# The Minerals

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<th>Mineral</th>
<th>Physiological Role within the Body</th>
<th>Food Sources</th>
<th>Deficiency Symptoms, Syndrome or Condition associated with inadequate intake of the mineral</th>
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</table>
| **Calcium*** | -One of the most important minerals in the human body!  
-Important for the formation, growth and maintenance of strong bones and teeth.  
-Necessary for optimal immune system function, nerve activity, and for the function and maintenance of muscle contractions  
-Additionally, involved in blood pressure regulation, hormone and enzyme secretions, and necessary for blood clotting | -milk and milk products (DAIRY!!),  
-fortified soy beverages,  
-green leafy vegetables – in particular: cooked bok choy & broccoli,  
-tofu,  
-soybeans,  
-navy beans,  
-white beans | -Hypocalcemia – this condition results when calcium levels in the blood are too low. Long term, this has potential to lead to osteoporosis. |
| **Chloride** | -A very important electrolyte found in one’s blood that helps to control various bodily processes such as: the balance of fluid inside and outside one’s cells, and enables the maintenance of appropriate blood volume, blood pressure and pH of various bodily fluids | -seaweed,  
-rye,  
-tomatos,  
-olives,  
-lettuce,  
-celery | Hypochloremia (or Hypochloraemia) - electrolyte interference in which there is an irregularly low level of chloride in one’s blood, symptoms include – dehydration, fluid loss, diarrhea or vomiting |
| **Chromium** | -Plays a key role in breakdown of fats and carbohydrates  
-Works with insulin to control and regulate blood sugar (glucose) levels. | -broccoli  
-potatoes,  
-green beans, -poultry,  
-beef,  
-whole-grain products,  
-apples,  
-bananas,  
-milk and dairy products. | -Lack of chromium in the diet hinders the body’s ability to utilize glucose to meets its energy requirements, resulting in increased insulin requirements |
| **Copper** | -Heavily reliant on iron – involved in the formation of red blood cells, the synthesis of various proteins and enzymes, the metabolism of glucose, and the absorption of iron. | -liver,  
- oysters,  
-spirulina,  
-lobster,  
-shiitake mushrooms,  
-leafy green vegetables, | -Symptoms include: low white blood cell count, anemia, paleness, issues with connective tissue, neurological problems, and muscle weakness. |
<table>
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<tr>
<th>Nutrient</th>
<th>Description</th>
<th>Sources</th>
<th>Deficiency Symptoms</th>
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<td>Fluoride</td>
<td>Involved in the formation of teeth and bones – helps to prevent tooth decay</td>
<td>- legumes, - nuts and seeds, - dark chocolate</td>
<td>- Tooth decay and increased dental caries, brittle or weak bones.</td>
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<td>Iodine</td>
<td>Involved in the synthesis of thyroid hormones which are created by the thyroid gland – this helps to regulate growth, metabolism, and development.</td>
<td>- Seafood – cod, tuna, seaweed, shrimp, - Dairy products – cheese, yogurt, milk, - Grains – breads and cereals</td>
<td>Deficiency symptoms are very similar to those of hypothyroidism or low thyroid hormones and include: weight gain, weakness, fatigue, swelling of the neck, learning difficulties, pregnancy-related issues, and heavy or irregular periods</td>
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<td>Iron</td>
<td>An essential component of hemoglobin - a protein found in red blood cells that transports oxygen throughout the body - Needed for cell growth and differentiation - Necessary for energy metabolism - An important component of myoglobin – a protein which provides oxygen to muscles</td>
<td>- Red meats (liver, beef, pork), - Organ meats, - Chicken, - Oysters and clams, - Leafy green vegetables (broccoli, spinach, Swiss chard), - Legumes (lentils, peas, dried beans), - Tofu, - Dried fruits (prunes, figs), - Egg yolks, - Fortified cereals and whole grain products</td>
<td>The development of anemia – symptoms include: general fatigue, shortness of breath, dizziness, pale skin, pica (cravings for substances that are not food).</td>
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<td>Magnesium*</td>
<td>Main role in the body is as a cofactor for various enzymatic reactions - Plays a vital role in protein synthesis and energy metabolism, regulating blood sugar levels, and helping to optimize immune system health - Additionally, magnesium is necessary for many physiological functions such as muscle contraction</td>
<td>- Green leafy vegetables, - Nuts and seeds (sesame, sunflower, pumpkin), - Legumes (lentils, peas, dried beans), - Seafood, - Chocolate, - Artichokes, - Whole grain products</td>
