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Magnesium Supplements Review (Including Calcium, Vitamins D & K, and Boron)

Find Out What Magnesium Does, Who Needs It, and Our Top Picks Among Supplements



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Summary

- **What is magnesium?** Magnesium is an essential mineral for proper metabolism and nervous system functioning, including helping to maintain the electrical stability of the heart (see [What It Is](#)).
- **How do you know if you need to take magnesium?** Although magnesium can be easily obtained through the diet and overt magnesium deficiency is not common, [nearly half the U.S. population](#) does not get adequate amounts of magnesium and can benefit from increasing magnesium intake from foods or supplementation. People most likely to get inadequate magnesium are adolescents and those over age 70. Conditions that may deplete magnesium include alcohol abuse, diabetes, diseases of the digestive tract, and use of medications such as Nexium and Prilosec. Inadequate intake of magnesium may modestly elevate blood pressure and increase the risk of osteoporosis and fractures. Early signs of magnesium deficiency include loss of appetite, nausea, vomiting, fatigue, and weakness (see [Magnesium Deficiency and Insufficiency](#)).
- **What does magnesium do?** In addition to boosting intake, supplementing with magnesium may be helpful for conditions such as migraines and menstrual pain, and it is an effective laxative and antacid. It may also improve glucose status in people with prediabetes – particularly if they are low in magnesium. It also helps control levels of vitamin D and can boost low levels. Maintaining adequate magnesium intake also has cardiovascular benefits, and maintaining a proper ratio of magnesium to calcium intake may have cognitive benefits, although magnesium threonate, which has been promoted for memory, has shown minimal cognitive benefit (see [What It Does](#)).
- **What did CL's tests of magnesium find?** Two supplements were **Not Approved** because they did not accurately list their chemical forms of magnesium, and one supplement that combined magnesium with other nutrients was **Not Approved** because it did not provide all of its listed amount of vitamin K. All other magnesium-containing supplements that ConsumerLab selected for review passed the laboratory tests of their quality. However, this does not necessarily reflect the quality of magnesium supplements in the overall marketplace, as problems with magnesium supplements have been reported by ConsumerLab and others (see [ConsumerTips](#)), and ConsumerLab generally does not select products that have previously failed testing because its goal is to find

best quality products. Even among Approved products, there were major differences in suggested dosage (from 77 mg to 566 mg daily) and cost — from less than 10 cents to more than \$1 to obtain 200 mg of magnesium (see [What CL Found](#) and [How Products Were Evaluated](#)).

- **Which magnesium is best?** Among products that were Approved in testing, CL selected two [Top Picks for magnesium](#), both of which have forms of magnesium that are relatively well absorbed. One of these costs just pennies per pill and is our choice when taking no more than 350 mg of magnesium daily. The other costs more but is a good choice if you need to take a higher dose, as it's less likely to have a laxative effect. CL also selected [Top Pick combinations](#) of magnesium with calcium, vitamin D, vitamin K, and boron. (In addition to the products tested in this review, other products discussed include *Country Life Calcium Magnesium Complex*, *Jarrow Formulas BoneUp*, and *Puritan Pride's Magnesium Citrate*.)
- **How do forms of magnesium differ?** Magnesium comes in many forms. Magnesium oxide tends to be less expensive than other forms but may also be less well absorbed and more likely to cause diarrhea. Forms that are more water soluble, such as magnesium chloride, citrate and many chelate forms (e.g., bisglycinate), may be better absorbed. Magnesium chloride is less likely to cause diarrhea and is recommended if you are taking a higher dose but is best in liquid form rather than as a tablet, as it tends to attract and hold water, which can cause pills to disintegrate and create problems with supplement [storage](#). Some magnesium chelates are also less likely to cause diarrhea but are bulky, requiring larger pills to get the same amount of elemental magnesium. Labels are required to show the amount of elemental magnesium in each serving, but you need to read labels carefully. See [What to Consider When Buying](#) for more about the different forms.
- **What's the right dose of magnesium?** Most people can get the daily required magnesium from their diet. *If you are not getting at least 300 to 400 mg of magnesium from your diet, consider a supplement that will get you to that level. Supplementing with about 200 mg should generally be sufficient and safe.*



When used to treat known deficiency, magnesium is often recommended at doses of 250 to 600 mg daily. However, unless treating a deficiency, limit your daily intake of magnesium from supplements and fortified foods to no more than 350 mg (the Tolerable Upper Intake Level), to avoid side-effects. You can easily get the rest of your required magnesium from your diet (see [What to Consider When Using](#)).

- **How can the recommended Daily Value (DV) for magnesium be higher than the Tolerable Upper Intake Level (UL)?** The upper limit only applies to magnesium from supplements (and fortified foods). Side effects are not likely to occur from magnesium naturally in foods.
- **Safety and side effects of magnesium:** Magnesium supplements may cause upset stomach, nausea, or diarrhea in some people. If using a powder form of magnesium, be sure to completely dissolve the powder in water before taking it to avoid injury to the esophagus. Although rare, excessive intake of magnesium can cause thirst, low blood pressure, drowsiness, muscle weakness and slowed breathing. Be aware that magnesium can interact with many supplements and drugs including cholesterol-lowering statins, such as rosuvastatin, antibiotics, sotalol, gabapentin, levothyroxine, and triamterene (see [Concerns and Cautions](#)).

Products tested in 2024 and 2025

What It Is:

Magnesium is an essential mineral for the body. It comes in a variety of chemical forms, including magnesium oxide, magnesium chloride, magnesium gluconate, magnesium citrate, magnesium orotate and many others. (For information about how these forms compare, see ConsumerTips™: [What to Consider When Buying](#)).

In addition to magnesium-only supplements, supplemental magnesium can be obtained from laxatives, antacids, multivitamin/multimineral products (see [Multivitamin/Multimineral Supplements Review](#)) and calcium supplements containing magnesium (see [Calcium Supplements Review](#)).

What It Does:

Magnesium deficiency and insufficiency

Magnesium is needed for proper metabolism and nervous system functioning, including helping to maintain the electrical stability of the heart.

Who's likely to need more magnesium:

While a sufficient amount of magnesium can be obtained easily from the diet, and few people have overt magnesium deficiency, it is estimated that 48% of the U.S. population gets less than recommended, **particularly men and women aged 71 and older and adolescents (ages 14 to 18)** ([USDA NHANES Data 2013-2016](#)) (see [ConsumerTips™](#) for more information about daily requirements and how to get magnesium from foods).

Conditions that may deplete magnesium include **alcohol abuse, diabetes, and diseases of the digestive tract such as ulcerative colitis, Crohn's disease and celiac sprue**. In people with Crohn's disease, magnesium supplementation should be considered during bouts of **severe diarrhea** — the form of magnesium should be one that is not likely to have a laxative effect and sipping an oral rehydration formula containing magnesium throughout the day may be better tolerated than taking a large dose of magnesium ([Huang, Inflamm Bowel Dis 2021](#)).

Medications that may decrease magnesium levels include certain **chemotherapy agents** (cisplatin, carboplatin, doxorubicin (Doxil), nedaplatin (Aqupla), and others) ([Komoda, J Gen Fam Med 2023](#)), **diuretics**, and **proton pump inhibitors (PPIs)**, which reduce stomach acid.

The FDA in 2011 specifically [warned](#) that PPIs may cause low serum magnesium levels if taken for prolonged periods of time (in most cases, longer than one year) or when used in combination with diuretics, digoxin, or other medications that can also lower blood levels of magnesium. Examples of PPIs are Nexium, Dexilant, Prilosec, Prevacid, Protonix, AcipHex, Vimovo, and Zegerid. Treatment of hypomagnesemia generally requires magnesium supplements. However, in approximately one-quarter of the cases reviewed, magnesium supplementation alone did not improve low serum magnesium levels and the PPI had to be discontinued. Even very high doses of magnesium (up to 1,000 mg per day) can fail to resolve low blood levels of magnesium during PPI use, although replacing the PPI with another type of acid reducer, such as an H2 antagonist (ranitidine), may help ([Cundy, Clin Endocrinol \(Oxf\) 2008](#); [Epstein, N Engl J Med 2006](#)). It can take weeks after discontinuing PPI use for blood levels of magnesium to normalize. In one case report, a 64-year-old Japanese man who had been taking esomeprazole (Nexium) for 12 years presented to the hospital due to dizziness, difficulty moving, and nausea and loss of appetite and, while at the hospital, experienced generalized seizures. His blood level of magnesium was <0.3 mg/dL (normal range: 1.9 to 2.5 mg/dL). Esomeprazole was discontinued and he was treated with intravenous magnesium for 3 weeks until his blood levels of magnesium returned to within normal range ([Sato, Cureus 2025](#)).

Effects of magnesium deficiency:

Early signs of magnesium deficiency include loss of appetite, nausea, vomiting, fatigue, and weakness. Low serum magnesium levels can, in some people, also result in serious adverse events including **muscle spasm** (tetany), **tremors**, **irregular heartbeat** (arrhythmias), and **convulsions** (seizures). Severe magnesium deficiency is rare ([Gragossian, StatPearls 2022](#)).

Low or deficient magnesium levels may increase the risk of certain conditions:

Magnesium deficiency may increase the risk of **osteoporosis** ([Castiglioni, Nutrients 2013](#)).

Very low intake of magnesium *from the diet*, and deficient levels of magnesium have been associated with **elevated blood pressure** ([Wu, Nutr J 2017](#)). A study in Spain that followed 14,057 people (average age 35) for about 10 years found that the risk of high blood pressure was 45% higher among those consuming less than 200 mg of magnesium daily compared to those consuming 400 to 500 mg daily, and this inverse association was strongest in people who were overweight or obese. However, intakes of more than 500 mg daily carried the same risk of high blood pressure as intakes below 200 mg daily ([Dominguez, Nutrients 2021](#)).

Magnesium *supplementation* appears to have only modest benefit in people with high blood pressure and insufficient or deficient magnesium levels. An analysis of 34 clinical studies among people with and without high blood pressure found that those who took approximately 368 mg of magnesium per day for about three months had overall reductions of just 2 mm Hg and 1.78 mm Hg, respectively, in systolic and diastolic blood pressures. The study also found that magnesium might only be effective among people with magnesium deficiency or insufficiency ([Zhang, Hypertension 2016](#)). A subsequent study among 59 healthy adults (average age 57) with elevated blood pressure (averaging 133.4 mm Hg systolic and 82.6 mm Hg diastolic) and not taking blood pressure-lowering medication, found that 480 mg of magnesium (as magnesium glycinate) taken daily for three months modestly decreased systolic and diastolic blood pressure by 4.5 mm Hg and 1.9 mm Hg, respectively, but the decreases were not statistically significant compared to placebo. However, it was not reported if participants were lacking in magnesium ([Sesso, Hypertension 2020](#)).

There is some evidence that magnesium supplementation may modestly decrease blood pressure in people with [metabolic syndrome](#), even if they have normal blood levels of magnesium.

On January 10, 2022, the FDA [announced](#) that it would not object to the use of a "qualified" health claim on foods and dietary supplements that states: "*Consuming diets with adequate magnesium may reduce the risk of high blood pressure (hypertension).*" A "qualified" claim is one that is not supported by significant scientific agreement and any such claim must be followed by "*However, the FDA has concluded that the evidence is inconsistent and inconclusive.*"

Several studies have shown a correlation between adequate magnesium levels or magnesium intake and heart health. A study that followed thousands of older men and women in the Netherlands for about 9 years found that those with the lowest blood serum magnesium levels (0.8 mmol/L and below) were 36% more likely to die from **coronary heart disease** and 54% more likely to experience sudden **cardiac death** over the course of the study than those with moderate levels (0.81 and 0.88 mmol/L) ([Kieboom, J Am Heart Assoc 2016](#)). High levels (above 0.89 mmol/L) were associated with a 6% lower risk of coronary heart disease but a 35% greater risk of sudden cardiac death than moderate levels. (Note: Normal magnesium levels range from 0.7 to 0.91 mmol/L or, using units more common in the U.S., 1.7 to 2.2 mg/dL). A study of middle-aged men in Finland followed for around 25 years also found lower serum magnesium to be associated with greater risk of future heart failure ([Kunutsor, Eur J Epidemiol 2016](#)). Similarly, a study in the U.S. that followed over 150,000 postmenopausal women (ages 50 to 79) for an average of ten years found that those with the lowest intakes of dietary magnesium (about 189 mg per day) had a 19% higher risk of fatal coronary heart disease than those with the highest intakes (about 330 mg per day) ([Li, J Womens Health \(Larchmt\) 2019](#)).

Low *tissue* levels of magnesium may be a contributing risk factor for the development of "**torsades de pointes**," an abnormal heart rhythm that can cause sudden death. Low blood levels of magnesium have been associated with another type of abnormal heart rhythm known as premature ventricular complexes (**PVCs**), which are sometimes also referred to as "palpitations." In adults with low blood levels of magnesium (< 0.70 mmol/L), the prevalence of PVCs was found to be twice that of adults with sufficient blood levels of magnesium, according to a study in Canada among obese men and women with type 2 diabetes ([Gobbo, Cardiovasc Diabetol 2012](#)). However, a review of the evidence for treating abnormal heart rhythms with magnesium concluded that more research is still needed to determine if correcting magnesium levels improves clinical outcomes ([Baker, Eur Heart J Cardiovasc Pharmacother 2017](#)).

Inadequate intake of magnesium has been linked with an increased risk of hyperuricemia (**high levels of uric acid**), which can contribute to **gout**, a painful condition caused by needle-shaped crystals that form in joints, especially in the feet. An analysis of data of 26,796 adults in the U.S. age 20 to 85 found that men and women with total daily intakes of magnesium from foods and supplements of < 200 mg for men and < 158 mg for women (which is about half the recommended intake for each group) were, respectively, 29% and 33%

more likely to have high blood levels of uric acid than those getting adequate daily intake, even after adjusting for age and other risk factors ([Zhang, Nutrients 2018](#)). However, the association does not prove a cause-and-effect relationship and there do not appear to be studies on the effects of magnesium supplementation for preventing or treating gout.

Getting adequate magnesium has been shown to help **maintain optimal blood levels of the active form of vitamin D**, boosting lower levels and, in some cases, moderating high levels. For example, a study in Spain among postmenopausal women, many of whom had low dietary intakes of magnesium and/or low blood or erythrocyte levels of magnesium, and most of whom had insufficient blood levels of vitamin D (< 20 ng/mL) found that 500 mg of magnesium taken daily for two months increased vitamin D levels by average increase 3 ng/mL ([Vázquez-Lorente, Nutrients 2020](#)). (For more details see the [Vitamin D Review](#).)

Tinnitus and hearing

Preliminary clinical research suggests that magnesium supplementation may modestly reduce **tinnitus (ringing in the ears)**, but better studies are needed. A study in Arizona among 19 adults (average age 62) with tinnitus found that taking 532 mg of magnesium (as oxide and amino acid chelates in *Mg Plus Protein*, 133-mg tablets; Miller Pharmacal Group) daily for 3 months significantly reduced tinnitus severity by 6.08 points (on a scale of 0 to 100) and tinnitus distress by 0.44 points (on a scale of 0 to 10) compared to baseline ([Cevette, Int Tinnitus J 2011](#)). Another preliminary study in Spain among adults (average age 48) with tinnitus showed that taking a combination supplement (*Tinnitan Duo* by Laboratorios Salvat, S.A., which funded the study) containing magnesium along with 5-hydroxytryptophan (5-HTP), ginkgo, melatonin, vitamin B-5 and B-6, and zinc (amounts of these ingredients per serving was not specified) twice daily (in the morning and at night) for 3 months significantly reduced tinnitus severity by 15.9% and tinnitus distress by 9.4% compared to baseline ([Knäpper, J Diet Suppl 2023](#)). Unfortunately, both of these studies lacked a placebo group, which is needed to prove a benefit, and it is unknown if the participants in either study had low levels of magnesium. A study found that people with tinnitus had slightly lower blood levels of magnesium than healthy individuals (1.8 mg/dL vs. 2.3 mg/dL), although both levels were considered adequate ([Uluyol, Kulak Burun Bogaz Ihtis Derg 2016](#)).

Magnesium may also be beneficial for preventing **hearing loss caused by excessive noise**. A study among young adult males (average age 21) with normal hearing showed that supplementing with 122 mg of magnesium (as magnesium aspartate) daily for 10 days prior to excessive noise exposure (90 dBA — similar to a power mower) for 10 minutes somewhat lessened the *temporary* reduction in hearing sensitivity otherwise caused by the noise ([Attias, Clin Otolaryngol Allied Sci 2004](#)). An earlier study conducted by the same researchers among young men (average age 18) undergoing 2 months of military basic training showed that supplementing with 167 mg of magnesium (as magnesium aspartate) daily during two months of exposure to shooting range noise reduced, by about half, the incidence of *permanent* shift in hearing sensitivity compared to placebo ([Attias, Am J Otolaryngol 1994](#)). In both cases, the benefit was inversely associated with blood levels of magnesium.

Dementia and cognition

Adequate intake of magnesium (from the diet and/or supplements) may optimize cognitive function and reduce the risk of developing dementia, as suggested by several studies, although getting too much is not beneficial. There is no human clinical evidence to suggest any particular form of magnesium is better than others at crossing the human blood-brain barrier to enter the brain (although some forms of magnesium are [better absorbed](#) than others from the gut). [Magnesium threonate \(Magtein\)](#) has been promoted for memory enhancement, but studies have shown little to no benefit.

Increasing magnesium intake for 12 weeks in a placebo-controlled study involving 240 healthy individuals in Tennessee was found to improve cognitive function by 9.1% among those aged 65 and older who otherwise consumed high amounts of calcium relative to magnesium. For example, if a person was consuming a total of 1,200 mg of calcium and 300 mg of magnesium per day (a ratio of 4 to 1), that person was assigned a dose of magnesium (as magnesium glycinate) of 221.7 mg, getting them to a calcium:magnesium ratio of 2.3 to 1. The daily dose ranged from 77.25 mg to 389.55 mg, with the average being 216.5 mg. Magnesium supplementation was found to affect activity at a gene (APOE) that plays a role in calcium signaling in nerve cells and is associated with late-onset Alzheimer's disease. The effects on this gene were associated with the improvements in cognitive function. Magnesium did not have

effects on people younger than 65 years of age ([Zhu, J Alz Dis 2020](#)). **ConsumerLab Note:** These findings suggest that supplementing with magnesium to lower high calcium:magnesium ratios may be helpful, but be aware that excessive magnesium intake can have negative effects on cognition and mortality ([Dai, BMJ Open 2013](#)) – do not reduce calcium:magnesium ratios to below 1.7.

A study in the U.S. that followed 6,473 women beginning around 70 years of age for an average of 20 years found that those who consumed between 257 mg and 317 mg of magnesium per day from foods and supplements had a 37% lower risk of developing **mild cognitive impairment** compared to those who consumed less than 197 mg per day, which is significantly below adult RDAs for magnesium ([Lo, BMJ Open 2019](#)). Somewhat similarly, a study that tracked over 9,500 adults in the Netherlands for about eight years found that those who began the study with the lowest or highest blood levels of magnesium (respectively, 0.79 mmol/L or less and 0.9 mmol/L or greater) were approximately 30% more likely to develop **dementia** (predominately Alzheimer's disease) over the course of the study compared to those with mid-range levels (0.84 to 0.85 mmol/L) after adjusting for factors such as age and other diseases ([Kieboom, Neurology 2017](#)). Although these types of studies do not prove cause-and-effect, getting the [daily requirement of magnesium](#) from one's diet and, if necessary, supplements, and avoiding excessive magnesium would seem prudent.

Another study found the intake of magnesium laxatives to be associated with reduced risk of dementia. The study, among over 6,000 men and women in Taiwan age 50 and older, found that those who were prescribed oral magnesium oxide for the treatment of constipation (average length of usage about 5 months) at the beginning of the study were 48% less likely to develop dementia over a 10 year follow-up period than those who had not taken magnesium oxide, even after adjusting for factors such as age, gender, and other medical conditions ([Tzeng, Curr Med Res Opin 2017](#)). Those who took magnesium oxide for more than one year had an even lower risk – they were 59% less likely to develop dementia. Unfortunately, the study did not report the average daily dose of magnesium taken by participants or take into account the amount of magnesium they were getting from their diets.

