Table 8-3 Minerals *(continued)*

NAME	FOOD SOURCES	FUNCTIONS	DEFICIENCY/TOXICITY
Phosphorus (P)	Milk, cheese Lean meat Poultry Fish Whole grain cereals Legumes Nuts	Development of bones and teeth Maintenance of normal acid-base balance of the blood Constituent of all body cells Necessary for effectiveness of some vitamins Metabolism of carbohydrates, fats, and proteins	Deficiency Poor tooth and bone formation Weakness Anorexia General malaise
Potassium (K)	Oranges, bananas Dried fruits Vegetables Legumes Milk Cereals Meat	Contraction of muscles Maintenance of fluid balance Transmission of nerve impulses Osmosis Regular heart rhythm Cell metabolism	Deficiency Hypokalemia Muscle weakness Confusion Abnormal heartbeat Toxicity Hyperkalemia
Sodium (Na^+)	Table salt Beef, eggs Poultry Milk, cheese	Maintenance of fluid balance Transmission of nerve impulses Osmosis Acid-base balance Regulation of muscle and nerve irritability	Deficiency Nausea Exhaustion Muscle cramps Toxicity Increase in blood pressure Edema
Chloride (Cl^-)	Table salt Eggs Seafood Milk	Gastric acidity Regulation of osmotic pressure Osmosis Fluid balance Acid-base balance Formation of hydrochloric acid	Deficiency Imbalance in gastric acidity Imbalance in blood pH Nausea Exhaustion
Magnesium (Mg^{++})	Green, leafy vegetables Whole grains Avocados Nuts Milk Legumes Bananas	Synthesis of ATP Transmission of nerve impulses Activation of metabolic enzymes Constituent of bones, muscles, and red blood cells Necessary for healthy muscles and nerves	Deficiency Normally unknown Mental, emotional, and muscle disorders
Sulfur (S)	Eggs Poultry Fish	Maintenance of protein structure For building hair, nails, and all body tissues Constituent of all body cells	Unknown

(continues)

Table 8-3 Minerals *(continued)*

TRACE MINERALS

NAME	FOOD SOURCES	FUNCTIONS	DEFICIENCY/TOXICITY
Iron (Fe^{+})	Muscle meats Poultry Shellfish Liver Legumes Dried fruits Whole grain or enriched breads and cereals Dark green and leafy vegetables Molasses	Transports oxygen and carbon dioxide Component of hemoglobin and myoglobin Component of cellular enzymes essential for energy production	Deficiency Iron deficiency anemia characterized by weakness, dizziness, loss of weight, and pallor Toxicity Hemochromatosis (genetic) Can be fatal to children May contribute to heart disease Injure liver
Iodine (I^{-})	Iodized salt Seafood	Regulation of basal metabolic rate	Deficiency Goiter Cretinism Myxedema
Zinc (Zn^{+})	Seafood, especially oysters Liver Eggs Milk Wheat bran Legumes	Formation of collagen Component of insulin Component of many vital enzymes Wound healing Taste acuity Essential for growth Immune reactions	Deficiency Dwarfism, hypogonadism, anemia Loss of appetite Skin changes Impaired wound healing Decreased taste acuity
Selenium (Se^{-})	Seafood Kidney Liver Muscle meats Grains	Constituent of most body tissue Needed for fat metabolism Antioxidant functions	Deficiency Unclear, but related to Keshan disease Muscle weakness Toxicity Vomiting Loss of hair and nails Skin lesions
Copper (Cu^{+})	Liver Shellfish, oysters Legumes Nuts Whole grains	Essential for formation of hemoglobin and red blood cells Component of enzymes Wound healing Needed metabolically for the release of energy	Deficiency Anemia Bone disease Disturbed growth and metabolism Toxicity Vomiting; diarrhea Wilson's disease (genetic)

(continued)

Table 8-3 Minerals *(continued)*

NAME	FOOD SOURCES	FUNCTIONS	DEFICIENCY/TOXICITY
Manganese (Mn^+)	Whole grains Nuts Fruits Tea	Component of enzymes Bone formation Metabolic processes	Deficiency Unknown Toxicity Possible brain disease
Fluoride (F^-)	Fluoridated water Seafood	Increases resistance to tooth decay Component of bones and teeth Component of bones and teeth	Deficiency Tooth decay Possibly osteoporosis Toxicity Discoloration of teeth (mottling)
Chromium (Cr)	Meat Vegetable oil Whole grain cereal and nuts Yeast	Associated with glucose and lipid metabolism	Deficiency Possibly disturbances of glucose metabolism
Molybdenum (Mo)	Dark green, leafy vegetables Liver Cereal Legumes	Enzyme functioning Metabolism	Deficiency Unknown Toxicity Inhibition of copper absorption

Water

Water is the most important yet often neglected nutrient. Without it we cannot exist; and when it is limited our bodies suffer. A fluid loss of just 2% to 3% of body weight will impair performance (Figure 8-5). Fluid loss of 7% to 10% can be fatal. The kidneys play an important role in conserving and excreting water when it is needed.

