

Digestive and Urinary Systems



- Lesson 1** The Digestive System
- Lesson 2** Caring for the Digestive System
- Lesson 3** The Urinary System



Dietary Supplement Advertising

Dietary supplement ads may make false claims. Advertisers may claim that using their product will help you

- ▶ lose weight.
- ▶ alleviate pain.
- ▶ cure disease.

Visit the Eye on the Media section at health.glencoe.com to learn more about how to analyze the claims made by makers of dietary supplements.

FOLDABLES™ Study Organizer

Before You Read

Make this Foldable to help you organize your notes on the structure and function of the digestive system. Begin with one sheet of plain 11" x 17" paper.

Step 1

Mark the midpoint of the long axis on a sheet of paper.



Step 2

Fold the outside edges of the paper in to touch the middle mark. Label as shown.



As You Read

As you read and discuss the material in the chapter, record what you learn about the structure and function of the digestive system under the appropriate side of your Foldable.

SPOTLIGHT ON HEALTH

Using Visuals. What choices can you and your family make to incorporate a variety of nutritious foods into your meal plans?

The Digestive System

Guide to Reading

Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- ▶ digestion (p. 442)
- ▶ absorption (p. 442)
- ▶ elimination (p. 442)
- ▶ mastication (p. 443)
- ▶ peristalsis (p. 443)
- ▶ gastric juices (p. 444)
- ▶ chyme (p. 444)
- ▶ bile (p. 445)

Focusing on the Main Ideas

In this lesson, you will learn how to:

- ▶ Describe the structures and functions of the digestive system.
- ▶ Show the pathway of food through the digestive system.

Reading Strategy

Predict

- ▶ Scan the headings, subheadings, and photo captions. List three questions you think will be answered in this lesson.

Quick Write

Describe how you can include a variety of nutritious foods in your meal plans.



Digestion begins when you take your first bite of food. What are three functions of the digestive system?

You may not give much thought to the digestive process as you enjoy a meal with friends or family. Your body cannot receive nourishment directly from the foods you eat. Food and drink are digested into smaller nutrients before they can be absorbed into the blood and carried to the body's cells.

Functions of the Digestive System

The functions of the digestive system can be divided into three main processes:

- ▶ **Digestion**, the mechanical and chemical breakdown of foods for use by the body's cells.
- ▶ **Absorption**, the passage of digested food from the digestive tract into the cardiovascular system.
- ▶ **Elimination**, the expulsion of undigested food or body wastes.

Digestion includes both mechanical and chemical processes. The mechanical portion involves chewing, mashing, and breaking food into smaller pieces. The chemical process involves digestive juices



that change food into simpler substances. Digestive juices are secretions produced by various organs in the digestive system. These secretions contain chemicals that help break down the food.

The nervous system and the cardiovascular system also play major roles in digestion. The nervous system triggers the digestive process to begin at the sight or smell of food and controls the muscles that move food through the digestive system. After food has been broken down, nutrients, including carbohydrates, proteins, fats, vitamins, and minerals, are absorbed into the blood and delivered to all cells of the body by the cardiovascular system. Health-literate teens understand how body systems work, and know strategies for health enhancement and risk reduction.


Structures of the Digestive System

The digestive process begins in the mouth. Ingestion, the first stage of the process, is the taking of food into the body. Structures involved in ingestion include your teeth, salivary glands, and tongue. These structures are shown in **Figure 17.1** on page 444.

- ▶ **Teeth.** The primary function of the teeth is to break the food you eat into smaller pieces. **Mastication** (MAS-tuh-KAY-shuhn) is *the process of chewing*, which prepares food to be swallowed.
- ▶ **Salivary glands.** The salivary glands in the mouth produce the first digestive juices used in the digestive process. Saliva produced by these glands contains an enzyme that begins to break down the starches and sugars in food into smaller particles. Saliva also lubricates food, making it easier to swallow.
- ▶ **Tongue.** The tongue forms chewed food into a size and shape that can be swallowed. As you swallow, muscular contractions force food into the pharynx, or throat. The uvula, a small flap of muscular tissue at the back of the mouth, closes the opening to the nasal passages. The epiglottis, the flap of tissue covering the throat, closes the opening to the trachea, or windpipe, to prevent food from entering the respiratory system.

