Minerals

Minerals are the basic building blocks of all things, both living and non-living. Their functions in our bodies are critical and are essential for good health.

The body utilizes over 80 minerals for maximum function. Because our plants and soils are so nutrient depleted, even if we eat the healthiest foods, we are not getting all the minerals we need. **Evidence of mineral malnutrition** are various minor and serious health conditions such as **energy loss, premature aging, diminished senses, and degenerative diseases like osteoporosis, heart disease, and cancer.**

In many cases, these could be prevented with proper mineral supplementation.

The more you learn about the benefits of minerals, the more you will be able to take charge of your own health!

Every living cell depends on minerals for proper structure and function. Minerals are needed for the formation of blood and bones, the proper composition of body fluids, healthy nerve function, proper operation of the cardiovascular system, among others. Like vitamins, minerals function as co-enzymes, enabling the body to perform its functions including energy production, growth and healing. Because all enzyme activities involve minerals, they are essential for the proper utilization of vitamins and other nutrients. Nutritionally, minerals are grouped into two categories: bulk or essential minerals, also called macro-minerals, and trace minerals or micro-minerals. Macro-minerals such as calcium and magnesium are needed by the body in larger amounts. Although only minute quantities of trace minerals are needed, they are nevertheless important for good health. Micro-minerals include boron, chromium, iron, zinc, and many others.

Three basic classifications of minerals exist. They are "metallic minerals," "chelated minerals," and "colloidal minerals."

Metallic minerals are found in their pure elemental form or as salts such as sodium chloride and zinc sulfate. They are the most commonly used form in nutritional supplements, especially for the essential minerals, because larger amounts are indicated. They are generally the least expensive form of minerals but their primary disadvantage is that **their degree of absorption is the least of all three forms**. Although they have their place, metallic minerals do not represent the full spectrum of all the trace minerals that are known to be of value in human nutrition.

Chelated minerals are the next step up the ladder in so far as the body's ability to assimilate. The term "chelate" originates from a Greek word that means "claw." In this process, be it either in the laboratory or in nature itself, a metallic mineral is "chelated" with an amino acid. The amino acid actually surrounds the metallic mineral like a claw and thereby helps to solubilize it, making the "mineral chelate" more bio-available or useful to the body. Examples of chelated minerals are the magnesium aspartate (magnesium chelated with the natural aspartic acid) and chromium picolinate (chromium chelated with picolinic acid). In many cases, **chelated minerals are about 40% more efficient in regards to absorption and assimilation into the body than metallic minerals**.

Colloidal minerals are those that occur in nature in the colloid state. That is, they are minute particles that either are or can be easily dispersed in a medium such as water. In that they are made up of such small particles, there is a major increase in surface area giving them greater exposure to the liquid or solvent they are to be distributed in. This results in increased solubility, bio-availability, absorption, and usefulness to the body. **Plant-derived colloidal minerals provide the best of all forms of minerals** not only because of this increased solubility but also because they are associated with natural plant tissue. This gives them all the advantages of chelated and metallic minerals and more!

Macrominerals

Calcium

Calcium in the body must be tightly controlled because it is necessary to cell function for such things as blood clotting, muscle contraction, enzyme reactions, cellular communication and skin differentiation. It also gives bones and teeth their strength. In fact, the hardest substance in the human body, tooth enamel, is 95% calcium.

Calcium is rather deficient in the environment. The body has developed special mechanisms to extract calcium from dietary sources. Normal adults adapt to decreased calcium intake by increasing the fraction of dietary calcium absorbed, but absorption is impaired by aging. Some 30-60% of dietary intake is normally absorbed. Several hormones are involved in calcium metabolism. Two protein hormones, parathyroid hormone and calcitonin, and a derivative of Vitamin D act to make sure the body optimally assimilates dietary calcium. A deficincy of calcium results in rickets in children and osteomalacia, both of which display a lack of bone mineralization. Calcium deficiency may also contribute to osteoporosis. Toxicity is rare except in certain diseases involving vitamin D or the parathyroid gland.

Dietary sources of calcium are mostly from the dairy foods. However, meat, some beans, seafood, tofu, and green leafy vegetables contain substantial amounts of calcium. 72% of the calcium available from dietary sources is normally consumed from the dairy group. An excellent calcium replacement for dairy products would be from soy (and soy products) and almond milk. RDA is at least 1100mg/day for adult women and 1600 mg/day for those age 11 to 24 and for pregnant or breastfeeding women.

