

Magnesium

Facts:

- ◆ Magnesium is the fourth most abundant cation in the body. Approximately 60 percent found in the body is contained within the bone with the remaining 40 percent distributed between muscle and non-muscular soft tissue.¹
- ◆ Dietary surveys consistently show that the average individual receives approximately 200 to 250 mg of magnesium per day. The RDA for adults is 300-400 mg/day. The occurrence of sudden cardiac death is lower among persons living in hard water regions than among those persons living in soft water areas. Many researchers have proposed that higher magnesium levels found in hard water are a protective factor against cardiac deaths.²

Functions:

- ◆ Magnesium is an essential nutrient required for many biologic functions in the body, including more than 300 enzyme reactions. It also functions in the activation of amino acids, the syntheses of DNA, and is involved in neurotransmission and immune function.¹
- ◆ Numerous studies show that a magnesium deficiency may be an underlying cause of cardiovascular disease, hypertension, asthma, chronic fatigue and pain syndromes, depression, insomnia, irritable bowel syndrome, and many pulmonary disorders.³
- ◆ Magnesium is necessary to prevent the calcification of soft tissue. It confers a protective effect on the arterial lining, and protects it from stress caused by changes in blood pressure.
- ◆ Studies show that magnesium can positively affect the occurrence of migraine headaches.
- ◆ Accompanied by vitamin B-6 (pyridoxine), magnesium can help reduce and dissolve calcium phosphate kidney stones.³
- ◆ Supplementing the diet with magnesium may also prevent depression, dizziness, muscle weakness, twitching, and premenstrual syndrome (PMS).
- ◆ It promotes the absorption and assimilation of other minerals including calcium, phosphorous, sodium, and potassium while enabling the utilization of vitamin B complex and vitamins C and E.⁴

Magnesium

Requirements:

The Food and Nutrition Board of the Institute of Medicine of the U.S. National Academy of Sciences recommends the following RDA values for magnesium¹:

Category and Age:	RDA (milligrams):
Infants 0-6 mos.	30 mg
7-12 mos.	75 mg
Children 1-3 yrs.	80 mg
4-8 yrs.	130 mg
9-13	240 mg
Males 14-18 yrs.	410 mg
Males 19-30 yrs.	400 mg
Males 30 yrs. +	420 mg
Females 14-18 yrs.,	360 mg
Females 19-30 yrs.	310 mg
Females 30 yrs. +	320 mg

Note: Stress increases the need for magnesium. According to Mildred Seelig, M.D., M.P.H., M.A.C.N., physical stress including exercise, working in high temperatures, surgery, trauma and psychological stress increase the body's need for magnesium. "Stress causes secretion of epinephrine (adrenaline) and corticosteroids and results in Mg loss in animals and humans."²

Other factors such as dietary fat, protein sugar and alcohol intake affect magnesium status in the body. Pregnant women and elderly persons need to ensure they are receiving enough magnesium in their diet.

Signs of Deficiency:

Symptoms of a magnesium-deficiency include: confusion, insomnia, irritability, nervousness, poor digestion, rapid heartbeat, seizures, diabetes, cardiac arrhythmia, cardiovascular disease, hypertension, asthma, chronic fatigue, chronic pain syndrome, depression, irritable bowel syndrome, premature labor, pre-eclampsia, and diabetes.^{3,5}

Safety:

People with kidney diseases or renal failure should not take magnesium supplements. Magnesium is also contraindicated in people who are sensitive to magnesium supplements.

Signs of Toxicity:

Hypermagnesia or magnesium toxicity is very rare yet can occur if urinary excretion is very low or there is a considerable increase in magnesium's absorption within the body.

Magnesium

Current Research:

Arrhythmia: Supplementation of magnesium and potassium treats arrhythmias. In a randomized, double blind study, 232 patients with frequent ventricular arrhythmias were treated over 3 weeks with either 6 mmol of magnesium/12 mmol of potassium-DL-hydrogenaspartate daily or placebo. The researchers concluded that oral administration of magnesium and potassium salts when directed to patients with frequent and stable ventricular tachyarrhythmias had an anti-arrhythmic effect. A 50 percent increase in the recommended minimum daily dietary intake of the two minerals for three weeks results in a moderate but significant anti-arrhythmic effect.⁶ Researchers at the University of California at Irvine have used magnesium to treat arrhythmia patients who did not respond to standard therapies.⁷

Asthma: Researchers have discovered low magnesium levels in persons suffering from asthma compared to non-asthmatics. "Dominguez et al. [2] report that intracellular (erythrocyte) magnesium levels are lower in asthmatic subjects and correlate with airway reactivity to methacholine in a group of asthmatic and non-asthmatic, atopic subjects with and without bronchial hyperreactivity. This is not the first study to report that intracellular magnesium levels are lower in asthmatic subjects. Lower levels of magnesium in skeletal muscle [3] and in polymorphonuclear cells [4] from asthmatic subjects have been demonstrated previously."⁸