The Esophagus

When food is swallowed, it enters the esophagus, the muscular tube about 10 inches long that connects the pharynx with the stomach. Food is moved through the esophagus, stomach, and intestines by a process called **peristalsis** (PER-uh-STAWL-suhs), *a series of involuntary muscle contractions that move food through the digestive tract*. The action of peristalsis is like a wave moving through the muscle to push food and fluid through each hollow organ. The peristaltic action begins as soon as food is swallowed and enters the esophagus. A sphincter muscle at the entrance to the stomach allows food to move from the esophagus into the stomach.

 **Your salivary glands respond to the smell of foods before you begin to eat. How does saliva help in the digestion process?**



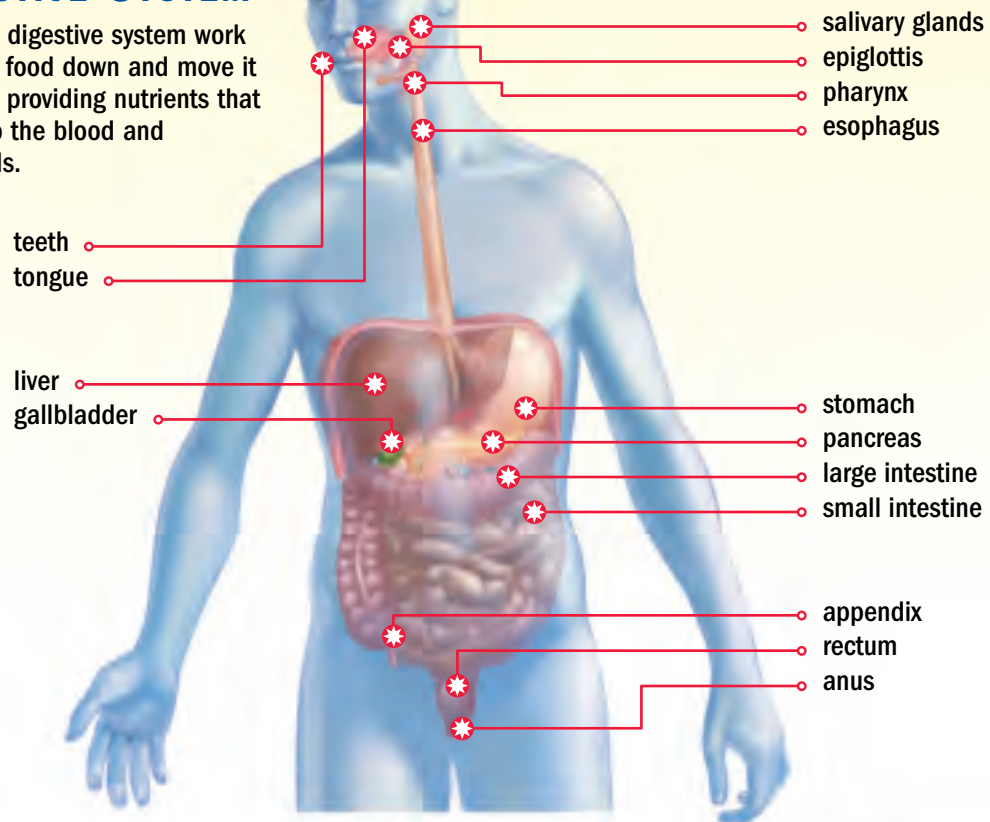
CHARACTER CHECK

Respect. Making healthful choices about what you eat and how you eat is a demonstration of responsibility and respect for your body. Using food to cope with emotions or to relieve boredom can lead to overeating or indigestion. **Follow the Dietary Guidelines and the Food Guide Pyramid to be sure that you are getting the right balance of nutrients each day. Take time to eat slowly to help your body digest foods properly.**

FIGURE 17.1

THE DIGESTIVE SYSTEM

The organs of the digestive system work together to break food down and move it through the body, providing nutrients that are absorbed into the blood and transferred to cells.



