mental health conditions also correlate with lower levels of GABA (gamma-aminobutyric acid).

However unlike other psychiatric medications, lithium is not believed to boost GABA levels. Instead, it has been theorized to help offset the side effect of low GABA – the overstimulation of neurons. This mineral may lower brain glutamine levels, but probably not glutamate. Increasing cerebral gray matter has also been seen in research. (2) (3)
Those are the best guesses of how it works.

While they may not know the exact mechanism, they do know it works for many people with bipolar disorder and manic depression. It is one of the few drugs which has been found to dramatically reduce suicide rates. (4)

A meta-analysis of 45 studies involving some 33,000 patients found that those who were being treated with prescription lithium had a 5-fold reduction in suicides and/or attempts when compared to other treatments. (5)

**But how about people without bipolar disorder or mental health issues? Might different forms of this trace mineral benefit human health as a dietary supplement?**

“Should We All Take a Bit of Lithium?” was the title of an opinion piece that ran in *The New York Times* a couple years back. The author, Anna Fels who is a prominent psychiatrist, stated that many scientists believe it should be classified as an essential trace mineral and that lithium microdosing might offer brain health benefits. (6)

A professor of psychiatry at Tufts University, Dr. Nassir Ghaemi, was quoted in the article as saying:

“**Lithium is, by far, the most proven drug to keep neurons alive, in animals and in humans, consistently and with many replicated studies. If lithium prevents dementia, then we may have overlooked a very simple means of preventing a major public health problem.**”

Why does he believe that? There’s quite a bit of research to support his theory, including these two studies that were mentioned by The New York Times:

- A Japanese study looked at over a million people during a 5 year period and the composition of their water supply. Those who lived in areas with naturally higher lithium content had fewer suicides and even lower levels of “all-cause mortality.” (7)
A study in Texas looked at 27 counties over a decade and found that the areas with higher amounts of this trace mineral in the municipal water supply had lower rates of suicides, homicides, and rapes. (8)

To be clear, as a dietary supplement, no health benefits of lithium have been proven. It should not be used to treat, cure, or prevent any disease. Many are calling this mineral the next big nootropic (brain supplement) and using a low dose daily in addition to their multivitamin (since none contain it).

Not because of low GABA levels or for boosting grey matter, but rather based on the theory that it might be an important trace mineral. A mineral that the modern diet of filtered water and processed food contains less of.

Some supplements combine it with other purported “feel good” ingredients, like 5-HTP (5-hydroxytryptophan), bacopa, and DHEA.

What is lithium orotate?

Lithium orotate is used as dietary supplement only. Lithium is combined with the mineral salts of orotic acid (orotates) instead of carbonate ions (which is lithium carbonate). In other forms, orotates are naturally found in living organisms. Some believe they act as electrolyte carriers for distributing minerals – such as lithium – throughout the body, but that remains theoretical and unproven.

Foods high in lithium orotate?

It is true that lithium is a trace alkali metal naturally present in the soil. Some of the richest known dietary sources of it include milk, eggs, tomatoes, cucumbers, mushrooms, black tea, and natural spring water. Given its prevalence in the environment, at least some very minute amount is in just about everything you eat and drink. However, natural lithium is not known to exist in the orotate form. That means there are no foods that contain lithium orotate. (9) (10)

Does lithium orotate work?

No, or more accurately stated, it has never been proven to offer benefits for general health or any condition. Its safety is also unknown. The controversial German scientist Dr. Hans Alfred Nieper patented it in the 1970’s and believed it might be effective in the treatment of depression, alcoholism, epilepsy, migraines, and recurring headaches. None of those have been validated.
The controversial history

In the PubMed database of nearly 30 million medical literature citations, you will only find 9 mentions of this compound. Only 2 out of those 9 are lithium orotate studies involving humans.

The first was published in 1973 by Dr. Hans Nieper himself. A total 64 patients were monitored as they used lithium orotate, for time spans ranging from 4 to 30 months. In the paper, he alleged it to be useful for a hodgepodge of diseases (those previously listed) but despite his hyperbole, it would not have been possible to evaluate all of those different things in a single study like this. (11) (12)

The only other human study which evaluated benefits was published in 1986. Though a more accurate description would be to call it a collection of case studies, since their treatments were not concurrent and each person had a gamut of different medical issues. That makes comparing them nearly impossible.

