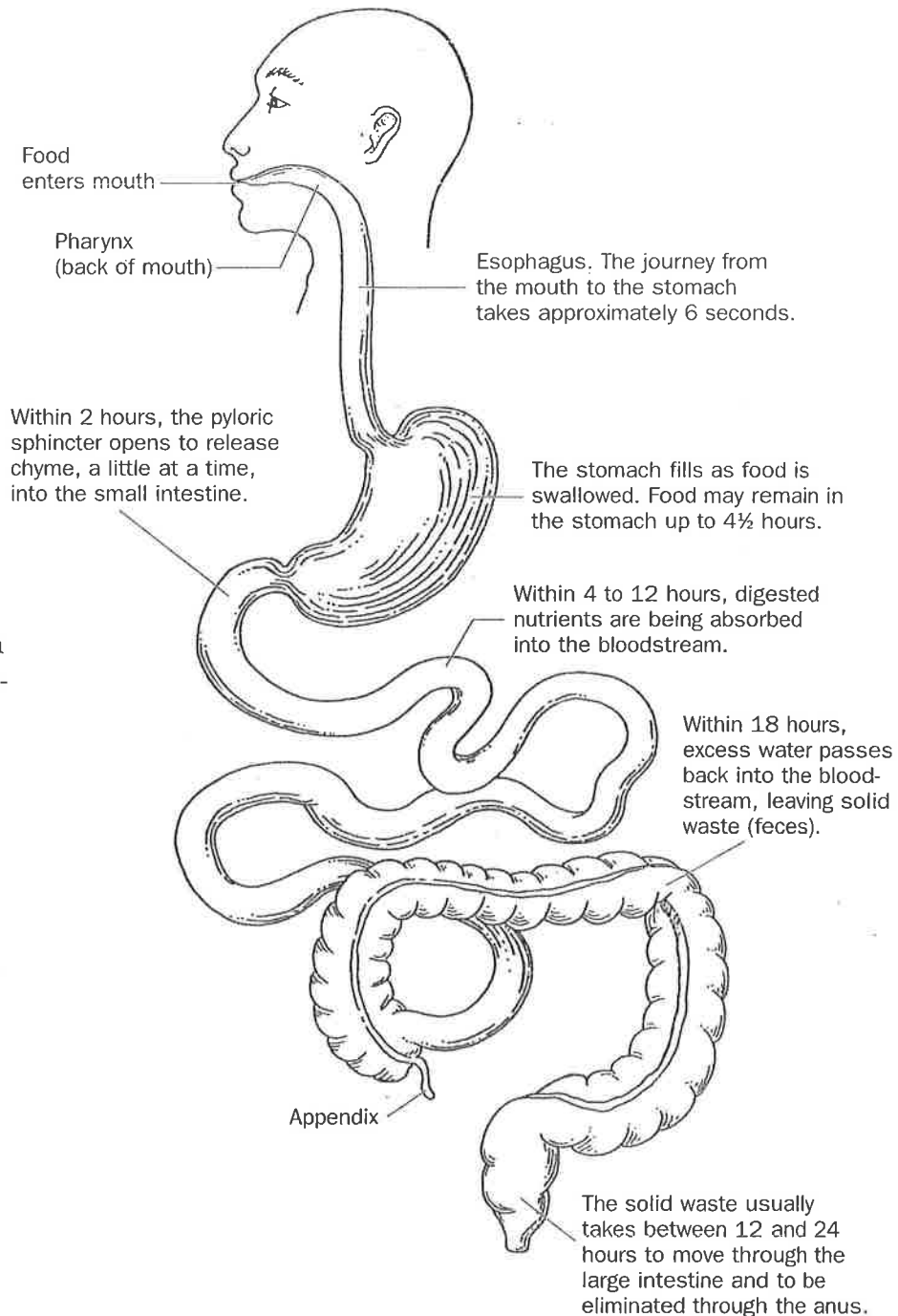


Moving Through the Digestive Tract



BACKGROUND

The purpose of digestion is to break foods down into a form that can be absorbed into the bloodstream and transported to the cells of the body. Digestion is not a single activity but a series of processes. These processes can be mechanical or chemical.

- **Mechanical digestive processes** include the tearing and grinding action of the teeth, the mixing and mashing action of the tongue, the churning of food by the muscles that line the walls of the digestive tract, and the breaking down of large fat droplets into smaller ones through the action of bile.
- **Chemical digestive processes** are a series of actions whose purpose is to break down the chemical bonds in nutrients so that they can be absorbed into the bloodstream. Chemical digestion is accomplished by the digestive enzymes.

The distinction between mechanical and chemical digestion is not always clear-cut. You may simply tell students that mechanical digestion prepares food for the more complex process of chemical digestion.