The Stomach

The stomach is a hollow, saclike organ enclosed in a muscular wall. These flexible muscles allow the stomach to expand when you eat. The stomach, shown in **Figure 17.2**, has three tasks in digestion.

- ▶ **Mixing foods with gastric juices.** **Gastric juices** are secretions from the stomach lining that contain hydrochloric acid and pepsin, an enzyme that digests protein. Hydrochloric acid in the stomach kills bacteria taken in with food and creates an acidic environment for the pepsin to do its work. The hydrochloric acid is strong enough to dissolve metal. Mucus produced in the stomach forms a protective lining so that the strong gastric juices do not digest the stomach.
- ▶ **Storing swallowed food and liquid.** The stomach holds food and liquid for further digestion before they move into the small intestine.
- ▶ **Moving food into the small intestine.** As food is digested in the stomach, it is converted to **chyme** (kym), a creamy, fluid mixture of food and gastric juices. Peristalsis moves the chyme into the small intestine.

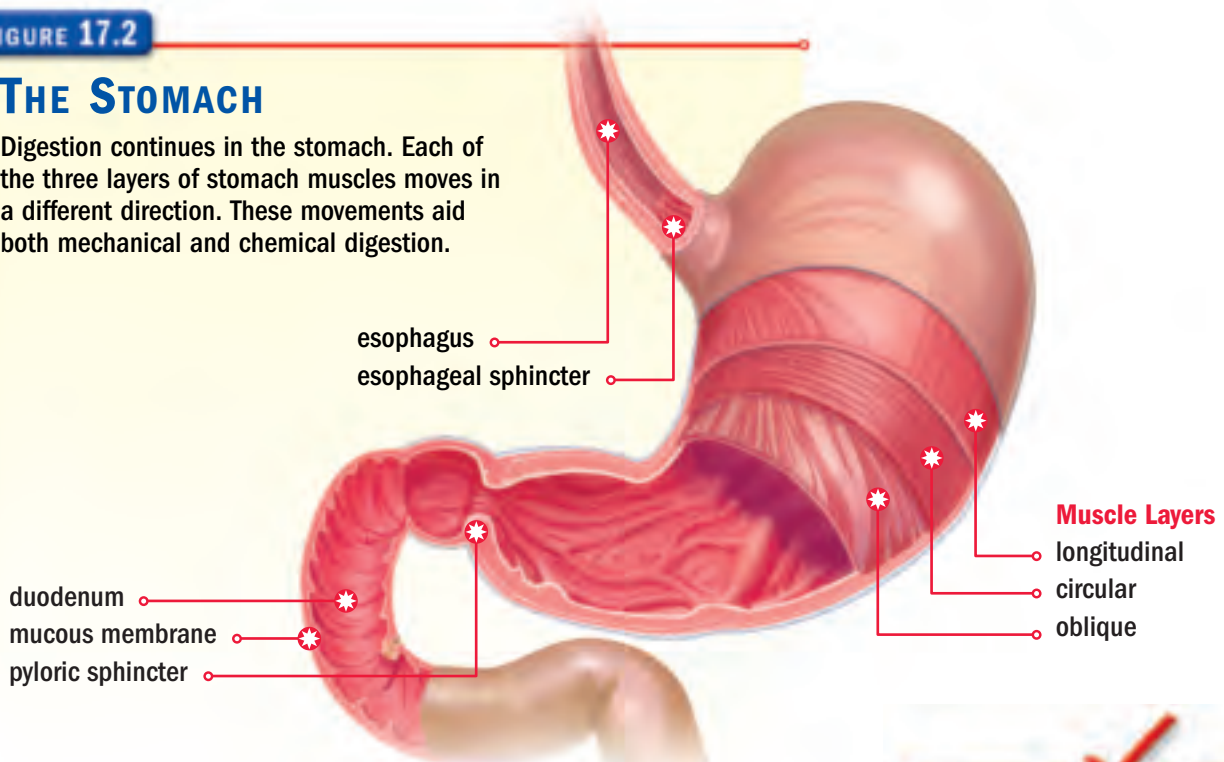
Reading Check

Explain What are the three structures involved in ingestion?

