The Digestive System

After studying this chapter, you will be able to:

14.1 Name the parts of the digestive system and discuss the function of each part
14.2 Define combining forms used in building words that relate to the digestive system
14.3 Identify the meaning of related abbreviations
14.4 Name the common diagnoses, clinical procedures, and laboratory tests used in treating disorders of the digestive system
14.5 List and define the major pathological conditions of the digestive system
14.6 Explain the meaning of surgical terms related to the digestive system
14.7 Recognize common pharmacological agents used in treating disorders of the digestive system

Structure and Function

The three basic functions of the digestive system are as follows:

1. **Digestion** is the process of breaking down foods into nutrients that can be absorbed by cells. **Mechanical digestion** takes place in the mouth by chewing and in the stomach by churning actions. **Chemical digestion** takes place in the mouth by the addition of the saliva and continues in the stomach with the addition of digestive juices to chemically break down the food into simpler elements.

2. **Absorption** is the passing of digested nutrients into the bloodstream. This primarily occurs in the small intestines.

3. **Elimination** is the conversion of any residual material from a liquid to a solid and removal of that material from the alimentary canal via defecation.

The digestive system consists of the **alimentary canal** (digestive tract or gastrointestinal tract) and several accessory organs. Food enters the alimentary canal through the **mouth**, passes through the **pharynx** and **esophagus** into the **stomach**, then into the **small intestine** and **large intestine** or **bowels**, and then into the **anal canal**. Figure 14-1a shows the digestive system, and Figure 14-1b diagrams the digestive process.

The alimentary canal is a tube that extends from the mouth to the **anus**. The wall of the alimentary canal has four layers that aid in the digestion of the food that passes through it.
FIGURE 14-1  (a) The process of digestion begins in the mouth. (b) A diagram of the pathway of food through the body.
The outer covering is a serous (watery) layer of tissue that protects the canal and lubricates the outer surface so that organs within the abdominal cavity can slide freely near the canal. The next layer is the muscular layer, which contracts and expands in wavelike motions called peristalsis, to move food along the canal. The third layer is made of loose connective tissue that holds various vessels, glands, and nerves that both nourish and carry away waste from surrounding tissue. The innermost layer is a mucous membrane that secretes mucus and digestive enzymes while protecting the tissues within the canal.

Digestive enzymes convert complex proteins into amino acids, compounds that can be absorbed by the body. Complex sugars are reduced to glucose and other simpler sugars, and fat molecules are reduced to fatty acids and other substances through the action of the digestive enzymes.

**Mouth**

The lips sense the food that is about to enter the mouth. They sense the temperature and texture of the food and can thus protect the mouth from receiving food that is too hot or too rough on the surface. Once food is taken into the oral cavity (mouth), it is chewed with the help of the muscles of the cheeks (the walls of the oral cavity), and the tongue (which moves food during mastication, chewing). The last mechanical process that takes place in the mouth is deglutition (swallowing). The tongue has papillae, small raised areas that contain the taste buds (cells that provide the sensation of taste). The tongue is connected to the floor of the mouth by a mucous membrane called a frenulum. At the back of the tongue, lingual tonsils form two rounded mounds of lymphatic tissue that play an important role in the immune system (see Chapter 13).

The roof of the mouth is formed by the hard palate, the hard anterior part of the palate with irregular ridges of mucous membranes called rugae, and the soft palate, the soft posterior part of the palate. At the back of the soft palate is a downward cone-shaped projection called the uvula. During swallowing, the soft palate and the uvula direct food downward into the esophagus, thus preventing any food from entering the sinus area. On either side of the back of the mouth are rounded masses of lymphatic tissue called the palatine tonsils. The mouth also contains the gums, the fleshy sockets that hold the teeth. Chapter 21 discusses the teeth.

Digestion of food begins in the mouth with mastication. In addition, the three sets of salivary glands surrounding the oral cavity secrete saliva, a fluid containing enzymes (such as amylase, an enzyme that begins the digestion of carbohydrates) that aid in breaking down food. Each gland has ducts through which the saliva travels to the mouth. The three pairs of salivary glands are the parotid glands, located inferior to the cheekbone; the submandibular glands, located below the mandible; and the sublingual glands, located in the base of the mouth below the tongue (Figure 14-2).

**Pharynx**

From the mouth, food goes through the pharynx (throat). Both food and air share this passageway. The pharynx is a muscular tube (about 5 inches long in adults) that moves food into the esophagus. Air moves through the
trachea (windpipe). When we eat and swallow food, a flap of tissue (the epiglottis) covers the trachea until the food is moved into the esophagus. The epiglottis prevents food from entering the larynx (the voice box). Food that happens to get into the larynx when we are eating causes choking.

**Esophagus**

The esophagus is a muscular tube (9 to 10 inches long in the average adult) that contracts rhythmically (peristalsis) to push food toward the stomach. At the bottom of the esophagus, just above the stomach, is a group of thickened muscles in the esophageal wall called the lower esophageal sphincter or

**MORE ABOUT . . .**

### Choking

People have died of choking, even when efforts were made to save them. If an object such as a chicken bone became lodged in the windpipe, it was difficult to remove it while still allowing the person to breathe. A doctor, Harry J. Heimlich, discovered that a simple series of movements can prevent choking to death in most cases. The movements involve placing arms around the abdomen just below the diaphragm, grasping fists, and thrusting upward to dislodge the item. Testimony from around the world affirms that this maneuver is put to good use every day.
The cardiac sphincter is a group of muscles that regulates the opening and closing of the stomach entrance. As the swallowed food is advanced toward the stomach by the peristaltic wave, the cardiac sphincter will open briefly. Once the food is in the stomach, it will close. This prevents reflux (backflow) and emesis or regurgitation (vomiting). Every time more food comes through the esophagus to the stomach, the muscles relax and allow the food to pass.

**Stomach**

The stomach is a pouchlike organ in the left hypochondriac region of the abdominal cavity. The stomach receives food from the esophagus and mixes it with gastric juice. The enzyme pepsin in the gastric juice begins protein digestion. Table 14-1 shows the major components of gastric juice. Gastric juice is produced by the gastric glands, which are stimulated to produce this substance continuously but in varying amounts depending on the amount of food being absorbed.

The stomach has four regions (Figure 14-3).

- The cardiac region, the region closest to the heart, is where the cardiac sphincter allows food to enter the stomach and prevents regurgitation.

<table>
<thead>
<tr>
<th>Component</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>pepsin</td>
<td>digests almost all types of protein</td>
</tr>
<tr>
<td>hydrochloric acid</td>
<td>provides acidic environment for action of pepsin</td>
</tr>
<tr>
<td>mucus</td>
<td>provides alkaline protective layer on the inside of the stomach wall</td>
</tr>
</tbody>
</table>

**FIGURE 14-3** The stomach has four regions and rugae in its lining.
If the cardiac sphincter does not close completely, or if it fails to remain closed, stomach juices can splash into the esophagus where there is no protective lining. This causes extreme burning known as heartburn.

- The **fundus** is the upper, rounded portion of the stomach.
- The **body** is the middle portion.
- The **pylorus**, the narrowed bottom part of the stomach, has a powerful, circular muscle at its base, the *pyloric sphincter*. This sphincter controls the emptying of the stomach’s contents into the small intestine.

Stomach juices are extremely acidic in order for them to digest food. The lining of the stomach (and of the intestines) serves to protect the cells of the lining from being affected by the digestive juices in the stomach. The lining is relatively thick with many folds of mucous tissue called *rugae*. As the stomach fills up, the wall distends and the folds disappear.

After eating, the muscular movements of the stomach and the mixing of food with gastric juice forms a semifluid mass called *chyme*. Chyme may consist of food that has been in the stomach for several hours, or it may contain food that is broken down in as little as one hour. The type of food and the amounts eaten determine how long it takes for the stomach to release the chyme. The muscles of the stomach release the chyme in small batches at regular intervals into the small intestine, where further digestion takes place.

**Small Intestine**

The small intestine receives chyme from the stomach, bile from the liver, and pancreatic juice from the pancreas (Figure 14-4). The small intestine has the following three parts:

1. The **duodenum** is only about 10 inches long. In it, chyme mixes with bile to aid in fat digestion; with pancreatic juice to aid in digestion of starch, proteins, and fat; and with intestinal juice to aid in digesting sugars (glucose). Glands in the walls of the small intestine excrete intestinal...
juice. The juices also help change starch (glycogen) into glucose. The entire small intestine is lubricated by secretions from mucous glands. The small intestine is lined with villi (singular, villus), tiny, one-cell-thick finger-like projections with capillaries through which digested nutrients are absorbed into the bloodstream and lymphatic system.

2. The jejunum is an eight-foot long section of the small intestine in which the digestive process continues.

3. The ileum connects the small intestine to the large intestine. Located at the bottom of the ileum is the ileocecal sphincter muscle that relaxes to allow undigested and unabsorbed food material into the large intestine in fairly regular waves. Other muscular contractions segment the ileum and prevent waste material in the large intestine from backing up into the small intestine.

Together, the three sections of the small intestine are about 20 feet long from the stomach to the large intestine. The small intestine lies within the abdominopelvic cavity, where it is held in place by the mesentery, a membranous tissue that attaches both the small and large intestines to the muscle wall at the dorsal part of the abdomen. Absorption (passage of material through the walls to the bloodstream) begins in the small intestine. Chyme takes from one to six hours to travel through the small intestine before it enters the large intestine. The length of time for digestion varies depending on the food being digested and the health of the digestive system.

**Large Intestine**

The large intestine (Figure 14-5), which is about five feet long, has the following four parts:

1. The cecum is a pouch attached to the bottom of the ileum of the small intestine. The cecum has three openings: one from the ileum into the cecum; one from the cecum into the colon; and another from the cecum into a wormlike pouch on the side, the appendix (also called the vermiform appendix). The appendix is filled with lymphatic tissue, but is considered an appendage, an accessory part of the body that has no central function, because it no longer has a role in the digestive process. The appendix can, however, become inflamed and may require surgical removal. Within the cecum, the process of turning waste material into semisolid waste (feces) begins, as water and certain necessary substances are absorbed back into the bloodstream. As the water is removed, a semisolid mass is formed and moved into the colon.

---

**MORE ABOUT . . .**

**Intestinal Health**

Intestinal health is often directly related to the amount of fiber in a person’s diet. In 2005, the federal nutritional guidelines specifically recommended an increase in fibrous foods as a boost to general health and especially to digestive health. The most fibrous foods include vegetables, fruits, and whole grains. Nutritional labels on food give the amount of dietary fiber per serving. It is generally recommended that a person ingest 25 grams of fiber per day.
2. The next section is the colon. The colon is further divided into three parts—the ascending colon, the transverse colon, and the descending colon. The ascending colon extends upward from the cecum to a place under the liver where it makes a right-angle bend known as the hepatic flexure. After the bend, the transverse colon continues across the abdomen from right to left where it makes a right-angle bend (the splenic flexure) toward the spleen. After the bend, the descending colon extends down to the rim of the pelvis where it connects to the sigmoid colon.

3. The sigmoid colon is an s-shaped body that goes across the pelvis to the middle of the sacrum, where it connects to the rectum.

4. The rectum attaches to the anal canal. Feces (stool) then pass from the anal canal into the anus. The anus and anal canal open during the release of feces from the body (defecation).

The entire large intestine forms a rectangle around the tightly packed small intestine. Undigestible waste products from digestion usually remain in the large intestine from 12 to 24 hours.

Liver

The liver is an important digestive organ located in the right, upper quadrant of the abdominal cavity. Although it is not within the digestive tract, it performs many digestive functions. The liver is a relatively large organ weighing about 3 pounds in the average adult. It is divided into two lobes, the right lobe and the left lobe (Figure 14-6).
The hepatic portal system is the group of blood vessels that transports blood and other substances to and from the liver. This system is particularly important in regard to the newly absorbed nutrients and other, possibly more harmful, substances that may have been ingested. The portal vein within this system directs all blood from the small intestines, with the newly absorbed substances from the villi, directly to the liver where there will be some filtration of harmful substances and some conversion of nutrients and medication into a form usable by the body.

