Glucose is the most abundant monosaccharide in nature. It is also the most important monosaccharide nutritionally for animals because glucose provides energy for cellular activities. The carbohydrates we eat are broken down into glucose, which may be used immediately by cells or stored in the liver as glycogen for later use. Glucose is also found in some fruits, corn, and the sap of plants.

Fructose, also called *fruit sugar,* is found in most fruits and in honey. The sweetest naturally occurring sugar, fructose is sweeter than table sugar. Because of its sweetness, fructose is sometimes used as a low-calorie sweetener because less fructose is needed to produce the same sweetness that table sugar does.

FIGURE 2 Most of the sugar produced throughout the world comes from sugar beets such as those shown here, or from sugar cane.

Disaccharides

Generally, when someone asks for "sugar," the person is asking for the disaccharide *sucrose*, $C_{12}H_{22}O_{11}$. *A* **disaccharide** *is a sugar that consists of two monosaccharide units that are joined together.* Like monosaccharides, disaccharides have polar hydroxy groups in their molecular structures and therefore are water soluble. A molecule of sucrose forms when a glucose molecule bonds to a fructose molecule. Commercially available sugar comes from sugar cane or sugar beets, such as those shown in **Figure 2.** Another important disaccharide is *lactose*, or milk sugar. Lactose is made up of a sugar called *galactose* and glucose. Human milk is 7 to 8% lactose, but cow's milk is only 4% to 5% lactose. Infant formula may be enriched with lactose to simulate human milk.

Carbohydrate Reactions

Carbohydrates undergo two important kinds of reactions: condensation reactions and hydrolysis reactions. *A* **condensation reaction** *is a reaction in which two molecules or parts of the same molecule combine.* **Figure 3** shows a condensation reaction in which a molecule of glucose combines with a molecule of fructose to yield a molecule of sucrose. Note that in this reaction a molecule of water is also formed.

Disaccharides and longer-chain polysaccharides can be broken down into smaller sugar units by hydrolysis. **Hydrolysis** *is a chemical reaction between water and another substance to form two or more new substances.* Sucrose will undergo a hydrolysis reaction with water, forming glucose and fructose. This hydrolysis, or "water-splitting," reaction occurs in many common processes, such as in the making of jams and jellies.

FIGURE 3 The disaccharide sucrose is formed by a condensation reaction between glucose and fructose.