FIGURE 17.2

THE STOMACH

Digestion continues in the stomach. Each of the three layers of stomach muscles moves in a different direction. These movements aid both mechanical and chemical digestion.



The Pancreas, Liver, and Gallbladder

In the small intestine, the juices of two other digestive organs mix with the food to continue the process of digestion. One of these organs is the pancreas. It produces enzymes that break down the carbohydrates, fats, and proteins in food. Other enzymes that are active in the process come from glands in the wall of the intestine.

The liver produces another digestive juice—**bile**, a yellow-green, bitter fluid important in the breakdown and absorption of fats. Between meals, the bile is stored in the gallbladder. At mealtime, it is secreted from the gallbladder into the bile duct to reach the intestine and mix with the fats in food. Bile acids dissolve the fats into the watery contents of the intestine. After the fat is dissolved, it is digested by enzymes from the pancreas and from the lining of the intestine.

The Small Intestine

The small intestine is 20 to 23 feet in length and 1 inch in diameter. It consists of three parts, the duodenum (doo-uh-DEE-nuhm), the jejunum (juh-JOO-nuhm), and the ileum (IL-lee-uhm). As chyme enters the duodenum from the stomach, it includes partially digested carbohydrates and proteins and undigested fats. This mixture is further dissolved by digestive juices secreted from glands in the lining of the small intestine, along with secretions from the liver and the pancreas.

Reading Check

Compare and Contrast

What are the differences between the small intestine and the large intestine?

Did You Know?

The liver is the body's heaviest gland and largest organ after the skin. It produces bile and removes toxic substances such as alcohol from the blood.

The pancreas produces three digestive enzymes: *amylase*, which breaks down carbohydrates; *trypsin*, which breaks down proteins; and *lipase*, which breaks down fats. These enzymes are carried to the small intestine by a tube leading from the pancreas to the small intestine.

Did You Know?

The small intestine is named for its diameter, not its length. It is about 1 inch wide and 20 to 23 feet long.

- It takes three to five hours for material to move through the small intestine.
- The small intestine is the main site of nutrient absorption. Ninety percent of all nutrients are absorbed through this organ.

The inner wall of the small intestine contains millions of finger-like projections called villi (VIL-eye). The villi are lined with capillaries. Nutrients entering these capillaries are absorbed and carried throughout the body by the cardiovascular system. Unabsorbed material leaves the small intestine in the form of liquid and fiber and moves by peristalsis into the large intestine.

The Large Intestine

The undigested parts of food pass into the colon, or large intestine. The large intestine is about 2.5 inches in diameter and 5 to 6 feet in length. Its main functions are to absorb water, vitamins, and salts, and to eliminate wastes.

REMOVING WASTES FROM THE BODY

The body produces wastes in the form of solids, gases, and liquids. Solid wastes are eliminated through the large intestine. Bacteria that live in the large intestine convert the undigested food materials into a semisolid mass called feces. Feces are excreted from the body through the anus during a bowel movement. The skin excretes some wastes through the pores by perspiration. The lungs expel carbon dioxide, a gaseous waste, when you exhale. Liquid wastes are filtered through the urinary system, described in Lesson 3.

LESSON

1

REVIEW

Reviewing Facts and Vocabulary

1. What are the functions of the digestive system?
2. Define *peristalsis*.
3. Describe the pathway of food and undigested wastes through the digestive system.

Thinking Critically

4. **Synthesizing.** Explain how the digestive system interacts with the cardiovascular system.
5. **Evaluating.** Assess the importance of the role of the pancreas in the digestive process.

