BUL 1102

Minerals

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Introduction

MINERALS ARE MICRONUTRIENTS or nutrients that we only need small amounts of (hence "micro") and that do not contribute calories to our diet. Although we only need a small amount of minerals, they perform important bodily functions. For example, iron is important for the transport of oxygen throughout our body; iodine is essential for optimal thyroid function and body temperature regulation; and calcium makes our bones strong. The consequences of inadequate intake of minerals include anemia, hypothyroidism, and osteoporosis; therefore, it is important to eat a diet rich in these nutrients. Table 1 lists the minerals, their bodily function, and the food sources of each mineral. We cannot make minerals in our body, so we have to consume them from foods and drinks. This bulletin helps you to understand the roles minerals play in our bodies and which foods are good sources of them.

Bone Health

Micronutrients (i.e., vitamins and minerals) are very important for healthy bones. Although calcium is the mineral usually associated with bone health, phosphorus, magnesium, manganese, fluoride, and boron also play important roles in growing and maintaining bones. Dairy products like milk and cheese are powerhouses for bone health. Dairy is a good source of calcium; however, it is also a good source of phosphorus and boron. Consume three daily servings of dairy for bone health. Darky leafy greens also provide calcium and other nutrients important to bone health. Good sources of magnesium include nuts and beans; other sources are whole grains, nuts, and rice. Finally, fluoridated tap water usually provides enough fluoride to meet our needs, but black tea and fish with bones are also good sources. It is also recommended that people two years of age and older use toothpaste with fluoride to support dental health. Consuming a diet rich in these foods starting at a young age allows you to build and maintain healthy bones throughout life.

Vitamin D is a different kind of micronutrient, and it also is important for healthy bones. It functions in two ways to improve bone health. First, it is required for the

Table 1. The minerals.

Mineral	Function	Food Source
Calcium	Bone health, helps our nerves and muscles work, blood clotting	Dairy products, dark leafy greens, and calcium-fortified foods (like orange juice)
Phosphorus	Helps build DNA and helps grow and maintain our cell's health, bone health, and pH balance	Dairy products, whole grains, eggs, and other protein-rich foods such as meats and poultry
Magnesium	Helps our immune system, helps nerves and muscles work, strengthens bones	Nuts, beans, dark chocolate, seeds, avocados, and bananas
Sodium	Water balance, helps our muscles move, helps our nerves work	Salt, dairy products, and processed foods
Chloride	Water balance	Salt, fruits, vegetables
Potassium	Helps our nerves work	Fruit and vegetables like potatoes, bananas, beans, lentils, leafy greens, and nuts
Iron	Transports oxygen through hemoglobin	Red meat and other meats, beans, leafy greens, and fortified foods
Zinc	Helps our immune system work, helps wound healing, and helps break down carbohydrates	Red meat, whole grains, eggs, and fortified foods
Copper	Helps make connective tissues, helps supply energy, and supports blood vessels	Shellfish, whole grains, beans, mushrooms, dark chocolate, leafy greens, and nuts
Manganese	Helps make connective tissues, bones, blood-clotting factors, and some hormones	Whole grains, nuts, rice, seeds, legumes, leafy greens, and fruits
Iodine	Supports thyroid function to control reproduction, body temperature, growth, and development	Iodized salt, seafood, dairy products
Selenium	Helps make DNA, protects cells from damage, protects from infection, activates thyroid hormones	Brazil nuts, eggs, sunflower seeds, poultry, and fish
Fluoride	Strengthens bones and teeth	Fluoridated water, black tea, fish
Molybdenum	Breaks down protein, alcohol, drugs, and toxins	Legumes, dairy, whole grains, nuts, and leafy greens
Boron	Bone development	Fruits like prunes, raisins, and apples; legumes; leafy greens; milk; and avocados
Chromium	Enhances insulin action	Broccoli, beef, whole grains, and coffee
Silicon	Helps make collagen	Grain products, fish, dairy, and fruits and vegetables

absorption of calcium. It also plays a role in bone mineralization. There are few food sources of vitamin D, but milk products are fortified with it. Additionally, we make vitamin D after exposing our skin to the sun. Because this is only possible for a few months each year, many individuals take a vitamin D supplement. See *Nutrition Basics: Vitamins* (BUL 1101) for more information regarding vitamin D and the other vitamins.

Electrolytes and Water Balance

Another essential role that minerals play is related to water balance. Sodium, chloride, and potassium are electrolytes, which help us maintain a healthy fluid level in our body. Fluid balance depends on how much water we have and where we store it (inside or outside our cells). Electrolytes drive this delicate balance. Concentrations of sodium and chloride are highest outside the cell, but potassium concentration is highest inside the cell. Chloride and potassium maintain water balance; however, sodium is the main driver. Foods like cheese and dairy, processed foods, and table salt contain sodium. However, many Americans consume too much sodium because of the high amount found in processed foods, so limit your intake of processed foods and prioritize dairy foods and iodized table salt to manage your intake. Table salt is a source of chloride, while fruits and vegetables are good sources of magnesium and potassium (see *Nutrition Basics: Water and Electrolytes* [BUL 1103]).

Blood and Other Connective Tissues

The minerals iron, copper, silicon, and manganese maintain the function of our blood and other connective tissues like cartilage. In our blood, hemoglobin transports oxygen throughout our bodies and iron is an essential component of hemoglobin. Without enough iron, we become anemic, which results in fatigue or feeling really tired. There are two types of iron we get from foods, heme and nonheme. Animal products, such as red meat, contain heme, the form of iron that your body easily uses. Vegetables, with spinach a good source, contain nonheme iron. To improve the availability of nonheme iron, pair a vitamin C–rich food with a nonheme iron-rich food, like strawberries and spinach in a salad. The vitamin C in food pairings makes nonheme iron more absorbable. Copper and silicon both work to make collagen, a protein that builds connective tissues. In addition to making bones, manganese also works to form cartilage.

Other Functions

Minerals play several other, more specific roles in our bodies. For example, iodine is an essential part of thyroid hormones that maintains our metabolism and body temperature, while selenium activates thyroid hormones. Without either of these nutrients, symptoms of poor thyroid function like cold intolerance and fatigue develop. Chromium is another mineral that affects hormones and insulin action to maintain optimal blood sugar levels. Zinc is important for immune function, while molybdenum breaks down protein, alcohol, drugs, and toxins. Finally, selenium also helps to make DNA and protects cells from damage.

Getting Enough Minerals from Food

The Dietary Reference Intakes (DRI) are a set of reference values for optimal intake of vitamins and minerals created by the National Academy of Medicine. The DRIs help us determine the amount of minerals that individuals and groups, like pregnant or lactating women, need for their bodies to function; however, it is not necessary to keep track of each individual mineral. Consuming a dietary pattern that includes two to three servings of dairy, five or more ½-cup servings of fruits and vegetables, along with whole grains, nuts, and meat or other protein sources help to meet your mineral needs. However, some individuals may need to consume a supplement. For example, pregnant and lactating women have increased nutrient needs, so if you are in that situation, take a prenatal supplement. Individuals who exclude meat from their diet may struggle to meet their iron or zinc needs and may also benefit from taking a supplement.

Summary

Minerals are micronutrients that we only need in small amounts but that have large impacts on our bodies and health. These nutrients are found in many different foods in our diets and by eating a variety of foods we can meet our mineral needs.

Further Reading

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