The blood circulates throughout the body, carrying nutrients and energy to the cells. Water in the bloodstream helps regulate body temperature, transport nutrients, eliminate toxins and waste products, and maintain proper metabolism.

On average, the body will lose approximately seven glasses of water each day. In an active individual, the amount of water loss will be much greater. We lose water by way of sweat, urine, and bowel movements. We even lose water every time we exhale.

To maintain proper hydration, drink six to eight glasses of fluids each day and more when active. Thirst is not always a good indicator of the need for fluid replacement. When working out or being physically active, it is a good idea to prehydrate prior to the activity. *Prehydration*

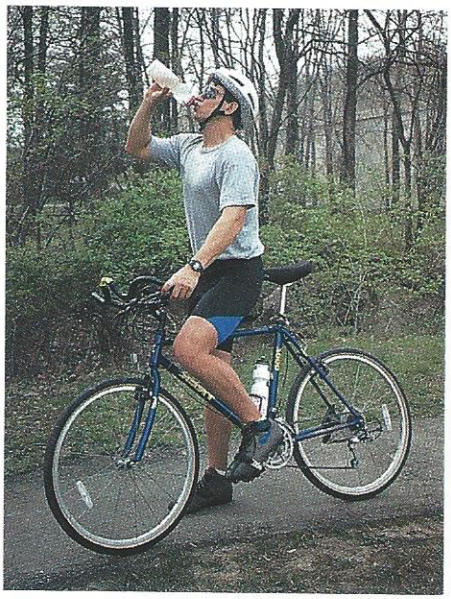

Figure 8-5 Preventing dehydration is an important element of proper nutrition. A fluid loss of just 2% to 3% of body weight will impair performance.

means to drink a glass or two of fluids within an hour exercise. This will help the body to cope with immediate water loss due to perspiration and increased metabolism. After the activity is over, it is important to drink as much fluid as possible to replace fluid loss.

As important as water is before and after activity, it is very important to drink water at intervals during activity. Restricting water intake during a practice or game is not only dangerous, but will also hamper performance. Coaches used to believe that restricting water from athletes during a practice or game would toughen them up. This old-school thinking led to many tragic results. Most coaches today understand the need for fluid replacement. They also know that a well-hydrated athlete will perform at a higher level and be healthier.

Fun Facts

A person can live about eight days without food, but only a few days without water.

DID YOU KNOW . . .

The sensation of thirst often lags behind the body's need for water, especially in children, the elderly, athletes, and persons who are ill.

Sports Drinks

Today's sports drinks contain sugar, minerals such as potassium and sodium, and water. In terms of ingredients, little distinguishes the many brands of sports drinks; they are nearly identical in nutritional content. Some brands have added vitamins or additional sodium, and at least one brand contains ephedra (ma huang). *Ephedra* is a powerful herbal stimulant that can cause nervousness, insomnia, nausea, spikes in blood pressure, and even heart attack and stroke. It also works to suppress the sweat mechanism while the athlete is exercising. This can cause a rapid rise in body temperature, leading to hyperthermia. Any sports drink or supplement containing this ingredient should be avoided.

Sports drinks can help with long, hard workouts that are more than one hour long. During these workouts, the body needs carbohydrates and water. Added sodium and potassium will not do much good unless the athlete sweats profusely for more than four hours. Water works as well as anything else if exercise lasts less than one hour. The real value of sports beverages lies in the carbohydrates, sugars, and other energy compounds that help feed the muscles and delay fatigue.

Dietary Fiber

dietary fiber *The indigestible component of plants that are consumed by humans.*

Dietary fiber is the indigestible component of plant material that humans consume. Fiber is found in all plant foods, such as grains, beans, lentils, fruits, and vegetables. Even though the nutritional component of fiber is not essential, fiber keeps the digestive tract running smoothly.