Applying Health Skills

Advocacy. Prepare a booklet that demonstrates knowledge about personal health concerns related to the digestive system. Your booklet should outline the organs of the digestive system, describe the function of each organ, and list behaviors that contribute to the health of these organs. Share the booklet with your family.

After You Read

Describe. What are the three main processes of the digestive system? Write one or two sentences describing each.



Caring for the Digestive System

Guide to Reading

Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- ▶ indigestion (p. 448)
- ▶ heartburn (p. 448)
- ▶ hiatal hernia (p. 448)
- ▶ appendicitis (p. 450)
- ▶ peptic ulcer (p. 451)

Focusing on the Main Ideas

In this lesson, you will learn how to:

- ▶ **Examine** the effects of health behaviors on the digestive system.
- ▶ **Identify** the problems of the digestive system.

Reading Strategy

Predict

- ▶ After reviewing the headings, subheadings, and pictures, write a few sentences describing how you care for your digestive system.

Quick Write

Write a summary describing the benefits of eating a healthful diet.

Do you often rush through your day without giving much thought to your next meal? Part of having good digestive health includes taking the time to prepare and eat a variety of nutrient-rich foods. Practicing health behaviors that include healthy eating habits can reduce the risk of developing problems with digestion or with the organs of the digestive system.

Health Behaviors and the Digestive System

Taking care of your digestive system begins with the choices you make about which foods to eat and how you eat them. The reward for maintaining good eating habits may well be a lifetime free of digestive problems or habits that may lead to disease. An informed individual understands the impact of personal health behaviors on body systems. The following health behaviors will keep your digestive system healthy.

- ▶ Follow a well-balanced diet that includes a variety of foods that are low in fat and high in fiber.



- ▶ **Choose high-fiber foods such as whole grain breads and vegetables to help keep your digestive system healthy. *What are some other health behaviors that might affect your digestive system?***



Incorporate physical activity into your day.

How does physical activity enhance the health of your digestive system?



- ▶ Wash your hands before preparing a meal and before eating to reduce the risk of introducing harmful bacteria into your digestive system.
- ▶ Eat slowly and chew your food thoroughly. Do not wash food down with liquid.
- ▶ Drink at least eight 8-ounce glasses of water each day to help your digestive system function properly.
- ▶ Avoid using food as a way of dealing with your emotions. Instead, take a walk or write in a journal when you feel stressed.

Practicing these healthy behaviors shows that you understand the potential impact of common risk behaviors on the quality of life.

Problems of the Digestive System

Problems of the digestive system include the minor discomfort caused by indigestion or an upset stomach, more serious bacterial infections or foodborne illness, and conditions that need immediate medical attention, such as appendicitis. Health-literate teens possess the ability to assess their own health. These teens are able to explain the relationship between eating habits and total health.

Functional Problems of the Digestive System

Problems such as indigestion, heartburn, gas, constipation, nausea, or diarrhea may result from illness, stress, and eating certain foods.

- ▶ **Indigestion** is a feeling of discomfort in the upper abdomen. This feeling of fullness can sometimes be accompanied by gas and nausea. Indigestion can be caused from eating too much food, eating too quickly, and eating foods that are spicy or high in fat. Stomach disorders and stress can contribute to indigestion.
- ▶ **Heartburn** is a burning sensation in the center of the chest that may rise from the bottom, or tip, of the breastbone up to the throat. It results from acid reflux, or the backflow of stomach acid into the esophagus. As the acid enters the esophagus, it irritates the tissues, causing a burning feeling. Heartburn can also be a symptom of a **hiatal hernia** (hy-AY-tuhl HER-nee-uh), a condition in which part of the stomach pushes through an opening in the diaphragm. Because frequent or prolonged heartburn can be an indication of more serious digestive disorders, it is important to discuss the symptoms with a medical professional.
- ▶ **Gas.** Although a certain amount of gas in the stomach and intestines produced from the breakdown of food is normal, excessive gas can result in cramps or an uncomfortable feeling of fullness in the abdomen. Most foods that contain carbohydrates or complex sugars, such as beans, cabbage, broccoli, onions, and starches, can cause gas.