A small study funded by the makers of a **magnesium-L-threonate** supplement called [Magtein](#) found that men and women with self-reported memory and concentration impairment, anxiety, and difficulty sleeping who received between 1.5 and 2 grams of magnesium-L-threonate (providing about 120 to 160 mg of magnesium) daily for three months had a small (10% on average) increase in the speed of performance on an executive function task, while those who took a placebo showed even smaller improvement. There was no improvement, however, in working memory, episodic memory, attention, anxiety or sleep, relative to placebo. No serious adverse events were reported and there were no significant changes in blood pressure or heart rate ([Liu, J Alzheimer's Dis 2016](#)).

Another small study that sought to determine if taking magnesium-L-threonate (600 mg in the morning and 1,200 mg two hours before bedtime) for two months improved learning and memory in 17 people with dementia was conducted at Stanford University and was completed in mid-2016. Based on results posted to ClinicalTrials.gov in February 2021 (but apparently not published in a peer-reviewed journal), patients in this study showed no clinically meaningful improvement in cognitive function, although, when retested four months later, there was still no decline from baseline levels. The lack of a placebo group and small study size limits the value of these results ([ClinicalTrials.gov](#), accessed 7/20/21).

Animal studies of magnesium's effects on memory and cognition have been conducted ([Slutsky, Neuron 2004](#); [Hoane, Magnes Res 2008](#); [Abumaria, J Neurosci 2011](#)), including one funded by the makers of Magtein that found that rats given magnesium-L-threonate performed significantly better on tests of long and short term memory. Magnesium-L-threonate also enhanced signaling of a specific part of brain receptors associated with the ability to store information. Other forms of magnesium tested, including magnesium chloride, magnesium citrate, magnesium glycinate, and magnesium gluconate, were not as efficient at raising magnesium levels in the central nervous system (as measured by levels in cerebrospinal fluid) and did not improve memory as well as magnesium-L-threonate ([Slutsky, Neuron 2010](#)). It has been noted by other researchers that the amount by which magnesium-L-threonate raised cerebrospinal fluid levels of magnesium was only 7% to 15%, and the dose used in the animals (50 mg/kg/day) would be equivalent to 7 grams (7,000 mg) per day in humans – 20 times the Tolerable Upper Intake Level for adults ([Bush, Neuron 2010](#)).

Parkinson's disease

Although there is preliminary evidence showing that magnesium levels are lower in the brains and cerebrospinal fluid of people with Parkinson's disease compared to healthy people, there is no clinical research showing that magnesium prevents or slows the progression or improves symptoms of Parkinson's disease. It has been reported that magnesium as magnesium-L-threonate increased magnesium levels in the cerebrospinal fluid in a mouse model of Parkinson's disease ([Shen, Neuropsychiatr Dis Treat 2019](#)), but this has not yet been confirmed in humans. Magnesium sulfate does not appear to enter the brain in an animal model ([Oyanagi, In: Magnesium in the Central Nervous System \[Internet\] 2011](#)), although it has been shown to enter the cerebrospinal fluid in small amounts in women with pre-eclampsia when administered intravenously ([Thurnau, Am J Obstet Gynecol 1987](#)).

Be aware that a very high dose of magnesium oxide was shown to reduce absorption of Parkinson's medications. At the same time, Parkinson's medications may increase absorption of magnesium (See [Concerns and Cautions](#)).

Type 2 diabetes, prediabetes and metabolic syndrome

Increased intake of magnesium from the diet and supplements has generally been associated with a decreased risk of developing type 2 diabetes – particularly among people with magnesium intakes below the Recommended Daily Allowance (RDA) ([Larsson, J Intern Med 2007](#)). Supplementation may modestly improve insulin sensitivity and some markers of blood sugar control, as well as modestly decrease blood pressure in people with prediabetes or metabolic syndrome, although it does not appear to help people who already being treated for type 2 diabetes, even if their magnesium levels are low.

A study among obese, **insulin insensitive people** with *normal* magnesium plasma levels showed that daily magnesium supplementation improved insulin sensitivity. A 7% improvement in fasting plasma glucose levels was observed among those taking 365 mg of magnesium (as magnesium-aspartate-hydrochloride) daily for 6 months – a significant improvement compared those taking placebo ([Mooren, Diab Obes Metab 2010](#)).

A study of people with **hypomagnesemia and prediabetes** in Mexico found that after 4 months of taking 382 mg of magnesium daily (as a magnesium chloride liquid supplement), 50.8% had improved glucose status versus 7% of those receiving placebo. On average, those taking magnesium had a 22% improvement in fasting glucose levels. During the study, both groups were advised to follow a balanced diet and to engage in physical activity for at least 30 minutes three times a week ([Guerrero-Romero, Diab & Metab 2015](#)).

A subsequent study by the same researchers involved giving the same dose and form of magnesium to people with low magnesium levels (below 1.8 mg/dL) and **metabolic syndrome**, which is a combination of high blood pressure and blood sugar, excess body fat around the waist, and low HDL-c. After four months, only 48% of those given magnesium had metabolic syndrome compared to 77.5% of those given placebo. The treated group experienced significantly greater improvements in blood pressure, fasting glucose, and triglycerides ([Rodriguez-Moran, Adv Chronic Kidney Dis 2018](#)).

A study in Germany among 24 men and women (average age 67) with metabolic syndrome and normal blood levels of magnesium found that 400 mg of magnesium (as magnesium citrate) taken daily for three months modestly decreased average values of HbA1c (a measure of blood sugar levels over time) from 6.43% to 6.15% (normal range is 4.0% to 5.6%), while the placebo group had little change. Those who took magnesium also experienced a large decrease in systolic blood pressure (- 24.2 mmHg) and a modest decrease in diastolic pressure (- 6.8 mmHg), compared to little improvement in the placebo group. Be aware that the dose of magnesium used in this study exceeds the daily Tolerable Upper Intake Level (UL) for magnesium from supplements for adults (350 mg). One person in the magnesium group reported having soft stool, but this was temporary and no other side effects associated with magnesium supplementation were reported ([Afitska, Magnes Res 2021](#)).

Although having low blood levels of magnesium is common in people with **type 2 diabetes**, taking magnesium does not seem to help such people if their diabetes is already being treated. A study of 14 men and women (average age 67) with insulin-treated type 2 diabetes and low blood levels of magnesium, found oral magnesium supplementation did *not* improve insulin sensitivity compared to placebo, despite modestly increasing blood levels of magnesium (from an average of 0.73 mmol/L to 0.75 mmol/L). There were also no

effects of magnesium supplementation on continuous glucose monitoring outcomes, HbA1c, insulin dose or blood pressure compared to placebo. In the study, 120 mg of magnesium was given as liquid magnesium gluconate three times daily, for a total of 360 mg magnesium per day ([Drethen, Diabetologia 2023](#)).

Stroke

An analysis of several studies concluded that magnesium may help reduce the risk of **stroke**. People who consumed 100 mg of magnesium more per day than average (the average being about 300 mg) had an 8% lower risk of strokes of any kind and a 9% lower risk of ischemic stroke ([Larsson, Am J Clin Nutr 2012](#)). This finding is based on total magnesium in the diet – it does not mean that 100 mg of magnesium from a supplement will necessarily have the same risk-lowering effect, but getting a total of at least 400 mg of magnesium from your diet per day may be beneficial. Similarly, an analysis of 40 observational studies ranging from 4 to 30 years in length and involving a total of 1 million participants found that each 100 mg/day increase in dietary magnesium intake (up to about 500 mg total daily intake) is associated with a 7% decrease in the risk of stroke, as well as 22%, 19% and 10% decreases in the risks of heart failure, type 2 diabetes, and all-cause mortality, respectively ([Fang, BMC Medicine 2016](#)).

Observational research has linked lower blood levels of magnesium with increased **arterial calcifications**, but there do not appear to be any studies showing that magnesium supplementation is beneficial for reducing arterial calcifications. Two small studies among hemodialysis patients showed that long-term treatment with dialysate containing a high concentration of magnesium helped slow calcification progression compared to baseline ([Vossen, Nutrients 2020](#)), but a study in 135 men and women with kidney disease who were not on dialysis found that magnesium supplementation did *not* slow the progression of calcifications. The magnesium was given as slow-release magnesium hydroxide providing 152 mg of elemental magnesium, taken twice daily for one year. Interestingly, a higher incidence of gout attacks (6 vs 1), major cardiovascular events (6 vs none), and deaths (5 vs 2) occurred in those taking the magnesium, although none of the events were suspected by researchers to be caused by magnesium supplementation ([Bressendorff, J Am Soc Nephrol 2023](#)).

Depression

Some observational studies have found that low blood levels of magnesium and low magnesium intake from food are each associated with an increased risk of **depression** ([Islam, BMC Psychiatry 2018](#); [Cheungpasitporn, Intern Med J 2015](#); [Yary, Biol Trace Elem Res 2013](#)). Supplementing depressed individuals with magnesium has shown some promise in preliminary studies, although none of the studies were placebo-controlled making it impossible to determine true efficacy. These studies, which lasted from 6 weeks to 3 months, involved daily doses of 250 mg to 300 mg of magnesium (from magnesium citrate or chloride) ([Barragán-Rodríguez, Magnes Res 2008](#); [Bagis, Rheumatol Int 2013](#)) to as much as 450 mg (from magnesium chloride liquid) in a study involving people with low blood levels of magnesium ([Tarleton, PLoS One 2017](#)). The studies showed comparable results to tricyclic antidepressants or improvements over no treatment (meaning the subjects were aware of when they were given the treatment or not). A study in Iran among 60 young men and women (average age 20) with moderate depression and magnesium blood levels at the lower end of normal found that 250 mg of magnesium (from magnesium oxide) taken twice daily for two months modestly reduced symptoms of depression compared to placebo (an average reduction of 16 points vs. 10 points on a scale of 0 - 63). In those who took magnesium, blood levels increased from an average of 1.77 mg/dL to 2.08 mg/dL, while there was no change in magnesium levels in those who took the placebo ([Rajizadeh, Nutrition 2017](#)). If you have depression, it seems prudent to at least make sure you are getting adequate magnesium from your diet and/or supplements.

Anxiety

An association between low dietary intake of magnesium and **anxiety** was *not* found in a large, observational study in Australia ([Felice, Aust N Z J Psychiatry 2009](#)), and there is a lack of quality clinical trials investigating the effects of magnesium supplementation on people with anxiety. A preliminary study suggested that magnesium supplementation (248 mg per day from magnesium chloride) modestly reduced self-reported anxiety severity compared to no magnesium supplementation among adults with mild to moderate depression, most of whom were also taking an SSRI or other anti-depressant/anti-anxiety medication; however, the study lacked a

placebo-control, which is needed to prove a benefit ([Tarleton, PLoS One 2022](#)). An earlier short-duration (5-day) placebo-controlled trial found no reduction in anxiety from giving 300 mg of magnesium daily (from magnesium citrate) to college students during final exams ([Gendle, J Artic Support Null Hypothesis 2015](#)).

Sleep

Several small studies suggest that taking magnesium may shorten the time it takes to fall asleep in older adults with **insomnia**, although it does not appear to improve sleep quality or increase total sleep time. This has been shown in studies using magnesium oxide or magnesium citrate, providing a total of 320 to 729 mg of magnesium daily. We would suggest using the citrate form due to better absorption and the lower range of dosage (around 300 mg), to reduce the risk of a laxative effect. Magnesium L-threonate (Magtein) does not seem to improve sleep. Magnesium deficiency is not associated with insomnia but is associated with **sleep apnea**. Magnesium has generally not helped with **restless leg syndrome**, and magnesium as zinc magnesium aspartate may worsen sleep among some people (see [Concerns and Cautions](#)). (Learn about [other supplements for sleep](#).)

A study in Iran among 43 older people (average age 65) with moderate to severe insomnia (not caused by a known condition) who had somewhat low blood levels of magnesium – 0.83 mmol/L (Note: Blood levels of magnesium do not necessarily reflect levels throughout the whole body, as [discussed below](#)) – showed that magnesium supplementation reduced the time to fall asleep by about 12 minutes, slightly improved the percentage of time spent asleep while in bed, and reduced self-reported insomnia symptoms by 2.38 points (on a scale of 0 to 28) compared to baseline, and these improvements were statistically significant compared to the placebo group. However, there was no significant improvement in total sleep time or early morning awakenings. Interestingly, blood levels of magnesium did not significantly increase after 8 weeks in those receiving magnesium, but blood levels of renin and melatonin – two hormones that help regulate sleep – slightly increased by 5.91 mIU/mL and 1.58 pg/mL for those given magnesium compared to decreases of 1.00 mIU/mL and 1.43 pg/mL for those in the placebo group. According to the researchers, earlier studies in rats showed that magnesium may increase melatonin production by increasing the activity of N-acetyltransferase, an enzyme involved in melatonin production. Another earlier study in humans showed that magnesium may stimulate renin release by increasing prostaglandin synthesis ([Ichihara, J Lab Clin Med 1993](#)). Magnesium was given as tablets – 250 mg (as 414 mg magnesium oxide) twice daily for 8 weeks ([Abbasi, J Res Med Sci 2012](#)). Similarly, an analysis of results from the Abbasi study and two others (conducted in Germany and the U.S.) among older adults (age range about 50 to 80) showed that taking 320 to 729 mg of magnesium daily (as magnesium oxide or magnesium citrate) for about 3 to 8 weeks reduced time taken to fall asleep by 17.36 minutes but did *not* significantly improve total sleep time. The most common side effect was soft stools ([Mah, BMC Complement Med Ther 2021](#)). It is unclear if magnesium supplementation is beneficial in younger adults or children.

A subsequent study among 76 adults (average age 45) with self-reported poor sleep quality showed that taking 1 gram of magnesium L-threonate providing 75 mg of elemental magnesium (Magtein by ThreoTech LLC, a branch of AIDP Inc., which was involved in funding and conducting the study) 2 hours before bedtime for 3 weeks did *not* significantly improve overall sleep or sleep quality based on questionnaires compared to placebo. In fact, it *increased* the time it took to fall asleep by about 1 minute ([Hausenblas, Sleep Med X 2024](#)).

Magnesium deficiency is *not* associated with an increased risk of insomnia, but is associated with slightly (12%) increased risk of "**sleep trouble**" (difficulty sleeping not diagnosed as a sleep disorder) and, *triple* the risk of **sleep apnea**, compared to adequate magnesium status in a study of 20,585 adults ([Luo, J Affect Disord 2024](#)). Interestingly, several clinical trials among people with sleep apnea have found that lower magnesium levels are more common among those with more severe sleep apnea than those with mild sleep apnea, and that magnesium status tends to improve with treatment for sleep apnea, leading researchers to suggest that the oxidative stress caused by sleep apnea might contribute to the depletion of magnesium ([Wadee, Biomedicines 2022](#)). However, more research is needed to determine true cause-and-effect, and there do not appear to be any studies investigating the effects of magnesium supplementation on the symptoms or severity of sleep apnea.

Urinary frequency

A small study among 40 middle-aged women with urinary frequency showed that 55% of woman who took magnesium hydroxide reported improvements in their urinary symptoms (such as frequency and incontinence episodes) versus 20% among those receiving placebo. Testing, however, generally failed to show significant improvements in measures such as bladder capacity and flow rate. The women took 350 to 700 mg of magnesium hydroxide (i.e., 147 to 294 mg of magnesium) *twice* daily, causing a laxative effect in some ([Gordon, Br J Ob Gyn 1998](#)). There do not appear to be other clinical studies of magnesium for urinary frequency. These results alone are not compelling, with nearly half the women not reporting an improvement and the possibility, at the higher dose, for side effects (diarrhea). Also be aware of the risk of [drug interactions](#) with magnesium hydroxide and of [hypermagnesemia](#) in people with reduced kidney function.

Kidney stones

Magnesium *may* help prevent calcium-oxalate kidney stones if taken with meals that contain oxalate, by binding oxalate so that it is excreted rather than absorbed. Oxalates are found in many vegetables and plant-based foods, as well as in eggs and dairy products ([Fleisch, Kidney Int 1978](#); [Grases, J Urol 2015](#)). In healthy adults experimentally given 180 mg of oxalate, taking 300 mg of magnesium (as magnesium oxide) reduced oxalate absorption in the gut as well as urinary oxalate levels ([Liebman, J Urol 2000](#)). Similarly, a study among people with a history of calcium oxalate stones and high urinary oxalate levels showed that 250 mg of magnesium (as magnesium oxide) taken daily with a meal led to greater decreases in urinary oxalate levels (-17.8 mg vs - 8.5 mg per day) compared to taking the same dose of magnesium on an empty stomach ([Sharbaugh, Clin Nephrol 2025](#)). Larger, longer-term studies are needed to determine if regular magnesium supplementation prevents calcium-oxalate kidney stones in people prone to this type of kidney stone.

Arthritis

There does not appear to be any evidence that *supplementing* with magnesium reduces the risk or severity of **osteoarthritis (OA)**, but it seems prudent to ensure that one's dietary intake of magnesium is adequate, as some research has linked low blood levels of magnesium with increased osteoarthritis risk and disease severity. For example, a study in China among 2,855 adults found that those with blood levels of magnesium >2.43 mg/dL (which is within the normal range of 1.8 to 2.6 mg/dL for adults) had a 28% lower risk of knee osteoarthritis compared to those with lower blood levels. Average daily intake of magnesium in the group with highest blood levels was 381 mg/day, which is similar to but slightly higher than the RDA of 350 mg daily ([Zeng, J Rheumatol 2015](#)).

Similarly, there does not appear to be evidence that supplementing with magnesium reduces risk or severity of **rheumatoid arthritis (RA)**, although getting an adequate amount of magnesium from the diet might be beneficial. Low dietary intake of magnesium (<181 mg daily) has been linked with higher prevalence of RA in one observational study. Be aware, however, that in the same study, *higher* dietary intake of magnesium (>446 mg daily) was also associated with an increased prevalence of RA. The researchers speculated that adequate intake of magnesium may be beneficial due to its anti-inflammatory effects, but that higher amounts of magnesium may reduce estrogen levels, which may worsen inflammatory conditions such as RA (although estrogen levels were not assessed in the study) ([Hu, BMJ Open 2020](#)).

Bone health

In a study of elderly men and women aged 70-79 years, magnesium intake from food and supplements was associated with a significant increase in **bone mineral density (BMD)** in white men and women, but not in Black men and women. Most people in this study did not have adequate magnesium intake. In white women, getting the recommended amount of 320 mg daily of magnesium was associated with a 2% higher BMD compared to intakes 220 mg or lower. Similarly, in men, intake meeting the recommended amount of 420 mg daily were associated with a 1% higher BMD compared intakes of 320 mg or lower ([Ryder, J Am Geriatr Soc 2005](#)). This does not, however, indicate that getting more than the daily requirement is beneficial or that a supplement is necessary if you get sufficient magnesium in your diet.

Higher intake of magnesium (from a combination of food and, if used, supplements) was shown to reduce the risk of **bone fracture** among older men and women (average age 61) in a study in the U.S. Participants recorded their magnesium intakes and their outcomes were followed for 8 years. Those who reported the highest intakes of magnesium (averaging 491 mg/day for men and 454 mg/day for women) also reported the fewest fractures over the follow-up period. The risk of fracture was 53% and 62% lower, respectively, among men and women with the highest intakes compared to those with the lowest intakes (205 mg/day for men and 190 mg/day for women). It was found that women meeting the RDA for magnesium (350 mg) had a 27% lower risk of fracture than those not meeting the RDA, although no such association was found for men (RDA of 420 mg). Interestingly, only one quarter of participants met the RDA ([Veronese, Br J Nutr 2017](#)). This association between higher magnesium intake and better bone health, however, was not seen in an analysis of older people in Taiwan that focused exclusively on use of magnesium oxide (typically taken as a laxative or antacid). It found that people who used magnesium oxide supplements were 66% more likely over a 5-year period to suffer a hip fracture than people who had not used magnesium oxide ([Wu, Osteopor Int 2020](#)).

