

Nutrients: Vitamins, Minerals, and Water

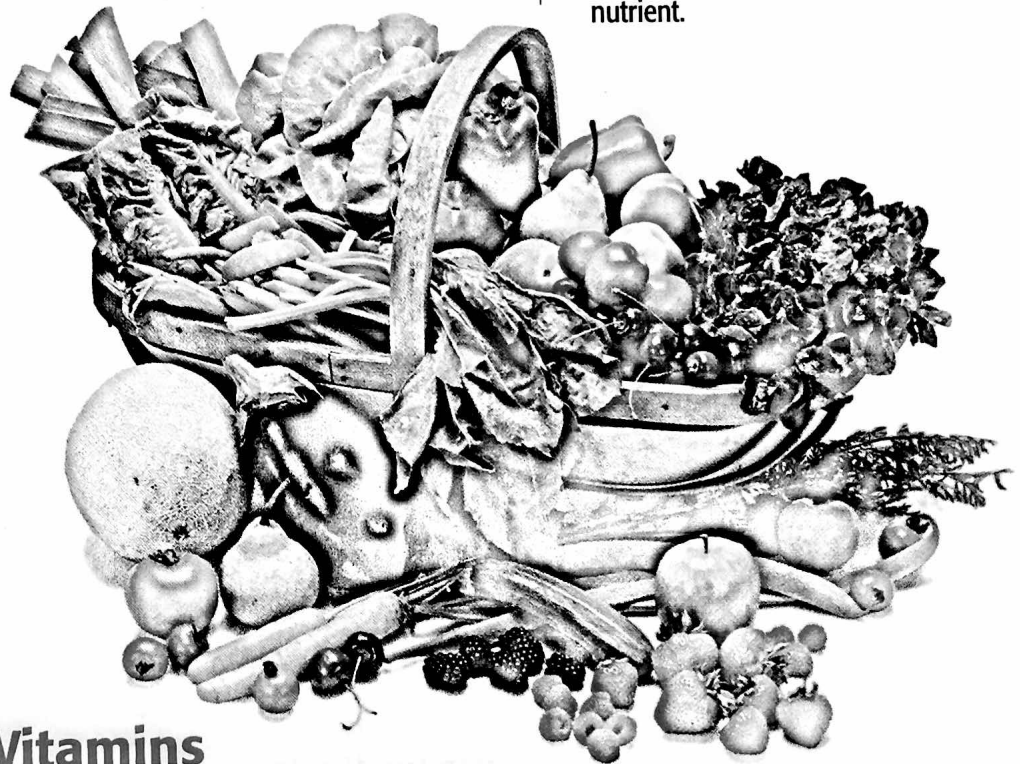
Some of the body's most essential nutrients are every bit as important as carbohydrates, fats, and proteins. These important nutrients are vitamins, minerals, and water. In this lesson you will learn about the unique function of each one and the best food sources of these nutrients.

HEALTH TERMS

vitamins
minerals

HEALTH CONCEPTS

- Healthful eating includes consuming ample amounts of vitamins and minerals.
- Water is the body's most essential nutrient.



Vitamins

Vitamins are compounds that help regulate many vital body processes, including the digestion, absorption, and metabolism of other nutrients. Vitamins are known as *micronutrients* because they are needed in small amounts. Although vitamins do not supply calories, some of them speed up reactions that produce energy in body cells.

Of the 13 vitamins that play a key role in good nutrition, only one—Vitamin D—is manufactured by the body. The rest must be derived from food. Vitamins are classified into two groups: *water-soluble* and *fat-soluble*.

Water-Soluble Vitamins

Water-soluble vitamins include Vitamin C and the eight vitamins in the Vitamin B complex. As their name suggests, water-soluble

