# Magnesium



## Overview

The mineral magnesium is important for every organ in the body, particularly the heart, muscles, and kidneys. It also contributes to the composition of teeth and bones. Most importantly, it activates enzymes, contributes to energy production, and helps regulate calcium levels as well as copper, zinc, potassium, vitamin D, and other important nutrients in the body.

Magnesium is available in many foods. However, most people in the United States probably do not get as much magnesium as they should from their diet. Magnesium is found in whole unprocessed foods in the diet. However, different methods for calculating amounts of magnesium in foods have often lead to conflicting results. In addition, not all foods have been thoroughly analyzed.

Despite the fact that dietary levels of magnesium are often low, actual deficiency of this nutrient is rare. Certain medical conditions, however, can upset the body's magnesium balance. For example, intestinal flu with vomiting or diarrhea can cause temporary magnesium deficiencies. Certain stomach and bowel diseases (such as irritable bowel, celiac sprue), diabetes, pancreatitis, hyperthyroidism, kidney malfunction, and use of diuretics can lead to deficiencies. Too much coffee, soda, salt, or alcohol intake as well as heavy menstrual periods, excessive sweating, and prolonged stress can also lower magnesium levels.

Symptoms of magnesium deficiency may include agitation and anxiety, irritability, nausea and vomiting, abnormal heart rhythms,

RELATED INFORMATION

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- Atherosclerosis
- Attention Deficit/Hyperactivity Disorder
- Chronic Obstructive Pulmonary Disease
- Diabetes Mellitus
- Fibromyalgia
- HIV and AIDS
- Hypertension
- Menopause
- Migraine Headache
- Myocardial Infarction
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**Supplements with Similar Warnings**

confusion, muscle spasm and weakness, hyperventilation, insomnia, poor nail growth, and even seizures.

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## Uses

Getting enough magnesium may help facilitate the results of conventional treatment for the following conditions:

**Asthma and Emphysema**

A population-based study of over 2,500 children aged 11 to 19 years found that low dietary magnesium intake may be associated with a risk of developing asthma. The same was found in a group of over 2,600 adults aged 18 to 70. In addition, some studies suggest that intravenous magnesium can help treat acute attacks of asthma in children aged 6 to 18 as well as adults. This may also be true for those with emphysema (also known as chronic obstructive pulmonary disease or COPD). A doctor will determine if this is necessary and appropriate in a hospital setting.

**Attention Deficit/Hyperactivity Disorder (ADHD)**

Some experts believe that children with ADHD may be exhibiting the effects of mild magnesium deficiency (such as irritability, decreased attention span, and mental confusion). In one study of 116 children with ADHD, 95% were magnesium deficient. In a separate study, 75 magnesium-deficient children with ADHD were randomly assigned to receive magnesium supplements in addition to standard treatment or standard treatment alone for 6 months. Those who received magnesium demonstrated a significant improvement in behavior, whereas those who received only standard therapy without magnesium exhibited worsening behavior.

These results suggest that magnesium supplementation, or at least high amounts of magnesium in the diet, may prove to be beneficial for children with ADHD. Speak with your physician about possible use.

**Diabetes**

Type 2 diabetes is associated with low levels of magnesium in the blood. In addition, at least one small study suggests that taking magnesium supplements may improve the action of insulin and decrease blood sugar levels, particularly in the elderly.

**Fibromyalgia**

Results of a preliminary study including 24 people with fibromyalgia suggest that a proprietary tablet containing both malic acid and magnesium may improve pain and tenderness

associated with this health condition when taken for at least 2 months. Others suggest that the combination of calcium and magnesium may be helpful for some people with fibromyalgia.

However, a review article evaluating many studies concluded that magnesium with malic acid offered no relief for those with this condition. Whether these supplements ease the discomfort of fibromyalgia may vary from one individual to the next. Work with your doctor to determine if a short-term trial of magnesium with calcium and/or malic acid is appropriate and follow your symptoms carefully to determine if this combination is working.