- 42 alcoholic patients were included (33 men and 9 women).
- In addition to alcoholism, it was noted that some suffered from seizures, hyperthyroidism, headaches, liver cancer, and lung cancer.
- Monitoring of these patients ranged from 6 months to 10 years.
- 150 mg daily of a lithium orotate dosage was used by these patients for varying lengths of time.

Authored by only one person (HE Sartori), the study’s author claimed that lithium orotate benefits were evident based on the following:

- 12 patients had no relapse in drinking for 6 to 12 months.
- 13 went for 1 to 3 years.
o 10 went for 3 to 10 years.

Side effects observed with lithium orotate included mild apathy, reduced appetite, and muscle weakness. When the 150 mg recommended dosage was changed from daily to only 4 or 5 times weekly, he claimed these adverse reactions went away. (13)

**With no placebo group, no blinding of treatment or results, and the fact that it was actually a collection of case reports makes it an interesting read, but not anything more.**

That’s the only published data related to alcohol and clearly, it’s far from being proof. So how about all the other things that user reviews and testimonials mention using the supplement for. Is lithium orotate good for depression, migraine headaches, and insomnia as some people allege?

No one knows.

**It is true that lithium (not specific to any type) does appear to have a calming effect on the brain,** if it can cross the blood-brain barrier and get inside. This is why lithium is used for manic depression and symptoms associated with it such as anxiety. Off-label, doctors have also used it for treating irritability in post-traumatic stress disorder (PTSD). (14)

**Though to be clear, all of those medical uses involve the prescription lithium carbonate in some form (e.g. Lithane and Lithobid).** Doctors are not using lithium orotate for depression, PTSD, ADHD, OCD, better sleep, quitting smoking, or any of the other things you may read about on blogs and forums.

The idea of switching from lithium carbonate to lithium orotate for bipolar disorder or any other mental health condition would be extremely dangerous. The former has been used for nearly five decades as a well-researched medical treatment. The latter – the orotate form – has *never* been used medically.

How long does lithium orotate take to work? No one would even be able to answer that question. Its half-life and what it does in the human body is unknown. Even *if* it were to cross the blood brain barrier (unproven), you still would not know how quickly does it work (absorption rate) and how much lithium orotate should I take, because bioavailability is unknown.
Published in 1978, a rat study did compare lithium orotate vs. lithium carbonate. The three scientists claimed that 2/3 of the mineral could be detected in blood serum after 24 hours, which would suggest in rats its half-life is longer than 24 hours. That would make sense with any form though, because lithium’s half-life is known to be longer than day in humans. (15) (16)

They also claimed that at the 24 hour mark, the lithium levels in the brain were around 3x higher on the rats given the orotate versus those on the carbonate.

Now for the big surprise...

Skeptical of the 1978 study, three other scientists repeated the same experiments in a study one year later. They reported:

“The higher lithium concentrations could be accounted for by the lower kidney function. It seems inadvisable to use lithium orotate for the treatment of patients.”

In other words, the reason more was detectable in the blood was because the kidneys of the rats were temporarily failing!

The kidneys couldn’t process the mineral as effectively, and hence, levels were higher after 24 hours. It was said that the “glomerular filtration rate and urine flow were markedly lower” when compared to the rats getting lithium carbonate or a placebo injection of the same dosage. (17)

It may just be a rat study, but it’s still evidence of this form being bad for kidneys. Possibly much worse than other forms of lithium.
Lithium orotate side effects

With no human clinical trials, the risk of adverse reactions is unknown. The following are based on experiences shared by orotate supplement users and the known side effects from non-orotate lithium.