A study among 50 adults (average age 32) receiving **dental implants** following extraction of a molar found that taking 200 mg of magnesium citrate once daily for 30 days after implant placement *slightly* increased dental implant stability by 3.46 (on a scale of 1 to 100) compared to baseline, and this change was statistically significant compared to placebo group, which showed a non-significant increase of 0.50. However, this difference is unlikely to be clinically meaningful, as the implants in both groups were considered to be "extremely stable" after 12 weeks, with no statistically significant difference between them. There was also no statistically significant difference in the density of regenerated bone between the groups. Magnesium supplementation did *not* significantly reduce postoperative pain ([Rajanna, Int J Oral Maxillofac Implants 2024](#)).

Physical performance & exercise recovery

Among people with low dietary intake of magnesium, taking magnesium may improve strength (but not endurance) and reduce post-exercise soreness. However, among people with adequate magnesium levels, taking magnesium may have negative effects.

A study in healthy women older than 65 involved in a mild, weekly exercise program found that **physical performance** improved for those who were given a daily magnesium supplement (300 mg from magnesium oxide) for 12 weeks, compared to those given placebo ([Veronese, AJCN 2014](#)). Improvements were seen with activities such as the speed of walking and rising from a chair. Although all the women had normal blood levels of magnesium, improvements in physical performance were more evident in participants with magnesium dietary intake lower than the RDA (320 mg for women 31 years and older), which is common among older women, suggesting that some women may still be "deficient" despite normal blood levels.

A small study among healthy male recreational endurance runners (average age 27) who consumed a diet low in magnesium (< 260 mg per day) found that supplementing with magnesium (166.6 mg taken 3 times a day [500 mg total] from magnesium oxide) for 7 days prior to a timed 10 kilometer downhill treadmill run **reduced muscle soreness** by 32% in the first 24 hours after the run and by 53% three days after the run in comparison to placebo. In addition, blood levels of a marker of inflammation (IL-6) were lower 24 hours after running when magnesium had been taken versus placebo. However, supplementation did not improve running performance, decrease muscle damage, or increase recovery of muscle strength. It should be noted that 500 mg of magnesium is above the daily Tolerable Upper Intake Level for magnesium and can cause a laxative effect. The published study failed to report on side effects ([Steward, Eur J Appl Physiol 2019](#)).

A study among 22 healthy college students (average age 22) found that 350 mg of magnesium glycinate (providing 50 mg of magnesium) taken once daily for 8 days prior to a bench press test modestly reduced self-reported **delayed onset muscle soreness (DOMS)** 48 hours after the test compared to placebo (average reduction of about 2 points on a 6-point scale vs. no reduction in placebo). Exercise performance (i.e., the number of repetitions) was also slightly improved in those who took magnesium, but this did not reach statistical significance. Blood levels of magnesium were not measured, but a dietary assessment before the study began showed that half of the participants were getting less than 50% of the RDA for magnesium (from foods and supplements) and only two individuals met or exceeded the RDA ([Reno, J Strength Cond Res 2020](#)).

A study among 15 healthy young adults (average age 26) who exercised regularly showed that taking 300 mg of magnesium chloride (*ReMag* by New Capstone Inc, which funded the study) twice daily for nine days *decreased* power output during a 30-second cycling test and *worsened* oxygen use during exercise, with no significant improvement in a 10-km cycling test compared to placebo. The magnesium raised participants blood magnesium levels from the lower end of normal to the higher end of normal ([Bomar, Nutrients 2025](#)). [Note: We've reached out to the investigators to confirm that the stated dose of 300 mg of magnesium chloride is correct, as this would provide only 36 mg of magnesium, since only 12% of magnesium chloride is magnesium. *Remag*, which is a liquid, is labeled as providing 300 mg of magnesium as magnesium chloride per teaspoon.]

Leg movements and cramps

Magnesium supplementation has been promoted to relieve symptoms of **restless legs syndrome (RLS)** but there is no good evidence to support this use. Magnesium deficiency was not associated with an increased risk of RLS in a large study that analyzed the magnesium status of 20,585 men and women (average age 49) ([Luo, J Affect Disord 2024](#)). A small study among 10 men and women with insomnia related to RLS found a dose of 301.38 mg of magnesium (as magnesium oxide) taken in the evening for 4-6 weeks significantly reduced leg movement associated with waking compared to baseline, but this study was not blinded or placebo-controlled, which are needed to prove a benefit ([Hornyak, Sleep 1998](#)).

Despite claims that supplementing with magnesium may reduce leg cramps, clinical studies have generally *not* found magnesium to reduce the frequency, intensity or duration of **leg cramps** or **nighttime leg cramps**, regardless of the form of magnesium (e.g., aspartate, bisglycinate, citrate, hydroxide, lactate, or oxide) or dosage ([Garrison, Cochrane Database Syst Rev 2020](#); [Maor, JAMA Intern Med 2017](#); [Sebo, Fam Pract 2014](#)).

Although a small study in Thailand among **pregnant women with leg cramps** found that a daily dose of 300 mg of magnesium (as magnesium bisglycinate chelate) reduced the intensity and frequency of leg cramps compared to placebo ([Supakatisant, Matern Child Nutr 2012](#)), other studies using similar doses of magnesium (as magnesium lactate and/or magnesium citrate) have not found a benefit ([Nygaard, Eur J Obstet Gynecol Reprod Biol 2008](#); [Araujo, PLoS One 2020](#)). An analysis of data from four studies, including the three discussed above, concluded that, overall, oral magnesium supplementation is not effective in the treatment of leg cramps during pregnancy ([Liu, Taiwan J Obstet Gynecol 2021](#)).

Interestingly, although magnesium malate is promoted for reducing leg cramps, this alleged benefit appears to be based on its weak evidence for reducing muscle pain in people with [fibromyalgia](#), not leg cramps.

Migraine

There is mixed evidence on whether magnesium supplements help prevent **migraine** headaches (including menstrual migraines) ([Yablon, 2011. Magnesium in the Central Nervous System](#)). Taken in divided doses, 600 mg/day of magnesium citrate or trimagnesium dicitrate was shown to be helpful ([Koseoglu, Magnes Res 2008](#); [Peikert, Cephalalgia 1996](#)), although 300 mg daily (as magnesium citrate and oxide) in combination with riboflavin and feverfew was no better than placebo ([Maizels, Headache 2004](#)). Magnesium taurate has been *proposed* for the prevention of migraines ([McCarty Med Hypotheses 1996](#)), but it hasn't been evaluated in people.

Magnesium *in combination with other ingredients* may reduce the frequency of vertigo in people experiencing **vertigo with migraine (vestibular migraine)**, but the evidence is preliminary and it is unclear if the potential benefits are due to magnesium. In a study among 82 people diagnosed with vestibular migraine, taking a supplement formula (*Migraine Care* from BioCeuticals) that included magnesium (300 mg) daily for three months reduced vertigo frequency by 9 points (on a scale of 0 to 60) compared to baseline, although this study lacked a placebo group, which is needed to prove a benefit. In addition to magnesium, the formula included significant amounts of vitamin B-2, pyridoxine (vitamin B-6), folinic acid, vitamin B-12, coenzyme Q10, and parthenolide from feverfew ([Hannigan, Intern Med J 2024](#)).

Magnesium for other conditions

Magnesium (150 mg twice daily from magnesium malate) was no better than placebo in reducing the pain of **fibromyalgia** in a 4-week trial. Use for 6 months suggested a benefit but, this was not compared to placebo ([Russell, J Rheumatol 1995](#)). Topical magnesium products have also been evaluated for fibromyalgia, but these forms do not appear to be helpful and may cause irritation.

Magnesium is one of several minerals (including calcium, iron, zinc, sodium, and copper) that make up nails. Some research suggests that people with "soft, flaky **nails that are inclined to break or split**" may have significantly reduced levels of magnesium in the blood and nail plate ([Cashman, Clin Dermatol 2010](#)). However, there do not appear to be any clinical studies on the effects of magnesium supplementation on nail health or strength.

Use of magnesium supplements may help prevent **menstrual pain** and **PMS** ([Parazzini, Magnes Res 2017](#)).

Magnesium is also an effective **laxative** and **antacid** ([Dupont, Nutrients 2020](#); [Swain, South Med J 1999](#)).

Intravenous magnesium (as opposed to oral magnesium supplementation), is sometimes used in hospitals to treat acute asthma, arrhythmias, overdoses of certain drugs, osmotic coma, diabetic ketoacidosis, pancreatitis, hyperthyroidism, hepatitis, and other conditions.

Magnesium orotate

Magnesium orotate is a complex of magnesium plus orotic acid. Although it has been promoted to improve athletic performance, there is no reliable evidence to support this. However, a preliminary clinical study in people with heart failure found that giving 6,000 mg of magnesium orotate daily for one month, followed by 3,000 mg daily for 11 months reduced the risk of dying during the study by about 25%. It also improved heart failure symptoms in about 40% of patients ([Stepura, Int J Cardiol 2009](#)). However, there are potential safety concerns with magnesium orotate (see [Concerns and Cautions](#)).

Magnesium creams, sprays and oils

There is some evidence that magnesium may be absorbed through the skin, but the amount absorbed is likely to be minimal and topical magnesium products have not been shown to be effective for any condition. Furthermore, they may cause irritation.

In one study, applying a cream (*MagPro*) containing magnesium (form not identified) and MSM on the leg before stretching and exercise had no effect on **flexibility or endurance** compared to a placebo cream ([Gulick, J Strength Cond Res 2012](#)). In a pilot study of a magnesium chloride spray (*Fibro Flex*, Magnesium Direct, Inc. — 31% magnesium chloride) on the quality of life in women with **fibromyalgia**, women reported modest improvements cramps and fatigue but there was no placebo control and no statistically significant improvement in quality of life. Participants were asked to apply (and rub in) 4 sprays per limb 2 times daily for 4 weeks, showering it off before bedtime to avoid transfer to bed sheets. Forty percent of participants dropped out of the study, with 22.5% being due to skin irritation ([Engen, J Integr Med 2015](#)). A small, placebo-controlled study in the UK found no statistically significant increase in blood levels of magnesium from applying a cream containing a low dose of magnesium chloride (56 mg) to the stomach and legs daily for two weeks ([Kass, PLoS One 2017](#)).

A study among men and women (average age 50) with **nighttime leg cramps** showed that applying a homeopathic product (*Theraworx Relief* by Avadim Technologies — which funded the study) containing magnesium sulfate 6X ("6X" means the active ingredient has been diluted at a ratio of 1 to 10 a total of six times so that each gram of product contains only 0.000001 gram of magnesium sulfate) in the evening before bedtime for 14 days *slightly* reduced the *frequency* of leg cramps from about 5.12 events per week at baseline to 3.92 events per week after treatment, but the *severity* of leg cramps did not improve. Although participants who used a placebo foam had no reductions in cramp frequency or severity, the researchers did not analyze whether the decreased frequency with *Theraworx* was statistically significant compared to placebo ([Topp, Int J Nur Health 2018](#)).

Magnesium "oil," which is technically not an oil but a solution of magnesium (typically magnesium chloride) and water, is also promoted to increase magnesium levels in the body and have other beneficial effects. A study among nine men and women found that daily use of a magnesium oil spray containing 31% magnesium chloride (*BetterYou Magnesium Oil Original spray* – 20 sprays per day anywhere on the body), plus a twice weekly magnesium foot soak (*BetterYou Magnesium Oil Original Soak* – 100 mL, 31% magnesium chloride) for three months increased cellular magnesium levels (as measured by hair samples) by an average of 59.7%. However, there was no placebo control, the significance of magnesium in hair samples has not been established, and blood/serum levels of magnesium were not measured ([Watkins, Eur J Nutr Res 2010](#)). In a study conducted by Dr. Norman Shealy ([Shealy Wellness Clinic](#), Fair Grove, Missouri) in which participants performed a 20-minute foot-soak with transdermal magnesium chloride bath flakes and sprayed their entire body with magnesium oil once daily for one month, intercellular levels of magnesium (as measured in skin cells swabbed from the mouth) were reported to increase from 31.4 mEq/L to 41.2 mEq/L. However, this study does not appear to have been placebo-controlled or published in a peer-reviewed journal.

Be aware that some companies selling topical magnesium products claim that the skin irritation caused by these products is an indication of low magnesium levels in the body. There does not appear to be evidence supporting this claim.

Epsom salt baths

Although no peer-reviewed studies have been published on the absorption of magnesium from Epsom salt (magnesium sulfate) baths, a non-controlled and undated study performed at the University of Birmingham (published by the [Epsom Salt Council](#)) showed that soaking in a bath with Epsom salts (flakes or granules of magnesium sulfate) increased concentrations of magnesium in the blood and urine. In the study, 19 men and women (ages 19 to 64) soaked for 12 minutes in a hot bath (122° to 131° F) in a standard bathtub with 400 mg to 600 grams (0.9 to 1.3 lb) of Epsom salt added to 15 gallons of bath water (2 cups of Epsom salt is about 1 lb). This was repeated daily for seven days. After the first bath, levels of magnesium in the blood rose by an average of 9% and, after seven days, by 35% (excluding two people with no significant increase), and magnesium levels in the urine rose on average by 109% – indicating that magnesium was being absorbed as well as excreted. Sulfate levels in the blood and urine also increased.

Quality Concerns and Tests Performed:

Like other supplements, neither the FDA nor any other federal or state agency routinely tests magnesium products for quality prior to sale. However, quality issues for magnesium supplements can include the following:

- **Labeled Amount** – Does the product really contain the labeled form and amount of magnesium? Too little magnesium in a supplement is a problem if relying on it to prevent or correct a deficiency – and several magnesium supplements have been [found to contain less magnesium than expected from their labels](#). Excessive consumption of oral magnesium frequently causes diarrhea. While it is unlikely that an individual with healthy kidneys can take enough magnesium orally to elevate blood levels, if this does occur, potentially dangerous heart and nerve-related symptoms may develop. Individuals with severe kidney disease should not take magnesium supplements.
- **Purity** – Many sources of magnesium, like other minerals, may naturally contain amounts of toxic heavy metals such as lead, arsenic, cadmium, and mercury. In 2005 and 2009, for example, ConsumerLab.com found magnesium supplements contaminated with lead, and, in 2012, found a combination product containing magnesium, calcium, vitamin D and vitamin K to exceed limits for lead contamination.
- **Ability to Break Apart for Absorption** – Will pills break apart properly so they can release their ingredients in the body? For a tablet to be most useful, it must fully disintegrate prior to leaving the stomach, delivering its contents for absorption in the gut. Some tablets and caplets are not properly made and can pass through your body completely or partially intact, depriving you of their ingredients. Remnants of such products are sometimes found in the stool. This happens, for example, when a tablet is too tightly compressed (too "hard") or is too thickly coated.

- **Side Effects at Suggested Dosage** — ConsumerLab.com reviewed the levels of magnesium to determine if any product provided doses high enough to carry a risk of adverse side effects. Those that exceeded Tolerable Upper Intake Levels (ULs — see discussion below) are footnoted.

ConsumerLab.com, as part of its mission to independently evaluate products that affect health, wellness, and nutrition, purchased many leading magnesium-containing supplements sold in the U.S. and Canada and tested them to determine whether they possessed the claimed amount of magnesium and, if listed, amounts of calcium, boron, vitamin D, and vitamin K. Products sold as regular tablets were tested to determine whether they could disintegrate properly. All products were tested to determine whether they were free of unacceptable levels of lead, arsenic, cadmium, and mercury (see [Testing Methods and Passing Score](#)).

What CL Found:

[**Updates: (5/15/24):** *Deva Vegan Magnesium* was added to this Review three weeks after the Review was published. The product was not available for purchase when the other products were purchased, delaying its acquisition and testing. **(7/30/24):** Six products were added to this Review that are combinations of magnesium with [calcium](#), [vitamin D](#), [vitamin K](#), and [boron](#) that also appear in our separate Reviews of those nutrients.]

Among the 14 magnesium supplements selected for testing, two were **Not Approved** because they appear to contain forms of magnesium not listed on their labels. In addition, a combination product was Not Approved because it contained less vitamin K than listed. Nevertheless, they and all of the other products contained their listed amounts of magnesium and other key, tested ingredients within an acceptable margin, as did nine products tested through ConsumerLab.com's voluntary [Quality Certification Program](#).

Problems found

BulkSupplements.com Magnesium Glycinate and **Bluebonnet Magnesium Aspartate** were **Not Approved** because our findings suggest that they contained some other form of magnesium (such as magnesium oxide) not identified on their labels.

BulkSupplements.com Magnesium Glycinate claims 400 mg of magnesium from 2,200 mg of magnesium glycinate (about 4/5 teaspoon), with no other listed ingredients. This means that 18% of the product is magnesium, but magnesium glycinate should only be 14% magnesium glycinate. Therefore, this product is not pure magnesium glycinate and includes another, unlisted, form of magnesium with a higher magnesium content, such as magnesium oxide, which is 60% magnesium but is not absorbed as well. This type of problem can actually be spotted from the label (see [ConsumerTips](#)) but our tests confirmed the problem, as we found a 2,200 mg serving to provide 431.2 mg of magnesium, or 19.6% — far above the expected yield from a 2,200 mg dose of magnesium glycinate.

[**Updates (7/28/25 and 5/2/24):** A ConsumerLab member asked BulkSupplements.com in 2024 about this issue, and a Customer Service Supervisor responded that "Our assay is testing the Magnesium content in the raw material and to verify if we have met the label claim. Consumer theories are calculated theoretically. The information supplied on our label is accurate." From this response, it appears that the company did not understand the amount of magnesium expected in magnesium glycinate is based on the molecular weight of its components, not a "consumer theory," and although the product contains its promised amount of magnesium, the label is *not* accurate regarding its listed *form* of magnesium.] However, BulkSupplements subsequently began to include "Magnesium Oxide" in its Supplement Facts labeling for its "Magnesium Glycinate" products, and, when a CL member asked about this, BulkSupplements admitted (in a 7/26/25 email) that 14% of its magnesium *glycinate* ingredient actually is magnesium *oxide*, explaining (in what seems contradictory to us) that "Our Magnesium glycinate is 100% pure with no additives or fillers" but is created from magnesium oxide and glycine and "there is leftover unreacted Magnesium Oxide content in the finished product..." Although such a product may provide it listed amount of magnesium, this may not be absorbed quite as well as magnesium that is entirely glycinate.

Similarly, **Bluebonnet Magnesium Aspartate** does not seem to be magnesium aspartate alone. It claims 400 mg of magnesium from 2 capsules, or 200 mg from one capsule. While it met that claim (we found a bit more — 219 mg per capsule), to get that much magnesium from magnesium aspartate, one would expect at least 1,250 mg of magnesium aspartate per capsule, since magnesium

aspartate is, at best, 16% magnesium. Instead, the average weight of the contents per capsule was just 836 mg. This means that magnesium was 26% of the content weight and that the capsule had to include another form of magnesium with a higher magnesium content, such as magnesium oxide. **[Update (5/2/24):** This type of mislabeling has been previously reported with magnesium *glycinate* products but not with magnesium aspartate products, like this one. Although ConsumerLab originally Approved this Bluebonnet product seven days ago when this Review was first published, ConsumerLab recognized the mislabeling issue today and, consequently, changed the status of this product to *Not Approved* and added this paragraph.]

Life Extension Bone Restore with Vitamin K2 was **Not Approved** because it contained only 80.8% of its listed amount of vitamin K2 as MK-7 (a deficiency confirmed in second independent laboratory), although it still provided a substantial dose of vitamin K and correct amounts of other key ingredients.

