

# Magnesium, the biological significance of magnesium as a biogenic element

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**Annotation:** Magnesium is an essential mineral for the human body that supports the health of bones, muscles, the nervous system, and the heart. It participates in energy production, helps regulate blood pressure, reduces stress, and is mainly obtained from green vegetables, nuts, and grain products.

Magnesium deficiency may lead to muscle cramps, insomnia, irritability, and other disorders; therefore, sufficient intake through diet or supplements is important. Vitamin B<sub>6</sub> improves the absorption of magnesium and facilitates its entry into cells.

**Keywords:** magnesium, its importance in the body, vitamin B<sub>6</sub>, medical applications, trace elements, chemical compounds

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## Analysis of Literature

Medical literature describes magnesium deficiency as a widespread condition. Research shows that insufficient magnesium may increase the risk of muscle spasms, insomnia, irritability, cardiac arrhythmias, and metabolic syndrome. Some clinical studies confirm that magnesium supplementation can be effective in reducing symptoms of stress and anxiety.

## The Role of Magnesium in the Body and the importance of Vitamin B<sub>6</sub>

Magnesium is an essential mineral that helps maintain bone and muscle health, supports nervous system function, reduces stress, regulates heart rhythm and blood pressure, and participates in energy production.

Vitamin B<sub>6</sub> enhances the absorption of magnesium, facilitates its movement into cells, and supports both nervous and muscular functions. Together, magnesium and vitamin B<sub>6</sub> increase each other's effectiveness, helping reduce muscle cramps, insomnia, irritability, and heart-related issues.

**Deficiency:**

Lack of magnesium leads to muscle cramps and insomnia.

Vitamin B<sub>6</sub> deficiency causes fatigue, irritability, and inflammation of the oral mucosa.

*Excess:*

Excessive intake may cause gastrointestinal disturbances and heart rhythm problems.

**Magnesium Isotopes and Their Use in Medicine**

Magnesium exists naturally in three stable isotopes: <sup>24</sup>Mg, <sup>25</sup>Mg, and <sup>26</sup>Mg. Radioactive isotopes also exist and are used in scientific research and, to a limited extent, in medicine. Magnesium isotopes are applied in studying biological processes, metabolism, and intracellular magnesium movement.

**Additional applications:**

Magnesium supplements: used to treat and prevent magnesium deficiency, muscle cramps, arrhythmias, and hypertension.

Intravenous magnesium preparations: used in acute conditions such as eclampsia (pregnancy-induced hypertension) and specific heart diseases.

Diagnostic isotope use: radioactive magnesium isotopes help study metabolism and cell activity.

Although generally safe, excessive magnesium intake may cause gastrointestinal disorders, low blood pressure, and arrhythmias.

**Magnesium and Toxicology***Physiological roles:*

Supports bone and muscle function, stabilizes the nervous system and heart rhythm, participates in energy production, and helps regulate blood pressure.

*Toxicological aspects:*

Magnesium is typically safe, but excessive intake can lead to:

- gastrointestinal disturbances,
- hypotension,
- muscle relaxation,
- heart rhythm disorders.

*Dose control:*

Magnesium from food is safe, but supplement doses should not exceed recommended limits.

**Other Magnesium Compounds and Their Medical Use***Magnesium compounds:*

Magnesium citrate: highly absorbable; supports gastrointestinal function.

Magnesium oxide: used mainly for neutralizing stomach acid and reducing cramps.

Magnesium chloride: supports metabolism and fluid balance.

Magnesium glycinate: well-absorbed, minimal allergic reactions; beneficial for nervous system

and sleep.

Magnesium lactate: supports muscle and heart function.

*Medical applications:*

Treating and preventing magnesium deficiency

Managing muscle cramps and irritability

Treating arrhythmias and hypertension

Managing eclampsia and certain metabolic disorders

Biologically Active Magnesium Compounds and New Prospects in Medicine

Magnesium's various compounds play different roles in biological systems depending on their absorption levels and therapeutic goals:

Magnesium citrate: high bioavailability; used to prevent muscle spasms and support cardiac function.

Magnesium glycinate: ideal for nervous system support and improving sleep quality.

Magnesium lactate and chloride: used to improve metabolism and maintain electrolyte balance.

Magnesium oxide: neutralizes stomach acid and helps manage gastrointestinal issues.

Medical use:

Muscle and nervous system support: reduces cramps, convulsions, insomnia, and irritability.

Cardiovascular system: used for arrhythmias, hypertension, and metabolic syndrome prevention.

Pregnancy-related conditions: intravenous magnesium prevents eclampsia and preeclampsia.

Dietary supplements: used for prophylaxis of magnesium deficiency.

Recent prospects:

Nanotechnology and isotopes: used to study magnesium metabolism and diagnostic processes.

Combination therapy: magnesium + vitamin B<sub>6</sub> effectively reduce stress, sleep disorders, and neurological problems.

Cardioprotective and neuroprotective therapies: emerging methods in treating cardiovascular and neurological diseases.

## **Conclusion**

Magnesium is a vital mineral that supports bone, muscle, nervous system, and heart function. Its deficiency may cause cramps, insomnia, irritability, and arrhythmias, while excessive intake may lead to gastrointestinal disorders and decreased cardiac function.

Biologically active magnesium compounds (citrate, glycinate, lactate, chloride, oxide) ensure better absorption and are widely used in treating muscle spasms, cardiovascular diseases, hypertension, and eclampsia. When combined with vitamin B<sub>6</sub>, magnesium works more effectively, reducing stress and neurological issues.

Recent studies indicate that magnesium-based nanotechnologies and isotopes can expand diagnostic and therapeutic applications, opening new prospects in medicine. Adequate magnesium intake is essential for maintaining health.

## Literature Review

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