<td>Symptoms include: loss of appetite, fatigue, nausea, weakness, muscle cramps and spasms, and vomiting.</td>
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| Manganese | -Main role is to metabolize various nutrients  
- Necessary for a range of chemical processes such as aiding in the metabolism of cholesterol and carbohydrates  
-Additionally, involved with the utilization and digestion of amino acids and protein. | -Green leafy vegetables,  
-nuts & seeds,  
-legumes,  
-whole grains – often added to breakfast cereals and fortified foods  
-Generally speaking, foods containing dietary fibre provide magnesium thus it is widespread in foods | -Hindered glucose tolerance, and altered metabolism of carbohydrates and lipids which has potential to result in impaired growth and reproductive function |
| Molybdenum | -Helps to activate various enzymes that are needed to prevent the build-up of toxins in the body – In addition, assists in the breakdown of various sulfites | -Legumes are the richest source,  
-whole grains,  
-nuts,  
-leafy vegetables,  
-beef liver, and  
-cereal grains | - Deficiency is extremely rare and only occurs in individuals with a rare genetic disorder known as molybdenum cofactor deficiency resulting in encephalopathy, leading to seizures and brain damage |
| Phosphorus* | -Necessary for the formation of bones and teeth  
-Plays a key role in carbohydrate and fat metabolism  
-Needed for the generation of protein, in order to aide in repair of cells and tissues  
-Additionally, an important component of the maintenance of acid-base balance within cells | -Milk and milk products,  
-meat,  
-poultry,  
-fish,  
-seeds and nuts,  
-whole grains,  
-eggs | Hypophosphatemia – which can result in bone diseases such as rickets in children and Osteomalacia in adults |
| Potassium* | -Main function within the body is for proper fluid balance, working to maintain osmotic pressure and acid-base balance  
-Also helps to regulate nerve signals and muscle contractions | -Bananas,  
-oranges,  
-apricots,  
-potatoes,  
-sweet potatoes,  
-beets,  
-broccoli,  
-squash,  
-legumes  
-milk products,  
-nuts,  
-whole grains | Hypokalemia – results when potassium levels in the blood serum are too low - this frequently results in vomiting, diarrhea, and adrenal gland disorders.  
-Often Hypokalemia leads to the use of diuretics, muscle weakness, twitching and cramping, and abnormal heart rhythms |
| **Selenium** | - Main purpose is to act as an antioxidant. Reminder: antioxidants are chemical compounds that help to protect cells from free radicals, preventing them from cell damage  
- Additionally, important for DNA production, reproduction and thyroid gland function | - Turkey, - pork, - beef, - chicken, - fish, - shellfish, - eggs, - various whole grains, - various dairy products | - Deficiency symptoms include: muscle weakness, fatigue, hair loss, mental fog and confusion, and negatively impacts both growth and reproduction |
| **Sodium*** | - An electrolyte involved in the maintenance of homeostasis and blood pressure, and the regulation of electrolyte and fluid balance,  
- Helps to control acid-base balance by regulating the amount of water that’s in and around your cells (osmotic pressure)  
- Additionally, needed for muscle contraction and nerve transmission | - Salt, - pickles, - cured meats such as bacon, ham or corned beef - soya sauce, - salted or seasoned seeds and nuts, - processed foods | - Hyponatremia – this occurs when the concentration of sodium in the blood is abnormally low -this is pretty common – especially within older adults. - Frequent symptoms include loss of energy, muscle weakness, headaches, nausea, and lethargy - in severe cases, seizures or a coma can result. |
| **Sulfur** | - Necessary for the production of key proteins within the body such as glutathione and insulin  
- Needed for the synthesis of connective tissue | - Meat & poultry, - fish and seafood, - eggs, - milk, - nuts, - legumes | - Results in reduced protein synthesis given there is little sulfur available for amino acids  
- Additionally, inadequate intake can lead to joint pain |
| **Zinc*** | - Plays a vital role in many physiological functions such as: DNA and protein synthesis, carbohydrate metabolism, cell growth, cell division, production of sperm, sexual maturation, fetal development, immune function, and wound healing  
- Needed for sense of smell and taste  
- Structural component of insulin | - Milk products, - whole grains, - poultry, - red meat, - oysters, - chickpeas, - nuts and seeds – in particular: almonds, cashews, - baked beans | - Symptoms include: hair loss, weight loss, skin and eye sores, issues with wound healing and loss of appetite. |