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Opinion

# Demystifying the power of magnesium

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Epsom salts was inadvertently discovered in Epson spring in England and used as magnesium salt in 1697. It is simply the magnesium sulphate, a commonly used ingredient in beauty and wellness kiosks for soothing joints, muscles and mind. Richard Martin Willstatter working on plant pigments begged a Nobel Prize in 1915 for his discovery of chlorophyll containing magnesium. The magnesium holds the centre position in chlorophyll in a manner as iron in hemoglobin. Chlorophyll plays the key role in transforming the Sunlight light energy into chemical energy in the form of ATP (adenosine triphosphate).

ATP must bind with magnesium and forms Mg-ATP complex to be biologically active. $Mg^{2+}$ is indispensable in biological pathways of energy metabolism such as glycolysis, Kreb cycle, β oxidation etc. Magnesium (Mg) is a key mineral and also a major divalent cation ($Mg^{2+}$) which participates in both extracellular as well as intracellular reactions that regulate a wide range of cellular processes. It is a cofactor for more than 300 enzymes involved in protein synthesis, muscle contraction, nerve function, blood glucose control, hormone receptor binding sites, blood pressure regulation, cardiac excitability or maintenance of normal heart rhythm and transmembrane ion influx.

Large part of magnesium and calcium are found in bones and muscles and participate antagonistically in muscular activity. Simply when muscle contracts calcium enters the cells and after the action is over magnesium helps the active transport pump and dispense the calcium out from the cell eventually the working muscle is relaxed. Insufficient magnesium prevents the calcium to flush out making the muscle either over excited or cause muscle spasm or cramps [1]. Mild magnesium deficiency symptoms appear like cramps, pain and tingling in foot, hands and calf muscles, fatigue, nausea, electrolyte abnormalities, irritability, confusion, disorientation, hypertension and personality changes.

Mounting evidence show that magnesium facilitates relaxation of smooth muscles of heart and also regulates the vascular tone and rhythm of electric signals in heart muscles. People with arrhythmia (irregular heartbeat), bradycardia (slow heartbeat) or tachycardia (too fast heartbeat); hypertension, obesity and postmenopausal women often have low serum concentration of magnesium. There is close association of low serum concentration of magnesium and high level of CRP (C-reactive protein) which is a biomarker of inflammation in the body. High CRP has been linked with numerous diseases including autoimmune diseases, insulin resistance, infection and tissue damage. Mg supplementation invariably decreased the level of serum CRP.

Serum concentration of magnesium is not always depressed by low dietary intake of magnesium but increased excretion through excessive use of diuretics, antacids, anti-inflammatory drugs, analgesics, and some medications used in diabetes, hypertension and renal disease. Absorption of magnesium in small intestine is also reduced under the influence of high intake of calcium rich foods; high fat diet, tea and carbonated beverages. Further presence of fiber, zinc and phytate in the food matrix binds Mg and hampers its absorption in the body. Malnutrition, alcoholism, smoking and stress are some of the major culprits upsetting Mg stores in the body. Aging, mild and moderate stress and consumption of refined food and sugary beverages can increase the demand for magnesium [2].

Supplementation of magnesium through dietary means or nutraceuticals may not replace the medication but certainly prevents many symptoms and complications. Serum magnesium level, which is generally performed, does not always reflect the availability of magnesium in body tissues for cellular processes.

Dietary diversification often prevents nutritional deficiency. Being central to chlorophyll green leafy vegetables, green herbs and grasses are obviously good sources of magnesium. Further pumpkin seeds, sesame seeds, hazel nuts, pine nuts, cashew nuts, almonds, buck wheat, dried beans oats and fresh ginger and cumin seeds also contain good amount of Mg and must be added in the diet. Animal foods lack this mineral but not sea foods [3].

Besides magnesium rich foods, there is vast variety of magnesium supplements in the form of tablets, capsules, milk of magnesia, Epsom salt, magnesium baths, magnesium available in the market. Numerous magnesium salts such as citrate; chloride, phosphate, bisglycinate etc., are used with or without prescription for wide range of health issues ranging from indigestion to insomnia. Magnesium is the key for proper assimilation of calcium in the body and also potentiates the bioavailability of vitamin D. Hence absence of adequate amount of magnesium, calcium and vitamin D may not support bone health. Thus it is also foreseen that magnesium supplement may dominate the market after calcium supplement. Dietary intake of magnesium @ 300 mg/ day by adults may prevent initial stages of Mg deficiency discomforts like muscle cramp, fatigue, weak muscles, anxiety, irregular heartbeat and poor vascular tone.

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