Phosphorus

Phosphorus is present in the body as inorganic phosphate or phosphate esters, and has many biological roles. Like calcium, the active form of vitamin D regulates phosphorus absorption. It is important for carbohydrate metabolism, cell membrane structure, transport processes, muscle function, and energy storage. Energy is stored in the form of adenosine triphosphate (ATP) which is used to fuel many biological processes. Phosphorus is present in nucleic acids and as a structural component of bones and teeth. The phosphate buffer system is important in maintaining the narrow pH range that is necessary for life. The widespread abundance of phosphorus in food makes a deficiency uncommon except in certain diseases. With excessive intake of aluminum, calcium or magnesium containing antacids or laxatives, a phosphate deficiency can occur because these substances prevent phosphate from being absorbed from the intestine.

Phosphorus containing laxatives are often used before surgery or x-ray of the intestines. Sodium phosphate increases the amount of water in the bowel that then stimulates bowel stretch receptors and increases muscle contractions of the intestines. Given as an enema, sodium phosphate primarily promotes evacuation of the colon.

The use of phosphate supplements by athletes as a power enhancer is controversial, although some studies suggest it improves aerobic performance. The effects of chronic supplementation is not known, however it is not recommended due to the potential to affect calcium metabolism, bone mineralization, and magnesium balance.

The RDA of phosphorus for males and females over 18 years is 700 mg. At high doses it may cause nausea, diarrhea, cramps, muscle paralysis, mental confusion, high blood pressure and abnormal heart rhythms. High levels of phosphate in the blood can cause precipitation of calcium as calcium phosphate in places other than bone and result in low levels of calcium in the blood. Low levels of calcium in the blood can cause tetany, which is characterized by tremor, seizures, muscle cramps, abnormal nerve sensation, and shortness of breath. Many cola drinks contain a high amount of phosphate and high consumption of these drinks can result in high phosphate and low calcium in the blood. People with osteoporosis are advised to limit their consumption of these beverages due to their effect on calcium balance.

Magnesium

Magnesium works in conjunction with many enzymes that are involved in energy metabolism, protein synthesis and nucleic acid synthesis. Magnesium supplements are available as several salts (chloride, gluconate, lactate, sulfate and oxide) and are used to treat people with magnesium deficiency due to poor nutrition, restricted diet, alcoholism, or magnesium-depleting drugs. Many antacids or laxatives also contain magnesium. It is sometimes given IV during pregnancy to control eclamptic seizures and to inhibit uterine motility during premature labor. Large doses can lower blood pressure and cause depression of the central nervous system.

Recently magnesium supplements have gained popularity for several unapproved uses. Many patients with migraine headaches have been found to have low levels of magnesium ions. Magnesium supplements appear to decrease the incidence of migraine attacks in certain people. Oral magnesium may be helpful in preventing premenstrual or menstrual migraines. It may also minimize premenstrual mood changes and fluid retention. When used IV under medical supervision, magnesium may be used to treat cluster migraines. Magnesium supplements should only be used under medical supervision in the presence of heart disease or kidney impairment.

A deficiency of magnesium is rare. Drugs that cause potassium depletion, such as certain diuretics, may also cause low magnesium levels. A deficiency can occur in diabetics, alcoholics and in the presence of gastrointestinal disorders where absorption is impaired, such as prolonged diarrhea. Magnesium appears to be involved in the regulation of calcium levels; therefore if magnesium levels are low, calcium levels may also be low and unresponsive to treatment unless magnesium levels are corrected. Signs of a deficiency include loss of appetite, irritability, disorientation, convulsions, and abnormal behavior.

The RDA of magnesium for males 31 years and older is 420 mg; for women 31 years and older, 320 mg; for pregnant women 19-30 years, 350 mg; and for lactating women 19-30 years, 310 mg.

Sodium

Sodium acts to maintain the normal hydration state of the bodily fluids. Sodium ions are found primarily in the plasma and fluid surrounding cells while potassium is found within cells. These ions affect the movement of water in an out of cells. Sodium ions balanced by other ions are necessary to normal cell function in all tissues of the body. Sodium, chloride and potassium concentrations are tightly controlled by osmoreceptors within the brain and the hormones ADH and aldosterone. These ions can be resorbed from or exceted in the urine, sweat, tears as needed. One to 2 grams of sodium is found in the normal diet. We require an intake of about 4-6 grams each day. Because sodium is added to many foods during processing as a flavor enhancer, intakes in the U.S. are often in excess of the requirement. Sodium may be involved in hypertension in some individuals.

Potassium

Potassium is essential to energy metabolism and to glycogen and protein synthesis. Because of its role in neuromuscular conduction, high or low levels of potassium can be life threatening. Too little potassium (hypokalemia) results in cardiac arrhythmias, muscle weakness, sodium loss in the urine, alterations in acid base balance and the inefficient use of carbohydrate. Too much potassium (hyperkalemia) requires immediate medical attention because the heart may fail to beat normally or at all.

Trace Minerals

- Iron
- Zinc
- Chromium
- Cobalt
- Copper
- Manganese
- Molybdenum
- Selenium
- Flouride