

The Science of Magnesium and Its Role in Aging and Disease

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STORY AT-A-GLANCE

- › Nearly 45% of the U.S. population doesn't get enough magnesium, primarily because our diets lack sufficient dark leafy greens where magnesium is abundant
- › Lifestyle factors, including sleep deprivation, stress and alcohol consumption, can lead to a decrease in magnesium levels
- › Even marginally low magnesium intake may take a toll on your health and lead to accelerated aging and the development of chronic disease
- › Magnesium has been studied for its potential role in preventing and treating migraines, high blood pressure, osteoporosis and more

Magnesium is a mineral that's essential for human health, playing a crucial role in more than 300 enzymatic reactions in your body. Magnesium is necessary for muscle and nerve function, blood glucose control and protein synthesis. It also supports a healthy immune system, keeps your heartbeat steady and plays a role in bone health.¹

Unfortunately, magnesium is also one of the most prevalent micronutrient deficiencies.

Why Magnesium Deficiency Puts Your Health at Risk

Nearly 45% of the U.S. population doesn't get enough magnesium, primarily due to insufficient consumption of dark leafy greens. Magnesium is found in the chlorophyll that gives plants their green color.

Magnesium deficiency can have serious consequences, impacting essential biological functions such as DNA repair, replication, and transcription. When magnesium levels are inadequate, these processes may be hindered, potentially leading to the formation of mutations that could contribute to cancer development.

Furthermore, recent research suggests a possible connection between low magnesium levels and increased brain volume loss, which may contribute to a faster decline in cognitive function and an earlier onset of dementia in aging individuals.

The RDA for magnesium is around 310 to 420 milligrams (mg) per day depending on your age and sex,² although some researchers believe we may need as much as 600 to 900 mg/day for optimal health. I believe many may benefit from amounts as high as 1 to 2 grams (1,000 to 2,000 mg) per day.

The Recommended Dietary Allowance (RDA) for magnesium only represents the minimum amount needed to prevent severe deficiency-related diseases. So, meeting the 300 to 400 mg daily requirement only provides the basic level necessary for bodily functions, rather than optimal health.

Magnesium is crucial for maintaining proper electrolyte balance and preventing dehydration. It regulates electrolytes, which are essential for nerve impulse transmission, muscle contraction, and maintaining a healthy heart rhythm. A magnesium deficiency can disrupt this balance, potentially leading to dehydration and associated complications.

The primary reason why so many people have magnesium insufficiency or deficiency is due to the typical standard American diet, which is low in micronutrients like magnesium. However, certain health conditions and lifestyle factors also play a role by increasing magnesium excretion. Diabetes is one example, as is alcohol consumption.

Alcohol consumption can accelerate magnesium loss from the body, even when gut absorption remains normal. This occurs because alcohol acts as a diuretic, stimulating increased urine production. As a result, more magnesium is filtered out by the kidneys and excreted in urine, rather than being retained and used by the body.

This diuretic effect leads to a higher rate of magnesium excretion, potentially depleting your magnesium stores. Sleep deprivation and your stress levels also affect magnesium, and chronic or even intermittent stress may lead to a decrease in magnesium levels.

Magnesium Boosts Brain Health

Intriguing research suggests higher dietary magnesium intake is linked to better brain health, particularly in women. One study of 6,001 people revealed that higher dietary magnesium consumption of about 550 mg per day was associated with larger gray matter and hippocampal volumes in the brain than the average intake of about 350 mg per day.³

Higher magnesium intake may result in larger brain volumes, potentially slowing brain aging by up to one year compared to those with lower magnesium consumption. Research has associated magnesium with the onset and progression of various age-related brain disorders. Elevated cerebral magnesium levels have been shown to reduce oxidative stress and inflammation while enhancing pro-synaptic plasticity.

Additionally, magnesium also helps counteract other mechanisms that contribute to neurodegeneration. For example, a systematic review and meta-analysis of 21 studies also revealed that individuals with Alzheimer's disease have significantly lower plasma magnesium levels compared to those without.⁴ These effects collectively suggest that maintaining adequate magnesium levels could play a role in preserving brain health and function as we age.

Magnesium is also involved with creatine, a substance naturally found in muscle cells and the brain. Creatine is commonly used by athletes to improve performance, as it's immediately used by your body to convert adenosine diphosphate (ADP) to adenosine triphosphate (ATP) – the main energy currency of cells – and supply energy muscles need for contraction. However, creatine also helps provide energy to your brain.