Aside from changing food nutrients into usable substances, the liver also secretes bile (a yellowish-brown to greenish fluid), which is stored in the gallbladder for use in breaking down fats and other digestive functions. It stores glucose and certain vitamins for release when the body needs them. The liver also secretes bilirubin, a bile pigment that is combined with bile and excreted into the duodenum.

**Gallbladder**

The bile released from the liver to the hepatic duct is then released into the cystic duct, which brings the substance into the gallbladder. The gallbladder performs two functions. It stores bile until it is needed for digestion and it concentrates bile by removing some of the water. Bile is thicker and richer in the gallbladder than it is in the liver, which is why gallstones form in the gallbladder. Then the bile is forced out of the cystic duct into the common bile duct.

At the entrance to the duodenum, bile mixes with pancreatic juices and enters the duodenum from the common bile duct. There the bile aids in emulsification, the breaking down of fats.

**Pancreas**

The chyme that empties into the small intestine mixes with secretions from the pancreas and liver. The pancreas is five to six inches long and lies across the posterior side of the stomach. The pancreas is a digestive organ in that it secretes digestive fluids into the small intestine through its system of ducts. The digestive fluid is called pancreatic juice, which includes various enzymes such as amylase and lipase. The pancreas is also an endocrine gland that regulates blood sugar through the release of insulin (a hormone) and, as such, is discussed in Chapter 15.

**Vocabulary Review**

In the previous section, you learned terms relating to the digestive system. Before going on to the exercises, review the terms below and refer to the previous section if you have any questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. The etymologies (word histories) are for your information only. You do not need to memorize them.

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>absorption [əb-ˈsər-p-shən] Latin absorbptio, a swallowing</td>
<td>Passing of nutrients into the bloodstream.</td>
</tr>
<tr>
<td>alimentary [əl-ˈmən-tə-rē] canal</td>
<td>Muscular tube from the mouth to the anus; digestive tract; gastrointestinal tract.</td>
</tr>
<tr>
<td>Term</td>
<td>Meaning</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>amino [ā-MÉ-nō] acid</td>
<td>Chemical compound that results from digestion of complex proteins.</td>
</tr>
<tr>
<td>amylase [ÄM-il-äs]</td>
<td>Enzyme that is part of pancreatic juice and saliva and that begins the digestion of carbohydrates.</td>
</tr>
<tr>
<td>anal [Ä-nāl] canal</td>
<td>Part of the digestive tract extending from the rectum to the anus.</td>
</tr>
<tr>
<td>anus [Ä-nūs]</td>
<td>Place at which feces exit the body.</td>
</tr>
<tr>
<td>appendage [ā-PĔN-dīj]</td>
<td>Any body part (inside or outside) either subordinate to a larger part or having no specific central function.</td>
</tr>
<tr>
<td>bile [bīl]</td>
<td>Yellowish-brown to greenish fluid secreted by the liver and stored in the gallbladder; aids in fat digestion.</td>
</tr>
<tr>
<td>bilirubin [bīl-i-RŬ-bĭn]</td>
<td>Pigment contained in bile.</td>
</tr>
<tr>
<td>body</td>
<td>Middle section of the stomach.</td>
</tr>
<tr>
<td>bowel [bōw-l]</td>
<td>Intestine.</td>
</tr>
<tr>
<td>cecum [SE-kūm]</td>
<td>Pouch at the top of the large intestine connected to the bottom of the ileum.</td>
</tr>
<tr>
<td>cheeks</td>
<td>Walls of the oral cavity.</td>
</tr>
<tr>
<td>chyme [kīm]</td>
<td>Semisolid mass of partially digested food and gastric juices that passes from the stomach to the small intestine.</td>
</tr>
<tr>
<td>colon [KŎ-lŏn]</td>
<td>Major portion of the large intestine.</td>
</tr>
<tr>
<td>digestion [dĭ-JĔS-chŭn]</td>
<td>Conversion of food into nutrients for the body and into waste products for release from the body.</td>
</tr>
<tr>
<td>duodenum [dŭ-ō-DE-nŭm]</td>
<td>Top part of the small intestine where chyme mixes with bile, pancreatic juices, and intestinal juice to continue the digestive process.</td>
</tr>
<tr>
<td>elimination [ē-lĭm-ĭ-NĂ-shŭn]</td>
<td>The conversion of waste material from a liquid to a semisolid and removal of that material via defecation.</td>
</tr>
<tr>
<td>emesis [ē-MĔ-sĕs]</td>
<td>See regurgitation.</td>
</tr>
<tr>
<td>enzyme [ĒN-zĭm]</td>
<td>Protein that causes chemical changes in substances in the digestive tract.</td>
</tr>
<tr>
<td>Term</td>
<td>Meaning</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>epiglottis [é-pi-GLÔ-tîs]</td>
<td>Movable flap of tissue that covers the trachea.</td>
</tr>
<tr>
<td>esophagus [é-SÔF-ä-gûs]</td>
<td>Part of alimentary canal from the pharynx to the stomach.</td>
</tr>
<tr>
<td>fatty acid</td>
<td>Acid derived from fat during the digestive process.</td>
</tr>
<tr>
<td>feces [FE-sëz]</td>
<td>Semisolid waste that moves through the large intestine to the anus, where it is released from the body.</td>
</tr>
<tr>
<td>frenulum [FRÉN-ýû-lûm]</td>
<td>Mucous membrane that attaches the tongue to the floor of the mouth.</td>
</tr>
<tr>
<td>fundus [FŪN-duûs]</td>
<td>Upper portion of the stomach.</td>
</tr>
<tr>
<td>gallbladder [GÄWL-blåd-èr]</td>
<td>Organ on lower surface of liver; stores bile.</td>
</tr>
<tr>
<td>glucose [GLÜ-kôs]</td>
<td>Sugar found in fruits and plants and stored in various parts of the body.</td>
</tr>
<tr>
<td>glycogen [GLĪ-kō-jên]</td>
<td>Starch that can be converted into glucose.</td>
</tr>
<tr>
<td>gums [gûmz]</td>
<td>Fleshy sockets that hold the teeth.</td>
</tr>
<tr>
<td>hard palate [PÅL-åt]</td>
<td>Hard anterior portion of the palate at the roof of the mouth.</td>
</tr>
<tr>
<td>ileum [ÍL-è-ûm]</td>
<td>Bottom part of the small intestine that connects to the large intestine.</td>
</tr>
<tr>
<td>jejunum [jē-JU-nûm]</td>
<td>Middle section of the small intestine.</td>
</tr>
<tr>
<td>large intestine</td>
<td>Passageway in intestinal tract for waste received from small intestine to be excreted through the anus; also, place where water reabsorption takes place.</td>
</tr>
<tr>
<td>lingual tonsils [LÎNG-gwål TÖN-sîls]</td>
<td>Two mounds of lymph tissue at the back of the tongue.</td>
</tr>
<tr>
<td>lipase [LÎP-ås]</td>
<td>Enzyme contained in pancreatic juice.</td>
</tr>
<tr>
<td>lips</td>
<td>Two muscular folds formed around the outside boundary of the mouth.</td>
</tr>
<tr>
<td>liver [LÎV-èr]</td>
<td>Organ important in digestive and metabolic functions; secretes bile.</td>
</tr>
<tr>
<td>mesentery [MÉS-en-tër-è, MÉZ-en-tër-è]</td>
<td>Membranous tissue that attaches small and large intestines to the muscular wall at the dorsal part of the abdomen.</td>
</tr>
<tr>
<td>mouth</td>
<td>Cavity in the face in which food and water is ingested.</td>
</tr>
<tr>
<td>palatine [PÅL-å-tîn] tonsils</td>
<td>Mounds of lymphatic tissue on either side of the pharynx.</td>
</tr>
<tr>
<td>pancreas [PÄN-krë-ås]</td>
<td>Digestive organ that secretes digestive fluids; endocrine gland that regulates blood sugar.</td>
</tr>
<tr>
<td>papilla (pl., papillae) [pä-PÎL-å (-è)]</td>
<td>Tiny projection on the superior surface of the tongue that contains taste buds.</td>
</tr>
<tr>
<td>Term</td>
<td>Meaning</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>pepsin [PÆP-sin]</td>
<td>Digestive enzyme in gastric juice.</td>
</tr>
<tr>
<td>peristalsis [pɛr-ɪ-STÄL-sis]</td>
<td>Coordinated, rhythmic contractions of smooth muscle that force food through the digestive tract.</td>
</tr>
<tr>
<td>pharynx [FÄR-ɪŋks]</td>
<td>Tube through which food passes to the esophagus.</td>
</tr>
<tr>
<td>pylorus [pɪ-LŌR-ʊs]</td>
<td>Narrowed bottom part of the stomach.</td>
</tr>
<tr>
<td>rectum [RĒK-tūm]</td>
<td>Bottom portion of large intestine; connected to anal canal.</td>
</tr>
<tr>
<td>reflux [RĒ-flūks]</td>
<td>See regurgitation.</td>
</tr>
<tr>
<td>regurgitation [rē-GŪR-ji-TĀ-shūn]</td>
<td>Backward flow from the normal direction.</td>
</tr>
<tr>
<td>rugae [RŪ-ge]</td>
<td>Folds in stomach lining; irregular ridges of mucous membrane on the hard palate.</td>
</tr>
<tr>
<td>saliva [sā-LĪ-vā]</td>
<td>Fluid secreted by salivary glands; contains amylase.</td>
</tr>
<tr>
<td>salivary [SĀL-ɪ-vär-e] glands</td>
<td>Glands in the mouth that secrete fluids that aid in breaking down food.</td>
</tr>
<tr>
<td>sigmoid [SĪG-mōyd] colon</td>
<td>S-shaped part of large intestine connecting at the bottom to the rectum.</td>
</tr>
<tr>
<td>small intestine</td>
<td>Twenty-foot long tube that continues the process of digestion started in the stomach; place where most absorption takes place.</td>
</tr>
<tr>
<td>soft palate [PĀL-ät]</td>
<td>Soft posterior part of the palate in the mouth.</td>
</tr>
<tr>
<td>stomach [STŌM-åk]</td>
<td>Large sac between the esophagus and small intestine; place where food is broken down.</td>
</tr>
<tr>
<td>stool [stūl]</td>
<td>Feces.</td>
</tr>
<tr>
<td>throat</td>
<td>Pharynx.</td>
</tr>
<tr>
<td>tongue [tʊŋ]</td>
<td>Fleshy part of the mouth that moves food during mastication (and speech).</td>
</tr>
<tr>
<td>uvula [YŪ-ˈvyu-lā]</td>
<td>Cone-shaped projection hanging down from soft palate.</td>
</tr>
<tr>
<td>villus (pl., villi) [VĪL-ʊs (-ɪ)]</td>
<td>Tiny, fingerlike projection on the lining of the small intestine with capillaries through which digested nutrients are absorbed into the bloodstream and lymphatic system.</td>
</tr>
</tbody>
</table>
Complete the Diagram

1. Label the digestive system parts in the illustration on the right.
   a. _____________
   b. _____________
   c. _____________
   d. _____________
   e. _____________

Check Your Knowledge

For each of the following words, write C in the space provided if the word is spelled correctly. If it is not, spell the word correctly.

