

SCI-CONF.COM.UA

FUTURE OF SCIENCE: INNOVATIONS AND PERSPECTIVES



**PROCEEDINGS OF VII INTERNATIONAL
SCIENTIFIC AND PRACTICAL CONFERENCE
MAY 19-21, 2025**

**STOCKHOLM
2025**

FUTURE OF SCIENCE: INNOVATIONS AND PERSPECTIVES

Proceedings of VII International Scientific and Practical Conference

Stockholm, Sweden

19-21 May 2025

Stockholm, Sweden

2025

UDC 001.1

The 7th International scientific and practical conference “Future of science: innovations and perspectives” (May 19-21, 2025) SSPG Publish, Stockholm, Sweden. 2025. 639 p.

ISBN 978-91-87224-03-4

The recommended citation for this publication is:

Ivanov I. Analysis of the phaunistic composition of Ukraine // Future of science: innovations and perspectives. Proceedings of the 7th International scientific and practical conference. SSPG Publish. Stockholm, Sweden. 2025. Pp. 21-27. URL: <https://sci-conf.com.ua/vii-mizhnarodna-naukovo-praktichna-konferentsiya-future-of-science-innovations-and-perspectives-19-21-05-2025-stokholm-shvetsiya-arhiv/>.

Editor

Komarytskyy M.L.

Ph.D. in Economics, Associate Professor

Collection of scientific articles published is the scientific and practical publication, which contains scientific articles of students, graduate students, Candidates and Doctors of Sciences, research workers and practitioners from Europe, Ukraine and from neighbouring countries and beyond. The articles contain the study, reflecting the processes and changes in the structure of modern science. The collection of scientific articles is for students, postgraduate students, doctoral candidates, teachers, researchers, practitioners and people interested in the trends of modern science development.

e-mail: sweden@sci-conf.com.ua

homepage: <https://sci-conf.com.ua>

©2025 Scientific Publishing Center “Sci-conf.com.ua” ®

©2025 SSPG Publish ®

©2025 Authors of the articles

EFFECT OF MAGNESIUM ON THE DEVELOPMENT AND TREATMENT OF NEUROLOGICAL DISEASES

Slipchuk Valentyna

Doctor of Sciences in Pedagogy, Professor,
Professor of the Department
of Medical Biochemistry and Molecular Biology

Yefymenko Anastasiia

student of medical faculty № 1
specialty 222 “Medicine”

Bogomolets National Medical University
Kyiv, Ukraine

Introduction. Magnesium is a very important trace element for the normal functioning of the human nervous system. Lack of magnesium in the human body is associated with an increased risk of developing neurological diseases, which are quite common in the world. The need to find new therapeutic approaches makes it important to study the effect of magnesium on the pathogenesis and course of such neurological diseases as migraine, chronic pain, epilepsy, stroke, Alzheimer's and Parkinson's diseases.

Aim: To research in the scientific literature the impact of magnesium deficiency in the human body on the development of health problems associated with neurological diseases, such as migraine, chronic pain, epilepsy, stroke, Alzheimer's disease, Parkinson's disease.

Materials and methods. The study used two theoretical methods that allow us to make specific conclusions through systematic thinking based on specific facts and generalization: descriptive and induction. The descriptive method allows us to outline the main clinical manifestations of magnesium deficiency in the human body. The induction method allows to make general conclusions based on specific facts of magnesium's influence on the pathogenesis and course of neurological diseases (migraine, chronic pain, epilepsy, stroke, Alzheimer's and Parkinson's diseases). The integration of both methods provides a holistic approach to analyzing sources on the chosen topic.

Results and discussion. Magnesium is the fourth most abundant mineral in the human body. To date, Magnesium has been recognized as a cofactor for more than 600 enzymatic reactions, such as DNA and RNA synthesis, protein synthesis, and ATP. Magnesium supports aerobic and anaerobic glycolysis, helps maintain low cytosolic calcium levels to limit the inhibition of ATP synthesis in the mitochondria, which ultimately reduces the likelihood of cell death caused by mitochondrial calcification. Magnesium is also important for optimal nerve transmission and neuromuscular coordination in the nervous system. Magnesium is also needed to protect against excessive excitement, which leads to cell death [1, 2].

One of the main neurological functions of magnesium is its interaction with the N-methyl-d-aspartate (NMDA) receptor, as magnesium serves as a blockade of the calcium channel in the NMDA receptor. Therefore, when magnesium leaves the calcium channels surrounded by NMDA receptors, a chronic influx of calcium ions occurs, leading to excitotoxicity (excessive stimulation of neurons by excitatory amino acids such as glutamate, aspartate, and quisqualate through postsynaptic receptors), which results in oxidative stress and neuronal cell death. As a result, abnormal glutamatergic neurotransmission is associated with many neurological diseases, including migraine, chronic pain, epilepsy, stroke, Alzheimer's and Parkinson's diseases [2, 3, 4].

Migraine is the most common neurological disorder in the United States, affecting 16.2% of the population. Studies have shown that people with migraines have significantly lower levels of magnesium in their serum, saliva, and cerebrospinal fluid, as well as in their brains during and between attacks [2]. Previously, scientists have determined that intravenous magnesium administration reduces acute migraine attacks within 15-45 minutes, 120 minutes and 24 hours after the initial infusion, and oral magnesium intake reduces the frequency and intensity of the disease [5].

Scientists divide chronic pain into regional and widespread pain, which occurs in 20-25% and 10% of the population, respectively. It is believed that magnesium is responsible for the antinociceptive and analgesic effects, which depend on the blockade of NMDA receptors in the spinal cord, in patients with chronic pain. In

addition, one of the most common chronic pain conditions, fibromyalgia, can be the result of insufficient oxygen, ADP, inorganic phosphate and magnesium, which are necessary for the synthesis of ATP. The results obtained by scientists on the administration of magnesium orally, transdermally and intravenously for various forms of chronic pain indicate that magnesium can be very important in the treatment and prevention of chronic pain [2].

