

# chapter 59

## Physiology of the Digestive System

### Objectives

AFTER STUDYING THIS CHAPTER, THE STUDENT WILL BE ABLE TO:

1. Review roles of the main digestive tract structures.
2. List common signs and symptoms affecting gastrointestinal functions.
3. Identify general categories of drugs used to treat gastrointestinal disorders.
4. Discuss the effects of nongastrointestinal drugs on gastrointestinal functioning.

### OVERVIEW

The digestive system consists of the alimentary canal (a tube extending from the oral cavity to the anus, approximately 25 to 30 feet [7.5 to 9 m] long) and the accessory organs (salivary glands, gallbladder, liver, and pancreas). The main function of the system is to provide the body with fluids, nutrients, and electrolytes in a form that can be used at the cellular level. The system also disposes of waste products that result from the digestive process.

The alimentary canal has the same basic structure throughout. The layers of the wall are mucosa, connective tissue, and muscle. Peristalsis propels food through the tract and mixes the food bolus with digestive juices. Stimulation of the parasympathetic nervous system (by vagus nerves) increases motility and secretions. The tract has an abundant blood supply, which increases cell regeneration and healing. Blood flow increases during digestion and absorption. Blood flow decreases with strenuous exercise, sympathetic nervous system stimulation (ie, “fight or flight”), aging (secondary to decreased cardiac output and atherosclerosis), and conditions that shunt blood away from the digestive tract (eg, heart failure, atherosclerosis).

### ORGANS OF THE DIGESTIVE SYSTEM

#### Oral Cavity

In the oral cavity, chewing mechanically breaks food into smaller particles, which can be swallowed more easily and provide a larger surface area for enzyme action. Food is also mixed with saliva, which lubricates the food bolus for swallowing and initiates the digestion of starch.

#### Esophagus

The esophagus is a musculofibrous tube about 10 inches (25 cm) long; its main function is to convey food from the pharynx to the stomach. It secretes a small amount of mucus and has some peristaltic movement.

#### Stomach

The stomach is a dilated area that serves as a reservoir. It churns and mixes the food with digestive juices, secretes mucus, hydrochloric acid, and enzymes, starts protein breakdown, and secretes intrinsic factor, which is necessary for absorption of vitamin B<sub>12</sub> from the ileum. Although there is much diffusion of water and electrolytes through the gastric mucosa in both directions, there is little absorption of these substances. Carbohydrates and amino acids are also poorly absorbed. Only a few highly lipid soluble substances, such as alcohol and some drugs, are absorbed in moderate quantities from the stomach.

The inlet of the stomach is the end of the esophagus, and the outlet is the pyloric sphincter at the beginning of the duodenum. The stomach normally holds about 1000 mL comfortably and empties in about 4 hours. Numerous factors influence the rate of gastric emptying, including the size of the pylorus, gastric motility, type of food, fluidity of chyme (the material produced by gastric digestion of food), and the state of the duodenum. Factors that cause rapid emptying include carbohydrate foods, increased motility, fluid chyme, and an empty duodenum. The stomach empties more slowly with decreased gastric tone and motility, fatty foods, chyme of excessive acidity, and a duodenum that contains fats, proteins, or chyme of excessive acidity.