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Magnesium 101 — A Comprehensive Guide to Its Health Benefits

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Magnesium is essential for over 80% of metabolic functions, but more than 50% of the U.S. population fail to meet the estimated average requirement, potentially leading to various health issues

Magnesium deficiency is linked to multiple diseases, including cardiovascular issues, diabetes, respiratory problems and neurological disorders. It's crucial for calcium regulation and overall cellular health

Studies suggest magnesium may help ease anxiety and depression. Research indicates potential mental health benefits when combined with vitamin D3

Magnesium plays a vital role in brain health, potentially reducing the risk of Alzheimer's and Parkinson's disease by curbing neuroinflammation and supporting cognitive functions

Adequate magnesium intake is important for heart health, bone strength and muscle function. It can be obtained through diet or supplements, with various forms available

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There's growing interest in magnesium, and the discourse about it has skyrocketed in recent years. An article published in Vogue[1] says that social media is partly responsible for the renewed interest in this nutrient, with various videos promoting it as a "miracle mineral" with a wide array of health benefits.

However, many people are still not getting enough magnesium to reap its positive effects. In the U.S., more than 50% of the population fail to meet the estimated average requirement (EAR) for this vital nutrient.[2]

With that being said, let's take a closer look at the myriad benefits magnesium offers so you'll understand why it's garnering so much attention, and why optimizing your levels is so important for your health.

Mighty Magnesium — How Does It Work in Your Body?

Dubbed "the MVP of minerals,"[3] magnesium is the fourth most abundant mineral in the human body (after calcium, potassium and sodium),[4] and is involved in 80% of metabolic functions.[5] This macronutrient is needed for biological processes such as muscle contraction,

maintaining your heartbeat, creating energy and activating nerves to send and receive messages.

According to an article in Bulletproof, magnesium is a "helper molecule," or a cofactor.[6] It assists around 600 enzymes required for cell metabolism and other processes,[7] such as:[8,9,10]

Protein synthesis	**Blood glucose control**
Blood pressure regulation	**Energy storage and transfer**
Regulating nerve and muscle (including your heart) function	**Gene maintenance**
Immune system support	

Magnesium is found in almost every single cell in your body, which is why you simply cannot function without it. Carolyn Dean, author of "The Magnesium Miracle," highlights the importance of this nutrient, saying, "All these minerals are essential but magnesium seems to do the most — it acts as a cell mineral ion gatekeeper, allowing the appropriate amount of the other minerals to enter the cells."[11]

Magnesium Deficiency Puts You at Risk of Various Diseases

As mentioned above, magnesium acts as a gatekeeper for other nutrients, playing a significant role in transporting calcium and potassium across your cell membranes, which is crucial for "nerve impulse conduction, muscle contraction, vasomotor tone, and normal heart rhythm."[12]

In addition, magnesium acts as a calcium channel blocker. According to Dr. Thomas Levy, a cardiologist who wrote the book "Magnesium: Reversing Disease," excess calcium inside your cells is a primary contributor to most diseases, saying:

> "[M]agnesium was the No. 1 calcium antagonist and general metabolic calcium function inhibitor. It mirrored everything. More calcium increased your chance of death by all causes, less decreased it. More magnesium decreased it, less magnesium increased it …"

Hence, it makes sense that having insufficient magnesium in your system can put you at high-risk of chronic pathologies. According to a 2023 study published in Nutrients,[13] "Habitually low intakes of magnesium and in general the deficiency of this micronutrient induce changes in biochemical pathways that can increase the risk of illness and, in particular, chronic degenerative diseases."

To give you an overview of just how instrumental magnesium is to your overall well-being, here are some of the potential diseases and health conditions associated with magnesium deficiency:[14]

Cardiovascular diseases	**Hypertension and stroke**	**Type 2 diabetes**
Respiratory illnesses and asthma	**Depression**	**Stress-related conditions and psychiatric disorders**
Dementia, Alzheimer's, and Parkinson's disease	**Muscle pain**	**Fragile bones**
Cancer	**Fibromyalgia**	**Chronic fatigue**

In healthy individuals, it's uncommon to be deficient in magnesium, since when you have low levels, your kidneys will simply regulate the amount that is excreted in the urine, helping conserve this nutrient.