- Abnormal kidney function
- Hypothyroidism
- Apathetic feelings
- Brain fog
- Increased sex drive (libido)
- Drowsiness
- Short-term memory loss
- Insomnia
- Dizziness
- Nausea/vomiting
- Headaches
- Muscle weakness
- Hand tremors
- Joint pain
- Change in appetite
- Increased thirst
- Abdominal pain
- Liver abnormalities
- Intestinal inflammation
- Diarrhea
- Constipation
- Reduced magnesium levels
- Acne
- Hair loss
- Unknown pregnancy safety
- Passes into milk during breastfeeding

Many of the reactions listed above have not been seen in online testimonials of supplemental micro dosages, but they are associated with lithium in general on the NIH’s MedlinePlus website. (18)
There are several frightening case studies of people who had a lithium orotate overdose, where they used more than what the product manufacturers recommended:

- A 38 year-old woman with pelvic inflammatory disease. (19)
- An 18 year-old woman was hospitalized after she suffered poisoning after ingesting 18 lithium orotate tablets from the brand Find Serenity Now. (20)
- Although signs of toxicity were not observed, a patient at a university clinic had been using a 240 mg per day dosage of orotate for “self diagnosed” bipolar disorder and health concerns were raised as a result. (21)

The lesson? If used, it should only be taken as a dietary supplement and the amount used should not exceed the label’s instructions.

Pros vs. cons

Some of the possible side effects may actually be viewed as a benefit, depending on the circumstance.

As long as you aren’t too horny, a libido boost may be good for you and your partner.

Anxiety is when you care and think too much about something. The opposite of that – lethargy – may be the pendulum swung too far in the opposite direction, but caring somewhat less could be beneficial in reducing anxiety and stress.

Does lithium orotate make you tired? That is something which has been claimed in numerous reviews, like this one on Reddit (22):

“It was a great mood stabilizer for me as someone who has mood swings and lack of impulse control. Very calming but can’t take it everyday because it makes me sleepy.”

Here’s another testimonial by a user who took 5 mg per night for a few weeks (23):

“With it I don’t feel any anxiety (even if I drink coffee…which would normally have a very strong impact on my anxiety), my intrusive thoughts are
decreased a LOT, I sleep much better and it has also decreased my brain fog a lot (things seem much clearer).”

What time of day to take it? This review recommends taking the supplement at night (24):

“I’ve been using lithium orotate for about a month and have had significantly better mood stability, lessened anxiety, and a sense of well-being. I take it at night.”

Taking lithium orotate morning or night may dictate whether it helps you sleep when needed – or – if it causes unwanted drowsiness during waking hours. By taking it late in the day, some uses claim it helps their insomnia.

For some of the digestive side effects, taking lithium orotate on an empty stomach may be a contributing factor. In a study involving 30 people who used another form of the mineral, lithium sulfate, 20% experienced diarrhea when they didn’t take it with a meal or food. (25)

Is it safe?

Technically nothing is 100% safe in life, as you can even overdose on water. Just about all supplements have a laundry list of possible side effects, but there are two here which are definitely noteworthy. These are practically guaranteed if too much lithium orotate is used:

Kidney damage

There’s no question that in high enough doses, all forms of lithium can harm your kidneys.
With prescription uses of lithium for bipolar and other mental health issues, up to 60% of patients experience impaired ability to concentrate urine during the start of treatment. After time, this drops to 20-25%. That’s according to the Harvard Mental Health Letter. (26)

*Symptoms of abnormal kidney function can include frequent urination, getting up during the night to urinate, dry mouth (plus excess thirst which goes along with that), and electrolyte imbalance which can cause you to feel tired or fatigued.*

The good news is that based on a long term study of patients who were on those medications for 10 to 30 years, only 5% experienced “severe or very severe” chronic renal failure. One-third did show signs of it, but it wasn’t bad. That study was published in the *Journal of Psychopharmacology*. (27)

**Thyroid effects**

Again, without any clinical data on the supplement, the best clue we have is to look at what happens with the prescription carbonate.

Studies have demonstrated that up to 47% of patients on long-term lithium treatment will develop hypothyroidism, which is an underactive thyroid gland. This means too little thyroid hormone is being produced. (28) (29)
Symptoms may include fatigue, weight gain, and thinning hair, among others.