Figure 2.1 Simplified illustration of the human digestive tract and the digestive processes

Digestion in the Stomach

BACKGROUND

Once food has been processed in the mouth and swallowed, it enters the stomach. Depending on its volume and composition, food remains in the stomach for up to 4 hours. As shown in Figure 5.1, the longer the food remains in the stomach, the smaller the particles become.

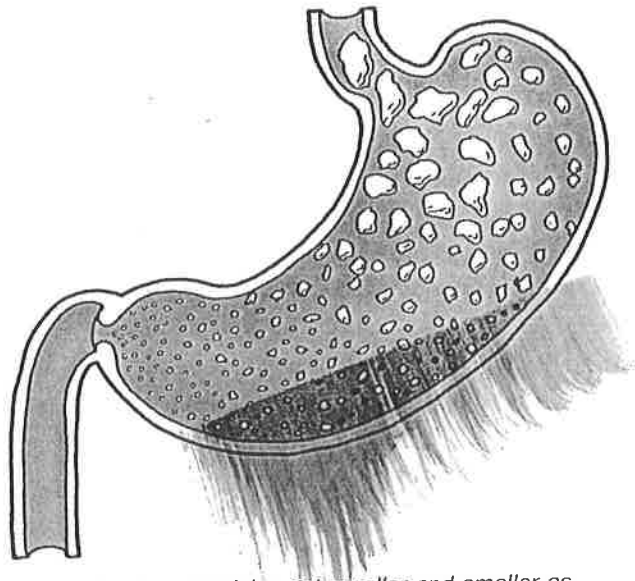


Figure 5.1 Food particles get smaller and smaller as they are processed in the stomach.

Embedded in the folds of the stomach wall are glands that secrete HCl, a digestive enzyme called **pepsin**, and mucus. The role of HCl is to activate the pepsin, which begins the chemical breakdown of proteins. Carbohydrates and fats continue to be mixed and broken down by muscular contractions of the stomach; however, they are not acted on by the chemicals secreted in the stomach.

The stomach also secretes mucus, a thick substance that helps protect the stomach walls from the powerful gastric juice. (When the supply of mucus is inadequate, the gastric juice begins to digest the stomach wall. If this process continues, the individual may develop an **ulcer**, which is a small perforation in the lining of the stomach.)

Eventually, the stomach contents turn into a thick, uniform liquid called **chyme**. As the chyme is pushed forward by the peristaltic action of the stomach muscles, the **pyloric sphincter**, which is the opening to the small intestine, opens. Chyme is released, a little at a time, into the small intestine, as shown in Figure 5.2.

The digestive processes in the stomach generally occur quite smoothly. Two minor conditions may cause problems. When the stomach is overworked or too full, its acidic contents may back up into the esophagus. This causes a condition called heartburn. The word is a misnomer, because the burning sensation is in the esophagus, not the heart. Heartburn can usually be relieved by taking an antacid.

When the stomach becomes upset as a result of a reaction to food or illness, the stomach muscles constrict violently in the opposite direction from

normal (reverse peristalsis). This is what causes vomiting. During that process, the contents of the stomach and of the upper part of the small intestine are eliminated rapidly from the body.