Water-Soluble Vitamins

VITAMIN	ROLE IN BODY	FOOD SOURCE
C (ascorbic acid)	Protects against infection; helps with formation of connective tissue; helps wounds heal; maintains elasticity and strength of blood vessels; promotes healthy teeth and gums.	Citrus fruits, cantaloupe, tomatoes, cabbage, broccoli, potatoes, peppers
B ₁ (thiamine)	Changes glucose into energy or fat; helps prevent nervous irritability; necessary for good appetite.	Whole-grain or enriched cereals, liver, yeast, nuts, legumes, wheat germ
B ₂ (riboflavin)	Is essential for producing energy from carbohydrates, fats, and proteins; helps keep skin in healthy condition.	Milk, cheese, spinach, eggs, beef liver
Niacin	Important to maintenance of all body tissues; helps in energy production; needed by body to utilize carbohydrates, to synthesize human fat, and for tissue respiration.	Milk, eggs, poultry, beef, legumes, peanut butter, whole grains, and enriched and fortified grain products
B ₆	Essential to amino acid and carbohydrate metabolism. Helps turn the amino acid tryptophan into serotonin (a messenger to the brain) and niacin.	Wheat bran and germ, liver, meat, whole grains, fish, vegetables
Folic acid	Necessary for the production of RNA and DNA and normal red blood cells; reduces risk of birth defects.	Nuts and other legumes, green vegetables, orange juice, folic acid-enriched breads and rolls, liver
B ₁₂	Necessary for production of red blood cells and normal growth.	Found in animal products, such as meat, fish, poultry, eggs, milk, other dairy foods, some fortified foods
Pantothenic acid	Functions in the breakdown and synthesis of carbohydrates, fats, and proteins; necessary for synthesis of some of the adrenal hormones.	Milk, cheese, poultry, wheat germ, whole-grain cereals and breads, legumes, green vegetables



Cooking Good!

Foods containing water-soluble vitamins need to be cooked carefully so that the vitamins are not destroyed by heat or lost through steam or in cooking water. Follow these tips:

- Cook fruits and vegetables quickly, or steam them.
- Cover food during cooking.

vitamins dissolve in water and thus pass easily into the bloodstream in the process of digestion. Excess amounts are excreted in urine. Since these vitamins are not stored in the body, you need to replenish your supply of them regularly through the foods you eat. Foods that contain these vitamins need to be cooked carefully so that only a minimum amount of vitamins are lost. Adding variety to the foods you eat will also ensure that you obtain these nutrients.

Fat-Soluble Vitamins

Fat-soluble vitamins—vitamins that are absorbed and transported by fat—include Vitamins A, D, E, and K. Your body obtains Vitamin A in two ways: directly from plant-eating organisms and by manufacturing it from carotenoids in plants such as *beta-carotene*, a substance found in carrots, broccoli, spinach, and other vegetables.

Fat-Soluble Vitamins

VITAMIN	ROLE IN BODY	FOOD SOURCE
A	Maintenance of epithelial tissue; strengthens tooth enamel and promotes use of calcium and phosphorus in bone formation; growth of body cells; keeps eyes moist; helps eyes adjust to darkness; possible aid in cancer protection.	Milk and other dairy products, green vegetables, carrots, deep-orange fruits, liver
D	Promotes absorption and use of calcium and phosphorus; essential for normal bone and tooth development.	Fortified milk; eggs; fortified breakfast cereal; sardines; salmon; beef; margarine; produced in the skin upon exposure to ultraviolet rays in sunlight
E	May relate to transporting oxygen through blood and longevity; may be a protection against red blood cell destruction.	Widely distributed in foods; vegetable oils, legumes, nuts, seeds, and wheat germ
K	Essential for blood clotting; assists in regulating blood calcium level.	Spinach, broccoli, eggs, liver, cabbage, tomatoes; produced by intestinal bacteria

Unlike water-soluble vitamins, which are eliminated through the urine, fat-soluble vitamins are stored in the body's fatty tissue, the liver, and the kidneys. Excess buildup of these vitamins can have a toxic or other damaging effect on the body. People who take nutrient supplements with very large doses of fat-soluble vitamins are especially vulnerable to these effects.

Minerals

Minerals are *inorganic substances that the body cannot manufacture but that act as catalysts, regulating many vital body processes*. Like vitamins, minerals are micronutrients. Despite the small amounts your body needs, each mineral has its own unique function in health.

Your body requires larger amounts of some minerals than others. So-called *trace* minerals—the ones your body needs in tiny, or trace amounts—include iron, iodine, copper, and others. During the teen years, when growth is rapid, iron is especially important. It is essential for the hemoglobin in your blood, which carries oxygen throughout the body. Without ample iron, you may feel tired and have little endurance.

Another important mineral to the body is calcium. Giving structure to your bones, calcium helps develop and maintain bone strength. It also aids muscle contraction, blood clotting, and the proper functioning of the nervous system. Milk and most other dairy products, some leafy green vegetables, and canned salmon are good sources of calcium. When you fail to get enough calcium through foods such as these, your body draws upon deposits of the mineral in the bones and sends these to the muscles, blood, and nerves. This



▲ The best source of vitamins and minerals is in the foods you eat.