Does lithium orotate cause weight gain? That’s unknown, but what can be said is that with the medical use of the high dose carbonate form, some studies have reported that 20% of patients gain over 10 kg (22 lbs).

Though it is worth noting that the risk of obesity already correlates with depression and mental health issues. In some of these studies, up to 68% of the patients were already obese to begin with. (30)

Can lithium orotate cause hair loss? No one can say one way or another, but alopecia is a confirmed side effect of the carbonate form.

How prescriptions are monitored

According to Current Psychiatry, the routine testing schedule for people using lithium meds as a mood stabilizer is as follows (31):

- During first 6 months, renal and thyroid function checked once or twice.
- After that, routine testing every 6 to 12 months in stable patients.
- Patients weight must also be checked after the first 6 months and on an annual basis.

How much lithium is there in supplements?

Prescription lithium carbonate often involves a starting dose of 300 mg (150 mg for the elderly) which is taken 2-3 times daily. Eventually, this is increased to the “target dose” of 900 to 1,800 mg per day total, which is divided into multiple doses. (32)

Now to be clear, lithium orotate is NOT a medication and should NOT be used for bipolar or any other condition/disease. The following is NOT meant to offer a conversion/comparison of these two very different things, but rather to show how much of the actual elemental mineral is found inside dietary supplements.

Here is what’s listed as the serving size or maximum dose of lithium orotate supplement brands:

- Doctor’s Best – 1 tablet (5 mg, from 125 mg of lithium orotate)
- **Find Serenity Now** – 1 capsule (3.83 mg elemental lithium, from 120 mg of lithium orotate)
- **GNC Vitalast Brighter Day Appetite Control With Mood Support** – 1 capsule of lithium orotate and 5-HTP together (4 and 50 mg, respectively), plus 170 mg rhodiola rosea and 125 mg ashwagandha
- **Green Valley** – 1 capsule (4.5 mg elemental lithium, from 50 mg of lithium orotate)
- **Kal** – 1 vegetarian capsule (5 mg)
- **NCI Advanced Research** – 1 tablet (120 mg, amount of elemental portion not listed)
- **Seeking Health** – 1 vegetarian capsule (5 mg)
- **Swanson** – 1 veggie capsule (5 mg, from 131 mg of lithium orotate)
- **Vital Nutrients** – 1 veg cap (20 mg)
- **Vitamin Research Products** – 1 capsule (4.8 mg, from 130 mg of lithium orotate)

As you see, the ingredients on each label are confusing. Some go by the total amount, while others notate the amount of elemental lithium.

The following ratios/percentages have been reported (33) (34):

- There’s 3.83 mg of elemental lithium per 100 mg of lithium orotate (about 4%).
- There’s 18.8 mg of elemental lithium per 100 mg of lithium carbonate (about 19%).

**If those numbers are accurate, it means almost all of those supplements should have around 4 to 5 mg of actual lithium.** The 20 mg listed for Vital Nutrients might be an outlier since they don’t specify what that number corresponds to.
That’s good news in that it should be a very low amount of elemental lithium per dietary supplement. You can’t say lithium orotate is safe in this micro dose, but the odds of it being dangerous should be minimal (in theory) if only 1 tablet/capsule is used per day, as per the manufacturers’ instructions.

But remember, no one knows how it is metabolized!

If what happened in that 1978 rat study correlates with human health, then it would mean that the kidneys have a harder time filtering out this type of lithium. In theory, that could make it dangerous even at relatively low supplemental doses. (15)

But here’s the scariest thing…

When something is mutagenic, that means it causes your cells’ DNA to mutate. Cancer comes from mutations.

Now to be clear, not all mutagenic agents are officially considered to be cancer causing (carcinogens).

In order to get that label, extensive research must be done to prove that the amount of mutations caused is enough to increase the risk of cancer in a statistically significant way.

Even if something does not get the carcinogen classification, DNA mutations are never good for you.
Proving higher cancer risk requires extensive animal and/or human studies before any government or international bodies, like the World Health Organization, will classify something as being a carcinogen.

