Magnesium Deficiency Raises Your Risk of Many Chronic Ailments and Premature Death

Story at-a-glance

- Magnesium is important to the heath of nearly every one of your cells, playing a role in over 600 different reactions in your body, reducing your risk for hypertension, heart disease, migraines and much more
- Your body loses magnesium with sweating, certain drugs and when you are insulin resistant; improve your levels through good dietary choices or taking a supplement balanced with vitamin K2, vitamin D3 and calcium
- Magnesium, a natural calcium channel blocker, may also reduce damage caused by exposure to electromagnetic fields and microwave radiation from cellphones and other wireless technologies

By Dr. Mercola

Magnesium is important to the health of nearly every cell in your body, especially your heart, kidneys and muscles. Symptoms of a deficiency can include unexplained fatigue, abnormal heart rhythms, eye twitches and muscle spasms.

As of 2011 data,[1] 45 percent of American adults do not get the recommended dietary allowance amount (RDA) of magnesium from their diet. Teen statistics are even more dire. Data[2] published in 2014 suggests nearly 92 percent of teens aged 14 to 18 do not meet the estimated average requirement for magnesium from food alone — likely because they do not eat fresh vegetables on a regular basis.

Unfortunately, determining a deficiency of magnesium from a simple blood sample isn't possible, as only 1 percent of the magnesium in your body is found in your bloodstream. Your best bet is to evaluate and track signs and symptoms of magnesium insufficiency, and to make sure you eat magnesium-rich foods and/or take a magnesium supplement, balanced with vitamins D3, K2 and calcium.

Magnesium Is Vital for Optimal Health

As the fourth most abundant mineral in your body, magnesium is involved in over 600 different reactions in your body. It's vitally important for biological function and optimal health as it plays a role in:

Creation of adenosine triphosphate (ATP), the energy currency of your body[3,4]
Metabolism of calcium, potassium, zinc, phosphorus, iron, sodium, hydrochloric acid, acetylcholine and nitric oxide (NO), as well as many enzymes, and the activation of thiamine[5]

Mitochondrial function and health. Magnesium is required both for increasing the number of mitochondria in your cells and for increasing mitochondrial efficiency
Regulation of blood sugar and insulin sensitivity, which is important for the prevention of type 2 diabetes[6,7,8,9] (In one study,[10] prediabetics with the highest magnesium intake reduced their risk for blood sugar and metabolic problems by 71 percent)
Relaxation of blood vessels and normalizing blood pressure
Detoxification, including the synthesis of glutathione
Muscle and nerve function, including the action of your heart muscle
Antioxidant defense via a number of different mechanisms, including anti-inflammatory activity and support of endothelial and mitochondrial function[11]
Improved sleep
Mental and physical relaxation; stress antidote[12]

Magnesium Deficiency Is Commonplace

A lack of magnesium will impede your cellular metabolic function and deteriorate mitochondrial function, which in turn can lead to more serious health problems. Eating plenty of organic unprocessed foods tend to be your best bet, but since most soils have become severely depleted of nutrients, some magnesium experts believe virtually everyone needs to take supplemental magnesium. As noted in a 2001 paper on the pathology of magnesium deficiency:[13]

> *"Unfortunately, [magnesium] Mg absorption and elimination depend on a very large number of variables, at least one of which often goes awry, leading to a Mg deficiency that can present with many signs and symptoms. Mg absorption requires plenty of Mg in the diet, [selenium] Se, parathyroid hormone (PTH) and vitamins B6 and D. Furthermore, it is hindered by excess fat.*
>
> *On the other hand, Mg levels are decreased by excess ethanol, salt, phosphoric acid (sodas) and coffee intake, by profuse sweating, by intense, prolonged stress, by excessive menstruation and vaginal flux, by diuretics and other drugs and by certain parasites (pinworms). The very small probability that all the variables affecting Mg levels will behave favorably, results in a high probability of a gradually intensifying Mg deficiency."*

Ailments Associated With Magnesium Deficiency

In this short video, Dr. Carolyn Dean discusses magnesium deficiency and the effect it has on your health. Since magnesium plays a role in a wide array of bodily systems, deficiency can lead to a broad range of health problems, from mild to life-threatening. Common pathologies associated with magnesium deficiency

include but are not limited to:[14,15]

Hypertension,[16] cardiovascular disease,[17] arrhythmias[18] and sudden cardiac death[19]
Recurrent or persistent bacterial infections such as sinus, vaginal, middle ear, lung and throat infections due to low levels of NO
Peroxynitrite damage, including migraines, multiple sclerosis, glaucoma and Alzheimer's disease
Kidney and liver damage
Impotence (also associated with low NO levels)
Fungal infections due to a depressed immune function
Increased risk of death from all causes[20]
Type 2 diabetes.[21] Estimates are that nearly half of all diabetics are magnesium deficient.[22] Low magnesium levels also affect insulin resistance, a precursor to type 2 diabetes.[23] High levels of insulin in the blood, common with insulin resistance, also lead to further loss of magnesium[24]
Premenstrual syndrome, mood swings, aggression, anxiety and depression[25] (as magnesium acts as a catalyst for mood-regulating neurotransmitters like serotonin)
Decreased hearing
Osteoporosis
Muscle cramps and muscle weakness