2. papilae _____________ 7. villi _____________
3. frenelum _____________ 8. amylase _____________
4. deglutition _____________ 9. lypase _____________
5. chime _____________ 10. bilirubin _____________
6. glycogen _____________

Fill in the Blanks

11. Food is moved along the alimentary canal by a process called _____________.
12. The four areas of the stomach are _____________, _____________, _____________, _____________, and _____________.
13. The three parts of the small intestine are the _____________, _____________, and _____________.
14. The four parts of the large intestine are the _____________, _____________, _____________, _____________, and _____________.
15. The longest intestine is the _____________ intestine.
16. A group of blood vessels that transports blood and other substances to and from the liver is called the _____________, _____________, _____________.
17. Two enzymes in pancreatic juice are _____________ and _____________.
18. Bile aids in the breaking down of fats, a process called _____________.
CASE STUDY

Getting a Referral

Asmin Sahib reported burning chest pains to her general practitioner. Ms. Sahib feared that the pains indicated that she was having a heart attack. After a thorough examination, including an ECG, the physician found Ms. Sahib to have no cardiovascular pathology. The general practitioner referred Asmin to Dr. Mary Walker, a gastroenterologist (specialist in the digestive system).

Critical Thinking

19. Why might Asmin feel she is having a heart attack?
20. What parts of the body will the gastroenterologist treat?

Combining Forms and Abbreviations

The lists below include combining forms and abbreviations that relate specifically to the digestive system. Pronunciations are provided for the examples.

<table>
<thead>
<tr>
<th>COMBINING FORM</th>
<th>MEANING</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>an(o)</td>
<td>anus</td>
<td>anoplasty [əⁿ-oʊ-PLĀS-tē], surgical repair of the anus</td>
</tr>
<tr>
<td>append(o), appendic(o)</td>
<td>appendix</td>
<td>appendicitis [â-pên-di-SĪ-tēs], inflammation of the appendix</td>
</tr>
<tr>
<td>bil(o), bili</td>
<td>bile</td>
<td>biliverdin [bĭl-ĭ-VĒR-dĭn], green bile pigment</td>
</tr>
<tr>
<td>bucc(o)</td>
<td>cheek</td>
<td>buccogingival [bŭk-ŏj-ĬN-ĭ-vāl], pertaining to the cheeks and gums</td>
</tr>
<tr>
<td>cec(o)</td>
<td>cecum</td>
<td>cecotomy [Sē-kō-pēk-ĕ], surgical repair or fixing of the cecum to correct excessive mobility</td>
</tr>
<tr>
<td>celi(o)</td>
<td>abdomen</td>
<td>celoma [SĒ-le-o-mā], tumor in the abdomen</td>
</tr>
<tr>
<td>chol(e), cholo</td>
<td>bile</td>
<td>choleic [kō-ĬL-ĭk], pertaining to bile</td>
</tr>
<tr>
<td>cholangi(o)</td>
<td>bile vessel</td>
<td>cholangiogram [kō-LĀN-jē-o-grām], x-ray image of the bile vessels</td>
</tr>
<tr>
<td>cholecyst(o)</td>
<td>gallbladder</td>
<td>cholecystectomy [kō-ĬL-ĭ-sis-TĒK-tō-mē], removal of the gallbladder</td>
</tr>
<tr>
<td>choledoch(o)</td>
<td>common bile duct</td>
<td>choledochotomy [kō-lēd-ŏ-KŌT-ŏ-mē], incision into the common bile duct</td>
</tr>
<tr>
<td>col(o), colon(o)</td>
<td>colon</td>
<td>colectomy [kō-LĒK-tō-mē], removal of all or part of the colon</td>
</tr>
<tr>
<td>duoden(o)</td>
<td>duodenum</td>
<td>duodenitis [dū-ŏd-ĕ-NĪ-tēs], inflammation of the duodenum</td>
</tr>
<tr>
<td><strong>COMBINING FORM</strong></td>
<td><strong>MEANING</strong></td>
<td><strong>EXAMPLE</strong></td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>enter(o)</td>
<td>intestines</td>
<td><em>enteropathy</em> [ên-tèr-ÔP-à-thè], any intestinal disease</td>
</tr>
<tr>
<td>esophag(o)</td>
<td>esophagus</td>
<td><em>esophagoscopy</em> [è-sôf-á-GÖS-kô-pê], examination of the interior of the esophagus</td>
</tr>
<tr>
<td>gastr(o)</td>
<td>stomach</td>
<td><em>gastralgia</em> [gás-TRÁL-jë-ä], stomachache</td>
</tr>
<tr>
<td>gloss(o)</td>
<td>tongue</td>
<td><em>glossopharyngeal</em> [GLÖS-ô-fâ-RÎN-jë-âl], of the tongue and pharynx</td>
</tr>
<tr>
<td>gluc(o)</td>
<td>glucose</td>
<td><em>glucogenesis</em> [glû-kô-JÉN-ë-sîs], formation of glucose</td>
</tr>
<tr>
<td>glyc(o)</td>
<td>sugar</td>
<td><em>glycosuria</em> [gli-kô-SÛ-re-ä], abnormal excretion of carbohydrates in urine</td>
</tr>
<tr>
<td>glycogen(o)</td>
<td>glycogen</td>
<td><em>glycogenolysis</em> [GLÎ-kô-jè-NÖL-î-sîs], breakdown of glycogen to glucose</td>
</tr>
<tr>
<td>hepat(o)</td>
<td>liver</td>
<td><em>hepatitis</em> [hèp-à-TÎ-tîs], liver disease or inflammation</td>
</tr>
<tr>
<td>ile(o)</td>
<td>ileum</td>
<td><em>ileitis</em> [îl-ë-Î-tîs], inflammation of the ileum</td>
</tr>
<tr>
<td>jejun(o)</td>
<td>jejunum</td>
<td><em>jejunostomy</em> [jè-jù-NÖS-tô-mê], surgical opening to the outside of the body for the jejunum</td>
</tr>
<tr>
<td>labi(o)</td>
<td>lip</td>
<td><em>labiaplasty</em> [LÂ-bè-ë-plås-të], surgical repair of lips</td>
</tr>
<tr>
<td>lingu(o)</td>
<td>tongue</td>
<td><em>linguodental</em> [líng-gwô-DÉN-tâl], pertaining to tongue and teeth</td>
</tr>
<tr>
<td>or(o)</td>
<td>mouth</td>
<td><em>orofacial</em> [ôr-ô-FÅ-shâl], pertaining to mouth and face</td>
</tr>
<tr>
<td>pancreat(o)</td>
<td>pancreas</td>
<td><em>pancreatitis</em> [pân-kra-à-TÎ-tîs], inflammation of the pancreas</td>
</tr>
<tr>
<td>periton(eo)</td>
<td>peritoneum</td>
<td><em>peritonitis</em> [PÉR-ë-tô-NÎ-tîs], inflammation of the peritoneum</td>
</tr>
<tr>
<td>pharyng(o)</td>
<td>pharynx</td>
<td><em>pharyngotonsillitis</em> [fâ-RÎN-jô-tôn-sî-LÎ-tîs], inflammation of tonsils and pharynx</td>
</tr>
<tr>
<td>proct(o)</td>
<td>anus, rectum</td>
<td><em>proctologist</em> [prôk-TÖL-ö-jîst], specialist in study and treatment of diseases of the anus and rectum</td>
</tr>
<tr>
<td>pylor(o)</td>
<td>pylorus</td>
<td><em>pylorospasm</em> [pî-LÖR-ö-spåzm], involuntary contraction of the pylorus</td>
</tr>
<tr>
<td>rect(o)</td>
<td>rectum</td>
<td><em>rectoabdominal</em> [RÈK-tô-àb-DÖM-ë-nâl], of the rectum and abdomen</td>
</tr>
<tr>
<td>sial(o)</td>
<td>saliva, salivary gland</td>
<td><em>sialism</em> [SÎ-à-lîzm], excessive secretion of saliva</td>
</tr>
<tr>
<td>sialaden(o)</td>
<td>salivary gland</td>
<td><em>sialoadenitis</em> [SÎ-à-lô-à-dë-NÎ-tîs], inflammation of the salivary glands</td>
</tr>
<tr>
<td>sigmoid(o)</td>
<td>sigmoid colon</td>
<td><em>sigmoidoscopy</em> [SÎ-g-môy-DÖS-kô-pê], visual examination of the sigmoid colon</td>
</tr>
</tbody>
</table>
Dr. Walker reviewed Asmin Sahib’s family history. It showed that two members of her immediate family had died from cancer of the digestive tract. Her father had stomach cancer, and her sister had liver cancer. Since Asmin has always known the risks associated with digestive cancers, she has maintained a healthy diet and has had regular checkups to detect any signs of the kinds of cancer that have afflicted her family.

**CASE STUDY**

**Seeing a Specialist**

**Critical Thinking**

21. Why is family history important in evaluating a patient?

22. Before cancer was detected in her family members, they suffered from chronic stomach and liver inflammations. What are the medical names for these two conditions?

**COMBINING FORMS AND ABBREVIATIONS EXERCISES**

**Build Your Medical Vocabulary**

Use the following combining forms or roots along with suffixes you learned in Chapter 2 to give the missing term.

- gastr(o) esophag(o) proct(o) chol(o) cholecyst(o) choledoch(o) hepat(o) pancreat(o) colon(o) duoden(o) rect(o)

23. Excision (removal) of the stomach: _____________

24. Inflammation of the esophagus: _____________

25. Prolapse of the rectum: _____________
26. Pertaining to the duodenum: 
27. Excision of a part of the common bile duct: 
28. Inflammation of the pancreas: 
29. Pain in the rectum: 
30. Visual examination of the colon: 
31. Enlargement of the liver: 
32. Suture of the stomach: 
33. Specialist in the study of diseases and treatment of the rectum and anus: 
34. Inflammation of the gallbladder: 
35. Liver tumor: 

Find the Combining Forms

For the following terms, write the gastrointestinal combining form(s) in the space provided and define each term.

36. pyloroduodenal 
37. perianal 
38. enterocolostomy 
39. ileocecal 
40. sublingual 
41. appendectomy 
42. cecostomy 
43. enteromycesis 
44. buccogingival 
45. cholecystitis 
46. labiodental 
47. appendicolith 
48. hepatomegaly 
49. gastroenterology 
50. esophagogastroduodenoscopy 
51. proctitis 
52. orpharynx 
53. celiac 
54. pancreatolysis 
55. biliuria 
56. enteroclisis 
57. ileoplexy 
58. hepatotoxic 
59. peritonitis 
60. pharyngitis 

CASE STUDY

Treating the Symptoms

Dr. Walker finds Asmin to be a healthy 49-year-old except for the burning sensations in her chest. Dr. Walker has decided to have Asmin try a bland diet (avoidance of spicy food, alcohol, and caffeine) and sleeping with the head of the bed raised. She prescribes a mild antacid. Dr. Walker suggests a return visit in three weeks to see if the steps to avoid esophageal reflux are showing improvement.

After three weeks, Asmin has shown marked improvement. Dr. Walker tells her she can add some spicy foods back into her diet slowly, but to continue to avoid alcohol and caffeine. Asmin will need a checkup with Dr. Walker in six months.

Critical Thinking

61. What diagnostic test will Dr. Walker use to check Asmin’s reflux condition in six months?
62. What other tests might Dr. Walker prescribe for someone with a family history of intestinal cancer?
Diagnostic, Procedural, and Laboratory Terms

The digestive or gastrointestinal system is examined in many different ways to diagnose a number of problems. Gastroenterologists (specialists in the digestive system) perform procedures to examine the internal health of various organs. They order blood tests to look for signs of infection or disease and also use some of the extensive number of imaging procedures available for this body system.

A stool specimen may be tested to identify disease-causing organisms such as parasites. This test is called a stool culture. A stool culture and sensitivity test (C & S) is used to try out different medications on microorganisms to check for effectiveness. A chemical test of a stool specimen (hemoccult test or stool guaiac) indicates whether there is bleeding in the digestive tract. Guaiac is a substance added to the stool sample that reacts with any occult (not visible) blood.

