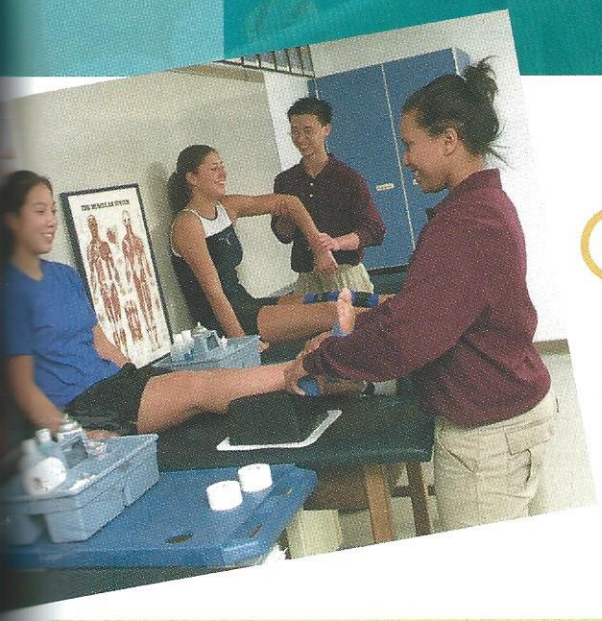

CHAPTER 8

Nutrition and the Athlete

KEY TERMS

anorexia nervosa
body mass index (BMI)
bulimia
calorie
carbohydrate
Daily Value (DV)
dietary fat
dietary fiber
disaccharide
energy
fat-soluble vitamin
fatty acid
female athlete triad
Food Guide Pyramid
insulin
mineral
monosaccharide
monounsaturated fatty acid
nutrition
polysaccharide
polyunsaturated fatty acid
protein
saturated fatty acid
trans fatty acid
vitamin
water-soluble vitamin

OBJECTIVES

Upon completion of this chapter, the reader should be able to:

- Explain how good nutritional habits lead to increased athletic performance and good health
- Discuss the relationship of energy to food
- Describe the seven food components and their importance to nutrition
- Explain the importance of vitamins and minerals to a sound diet
- Compare and contrast the four food pyramids outlined in the chapter
- Define nutritional quackery
- Discuss proper weight control
- Discuss the underlying reasons for disordered eating

NUTRITION

nutrition The process by which a living organism assimilates food and uses it for growth and replacement of tissues; the science or study that deals with food and nourishment.

Nutrition can be defined as the process by which a living organism assimilates food and uses it for growth and for replacement of tissues. *Nutrition* also refers to the field of science or study that deals with food and nourishment.

Athletic performance can be attributed in part to a sound understanding of nutritional principles. Proper nutrition can reduce the likelihood of injury and allow the athlete to perform at a higher level. It is important for athletes to understand the difference between fads and nutritional science.

ENERGY

energy The power used to do work or to produce heat or light.

Energy is the power used to do work or to produce heat or light. Energy cannot be created or destroyed, but it can be changed from one form to another. For example, when a piece of coal burns, the energy locked up in the chemicals in the coal is converted to heat and light.

Energy comes from the sun, and in that form is called *solar energy*. Living plants are able to convert solar energy to chemical energy by a process called *photosynthesis* (Figure 8-1). This chemical energy is used to make other substances such as protein, carbohydrates, and fat, all of which provide energy.

Fun Facts

March is National Nutrition Month!

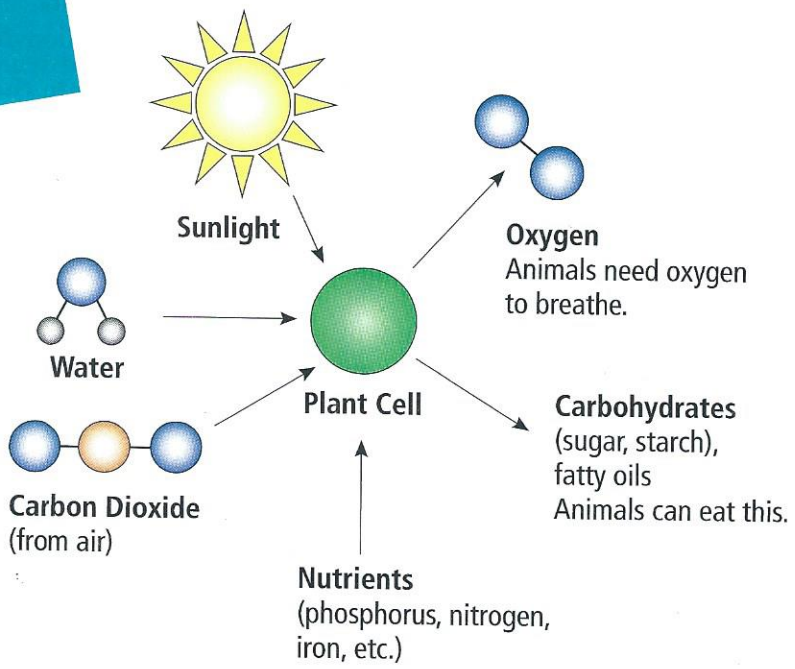

Figure 8-1 The process of photosynthesis

KEY CONCEPT

Athletic performance can be enhanced by a sound understanding of nutritional principles. An athlete who follows a proper diet will have fewer injuries and perform at a higher level.