**Heart Disease**

Magnesium is essential to heart health. This mineral is particularly important for maintaining a normal heart rhythm and is often used by physicians to treat irregular heartbeat (arrythmia). People with congestive heart failure (CHF) are often at particular risk for developing an arrhythmia. For this reason, your doctor may determine that magnesium should be a part of the treatment of CHF.

Results of studies using magnesium to treat heart attack survivors, however, have been inconsistent. Some studies have reported reduced death rates as well as fewer arrythmias and improved blood pressure when magnesium is used as part of the treatment following a heart attack. But, again, not all research trials agree. In a hospital setting, if you have had a heart attack, the doctor will determine if magnesium supplementation, either intravenously or orally, is necessary.

**High Blood Pressure**

Eating low fat dairy products along with lots of fruits and vegetables on a regular basis is associated with lower blood pressure. All of these foods are rich in magnesium as well as calcium and potassium. Singling out which of these nutrients is responsible for lowering blood pressure is difficult. In addition, studies using magnesium supplements have not demonstrated a reduction in blood pressure. Consequently, the key is to obtain magnesium, along with the other important minerals, from the diet.

**Human Immunodeficiency Virus (HIV)**

Several studies suggest that between 30% and 65% of people with HIV have low levels of magnesium. Those with low levels may be more likely to complain of fatigue, diminished energy, and confusion. Whether magnesium supplements would improve these symptoms in people with HIV, however, has not been evaluated.

**Inflammatory Bowel Disease (IBD)**
People with IBD (particularly ulcerative colitis) may have low magnesium levels. In addition, there is some early evidence that dietary magnesium supplements may be of some value for preventing IBD flare-ups.

**Infertility and Miscarriage**
A small study of infertile women as well as women with a history of miscarriage found that low levels of magnesium may impair reproductive function and increase the risk for miscarriage. The authors of the study suggest that one aspect of the treatment of infertility (particularly in women with a history of miscarriage) should include magnesium along with selenium. More research in this area is needed. In the meantime, check your prenatal vitamin for selenium and magnesium content and talk to your doctor about the proper amounts.

**Menopause**
Because magnesium improves the absorption of calcium from the gastrointestinal tract, some practitioners suggest that women take calcium and magnesium together at a ratio of 2:1, particularly around the time of menopause. This helps prevent loss of bone mass.

In addition, as estrogen levels drop during menopause, magnesium levels seem to diminish as well. For this reason, magnesium may also help to relieve some menopausal symptoms such as hot flashes. More research is needed.

**Migraine Headache**
Magnesium levels tend to be lower in those with migraine headaches, including children and teenagers, when compared to those with tension headaches or no headaches at all. In addition, a few studies suggest that magnesium supplements may decrease the length of time that one suffers from a migraine and reduces the amount of medication needed.

Some experts suggest that oral magnesium may be an appropriate alternative to prescription medication for people who suffer from migraine headaches. Other experts suggest that combining magnesium with the herb feverfew along with vitamin B2 (riboflavin) may be particularly helpful when you have a headache.

Magnesium sulfate may even be administered intravenously in the hospital if home remedies for the migraine symptoms are not working. The physician in the emergency room will determine if this or another therapy is most appropriate.

On the other hand, magnesium sulfate seems to be less effective than prescription medications for preventing migraines in those who have 3 or more headaches per month. The only exception to this may be women who get migraine headaches around the time of their menstrual period. In addition, magnesium supplements may prove to be a welcome option for migraine sufferers who cannot tolerate medications due to side effects or who can't take migraine medications due to pregnancy or heart disease. These issues are under scientific investigation.

**Osteoporosis**

Calcium, vitamin D, magnesium, and other micronutrient deficiencies are believed to play a role in the development of osteoporosis. Adequate intake of calcium, magnesium, and vitamin D coupled with overall proper nutrition and weight-bearing exercise throughout childhood and adulthood are the primary preventive measures for this condition, in both men and women.

**Preeclampsia and Eclampsia**

Intravenous magnesium sulfate is commonly used to prevent complications from preeclampsia and eclampsia. Preeclampsia is a condition characterized by a sharp rise in blood pressure during the third trimester of pregnancy. Women with preeclampsia may develop seizures, which is then called eclampsia. Magnesium, administered in the hospital, is the treatment of choice to prevent or treat seizures associated with eclampsia.