ACTIVITY Identify which nutrients are in these foods.

Minerals

MINERAL	PRIMARY FUNCTION	FOOD SOURCE
Calcium	Building material of bones and teeth (about 99 percent of body calcium is in your skeleton); regulation of body functions: heart muscle contraction, blood clotting.	Dairy products, leafy vegetables, canned fish with soft, edible bones, tofu processed with calcium sulfate
Phosphorus	Combines with calcium to give rigidity to bones and teeth; essential in cell metabolism; helps to maintain proper acid-base balance of blood (calcium and phosphorus are the most abundant minerals in the body).	Milk and most other dairy foods, peas, beans, liver, meat, fish, poultry, eggs, broccoli, whole grains
Magnesium	Enzyme activator related to carbohydrate metabolism; aids in bone growth and muscle contraction.	Whole grains, milk, dark green leafy vegetables, legumes, nuts
Sodium	Regulates the fluid and acid-base balance in the body; aids in transmission of nerve impulses.	Table salt, prepared sauces, soy sauce, milk, processed foods, foods in a brine such as pickles
Potassium	Part of the system that controls the acid-base and liquid balances; thought to be an important enzyme activator in the use of amino acids.	Legumes, potatoes, bananas, oranges, meat, milk
Sulfur	Component of the hormone insulin and some amino acids; builds hair, nails, skin.	Nuts, dried fruits, barley, oatmeal, eggs, beans, cheese
Chloride	Associated with sodium and its functions; a part of the gastric juice, hydrochloric acid; also functions in the starch-splitting system of saliva.	Table salt, milk, meat, fish, poultry, egg whites
Iron	Part of the red blood cells' oxygen and carbon dioxide transport system; important for use of energy in cells and for resistance to infection.	Meat, shellfish, poultry, legumes, peanuts, dried fruits, egg yolks, liver, fortified breakfast cereal, enriched rice
Iodine	Essential component of the thyroid hormone, thyroxin, which controls the rate of cell oxidation; helps maintain proper water balance.	Iodized salt, saltwater fish
Zinc	Function still under study; a component of many enzyme systems and an essential component of the pancreatic hormone insulin; essential for growth; promotes cell reproduction and repair.	Shellfish, meat, milk, eggs
Selenium	Works with Vitamin E to prevent cell damage.	Grain products, milk, eggs, meat, kidney, liver, seafood
Copper	An essential ingredient in several enzymes; needed for development of red blood cells.	Beans, Brazil nuts, whole-meal flour, lentils, seafood, kidney, liver
Fluoride	Essential to normal tooth and bone development and maintenance.	Fluoridated water, fish with edible bones
Manganese	Enzyme activator for carbohydrate, protein, and fat metabolism; also important in growth of cartilage and bone tissue.	Whole-grain products, nuts, green leafy vegetables, kidney, liver, beans, Brazil nuts, lentils

can result in weakening of the skeleton and can increase your body's susceptibility to bone **fractures**. A lack of calcium in the teen years can lead to poor bone density and later in life to osteoporosis, a condition in which bones become brittle and weak.

Three other important minerals—sodium, chloride, and potassium—belong to a group of minerals known as *electrolytes*. They are called this because they become electrically charged when in solution, as they are in the body fluids. Sodium and potassium help maintain the balance of fluid within body cells. You probably get enough sodium in the form of salt—sodium chloride. Bananas and orange juice are excellent sources of potassium.

Water

If you were asked to guess which nutrient makes up the greatest percentage of your body, what would you say? If your answer was “water,” you would be right.

Water is a regulator and is vital to every body function. It carries nutrients to and transports waste from your cells, mainly through the plasma in your blood. Water lubricates your joints and mucous membranes. It enables you to swallow and digest foods, absorb nutrients, and eliminate wastes. Through perspiration, water helps your body cool down and prevents the buildup of internal heat.

Your body uses about 10 cups (2.4 liters) of water a day. If you perspire from fever, hot weather, or strenuous exercise, you use more. Some water can be replaced by drinking fluids such as juice, milk, or water itself—about six to eight cups (1.4 to 1.9 liters) daily. Food is also a source of water. On average, fruits, vegetables, and milk products contain about 75 percent water.

hot link

fractures For more information on fractures and other problems of the skeletal system, see Chapter 15, page 344.