Various types of endoscopes are used to examine the digestive system, either through the mouth, the anus, or an opening into the abdominal cavity. An esophagoscopy is the use of an esophagoscope to illuminate the esophagus as it is passed through the mouth and into the esophagus. When ulcers are seen in the digestive system through the endoscope, a diagnosis of H. pylori (Helicobacter pylori), bacteria that cause ulcers, is given. This is usually treated with an antibiotic and dietary modification. A gastroscope is used to examine the stomach in gastroscopy. A colonoscopy is the use of an endoscope to examine the colon. A proctoscopy is the use of a proctoscope to examine the rectum and anus in a proctoscopy. A sigmoidoscopy is used to examine the sigmoid colon in sigmoidoscopy. Endoscopic retrograde cholangiopancreatography (ERCP) is a procedure used to examine the biliary ducts with x-ray, a contrast medium, and the use of an endoscope. Peritoneoscopy or laparoscopy is the examination of the abdominal cavity with an instrument called a peritoneoscope or a laparoscope.

X-rays and other imaging techniques are used extensively to search for abnormalities. An MRI shows the major organs of the digestive system. A CAT scan provides a visual image of the abdominal cavity and the digestive tract. To examine more specific areas, patients are usually given a contrast medium or other substance that stands out against the background of the x-ray produced. A barium swallow is the ingestion of a barium solution before an x-ray of the esophagus, which is generally used to locate foreign objects that have been swallowed (Figure 14-7). A barium enema is the administration of a barium solution through an enema before taking a series of x-rays of the colon called a lower GI series. An upper GI series (UGIS) provides x-rays of the esophagus, stomach, and duodenum, usually after the patient swallows a barium solution or other contrast medium. A cholangiogram is an image of the bile vessels taken in cholangiography, an x-ray of the bile ducts. A cholecystogram is an image of the gallbladder taken in cholecystography, an x-ray of the gallbladder taken after the patient swallows iodine. A liver scan, done after injection of radioactive material, can reveal abnormalities. Ultrasound is used to provide images of the entire abdominal area, as in abdominal ultrasonography.

Several serum tests indicate how the liver is functioning. A serum glutamic oxaloacetic transaminase (SGOT) or an aspartate transaminase (AST) measures the enzyme levels in serum that has leaked from damaged liver cells. Another serum test for liver function is the serum glutamic pyruvic transaminase (SGPT). This test is also known as an alanine transaminase (ALT, AT). A serum bilirubin measures bilirubin in the blood as an indicator of jaundice.

FIGURE 14-7 A scanned image of the intestinal tract.
An alkaline phosphatase reveals levels of the enzyme alkaline phosphatase in serum as an indicator of liver disease, especially liver cancer.

A nasogastric (NG) tube is passed through the nose to the stomach to relieve fluid buildup or to take stomach content samples for analysis (Figure 14-8). This process is called nasogastric intubation.

**VOCABULARY REVIEW**

In the previous section, you learned terms relating to diagnosis, clinical procedures, and laboratory tests. Before going on to the exercises, review the terms below and refer to the previous section if you have any questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. The etymologies (word histories) are for your information only. You do not need to memorize them.

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cholangiography</strong></td>
<td>[kō-län-jē-ŎG-rā-fē] X-ray of the bile ducts.</td>
</tr>
<tr>
<td>cholangio-</td>
<td>bile vessel + -graphy, a recording</td>
</tr>
<tr>
<td><strong>cholecystography</strong></td>
<td>[kō-le-sī-TŌG-rā-fē] X-ray of the gallbladder.</td>
</tr>
<tr>
<td>chole-, bile</td>
<td>+ cysto-, bladder + -graphy</td>
</tr>
<tr>
<td><strong>colonoscopy</strong></td>
<td>[kō-lōn-ŎS-kō-pē] Examination of the colon using an endoscope.</td>
</tr>
<tr>
<td>colono-, colon</td>
<td>+ -scopy, a viewing</td>
</tr>
<tr>
<td><strong>esophagoscopy</strong></td>
<td>[ē-sōf-ă-ŎS-kō-pē] Examination of the esophagus with an esophagoscope.</td>
</tr>
<tr>
<td>esophago-, esophagus</td>
<td>+ -scopy</td>
</tr>
<tr>
<td><strong>gastroscopy</strong></td>
<td>[gās-TRŎS-kō-pē] Examination of the stomach using an endoscope.</td>
</tr>
<tr>
<td>gastro-, stomach</td>
<td>+ -scopy</td>
</tr>
</tbody>
</table>
### Term | Meaning
--- | ---
peritoneoscopy [pɛr-ɪ-to-ne-ŌS-kŏ-pĕ] peritoneo-, peritoneum + -scopy | Examination of the abdominal cavity using a peritoneoscope.
proctoscopy [pɾɒk-TŐS-kŏ-pĕ] procto-, rectum + -scopy | Examination of the rectum and anus using a proctoscope.
sigmoidoscopy [SIG-mŏy-DŎS-kŏ-pĕ] sigmoido-, sigmoid colon + -scopy | Examination of the sigmoid colon using a sigmoidoscope.

### Find a Match

Match the diagnostic test in the left-hand column with the definition or possible diagnosis resulting from the test in the right-hand column.

63. ____ serum bilirubin  
64. ____ alkaline phosphatase  
65. ____ upper GI series  
66. ____ image of bile vessels  
67. ____ testing of waste for disease-causing organisms  
68. ____ tube to retrieve stomach contents for examination  
69. ____ element in a solution used in x-rays  
70. ____ test for liver function  
71. ____ x-rays of the intestines and anal canal  
72. ____ hemoccult test

#### a. x-ray of esophagus, stomach, and duodenum  
#### b. barium  
#### c. cholangiogram  
#### d. nasogastric tube  
#### e. SGOT  
#### f. stool guaiac  
#### g. jaundice  
#### h. liver cancer  
#### i. stool culture  
#### j. lower GI series

### CASE STUDY

#### Testing and Diagnosing

Dr. Walker has morning hours at a local hospital several days a week. Today, Jim Santarelli is scheduled for a colonoscopy. His medical record is shown below:

**PROCEDURE:** colonoscopy  
**SURGEON:** Dr. Walker  
**INDICATION:** This man has a two-year history of increasing, intermittent, sudden bouts of diarrhea without mucus or blood. Antispasmodic treatment with Bentyl has failed. He had a negative barium enema 3 1/2 months ago. Stools have been hemoccult negative. There are no systemic symptoms. The frequency of the diarrhea is once every other day to twice a week.

With the patient turned onto his left side, he was monitored using continuous SAO2 pulse monitoring and intermittent blood pressure monitoring. An IV was started in the left forearm. Mr. Santarelli was given 50 mg of Demerol and 10 mg of Valium by slow intravenous injection. After adequate sedation was achieved, the colonoscopy was performed.

#### Critical Thinking

73. What might Dr. Walker be looking for in this procedure?
74. If the examination shows a clear colon, what lifestyle changes might Dr. Walker recommend?
Pathological Terms

The digestive system is both the site and the source of many diseases and disorders. What we take into our mouths determines the type of nutrition our body receives. Eating disorders can be the catalyst for disease processes to start.

Eating Disorders

Anorexia is a loss of appetite. In its most severe form, anorexia nervosa, it is a morbid refusal to eat because the person wishes to be dangerously thin. Bulimia is a disease wherein bingeing on food and then purposely purging or vomiting is also a quest for abnormal weight loss. Both anorexia nervosa and bulimia can produce many health problems and symptoms, such as hair loss, amenorrhea, and heart damage. Figure 14-9 shows the overlap of starving, bingeing, and purging that can be present in both anorexia nervosa and bulimia. Obesity is often the result of overeating, although recent gene studies indicate a possible hereditary defect in many obese people. Obesity can be one of the factors in many health problems, such as heart disease and diabetes. Many eating disorders can be treated with psychological counseling; some, such as anorexia nervosa, may result in death if the patient is not treated at an eating disorder unit or clinic.

Disorders of the Mouth, Pharynx, and Esophagus

Areas in the mouth can become inflamed from an infection, allergy, injury, or internal disorder. Cheilitis occurs on the lips; glossitis occurs on the tongue; sialoadenitis occurs in the salivary glands; and parotitis or parotiditis occurs in the parotid glands. Various other dental disorders may similarly cause inflammation (see Chapter 20). Halitosis is unusually foul mouth odor, which may be caused by poor dental hygiene, gum disease, certain foods, or by an internal disorder such as a sinus infection. Ankyloglossia is a condition in which the tongue is partially or completely attached to the floor of the mouth, thereby preventing normal movement. Normal swallowing is an important part of maintaining good nutrition. People with swallowing disorders usually have to have their diet supplemented via a tube. Aphagia is an inability to swallow; dysphagia is difficulty in swallowing.

Diseases of the pharynx are discussed in Chapter 7 as part of the respiratory system. Food travels into the mouth, through the pharynx, and into the esophagus. Esophageal varices are twisted veins in the esophagus that are prone to hemorrhage and ulcers. Esophagitis is any inflammation of the esophagus. Gastroesophageal reflux disease (GERD) or esophageal reflux involves malfunctioning of the sphincter muscle at the bottom of the esophagus. It opens at the wrong time to allow backflow of stomach contents into the esophagus, causing irritation of the esophageal lining. Achalasia is the failure of the same esophageal sphincter to relax during swallowing and allow food to pass easily from the esophagus into the stomach to continue the digestive process. This disorder interferes with the intake of normal amounts of nutrients.

Stomach Disorders

The stomach is also the site of many disorders. Some people are sensitive to various foods (such as very spicy dishes) or have allergies to others (as milk...
Achlorhydria is the lack of hydrochloric acid in the stomach, a chemical necessary for digestion. Dyspepsia is difficulty in digesting food, particularly in the stomach. Gastritis is any stomach inflammation. Gastroenteritis is an inflammation of both the stomach and small intestine. Flatulence is an accumulation of gas in the stomach or intestines. Eructation (belching) may release some of this gas. Nausea is a sick feeling in the stomach caused by illness or the ingestion of spoiled food. Nausea may also be felt in certain situations such as early pregnancy or when repetitive motion causes discomfort as in car sickness, sea sickness, and so on. Hematemesis is the vomiting of blood from the stomach, usually a sign of a severe disorder. Stomach ulcers or gastric ulcers are a type of peptic ulcer, a sore on the mucous membrane of any part of the gastrointestinal system. A hiatal hernia is a protrusion of the stomach through an opening in the diaphragm called the hiatal opening. The pyloric sphincter can become abnormally narrow and cause the condition known as pyloric stenosis.

**Disorders of the Liver, Pancreas, and Gallbladder**

Secretions of the liver, pancreas, and gallbladder mix with the stomach contents that move into the duodenum. The liver can be the site of jaundice or icterus, when excessive bilirubin in the blood (hyperbilirubinemia) causes a yellow discoloration of the skin. Newborn jaundice may be a result of liver disease or many other factors. It is sometimes treated with exposure to artificial lights or sunlight. Hepatomegaly is an enlarged liver. Hepatopathy is a general term for liver disease, and hepatitis is a term for several types of contagious diseases, some of which are sexually transmitted (see Chapter 10). Cirrhosis is a chronic liver disease usually caused by poor nutrition and excessive alcohol consumption. Pancreatitis is an inflammation of the pancreas. (Other pancreatic diseases are discussed in Chapter 15.)

The gallbladder can be the site of calculi (gallstones or cholelithiasis) that block the bile from leaving the gallbladder. The presence of gallstones in the common bile duct is called choledocholithiasis. Cholangitis is any inflammation of the bile ducts. Cholecystitis is any inflammation of the gallbladder, either acute or chronic. The duodenum can be the site of duodenal ulcers. Duodenal ulcers are a type of peptic ulcer and are thought to be bacterial (H. pylori) in origin. This discovery has lead to the widespread use of antibiotics to treat many types of ulcers. On the side of the duodenum lies the appendix, which can become inflamed if gastric substances leak into it from the duodenum. This condition is called appendicitis, which usually requires surgery to prevent the appendix from bursting.