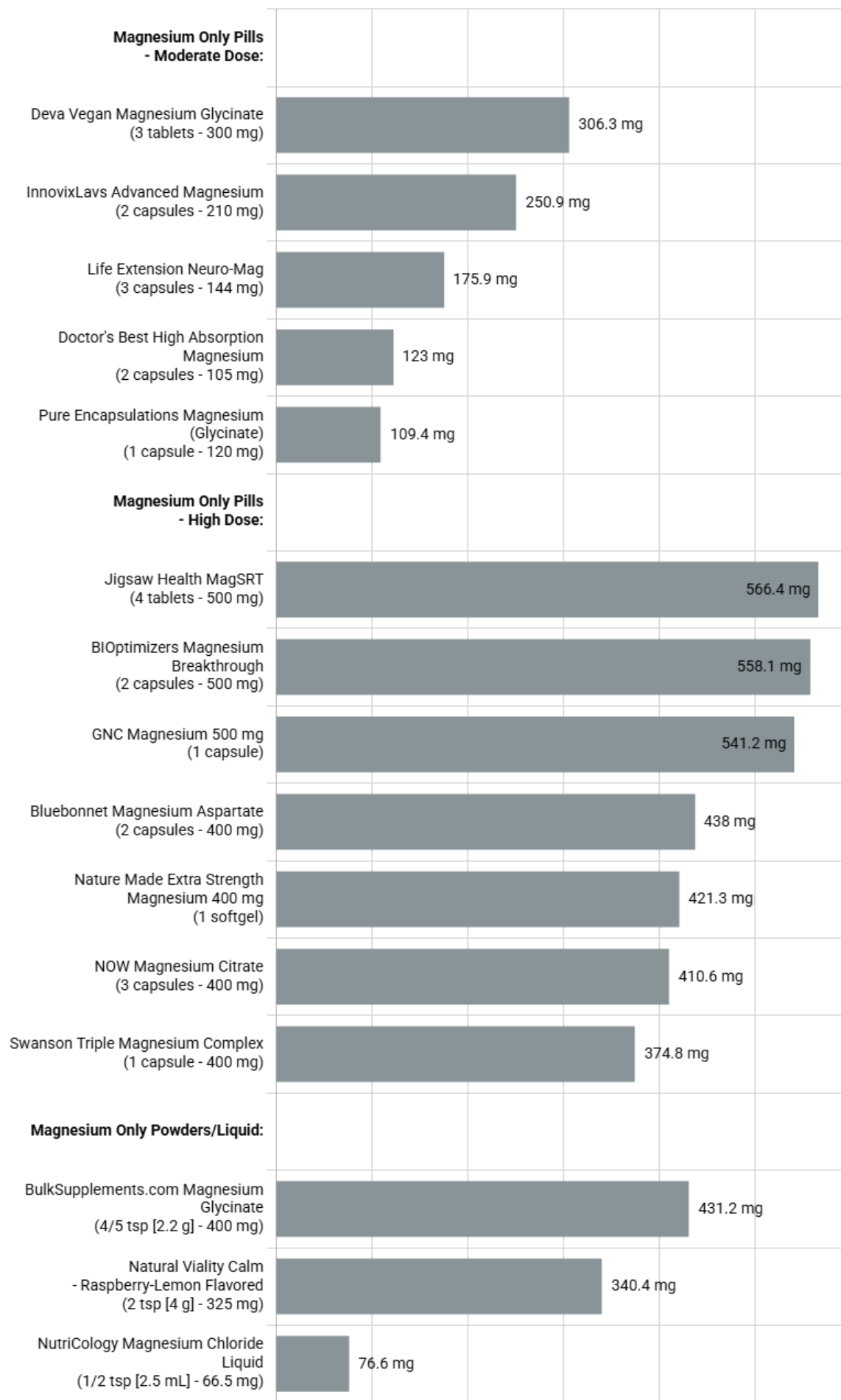
The fact that *Life Extension* contained less vitamin K than listed but had the correct amounts of other key ingredients may be due to known issues with the purity of MK-7 (i.e., how much is in the active "trans" form rather than the inactive "cis" form) and instability of MK-7 when it is combined with large amounts of minerals such as calcium and magnesium, as has been suggested by other studies ([Orlando, Molecules 2019](#); [Szterk, Food Chem 2018](#)). These issues may also help explain why, in our Review in 2022, we found that *Jarrow Formulas BoneUp* contained only 30.7% of its claimed vitamin K2 (as MK-7) (4.6 mcg instead of 15 mcg), despite containing its amounts of calcium, magnesium, boron, and vitamin D.

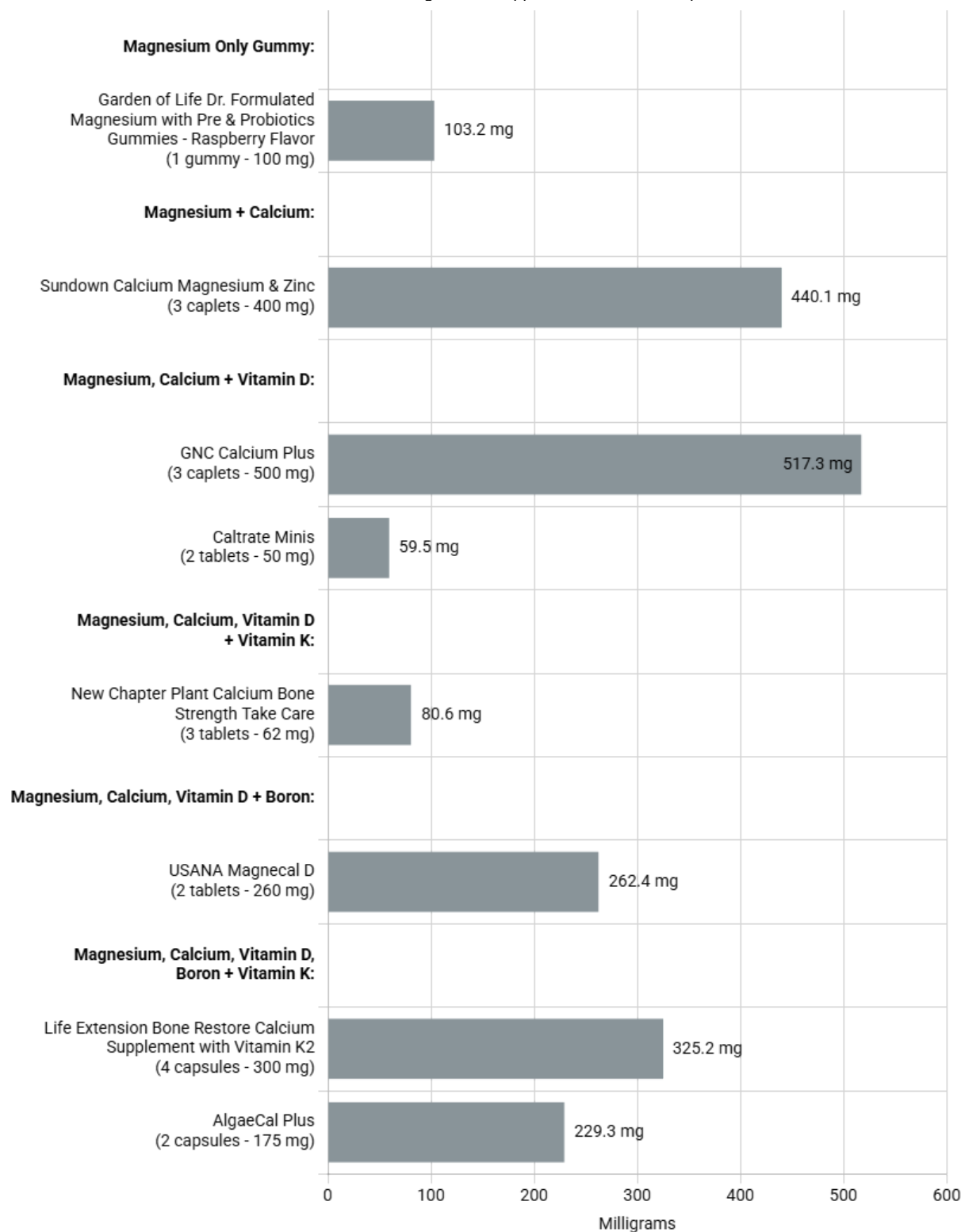
It should be noted that ConsumerLab's selection of products in this Review is not a random sampling of products in the market but is largely driven by suggestions from ConsumerLab members and products that have passed earlier Reviews. ConsumerLab.com's mission is to *find the best quality supplements*, so products that have failed previous tests are typically excluded from selection. For example, *Vitacost Magnesium Citrate* was not tested because, when tested for our Review in 2022, we found only 339.1 mg of its listed 400 mg of magnesium per 2-tablet serving.

Be aware that even among products that were Approved in testing, several provide daily amounts of magnesium above the Tolerable Upper Intake Level (UL) for magnesium (350 mg per day for an adult) if taken within their listed suggested daily serving sizes. Each is identified with "UL" in the second column of the [Results table](#). This can be acceptable when magnesium is taken to treat deficiency but is otherwise generally not advisable.

Magnesium per serving

The amount of magnesium found in a suggested serving of a supplement varied tremendously across products. As shown below, among magnesium-only supplements, this ranged from 76.6 mg from a ½ teaspoon of *Nutricology Magnesium Chloride Liquid* to 566.4 mg from 4 tablets of *Jigsaw Health MagSRT*. Among combination products, this ranged from 59.5 mg from 2 tablets of *Caltrate Minis* to 517.3 mg from *GNC Calcium Plus*. Note that a suggested *daily* serving of all the high-dose pills, as well as *BulkSupplements.com Magnesium Glycinate* powder and four combination products (*Sundown Calcium, Magnesium & Zinc*, *GNC Calcium Plus*, *AlgaeCal Plus*, and *USANA Magnecal D*) exceed the UL for magnesium, discussed above.

Magnesium Found Per Serving



Pill disintegration and heavy metals

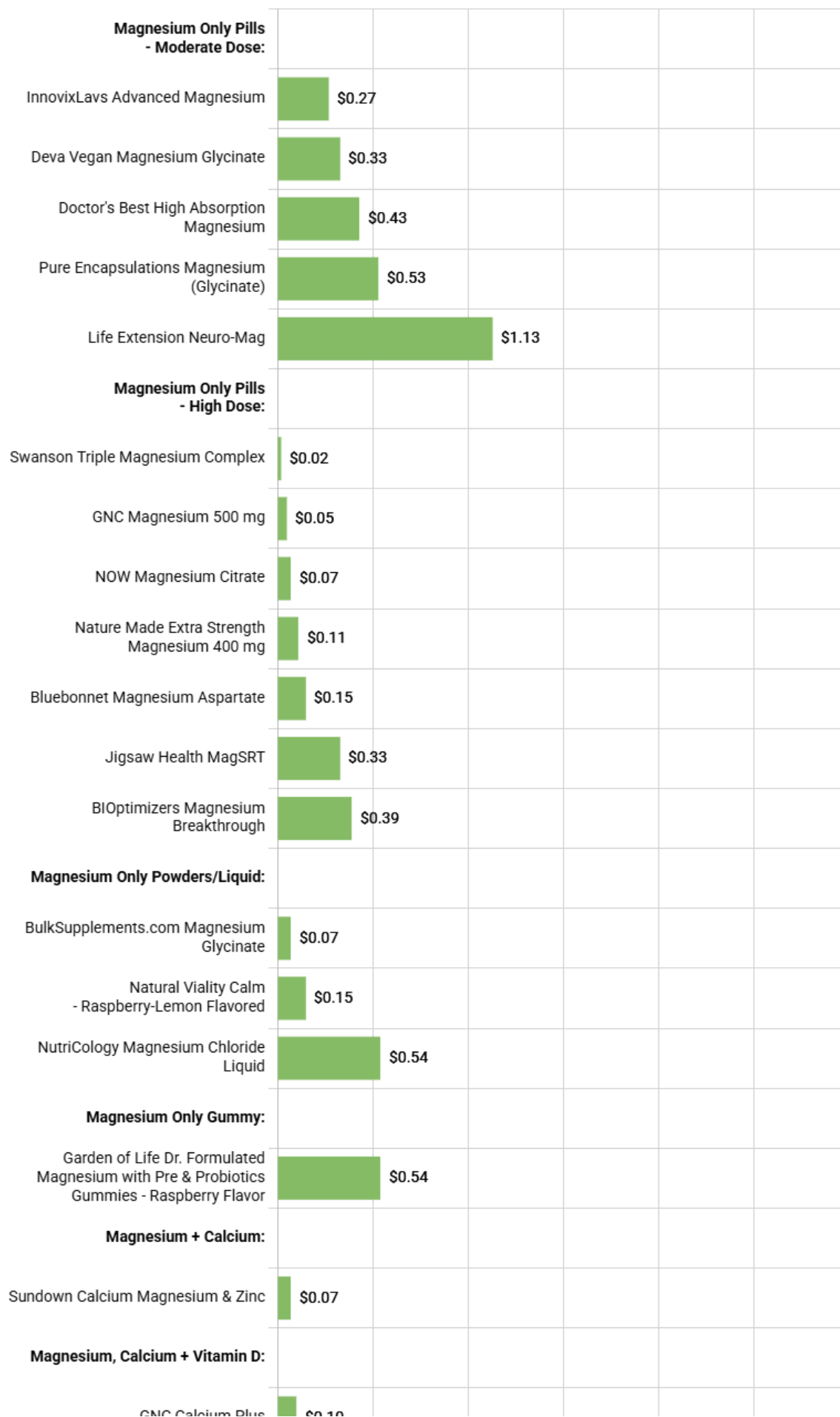
All tablets and caplets disintegrated properly, and none was contaminated with concerning amounts of heavy metals. **[UPDATE (7/7/25):** In June 2025, independent testing group [Lead Safe Mama](#) reported "concerning" levels of lead in three magnesium supplements — one of which was tested in this Review. However, the levels found were actually very low: 0.008 mcg/g (8 ppb) in *Doctor's Best High Absorption Magnesium Lysinate Glycinate* (tested in this Review), 0.019.0 mcg/g in *Genemedics Nutrition Magnesium Bisglycinate*, and 0.026 mcg/g in *Organics Ocean Pure Magnesium Glycinate + Low Dose Zinc*. We actually found a higher lead level (0.024 mcg/g) in *Doctor's Best* than Lead Safe Mama, but this is still very low. As we have [previously noted](#), Lead Safe Mama bases its

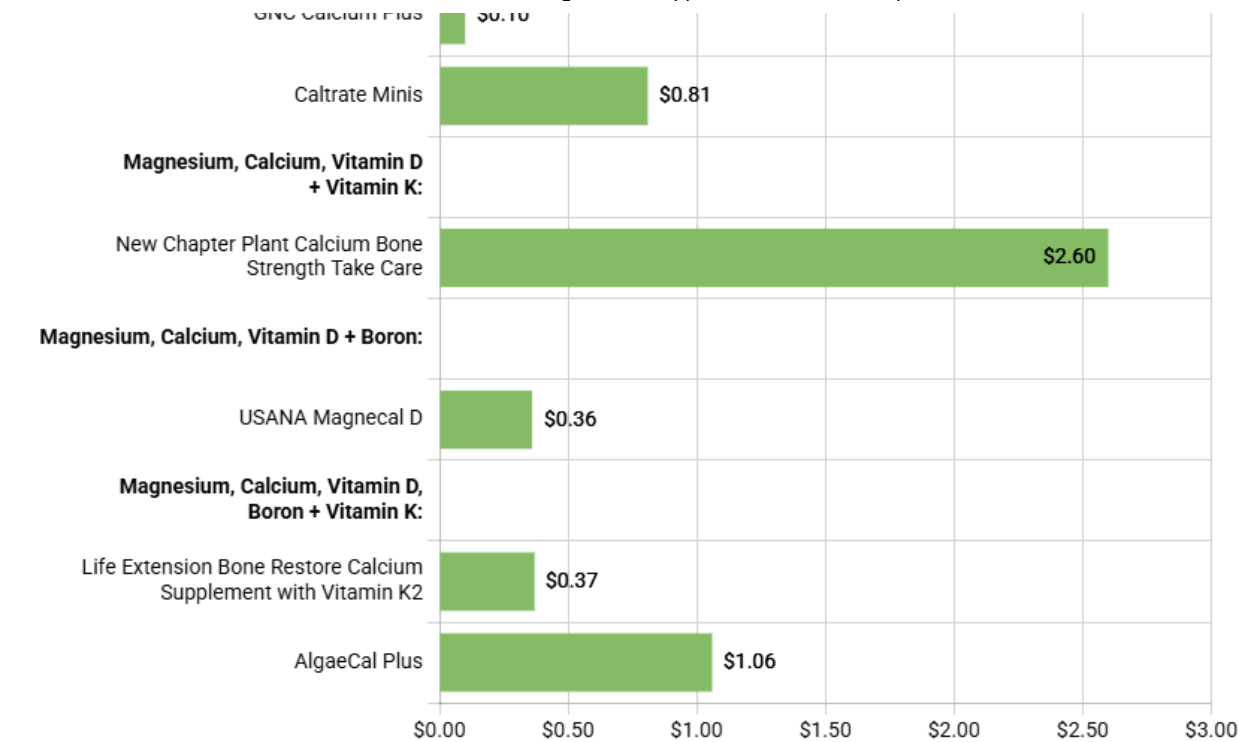
"concern" on the fact that levels exceed a *proposed* limit that did *not* become and was intended to only apply to heavy metals in infant and toddler foods, which are consumed in much larger amounts than magnesium supplements. In fact, the amount of lead we found per serving in *Doctor's Best* was only 0.03 mcg, which is far below the strict 0.5 mcg warning level applied by the state of California.]

Cost

Magnesium can be a fairly *inexpensive* ingredient, with the cost to obtain 200 mg being as little as 2 to 7 cents from partial servings of some high-dose products, as shown in the graph below.

The lowest cost to get magnesium from a single unit would be 4 cents from a capsule of *Swanson Triple Magnesium Complex* (in which we found 374.8 mg of magnesium) and 5 cents for a capsule of *NOW Magnesium Citrate* (in which we found 137 mg of magnesium). However, products with certain chemical forms, special formulations or extra ingredients were more expensive. For example, the cost of a daily serving of 3 capsules of *Life Extension Neuro-Mag* (144 mg of magnesium claimed, although we found a bit more), is \$1.00. This product is made with magnesium threonate, likely due to preliminary research that suggested a benefit on memory — although [clinical studies have shown minimal benefit](#).

Cost of 200 mg Magnesium*



* Costs based on amounts found.

Top Picks:

Among Approved products, ConsumerLab.com chose several **Top Picks** (see below). To be a CL *Top Pick*, a supplement had to, among other things, pass ConsumerLab's tests of [quality](#), provide a reasonable dose, offer good value (i.e., a favorable price), and be convenient to use.

Magnesium Only: **NOW Magnesium Citrate** and **Deva Vegan Magnesium Glycinate**

We selected two *Top Picks* for magnesium only: **NOW** and [Deva](#). Between these two, **NOW Magnesium Citrate** is much less expensive and, therefore, our *first choice when taking less than 350 mg magnesium per day*. If you need to take more than 350 mg of magnesium per day, above which the citrate form in **NOW** may have a laxative effect, we think it's worth paying more for **Deva Vegan Magnesium Glycinate**, which, due to its glycinate (as bisglycinate) form, is less likely to cause a laxative effect at a high dosage. *Deva* can also be used at a lower dose, but it's probably not worth the additional cost compared to **NOW**.

Each capsule of **NOW Magnesium Citrate** costs just 5 cents and promises 133.3 mg of magnesium (we found slightly more -- 136.9 mg), making it one of the least expensive sources of magnesium among the supplements we tested, and its citrate form is better absorbed and less likely to have a laxative effect than the magnesium **oxide** in less expensive products. (Our *Top Pick* for magnesium in 2022 was *Puritan Pride's Magnesium Citrate* (100 mg per capsule), but **NOW** provides somewhat more magnesium per capsule and is slightly less expensive.) About 30% of the magnesium in magnesium citrate gets absorbed, versus only about 4% of magnesium in magnesium oxide. Be aware that citrate-containing supplements can increase absorption of aluminum from other medications and foods (and aluminum may be harmful in the body). This is not a problem for people with normal kidney function. However, it would be best not to take magnesium citrate along with aluminum-containing medications, such as Maalox (which also contains magnesium in the hydroxide form).