However, deficiency can occur if you're not getting the optimal amount from your diet (or through supplements) for prolonged periods. Taking certain medications like diuretics or having a medical condition like Type 2 diabetes can also cause you to become deficient.[15]

Some of the symptoms of magnesium deficiency[16] are listed below — if you're experiencing any of these, it's best to evaluate your diet and increase your intake:

Appetite loss	**Nausea**
Vomiting	**Fatigue or weakness**
Numbness and tingling	**Shaking or muscle cramps (usually indicate severe deficiency)**

Magnesium May Help Ease Anxiety and Promote Mental Health

One of the reasons why magnesium's popularity on social media has skyrocketed recently may be related to its effects on mental health. According to research, magnesium impacts your mental well-being, as having insufficient levels of this nutrient may lead to depression, anxiety and panic attacks.[17]

In July 2023, a photographer named Tyler Wesley posted a Tiktok video[18] on how taking 500 milligrams of magnesium glycinate supplement, combined with vitamin D3, helped ease his anxiety. As of this writing, Wesley's video has over 2.1 million likes and over 19.2K comments, many of whom say the supplement also worked for them. In an article published in The Guardian,[19] Katie Holton, a nutritional neuroscientist at American University, further explains:

> "Magnesium seems to have an overall calming effect. It may inhibit stress responses by preventing over-excitation through a neurotransmitter called glutamate. Too much glutamate can disrupt brain processes and has been associated with multiple mental

health conditions."[20]

There are many studies supporting the positive effects that magnesium has on mood and mental health. A 2020 systematic review published in the journal Nutrients looked at the efficacy of magnesium and its role in neurological and psychiatric diseases. The researchers noted that "magnesium could be considered a hallmark of pathology or could represent a biomarker of response to drug treatment in patients with mood disorders."[21]

A systematic meta-analysis published in the Frontiers in Psychiatry also highlighted magnesium's potential effects on depression.[22] After reviewing seven clinical trials, they found that taking supplemental magnesium led to a significant decline in depression scores among adults with depressive disorder.

As Wesley mentioned in his video, he took a combination of vitamin D3 and magnesium to ease his anxiety. In fact, these two nutrients work harmoniously to help boost your mental well-being. You need magnesium to activate vitamin D, and deficiency may hamper your ability to convert vitamin D from sun exposure and/or oral supplementation. For more about this topic, I recommend reading my article "Can This Dynamic Duo Curb Your Anxiety and Depression?"

Magnesium Helps Reduce Risk of Alzheimer's and Parkinson's Disease

Having low levels of magnesium may influence how your brain works, as it is crucial in the proper transmission of nerve signals and in preserving the integrity of the blood-brain barrier. This nutrient acts as a buffer between neuron synapses, particularly those involved with cognitive functions (learning and memory).

Magnesium also plays a role in curbing neuroinflammation. One review[23] published in the Journal of Molecular Sciences gives insight into how an imbalance in magnesium levels is associated with multiple sclerosis (MS), Parkinson's and Alzheimer's disease, all of which are rooted in neuroinflammation.

> "Neuroinflammation drives tissue damage in neurodegeneration. Solid evidence suggests a role of Mg [magnesium] in taming neuroinflammation and in retarding some neurodegenerative diseases.
>
> Therefore, a correct and, if possible, personalized dietary intake of Mg might represent a preventive measure, whereas supplementing Mg might be an adjunct option in neurodegeneration," the researchers said.[24]

Some of their review's highlights include:[25]

- A meta-analysis of 21 studies[26] published in the last 20 years found that Alzheimer's patients had significantly lower levels of magnesium compared to healthy individuals
- A multicenter case-control study[27] conducted in Japan found that people who ate more magnesium-rich foods had a lower chance of developing Parkinson's disease

- Magnesium increases brain-derived neurotrophic factor (BDNF),[28] a neurotransmitter that is essential for dopamine production; this hormone is necessary for pleasure, memory and learning

Studies also stress the importance of both vitamin D and magnesium, and how improving your levels of both nutrients can play a significant role in cognitive function, especially among the elderly. One study, published in the European Journal of Nutrition, notes:[29]

> "[O]ur findings suggest that participants who had high intake of magnesium or those with optimal vitamin D status ranging from 81-98 nmol/l are associated with better cognitive function.
>
> In particular, among those who had sufficient vitamin D status (≥50 nmol/l), daily total magnesium intake meeting the RDA was related to better cognitive performance, indicating that both optimal levels of serum 25(OH)D and adequate magnesium intake may be required to protect against cognitive decline in older adults."

Magnesium Helps Protect Against Cardiovascular Diseases

Magnesium is also particularly important for your heart health, as it helps maintain normal blood pressure levels and protect against stroke. According to an article in Everyday Health:[30]

> "Magnesium is central to a healthy heart rhythm because it's involved in transporting other electrolytes, such as calcium and potassium, into cells. Electrolytes are all important for nerve signals and the muscle contractions of a normal heartbeat … [M]agnesium also helps with muscle contraction or pumping of the heart."