Magnesium Supplementation Recommended for Migraines

Magnesium (which can affect both serotonin receptor function and the production and use of neurotransmitters) has also been shown to play an important role in the prevention and treatment of migraines,[26] and migraine sufferers are more likely to suffer from magnesium deficiency than non-migraineurs.[27]

Researchers theorize that migraine sufferers may develop magnesium deficiency from a variety of reasons, including poor absorption, renal wasting, increased excretion due to stress or low nutritional intake. Since magnesium administration is both easy and safe, researchers have noted that empiric treatment with a magnesium supplement is justified for all migraine sufferers.[28] As a prophylactic, be prepared to boost your magnesium intake for at least three months to experience results, ideally in combination with CoQ10.

In many cases, receiving a high dose of magnesium can also abort an attack in progress. The most effective way would be to get an intravenous (IV) infusion. Barring that option, magnesium threonate may be your

best option for an oral supplement. It has superior absorbability compared to other forms of magnesium, since its ability to cross the blood-brain barrier makes it more likely to have a beneficial effect on your brain.

Could Magnesium Lower Risk of EMF-Related Damage?

About a year ago, Martin Pall, Ph.D., identified and published research describing the likely molecular mechanisms of how non-ionizing microwave radiation from cellphones and wireless technologies damage plants, animals and humans.[29,30,31,32] (To learn more, see "The Harmful Effects of Electromagnetic Fields Explained.") Interestingly, he stumbled across this mechanism when he discovered studies showing you can block or significantly reduce the effects of electromagnetic fields (EMF) using calcium channel blockers.

Since magnesium is a natural calcium channel blocker, it's possible that having an optimal level of cellular magnesium could help limit the damage from exposure to EMF, which includes heart arrhythmias, infertility, anxiety and depression — all of which are indeed associated with magnesium deficiency.

Conversely, being magnesium deficient may increase your sensitivity to EMFs. Considering the health hazards associated with EMF exposure, it's another reason to make sure you're not insufficient in magnesium. Granted, this is still only a hypothesis, but the evidence suggests it's a sound one.

Signs and Symptoms of Magnesium Deficiency

Unfortunately, there is no simple routine blood test to determine your magnesium level. It is best to get an RBC magnesium test. As a general rule, serum (blood) levels of magnesium are not a good indication of whether your muscles and bones have enough magnesium for optimal health. Considering these limitations, it would be wise to carefully evaluate and track symptoms associated with magnesium insufficiency, such as[33]

- Muscle spasms, especially "charley horses" or spasms in your calf muscle that happen when you stretch your leg and/or eye twitches; seizures; numbness or tingling in your extremities
- Insulin resistance
- High blood pressure, heart arrhythmias and/or coronary spasms
- Low energy, fatigue and/or loss of appetite
- Increased number of headaches and/or migraines

Dean's book, "The Magnesium Miracle," contains a far more exhaustive list of signs and symptoms that can help you determine whether or not you might be deficient. You can also follow the instructions in her blog post, "Gauging Magnesium Deficiency Symptoms,"[34] which will give you a checklist to go through every few weeks. This will also help you gauge how much magnesium you need to resolve your deficiency symptoms.

Risk Factors That Raise Your Risk for Magnesium Insufficiency

A primary risk factor for magnesium deficiency is eating a processed food diet, as magnesium resides at the center of the chlorophyll molecule. If you rarely eat leafy greens and other magnesium-rich whole foods (below), you're probably getting very little magnesium from your diet.

Frequently drinking carbonated beverages and eating refined sugar will also increase magnesium excretion, thereby raising your risk of insufficiency. Moreover, phosphates in soft drinks actually bind to magnesium,

thereby preventing absorption, so soda drinkers are more prone to magnesium deficiency. Magnesium is also lost through:

Stress
Lack of sleep
Heavy sweating
Alcohol consumption
Prescription drug use (especially diuretics, statins, fluoride and fluoride-containing drugs such as fluoroquinolone antibiotics)
Elevated insulin levels[35]

Are You Eating a Magnesium-Rich Diet?

While many, including Dean, believe most people need magnesium supplementation these days (due to denatured soils), it would certainly be wise to try to get as much magnesium from your diet as possible. Organic unprocessed foods would be your best bet, but if they're grown in magnesium-depleted soil, even organics could be low in this vital mineral.

Dark-green leafy vegetables lead the pack when it comes to magnesium content and juicing your greens is an excellent way to boost your intake. Greens with the highest magnesium levels include:

Spinach
Swiss chard
Turnip greens
Beet greens
Collard greens
Broccoli
Brussels sprouts
Kale
Bok Choy

Romaine lettuce

Other foods that are particularly rich in magnesium include:[36,37,38,39]

Raw cacao nibs and/or unsweetened cocoa powder

One ounce (28 grams) or raw cacao nibs contain about 64 mg of magnesium.

Avocados

One medium avocado contains about 58 mg of magnesium. They're also a good source of potassium, which helps offset the hypertensive effects of sodium.