Deva Vegan Magnesium Glycinate promises 100 mg of magnesium per tablet (we found slightly more 102 mg per tablet) for 17 cents (\$14.99 for 90 tablets), making it more than four times as expensive a source of magnesium as **NOW** but -- as mentioned earlier -- its glycinate form is less likely to have a laxative effect at high doses than magnesium citrate. Note that the label on *Deva* suggests taking

"3 tablets" per day (about 300 mg) "or as directed by a health care professional." However, if you are instructed to take more than three tablets, such as four, this should still be okay due to the lower risk of a laxative effect with this form of magnesium versus magnesium citrate or oxide.

Other forms in magnesium-only supplements:

Another form that is less likely to have a laxative effect when taking more than 350 mg of magnesium is the **chloride** form, which is best to get in liquid form (because magnesium chloride tablets will [absorb water from the air](#)) such as in *Nutricology Magnesium Chloride Liquid*, which was Approved, although not a *Top Pick*. It promises 66.5 mg of magnesium (we found 76.6 mg) as magnesium chloride per ½ teaspoon for 21 cents. (In 2019, we tested another liquid magnesium chloride product, [ReMag](#), but it was *Not* Approved as it was found to be contaminated with a small amount of lead – 0.58 mcg per ½ teaspoon and 1.2 mcg per 1 teaspoon of liquid. Compared to *Nutricology*, *ReMag* has a higher concentration of magnesium – 150 mg per ½ teaspoon).

Be aware that magnesium **carbonate** is used in some supplements, although it is generally not well-absorbed. A possible exception is in the powdered supplement *Natural Vitality Calm* (Approved in this Review) which, when mixed in water, creates an effervescent drink where magnesium carbonate reacts with citric acid that is also in the powder, releasing carbon dioxide bubbles and allowing the magnesium to form magnesium citrate, which, as noted earlier, has a relatively high level of magnesium absorption. However, there is *no good evidence that magnesium has a calming effect* (see What It Does – [Anxiety](#)). Magnesium carbonate is often the magnesium source in "bone health" combination supplements, likely because the carbonate is less bulky than other forms, such as citrate, allowing for smaller pill size.

Magnesium with Other Vitamins and Minerals

Magnesium and Calcium: As discussed in our [ConsumerTips](#), it is not necessary to take magnesium just because you are taking calcium, and, it's probably best not to take more than 250 mg of either together as this could possibly reduce absorption of the other. This could be achieved with our *Top Pick* for magnesium (*NOW Magnesium Citrate*) and our [Top Pick for calcium](#) (*Solaray Calcium Citrate*, providing 250 mg of calcium per capsule for 9 cents). If you feel compelled to take these together, the *Sundown Calcium Magnesium & Zinc* supplement Approved in our tests is an option, but only if you also need to get more zinc, and it would be best, in our opinion, *not* to take the suggested 3-caplet dose (as that would provide a little over 1,000 mg of calcium and 440 mg of magnesium), but just a single caplet with a meal and, if needed, and a second caplet with a different meal.

In 2022, we tested and Approved *Country Life Calcium Magnesium Complex* which offers 500 mg of calcium and 250 mg of magnesium per tablet (currently 11 cents). *Country Life* suggests taking 2 tablets, but this would put you 150 mg over the Tolerable Upper Intake Level for magnesium from supplements, which is only 350 mg.

Magnesium, Calcium, and Vitamin D: Both products tested in this category – *Caltrate Minis* and *GNC Calcium Plus* – were Approved for quality and are fairly inexpensive, although both use calcium carbonate and magnesium oxide, which are less bulky than other forms (keeping pill size down) but may not be absorbed as well as other forms such as citrate if taken on an empty stomach by people with low stomach acid, including those who take acid-blocking drugs.

Our *Top Pick* in this category is **GNC Calcium Plus** as it offers, per caplet (8 cents) a good dose of calcium (333 mg – we found 318 mg), magnesium (167 mg – we found 172 mg) and 6.67 mcg (267 IU) of vitamin D3 (we found 8.6 mcg). The label suggests taking 3 caplets per day, and we would suggest taking just one caplet with a meal, and, if needed, a second with a later meal, so as not to get too much calcium at one time. We would not recommend taking the full 3-caplet dose per day, as that would provide 517 mg of magnesium per day, which could have a laxative effect.

Caltrate Minis is not our *Top Pick* in this category as it offers little magnesium – just 50 mg (we found 59.5 mg) per 2-tablet serving. While this permits the tablets to be smaller in size, the product is more like a calcium-vitamin D supplement. Each mini tablet offers 300 mg of calcium (we found a bit less – 281 mg) and 20 mcg (800 IU) of vitamin D (we found a bit more 23.6 mcg).

If you have low stomach acid (such as from taking an acid-blocking drug) or are unable to time supplementation with a meal, *USANA Magnecal D* may be a better option as its calcium and magnesium are each at least 50% in the citrate form (which will help you with absorption), with the remainder being in the carbonate form. It also includes a little boron in the citrate form. A downside is that it costs a lot more than the other products — 47 cents per 2 tablet serving. The product suggests taking 2 tablets twice daily, but that's a lot of magnesium per day (about 520 mg), which is above the 350 mg upper tolerable intake level and could cause loose stools. A single 2-tablet serving should provide enough magnesium for most people, along with about 260 mg of calcium and 500 IU (12.5 mcg) of vitamin D.

Magnesium, Calcium, Vitamin D, and Vitamin K: It's not clear that supplementing with vitamin K improves bone health, and most people already get sufficient vitamin K from their diets, as discussed in our [Vitamin K Review](#). However, if you want a product combining calcium with vitamin K, vitamin D, and magnesium, our *Top Pick* is **New Chapter Bone Strength Take Care** — just be aware that it provides little magnesium. A single vegetarian slim tablet (35 cents), offers 302 mg of calcium, 8.3 mcg (333 IU) of vitamin D3, two forms of vitamin K: vitamin K1 (11.6 mcg) and vitamin K2 (15 mcg), and a small amount of magnesium — just 20.7 mg. We found a bit more than these listed amounts. It also claims to provide small amounts of strontium (1.8 mg) and vanadium (14 mcg), which are not essential minerals. The calcium and magnesium in *New Chapter* are from algae, but there is no compelling research showing superiority of algae-based forms of these minerals. The label suggests taking three tablets daily with food, but we suggest not taking more than one tablet per serving to avoid getting too much calcium at one time.

Magnesium, Calcium, Vitamin D, Boron, and Vitamin K: We tested two products in this category, although neither is a *Top Pick* because one, *Life Extension Bone Restore with Vitamin K2* was found to provide somewhat less vitamin K than listed and was, therefore, *Not Approved*, while the other, *AlgaeCal Plus*, is unusually expensive (\$1.22 per 2-capsule serving) and we do not consider it a good value. (As noted earlier, in 2022 we tested *Jarrow Formulas BoneUp* — a popular product in this category — but found that it contained only 30.7% of its claimed vitamin K2 (as MK-7), despite containing its amounts of calcium, magnesium, boron, and vitamin D.)

With that said, if you don't mind paying the high price, a 2-veggie capsule serving of *AlgaeCal Plus* does deliver good amounts of all five of the nutrients in this category (as well as some vitamin C). The calcium and some of the magnesium are derived from algae, but there is no proven clinical advantage with this source, and it doesn't justify the premium price. It would be far less expensive to get these ingredients by combining other, less expensive, supplements that ConsumerLab has Approved. The label on *AlgaeCal Plus* suggests taking a two-capsule serving with a meal twice daily (4 capsules in total), but, be aware that this would provide a total of 458.6 mg of magnesium (based on the amounts we found, which is about 100 mg more than listed) and this exceeds the daily tolerable upper intake level (UL) for magnesium of 350 mg, above which there is increasing risk of a laxative effect.

Although *Life Extension Bone Restore with Vitamin K2* was *Not Approved* because it fell somewhat short on its vitamin K2 as trans MK-7 (we found 80.8% of its listed 200 mcg), this is still a substantial dose of vitamin K and the product did contain its listed amounts (or somewhat more) of calcium, magnesium, and boron. The label suggests taking 4 capsules daily — although it would seem best to not take more than two at a time to reduce competition for mineral absorption, particularly as the major forms in the product are calcium carbonate and magnesium oxide, which might not be the best absorbed forms for people with low stomach acid.

Test Results by Product:

Listed below are the test results for 23 supplements containing magnesium, grouped as moderate-dose and high-dose pills, powders and liquids, and gummies, followed by combinations that include magnesium along with calcium, vitamin D, vitamin K, and/or boron. Within each group, products are listed alphabetically. ConsumerLab.com selected 14 of these products. Nine others (each indicated with a CL flask) were tested at the request of their manufacturers/distributors through CL's voluntary [Quality Certification Program](#) and are included for having passed testing.

Results of ConsumerLab.com Testing of Magnesium Supplements (Including Combinations With Calcium, Vitamin D, Vitamin K, and Boron)					
(Price Checks are not included in printed reviews)					
Approval Status	Claimed Amount	Suggested Serving on	Cost	Notable Features	Full List of Ingredients
Product Name	and Form of Key Ingredient(s) Per Serving	Label Pill Size	[Per 200 mg Magnesium Found]	and Precautions on Label	Per Serving
Heavy Metals					
Magnesium Only Pills - Moderate Dose (<350 mg):					
➤ APPROVED ➤ ➤ Top Pick ➤ for magnesium only Deva® Vegan Magnesium Glycinate   Dist. by DEVA Nutrition LLC	3 tablets	For adults, take three (3) tablets daily with food, or as directed by a health care professional.	\$0.50/3 tablets	Trace minerals (from Utah Inland Sea)30 mg per 3 tablets	3 tablets
	Magnesium: 300 mg (magnesium bisglycinate) [Found 306.3 mg ✓]	Large tablet	[\$0.33] \$14.99/90 tablets	<i>Vegan Society seal.</i> <i>Food Sensitivity: Free of yeast, wheat, gluten, sugar, shellfish, soy, animal products, by products or derivatives.</i>	Magnesium (from Magnesium Bisglycinate) 300 mg, Trace Minerals (from Utah Inland Sea) 30 mg. Other Ingredients: Dicalcium phosphate, cellulose, vegetable stearic acid Additional Information 3 tablets Magnesium (from Magnesium Bisglycinate) 300 mg, Trace Minerals (from Utah Inland Sea) 30 mg. Other Ingredients: Dicalcium phosphate, cellulose, vegetable stearic acid, croscarmellose sodium, silica, hypromellose, and vegetable magnesium stearate.

APPROVED Doctor's Best® High Absorption Magnesium  Dist. by Doctor's Best, Inc.	2 veggie caps Magnesium: 105 mg (magnesium lysinate glycinate chelate) [Found 123 mg ✓] Metals: Pass Lead: 0.03 mcg Arsenic: Cadmium: Mercury:	Take 2 capsules daily or as recommended by a nutritionally informed physician. Large veggie cap	\$0.27/2 veggie caps [\$0.43] \$15.99/120 veggie caps	<i>Non-GMO / Gluten Free / Soy Free / Vegan. Albion Minerals.</i>	2 veggie caps Magnesium (from 1,050 mg magnesium lysinate glycinate chelate) 105 mg. Other Ingredients: Hypromellose (vegetarian capsule), calcium stearate, microcrystalline cellulose, silicon dioxide.
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APPROVED InnovixLabs Advanced Magnesium   Dist. by InnovixLabs - A Division of Innovix Pharma Inc.	2 vegetarian capsules Magnesium: 210 mg (magnesium malate, magnesium glycinate) [Found 250.9 mg ✓] Metals: Pass Lead: 0.05 mcg Arsenic: 0.08 mcg Cadmium: Mercury:	Take two (2) capsules once or twice daily. May be taken with or without a meal. Large vegetarian capsule	\$0.33/2 vegetarian capsules [\$0.27] \$24.99/150 vegetarian capsules	<i>Vegan. Gluten Free. Does Not Contain: Dairy, eggs, fish, shellfish, tree nuts, peanuts, wheat/gluten, soy, sugar, yeast, artificial colors or flavors. All ingredients are non-BE (Bioengineered) and suitable for vegans. Does not contain Magnesium Oxide</i> <i>Additional Information</i> <i>Vegan. Gluten Free. Does Not Contain: Dairy, eggs, fish, shellfish, tree nuts, peanuts, wheat/gluten, soy, sugar, yeast, artificial colors or flavors. All ingredients are non-BE (Bioengineered) and suitable for vegans. Does not contain Magnesium Oxide.</i> <i>Magnesium chelated, encapsulated, packaged, and tested in USA.</i>	2 vegetarian capsules Magnesium (Elemental) (as Magnesium Malate, Magnesium Glycinate) 210 mg. Other Ingredients: Vegetarian Capsule (Plant Cellulose), Medium Chain Triglyceride, and Rice Extract.
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APPROVED Life Extension® Neuro-Mag®  Dist. by Quality Supplements and Vitamins, Inc	3 vegetarian capsules Magnesium: 144 mg (Magtein® magnesium L-threonate) [Found 175.9 mg ✓] Metals: Pass Lead: 0.05 mcg Arsenic: Cadmium: Mercury: 0.003 mcg	Take three (3) capsules daily, or as recommended by a healthcare practitioner. Large vegetarian capsule	\$1.00/3 vegetarian capsules [\$1.13] \$29.94/90 vegetarian capsules	Gluten Free. Non GMO.	3 vegetarian capsules Magnesium (from 2,000 mg Magtein® magnesium L-threonate) 144 mg. Other Ingredients: Vegetable cellulose (capsule), microcrystalline cellulose, stearic acid, silica, vegetable stearate.
APPROVED Pure Encapsulations® Magnesium (Glycinate)  Dist. by Pure Encapsulations	1 capsule Magnesium: 120 mg (magnesium glycinate) [Found 109.4 mg ✓] Metals: Pass Lead: 0.01 mcg Arsenic: Cadmium: Mercury:	Take 1-4 capsules daily. Consume with food. Large capsule	\$0.29/capsule [\$0.53] \$26.00/90 capsules	GFCO.org Gluten-Free seal. Gluten -free, Non-GMO & Hypoallergenic.	1 capsule Magnesium (as magnesium glycinate) 120 mg. Other Ingredients: Vegetarian capsule (cellulose, water), ascorbyl palmitate.
Magnesium Only Pills - High Dose (>350 mg):					

APPROVED BIOptimizers® Magnesium Breakthrough  Dist. by BIOptimizers USA Inc.	2 veggie caps Magnesium: 500 mg (magnesium chelate, magnesium bisglycinate, Sucrosomial® magnesium (as magnesium oxide), magnesium malate, magnesium orotate, magnesium taurate, magnesium citrate) [Found 558.1 mg ✓] Metals: Pass Lead: 0.36 mcg Arsenic: 0.32 mcg Cadmium: 0.04 mcg Mercury:	Take 2 capsules with your evening meal, or as recommended by a healthcare practitioner. Large veggie cap	\$1.08/2 veggie caps [\$0.39] \$26.99/50 veggie caps	Vitamin B6 2 mg, manganese 1 mg & humic/fulvic monoatomic blend per 2 veggie caps <i>Vegan. Gluten-Free. Soy-Free.</i> Made in the USA with globally sourced ingredients.	2 veggie caps Vitamin B6 (as pyridoxine HCl) 2 mg, Elemental Magnesium (from 1,711 mg of Magnesium Proprietary Blend) [Magnesium Chelate, Magnesium Bisglycinate, Sucrosomial® Magnesium (as magnesium oxide), Magnesium Malate, Magnesium Orotate, Magnesium Taurate, Magnesium Citrate] 500 mg, Manganese (as manganese citrate) 1 mg Additional Information 2 veggie caps Vitamin B6 (as pyridoxine HCl) 2 mg, Elemental Magnesium (from 1,711 mg of Magnesium Proprietary Blend) [Magnesium Chelate, Magnesium Bisglycinate, Sucrosomial® Magnesium (as magnesium oxide), Magnesium Malate, Magnesium Orotate, Magnesium Taurate, Magnesium Citrate] 500 mg, Manganese (as manganese citrate) 1 mg, Humic/Fulvic Monoatomic Blend. Other Ingredients: Cellulose (capsule), Nu-Mag® (rice extract, rice hulls, gum arabic, sunflower oil), Nu-
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					Flow® (rice hulls), silica.
➤ NOT APPROVED ⚠ Bluebonnet Magnesium Aspartate  Mfd. by Bluebonnet Nutrition Corporation	2 vegetable capsules Magnesium: 400 mg (magnesium aspartate) [Found 438 mg but % of magnesium in product is too high for magnesium aspartate -- .] Metals: Pass Lead: 0.18 mcg Arsenic: 0.23 mcg Cadmium: Mercury: 0.002 mcg	Take two capsules once daily or as directed by a healthcare practitioner. Large vegetable capsule	\$0.34/2 vegetable capsules [\$0.15] \$16.76/100 vegetable capsules	<i>Non GMO. Vegan. Gluten Free. Kosher. Free of milk, egg, fish, crustacean shellfish, tree nuts, peanuts, wheat, soybeans and sesame. Also free of corn, gluten, barley, sodium and sugar.</i> Precaution: For adults only.	2 vegetable capsules Magnesium (as magnesium aspartate) 400 mg. Other Ingredients: Capsule (hypromellose, purified water), vegetable cellulose, vegetable magnesium stearate.
➤ APPROVED ⚠ GNC Magnesium 500 mg  Dist. by GNC Holdings, LLC	1 capsule Magnesium: 500 mg (magnesium oxide) (Found 541.2 mg ✓) Metals: Pass Lead: 0.17 mcg Arsenic: 0.9 mcg Cadmium: 0.39 mcg Mercury:	Take one capsule daily. Large capsule	\$0.12/capsule [\$0.05] \$14.99/120 capsules	<i>No Artificial Colors, No Artificial Flavors, Gluten Free, No Milk.</i> Precaution: Contains a bioengineered food ingredient.	1 capsule Magnesium (as Magnesium Oxide) 500 mg. Other Ingredients: Microcrystalline Cellulose, Gelatin, Stearic Acid, Magnesium Stearate Vegetable Source.

APPROVED Jigsaw Health® MagSRT®  Mfd. by Jigsaw Health, LLC	4 tablets Magnesium: 500 mg (dimagnesium malate) [Found 566.4 mg ✓] Metals: Pass Lead: 0.16 mcg Arsenic: Cadmium: Mercury:	Take 4 tablets per day with food. Divide dose if desired, or use as directed by your healthcare professional. Large tablet	\$0.93/4 tablets [\$0.33] \$27.97/120 tablets	Vitamin B6 5 mg, folate 200 mcg DFE, vitamin B12 6 mcg & malic acid 1,436 mg per 4 tablets <i>ConsumerLab seal. No GMO. No Gluten. Vegan. Sustained Release Technology.</i> Product of the U.S.A.	4 tablets Vitamin B6 (as Pyridoxal 5-Phosphate Monohydrate) 5 mg, Folate (as Quatrefolic® 5-Methyl Tetrahydrofolic Acid Glucosamine Salt) 200 mcg DFE, Vitamin B12 (as MecobalActive® Methyl-cobalamin) 6 mcg Additional Information 4 tablets Vitamin B6 (as Pyridoxal 5-Phosphate Monohydrate) 5 mg, Folate (as Quatrefolic® 5-Methyl Tetrahydrofolic Acid Glucosamine Salt) 200 mcg DFE, Vitamin B12 (as MecobalActive® Methyl-cobalamin) 6 mcg, Magnesium (as Dimagnesium Malate) 500 mg, Malic Acid (as Dimagnesium Malate) 1,436 mg. Other Ingredients: Microcrystalline Cellulose, Hydroxypropyl Cellulose, Croscarmellose Sodium & Hydroxypropyl Methylcellulose (Plant-based insoluble fibers used to achieve Sustained Release Technology®); L-Leucine (Essential amino acid used as lubricant), Silicon Dioxide (Anti-caking
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					agent), Clear Coating (Hydroxypropyl Methylcellulose and Sunflower oil) and Micro Wax (for easier swallowing).
➤ APPROVED ➤ Nature Made® Extra Strength Magnesium 400 mg  Dist. by Nature Made Nutritional Products	1 softgel Magnesium: 400 mg (magnesium oxide) [Found 421.3 mg ✓] Metals: Pass Lead: 0.11 mcg Arsenic: 0.85 mcg Cadmium: 0.11 mcg Mercury:	Adults, take 1 softgel daily with water and a meal. Large softgel	\$0.24/softgel [\$0.11] \$14.29/60 softgels	No Synthetic Dyes - Colors Derived from Natural Sources. No Artificial Flavors. No Preservatives. Gluten Free.	1 softgel Calories 10, Total Fat 0.5 g, Saturated Fat 0.5 g, Magnesium (as Magnesium Oxide) 400 mg. Other Ingredients: Medium Chain Triglycerides, Gelatin, Glycerin, Rapeseed Lecithin, Colors Added, Natural Flavor.
➤ APPROVED ➤ ➤ Top Pick ➤ for magnesium only NOW® Magnesium Citrate  Mfd. by NOW FOODS	3 veg capsules Magnesium: 400 mg (magnesium citrate) [Found 410.6 mg ✓] Metals: Pass Lead: 0.03 mcg Arsenic: Cadmium: Mercury:	Take 3 capsules daily, preferably in divided doses, with food. Large veg capsule	\$0.15/3 veg capsules [\$0.07] \$12.24/240 veg capsules	Non-GMO. Kosher. Halal. Precaution: Not manufactured with wheat, gluten, soy, milk, egg, fish, shellfish, tree nut or sesame ingredients. Produced in a GMP facility that processes other ingredients containing these allergens.	3 veg capsules Magnesium (elemental) (from 2,667 mg Magnesium Citrate) 400 mg. Other Ingredients: Hypromellose (cellulose capsule), Ascorbyl Palmitate and Silicon Dioxide.