**Premenstrual Syndrome (PMS)**

Scientific evidence and clinical experience suggest that magnesium supplements may help relieve symptoms associated with PMS, particularly bloating, leg swelling, weight gain, and breast tenderness. Preliminary information suggests that magnesium may be helpful for alleviating mood swings as well.

**Stroke**

Population based information suggests that people with low magnesium in their diet may be at greater risk for stroke. Some preliminary scientific evidence suggests that magnesium sulfate may be helpful in the treatment of a stroke or transient ischemic attack (TIA; a temporary disturbance of blood supply to an area of the brain). More research is needed to know for certain if use of this mineral following a stroke or TIA is helpful.

**Other**

A small study including only 10 patients found that magnesium improved insomnia related to restless legs syndrome (a disorder characterized by uncomfortable sensations in the legs, which are

worse during periods of inactivity or rest or while sitting or lying down). In another study including 42 patients undergoing abdominal hysterectomy, those who received intravenous magnesium sulfate before and after surgery required fewer pain-killers, experienced less discomfort, and slept better after surgery compared to those who received placebo.

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## Dietary Sources

Rich sources of magnesium include tofu, legumes, whole grains, green leafy vegetables, wheat bran, Brazil nuts, soybean flour, almonds, cashews, blackstrap molasses, pumpkin and squash seeds, pine nuts, and black walnuts. Other good dietary sources of this mineral include peanuts, whole wheat flour, oat flour, beet greens, spinach, pistachio nuts, shredded wheat, bran cereals, oatmeal, bananas, and baked potatoes (with skin), chocolate, and cocoa powder. Many herbs, spices, and seaweeds supply magnesium, such as agar seaweed, coriander, dill weed, celery seed, sage, dried mustard, basil, cocoa powder, fennel seed, savory, cumin seed, tarragon, marjoram, poppy seed.

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## Available Forms

Magnesium is available in many forms. Recommended types include magnesium citrate, magnesium gluconate, and magnesium lactate which are more soluble and, therefore, more easily absorbed than magnesium oxide. Time-release preparations may improve magnesium absorption.

Other familiar sources of magnesium are magnesium hydroxide (often used as a laxative or antacid) and magnesium sulfate (generally used as a laxative or tonic, or added to a bath). Some magnesium can be absorbed through the skin.

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## How to Take It

Magnesium is generally recommended in small doses 3 to 6 times throughout the day, with a full glass of water with each dose to avoid diarrhea. Be sure to check with your healthcare provider before taking magnesium supplements and before considering them for a child. Under certain circumstances, such as certain heart arrhythmias and preeclampsia, a physician will have magnesium administered intravenously in the hospital.

It is a good idea to take a B vitamin complex, or a multivitamin containing B vitamins, because the level of vitamin B6 in the body determines how much magnesium will be absorbed into the cells.

Below is a list of recommendations for adequate daily magnesium intake from the diet established by the Food and Nutrition Board of the Institute of Medicine in 1997:

**Pediatric**

- Infants birth to 6 months: 30 mg
- Infants 6 months to 1 year: 75 mg
- Children 1 to 3 years: 80 mg
- Children 4 to 8 years: 130 mg
- Children 9 to 13 years: 240 mg
- Adolescent males 14 to 18 years: 410 mg
- Adolescent females 14 to 18 years: 360 mg

**Adult**

- Males 19 to 30 years: 400 mg
- Females 19 to 30 years: 310 mg
- Males 31 years and older: 420 mg
- Females 31 years and older: 320 mg
- Pregnant females under 18 years: 400 mg
- Pregnant females 19 to 30 years: 350 mg
- Pregnant females 31 to 50 years: 360 mg
- Breastfeeding females under 18 years: 360 mg
- Breastfeeding females 19 to 30 years: 310 mg
- Breastfeeding females 31 to 50 years: 320 mg

Magnesium needs increase during times of protein synthesis, such as pregnancy, recovering from certain illnesses, and athletic training.