**Intestinal Disorders**

The small and large intestines can have ulcers, obstructions, irritations, inflammations, abnormalities, and cancer. An ileus is an intestinal blockage, which may be caused by lack of sufficient moisture to move waste material through the system or by an internal disorder. Enteritis and colitis are general terms for inflammations in the small intestine. Ulcerative colitis is a chronic type of irritable bowel disease (IBD) or inflammatory bowel disease with recurring ulcers and inflammations. Other symptoms may include cramping, abdominal pain, and diarrhea. IBDs are often associated with stress. Crohn’s


disease is another type of IBD with symptoms similar to ulcerative colitis but lacking ulcers and sometimes having fistulas, abnormal passages or openings in tissue walls. Colic is a condition (usually in infants) of gastrointestinal distress due to allergies, an underdeveloped digestive tract, or other conditions that prevent easy digestion of food. In infants, colic usually resolves itself within a few months as the infant matures. Diverticulosis is a condition in which diverticula, small pouches in the intestinal wall, trap food or bacteria. Diverticulitis is an inflammation of the diverticula. Ileitis is an inflammation of the ileum. Dysentery is a general term for irritation of the intestinal tract with loose stools and other symptoms, such as abdominal pain and weakness. It is often caused by bacteria such as those found in many underdeveloped countries. Polyposis is a general term for a condition in which polyps develop in the intestinal tract. Polyps can become cancerous so they are often checked or removed to detect any abnormalities at an early stage. Colonic polyposis is polyps in the colon, which have a high likelihood of changing to colorectal cancer.

A volvulus, an intestinal blockage caused by twisting of the intestine on itself, requires emergency surgery (Figure 14-10). An intussusception is the telescoping of the intestine. One section prolapses (collapses) into a neighboring part (Figure 14-11). The abdominal and peritoneal regions surrounding the intestinal tract can become filled with fluid (ascites) or inflamed (peritonitis).

The Rectum and Anus

The rectum, anus, and stool may play a role in some disorders. Proctitis is an inflammation of the rectum and anus. Constipation is a condition with infrequent or difficult release of bowel movements, sometimes the result of insufficient moisture to soften and move stools. Diarrhea is loose, watery stools that may be the result of insufficient roughage or of an internal disorder. Flatus is the release of gas through the anus.

The analysis of stool for blood, bacteria, and other elements can provide a clue to various ailments. Melena is a condition in which blood that is not fresh appears in the stool as a black, tarry mass. Hematochezia is bright red blood in the stool. Steatorrhea is fat in the stool.

A small opening in the anal canal is called an anal fistula. Waste material can enter the abdominal cavity through a fistula. The anus may be the site of hemorrhoids, swollen, twisted veins that can cause great discomfort.

Hernias

A hernia is any loop or twist of an intestine or other organ not positioned correctly in the abdomen. There are many types of hernias. Some common ones are as follows:

- A hiatal hernia is the protrusion of the stomach through the esophageal hiatus of the diaphragm.
- An inguinal hernia is a protrusion of the intestine through a weakness in the abdominal wall (Figure 14-12).
- A strangulated hernia is one in which blood flow is restricted or absent.
- A femoral hernia is a protrusion of a loop of intestine into the femoral canal.

FIGURE 14-10 A volvulus is a twisting of the intestine that causes a blockage and requires surgery.

FIGURE 14-11 An intussusception occurs most often in children and requires surgical correction.

FIGURE 14-12 An inguinal hernia usually requires surgery.
An umbilical hernia is a protrusion of part of the intestine into the umbilicus.

An incarcerated hernia is one in which movement of bowel is restricted or obstructed.

**VOCABULARY REVIEW**

In the previous section, you learned terms relating to pathology. Before going on to the exercises, review the terms below and refer to the previous section if you have any questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. The etymologies (word histories) are for your information only. You do not need to memorize them.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>achalasia [ák-ā-LĀ-zhē-ā]</td>
<td>Inability of a muscle, particularly the cardiac sphincter, to relax.</td>
</tr>
<tr>
<td>a-, without + Greek chalasis, a relaxing</td>
<td></td>
</tr>
<tr>
<td>anal fistula [Ā-nāl FĪS-tyū-lā]</td>
<td>Small opening in the anal canal through which waste matter can leak into the abdominal cavity.</td>
</tr>
<tr>
<td>ankyloglossia [ĀNG-kī-lō-GLŌS-ē-ā]</td>
<td>Condition of the tongue being partially or completely attached to the bottom of the mouth.</td>
</tr>
<tr>
<td>Greek ankylos, bent + glossus, tongue</td>
<td></td>
</tr>
<tr>
<td>an-, without + Greek orexis, appetite</td>
<td></td>
</tr>
<tr>
<td>aphagia [ā-FĀ-jē-ā]</td>
<td>Inability to swallow.</td>
</tr>
<tr>
<td>a-, without + phagia, eating</td>
<td></td>
</tr>
<tr>
<td>appendicitis [ā-pēn-dī-ŚI-tīs]</td>
<td>Inflammation of the appendix.</td>
</tr>
<tr>
<td>appendic-, appendix + -itis, inflammation</td>
<td></td>
</tr>
<tr>
<td>Latin, bags</td>
<td></td>
</tr>
<tr>
<td>bulimia [bu-LĒM-ē-ā]</td>
<td>Eating disorder with bingeing and purging.</td>
</tr>
<tr>
<td>Greek boux, ox + limos, hunger</td>
<td></td>
</tr>
<tr>
<td>cheilitis [kī-LĪ-tīs]</td>
<td>Inflammation of the lips.</td>
</tr>
<tr>
<td>Greek cheilos, lip + -itis</td>
<td></td>
</tr>
<tr>
<td>cholangitis [kō-lān-jĪ-tīs]</td>
<td>Inflammation of the bile ducts.</td>
</tr>
<tr>
<td>cholangi-, bile vessel + -itis</td>
<td></td>
</tr>
<tr>
<td>cholecystitis [KŌ-lē-sīs-TĪ-tīs]</td>
<td>Inflammation of the gallbladder.</td>
</tr>
<tr>
<td>chole-, bile + cyst-, bladder + -itis</td>
<td></td>
</tr>
<tr>
<td>chole- + Greek lithos, stone + -iasis, condition</td>
<td></td>
</tr>
<tr>
<td>cirrhosis [sīr-RŌ-sīs]</td>
<td>Liver disease, often caused by alcoholism.</td>
</tr>
<tr>
<td>Greek kīrhōs, yellow + -osis, condition</td>
<td></td>
</tr>
<tr>
<td>colic [KŌL-īk]</td>
<td>Gastrointestinal distress, especially of infants.</td>
</tr>
<tr>
<td>Greek kolikos, of the colon</td>
<td></td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>colitis [kō-LĪ-tīs]</td>
<td>Inflammation of the colon.</td>
</tr>
<tr>
<td>constipation [kōn-stī-PĀ-shūn]</td>
<td>Difficult or infrequent defecation.</td>
</tr>
<tr>
<td>constipo, to press together</td>
<td></td>
</tr>
<tr>
<td>diarrhea [dī-ā-RĒ-ā]</td>
<td>Loose, watery stool.</td>
</tr>
<tr>
<td>diverticula [dī-vēr-TĪK-yū-lā]</td>
<td>Small pouches in the intestinal walls.</td>
</tr>
<tr>
<td>diverticulitis [DĪ-vēr-tīk-yū-LĪ-tīs]</td>
<td>Inflammation of the diverticula.</td>
</tr>
<tr>
<td>diverticulosis [DĪ-vēr-tīk-yū-LŌ-sīs]</td>
<td>Condition in which diverticula trap food or bacteria.</td>
</tr>
<tr>
<td>duodenal [DŪ-ō-DĒ-nāl] ulcer</td>
<td>Ulcer in the duodenum.</td>
</tr>
<tr>
<td>dysentery [DĪS-ēn-tēr-ē]</td>
<td>Irritation of the intestinal tract with loose stools.</td>
</tr>
<tr>
<td>dyspepsia [dīs-PĒP-sē-ā]</td>
<td>Indigestion.</td>
</tr>
<tr>
<td>enteritis [ēn-tēr-Ī-tīs]</td>
<td>Inflammation of the small intestine.</td>
</tr>
<tr>
<td>esophagitis [ē-sof-ā-JĪ-tīs]</td>
<td>Inflammation of the esophagus.</td>
</tr>
<tr>
<td>fistula [FĪS-tyū-lā]</td>
<td>Abnormal opening in tissue.</td>
</tr>
<tr>
<td>flatulence [FLĀT-yū-lēns]</td>
<td>Gas in the stomach or intestines.</td>
</tr>
<tr>
<td>flatus [FLĀ-tūs]</td>
<td>Gas in the lower intestinal tract that can be released through the anus.</td>
</tr>
<tr>
<td>gallstones</td>
<td>Calculi in the gallbladder.</td>
</tr>
<tr>
<td>gastritis [gās-TRĪ-tīs]</td>
<td>Inflammation of the stomach.</td>
</tr>
<tr>
<td>gastroenteritis [GĀS-trō-ēn-tēr-Ī-tīs]</td>
<td>Inflammation of the stomach and small intestine.</td>
</tr>
<tr>
<td>glossitis [glō-SĪ-tīs]</td>
<td>Inflammation of the tongue.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>halitosis [hæl-ɪ-TÖ-sɪs] Latin halitus, breath + -osis</td>
<td>Foul mouth odor.</td>
</tr>
<tr>
<td>hemorrhoids [HɛM-ˈo-roɪdز]</td>
<td>Swollen, twisted veins in the anus.</td>
</tr>
<tr>
<td>hepatitis [hɛp-ˈæ-TЇ-tɪs]</td>
<td>Inflammation or disease of the liver.</td>
</tr>
<tr>
<td>hepatopathy [hɛp-ˈæ-TØP-ā-the] hepato- + -pathy, disease</td>
<td>Liver disease.</td>
</tr>
<tr>
<td>icterus [ɪkˈtɛrʊs] Greek ikteros</td>
<td>Jaundice.</td>
</tr>
<tr>
<td>ileus [ɪl-ɛ-ˈʊs] Latin, a twisting</td>
<td>Intestinal blockage.</td>
</tr>
<tr>
<td>intussusception [ɪn-tʊs-sʊ-Sɛp-shʊn] Latin intus, within + suscipio, to take up</td>
<td>Prolapse or collapse of an intestinal part into a neighboring part. One section collapses into another like a telescope.</td>
</tr>
<tr>
<td>jaundice [ˈdʒæWN-dɪs]</td>
<td>Excessive bilirubin in the blood causing yellowing of the skin.</td>
</tr>
<tr>
<td>melena [mɛ-ˈLÉ-nɛ] Greek melaina, black</td>
<td>Old blood in the stool.</td>
</tr>
<tr>
<td>nausea [nɔz-ˈæ] Latin, seasickness</td>
<td>Sick feeling in the stomach.</td>
</tr>
<tr>
<td>obesity [oʊ-ˈBɛs-ɪ-ˈte] Latin obesus, fat</td>
<td>Abnormal accumulation of fat in the body.</td>
</tr>
<tr>
<td>peptic ulcer</td>
<td>Sore on the mucous membrane of the digestive system; stomach ulcer or gastric ulcer.</td>
</tr>
</tbody>
</table>
Term | Definition
--- | ---
peritonitis [PÉR-i-tō-NĪ-tīs] periton-, peritoneum + -itis | Inflammation of the peritoneum.
polyposis [PŌL-i-PŌ-sīs] polyp + -osis | Condition with polyps, as in the intestines.
proctitis [prōk-TĪ-tīs] proct-, rectum + -itis | Inflammation of the rectum and anus.
ulcerative colitis [kō-LĪ-tīs] | Inflammation of the colon with ulcers.
volvulus [VŌL-vyū-lūs] Latin volvo, to roll | Intestinal blockage caused by the intestine twisting on itself.