➤ APPROVED Swanson® Triple Magnesium Complex  Dist. by Swanson Health Products	1 capsule Magnesium: 400 mg (magnesium oxide, magnesium citrate, magnesium aspartate) [Found 374.8 mg ✓] Metals: Pass Lead: 0.03 mcg Arsenic: 0.01 mcg Cadmium: Mercury:	Take one capsule per day with food and water. Large capsule	\$0.04/capsule [\$0.02] \$4.37/100 capsule	Precaution: Warning: For adults only.	1 capsule Magnesium (from magnesium oxide, magnesium citrate, magnesium aspartate) 400 mg. Other Ingredients: Gelatin, rice flour, magnesium stearate, silica.
Magnesium Only Powders/Liquid:					
➤ NOT APPROVED BulkSupplements.com® Magnesium Glycinate  Dist. by BulkSupplements.com	4/5 tsp [2.2 g] Magnesium: 400 mg (magnesium glycinate) [Found 431.2 mg but % of magnesium in product is too high for magnesium glycinate -- .] Metals: Pass Lead: 0.22 mcg Arsenic: Cadmium: Mercury:	Take 2,200 mg (about 4/5 tsp) once to twice daily with water, or as directed by a physician. <i>Taste: White powder that, when mixed in water, creates a milky white suspension with a very unpleasant metallic flavor.</i>	\$0.14 per 4/5 tsp [\$0.07] \$15.96/8.8 oz [250 g] pouch (approx. 114 servings)	<i>Free of: Sugar, soy, dairy, yeast, gluten, additives.</i>	4/5 tsp Magnesium (as Magnesium Glycinate) 400 mg Other Ingredients: None.

APPROVED Natural Vitality Calm® - Raspberry-Lemon Flavored  Dist. by Nutranext Business, LLC	2 tsp [4 g] Magnesium: 325 mg (magnesium carbonate) [Found 340.4 mg ✓] Metals: Pass Lead: 0.16 mcg Arsenic: 0.6 mcg Cadmium: 0.56 mcg Mercury:	Directions suggest starting out with a half teaspoon (1 g) of Natural Vitality CALM® powder, and gradually increasing to 2 teaspoons (4 g) daily. Start by placing the desired amount of powder into a cup or mug, add 2-3 ounces of warm water, and let your drink fizz Additional Information Directions suggest starting out with a half teaspoon (1 g) of Natural Vitality CALM® powder, and gradually increasing to 2 teaspoons (4 g) daily. Start by placing the desired amount of powder into a cup or mug, add 2-3 ounces of warm water, and let your drink fizz. Stir the drink until the powder is completely dissolved, then fill the remainder of the cup with warm or cold water. <i>Taste: White powder that mixes easily in warm water (per instructions), creating a slightly fizzy, sweet, and fruity drink.</i>	\$0.25/2 tsp [\$0.15] \$28.79/16 oz [453 g] container (approx. 113 servings)	<i>Non GMO Project Verified seal. Vegan. Gluten-Free. Certified Clean. Contains no sugar, or artificial flavor or color.</i>	2 tsp Magnesium (as magnesium carbonate) 325 mg. Other Ingredients: Citric acid, organic lemon flavor, organic raspberry flavor with other natural flavors, organic stevia (leaf) extract.
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APPROVED NutriCology® Magnesium Chloride Liquid  Dist. by NutriCology®	1/2 tsp [2.5 mL] Magnesium: 66.5 mg (magnesium chloride) [Found 76.6 mg ✓] Metals: Pass Lead: 0.03 mcg Arsenic: Cadmium: Mercury:	1/2 teaspoon diluted in eight ounces of your favorite beverage, two or three times daily, or as directed by a healthcare practitioner. Shake product prior to dilution. <i>Taste: Clear liquid that mixes easily in water imparting a moderately metallic flavor - best to mix into a beverage to mask the flavor, as suggested on label.</i>	\$0.21 per 1/2 tsp [\$0.54] \$19.49/8 fl oz [236 mL] glass bottle (approx. 94 servings)	<i>Hypoallergenic.</i> Refrigerate after opening.	1/2 tsp Magnesium (as Magnesium Chloride) 66.5 mg. Other Ingredients: Deionized water, lactic acid, potassium sorbate.
Magnesium Only Gummy:					

APPROVED Garden of Life® Dr. Formulated Magnesium with Pre & Probiotics Gummies - Raspberry Flavor   Dist. by Garden of Life LLC	1 gummy Magnesium: 100 mg (magnesium citrate) [Found 103.2 mg ✓] Metals: Pass Lead: 0.04 mcg Arsenic: Cadmium: Mercury:	Adults & teens, chew one to four gummies daily, start gradually. Kids 4 to 12 years old, chew one gummy daily under adult supervision. Medium/large gummy <i>Taste: Slightly chewy, somewhat sweet, raspberry-flavored gummy.</i>	\$0.28/gummy [\$0.54] \$16.79/60 gummies	<i>Bacillus subtilis</i> DE111® 3.5 mg (250 million CFU) per gummy <i>Non GMO Project Verified seal. Certified Gluten Free, NSF Certified, No Stevia. Kosher. No Added Sugars. Made without dairy or soy ingredients, peanut or shellfish</i> <i>Additional Information</i> <i>Bacillus subtilis</i> DE111® 3.5 mg (250 million CFU) per gummy <i>Non GMO Project Verified seal. Certified Gluten Free, NSF Certified, No Stevia. Kosher. No Added Sugars. Made without dairy or soy ingredients, peanut or shellfish.</i> Precaution: <i>Manufactured in a facility that also processes fish.</i>	1 gummy Calories 10, Total Carbohydrate 3 g, Dietary Fiber 1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Magnesium (as Magnesium Citrate) 100 mg, <i>Bacillus subtilis</i> DE111® 3.5 mg (250 Million CFU). Other Ingredients: Fructooligo-saccharides Additional Information 1 gummy Calories 10, Total Carbohydrate 3 g, Dietary Fiber 1 g, Total Sugars [Includes 0 g Added Sugars] 0 g, Magnesium (as Magnesium Citrate) 100 mg, <i>Bacillus subtilis</i> DE111® 3.5 mg (250 Million CFU). Other Ingredients: Fructooligo-saccharides, citrus pectin, agar agar, tapioca starch, natural flavor, black carrot (for color), citric acid, trisodium citrate, carnauba wax.
Magnesium & Calcium:					

APPROVED Sundown® Calcium Magnesium & Zinc   Mfd. by Rexall Sundown, Inc.	3 caplets Magnesium: 400 mg (magnesium oxide, magnesium gluconate) [Found 440.1 mg ✓] Calcium: 1,000 mg (calcium carbonate, calcium gluconate) [Found 1,007.8 mg ✓] Metals: Pass Lead: 0.74 mcg Arsenic: 0.92 mcg Cadmium: 2.3 mcg Mercury: 0.004 mcg Also passed disintegration testing	For Adults, Take Three (3) Caplets Daily, Preferably With A Meal. Large caplet	\$0.16/3 caplets [\$0.07] \$5.35/100 caplets	Zinc 25 mg per 3 caplets <i>Vegetarian. Clean Nutrition. Non-GMO. No Gluten. No Wheat. No Milk. No Lactose. No Artificial Flavor. No Artificial Sweetener. No Preservatives. No Sugar. No Soy. No Starch. No Yeast. No Peanuts. No Fish. Sodium Free. Dairy Free.</i>	3 caplets Calcium (as Calcium Carbonate and Calcium Gluconate) 1,000 mg, Magnesium (as Magnesium Oxide and Magnesium Gluconate) 400 mg, Zinc (as Zinc Oxide and Zinc Citrate) 25 mg. Other Ingredients: Vegetable Cellulose. Contains <2% of: Calcium Carbonate (color), Medium Chain Triglycerides, Polydextrose, Vegetable Magnesium Stearate.
Magnesium, Calcium & Vitamin D:					

APPROVED Caltrate Minis  Dist. by GSK Consumer Healthcare	2 mini tablets Magnesium: 50 mg (magnesium oxide) [Found 59.5 mg ✓] Calcium: 600 mg (calcium carbonate) [Found 561.9 mg ✓] D3: 40 mcg (1,600 IU) [Found 47.1 mcg (1,882.4 IU) ✓] Metals: Pass Lead: 0.23 mcg Arsenic: 0.26 mcg Cadmium: 1.4 mcg Mercury: Also passed disintegration testing	Adults: Take two (2) mini tablets once daily with food or as directed by your physician. Not formulated for use in children. Medium/large mini tablet	\$0.24/2 mini tablets [\$0.81] \$17.99/150 mini tablets	Zinc 7.5 mg & manganese 1.8 mg per 2 mini tablets Gluten Free.	2 mini tablets Vitamin D3 40 mcg (1,600 IU), Calcium 600 mg, Magnesium 50 mg, Zinc 7.5 mg, Manganese 1.8 mg. Ingredients: Calcium Carbonate, Magnesium Oxide, Maltodextrin, Microcrystalline Cellulose. Contains <2% of: Blue 2 Lake, Cholecalciferol (Vit. D3), Copper Sulfate, Croscarmellose Sodium, Magnesium Stearate, Manganese Sulfate Additional Information 2 mini tablets Vitamin D3 40 mcg (1,600 IU), Calcium 600 mg, Magnesium 50 mg, Zinc 7.5 mg, Manganese 1.8 mg. Ingredients: Calcium Carbonate, Magnesium Oxide, Maltodextrin, Microcrystalline Cellulose. Contains <2% of: Blue 2 Lake, Cholecalciferol (Vit. D3), Copper Sulfate, Croscarmellose Sodium, Magnesium Stearate, Manganese Sulfate, Polyethylene Glycol, Polyvinyl Alcohol, Red 40 Lake, Sodium Ascorbate (to preserve freshness), Talc, Titanium Dioxide, Tocopherols (to preserve freshness),
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					Yellow 6 Lake, Zinc Oxide.
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APPROVED Top Pick for magnesium, calcium and vitamin D combination product GNC Calcium Plus®   Dist. by GNC Holdings, LLC	3 caplets Magnesium: 500 mg (magnesium oxide) [Found 517.3 mg ✓] Calcium: 1,000 mg (calcium carbonate) [Found 955.3 mg ✓] D3: 20 mcg (800 IU) [Found 25.8 mcg (1,033.4 IU) ✓] Metals: Pass Lead: 0.86 mcg Arsenic: 1.9 mcg Cadmium: 0.96 mcg Mercury: 0.004 mcg Also passed disintegration testing	Take three caplets daily. Large caplet	\$0.25/3 caplets [\$0.10] \$14.99/180 caplets	Gluten Free. No Artificial Flavor, Gluten Free, No Milk.	3 caplets Vitamin D (as Cholecalciferol D-3) 20 mcg (800 IU), Calcium (as Calcium Carbonate) 1,000 mg, Magnesium (as Magnesium Oxide) 500 mg. Other Ingredients: Microcrystalline Cellulose, Hydroxypropyl Methylcellulose, Magnesium Stearate Vegetable Source, Titanium Dioxide (Mineral Whitener), Hydroxypropyl-cellulose, Sodium Starch Glycolate, Croscarmellose Sodium, Silicon Dioxide, Vegetable Acetoglycerides Additional Information 3 caplets Vitamin D (as Cholecalciferol D-3) 20 mcg (800 IU), Calcium (as Calcium Carbonate) 1,000 mg, Magnesium (as Magnesium Oxide) 500 mg. Other Ingredients: Microcrystalline Cellulose, Hydroxypropyl Methylcellulose, Magnesium Stearate Vegetable Source, Titanium Dioxide (Mineral Whitener), Hydroxypropyl-cellulose, Sodium Starch Glycolate, Croscarmellose
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					Sodium, Silicon Dioxide, Vegetable Acetoglycerides, Polyethylene Glycol, Polysorbate 80.
Magnesium, Calcium, Vitamin D & Vitamin K:					

➤ APPROVED ➤ Top Pick ➤ for magnesium, calcium, vitamin D and vitamin K combination product New Chapter® Plant Calcium Bone Strength Take Care®  Dist. by New Chapter, Inc.	3 vegetarian slim tablets Magnesium: 62 mg (from organic algae <i>Lithothamnion spp.</i>) [Found 80.6 mg ✓] Calcium: 905 mg (from organic algae <i>Lithothamnion spp.</i>) [Found 958.3 mg ✓] D3: 25 mcg (1,000 IU) [Found 35.3 mcg (1,412.4 IU) ✓] K1: 35 mcg [Found 52.9 mcg ✓] K2 as MK-7: 45 mcg [Found 59.4 mcg ✓] Metals: Pass Lead: 0.09 mcg Arsenic: 2.6 mcg Cadmium: 1.6 mcg Mercury: Also passed disintegration testing	Three Tablets Daily With Food. Large vegetarian slim tablet	\$1.05/3 vegetarian slim tablets [\$2.60] \$41.97/120 vegetarian slim tablets	Strontium 5.5 mg & vanadium 14 mcg per 3 vegetarian slim tablets <i>USDA Organic seal. Non GMO Project Verified seal. NSF® Certified Gluten-Free seal. 100% vegetarian; no artificial flavors or colors.</i> Precaution: Contains: Fermented soy.	3 vegetarian slim tablets Vitamin D3 (as cholecalciferol from ferment media) 25 mcg (1,000 IU), Vitamin K1 (as phylloquinone from ferment media) 35 mcg, Vitamin K2 (as menaquinone-7) 45 mcg, Calcium (from organic algae <i>Lithothamnion spp.</i>) 905 mg, Magnesium (from organic algae <i>Lithothamnion spp.</i>) 62 mg, Strontium (from organic algae <i>Lithothamnion spp.</i>) 5.5 mg, Vanadium (from organic algae <i>Lithothamnion spp.</i>) 14 mcg. Other Ingredients: Organic gum acacia; Less than 2% of: ferment media (organic soy flour, organic <i>Saccharomyces cerevisiae</i>, organic alfalfa powder, papain [deactivated]) Additional Information 3 vegetarian slim tablets Vitamin D3 (as cholecalciferol from ferment media) 25 mcg (1,000 IU), Vitamin K1 (as phylloquinone from ferment media) 35 mcg, Vitamin K2 (as menaquinone-7) 45 mcg, Calcium (from organic algae <i>Lithothamnion spp.</i>) 905 mg, Magnesium
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					(from organic algae <i>Lithothamnion spp.</i>) 62 mg, Strontium (from organic algae <i>Lithothamnion spp.</i>) 5.5 mg, Vanadium (from organic algae <i>Lithothamnion spp.</i>) 14 mcg. Other Ingredients: Organic gum acacia; Less than 2% of: ferment media (organic soy flour, organic <i>Saccharomyces cerevisiae</i>, organic alfalfa powder, papain [deactivated], bromelain [deactivated], lactic acid bacteria [<i>L. acidophilus</i>, <i>B. bifidum</i>, <i>L. rhamnosus</i>]), organic coating (organic maltodextrin, organic sunflower lecithin, organic palm oil, organic guar gum), organic MCT oil, organic psyllium husk, organic oat fiber, organic guar gum and organic agave fiber.
Magnesium, Calcium, Vitamin D & Boron:					

APPROVED USANA® MagneCal D   Mfd. by USANA Health Sciences, Inc.	2 tablets Magnesium: 260 mg (magnesium citrate, magnesium carbonate) [Found 262.4 mg ✓] Calcium: 260 mg (calcium citrate, calcium carbonate) [Found 269.2 mg ✓] D3: 12.5 mcg (500 IU) [Found 16 mcg (639.5 IU) ✓] Boron: 0.66 mcg (boron citrate) [Found 0.83 mcg ✓] Metals: Pass Lead: 0.14 mcg Arsenic: 0.11 mcg Cadmium: 0.3 mcg Mercury: 0.005 Also passed disintegration testing	Adults take two (2) tablets twice daily, preferably with food. Large tablet	\$0.47/2 tablets [\$0.36] \$26.50/112 tablets	Kosher.	2 tablets Vitamin D3 (as Cholecalciferol) 12.5 mcg, Calcium (as Calcium Citrate and Calcium Carbonate) 260 mg, Magnesium (as Magnesium Citrate and Magnesium Carbonate) 260 mg, Boron (as Boron Citrate) 0.66 mg. Other Ingredients: Microcrystalline Cellulose, Ascorbyl Palmitate, Organic Maltodextrin, Calcium Silicate, Croscarmellose Sodium, Organic Sunflower Lecithin, Organic Palm Olein, Organic Guar Gum.
Magnesium, Calcium, Vitamin D, Vitamin K & Boron:					

APPROVED AlgaeCal Plus  Dist. by AlgaeCal Inc.	2 veggie capsules Magnesium: 175 mg (magnesium oxide, AlgaeCal® <i>I. superpositum</i>) [Found 229.3 mg ✓] Calcium: 360 mg (AlgaeCal® <i>I. superpositum</i>) [Found 403.2 mg ✓] D3: 20 mcg (800 IU) [Found 26 mcg (1,039.4 IU) ✓] K2 as MK-7: 50 mcg [Found 50.7 mcg ✓] Boron: 1.5 mg (boron glycinate) [Found 1.5 mg ✓] Metals: Pass Lead: 0.58 mcg Arsenic: 2.5 mcg Cadmium: 0.01 mcg Mercury: 0.002 mcg	As Take 2 caps twice daily with meals (4 caps per day) to support bone strength. Large veggie capsule	\$1.22/2 veggie capsules [\$1.06] \$219.00/three bottles of 120 veggie capsules (360 veggie capsules total)	Vitamin C 25 mg per 2 veggie capsules Manufactured In USA	2 veggie capsules Vitamin C (as Calcium Ascorbate) 25 mg, Vitamin D (as Cholecalciferol) 20 mcg (800 IU), Calcium (as AlgaeCal® <i>I. superpositum</i>) 360 mg, Magnesium (as Magnesium Oxide & AlgaeCal® <i>I. superpositum</i>) 175 mg, Boron (as Boron Glycinate) 1.5 mg, Vitamin K (as K2 Vital® Delta MK-7) 50 mcg. Other Ingredients: Vegetable cellulose (Vegetarian capsule), magnesium stearate (vegetable grade), microcrystalline cellulose.
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NOT APPROVED Life Extension® Bone Restore Calcium Supplement with Vitamin K2  Dist. by Quality Supplements and Vitamins, Inc.	4 capsules Magnesium: 300 mg (magnesium oxide) [Found 325.2 mg ✓] Calcium: 700 mg (calcium carbonate, calcium citrate malate, calcium bisglycinate, calcium fructoborate) [Found 671.1 mg ✓] D3: 25 mcg (1,000 IU) [Found 31.4 mcg (1,257.4 IU) ✓] K2 as <i>trans</i> MK-7: 200 mcg [Found only 161.6 mcg (80.8% of listed amount)] Boron: 3 mg (calcium fructoborate) [Found 3.2 mcg ✓] Metals: Pass Lead: 0.38 mcg Arsenic: 1.2 mcg Cadmium: 0.68 mcg Mercury:	Take four (4) capsules daily, or as recommended by a healthcare practitioner. Scientific studies suggest calcium supplementation in divided doses with food in the morning and evening may yield the best results. Large capsule	\$0.60/4 capsules [\$0.37] \$18.00/120 capsules	Zinc 2 mg, manganese 1 mg & silicon 5 mg per 4 capsules Gluten Free.	4 capsules Vitamin D3 [as cholecalciferol] 25 mcg (1,000 IU), Vitamin K [as <i>trans</i> menaquinone-7] 200 mcg, Calcium [as carbonate, citrate malate, bisglycinate, fructoborate] 700 mg, Magnesium [as magnesium oxide] 300 mg, Zinc [as zinc amino acid chelate] 2 mg, Manganese [as manganese amino acid chelate] 1 mg, Silicon [from horsetail extract (herb)] 5 mg, Boron [calcium fructoborate as patented Fruitex B® OsteoBoron®] 3 mg. Other Ingredients: Vegetable cellulose (capsule), stearic acid, ascorbyl palmitate, maltodextrin, microcrystalline cellulose, silica, food starch-modified.
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Unless otherwise noted, information about the products listed above is based on the samples purchased by ConsumerLab.com (CL) for this Product Review. The samples are from a single lot of the respective product. Be aware that there may lot-to-lot variation in products, particularly natural products. Manufacturers may change ingredients and label information at any time, so be sure to check labels carefully when evaluating the product you use or buy as it may be different from the product we tested. Manufacturers may also change ingredient suppliers, which can affect product quality. Pricing can change over time and vary based on retailer, promotions, and other factors.

