

# Magnesium deficiency (medicine)

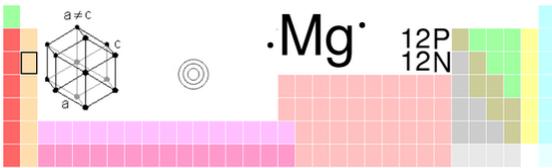
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**Magnesium deficiency** or **hypomagnesia** (not to be confused with hypomagnesemia) refers to inadequate intake of dietary magnesium or impaired absorption of magnesium, which can result in numerous symptoms and diseases.<sup>[1]</sup> It is generally corrected by an increase of magnesium in diet, oral supplements, and in severe cases, intravenous supplementation.

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**Magnesium deficiency**



Magnesium

**Classification and external resources**

<b>Specialty</b>	Endocrinology
<b>ICD-10</b>	E61.2 ( <a href="http://apps.who.int/classifications/icd10/browse/2016/en#/E61.2">http://apps.who.int/classifications/icd10/browse/2016/en#/E61.2</a> )
<b>MedlinePlus</b>	002423 ( <a href="http://www.nlm.nih.gov/medlineplus/ency/article/002423.htm">http://www.nlm.nih.gov/medlineplus/ency/article/002423.htm</a> )

## Terminology

"Magnesium deficiency" (or "depletion") should be distinguished from hypomagnesemia. Magnesium deficiency encompasses a broader scope, and includes disorders of magnesium metabolism and low intracellular storage.

Hypomagnesemia refers only to low serum (blood) levels of magnesium.<sup>[2]</sup> Therefore, magnesium deficiency can be present without hypomagnesemia, and hypomagnesemia can be present without magnesium deficiency.<sup>[3]</sup> As a disorder of metabolism, magnesium deficiency can be much harder to treat than hypomagnesemia.

## Signs and symptoms

Symptoms of magnesium deficiency include hyperexcitability, muscular symptoms (cramps, tremor, fasciculations, spasms, tetany, weakness), fatigue, loss of appetite, apathy, confusion, insomnia, irritability, poor memory, and reduced ability to learn. Moderate to severe magnesium deficiency can cause tingling or numbness, heart changes, rapid heartbeat, continued muscle contractions, nausea, vomiting, personality changes, delirium, hallucinations, low calcium levels, low serum potassium levels, retention of sodium, low circulating levels of parathyroid hormone (PTH),<sup>[4]</sup> and potentially death from heart failure.<sup>[5]</sup> Magnesium plays an important role in carbohydrate metabolism and its deficiency may worsen insulin resistance, a condition that often precedes diabetes, or may be a consequence of insulin resistance.<sup>[6][7]</sup>

## Causes

Causes of magnesium deficiency include diet, alcohol abuse, chronic stress, poorly controlled diabetes, excessive or chronic vomiting and/or diarrhea. Phytate<sup>[8]</sup> or oxalate<sup>[9]</sup> in the diet may bind magnesium causing it to be eliminated from rather than absorbed in the colon. Certain drugs can deplete magnesium levels such as osmotic diuretics, cisplatin, ciclosporin, amphetamines, and possibly proton pump inhibitors.<sup>[10]</sup> Also deficiency may occur in Bartter syndrome<sup>[11]</sup> and Gitelman syndrome.<sup>[12]</sup>

## Pathophysiology

Magnesium is a co-factor in over 300 functions in the body regulating many kinds of biochemical reactions. It is involved in protein synthesis, muscle and nerve functioning, bone development, energy production, the maintenance of normal heart rhythm, and the regulation of glucose and blood pressure, among other important roles.<sup>[13]</sup> Low magnesium intake over time can increase the risk of illnesses, including high blood pressure and heart disease, diabetes mellitus type 2, osteoporosis, and migraines.<sup>[13]</sup>

## Diagnosis

Diagnosis of severe hypomagnesemia can be made through a standard serum magnesium test.

The accuracy of the serum magnesium blood test as an indicator of overall magnesium sufficiency is disputed due to claims that the total percentage of magnesium stored freely in the blood is less than 1%.<sup>[14]</sup>

## Treatments

Magnesium deficiency can often be effectively treated with an oral magnesium preparation. It can also be treated by using a nebulizer filled with magnesium sulphate or magnesium chloride dissolved in water. Nebulising has the advantage of taking effect within minutes, relieving muscle pain, tension or breathing difficulties. Nebulizers can be bought without prescription in the U.K, as can magnesium sulphate and magnesium chloride. For those that require frequent doses, a portable, battery driven nebulizer is useful although more expensive and prone to break down than older style plug in nebulizers.

Probiotic lactobacilli, and other species of endogenous digestive microflora *may* play a role in the bioavailability of magnesium as they may affect the breakdown of antagonists such as phytate and oxalate in the diet. Other minerals in the diet, such as calcium and zinc, may interact with phytate and oxalate, reducing magnesium loss.

Severe hypomagnesemia is often treated medically with intravenous or intramuscular magnesium sulfate solution, which is completely bioavailable, and effective.

## Food sources of magnesium

Food sources of magnesium include leafy green vegetables, soybeans, raw nuts, and fruit.<sup>[13]</sup>

## Epidemiology

57% of the US population does not meet the US RDA for dietary intake of magnesium.<sup>[15]</sup> The kidneys are very efficient at maintaining body levels, except in cases where the diet is deficient due to the use of certain medications such as proton-pump inhibitors<sup>[10]</sup> or chronic alcoholism.<sup>[13]</sup>