

# Magnesium

## Under construction / Forgotten

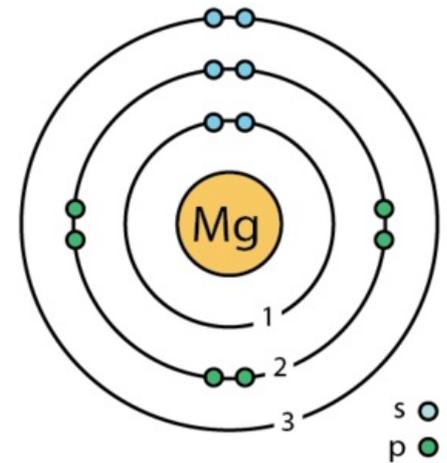
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Magnesium is an element with atomic number 12 and chemical symbol Mg. It is a light metal that is most commonly found as the magnesium cation  $Mg^{2+}$ . The Latin name for magnesium is from the Greek region of Magnesia in the region of Thessaly, where magnesium oxide  $MgO$  ("magnesia alba") is found in abundance, already used by ancient physicians.

Magnesium is abundant in the earth's crust (making up 13% of the planet's mass), in seawater, and in the universe as a whole. Due to its high reactivity, it does not occur naturally on Earth in its pure (metallic) form. If artificially prepared, the metal is quickly covered with a thin layer of oxide that is resistant and insoluble. The metal is prepared by electrolysis of magnesium salts. Metallic magnesium has a lower density than aluminum and is therefore valued as a component of light alloys.

Magnesium is an essential building block of living organisms. More than 300 enzymes use magnesium ions for their catalytic activity, including all enzymes that use or synthesize ATP. The body of an adult individual contains about 24 g of magnesium, of which 60% is in the skeleton. A low level of magnesium is associated with the development of a number of diseases such as asthma, diabetes, or osteoporosis.



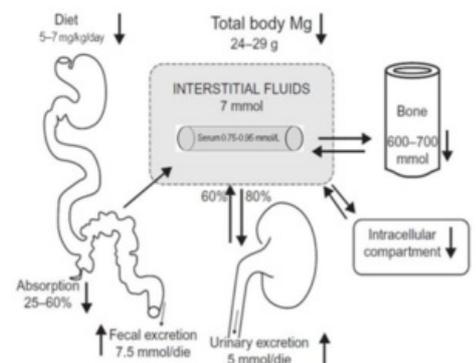
Magnesium

## Levels of magnesium

- in serum 0.7–0.9 mmol/l
- in urine 1.2–11 mmol/d
- 53% in bones, the rest in muscles, etc.
- in ECT it is only 1%, of which 0.5% is in erythrocytes - similar to Potassium, but S-Mg does not reflect the Mg store in the body
- like calcium, it is also bound to proteins, 55–60% is free
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## Importance in the organism

- after Potassium, it is the second most important IC cation, cofactor of enzymes binding ATP and other nucleoside triphosphates (e.g.  $Na^+ + K^+ -ATPase$ , ...)
- ATPase activity preventing  $Ca^{2+}$  entry into cells
- antiarrhythmic, vasomotor function, reduces myocardial excitability, improves flow through coronary arteries
- it is necessary for the activity of some enzymes of the Krebs cycle, the respiratory chain and the metabolism of nucleic acids



## Hypomagnesemia

### Causes

- reduced intake, reduced absorption (alcoholism, vomiting, malabsorption), increased excretion (enteric diseases, endocrinopathy (hyperparat., hyperaldost., DM), ATB), pregnancy, lactation

### Symptoms

- when it drops below 0.5 mmol/l, arrhythmia, hypertension
- metabolic symptoms - hypokalemia, hypocalcemia, hypophosphatemia, hyponatremia
- psychological symptoms - depression, agitation
- neurological symptoms - increased neuromuscular excitability, Tinnitus, fasciculation, spasms, tetany

### Therapy

- in convulsions – 16 mmol MgSO<sub>4</sub> (laxative effects) within 10 minutes

## Hypermagnesemia

### Causes

- renal failure, endocrine ( hypothyroidism , Addison's m. , STH deficiency), some drugs with Mg (antacids, laxatives), dehydration , tumor metastases, myeloma, acidemia

### Symptoms

- nausea, vomiting , warm skin, hypotension , bradycardia , lethargy, muscle weakness, decreased reflexes, prolonged QT, coma , cardiac and respiratory arrest (above 5 mmol/l)

### Therapy

- stopping intake, adjusting acidosis or hydration

## Food sources

Adults should get at least 365 mg of magnesium per day. The main sources are leafy greens, animal protein and nuts. Some mineral waters, e.g. Šaratice and Zaječice, also have a high magnesium content. These contain magnesium sulfate heptahydrate, which is absorbed from the intestine to a limited extent and binds water to itself - thus acting as an osmotically effective laxative. Magnesium carbonate, magnesium citrate or lactate is administered orally to replace magnesium deficiency, and magnesium aspartate is administered parenterally in case of acute deficiency.

## Links

### References

- SCHNEIDERKA, Petr. *Kapitoly z klinické biochemie*. 2. edition. Praha : Karolinum, 2004. ISBN 80-246-0678-X.