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## Precautions

Because of the potential for side effects and interactions with medications, dietary supplements should be taken only under the supervision of a knowledgeable healthcare provider.

Individuals with heart or kidney disease should not take magnesium supplements except under the guidance of a qualified healthcare practitioner.

It is extremely rare to overdose on magnesium from food alone. However, people who consume excessive amounts of milk of magnesia (as a laxative or antacid) or Epsom salts (as a laxative or tonic) may overdose on this mineral, especially if they have kidney problems. Too much magnesium can cause serious health problems including nausea, vomiting, severely lowered blood pressure, slowed heart rate, deficiencies of other minerals,

confusion, coma, and even death. More common side effects from magnesium include upset stomach and diarrhea.

Magnesium competes with calcium for absorption and can cause a calcium deficiency if calcium intake levels are already low.

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## Possible Interactions

If you are currently being treated with any of the following medications, you should not use magnesium without first talking to your healthcare provider.

**Antibiotics**
The absorption of quinolone antibiotics (such as ciprofloxacin and moxofloxacin), tetracycline antibiotics (including tetracycline, doxycycline, and minocycline), and nitrofurantoin is diminished when taken with magnesium supplements. Therefore, magnesium should be taken two to four hours before or after taking these medications to avoid interference with absorption.

**Blood Pressure Medications, Calcium Channel Blockers**
Magnesium may increase the likelihood of negative side effects (such as dizziness, nausea, and fluid retention) from calcium channel blockers (particularly nifedipine) in pregnant women. Other calcium channel blockers include amlodipine, diltiazem, felodipine, and verapamil.

**Diabetic Medications**
Magnesium hydroxide, commonly found in antacids, may increase the absorption of glipizide and glyburide, medications used to control blood sugar levels. Ultimately, this may prove to allow for reduction in the dosage of those medications.

**Digoxin**
It is important that normal levels of magnesium be maintained while taking digoxin because low blood levels of magnesium can increase adverse effects from this drug. In addition, digoxin can lead to increased loss of magnesium in the urine. A healthcare provider will follow magnesium levels closely to determine whether magnesium supplementation is necessary.

**Diuretics**
Two types of diuretics known as loop (such as furosemide) and thiazide (including hydrochlorothiazide) can deplete magnesium levels. For this reason, physicians who prescribe diuretics may consider recommending magnesium supplements as well.

**Hormone Replacement Therapy for menopause**

Magnesium levels tend to decrease during menopause. Studies suggest, however, that hormone replacement therapy may help prevent the loss of this mineral. Postmenopausal women or those taking hormone replacement therapy should talk with a healthcare provider about the risks and benefits of magnesium supplementation.

**Levothyroxine**

There have been case reports of magnesium containing antacids reducing the effectiveness of levothyroxine, which is taken for an under active thyroid. This is important because many people take laxatives containing magnesium without letting their doctor know.

**Penicillamine**

Penicillamine, a medication used for the treatment of Wilson's disease (a condition characterized by high levels of copper in the body) and rheumatoid arthritis, can inactivate magnesium, particularly when high doses of the drug are used over a long period of time. Even with this relative inactivation, however, supplementation with magnesium and other nutrients by those taking penicillamine may reduce side effects associated with this medication. A healthcare practitioner can determine whether magnesium supplements are safe and appropriate if you are taking penicillamine.

**Tiludronate and Alendronate**

Magnesium may interfere with absorption of tiludronate, a medication similar to alendronate that is used for the treatment of osteoporosis. This interaction has not been reported with alendronate specifically. Magnesium supplements or magnesium-containing antacids should be taken at least two hours before or two hours after taking these medications to minimize potential interference with absorption.

**Others**

Aminoglycoside antibiotics (such as gentamicin and tobramycin), thiazide diuretics (such as hydrochlorothiazide), loop diuretics (such as furosemide and bumetanide), amphotericin B, corticosteroids, antacids, and insulin may lower magnesium levels. Please refer to the depletions monographs on some of these medications for more information.

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