

MINERALS

Minerals Defined

Dietary minerals are the chemical elements, in addition to carbon, oxygen, hydrogen and nitrogen, which are needed for life. Simply stated, they come from either water or the earth, and plants and animals absorb them to obtain the nutrients. There are 22 minerals identified as needed from the diet. They are usually referred to as either “**macro-minerals**” or “**micro-minerals**”. Macro-minerals are needed in large amounts and play major structural roles (such as calcium and phosphorus) and function as electrolytes (such as sodium and potassium). Micro-minerals (trace minerals), often serve as catalysts in enzyme reactions and are only needed in small amounts.

This brochure is written to serve as a source of reliable information on mineral sources from foods. A “Dietary Supplements” pamphlet is also provided through UNT Dining Services to address questions when you believe supplementation is needed. Keep in mind that while it is rare to obtain too much of a dietary mineral through food consumption, it **can** occur when taking supplements. It is well documented that minerals, such as iron and calcium or phosphorus and calcium, compete for absorption in the GI tract. Imbalances with minerals seem to occur more readily than with vitamins, so consult a Registered Dietitian (RD) or educated health care provider before beginning or continuing a regimen of dietary supplementation.

Macro-minerals

Calcium

You have more calcium in your body than any other mineral, and 99% of it is stored in your bones and teeth. The remaining calcium can be found circulating in your bloodstream, or in your muscle (including the heart), as well as in the fluid that surrounds your cells. The obvious need for calcium is in the structure it provides for our skeletons. Calcium is essential for hormone and enzyme secretion, muscle and blood vessel contraction, and communication throughout the central nervous system. It also seems to offer protection against high blood pressure. Estimated absorption: only 30-60%. Vitamin D facilitates the body’s absorption of calcium. **Sources:** milk, cheese, yogurt, dehydrated milk powder, tofu with calcium sulfate, broccoli, cabbage, kale, salmon, sardines (when the small bones are included), almonds and Brazil nuts.

Phosphorus

It is needed for bone and teeth formation, helps the body produce energy from amino acid, fat, and carbohydrate metabolism and aids in vitamin utilization. Excessive intake of carbonated drinks increases phosphorus intake and can cause a decreased absorption of calcium. **Sources:** meats, egg yolks, dried beans/peas, nuts, whole grains, enriched breads, chocolate, wheat germ, dairy products and corn.

Magnesium

It is needed for normal muscle and nerve function, maintenance of a regular heart beat, muscle contractions, nerve transmission, protein synthesis, use of glucose, growth and development of bone matrices and perhaps the prevention of atherosclerosis. **Sources:** cocoa, chocolate, nuts, soybeans, dried beans/peas, green leafy vegetables, whole grains and wheat germ, meat, milk, tofu and halibut.

Sodium

It is needed for the body's acid/ base balance, regulation of blood pressure, glucose transport into cells, muscle contraction and nerve stimulation. We generally take in too much sodium from our diets.

Sources: table salt, processed, "instant" and frozen dinner foods, cheese, seasonings, condiments and leavening agents.

Potassium

Potassium (K+) is present in muscle and involved in nerve cell conduction, muscle contraction, formation of glycogen (storage form of glucose), protein synthesis/functioning, the body's water balance and acid-base balance. **Sources:** fruits, vegetables (including oranges and orange juice, cantaloupe, avocado, banana, prunes, dates, figs, apricots, broccoli, potato, tomato juice and winter squash), legumes, whole grains and milk.

Chloride

It is essential for digestion in the stomach, acid-base balance, fluid balance and exchange of oxygen and carbon dioxide in red blood cells. **Sources:** table salt and processed food using table salt and salt substitutes.

Sulfur

Sulfur is part of amino acids (building blocks of protein), such as methionine, cystine, cysteine. It helps make up the keratin of skin, hair and nails and is part of the insulin molecule. **Sources:** meats, eggs, legumes, wheat germ, broccoli, cabbage and Brussels sprouts.

Trace Minerals

Chromium

The form of chromium found in foods is trivalent chromium (not the industrial toxic form). It is known to enhance the action of insulin and was once called the "Glucose Tolerance Factor". It is directly involved in fat, protein and carbohydrate metabolism and in peripheral nerve functioning. **Sources:** brewer's yeast, whole grains, eggs, vegetable oils, nuts, meats, dairy products, peanuts, broccoli and grape juice.