Attention Deficit Disorder (ADD): According to one study in Poland, mineral concentrations of magnesium, zinc, copper, iron, and calcium in the children diagnosed with ADD was lower compared to healthy, ADD-free children. Study's authors show that it is critical to supplement trace elements in children diagnosed with ADD.⁹

Diabetes: "Magnesium plays the role of a second messenger for insulin action; on the other hand, insulin itself has been demonstrated to be an important regulatory factor of intracellular magnesium," according to the findings of one study in Germany. The study authors state that chronic magnesium supplementation can improve the insulin action in diabetic patients.¹⁰

Energy: According to Carolyn Dean N.D., M.D., author of *The Miracle of Magnesium*, magnesium participates in the production of ATP (adenosine triphosphate), which are the "energy packets" the body uses to produce and store energy. If one is not getting enough magnesium, states Dean, then energy levels will be low because one is not generating enough energy to run the body. When magnesium intake is increased, however, many notice increased energy. In addition to producing ATP, magnesium also helps the body make the most of energy consumed from foods. Magnesium is involved in the production, function, and transport of insulin. It makes it possible for the body's cells to allow glucose to enter so that it can be used for energy.¹¹

Magnesium

Epilepsy: According to researchers at the International Center for the Disabled in New York City, a deficiency of magnesium exists in the red blood cells of a number of epileptics suffering from seizures not responding to conventional drug therapy.⁷

Heart-Related Conditions: Several studies have demonstrated a relationship between intake of magnesium and the occurrence of cardiovascular problems. According to Seelig, magnesium "... is accepted treatment in conditions in which arrhythmias are a risk (in congestive heart failure and after cardiac surgery) and even in forms of arrhythmia resistant to drug therapy."² In fact, continues Seelig, "When the first analysis of magnesium intakes and balances in normal young adults was published in 1964, magnesium deficiency was suggested as a neglected factor in vulnerability to heart disease."² Magnesium has been clinically shown to confer a cardioprotective effect. Several animal studies have shown that inducing a magnesium deficiency caused the formation of arterial and cardiac lesions resembling that witnessed in diseases that afflict mankind.^{2,12}

Myocardial Infarction: According to Seelig, "There is growing evidence that magnesium deficiency may be a predisposing factor for myocardial infarction and subsequent complications...addition of magnesium to the postmyocardial infarction parenterally...and orally subsequently—needs serious consideration."¹¹

Congestive Heart Failure: Again, according to Seelig, in cases of congestive heart failure, "...the only antiarrhythmic intervention needed to prevent recurrence of cardiac arrest may be repletion of K (potassium) and Mg (magnesium)."¹²

Hypertension: There is a significant body of research demonstrating magnesium deficiency increases high blood pressure and that increasing magnesium intake decreases blood pressure. Supplementation of magnesium both intravenously and orally has been used to lower blood pressure.^{7,12} In hypertensive diabetic patients, one study concluded that, "magnesium administration may be useful in decreasing arterial blood pressure and improving insulin-mediated glucose uptake."¹³

Migraine Headaches: Several studies support the theory that an underlying magnesium deficiency is intricately involved in the occurrence of migraine headaches. Researchers have found that nearly 50 percent of patients have low levels of ionized magnesium during an acute migraine headache attack.¹⁴ According to one study, "Two double-blind studies suggest that chronic oral magnesium supplementation may also reduce the frequency of migraine headaches...we feel that a trial of oral magnesium supplementation can be recommended to a majority of migraine sufferers."¹⁴ A large-scale study comprised of 500 women (300 of whom were pregnant) who suffered from migraine headaches were administered 200 mg of magnesium per day. Eighty percent of women reported cessation of their migraines.⁷

Magnesium

Pre-Eclampsia and Pre-Term Labor: Pregnant women that supplement their diet with magnesium supplements do not have premature uterine contractions and have fewer complications during pregnancy.¹ Pregnant women that consumed a magnesium supplement did not have premature uterine contractions and also had a reduced occurrence of calf cramps, numbness and fewer complications.¹ In addition, supplementation with magnesium during pregnancy also resulted in fewer pre-term deliveries and fewer cases of intrauterine growth retardation. In Hungary, where the rate of pre-term deliveries is high, 255 pregnant women were given 300 mg/day magnesium from diagnostic confirmation of pregnancy to delivery. The pre-term birth rate for this group was 8.5 percent. For the 280 pregnant women who received placebo, the pre-term birth rate was 10.9 percent.¹⁵

Muscle Cramps: Researchers at Brigham Young University in Provo, Utah found that when pregnant women in their last trimester were given 266 mg of magnesium, it reduced the occurrence of leg cramps approximately 57 percent.⁷