DID YOU KNOW . . .

Good nutrition enhances appearance and is commonly exemplified by shiny hair, clear skin, clear eyes, erect posture, alert expression, and firm flesh on well-developed bone structures. Good nutrition aids emotional adjustment, provides stamina, and promotes a healthy appetite. It also helps establish regular sleep and elimination habits.

Animals cannot use solar energy directly, but can use the chemical energy contained in plants or other animals. They can oxidize carbohydrate, fat, and protein (and alcohol) to produce energy, carbon dioxide, and water. The energy is needed:

- to maintain body functions (for example, to breathe, to keep the heart beating, to keep the body warm, and to carry out all the other functions that maintain life)
- for active movement (for example, muscle contraction)
- for growth and repair, which require new tissues to be made

When energy is being used, some heat is nearly always generated.

In nutrition, energy is measured as calories. A **calorie** (cal) is defined as the energy needed to raise the temperature of 1 gram of water from 14.5° to 15.5° Celsius (C) (Figure 8-2). People use large amounts of energy, so nutritionists use larger units. One kilocalorie (kcal) equals 1,000 calories. To make things simple, nutritionists calculate kcals as one calorie. As an example, a 2,000-kcal diet really consists of 2,000,000 calories!

calorie *The energy needed to raise the temperature of one gram of water from 14.5° to 15.5° Celsius.*

The number of kcals in food is the food's energy value. Energy values of foods vary a great deal because they are determined by the types and amounts of nutrients each food contains. For example:

- carbohydrate = 4 calories per gram
- protein = 4 calories per gram
- fat = 9 calories per gram
- alcohol = 7 calories per gram

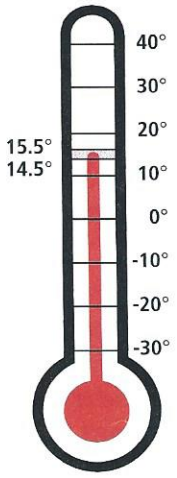

Figure 8-2 A calorie is the energy needed to raise the temperature of 1 gram of water from 14.5° to 15.5° Celsius.

KEY CONCEPT

In nutrition, energy is measured as calories. Calories define the energy value of foods.

FOOD COMPONENTS

The human body must have a balanced diet consisting of the following seven food components or nutrients.

- carbohydrates
- proteins
- fats
- vitamins
- minerals
- water
- fiber

A balanced combination of these seven components will allow the growth, repair, and maintenance of all tissues within the human body.

Carbohydrates

carbohydrate *An essential nutrient that provides the primary source of fuel for the body; sugars and starches.*

Carbohydrates are the body's primary source of fuel (glucose) for energy. This family of substances includes simple carbohydrates (sugars) and complex carbohydrates (starches). Though both types end up as glucose, foods that are high in complex carbohydrates, such as grains and vegetables, usually supply a good-health bonus of vitamins, minerals, and fiber as well (Figure 8-3). Simple carbohydrates, from candy, cake, table sugar, syrups, sweetened cereals, and other sources of concentrated sugar, contribute "empty" calories that provide energy but no nutrients.

DID YOU KNOW . . .

Carbohydrates are named for the chemical elements they are composed of: carbon, hydrogen, and oxygen.

Before carbohydrates can be used by the body, they must be broken down in the intestines by digestive enzymes into simple sugars: glucose, fructose (fruit sugar), and galactose (a component of milk sugar). Some of the glucose is used immediately for energy; the rest is stored in the liver, muscles, and fat cells in the form of glycogen and fat for future use. (Fructose and galactose, however, must first be converted by the liver to glucose.) After a meal, the hormone **insulin**, which is produced in the pancreas, lowers the level of glucose in the blood by stimulating body cells to take up and store excess glucose. When a person's blood sugar is low—say, before breakfast or after exercise—another pancreatic hormone, glucagon, stimulates the conversion of liver glycogen back to glucose, preparing it to be returned to the bloodstream.

insulin *A hormone, produced in the pancreas, that lowers the level of glucose in the blood by stimulating cells to store excess glucose.*

When a person has diabetes, a shortage or absence of insulin prevents glucose from moving into the cells. Insulin also plays an important role in preventing an excessive release of glucose from the liver in between meals. Eating sugar does not cause the disease—individuals with diabetes have to watch their total carbohydrate intake, rather