Seeds and nuts

Pumpkin seeds, sesame seeds and sunflower seeds score among the highest, with one-quarter cup providing an estimated 48 percent, 32 percent and 28 percent of the RDA of magnesium respectively. Cashews, almonds and Brazil nuts are also good sources; 1 ounce of cashews contains 82 mg of magnesium, about 20 percent of the RDA.

Fatty fish

Interestingly, fatty fish such as wild-caught Alaskan salmon and mackerel are also high in magnesium. A half fillet (178 grams) of salmon can provide about 53 mg of magnesium, equal to about 13 percent of the RDA.

Herbs and spices

Herbs and spices pack lots of nutrients in small packages and this includes magnesium. Some of the most magnesium-rich varieties are coriander, chives, cumin seed, parsley, mustard seeds, fennel, basil and cloves.

Fruits and berries

Ranking high for magnesium are papaya, raspberries, tomato, cantaloupe, strawberries and watermelon. For example, one medium-sized papaya can provide nearly 58 grams of magnesium.

Organic, raw grass fed yogurt

Yogurt made from raw organic grass fed milk with no added sugars

How Much Magnesium Do You Need and What Kind Is Best?

While magnesium is ideally obtained from your diet, there are instances where supplementation is particularly advisable, such as if you:[40]

- Have suffered or at risk of a heart attack, or experience ventricular arrhythmia
- Have had or are planning heart transplant or open heart surgery
- Are taking diuretics
- Have hypertension or congestive heart failure
- Experience symptoms of insufficiency or deficiency

The RDA for magnesium is around 310 to 420 milligrams (mg) per day depending on your age and sex,[41] 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. A simple and effective way to determine your ideal dose is to use your intestinal reaction as a marker.

Start out by taking 200 mg of oral magnesium citrate per day, and gradually increase your dose until you develop slightly loose stools. Excessive magnesium is simply flushed out, so in this way you can determine your own individual cutoff point. (Be sure to use magnesium citrate, as it's known for having a laxative effect.) In many ways, it is similar to supplementing with MCT oil. You need to start gradually and slowly increase. Over time, you can tolerate much larger amounts.

As for supplements to optimize your magnesium level, my preference is magnesium threonate. It seems to be most efficient at penetrating cell membranes, including your mitochondria, which can help boost your energy level. It also penetrates your blood-brain barrier and may help improve memory.

If you struggle with headaches or migraines, magnesium threonate may be a good alternative for that reason as well. (For headaches and migraines, make sure you're getting enough vitamin B2 and Coenzyme Q10.) Another effective way to boost your magnesium level is to take Epsom salt (magnesium sulfate) baths, as the magnesium will effectively absorb through your skin.

When Supplementing, Balance Your Magnesium With Calcium, Vitamin K2 and D

Foods generally contain all the cofactors and needed co-nutrients in the proper ratios, so one of the major benefits of getting your nutrients from a varied whole food diet is that you're less likely to end up with lopsided nutrient ratios. Essentially, the wisdom of Mother Nature eliminates the guesswork. When you rely on supplements, you need to become savvier about how nutrients influence and interact with each other to avoid getting yourself into trouble.

For example, it's important to maintain the proper balance between magnesium, calcium, vitamin K2 and vitamin D. These four nutrients work together in a synergistic fashion. Improper balance between them is why calcium supplements have become associated with increased risk of heart attacks and stroke, and why some people experience vitamin D toxicity. Unfortunately, we don't know the precise ideal ratios between all of these nutrients, but some general guidelines and considerations include the following:

- The ideal ratio between magnesium and calcium is currently thought to be 1-to-1. Keep in mind that since you're likely getting far more calcium from your diet than you are magnesium, your need for supplemental magnesium may be two to three times greater than calcium
- While the ideal or optimal ratios between vitamins D and K2 have yet to be determined, Dr. Kate Rheaume-Bleue (whom I've interviewed on this topic) suggests that for every 1,000 IUs of vitamin D you

take, you may benefit from about 100 micrograms (mcg) of K2, and perhaps as much as 150 to 200 mcg

- As for how much vitamin D you need, I strongly recommend getting your vitamin D level tested twice a year (summer and winter) to help determine your personal dosage. Sun exposure is the ideal way to optimize your levels, but if you opt for a supplement, your "ideal dosage" is one that will put you into the therapeutic range of 40 to 60 ng/ml.

If Your Health and Energy Levels Are Flagging, You May Need More Magnesium

Remember, your need for magnesium can be magnified by factors such as advancing age, stress, lack of sleep, alcohol consumption, insulin resistance and diabetes, prescription drug use, an unbalanced gut microbiome, poor kidney function and more. If you have any of these risk factors, or if you eat a lot of processed foods, you may want to a) reconsider your diet and b) consider taking a magnesium supplement.

Also remember that while it's best to get your magnesium from your diet, many foods are likely to be deficient in magnesium and other minerals due to being grown in mineral-depleted soils. Fertilizers like glyphosate actually act as chelators, effectively blocking the uptake and utilization of minerals. As a result, I believe it would be prudent for most people to consider a magnesium supplement. Alternatively, juice your vegetables, which will allow you to consume far greater quantities.