Cobalt

It makes up part of the structure in Vitamin B-12 and has some role in immunity. It is used in the treatment of some anemias and is needed for healthy nerves and red blood cells. **Sources:** seafood, meats (liver, poultry), some grains and cereals.

Copper

Trace amounts of copper are needed by the body for skeletal development, immunity, the formation of red blood cells, phospholipid synthesis, electron transport, connective tissue formation, pigmentation of the skin, and central nervous system structure. Copper may also help maintain antioxidant defenses and could decrease heart disease risk, when consumed in recommended amounts. **Sources:** nuts, dried beans/peas, cocoa, eggs, prunes, potatoes, organ meats and shellfish.

Fluoride

Known for its role in preventing dental caries, it may also be needed for calcium uptake, prevention of aortic calcification, prevention of osteoporosis and anemia, and for enamel growth. **Sources:** fluoridated water and some seafood (when small bones are included).

Iodine

It is needed for proper thyroid function, normal growth and reproduction, energy metabolism, prevention of goiters and the regulation of cellular metabolism and body temperature. **Sources:** seaweed, seafood, milk, cream, eggs, plant leaves, cranberries, legumes and iodized salt.

Iron

Iron is primarily crucial for carrying oxygen to cells through hemoglobin and myoglobin (oxygen to the muscle). Iron is also important in skeletal muscle functioning, T-cell immunity, normal cell respiration and in cognitive functions. **Sources:** lean meat, fish, poultry, egg yolk, dried beans/peas, molasses, cocoa/baking chocolate, green leafy vegetables and whole grain or fortified breads and cereals. **Note:** Consuming Vitamin C with high iron foods can increase absorption of the iron, as can sulfur amino acids. Foods high in oxalic, tannic, and phytic acids can decrease absorption of iron. The heme iron form that is found in meats is better absorbed than the iron in non-heme sources (plant foods), but both supply needed iron to the body.

Manganese

This mineral provides for enzyme activation, fatty acid and polysaccharide metabolism and may have a role in preventing high blood pressure. It is involved in dopamine, glucose and energy production, as well as being part of the precursor structure to cholesterol and sex hormones (involved in fertility and reproduction). **Sources:** Tea, coffee, blueberries, beans/peas, nuts, wheat germ and bran, spinach and cocoa powder. **Note:** Animal foods are not a source of manganese. Only 5% of manganese is absorbed from the diet. Manganese, cobalt, and iron compete for absorption pathways.

Molybdenum

It is a component of some oxidase enzymes and is involved in iron storage and energy metabolism. It is also a copper antagonist, meaning that it inhibits the body's ability to use copper. **Sources:** legumes, whole grain breads/cereals, dark green leafy vegetables and organ meats.

Zinc

Zinc is essential to a healthy immune system and aids wound healing. It also helps maintain your sense of taste and smell. It is needed to support normal growth in childhood and adolescence as well as in pregnancy. It stimulates the activity of about 100 enzymes, including those involved with protein, carbohydrate and fatty acid metabolism, alcohol detoxification in the liver and hemoglobin synthesis. Zinc, too, is a known copper antagonist. **Sources:** seafood (especially oysters and fish), poultry, meats (especially organ meats), eggs, milk, peanuts, oatmeal, corn, whole grains, wheat germ and yeast.

Other known minerals/ trace metals are vanadium, tin, silicon, nickel, lithium, lead, cadmium, boron and arsenic. Either there is not enough known and understood about their dietary roles and functions, OR they are not believed to be needed by people (or may be toxic instead, such as lead and arsenic) OR are needed in very minute amounts and readily obtained in the diet.

Additional Reading & Resources

- <http://www.eatright.org>
- <http://www.nlm.nih.gov/medlineplus/minerals.html>
- <http://ods.od.nih.gov/factsheets/chromium.asp>
- <http://www.mdconsult.com/das/article/body/867360182/jorg=journal&source=&sp=10288367&sid=0/N/13276/1.html>
- http://www.cancer.org/docroot/ETO/content/ETO_5_3X_Copper.asp

- <http://ods.od.nih.gov/factsheets/cc/zinc.html>
- <http://nutritionandmetabolism.com/content/4/1/24>
- <http://www.ext.vt.edu/pubs/nutrition/348-071/348-071.html>

Bowes & Church's Food Values of Portions Commonly Used, 18th edition by Jean Pennington and Judith S. Douglass. Published by Lippincott, Williams & Wilkins, 2005.

Nutrition and Diagnosis-Related Care, 6th edition by Sylvia Escott-Stump. Published by Lippincott, Williams & Wilkins, 2007.