

# **Magnesium**

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# Mg<sup>2+</sup>

- **Reference values /S, P = 0.8 – 1.1 mmol/l**
- *↑ concentration = hypermagnesemia*
- *↓ concentration = hypomagnesemia*
  
- **Total body Mg<sup>2+</sup> = 1.1 mol = 27 grams:**
  - **65 % within bones (14 g)**
  - **20% within muscles and other soft tissues (12 g)**
  - **170 mg within the EC fluid, 60 mg within the plasma**
  
- **55% as Mg<sup>2+</sup>, 32% protein-bound, 13% Mg complexes**

# Mg<sup>2+</sup>

- **absorption** 24 – 76 % of intake Mg, augmented by calcitriol
- **RDI = 12.5 mmol**
- **alimentary sources:**
- leafy green vegetables, meats, grains, seafood, coconuts
- **urinary excretion:** 1.7 – 8.2 mmol/day; reduced by PTH which stimulates the tubular absorption

## **Mg<sup>2+</sup> significance**

- **essential cofactor of ~ 300 different enzymes, including transphosphorylation reactions involving ATP →**
- **central to cellular energy metabolism and the macromolecules synthesis**
- **stabilisation of cell membranes**
- **needed for production of bone matrix, blood coagulation**
- **protects from urinary concrements production**

## Clinical symptoms of hypermagnesemia:

- peripheral vasodilatation → **hypotension**
- depression of cardiac conduction system → **bradyarrhythmias**
- depression of the CNS
- curarelike effect on neuromuscular junctions → **muscle weakness**
- emesis

## Clinical symptoms of hypomagnesemia:

- **Hypocalcemia** ( $\leftarrow \downarrow$  PTH secretion)  $\rightarrow$  lethargy, weakness, fatigue, paresthesias, tremor, muscle fasciculations
- **Hypokalemia** ( $\leftarrow$  urinary K wasting)
- **Arrhythmias** (ventricular tachycardia, fibrillation)

# **Mg<sup>2+</sup> /S and myocardial ischemia**

- As a co-enzyme participates in lipids, steroids, saccharides and AA metabolism, NA degradation, ATP involved reactions, that is *reactions of energy transport needed for muscle contraction.*
- physiological antagonist of Ca<sup>2+</sup>
- *It protects the myocardial cells from excessive influx of Ca<sup>2+</sup> and supports the stripping of Ca<sup>2+</sup>.*
- Mechanism of influence of hypomagnesemia on myocardial ischemia:  
↓ Mg<sup>2+</sup> → ↑ Ca<sup>2+</sup> influx → vasoconstriction → aggravation of myocardial ischemia

# **Mg<sup>2+</sup> /S and myocardial ischemia**

- **control group** **0.75 ± 0.04 mmol/l**
- **IHD or cardiomyopathy**
  - **with diuretics (↑ urinary loss of Mg<sup>2+</sup>)** **0.64 ± 0.08 mmol/l**
  - **without diuretics** **0.68 ± 0.09 mmol/l**



- **Control Mg<sup>2+</sup> /S in patients with cardiovascular dis.**
- **Mg administration in these patients is helpful.**