One study published in Antioxidants[31] notes that "having low levels of this nutrient is a predictor for cardiovascular and all-cause mortality," and that addressing deficiency may help protect against these health conditions.

A separate study, published in Nutrients,[32] also notes that being deficient in magnesium not only causes severe muscle cramps but also increases the risk of irregular heartbeats (arrhythmia).

> "[H]igh magnesium intake is related to lower probability of major CV risk factors (such as hypertension and diabetes), stroke, and total CVD. In addition, a reduced risk of ischemic and coronary heart disease is related to higher levels of circulating magnesium," the authors comment.[33]

Magnesium Is Essential for Healthy Bones and Muscles

Elderly populations have a higher tendency to be chronically deficient in magnesium, mainly due to a reduction in both dietary intake and intestinal absorption.[34] This can be detrimental, as magnesium significantly impacts bone and muscular health.

In the human body, magnesium is mostly stored in the bones, along with calcium and phosphorus — this is why this nutrient is vital to maintaining optimal bone health. Having

low magnesium levels has been associated with lower bone mineral density, which can increase the risk of fractures, especially among older individuals.[35,36]

A comprehensive review[37] published in 2023 looked at the effects of magnesium on skeletal muscle health, particularly its impact on muscle aging and integrity. Based on their analysis, the researchers found that supplementation enhances "muscle power, torque, exercise performance, lean body mass and handgrip strength." They also noted a reduction in muscle soreness and markers of muscle damage.

> "Magnesium plays multifaceted roles in muscle function, including its roles in contraction, electrolyte balance, energy provision, and anti-inflammatory and antioxidant defense, and has emerged as a critical mineral in preserving muscle health and functionality," they conclude.[38]

Are You Getting Enough Magnesium?

The recommended dietary allowances (RDA) for magnesium depend on your age and gender. Below are the recommended RDAs, according to the National Institutes of Health:[39]

Age	Male	Female	Pregnancy	Lactation
Birth to 6 months	30 mg	30 mg		
7–12 months	75 mg	75 mg		
1–3 years	80 mg	80 mg		
4–8 years	130 mg	130 mg		
9-13 years	240 mg	240 mg		
14-18 years	410 mg	360 mg	400 mg	360 mg
19-30 years	400 mg	310 mg	350 mg	310 mg
31-50 years	420 mg	320 mg	360 mg	320 mg
51+ years	420 mg	320 mg		

As mentioned above, elderly groups are more likely to be deficient, so they are advised to increase their intake of this nutrient. Pregnant and breastfeeding mothers also have slightly higher requirements.

Most of the magnesium in your system is stored in your cells (99%), mostly in your bones (50% to 65%), and soft tissues, muscle and organs (34% to 39%). Only 1% to 2% is stored in the blood and other fluids[40] — this is why blood tests are not a reliable tool to determine if you're meeting the recommended levels.

Hence, it would be wise to increase your intake of this nutrient through your diet. Some of the foods that are high in magnesium include:[41,42]

Raw milk and homemade yogurt	**Broccoli**
White rice	**Bok choy**
Potato	**Turnip greens**
Dried seaweed or agar	**Brussels sprouts**

Oral Supplementation and Other Ways to Boost Your Levels

Ideally, it's best to buy organic and unprocessed varieties of the foods above to ensure that you're getting enough magnesium. However, some factors may affect your ability to absorb magnesium from these healthy choices.

For example, fruits and vegetables, even organic varieties, will have poor levels of this nutrient if they're grown in magnesium-depleted soil. Herbicides like glyphosate also act as agricultural chelators, which can effectively obstruct the uptake of minerals from the soil in many foods. Cooking and processing can deplete magnesium levels in foods as well.

In this case, you may benefit from 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.

You can take magnesium threonate with or without food. If you're also taking calcium, I advise taking 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 magnesium-to-calcium ratio is thought to be 1-to-1, take note that most people get far more calcium than magnesium from their diet. Hence, your need for supplemental magnesium may be two to three times greater than calcium.

It's virtually impossible to overdose on magnesium, since your body has a built-in mechanism to prevent toxicity. Similar to vitamin C, when you consume too much oral magnesium, your body will simply excrete it in the form of loose stools — this is a sign that you've exceeded your ideal dose. Aside from oral supplements, there are other easy and inexpensive ways to get higher dosages of magnesium without having to deal with its laxative effects:

- Take Epsom salt (magnesium sulfate) baths — The magnesium will effectively absorb through your skin.
- Use 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.

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