The information contained in this report is based on the compilation and review of information from product labeling and analytic testing. CL applies what it believes to be the most appropriate testing methods and standards. The information in this report does not reflect the opinion or recommendation of CL, its officers or employees. CL cannot assure the accuracy of information.

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Products tested in 2024 and 2025

ConsumerTips™:

How much magnesium do you need?

The recommended daily allowance (RDA) of magnesium is 80 mg for children 1 to 3, 130 mg for those 4 to 8, and 240 mg for those 9 to 13. For males 14 to 18 it is 410 mg, for those 19 to 30 it falls to 400 mg, and for those 31 years and older it is 420 mg. For females 14 to 18 it is 360 mg, for those 19 to 30 it falls to 310 mg, and for those 31 years and older it is 320 mg. However, for pregnant women it is 400 mg if 18 years or younger, 350 mg if 19 to 30, and 360 mg if 31 or older. For lactating women it is 360 mg if 18 years or younger, 310 mg if 19 to 30, and 320 mg if 31 or older.

Bear in mind that the recommended amounts noted above are for total daily magnesium intake. *The average daily intake of magnesium from food sources in the United States is approximately 320 mg*; thus, supplementation can easily increase magnesium intake above the RDA for many. However, as noted earlier, due to medications or gastrointestinal conditions, some people are not able to properly absorb magnesium despite getting significant amounts in their diets.

The daily requirement for magnesium can be obtained through food sources without much difficulty, although about 48% of people in the U.S. don't get the full amount from their diet.

Dietary Sources of Magnesium

Food	Magnesium (mg)
Pumpkin seeds, roasted, (1 oz)	156
Chia seeds (1 oz)	111
Almonds, dry roasted, (1 oz)	80
Spinach, boiled (½ cup)	78
Cashews, dry roasted (1 oz.)	74
Peanuts, oil roasted (¼ cup)	63
Cereal, shredded wheat (2 large biscuits)	61
Soymilk , plain or vanilla (1 cup)	61
Black beans, cooked (½ cup)	60
Edamame, shelled, cooked (½ cup)	50
Dark chocolate 60 to 90% cacao solids (1 oz.)	50
Potato, baked with skin, (3.5 oz.)	43
Rice, brown, cooked (½ cup)	42
Yogurt, plain, low fat (8 oz.)	42

Breakfast cereals, fortified with 10% DV magnesium (1 serving)	42
Oatmeal , instant, 1 packet	36
Kidney beans, canned (½ cup)	35
Banana (1 medium)	32
Salmon, pink, canned (3 oz.)	27

Source: [National Institutes of Health Magnesium Fact Sheet 2020](#); [USDA National Nutrient Database for Standard Reference Legacy \(2018\)](#).

What to Consider When Buying:

In the products evaluated, the labeled amounts of magnesium ranged from 77 mg to 566 mg per suggested daily serving. This large range should be considered when comparing products, particularly as most people only need a dose of 100 to 200 mg to bring them to the daily requirement and exceeding 350 mg per day (for adults) from a supplement is not advisable unless you are treating deficiency. The limit is lower for children. (See [dosage information](#) below)

Look carefully at labels

Product labels should indicate the amount of actual magnesium (or "elemental" magnesium) per dosage unit. This is important because magnesium often makes up less than half of the weight of magnesium compounds. For example, the amount of magnesium in magnesium gluconate is only 5.8%, and it is 12% in magnesium chloride hexahydrate, 11.2% in magnesium citrate (or 16.2% if in the form of trimagnesium dicitrate), 14.1% in magnesium glycinate, 20.2% in magnesium sulfate, 41.67% in magnesium hydroxide, and 60.3% in magnesium oxide.

An example of an incorrectly labeled product identified in ConsumerLab.com's Review in 2012 is shown below. At first glance, this label seems to contain "720 mg" of magnesium, but only a small amount of this (115 mg) was actually listed as elemental magnesium. Making matters worse, our testing showed that even that amount was not correct. We found only 52 mg of magnesium. If this product had been properly made and labeled and actually provided 115 mg of elemental magnesium, the label should have read: "Magnesium (as magnesium citrate)... 115 mg" -- although since 115 mg is only about 16% of the claimed magnesium citrate, the form of magnesium would likely have been trimagnesium dicitrate, which was not specified.

Misleading Label on Tropical Oasis Product

Vitamin D (as Cholecalciferol)	400 IU	Lists 1,200 mg of calcium, but actually promises only 252 mg and testing found only 131 mg. Lists 720 mg of magnesium, but actually promises only 115 mg and testing found only 52 mg.
Calcium (as Citrate) (252 mg elemental)	1200 mg	
Magnesium (as Citrate) (115 mg elemental)	720 mg	
Boron (as Citrate)	750 mcg	

A review of products by the supplement company [NOW](#), in 2022, identified five brands of magnesium glycinate mislabeled in this way (*Deal Supplement*, *Innate Vitality*, *Naturebell*, *Terranics* and *ZYY Nutrition*) as well as quality issues with these and several other brands.

Be aware that supplement labels on older products may not reflect the latest Daily Value (DV) for magnesium. In 2016, the FDA raised the DV for magnesium for adults and children age 4 years and older to 420 mg (it was 400 mg). However, all labels did not have to reflect this change until January 2021.

Choosing the right form of magnesium

Magnesium is sold in several different chemical forms that affect the body in different ways, so it is important to choose the right form for a particular condition. In the table below, we summarize information about different forms of magnesium, including details about bioavailability, laxative effects, antacid effects, and whether the form is beneficial for increasing magnesium levels.

Comparison of Forms of Magnesium

Form of Magnesium (Percent of Compound That Is Mg)	Percent Absorbed	Laxative Effects	Good for Increasing Mg Levels	Antacid Effects	Additional Comments
Mg aspartate (16% as Mg aspartate anhydrous powder) (7% as Mg aspartate dihydrate) (10% as Mg aspartate hydrochloride trihydrate) (7% as Mg aspartate tetrahydrate)	42%	At higher doses	Yes	No	Increased absorption as powder dissolved in water than as powder in a tablet.
Mg bisglycinate (aka Mg glycinate) (14%)	24%	No	Yes	No	
Mg carbonate (29%)	Low — similar to Mg sulfate	At typical doses	No	Yes	
Mg chloride (12% as Mg chloride hexahydrate)	20% to as much as 42%	At typical doses	Yes	No	Better as a liquid than as a pill. Store pills away from other supplements.
Mg gluconate (5%)	19% or higher (similar to Mg chloride)	At higher doses	Yes	No	May be more expensive
Mg citrate (11% as Mg citrate) (16% as trimagnesium dicitrate)	30%	At higher doses	Yes	No	
Mg glycono-phosphate (12%)	May be less than Mg aspartate	No	Yes	No	May be more expensive
Mg hydroxide (42%)	Similar to Mg sulfate	At typical doses; fast-acting	No	Yes	Also known as "milk of magnesia"
Mg lactate (as in Mag-Tab®SR, a sustained release formulation) (12%)	11% to 41%	At higher doses	Yes	No	
Mg malate (16%)	Uncertain	At higher doses	Yes	No	
Mg orotate (6%)	Uncertain	No	No	No	Possible safety concerns. May be more expensive.
Mg oxide (60%)	4%	At typical doses	No	Yes	Increased absorption from liposomal formulation or from effervescent tablets
Mg sulfate (20%)	4%	At typical doses; potent	No	No	Also known as "Epsom salt"
Mg taurate (9%)	Uncertain	No	Uncertain	No	
Mg threonate (8%)	Uncertain	No	Yes	No	

Sources: [Ranade, Am J Ther. 2001](#); [Guerrera, Am Fam Physician 2009](#); [Driessens, Mag Bulletin 1993](#); [Firoz, Magnes Res 2001](#); [Schuchardt, Curr Nutr Food Sci 2017](#); [Dogterom, Drug Dev Ind Pharm 2018](#)

- Forms that **are absorbed fairly well by the body without causing significant laxative effects** — such as **magnesium chloride**, **bisglycinate** (also referred to as **magnesium glycinate** or **diglycinate**), and **glycerophosphate** — tend to be good options for increasing levels of magnesium in the body. Other forms such as magnesium **citrate**, **gluconate**, **aspartate** and **lactate** are also fairly well absorbed, but these forms can have laxative effects at high doses ([Mühlbauer, Eur J Clin Pharmacol 1991](#); [Driessens, Mag Bulletin 1993](#); [Schuette, JPEN J Parenter Enteral Nutr 1994](#); [Ranade, Am J Ther 2001](#); [DiSilvestro, FASEB 2013](#)). The gluconate and glycerophosphate forms may also be more expensive. [Note: The branded product *ReMag* is promoted on the Internet as a "picometer-ionic form of magnesium." It is magnesium chloride dissolved in water. It is promoted as having no laxative effect, which, being magnesium chloride, should be essentially true. We are not aware, however, of any published studies with *ReMag*. ConsumerLab tests of *ReMag* in 2019 found it to be contaminated with lead, and therefore it was Not Approved — see the discussion in the [Top Picks](#) section above for more details.]

- When looking for magnesium glycinate or bisglycinate, be sure that the product actually contains the chelated magnesium glycinate compound and not just a blend of magnesium (such as magnesium oxide or magnesium carbonate) plus glycine as separate molecules, as the magnesium may not be absorbed as well — and have more of laxative effect — unlike chelated magnesium glycinate. This may be done to save money by manufacturers, as the chelated form is more expensive. Testing by the supplement company [NOW](#) of what it considered lesser-known brands of magnesium glycinate sold on Amazon in 2022 found that all appeared to be blends and not full chelates. The brands were *Deal Supplement*, *Doublewood*, *Dr. Martin's Nutrition*, *Horbaach*, *Innate Vitality*, *Nature's Branch*, *NaturaLife Labs*, *Nature's Craft*, *Naturebell*, *Purely Holistic*, *Terranics*, *Toniq*, *Wholium*, and *ZYY Nutrition*. In addition, four products did not even contain the amounts of magnesium expected from the label (*Innate Vitality*, *Naturebell*, *Terranics*, and *ZYY*) and were [improperly labeled](#), as was the product from *Doublewood*. NOW reported that its own products — *NOW Magnesium Glycinate 100 mg* (which was tested and Approved by ConsumerLab.com in 2022) and *NOW Magnesium Bisglycinate Powder* — were the only chelates that passed its tests.

In its report, NOW suggested that products made with magnesium bisglycinate chelate from Albion/Balchem, are high quality. However, ConsumerLab has found that products providing "TRAACS magnesium bisglycinate chelate *buffered*" include some magnesium oxide (as the buffer), which is not absorbed as well as the bisglycinate form. In July 2020, we contacted Balchem, which, through its Albion subsidiary, manufactures the TRAACS ingredient and asked what percentage of magnesium in the ingredient is actually from magnesium bisglycinate versus magnesium oxide. They would not provide an answer, leaving us unsure of the composition of its "buffered" chelates.

To help confirm that a magnesium glycinate/bisglycinate supplement does not contain unreacted glycine or another form of magnesium, avoid products that list a "magnesium complex" or "buffered magnesium glycinate," which is the case for products such as *Magnesium Glycinate* by Dr. Martin's Nutrition or *Toniq*, as well as *High Absorption Magnesium Glycinate* by Horbaach. All of these products contain an undefined amount of magnesium oxide. Among products listing only magnesium glycinate/bisglycinate, check that the **percentage of elemental magnesium to magnesium glycinate/bisglycinate is not above 14%**. Products that list a higher percentage — such as *Deal Supplement Magnesium Glycinate* and *NaturaLife Labs Magnesium Glycinate* (both of which list 18% elemental magnesium) — may actually contain other forms of magnesium. This is likely the case with [BulkSupplements.com Magnesium Glycinate](#), tested in this Review. **[Update (5/2/24):** Although not tested by ConsumerLab, it was announced yesterday that Naturelo agreed to pay a \$1.5 million to settle a [lawsuit](#) claiming that *Naturelo Magnesium Glycinate Chelate* capsules are not large enough to contain 200 mg of high-quality magnesium glycinate chelate. Scientifically, a capsule would need to contain 1.4 grams of magnesium glycinate to provide 200 mg of magnesium, which would exceed the capacity of its capsules. It could only provide that much magnesium if a different form was used, as explained above. Affected consumers can apply for a refund from Naturelo.] Be aware that the percentage of magnesium glycinate that is magnesium may be **lower than 14% — such as 10%** — in products when the manufacturer has factored in water (which may be absorbed from air) in the listed weight of the magnesium glycinate. This is acceptable — so long as the amount of magnesium itself is accurate.

- Forms that are not absorbed as well — such as **magnesium hydroxide, carbonate, oxide and sulfate** — are *not* recommended as an oral supplement for magnesium replacement. These forms tend to be better options for **use as laxatives** ([Ranade, Am J Ther 2001](#); [Firoz, Magnes Res 2001](#); [Walker, Magnes Res 2003](#)). Magnesium hydroxide (milk of magnesia) is particularly fast acting as a laxative, and magnesium sulfate (Epsom salt) is the most potent. (The sulfate form may also be used intravenously under medical supervision for seizures, uterine tetany and other acute conditions.) [Note: A study published in 2012 suggested that magnesium oxide was better than magnesium citrate at raising magnesium levels in tissues in the body, but the dose of magnesium oxide given was 73% greater than the dose of magnesium citrate, and neither greatly raised magnesium levels as they were given to healthy people generally not deficient in magnesium ([Shechter, Magnes Res 2012](#); [Kisters, Magnes Res 2013](#)).]

- Forms such as **magnesium carbonate and trisilicate** are good options for **use as an antacid**. Magnesium hydroxide and oxide can also work but, as noted above, may cause diarrhea.
- Some websites claim that **magnesium orotate** is better absorbed than other forms, but research does not support this ([Andermann, Eur J Drug Metab Pharmacokinet 1982](#)). Furthermore, this form of magnesium can cost up to nine times more than other magnesium products. To get, for example, 200 mg of magnesium from magnesium orotate supplements you might spend 10 to 18 cents. In contrast, you can get the same amount of magnesium for as little as 3 cents. There are also potential safety concerns (see [Concerns and Cautions](#)).

Magnesium bicarbonate is a liquid formed through the reaction of carbonic acid and magnesium hydroxide. It is occasionally sold as a supplement, but more commonly, made from "home recipes" combining magnesium hydroxide (milk of magnesia) and seltzer water and described as a "health tonic" and/or less expensive alternative to mineral water. There is some evidence that it might increase levels of magnesium in the body ([Day, BMC Res Notes 2010](#)), but there is no evidence that it works better than other forms described above.

In addition to different chemical forms, the way in which a magnesium supplement is *formulated* can make it more useful for certain purposes, mainly by affecting magnesium's absorption and bioavailability:

- A **liposomal formulation** of magnesium *oxide* (*Sucrosomial* magnesium), which typically has low absorption, has been shown to be absorbed slightly better than magnesium citrate or magnesium bisglycinate, suggesting that liposomal formulations may improve bioavailability of magnesium forms with low absorption ([Brilli, Eur Rev Med Pharmacol Sci 2018](#)).

Magnesium *oxide* also appears to be absorbed better from **effervescent tablets** than from capsules, possibly due to increased ionization of magnesium from magnesium oxide ([Siener, Urol Res 2011](#)). Similarly, magnesium aspartate in **powder form dissolved in water** appears to be absorbed slightly better than from tablet form ([Mühlbauer, Eur J Clin Pharmacol 1991](#)), although the powder form can have an unpleasant taste, which would not be noticeable with a tablet. Also, keep in mind that powders need to be well dissolved before ingestion (see [Concerns and Cautions](#)). Be aware that effervescent tablets and powders may [contain a substantial amount of sodium](#) – which may raise blood pressure and should be avoided by those on a low-salt diet.

Magnesium *chloride* may be better as a **liquid** than as a pill, as this form of magnesium is hygroscopic i.e., it attracts water, and pills containing this form can [quickly become "wet" from moisture](#) in the air. In fact, after leaving a magnesium chloride tablet out for less than a day during a photo shoot for our Magnesium Review in 2017, droplets formed on its surface and this water caused adjacent pills to become wet as well, as shown in the photo below.



Magnesium chloride tablet (round) rapidly absorbed water from air, damaging it and adjacent pills

- **Enteric-coatings** may reduce magnesium absorption, as the coating may delay the release of magnesium and make it less available for absorption in the intestine ([Fine, J Clin Invest 1991](#)). Such formulations may also not be suitable for people with disorders of gastric and intestinal motility, as suggested by a case in which a man accumulated 21 enteric-coated magnesium chloride tablets (which had been given over 4 days) in his stomach. The patient had evidence of mild pylorospasm (which can delay passage of stomach contents into the duodenum) and suspected gastric motor dysfunction. ([Chapron, Ann Pharmacother 1994](#)).

Dosing and how to take

When used to supplement the diet, a dose of about 100 to 200 mg is typically used, although, as a treatment for deficiency or other condition, magnesium is often recommended at doses of 250 to 600 mg daily.

Magnesium specifically from supplements can often cause diarrhea – which is why it is an ingredient in many laxatives. Diarrhea is particularly common in products also containing aluminum. **Taking magnesium with food can reduce the occurrence of diarrhea.**

How much is too much?

Excessive magnesium levels in the blood can cause dangerous side effects, but oral supplements taken as directed seldom dangerously raise blood levels in individuals with healthy kidneys – which regulate magnesium status. Tolerable Upper Intake Levels (ULs) have been established for magnesium supplement intake. The UL is defined as "a level of chronic daily intake judged to be likely to pose no risk of adverse health effects to the most sensitive members of the healthy population." The UL recommendations (which apply specifically to magnesium consumed from supplements or other medications) are 65 mg for children 1 to 3 and 110 mg for those 4 to 8. For individuals 9 years and older the UL is 350 mg. Note that the ULs for supplements are sometimes lower than the respective RDAs, because side effects are not likely to occur from magnesium obtained solely from foods.

Taking magnesium with other minerals?

Products that contain calcium in addition to magnesium are sometimes touted as improving the absorption of the other, however, this is not the case and it is not necessary to take extra calcium when supplementing with magnesium, nor vice versa. Nor is a specific ratio of the two minerals known to produce superior absorption (although [some evidence suggests](#) that, for cognitive benefits, people over age 65 should maintain a calcium/magnesium ratio between 1.7 and 2.3).