Epilepsy is a tendency to unprovoked seizures that affects 50 million people worldwide. Hypomagnesemia has been found to be a risk factor for the development of such unprovoked attacks in infants and adults. In turn, extracellular magnesium through the NMDA receptor reduces spontaneous bursts of seizure activity and hyperexcitability of the neuronal surface. A study by scientists on the treatment of epilepsy with magnesium showed that intravenous administration of adrenocorticotrophic hormone (ACTH) with magnesium supplements over a three-week period led to the following result: eight weeks after administration, the group receiving magnesium supplements had 79% of seizure-free cases compared to only 53% of seizure-free cases in the group taking ACTH alone [2, 6].

A stroke is a cerebrovascular disorder that manifests itself with symptoms such as slurred speech, paralysis or numbness, and difficulty walking. Since induced hypoxia causes excitotoxicity, which is dependent on the interaction of NMDA receptors and magnesium, the latter has become the basis for scientific research. Scientists have shown that an increase in magnesium intake by 100 mg/day is associated with an 8% reduction in the risk of total stroke [2, 7].

Parkinson's disease (PD) is a neurological disorder with symptoms such as loss of balance, muscle tension, slowed body movements, tremors of the limbs at rest, and cognitive impairment caused by damage to dopaminergic neurons in the dense part of the midbrain's substantia nigra. Studies in patients have revealed a negative correlation between magnesium homeostasis and the expression of the 60S ribosome subunit L6 protein (RPL6). This relationship allows us to consider changes in magnesium levels and RPL6 expression as a potential biomarker for the early diagnosis of PD [2, 8, 9].

Alzheimer's disease (AD) is a degenerative neurological disease characterized by loss of synapses and the development of cognitive impairment, including learning and memory impairment. The inflammatory process plays an important role in the pathogenesis of AD, leading to progressive neuronal damage. Due to its anti-inflammatory and antioxidant properties, magnesium has an impact on the course of the disease, as it has been shown that magnesium sulfate inhibits endothelial cell activation, reduces neuroinflammation in microglia [2, 3].

Conclusions. Magnesium is an essential chemical element for a wide range of physiological and biochemical processes in the nervous system, as its deficiency is associated with the development of many neurological diseases. The therapeutic use of magnesium has been shown to have a positive effect on migraines, chronic pain, and epilepsy, is diagnostic for Parkinson's disease, and can be an important component in the treatment of stroke and neurodegenerative diseases. Magnesium can be an important dietary factor in the prevention of neurological disorders such as migraine, chronic pain, epilepsy, stroke, Alzheimer's and Parkinson's diseases.

Thus, maintaining optimal levels of magnesium in the human body is important for the prevention and alleviation of neurological disorders, which determines the relevance of further research in this area.

REFERENCES

1. Gröber, U., Schmidt, J., & Kisters, K. (2015). Magnesium in Prevention and Therapy. *Nutrients*, 7(9), 8199–8226. <https://doi.org/10.3390/nu7095388>
2. Kirkland, A. E., Sarlo, G. L., & Holton, K. F. (2018). The Role of Magnesium in Neurological Disorders. *Nutrients*, 10(6), 730. <https://doi.org/10.3390/nu10060730>
3. Pei Xu, Dehua Cui, Mingyue Jin & Liyuan Sun. (2024). Magnesium ions and dementia, *Journal of Neurorestoratology*, 12(1), 100094. <https://doi.org/10.1016/j.jnrt.2024.100094>.
4. Khalilpour, S., Latifi, S., Behnammanesh, G., Majid, A. M. S. A., Majid, A. S. A., & Tamayol, A. (2017). Ischemic optic neuropathy as a model of

neurodegenerative disorder: A review of pathogenic mechanism of axonal degeneration and the role of neuroprotection. *Journal of the neurological sciences*, 375, 430–441. <https://doi.org/10.1016/j.jns.2016.12.044>

5. Chiu, H. Y., Yeh, T. H., Huang, Y. C., & Chen, P. Y. (2016). Effects of Intravenous and Oral Magnesium on Reducing Migraine: A Meta-analysis of Randomized Controlled Trials. *Pain physician*, 19(1), E97–E112.

6. Milligan, Tracey A. (2021). Epilepsy: A Clinical Overview. *The American Journal of Medicine*, 134(7), 840-847. <https://doi.org/10.1016/j.amjmed.2021.01.038>

7. Larsson, S. C., Orsini, N., & Wolk, A. (2012). Dietary magnesium intake and risk of stroke: a meta-analysis of prospective studies. *The American Journal of Clinical Nutrition*, 95(2), 362–366. <https://doi.org/10.3945/ajcn.111.022376>

8. Cibulka, M., Brodnanova, M., Halasova, E., Kurca, E., Kolisek, M., & Grofik, M. (2024). The Role of Magnesium in Parkinson's Disease: Status Quo and Implications for Future Research. *International Journal of Molecular Sciences*, 25(15), 8425. <https://doi.org/10.3390/ijms25158425>

9. Anirudhan, A., Angulo-Bejarano, P. I., Paramasivam, P., Manokaran, K., Kamath, S. M., Murugesan, R., Sharma, A., & Ahmed, S. S. S. J. (2021). RPL6: A Key Molecule Regulating Zinc- and Magnesium-Bound Metalloproteins of Parkinson's Disease. *Frontiers in Neuroscience*, 15. <https://doi.org/10.3389/fnins.2021.631892>