

- Anecdotal reports of calcium use as natural tranquilizer, alleviation of cramps in legs of pregnant women & improved skin health (a calcium-dependent anti-oxidant enzyme is present in skin; calcium deficiency may speed skin ageing)
- **Synergists:** vitamins D and K; magnesium; phosphate; silicon; boron.

## ***MAGNESIUM (Mg)***

**General:** macronutrient element; the relaxation mineral; heart mineral;

- Adult body contains about 25 grams of magnesium;
- First studied in rats & found associated with neuro-muscular abnormalities;
- Human depletion of this mineral is more common than expected;
- Many interrelationships with electrolytes, messengers, hormone receptors, vitamin D metabolism, bone functions, etc.;
- Plays a major role in cell functions in all organs;
- **History:** discovered in 1859; essentiality established for mice in 1926, for rats in 1932; essentiality for humans established in 1950; magnesium deficiency first described clinically in humans in early 1950's;

## ***Nutrition***

- **Sources:** good: mineral ion in chlorophyll present in all green plants; abundant in whole foods (except milk) - soybeans, shrimp, wheat germ, whole grains, molasses, clams, cornmeal, spinach, oysters, crab, peas, liver, beef; poor: refined & processed foods;
- **Supplements:** magnesium salt, acid salt, amino acid chelate, multi-mineral, multi-vitamin mineral formulations;
- **Absorption** from small intestine; about 50% of magnesium in foods is absorbed (30% from high intake; 60% from lower intake);
- **Improved by:** body's need for magnesium;
- **Lost by:** some drugs; fasting, low phosphate, low potassium, high calcium & high magnesium; stress, disease, sweat, excess fiber; alcohol, diuretics; vomiting of gastric juice;
- **Storage:** more than 65% of magnesium found in bone; level of intracellular magnesium in muscle & liver = 7x that in blood;
- **Excretion:** excreted & regulated through kidneys;
- **Metabolism:** controlled by thyroid gland;
- **Interactions:** diuretics, drugs toxic to kidneys, corticoid-steroids; heart drug digitalis induces magnesium deficiency;

## ***Functions of magnesium***

- Catalyst in hundreds of reactions, many in energy production facilities of cells (mitochondria);
- Required in all reactions that involve release or expenditure of energy; ATP production;
- Required in almost all reactions involving carbohydrate, lipid, protein & nucleic acid metabolism;
- Involved in reactions related to synthesis, degradation & stability of genetic material (DNA);
- Fulfills vital role in nerve transmission & muscle relaxation;
- Important to maintain electrical stability of cells, membrane integrity, regulation of blood vessel tone; regulates calcium entrance into cells; regulates heartbeat;

- Necessary to maintain acid-alkaline balance of body fluids;
- Important role in bone physiology & tooth enamel formation;
- Plays part as co-factor or catalyst in at least 300 enzyme reactions;
- Necessary to transform essential fatty acids to prostaglandins;
- Plays role in cold adaptation;

### *Quantities*

- **Measurement:** milligrams;
- **Optimum: (SONA)** set at 300 mg/day
- **Individual** optimum needs to be determined for each individual case; best balance between calcium & magnesium is about 1: 1;
- **Minimum: (DRI)** set at 300/400 mg/day;
- **Less than RDA:** 70% of population, according to a U.S government survey; imbalance in magnesium-calcium ratio is widespread because of over-consumption of magnesium-poor dairy products & calcium-rich formulations;
- **Deficiency** from inadequate diet, poor absorption, diarrhoea, inflammatory bowel disease, gluten intolerance, short bowel syndrome; impaired kidney reabsorption, hormonal disorders, genetic conditions; alcoholism, burns, trauma, protein-energy malnutrition; low phosphate, low potassium, low calcium; increased dietary requirement;
- **At risk:** elderly, people on low-calorie diets, diabetics, people taking diuretics or digitalis, alcoholics, pregnant women, those doing regular & strenuous exercise;
- **Symptoms include:** muscle ache, tremor, spasm & cramp; low blood sugar, irritability, fatigue, depression, anxiety, sleeplessness;
- **Extreme deficiency:** growth impairment, cardiovascular disturbances, calcium deposits in kidneys, heart & joints; calcium deposition in soft tissues; loss of appetite, nausea, vomiting, confusion, tremors, loss of coordination, cardiac arrhythmia;
- **Toxicity:** excess (more than 3 grams) causes diarrhoea; not toxic if kidneys are normal; in kidney failure, high magnesium can result in coma & heart failure;

### *Therapy with magnesium*

- Protective against heart disease & helpful in treatment of high blood pressure; improves survival chances after heart attack; prevents ischemic heart disease;
- May be helpful in treating PMS, along with zinc, vitamins B-6, B-3 & C;
- Appears to help prevent oxalate kidney stones, with B-6; not effective with gall stones;
- Might have positive effect on depression, through its role in neurotransmitter synthesis;
- Effective in treatment of convulsions in pregnant women, premature labour & pre-eclampsia (high blood pressure, swelling {oedema} of tissues, protein in urine) & eclampsia (convulsions, coma);
- Treats neuro-muscular & nervous disorders due to magnesium deficiency;
- Treats magnesium deficiency-induced respiratory muscle weakness;
- Can be used to induce diarrhoea (cure constipation);
- Useful, with calcium in the treatment of cramps;
- Prevents arrhythmias;
- Replenishes loss of magnesium from diarrhoea, prolonged sweating, diuretic use & alcoholism;
- Part of program to alleviate cramps & cravings of premenstrual syndrome (PMS);
- **Synergists:** vitamin B-6; calcium; phosphorus;