**Pathological Terms Exercises**

**Find a Match**

Match the terms in the left-hand column with the correct definition in the right-hand column.

75. ____ bulimia  | a. intestinal blockage caused by the intestine twisting on itself
76. ____ colitis  | b. red blood in the stool
77. ____ diverticula  | c. prolapse of an intestinal part into a neighboring part
78. ____ eructation  | d. eating disorder with bingeing and purging
79. ____ hematochezia  | e. inflammation of the colon
80. ____ intussusception  | f. inflammation of the peritoneum
81. ____ jaundice  | g. fat in the stool
82. ____ peritonitis  | h. small pouches in the intestinal wall
83. ____ steatorrhea  | i. icterus
84. ____ volvulus  | j. belching

**Check Your Knowledge**

Circle the correct term that completes the sentence.

85. Jane's parents have brought her to see an internist. Jane is 5’10” and weighs 105 pounds. Jane thinks she is fat. The doctor suspects Jane's problem is ___________. (obesity, anorexia, aphagia)

86. John was seen in the emergency room. He complained of abdominal pain with cramping and diarrhea. He was concerned that he might have _____________. (constipation, irritable bowel disease, hemorrhoids)

87. Jean has been complaining of severe pain in the RUQ following the ingestion of food, especially foods like nuts and ice cream. She believes she might have _____________. (pancreatitis, appendicitis, cholecystitis)

88. Dora is feeling sluggish and unwell. She complains to her doctor that she has been unable to have a bowel movement for the past 5 days. She is diagnosed with _____________. (diarrhea, hematochezia, constipation)
89. Many people cannot lie flat after eating because of a burning sensation in the chest and throat. The pain makes the person feel that he or she is having a heart attack. This condition, seen frequently in the emergency room, is called ___________. (inguinal hernia, dysentery, gastroesophageal reflux)

**Spell It Correctly**

For each of the following words, write C if the spelling is correct. If it is not, write the correct spelling.

90. dyepsia _____________
91. hyperbilirubinemia _____________
92. diverticuli _____________
93. hematocchia _____________
94. inginal hernia _____________
95. ilitis _____________
96. polyposis _____________
97. cirrosis _____________
98. hietal hernia _____________
99. achlorhydria _____________
100. flatusence _____________

**CASE STUDY**

**Performing Surgery**

Dr. Walker has another patient scheduled for a colonoscopy. Laura Martinez had an earlier colonoscopy, which was negative. Since then, she has experienced some rectal bleeding. This time her colonoscopy shows several suspicious-looking polyps near the rectum. Dr. Walker biopsies several of them. The result is positive for cancer, but the area of malignancy that needs to be removed is limited.

**Critical Thinking**

101. What operation will likely be performed?
102. Why might the operation include a colostomy?

**Surgical Terms**

Treating the digestive tract often includes biopsies, surgeries, and observation using endoscopes. The following is a list of some of the surgical procedures performed on the digestive system.

- **Abdominocentesis** or **paracentesis** is a surgical puncture to remove fluid or relieve pressure in the abdominal cavity, as in ascites.
- **Cholelithotomy** is an incision for the removal of stones. **Choledocho-lithotomy** is an incision for removal of stones in the common bile duct. **Cholelitotripsy** is the crushing of gallstones using sound waves or other techniques.
- Surgical repair of the digestive tract includes **cheiloplasty** (lip repair); **glossorrhaphy** (tongue suturing); **esophagoplasty** (esophagus repair); and **proctoplasty** (repair of the rectum and anus).
- Some parts of the digestive tract may require partial or complete removal because of malignancies or chronic inflammation. A **glossectomy** is removal of the tongue. A **polypectomy** is the removal of polyps, particularly in areas such as the colon, which are susceptible to cancer. An **appendectomy** is the removal of a diseased appendix.
that is in danger of rupturing. A **cholecystectomy** is the removal of the gallbladder, particularly one that is constantly inflamed and susceptible to painful bouts of gallstones. A **diverticulectomy** is removal of diverticula. A **gastrectomy** is removal of some or all of the stomach. It may be followed by a gastric resection, to repair the remaining part of the stomach. A **gastric resection** or **gastric bypass** removes a portion of the stomach to limit overeating as a treatment for obesity. A simpler procedure called **gastric lap band surgery** is also used as a treatment for obesity. A **colectomy** is the removal of some or all of the colon. This may be a temporary operation that is followed by a surgical reconnection of parts of the colon or it may require the use of a colostomy bag. A **pancreatectomy** is removal of the pancreas usually only in cases with malignancy. A **hemorrhoidectomy** is the removal of hemorrhoids, which are sometimes treated by laser cauterization. A **hepatic lobectomy** is removal of one or more lobes of the liver. It is usually preceded by a **liver biopsy** to determine the type and extent of disease. People can live with only part of a liver. However, if a person with a completely diseased liver does not receive an organ transplant, he or she will usually die. An anal fistula is removed in an **anal fistulectomy**. **Billroth's I** and **Billroth's II** are two types of operations. The first is the excision of the pylorus, and the second is the resectioning of the pylorus with the stomach.

- An **anastomosis**, a surgical union of two hollow tubes, is sometimes used to bypass parts of the intestines as in the case of removal of a section of the intestines. There are many types of anastomoses used in various body systems. There are a number of ways that anastomoses can correct digestive disorders. An **ileorectal anastomosis** is the connection of the ileum and the rectum after a total colectomy. An **end-to-side anastomosis** is a connection of the end of one vessel to the side of a larger one.

**MORE ABOUT . . .**

**Gastric Lap Band Surgery**

This surgical procedure is one of the newer methods for weight loss surgery that places a silicone band device around the stomach. Unlike gastric bypass surgery, which removes part of the stomach, this procedure surgically implants a band at the upper part of the stomach, forming a small pouch that can hold only a small amount of food. The surgery only involves cutting into the abdomen for the placement of the band. No cutting is done on the stomach itself. Patients must be willing to make major changes in their eating habits and lifestyles just as they would with other weight loss practices. To be eligible, other nonsurgical weight loss methods have not been successful and a person must have a Body Mass Index (BMI) of at least 40 and with one or more comorbidities.

Research suggests that although weight loss is usually not as extreme, gastric lap band surgery can be as beneficial in sending diabetes into remission as gastric bypass surgery. Linking research on the disease processes that are exacerbated by obesity is an important association when making advances in our ability to reduce the effects of the over weight condition of our population’s health.

Openings may have to be made in the gastrointestinal tract. Sometimes they are temporary to allow evacuation of waste material. In some cases, they are permanent as when intestinal parts cannot be reconnected. An **ileostomy** is the creation of an opening in the abdomen, which is attached to the ileum to allow fecal matter to discharge into a bag outside the body. A **colostomy** is an opening in the colon to the abdominal wall to create a place for waste to exit the body other than through the anus. A colostomy is sometimes required in the case of diseases such as cancer and ulcerative colitis.

---

**Vocabulary Review**

In the previous section, you learned terms relating to surgery. Before going on to the exercises, review the terms below and refer to the previous section if you have any questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. The etymologies (word histories) are for your information only. You do not need to memorize them.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>abdominocentesis [āb-DÔM-ī-nō-sēn-TĒ-sēs] Latin abdominis, abdomen + -centesis, puncture</td>
<td>Incision into the abdomen to remove fluid or relieve pressure.</td>
</tr>
<tr>
<td>Billroth’s II</td>
<td>Resection of the pylorus with the stomach.</td>
</tr>
<tr>
<td>choledocholithotomy [kō-LĒD-o-kō-lē-THÔT-o-mē] choledocho-, common bile duct + Greek lithos, stone + -tomy, a cutting</td>
<td>Removal of stones from the common bile duct.</td>
</tr>
<tr>
<td>cholelithotripsy [kō-lē-LĪTH-o-trīp-se] chole- + Greek lithos, stone + tripps, a rubbing</td>
<td>Breaking up or crushing of stones in the body, especially gallstones.</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>colostomy [kō-LÖS-tō-mē]</td>
<td>Creation of an opening from the colon into the abdominal wall.</td>
</tr>
<tr>
<td>gastrectomy [gās-TRÉK-tō-mē]</td>
<td>Removal of part or all of the stomach.</td>
</tr>
<tr>
<td>gastric resection or gastric bypass</td>
<td>Removal of part of the stomach and repair of the remaining part.</td>
</tr>
<tr>
<td>glossorrhaphy [glō-SÖR-ā-fē]</td>
<td>Suture of the tongue.</td>
</tr>
<tr>
<td>hepatic lobectomy [hē-PÄT-īk lō-BEK-tō-mē]</td>
<td>Removal of one or more lobes of the liver.</td>
</tr>
<tr>
<td>ileostomy [ĪL-ē-ŌS-tō-mē]</td>
<td>Creation of an opening into the ileum.</td>
</tr>
<tr>
<td>liver biopsy</td>
<td>Removal of a small amount of liver tissue to examine for disease.</td>
</tr>
<tr>
<td>paracentesis [PĀR-ā-sēn-TĒ-sīs]</td>
<td>Incision into the abdominal cavity to remove fluid or relieve pressure.</td>
</tr>
<tr>
<td>proctoplasty [PRÖK-tō-plās-tē]</td>
<td>Repair of the rectum and anus.</td>
</tr>
</tbody>
</table>

**SURGICAL TERMS EXERCISES**

**Fill in the Blanks**

103. Removal of a liver lobe is a(n) _____________ _____________.

104. Repair of a part of the stomach is a(n) _____________ _____________.

105. Two openings that allow waste to exit the body other than through the anus are a(n) _____________ and a(n) _____________.

106. The crushing of gallstones is called _____________.

107. Incision into the intestinal tract to remove fluid is _____________. or _____________.
Chapter 14 The Digestive System

Pharmacological Terms

Aside from treatments for cancer, medications for the digestive tract counteract situations that occur in various parts of the tract. Antacids neutralize stomach acid. Many antacids are taken before meals to prevent the building up of excess stomach acids. Others are taken after symptoms appear. Antiemetics prevent vomiting. Antispasmodics relieve spasms in the gastrointestinal tract. A laxative stimulates movement of bowels. A cathartic induces vomiting. An antidiarrheal helps to control loose, watery stools. Table 14-2 lists some common medications used to treat the intestinal tract.

TABLE 14-2 Medications Used to Treat Digestive Disorders

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Purpose</th>
<th>Generic</th>
<th>Trade Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>antacid and anti-gastric reflux agents</td>
<td>to neutralize stomach acid</td>
<td>cimetidine</td>
<td>Tagamet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aluminum &amp; magnesium hydroxide</td>
<td>Maalox, Mylanta</td>
</tr>
<tr>
<td></td>
<td></td>
<td>famotidine</td>
<td>Pepcid</td>
</tr>
<tr>
<td></td>
<td></td>
<td>magaldrate</td>
<td>Riopan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ranitidine</td>
<td>Zantac</td>
</tr>
<tr>
<td></td>
<td></td>
<td>esomeprazole</td>
<td>Nexium</td>
</tr>
<tr>
<td>antidiarrheal</td>
<td>to control loose stools</td>
<td>bismuth subsalicylate</td>
<td>Pepto-Bismol</td>
</tr>
<tr>
<td></td>
<td></td>
<td>loperamide</td>
<td>Imodium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>attapulgite</td>
<td>Kaopectate, Diasorb</td>
</tr>
<tr>
<td>antiemetic</td>
<td>to prevent regurgitation</td>
<td>dimenhydrinate</td>
<td>Dramamine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>meclizine</td>
<td>Bonine, Antivert</td>
</tr>
<tr>
<td>antispasmodic</td>
<td>to calm spasms in the intestinal tract</td>
<td>dicyclomine</td>
<td>Antispas, Bentyl</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hyoscyamine</td>
<td>Anaspaz, Cystospaz</td>
</tr>
<tr>
<td>cathartic</td>
<td>to cause vomiting (after ingestion of poison)</td>
<td>ipecac syrup</td>
<td>none</td>
</tr>
<tr>
<td>laxative</td>
<td>to relieve constipation</td>
<td>psyllium</td>
<td>Metamucil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bisacody</td>
<td>Dulcolax, Theralax</td>
</tr>
<tr>
<td></td>
<td></td>
<td>senna</td>
<td>Senokot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>docusate</td>
<td>Therevac</td>
</tr>
</tbody>
</table>

Dora, a patient complaining of constipation, was given a laxative to regulate her bowel movements. Doctors found that Dora avoided foods high in roughage because of an acid condition in her stomach.