Pre-Menstrual Syndrome: Magnesium deficiency has been affiliated with premenstrual syndrome.¹⁵⁻
¹⁶ According to Seelig, "The condition [PMS] has been reported to respond to Mg supplements alone or in combination with trace minerals and vitamins."¹⁵

Prostate Health: Magnesium plays an important role in male reproduction. Researchers have identified high levels of magnesium and zinc in the prostate. One study that analyzed the differences in magnesium and zinc levels in men with chronic inflammation of the prostate revealed that magnesium levels—not zinc—were significantly lower in men with chronic prostatitis. They proposed that low magnesium in seminal fluid be classified as a diagnostic marker for prostatitis.¹⁶

Thromboses: Magnesium helps prevent the occurrence of thromboses and emboli. When individuals supplemented their diet with magnesium, thromboses and embolisms were prevented. However, these conditions often recurred once the supplements were discontinued.^{4,15}

Osteoporosis: Women suffering from osteoporosis have reduced serum magnesium levels compared to osteoporosis-free, similarly aged women.¹⁵ "Mg is needed for maintenance of normal bone structure, both directly for matrix formation and indirectly for mineralization through its requirement for normal parathyroid and vitamin D metabolism," according to Seelig.¹⁵ In one study, a group of menopausal women were administered magnesium to gauge the effects of magnesium on bone density. At the conclusion of the study, researchers found that magnesium prevented fractures and resulted in a significant increase in bone density."¹⁸

Magnesium

References:

1. Fischer P., Kubena K. (2006) , Magnesium. American Society of Nutrition. Retrieved from: <http://www.jn.nutrition.org/nutinfo/content/magn.shtml>.
2. Seelig, M. Human needs for magnesium are not met by most people. Mineral Resources International, 2001.
3. Balch, J.F. and P.A (1997).In: *Prescription for Nutritional Healing* (pp. 26). New York, NY: Avery Publishing.
4. Dunne, L.J (1990). In: *Nutrition Almanac* (3rd ed., pp. 77-79). New York, NY: McGraw-Hill Publishing Company.
5. Schauss, A (1995). In: *Minerals and human health: the rationale for optimal and balanced trace element levels* (pp.27-29). Tacoma, WA: Life Sciences Press.
6. Zehender M, Meinertz T, Faber T, Caspary A, Jeron A, Bremm K, Just H. Antiarrhythmic effects of increasing the daily intake of magnesium and potassium in patients with frequent ventricular arrhythmias. Magnesium in Cardiac Arrhythmias (MAGICA) Investigators. *J Am Col. Cardiol* 1997 Apr 29;5 1028-34
7. Prevention Magazine (1988). In: *Complete Book of Vitamins and Minerals* (pp. 206-08; 199-200; 322). New York, NY:Rodale Press.
8. Durlach, J. Commentary on recent clinical advances: Magnesium depletion, magnesium deficiency and asthma. *Magnesium Res* (1995) 8, 4, 403-405
9. Deficiency of certain trace elements in children with hyperactivity. *Psychiatry Pol* (Poland), May-June 1994, 28 (3):345-53.
10. Magnesium and glucose homeostasis. *Diabetologia* (Germany), 1990, 33/9:511-514.
11. Dean C. (2003). In: *The Miracle of Magnesium*. New York, NY: Ballantine Books.
12. Seelig, M. Cardiovascular consequences of magnesium deficiency and loss: pathogenesis, prevalence and manifestations—magnesium and chloride loss in refractory potassium repletion. *Am J Cardiol*, 1989; 63:4G-21G.
13. Hypertension, diabetes mellitus, and insulin resistance: the role of intracellular magnesium. *Am J Hypertens*, 1987; 10(3):346-355.
14. Mauskop, A., Altura BM. Role of magnesium in the pathogenesis and treatment of migraines; *Clin Neurosci* 1998; 5(1):24-7.
15. Seelig, M. Interrelationship of magnesium and estrogen in cardiovascular and bone disorders, eclampsia, and premenstrual syndrome. *J Am Col. Nutr*, 1993;12(4):442-458.
16. Etorh AP, Tachev K, Hadou T, Gbeassor M, Sanni A, Creppy EE, Le Faou A, Rihn BH. Magnesium content in seminal fluid as an indicator of chronic prostatitis. *Cell Mol Biol* 2003;49 Online Pub:OL419-23.
17. Abraham GE, Lubran MM. Serum and red cell magnesium levels in patients with premenstrual tension. *Am J Clin Nutr*, 1981; 34(11):2364-6.
18. Magnesium supplementation and osteoporosis. *Nutr Rev*, 1995, 53/3:71-74.
19. Magnesium requirements in human nutrition. *Contemporary Nutrition*, January 1982; 7 (1).