In humans, tumors take years and sometimes even decades to form (brain cancer takes up to 30 years). So as you can imagine, trying to answer the question is never easy. **Do cell phones cause cancer** is still something unknown, but the case against them continues to build.

**Is lithium mutagenic?** The evidence does not suggest

**International Agency Research on Cancer**

**World Health Organization**

**Group 1**  
Carcinogenic to humans

**Group 2A**  
Probably carcinogenic to humans

**Group 2B**  
Possibly carcinogenic to humans

**Group 3**  
Not classifiable as to its carcinogenicity to humans

**Group 4**  
Probably not carcinogenic to humans

"No information is available on cancer caused by treatment with lithium, and it is **highly unlikely** that lithium is carcinogenic."

That conclusion is based on the isolated element, occupational exposure, and the form commonly consumed by humans for bipolar treatment; lithium carbonate.
When bonded with orotic acid, it may be a different story.

The science suggests lithium orotate toxicity to cells is likely, because orotic acid is a confirmed mutagen. For the science geeks out there, it’s a type of heterocyclic compound. **Heterocyclic amines (HCAs)** are a well-known class of cancer causing agents. (36)

**Although humans have not been tested, orotic acid has been found to be mutagenic to the cells of other mammals and even bacteria.**

In grilled and charred meats, the amount of HCAs – like PhIP which is a Group 2B carcinogen – are less than 1% even that’s considered bad for you. In these lithium supplements, the orotate portion is a whopping 96% of the compound, since there is 3.83 mg of lithium per 100 mg.

Taking a supplement containing a mutagenic substance is the opposite of health promoting!

**Lithium orotate vs. aspartate**

Those wishing to take a dietary supplement of this trace mineral do have another option... the aspartate version.

What is the difference between lithium orotate and lithium aspartate?

The former is made with orotic acid, while the latter uses aspartic acid, which is an amino acid (protein). Its name comes from the 1827 discovery of it in asparagus juice. The aspartate acts as an ion carrier for the lithium.

<table>
<thead>
<tr>
<th>Supplement Facts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serving Size</strong></td>
</tr>
<tr>
<td><strong>Servings per container</strong></td>
</tr>
<tr>
<td><strong>Amount per serving % Daily Value</strong></td>
</tr>
<tr>
<td>Lithium</td>
</tr>
<tr>
<td>(from 125 mg of lithium aspartate)</td>
</tr>
<tr>
<td>† Daily Value not established.</td>
</tr>
</tbody>
</table>

**Other ingredients:** Cellulose, magnesium stearate (vegetable source).

**Suggested adult use:** Take one capsule per day with food, or as directed by a nutritionally informed physician.
This is the supplement facts label for Doctor’s Best brand, showing how the elemental mineral represents 4%. They have discontinued this product due to lack of demand. Very few brands today sell it because orotate is believed to be best, even though it has no proven advantages.

Both of these forms are sold over the counter without a prescription because they are only for use as dietary supplements. Both contain approximately 4% of the mineral, with the rest being the ion carrier.

While there are no special health benefits of lithium aspartate, the same holds true with side effects – there is no evidence of it being mutagenic like orotic acid is.

At least when it’s separate from lithium, the safety of aspartic acid (aspartate) is believed to be neutral, since it is a non-essential amino acid. In addition to food sources, our bodies create aspartate for use in various biological processes, such as for the ATP synthase enzyme (the primary source of energy for cells). (37)

For this reason, aspartate appears to be the best supplement type, or at least it’s better than orotate.

Finding where to buy lithium orotate or aspartate can be a challenge, because so few people take this trace mineral. The brands that make the aspartate version are Solaray, Swanson, BioTech Pharmacal, and American Biologics. Most of those brands are not even sold at brick and mortar retailers, with the exception of Solaray. Even if a given store sells Solaray, they may not bother to carry this niche product.

Even if you can find them, capsules or tablets of the orotate version seem like a bad idea.

On Amazon you can get the aspartate version from Solaray in 5 mg and BioTech Pharmacal in 20 mg. As a reminder, those are dietary lithium supplements only. They should not be used for any disease/condition. Consulting your doctor beforehand is always recommended before using any type of supplement.