CASE STUDY

Resolving a Complaint

Dora, a patient complaining of constipation, was given a laxative to regulate her bowel movements. Doctors found that Dora avoided foods high in roughage because of an acid condition in her stomach.

Critical Thinking

108. Why is it important that Dora eat foods with high roughage content?
109. What other medication might the doctor prescribe to make it easier for her to digest such foods?
In the previous section, you learned terms relating to pharmacology. Before going on to the exercises, review the terms below and refer to the previous section if you have any questions. Pronunciations are provided for certain terms. Sometimes information about where the word came from is included after the term. The etymologies (word histories) are for your information only. You do not need to memorize them.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>antacid [ant-ĂS-íd]</td>
<td>Agent that neutralizes stomach acid.</td>
</tr>
<tr>
<td>antiemetic [ĂN-tê-ë-MĒT-ık]</td>
<td>Agent that prevents vomiting.</td>
</tr>
<tr>
<td>antispasmodic [ăn-tê-spâz-MÔD-ık]</td>
<td>Agent that controls intestinal tract spasms.</td>
</tr>
<tr>
<td>cathartic [kā-THÂR-tık]</td>
<td>Agent that induces vomiting; also a strong laxative for emptying the bowels.</td>
</tr>
<tr>
<td>laxative [LĂX-ă-tiv]</td>
<td>Agent that induces bowels to move in order to relieve constipation.</td>
</tr>
</tbody>
</table>

**PHARMACOLOGICAL TERMS EXERCISES**

**Find a Match**
Match the pharmacological agent in the left-hand column with its use in the right-hand column.

110. ____ antacid         a. causes vomiting
111. ____ antidiarrheal    b. calms spasms
112. ____ antiemetic       c. prevents regurgitation
113. ____ antispasmodic    d. relieves constipation
114. ____ cathartic        e. controls loose, watery stools
115. ____ laxative         f. relieves burning sensation in digestive disorder

**CHALLENGE SECTION**

The record for Dr. Walker's patient, Holly Berger, shows a history of gastrointestinal problems. Dr. Walker performed a procedure that allowed a full examination and biopsies of certain sections of Holly's intestinal tract. The procedure was performed in the hospital, and the patient was able to leave after a few hours in the recovery room.

**Critical Thinking**

116. Why did Dr. Walker take biopsies of various intestinal tract areas?
117. From his examination of the stomach and duodenum, Dr. Walker able to rule out Crohn's disease. What indication was most likely in the record that made this possible?
**TERMINOLOGY IN ACTION**

The patient record for Manny Ramos lists two procedures and four diagnostic terms. Define all six terms and break them down into their word parts.

<table>
<thead>
<tr>
<th>MEDICAL RECORD</th>
<th>PROGRESS NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATE</td>
<td></td>
</tr>
<tr>
<td>6/28/XX</td>
<td>Patient complains of intermittent stomach pains, some rectal bleeding, heartburn. Schedule tests on two successive days in three weeks.</td>
</tr>
<tr>
<td>7/22/XX</td>
<td>8:00 Colonoscopy. Four polyps removed and biopsied. Otherwise normal. J. Phelps, M.D.</td>
</tr>
<tr>
<td>7/23/XX</td>
<td>8:00 Esophagoscopy. Numerous lesions present. J. Phelps, M.D.</td>
</tr>
<tr>
<td>7/25/XX</td>
<td>Colonoscopy shows precancerous polyps. Recommend 6 month follow up. Gastric reflux present—treat with Nexium. Stomach ulcers, give 4 week course of treatment and list of dietary restrictions. Recheck stool in 6 weeks. Recommend dental visit for persistent halitosis.</td>
</tr>
</tbody>
</table>

**USING THE INTERNET**

Go to the American Gastroenterological Association site (http://www.gastro.org), click the public section, then click the digestive health resource center, and then choose a gastroenterological disease site. Write a brief one-paragraph summary of some of the information you gather about the disease.
CHAPTER REVIEW

The material that follows is to help you review this chapter.

Root Out the Meaning
Separate the following terms into word parts and define each word part:

118. buccal
119. cecotomy
120. cecopexy
121. cecal
122. celiorrhaphy
123. celiotomy
124. celiscopy
125. celiocentesis
126. cholelith
127. cholemesis
128. cholelithotomy
129. cholepoiesis
130. cholestatis
131. cholelithotripsy
132. cholangiocarcinoma
133. cholangiectasis
134. cholangiostomy
135. cholangiogram
136. cholangiography
137. cholangioma
138. cholangiopancreatography
139. cholangioscope
140. cholecystectomy
141. cholecyst
142. cholecystocolostomy
143. cholecystoduodenostomy
144. cholecystopexy
145. cholecystogram
146. cholecystorrhaphy
147. cholecystosonography
148. cholecystostomy
149. cholecystotomy
150. choledocholithiasis
151. colitis
152. colorectitis
153. colostomy
154. duodenectomy
155. enteritis
156. enterocolitis
157. esophagocele
158. gastrocolitis
159. gastroenteritis
160. glossitis
161. hepatoscopy
162. ileostomy
163. jejunectomy
164. labiogingival
165. pancreatopathy
166. pharyngectomy

Complete the Sentence
Circle the term that best describes the italicized description of the correct answer:

167. Creation of an opening from the colon (colonostomy, colectomy, colostomy) into the abdominal wall.

168. A(n) (fistula, anastomosis, icterus), a surgical union of two hollow tubes, is sometimes used to bypass parts of the intestines as in the case of removal of a section of the intestines.

169. A gastric bypass or (gastrotomy, gastric resection, gastric ascites) removes a portion of the stomach to limit overeating as a treatment for obesity.
170. Mrs. Abernathy has been experiencing an uncomfortable burning in her upper chest area after eating. The doctor suspects (UGIS, GERD, EGD).

171. The coordinated, rhythmic contractions of smooth muscle that force food through the digestive tract are known as: (peritoneal, peristatic, peritasis).

**Build Your Medical Vocabulary**

Build a word that means the same as each of the phrases below.

172. Abnormal condition of fungus in the mouth _____________
173. Fatty inflammation of the liver _____________
174. Excessive secreting of saliva _____________
175. Pertaining to the rectum and abdomen _____________
176. Surgical fixation of the liver _____________
177. Herniation of the liver _____________
178. Surgically created opening in the stomach _____________
179. Surgical repair of the stomach and the intestines _____________
180. Incision into the esophagus _____________
181. Pertaining to the intestines _____________
182. Observation of the duodenum: _____________
183. Any intestinal disease _____________
184. Discharge of abnormal amounts of sugar _____________
185. The study of the intestines _____________
186. Surgical fixation of the intestines _____________
187. Pertaining to the ileum and cecum _____________
188. A stone or calculus in the stomach _____________
189. An x-ray examination of the liver _____________
190. Surgical suturing of the common bile duct _____________
191. Pathological condition or state of stones in the gallbladder _____________
192. Fibrous condition of the bile ducts _____________
193. Inflammation of the abdomen _____________
194. Production of bile _____________
195. Inflammation of the common bile duct _____________
196. A heavy (unusual) discharge from the colon _____________
197. Presence of a gallstone _____________
198. Disease of the gallbladder _____________
199. Dilation of the bile ducts _____________

**Matching**

Match each of the following medical conditions with its description.

200. _____ intestinal blockage caused by the intestine twisting on itself   a. anorexia nervosa
201. ____ condition of having polyps, as in the intestines
202. ____ foul mouth odor
203. ____ gas in the stomach or intestines
204. ____ inability to swallow
205. ____ eating disorder with binging and purging
206. ____ old blood in the stool
207. ____ blood in vomit
208. ____ eating disorder with extreme weight loss
209. ____ belching
210. ____ small pouches in the intestinal walls
211. ____ liver disease, often caused by alcoholism
212. ____ indigestion
213. ____ irritation of the intestinal tract with loose stools
214. ____ gastrointestinal distress, especially in infants
215. ____ fluid buildup in the abdominal and peritoneal cavities
216. ____ abnormal opening in tissue
217. ____ prolapse or collapse of an intestinal part into a neighboring part
218. ____ jaundice
219. ____ protrusion of the stomach through an opening in the diaphragm

b. eructation
c. colic
d. polyposis
e. halitosis
f. aphagia
g. bulimia
h. icterus
i. volvulus
j. melena
k. diverticula
l. dyspepsia
m. fistula
n. intussusception
o. hiatal hernia
p. cirrhosis
q. dysentery
r. hematemesis
s. flatulence
t. ascites

True or False
Indicate in the blank whether the statement is true (T) or false (F).
220. Reflux is another name for regurgitation. T F
221. Crohn's disease is a type of IBD. T F
222. An inguinal hernia is the protrusion of the intestine through a weakness in the stomach wall. T F
223. The medical term for red blood in the stool is hematochezia. T F
224. Cheil(o) and labi(o) are both word parts for the lip(s). T F
225. A cathartic is a medication used to stop diarrhea. T F
226. The definition of dysphagia is inability to speak. T F
227. A strangulated hernia is one in which movement of bowel is restricted or obstructed. T F
228. Another name for the digestive tract is the alimentary canal. T F
229. The upper portion of the stomach is known as the frenulum. T F

Check Your Spelling
Write the correct spelling in the blank to the right of each word. If the word is already spelled correctly, place a C in the blank.
230. rectoskope _______________ 233. cheilorrhaphy _______________
231. esophagomalacia _______________ 234. enzyme _______________
232. coalo[?] _______________ 235. mastacation _______________
Define the following terms and combining forms. Review the chapter before starting. Make sure you know how to pronounce each term as you define it. The blue words in curly brackets refer to the Spanish glossary available online at www.mhhe.com/medterm3e.

