

Why Magnesium Is a Cornerstone Mineral for Health

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✓ Fact Checked

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STORY AT-A-GLANCE

- › Magnesium is required for the activation of vitamin D, and deficiency may increase your risk of anxiety, depression, heart disease, migraines, osteoporosis and more
- › Statistics show that at least 50% of the American population are deficient in magnesium; a simple blood panel may not reveal magnesium deficiency as only 1% is available in your blood and the rest is stored in your bones and muscle
- › Research suggests magnesium is necessary for optimal heart and kidney health as it protects your arteries from calcification; it has also shown effectiveness in treatment or prevention of migraines, anxiety and depression
- › Seek out organically grown, whole foods rich in magnesium, such as spinach, broccoli and avocado; if you choose to supplement, consider magnesium threonate as it appears to be the most efficient at penetrating cell membranes

This article was previously published April 1, 2019, and has been updated with new information.

Magnesium is the fourth most abundant element in your body,¹ and one of the seven essential minerals we can't live without.² It's necessary for the healthy functioning of most cells, but especially your heart, kidneys and muscles. Low levels of magnesium impede cellular metabolic function and deteriorate mitochondrial function.

As it is also required for the activation of vitamin D, deficiency may hamper your ability to convert vitamin D from sun exposure and/or oral supplementation. Unfortunately,

deficiency is common and research shows even subclinical deficiencies may jeopardize your health.

If you've recently had a blood panel drawn, you may assume it would reveal a magnesium deficiency. However, only 1% of magnesium is distributed in your blood, which means a blood test is not useful to determine whether you are deficient at the cellular level.³ Recent research confirms optimal levels of magnesium are necessary for your heart⁴ and kidney health.⁵

Magnesium Deficiency Affects the Vast Majority

Statistics show that at least 50% of Americans are deficient in magnesium, with some estimations going as high as 75% overall, and as many as 84% of postmenopausal women being deficient in it.^{6,7,8} Other scientists believe the deficiency affects the vast majority of individuals based on current dietary habits, saying:⁹

"[B]ecause of chronic diseases, medications, decreases in food crop magnesium contents and the availability of refined and processed foods, the vast majority of people in modern societies are at risk for magnesium deficiency."

The recommended daily allowances (RDA) for magnesium are based on age, gender and pregnancy status.¹⁰ Although it may be difficult to pinpoint the exact percentage of individuals who suffer from magnesium deficiency, data do demonstrate subclinical levels of magnesium contribute to a number of widespread health problems.

The number who suffer from deficiency increases with an aging population as the elderly tend to consume less and don't efficiently absorb magnesium from what is eaten.¹¹

Digestive disorders, such as Crohn's disease and celiac, may also affect magnesium absorption.¹² Individuals who suffer from Type 2 diabetes¹³ or use diuretics may lose more magnesium through their urine.¹⁴

As the number of people suffering Type 2 diabetes is growing, and the age at which the condition arises is getting younger,¹⁵ the number who are also at risk for magnesium deficiency is also rising. Type 2 diabetes is associated with a number of health conditions also linked to magnesium deficiency, including heart disease and kidney disease.

Magnesium Integral to Arterial Health

Magnesium is required for energy production and is a cofactor in more than 300 enzyme systems that regulate biochemical reactions, including muscle and nerve function, and blood pressure regulation.¹⁶ Magnesium also helps regulate your blood vessels and helps prevent calcification known as coronary artery calcification (CAC).

CAC is an indicator of advanced atherosclerosis, a common predictor of cardiovascular disease and chronic kidney disease.¹⁷ In 1948, researchers undertook a nearly 70-year-long heart study under the direction of the National Heart Institute.

The Framingham Heart Study¹⁸ became a joint project of the National Heart, Lung and Blood Institute and Boston University with the objective to identify factors contributing to cardiovascular disease.

Magnesium Is Necessary for Optimal Heart and Kidney Health

Researchers¹⁹ recently examined data of magnesium intake in those free of cardiovascular disease at the beginning of the Framingham Heart Study and followed them over a period of 11 years.

They found a strong association between higher self-reported magnesium intake and lower calcification in the coronary arteries, which translates to lower risk of atherosclerosis and cardiovascular disease.

The researchers believe this may play a role in magnesium's protective association in stroke and fatal coronary artery disease. The data also revealed a lower risk of

abdominal aortic calcification,²⁰ also associated with cardiovascular disease.²¹ A second study²² analyzed the associated risk of hypomagnesemia with diabetes and hypertension, which can contribute to a decline in kidney function.

The hypothesis was that subclinical levels contributed to a decline in glomerular filtration rate. Researchers engaged over 2,000 participants from the Dallas Heart Study. During a median follow-up of seven years, researchers evaluated glomerular filtration rate, biochemical parameters, C-reactive proteins and the prevalence of hypertension and diabetes.

The results led the researchers to conclude subclinical levels of magnesium were independently associated with decline in glomerular filtration rates indicating declining kidney function.²³

Magnesium is a natural calcium antagonist and has several effects on vasodilation, regulation and changes in metabolism enhancing atherosclerotic changes in arterial stiffness, likely in part contributing to heart and kidney disease.²⁴

Magnesium for Your Bone and Muscle Health

Magnesium contributes to the structural development of bone, and adult bone contains nearly 60% of the total magnesium in your body.²⁵ As it is involved in bone formation, subclinical levels may contribute to the development of osteoporosis.

Research²⁶ has found women with osteoporosis have lower serum magnesium levels than those without osteoporosis or osteopenia. Magnesium is also fundamental for physical performance.²⁷ Just as it contributes to heart muscle contraction, skeletal muscles also require magnesium to relax muscle cramping and it is a cornerstone for circulatory health.