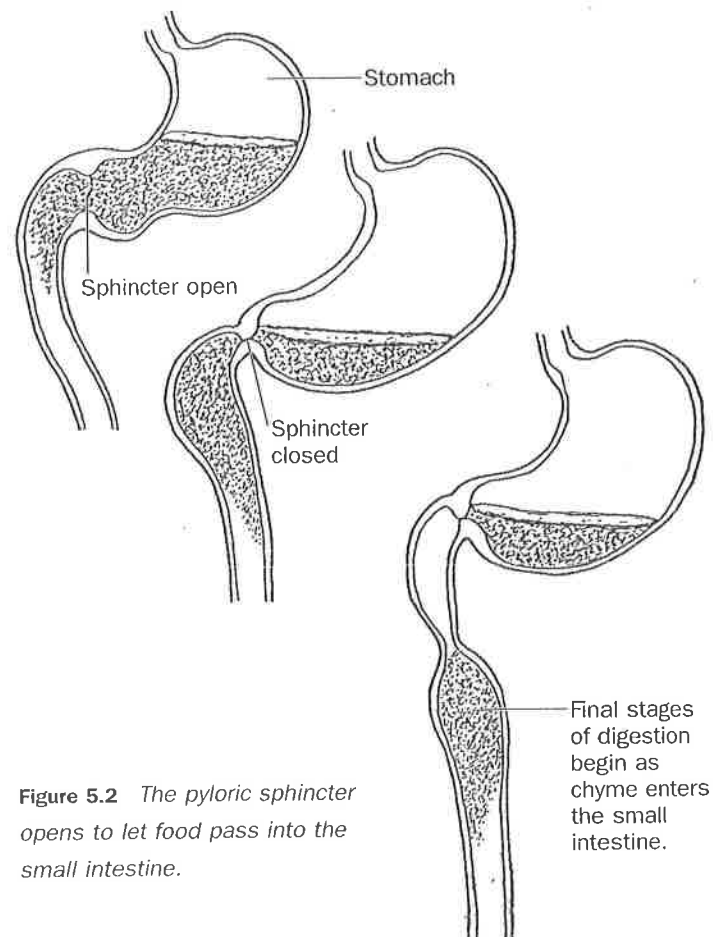


Figure 5.2 The pyloric sphincter opens to let food pass into the small intestine.

The human digestive tract (see Figure 2.1) is a single, convoluted tube that is about 8 to 10 meters (m) long. Its walls are composed of an inner layer of circular muscle that is surrounded by a layer of longitudinal muscle. (The stomach has a third layer composed of diagonal muscle.) These muscular layers are held together by connective tissue and are covered and protected by epithelial tissue.

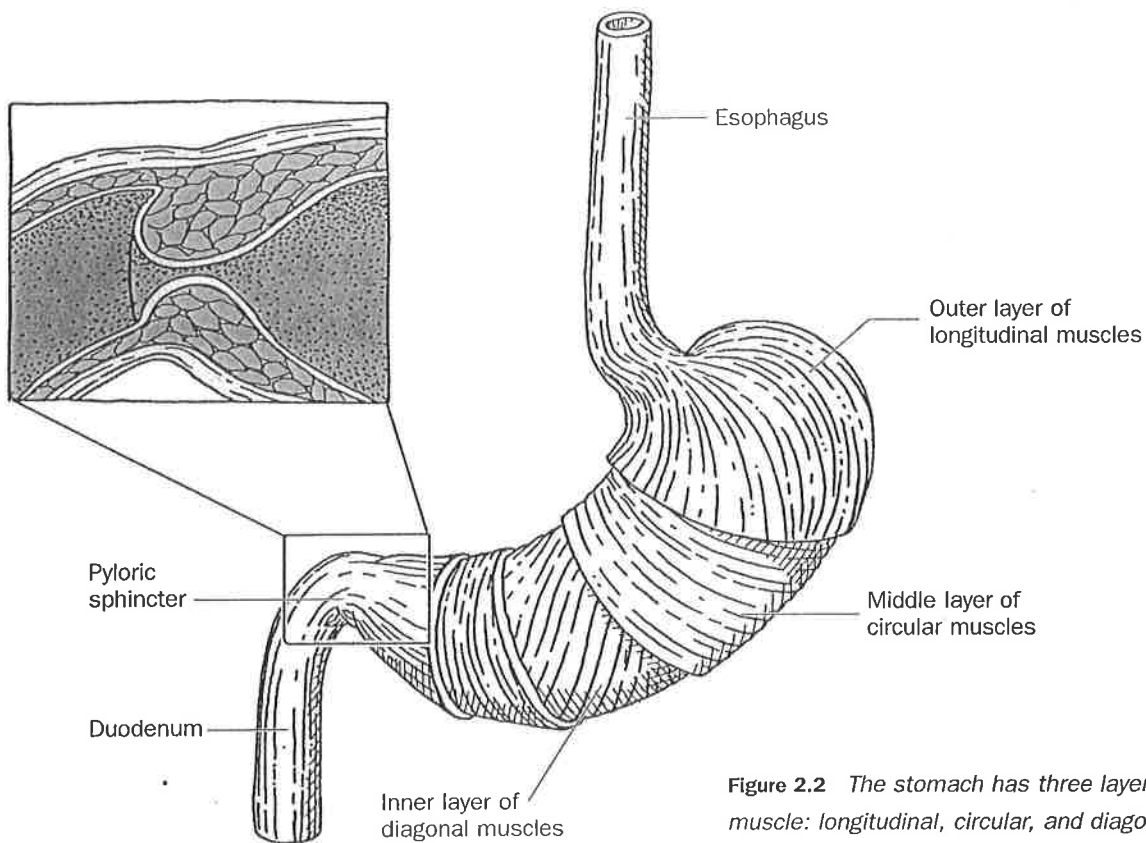


Figure 2.2 The stomach has three layers of muscle: longitudinal, circular, and diagonal. The inset at the left shows a transverse view of the pyloric sphincter.

The sphincters control the passage of food from one area to another. For example, the pyloric sphincter (see Figure 2.2) helps regulate the passage of food into the small intestine.