Some laboratory and animal experiments have suggested that calcium and magnesium can inhibit absorption of the other. It is not clear if this is the case in people. A study in healthy males found that intake of 826 mg of magnesium daily did not affect absorption of calcium taken at 241 and 812 mg daily, nor did the calcium affect magnesium absorption ([Spencer, J Am Coll Nutr 1994](#)). However, the amounts given in this study were each *divided into three doses per day*, the magnesium was taken *with* meals, and the calcium was taken 2 hours *after* meals – so they were not given together, nor in very large doses. Furthermore, magnesium oxide was used, which, as noted earlier, is not among the best absorbed forms of magnesium. Until there is more research, it would seem best to take doses of magnesium and calcium that are more than 250 mg at least 2 hours apart from one another to assure maximum absorption.

Storage

As [mentioned earlier](#), be aware that magnesium chloride is extremely hygroscopic – it attracts and holds water – even in moderate humidity, which can cause pills to become wet and disintegrate. Keep magnesium chloride pills in a sealed container, along with any desiccant packet with which they may have come. Also, keep magnesium chloride pills *away from other pills*, including softgels, because the absorbed water can cause disintegration of those pills (in addition to prematurely activating enzymes and probiotics). It is wise to keep all forms of magnesium out of humidity, although they can be stored with other pills.

Testing for magnesium levels

Magnesium is not normally part of routine blood tests and not considered the most reliable marker of magnesium sufficiency because levels in blood plasma do not necessarily reflect levels in tissues. However, a normal range in blood plasma is considered to be 1.7 to 2.2 mg/dL (0.85 to 1.10 mmol/L) ([NIH Fact Sheet](#); [Medline Plus](#), [NIH](#)).

There is no single blood test or other type of test to accurately measure magnesium levels in the whole body. When magnesium deficiency is suspected, doctors may use a combination of testing and assessment of symptoms to diagnose deficiency.

Serum magnesium concentration (SMC) is the most commonly used blood test and may be valuable for detecting severe and sudden changes in magnesium status. However, only 1% of total body magnesium is found in the blood, so this test does not measure the majority of magnesium in the body, including magnesium found in soft tissue, muscle and bone. For this reason, it's possible to have a serum magnesium concentration within normal range but still have a deficiency in total body magnesium ([Jahnen-Dechent, Clin Kidney J 2012](#)).

Similarly, blood tests can measure magnesium levels within red blood cells (RBC), which gives an idea of magnesium status in the recent past. Levels tend to be somewhat higher (1.65 - 2.65 mmol/L), but these levels also do not reflect total body magnesium ([Swaminathan, Clin Biochem Rev 2003](#)).

A third type of blood test measures the "serum ionized (free) magnesium concentration," which represents the largest portion of magnesium in the blood and may be the most biologically active ([Jahnen-Dechent, Clin Kidney J 2012](#)) -- however, not all researchers agree on this last point, and, due to the specialized equipment, materials and training needed for the test, it is rarely used outside of a research setting ([Elin, Mag Res 2010](#)).

A magnesium retention or "loading" test is considered the "gold standard" in magnesium testing by some experts ([Ismail, Clin Chem Lab Med 2010](#)); this test involves receiving a large oral or intravenous dose of magnesium, and then measuring how much is excreted in the urine. The oral version of this test can indicate problems with intestinal absorption of magnesium. The intravenous version reflects amounts of magnesium in bone, and deficiency is diagnosed if less than 90% of the magnesium is excreted (the body will retain more magnesium in the bone when it is deficient). However, because this test is so time-consuming, it is also rarely used outside of a research setting ([Ismail, Clin Chem Lab Med 2010](#); [Jahnen-Dechent, Clin Kidney J 2012](#)).

The 24-hour excretion test, commonly offered in hospitals, measures levels of magnesium in the urine at various times over a 24-hour period (as amounts in urine fluctuate the course of a night and day). This can be helpful for evaluating kidney function, but not overall magnesium status ([Elin, Mag Res 2010](#)).

A test that involves swabbing under the tongue and measuring the magnesium in these skin cells (EXA Test) has been promoted as a non-invasive and accurate measure of magnesium levels. A small study authored, in part, by the owner of the company that sells this test found that levels of magnesium in swabbed samples correlated with magnesium levels in coronary artery tissue (obtained during surgery) ([Haigney, Circulation 1995](#)). However, this test is not mentioned in reviews of known testing methods ([Ismail, Clin Chem Lab Med 2010](#); [Jahnen-Dechent, Clin Kidney J 2012](#)).

Concerns and Cautions:

Magnesium supplements may cause **stomach upset, nausea, vomiting and diarrhea**. (If you are taking magnesium for a reason other than its laxative effect, such as correcting a deficiency, you may want to choose a form which is less likely to cause diarrhea — see [Choosing the right form of magnesium](#)).

Although rare, excessive intake of magnesium (above the ULs) may result in **too much magnesium in the blood (hypermagnesemia)**, causing nausea, headache, flushing, warmth, lightheadedness, thirst, low blood pressure, drowsiness, muscle weakness, slowed breathing, and even death. Outside of serious medical conditions, injury or illness, the most common cause of elevated blood levels of magnesium is excessive intake of magnesium-containing laxatives or supplements, especially in people with constipation, bowel injuries or decreased small bowel motility, or those taking anticholinergic drugs (such as certain drugs for Parkinson's disease) or narcotic drugs ([Birrner, J Emerg Med 2002](#)). This is of particular concern in people with poor kidney function, as they may have trouble excreting excess magnesium. For example, a 74-year-old woman with chronic constipation and impaired kidney function developed hypermagnesemia after consuming *30 ounces (3 full bottles)* of liquid magnesium citrate in an attempt to treat her constipation. Normally no more than 1 bottle (10 ounces) should be consumed over 24 hours, with each ounce providing about 1,745 mg of magnesium citrate (providing 290 mg of magnesium according to the study and Drug Facts panels on magnesium citrate bottles). In effect, she consumed *several thousand milligrams* of magnesium. This resulted in respiratory distress, low blood pressure, and injury to her intestine due to decreased blood flow, which then perforated and required surgical repair ([Hubbard, BMJ Case Rep 2021](#)).

A study among 69 healthy male athletes (average age 23) with a balanced diet showed that taking **zinc magnesium aspartate** capsules providing 450 mg of magnesium, 30 mg of zinc, and 10.5 mg of vitamin B6 (by PhD Nutrition Ltd.) 30 minutes before bedtime for two nights *reduced* total sleep time on the second night by about one hour compared to placebo. However, cognitive function on the

subsequent morning was not affected, and the supplement had no effect on sleep time in subjects who had been intentionally sleep deprived (only 4 hours sleep) the night before. [ConsumerLab Note: As the amount of magnesium taken exceeded the level (350 mg) above which magnesium may cause diarrhea, it is possible that gastrointestinal disturbances could have impacted sleep, but, unfortunately, side effects were not recorded in the study] ([Edwards, Behav Sci 2024](#)).

As with other forms of magnesium, ingesting large quantities of **Epsom salt (magnesium sulfate)** can result in weakness, vomiting, shortness of breath and irregular heartbeat ([Milne, BMJ Case Reports 2009](#)). A case of liver injury was reported in a 38-year-old man in India consuming 3 tablespoons of Epsom salt in warm water daily to help dissolve his gallstones. After 12 days of this treatment, he developed loss of appetite, dark urine, yellowing of the skin, and elevated liver enzymes and bilirubin. These symptoms resolved and liver function normalized approximately one month after he stopped taking the Epsom salt. His treating doctors noted that his non-alcoholic fatty liver disease may have made him more susceptible to liver injury from magnesium ingestion ([Philips, BMJ Case Reports 2017](#)). A healthy 31-year-old woman lost consciousness and eventually died of cardiac arrest after **gargling with large amounts of Epsom salt** frequently over a period of several weeks as a treatment for halitosis (bad breath). Her blood levels of magnesium were found to be extremely high (23.6 mg/dL – [normal range](#) is 1.7 mg/dL to 2.2 mg/dL); in the two days prior to her death she had used an entire box of Epsom salt for gargling ([Birrer, J Emerg Med 2002](#)).

If using a powder form of magnesium, be sure to **completely dissolve the powder in water** before taking it. Swelling and irritation to the esophagus, leading to eventual scarring and narrowing of the esophagus, was reported for a 40-year-old man who ingested 1 teaspoon of magnesium citrate powder (providing 630 mg of elemental magnesium) *without* first dissolving it in water as recommended ([Assal, Can J Gastroenterol Hepatol 2014](#)). We are unaware of similar injury when magnesium is taken as recommended.

Individuals with **kidney disease** cannot properly control levels of electrolytes in the body; for this reason, the use of magnesium (or any other mineral) can be very dangerous. There may be risks for people with severe heart disease or diseases of the intestines as well.

There has been concern that **coffee** might decrease levels of magnesium in the body, but this concern does not appear to be valid. Due its caffeine content, drinking coffee, especially in excess, may cause a modest loss of magnesium, e.g., 20 ounces of coffee may cause an adult to lose 4 mg of magnesium, which is not much ([Kynast-Gales, J Am Coll Nutr 1994](#)). However, coffee also provides magnesium – about 7 mg per 8-ounce cup of brewed coffee and 24 mg per 1-ounce serving of espresso ([Higdon, Crit Rev Food Sci Nutr 2006](#)), so drinking coffee would more than offset any loss due to its caffeine. In fact, observational studies have linked increased coffee intake with higher levels of magnesium ([Salazar-Martinez, Ann Intern Med 2004](#); [van Dam, Diabetes Care 2006](#)). There is also concern that coffee may reduce the absorption of magnesium due to its oxalates (which can bind to magnesium and other minerals), but laboratory experiment showed that, after exposure to simulated gastrointestinal conditions, the magnesium in both instant and brewed coffee remains bioavailable (i.e., able to be absorbed) ([Stelmach, Food Chem 2016](#)).

Drug interactions

Laboratory and animal studies suggest magnesium may have anticoagulant/antiplatelet effects ([Hsiao, J Biomed Sci 2004](#); [Kh, J Hypertens 2000](#)). In healthy people, intravenous magnesium sulfate has been shown to increase anti-platelet activity and bleeding time by 48% ([Ravn, Thromb Haemost 1996](#)), while in people with coronary artery disease, oral magnesium oxide (800 mg - 1,200 mg/day) was not found to increase anti-platelet activity, but did inhibit platelet-dependent thrombosis ([Shechter, Magnes Res 2000](#)). To be safe, people taking **blood-thinning medications**, such as warfarin (Coumadin), clopidogrel (Plavix), heparin, indomethacin (Indocin) and ticlopidine (Ticlid), should consult with their physician before taking magnesium.

Magnesium hydroxide may increase the absorption and/or rate of absorption of **sulfonylurea anti-diabetes drugs** such as glibenclamide (DiaBeta, Micronase, Glynase) and glimepiride (Amaryl) ([Neuvonen Br J Clin Pharmacol 1991](#); [Kivisto, Clin Pharmacol Ther 1991](#)), which could potentially affect blood sugar control.

Conversely, another class of drugs that improves glucose control in people with type 2 diabetes, called sodium-glucose cotransporter 2 (**SGLT2**) **inhibitors**, such as canagliflozin (Invokana, Invokamet), dapagliflozin (Farxiga), and empagliflozin (Jardiance), can modestly increase magnesium levels in the blood, which could potentially cause some people to experience magnesium blood levels above the

normal range ([Tang, Diabetologia 2016](#)). Interestingly, a 58-year-old woman with persistent low blood levels of magnesium (1.2 mg/dL, normal range 1.7 to 2.2 mg/dL) and symptoms of hypomagnesemia (e.g., generalized weakness, muscle pain, nausea, chronic fatigue, headaches, dizziness, and difficulty concentration) despite supplementation with magnesium showed that taking 10 mg of empagliflozin for 4 weeks increased blood levels of magnesium (to 2.2 mg/dL) and resolved symptoms, suggesting a possible benefit of SGLT2 inhibitors on magnesium levels, although it should be noted that the woman's dose of magnesium needed to be reduced due to the effects ([Saha, JCEM Case Rep 2023](#)).

Magnesium should be taken two or more hours apart from the following medications:

- **Some statin drugs:** Certain forms of magnesium which have an antacid effect (namely, magnesium hydroxide, oxide, carbonate, and trisilicate) may reduce drug levels of some cholesterol-lowering statin medications. This has been demonstrated for Crestor (rosuvastatin calcium) in a study which found that taking Crestor along with the antacid Maalox (which contains magnesium hydroxide and aluminum hydroxide) reduced blood levels of the drug by an average of 54% compared to taking the drug alone. Taking the antacid two hours after the drug had a smaller effect, but still reduced drug levels by 22%. The study did not evaluate the effect of taking the antacid prior to the drug nor the effect of repeated, long-term antacid use ([Martin, Curr Med Res Opin 2008](#)). Based on this study, the label on Crestor states that if using an antacid with aluminum hydroxide and magnesium hydroxide, the antacid should be taken at least 2 hours after Crestor. A preliminary study suggests a similar, although smaller effect (a 34% reduction in drug when taken with Maalox) for Lipitor (atorvastatin) (Yang, Pharm Res 1996 – not online).
- **Tetracycline antibiotics:** Magnesium can reduce the absorption of tetracycline antibiotics including tetracycline (Achromycin, Sumycin), demeclocycline (Declomycin), doxycycline (Vibramycin) and minocycline (Minocin); these medications should be taken 1 hour before or 2 hours after magnesium supplements and/or magnesium-containing antacids or laxatives ([NIH 2017](#)).
- **Quinolone antibiotics:** Magnesium can reduce the absorption of quinolone antibiotics such as ciprofloxacin (Cipro), levofloxacin (Levaquin), moxifloxacin (Avelox) and ofloxacin (Floxin). For example, taking antacids containing magnesium hydroxide or aluminum hydroxide has been shown to reduce the bioavailability of ciprofloxacin by as much as 90%; for this reason, quinolone antibiotics should be taken either 2 hours before or 6 hours after taking magnesium supplements and/or magnesium-containing antacids or laxatives ([Cipro Prescribing Information 2016](#)).
- **Sotalol:** Magnesium and antacids containing magnesium hydroxide and aluminum oxide can reduce blood levels and effectiveness of sotalol (Betapace, Sotylize, Sorine), a medication prescribed for heart rhythm disorders such as atrial fibrillation; for this reason, this medication should not be taken within 2 hours of taking magnesium ([Betapace Prescribing Information 2010](#)).
- **Gabapentin (Neurontin):** Taking an antacid containing magnesium hydroxide and aluminum hydroxide can decrease the bioavailability of gabapentin by 20%; this medication should be taken at least two hours after taking magnesium hydroxide and/or magnesium hydroxide-containing antacids or laxatives ([Neurontin Prescribing Information 2017](#)).
- **Levothyroxine (Synthroid):** Antacids containing aluminum hydroxide and **magnesium hydroxide** (such as *Maalox*) should be taken at least four hours before or after taking levothyroxine. These antacids may increase pH in the stomach, which may delay or prevent the absorption of levothyroxine, as gastric acidity is required for adequate absorption of this drug ([Synthroid Prescribing Information 2017](#)). Reduced absorption of levothyroxine has also been linked with concomitant intake of **magnesium oxide** laxatives, which can also reduce gastric acidity ([Mersebach, Pharmacol Toxicol 1999](#)).

Although **other forms of magnesium** such as magnesium aspartate, chloride, citrate, gluconate, glycinate, lactate, malate, orotate, taurate, and threonate, are not likely to affect gastric acidity, these magnesium salts should also be taken 2 to 4 hours before or after taking levothyroxine. Magnesium from these salts may bind to levothyroxine in the stomach and reduce its absorption ([Vitic, Can Fam Physician 2023](#)).

Potassium-sparing diuretics such as triamterene (Dyrenium) and spironolactone (Aldactone), may increase magnesium levels in the blood. Do not take magnesium with the potassium-sparing diuretic amiloride (Midamor), as serious interactions can occur ([Henderson, Ugeskr Laeger 1987](#)).

Magnesium can interfere with the effectiveness of **cellulose sodium phosphate**, a drug that lowers calcium levels in the urine and helps prevent kidney stones. Do not take magnesium or magnesium-containing antacids or laxatives within one hour of taking this drug.

Magnesium carbonate, magnesium citrate, and magnesium hydroxide can interfere with **sodium polystyrene sulfonate** (a drug that removes excess potassium from the body) and should not be taken at the same time ([PDR 2017](#)).

Given intravenously, magnesium sulfate has been reported cause low blood pressure when taken with the **calcium channel blocker** nifedipine (Adalat, Procardia) ([Koontz, Am J Obstet Gynecol 2004](#)); it's possible that very high doses of oral magnesium taken with calcium channel blocker drugs may also have this effect, although this has not been reported in clinical studies.

Magnesium hydroxide and magnesium trisilicate may reduce the absorption of **digoxin** (Lanoxin, Digox); there is some evidence that digoxin in capsules may be less likely to be affected than digoxin in tablet form ([Rodin, Clin Pharmacokinet 1988](#)). Taking digoxin lowers magnesium levels in the body, which can increase the risk of digoxin toxicity and heart arrhythmias. If you are taking this drug, your physician should monitor your magnesium levels and supervise any use of magnesium ([Rao, J Emerg Med 2013](#)).

Taking a very large dose of magnesium (1,000 mg as magnesium oxide) along with 100 mg of L-dopa/10 mg of carbidopa reduced the absorption of **L-dopa** by 35.3% and the absorption of carbidopa by 80.9% in healthy people, suggesting that at least some forms of magnesium may reduce the effectiveness of drugs for Parkinson's disease ([Kashihara, Eur J Clin Pharmacol 2019](#)).

The immunosuppressant drug **tacrolimus** can cause low blood levels of magnesium in kidney transplant patients; supplementation with magnesium is often required, but should be done under physician supervision ([Niederstadt, Transplant Proc 1997](#)).

A number of other drugs, including **oral contraceptives, estrogen replacement therapy and loop and thiazide diuretics** can also decrease magnesium levels in the body.

Use of certain antacid medications, including **H2 blockers** such as cimetidine (Tagamet), famotidine (Pepcid AC) and ranitidine (Zantac), and **proton pump inhibitors** such as esomeprazole (Nexium) and lansoprazole (Prevacid), may decrease the laxative effect of magnesium. Some experts recommend a dose of 755 mg or more of magnesium (from 1,250 mg of magnesium oxide) if magnesium is being taken as a laxative along with these medications ([Yamasaki, Eur J Clin Pharmacol 2014](#)).

Some concerns have been raised about the safety of **magnesium orotate** due to its orotic acid content. Research in animals shows that doses of 100 mg/kg/day or more of orotic acid have tumor promoting effects in experimental tumors. Lower doses of 50 mg/kg/day did not have this effect ([Laconi, Carcinogenesis 1993](#), [Laconi, Carcinogenesis 1993](#), [Laconi, Carcinogenesis 1988](#)). Based on these data, a panel of the European Food Safety Authority (EFSA) concluded that orotic acid-containing products, such as magnesium orotate, represent a safety concern when used in amounts of 100 mg/kg or more daily (e.g., 7,000 mg for a 70 kg [154 lb] adult) ([EFSA Journal 2009](#)). Until more is known about these potential risks, it may be best not to use magnesium orotate.

High doses of magnesium or other minerals (calcium, zinc, and ferrous iron) from supplements may decrease the absorption of carotenoids, such as [beta-carotene](#), [lycopene](#) and [astaxanthin](#), from foods and/or supplements. This is likely due to a reaction between carotenoids and the divalent ions of calcium, magnesium, [certain forms of iron](#), and zinc, making the carotenoids less bioavailable ([Borel, Br J Nutr 2017](#); [Corte-Real, Food Chem 2016](#)). **It is best to take carotenoid supplements at a different time of day** than a supplement or meal containing large amounts of a mineral (e.g., hundreds of milligrams of calcium or magnesium).

+ 167 sources

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