**WORD**

236. paracentesis _____________ 238. emasis _____________ 239. rugay _____________

240. abdominocentesis [āb-DÔM-I-nō-sēn-TE-sēs]
241. absorption [āb-SÔRP-shūn] {absorción}
242. achalasia [āk-à-LĀ-zhē-ā] {acalasia}
243. achlorhydia [āk-lōr-HĪ-drē-ā]
244. alimentary [āl-ī-MĒN-tēr-e] canal
245. amino [ā-MĒ-nō] acid {aminoácido}
246. amylase [ÄM-Ī-lās] {amilasa}
247. anal [Ā-nāl] canal
248. anal fistula [FĪS-tyū-lā]
249. anal fistulectomy [fīs-tyū-LĒK-tō-mē]
250. anastomosis [ā-NĀS-tō-MŌ-sēs] {anastomosis}
251. ankyloglossia [ĀNG-kī-lō-GLŌS-ē-ā] {ankiología}
252. an(o)
253. anorexia nervosa [ān-ō-RĒK-sē-ā nēr-VO-sā]
254. antacid [ānt-ĂS-īd]
255. antidiarrheal [ānt-dē-dī-ā-RĒ-āl]
256. antiemetic [ĀN-tē-ē-MĒT-īk]
257. antispasmodic [ānt-spāz-MÔD-īk]
258. anus [Ā-nūs] {ano}
259. aphagia [ā-FĀ-jē-ā] {afagia}
260. append(o), appendic(o)
261. appendage [ā-PĒN-dīj] {apéndice}
262. appendectomy [āp-pēn-DĒK-tō-mē] {apendectomía}
263. appendicitis [ā-pēn-dī-SĪ-tēs] {appendicitis}
264. appendix [ā-PĒN-dīks] {apéndice}
265. ascites [ā-SĪ-tēs] {ascitis}
266. bil(o), bili
267. bile [bīl] {bilis}
268. bilirubin [bīl-ī-RŪ-bīn] {bilirrubina}
269. Billroth’s [BĪL-Rṓths] I
270. Billroth’s II
271. body {cuerpo}
272. bowel [bōw-l] {intestine}
273. bucc(o)
274. bulimia [bū-lĒM-ē-ā]
275. cathartic [kā-THĀR-tīk]
276. cec(o)
277. cecum [SE-kūm] {ciego}
278. celi(o)
279. cheeks {carrillos}
280. cheilitis [kē-LĪ-tēs] {queilitis}
281. cheiloplasty [KĒ-lō-plās-tē]
282. chol(e), cholo
283. cholangi(o)
284. cholangiography [kō-lān-jē-ŌG-rā-fē]
285. cholangitis [kō-lān-JĪ-tēs] {colangitis}
286. cholecyst(o)
287. cholecystectomy [KŌ-lē-sē-TĒK-tō-mē]
288. cholecystitis [KŌ-lē-sē-TĪ-tēs] {colecistitis}
289. cholecystography [kō-lē-sē-TŌG-rā-fē] {colecistografía}
290. choledoch(o)
291. choledocholithotomy [kō-lĒD-ō-kō-Ī-THŌT-ō-mē]
292. cholelithiasis [KŌ-lē-Ī-THĪ-ā-sīs]
293. cholelithotomy [KŌ-lē-ī-THŌT-ō-mē]
294. cholelithotripsy [kō-lē-LĪTH-ō-trīp-se]
295. chyme [kīm] {quimo}
296. cirrhosis [sir-RO-sīs] {cirrosis}
297. col(o), colon(o)
298. colectomy [kō-LĒK-tō-mē] {colectomía}
299. colic [KŌL-īk] {cólico}
300. colitis [kō-LĪ-tīs] {colitis}
301. colon [KŌ-lōn] {colon}
302. colonoscopy [kō-lōn-ŌS-kō-pē] {colonoscopia}
303. colostomy [kō-LŌS-tō-mē] {colostomía}
304. constipation [kōn-stī-PĀ-shūn] {constipación}
305. Crohn’s [kronz] disease
Chapter 14  The Digestive System
Acknowledgements

Preparation of this book has been supported by a grant from the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health under Award Number 5T32DK007437. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.
Answers to Chapter Exercises

1. a. stomach; b. small intestine; c. large intestine; d. rectum; e. liver
2. papillae
3. frenulum
4. C
5. chyme
6. C
7. C
8. C
10. lipase
11. C
12. peristalsis
13. cardiac region, fundus, body, pylorus
14. duodenum, jejunum, ileum
15. cecum, colon, sigmoid colon, rectum
16. small
17. hepatic portal system
18. amylase, lipase
19. emulsification
20. Burning chest pains may also be a sign of a heart attack.
21. Esophagus and stomach, because the burning sensation is probably related to backflow from the stomach to the esophagus.
21. Many diseases are either directly hereditary or may be the result of a hereditary tendency. Early detection may enable better treatment.
22. gastritis and hepatitis
23. gastrectomy
24. esophagitis
25. rectocle
26. duodenal
27. choledochoectomy
28. pancreatitis
29. rectodynia, rectalgia
30. colonoscopy
31. hepatomegaly
32. gastrorrhaphy
33. proctologist
34. cholecystitis
35. hepatoma
36. pyloro, duoden, of the pylorus and duodenum
37. an-, around the anus
38. entero, colo-, opening between the small intestine and colon
39. ileo-, cec-, of the ileum and cecum
40. lingu-, under the tongue
40. append(o)-, appendix + -ectomy, surgical removal
41. cec(o)-, cecum + -stomy, surgically created opening
42. enter(o), intestines + myc(o), fungus + -osis abnormal condition of
43. gastr(o), stomach + col(o), colon + -stomy, surgically created opening
44. bucc(o)-, cheek + gingivo-, gums, + -al, pertaining to
45. cholecyst(o)-, gallbladder + -itis, inflammation
46. labi(o), lip + dent(o), teeth + -al, pertaining to
47. appendic(o)-, appendix + -lith, stone
48. hepat(o), liver + -megaly, enlargement of
49. gastr(o), stomach + enter(o), intestines + -logy, study or practice of
50. esphag(o), esophagus + gastr(o), stomach + duoden(o), duodenum + -scopy, use of an instrument for observing
51. proct(o), rectum + -itis, inflammation
52. or(o), mouth + -pharynx, throat
53. cell(o), abdomen + -ac, pertaining to
54. pancreat(o), pancreas + -lysis, destruction of
55. bili-, bile + -uria, urine
56. enter(o), intestines + -ectasis, expanding, dilating
57. ilei(o), ileum + -pexy, surgical fixation of
58. hepat(o), liver + tox(o), toxic, poison + -ic, pertaining to
59. periton( eo), peritoneum + -itis, inflammation of the
60. pharyng(o), pharynx, throat + -itis, inflammation of
61. gastroscopy
62. biopsies for cancer, blood tests for liver function
63. g
64. h
65. a
66. c
67. i
68. d
69. b
70. e
71. j
72. f
73. colitis, colon cancer, or other colon disorders
74. bland diet, avoiding alcohol and caffeine
75. d
76. e
77. h
78. j
79. b
80. c
81. i
82. f
83. g
84. a
85. anorexia
86. irritable bowel disease
87. cholecystitis
88. constipation
89. gastroesophageal reflux
90. dyspepsia
91. C
92. diverticula
93. hematocritia
94. inguinal hernia
95. ileitis
96. C
97. cirrhosis
98. hiatal hernia
99. C
100. flatulence
101. colectomy
102. At least until reconstructive surgery is done, an alternative waste excretion site will be needed.
103. hepatic lobectomy
104. gastric resection
105. ileostomy, colostomy
106. cholelithotripsy
107. abdominocentesis or paracentesis
108. A diet high in roughage may eliminate constipation.
Chapter 14 The Digestive System

109. antacid
110. f
111. e
112. c
113. b
114. a
115. d
116. to check for cancer
117. There were ulcerations.
118. bucc(o), cheek + -al, pertaining to
119. cec(o)-, cecum + -tomy, incision into
120. cec(o)-, cecum + -pexy, surgical attachment
121. cec(o)-, cecum + -tomy, incision into
122. celi(o)-, abdomen + -ac, pertaining to
123. celi(o)-, abdomen + -tomy, incision into
124. celi(o)-, abdomen + -scopy, use of an instrument for observing
125. celi(o)-, abdomen + -centesis, puncture
126. chol(e)-, abdomen + -lith, stone
127. chol(e)-, bile + -emesis, vomiting
128. chol(e)-, bile + lith(o)-, stone + -tomy, incision into
129. chol(e)-, bile + -poiesis, formation of
130. chol(e)-, bile + -stasis, stopping (of the flow of)
131. chol(e)-, bile + litho, stone + -tripsy, surgical crushing
132. cholangi(o), bile vessel or duct + carcin(o), cancer + -oma, tumor
133. cholangi(o), bile vessel or duct + -ectasis, dilatation of the
134. cholangi(o), bile vessel or duct + -stomy, opening into
135. cholangi(o), bile vessel or duct + -gram, a record of
136. cholangi(o), bile vessel or duct + -graphy, process of recording
137. cholangi(o), bile vessel or duct + -oma, tumor
138. cholangi(o), bile vessel or duct + pancreat(o), pancreas + -graphy, process of recording
139. cholangi(o), bile vessel or duct + -scopy, instrument used for observing
140. chole(cyst(o)-, gallbladder + -ectomy, removal
141. chol(e)-, gall + cyst, bladder
142. chole(cyst(o)-, gallbladder + col(o), colon + -stomy, surgically created opening
143. cholecyst(o)-, gallbladder + duoden(o), duodenum + -stomy, surgically created opening
144. cholecyst(o)-, gallbladder + -pexy, surgical attachment
145. cholecyst(o)-, gallbladder + -gram, arecord
146. cholecyst(o)-, gallbladder + -rhaphy, surgical suturing
147. cholecyst(o)-, gallbladder + son(o), sound + -graphy, process of recording
148. cholecyst(o)-, gallbladder + -stomy, surgically created opening
149. cholecyst(o)-, gallbladder + -tomy, incision into
150. choledoch(o), common bile duct + lith(o), stone(s) + -osis, pathological condition or state
151. col(o), colon + -itis, inflammation
152. col(o), colon + rect(o), rectum + -itis, inflammation
153. col(o), colon + -stomy, surgically created opening
154. duoden(o), duodenum + -ectomy, surgical removal
155. enter(o), intestines + -itis, inflammation
156. enter(o), intestines + col(o), colon + -itis, inflammation
157. esophag(o), esophagus + -cele, herniation of
158. gastr(o), stomach + col(o), colon + -itis, inflammation
159. gastr(o), stomach + enter(o), intestines + -itis, inflammation
160. gloss(o), tongue + -itis, inflammation of
161. hepat(o), liver + -scopy, use of an instrument for observing
162. ilei(o), ileum + -stomy, surgically created opening
163. jejun(o), jejunum + -ectomy, removal of
164. labi(o), lip + gingiv(o), gums + -al, pertaining to
165. pancreat(o), pancreas + -pathy, disease of the
166. pharyng(o), pharynx, throat + -ectomy, surgical removal of
167. colostomy
168. anastomosis
169. gastric resection
170. GERD
171. peritennis
172. stomatombiosis
173. steatohepatitis
174. sialism
175. rectoabdominal
176. hepatopexy
177. hepatocle
178. gastrostomy
179. gastroenteroplasty
180. esophagotomy
181. enteric
182. duodenoscopy
183. enteropathy
184. glycorrhoea
185. enterology
186. enteropexy
187. ileocecal
188. gastrolith
189. hepatography
190. choledochorrhaphy
191. cholecystolithiasis
192. cholangioliposis
193. colitis
194. biligenesis
195. choledochitis
196. colorrhagia
197. cholecystolithiasis
198. cholecystopathy
199. cholangioecstasy
200. i
201. d
202. e
203. s
204. f
205. g
206. j
207. r
208. a
209. b
210. k
211. p
212. l
213. q
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>214. c</td>
<td>T</td>
</tr>
<tr>
<td>215. t</td>
<td>T</td>
</tr>
<tr>
<td>216. m</td>
<td>T</td>
</tr>
<tr>
<td>217. n</td>
<td>T</td>
</tr>
<tr>
<td>218. h</td>
<td>T</td>
</tr>
<tr>
<td>219. o</td>
<td>T</td>
</tr>
<tr>
<td>220. T</td>
<td>T</td>
</tr>
<tr>
<td>221. T</td>
<td>T</td>
</tr>
<tr>
<td>222. F</td>
<td>T</td>
</tr>
<tr>
<td>223. T</td>
<td>T</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>224. T</td>
<td>T</td>
</tr>
<tr>
<td>225. F</td>
<td>T</td>
</tr>
<tr>
<td>226. F</td>
<td>T</td>
</tr>
<tr>
<td>227. F</td>
<td>T</td>
</tr>
<tr>
<td>228. T</td>
<td>T</td>
</tr>
<tr>
<td>229. F</td>
<td>T</td>
</tr>
<tr>
<td>230. rectoscope</td>
<td>T</td>
</tr>
<tr>
<td>231. C</td>
<td>T</td>
</tr>
<tr>
<td>232. colopexy</td>
<td>T</td>
</tr>
<tr>
<td>233. C</td>
<td>T</td>
</tr>
</tbody>
</table>

234. enzyme
235. mastication
236. C
237. antidiarrheal
238. emesis
239. rugae
240–463. Answers are available in the vocabulary reviews in this chapter.