Magnesium is also important in energy regulation and plays a role in oxygen delivery and uptake in muscle. The relationship between magnesium and circulation also affects your brain. Dr. Maiken Nedergaard, co-director of the University of Rochester Center for Translational Neuromedicine, commented on the energy supply needed by the brain:²⁸

"Our brains require a tremendous amount of energy and in order to meet this demand the flow of blood must be precisely choreographed to ensure that oxygen is being delivered where it is needed and when it is needed. This study demonstrates that microvessels in the brain play a key role in reacting to spikes in demand and accelerating the flow of blood to respond to neuronal activity."

Magnesium Deficiency Affects Migraines, Anxiety, Depression

Although the brain is just 2% of your body weight, it uses nearly 20% of your oxygen supply in metabolic processes,²⁹ remaining remarkably constant despite changes in mental and motor activities. Magnesium facilitates processing in the neural networks and is used to keep the blood-brain barrier healthy.³⁰

Magnesium has proven to be essential for learning, concentration and memory and enables the brain's plasticity, or its ability to adapt to challenges.³¹ Additionally, maintaining optimal levels of magnesium has proven effective in reducing the number of attacks and the number of days per month you may experience a migraine.³²

In a comparison against valproate sodium, a medication used to help prevent migraine headache attacks, a randomized, controlled, double-blind study indicated 500 milligrams (mgs) of magnesium per day was an effective prophylaxis, similar to the effectiveness experienced by those taking valproate sodium, without side effects.

Anxiety disorders affect up to 13% of the population in the U.S.³³ The condition may be debilitating, and like other mental disorders, it exists on a spectrum. Low levels of magnesium have been associated with increasing levels of noradrenaline, leading to a higher heart rate and blood pressure.

Conversely, optimal levels of magnesium may decrease the release of adrenocorticotrophic hormone (ACTH), responsible for the controlled release of cortisol. Essentially, this means the release of fewer stress hormones and the modulation of the ones released.³⁴

Optimal levels of dietary intake are also inversely associated with anxiety and depression.³⁵ In an outpatient clinic treating 126 adults with mild to moderate symptoms, researcher found supplementation with magnesium chloride for six weeks resulted in clinically significant improvements in depression and anxiety without side effects.³⁶

Higher Magnesium Intake Lowers Risk of Vitamin D Deficiency

Vitamin D levels below 20 nanograms per milliliter (ng/mL) or 50 nanomoles per liter (nmol/L) have repeatedly been shown to raise your risk of a number of health conditions, including depression and Type 2 diabetes. According to the most recent research, a vitamin D level between 60 and 80 ng/mL (150 and 200 nmol/L) appears to offer the greatest protection against cancer and other chronic diseases.³⁷

Adequate vitamin D levels may also help prevent or treat dry eye syndrome,³⁸ macular degeneration,³⁹ neurological diseases,⁴⁰ fractures⁴¹ and obesity.⁴² Adequate levels of vitamin D also lower your mortality risk associated with heart disease,⁴³ and may lower your risk of mortality from all causes.⁴⁴

However, without adequate levels of magnesium, any vitamin D supplementation may be ineffective,⁴⁵ as magnesium is required for the activation of vitamin D, and vitamin D may trigger vascular calcification if magnesium and vitamin K2 levels are not optimal.⁴⁶ Higher levels of magnesium may actually lower your risk of vitamin D deficiency by allowing for the activation of more vitamin D.⁴⁷

Magnesium – Supplementation and Natural Sources

One of the biggest culprits behind deficiencies is processed foods, which unfortunately has become a staple in the American diet. Some of the magnesium rich foods you may add to your diet include:^{48,49}

Spinach

Swiss chard

Avocado	Papaya
Broccoli	Bok Choy
Beet greens	Turnip greens
Seeds and nuts, such as pumpkin seeds, sesame seeds, cashews and raw almonds	Fatty fishes like wild-caught Alaskan salmon
Dried seaweed or agar	Brussels sprouts

An interesting number of factors may affect your ability to absorb magnesium from your foods. Herbicides like glyphosate act as agricultural chelators, effectively obstructing the uptake of minerals from the soil in many foods grown today. As a result, it may be quite difficult to find truly magnesium-rich foods. Cooking and processing further depletes magnesium.

Meanwhile, certain foods may actually influence your body's absorption of magnesium. High levels of sugar intake may trigger excretion of magnesium through your kidneys, "resulting in a net loss," according to Dr. Danine Fruge, associate medical director at the Pritikin Longevity Center in Florida.⁵⁰

When it comes to oral supplementation, my personal preference is magnesium threonate, as it appears to be the most efficient at penetrating cell membranes, including your mitochondria and blood-brain barrier. Other effective ways to boost your magnesium level include:

- Taking Epsom salt (magnesium sulfate) baths, as the magnesium will effectively absorb through your skin.
- Using a topical solution – I prepare a supersaturated solution of Epsom salt by dissolving 7 tablespoons of the salt into 6 ounces of water and heating it until all

the salt has dissolved. I pour it into a dropper bottle and then apply it to my skin and rub fresh aloe leaves over it to dissolve it.

This is an easy and inexpensive way to increase your magnesium and will allow you to get higher dosages into your body without having to deal with its laxative effects.

Magnesium can be taken with or without food. If you're also taking calcium, take them together. If you exercise regularly, consider taking your calcium and magnesium in a ratio of one part calcium to two parts magnesium with your pre-workout meal.

While the ideal ratio of magnesium to calcium is thought to be 1-to-1, most people get far more calcium than magnesium from their diet, so your need for supplemental magnesium may be two to three times greater than calcium.

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