Creatine plays a crucial role in energy production by transferring phosphate groups from phosphocreatine to ADP, thereby generating ATP, your body's primary energy currency. This process is facilitated by enzymes that require magnesium as a cofactor to function effectively.

This mechanism highlights another significant reason why magnesium is essential for brain function, as it directly supports the energy metabolism necessary for optimal cognitive performance and overall brain health.

The Role of Magnesium in Aging

Even marginally low magnesium intake may take a toll on your health and lead to accelerated aging and the development of chronic disease. According to Bruce Ames, Ph.D., professor emeritus of biochemistry and molecular biology at the University of California Berkeley, and former senior scientist at the Children's Hospital Oakland Research Institute, proteins and enzymes fall into two general categories:

- Survival proteins, which are crucial for our immediate survival and ability to reproduce
- Longevity proteins, which help us stay healthy in the long run

According to [Ames' triage theory](#), if your body is low in certain nutrients or cofactors, it prioritizes survival proteins over longevity proteins. This means that in times of nutrient deficiency, your body chooses to support functions that keep you alive and reproducing rather than those that prevent long-term damage, which can lead to faster aging and age-related diseases.

With regard to magnesium, it plays a crucial role in numerous biological functions, both for immediate survival and long-term health. The triage theory suggests that when magnesium is limited, your body then prioritizes its use for essential short-term survival processes, such as energy production, at the expense of long-term health processes like DNA repair.

So, while we may consume enough magnesium to avoid acute deficiency, this level might not be optimal for long-term health. Your body may even deplete magnesium from bones to maintain levels in muscles and other tissues, potentially leading to issues like osteoporosis later in life.

Impaired DNA repair and replication processes due to chronically inadequate magnesium levels can also result in an accumulation of DNA damage and mutations, potentially leading to cell dysfunction and even cancer development over time.

This scenario illustrates how subtle, long-term effects of micronutrient inadequacy, particularly magnesium, can contribute to the aging process and the development of chronic diseases. The damage is insidious, accumulating gradually over time without immediate noticeable effects, but potentially having significant long-term health consequences.

Magnesium for Migraines, High Blood Pressure, Osteoporosis and More

Magnesium has been studied for its potential role in preventing and treating migraines. Several studies suggest that magnesium deficiency may be linked to the occurrence of migraines, and supplementation might help reduce the frequency and severity of migraine attacks.⁵ Magnesium can also affect neurotransmitter release and blood vessel constriction, both of which are factors in migraine development.

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During a migraine, a phenomenon called cortical spreading depression occurs, which is a wave of brain activity leading to visual and sensory changes often associated with migraine auras. Magnesium supplementation may help prevent these waves.

Additionally, magnesium may decrease the release of certain pain-signaling chemicals in the brain, such as substance P and glutamate, potentially lessening migraine-associated pain. It might also prevent further narrowing of brain blood vessels caused by serotonin, another neurotransmitter involved in migraines.

Magnesium also plays an important role in other common chronic conditions, including high blood pressure. It helps control blood pressure by boosting the production of substances like prostacyclin and nitric oxide, which relax blood vessels and improve overall cardiovascular health. Magnesium aids in vasodilation, making it easier for the heart to pump blood and reducing blood pressure.

Furthermore, its ability to combat inflammation and protect against blood vessel damage contributes to cardiovascular health support.

Magnesium is also a key player in bone health, with adequate intake necessary to build strong bones starting early in life. Most of the magnesium in your body is stored in your bones. They basically serve as a reservoir that your body can draw from when needed. As you age, magnesium losses from the bones increase, partly due to your body's efforts to maintain a stable range of magnesium in the plasma.

Over a lifetime, this process can lead to a significant decrease in bone magnesium content. Therefore, ensuring adequate magnesium intake early in life is crucial for long-term bone health and reducing your risk of age-related bone density loss and associated conditions like osteoporosis.

What Are the Best Sources of Magnesium?

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. However, as a general rule, I recommend starting out with a dose of 200 mg of oral magnesium citrate per day, gradually increasing your dose until you develop slightly loose stools.

I recommend using a food tracking app such as [Cronometer](#) to find out your magnesium intake. Dark green leafy vegetables are a good source of magnesium, and juicing your greens is an excellent way to boost your intake, although supplementation is likely necessary for most people, as magnesium-depleted soils have dramatically lowered the magnesium content of our food.

Sources and References

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