How does viral hepatitis affect the liver?

Hepatitis, an inflammation of the liver, is caused by viral infections. Several different viruses exist, including hepatitis A, B, and C. Hepatitis A is spread by contaminated food or water and by the feces of infected people. Hepatitis B and C can be spread by sexual contact, by contact with infected blood, and by sharing needles with infected drug users. Hepatitis B and C viruses can cause chronic hepatitis, a disease that can last a lifetime.



► **Constipation** is a condition in which feces become dry and hard and bowel movements are difficult. Constipation can be caused by not drinking enough water or consuming enough **fiber** to move wastes through the digestive system. Some medications can also cause constipation. Following a diet that includes fruits and vegetables, drinking at least eight 8-ounce glasses of water each day, and getting regular physical activity are the best ways to avoid constipation.

When recommended by a health care professional, laxative drugs may be used to treat constipation. Laxatives can cause diarrhea, abdominal cramps, and gas. Some types of laxatives coat the intestine.



Explain What are some of the functional problems of the digestive system?

Hands-On Health ACTIVITY

Avoiding Stress for Healthy Digestion

What does stress have to do with digestion? More than you might think! Stress can affect how your digestive system functions. Plus, stress can lead to poor eating habits. Chronic stress can cause poor absorption of vitamins and minerals, which can lead to nutritional deficiencies. In this activity, you will design a poster displaying stress-management strategies to aid healthy digestion.

What You'll Need

- pencil and paper
- poster board
- markers

What You'll Do

1. Divide a piece of paper into four sections.
2. Write one of the following concepts in each section:
 - Eat regular meals, with a variety of foods, instead of over- or undereating.
 - Limit comfort foods, which are frequently full of fat and sugar.
 - Limit caffeine, which is a stimulant.

- Don't rush through meals; sit down and relax.

3. Under each concept, list 5–10 positive stress-management strategies. For example, under “Limit comfort foods” you may write, “When I’m stressed, I will take a long walk instead of eating cookies.” Under “Don’t rush through meals,” you may write, “I will get up ten minutes earlier every morning so I have time to eat a leisurely breakfast.”
4. Working with a small group, create a poster about one of these four concepts, showing how teens can avoid stress and maintain digestive system health. Make your poster colorful and attractive. Be sure to include tips for stress-management techniques.

Apply and Conclude

Present your stress-management poster to the class. Consider displaying the posters in the cafeteria or other areas of the school.



Reducing Digestive Discomfort

It is natural for indigestion, heartburn, and gas to occur occasionally. There are several things you can do to avoid these problems.

Tips for avoiding digestive discomfort:

- ▶ Avoid lying down immediately after finishing a meal. If possible, wait two to three hours before going to bed after eating your last meal of the day.
- ▶ Eat smaller, more frequent meals.
- ▶ Avoid fried foods and other foods that are high in fat.
- ▶ Participate in regular physical activity, which helps regulate the flow of materials through the digestive system.



Examine What is the cause of peptic ulcers?

The coating may prevent vitamin absorption. The body may also become dependent on laxatives and fail to function on its own.

- ▶ **Nausea** is the feeling of discomfort that sometimes precedes vomiting. Motion sickness, pathogens, some medications, and dehydration can cause nausea. Vomiting is a reflex in which the contents of the stomach are brought back up the esophagus and out of the mouth. Powerful contractions of the abdominal muscles compress the stomach, while the esophageal sphincter relaxes to allow the contents to exit the stomach.
- ▶ **Diarrhea** is the frequent passage of watery feces. When digested food passes too quickly through the large intestine, water cannot be absorbed and diarrhea results. Diarrhea may result from changes in eating style, overeating, emotional turmoil, or nutritional deficiencies. Bacterial or viral infections and certain medications can cause diarrhea. One of the greatest concerns about diarrhea, especially when it occurs in infants and young children, is dehydration. To avoid dehydration during an episode of diarrhea, drink plenty of water and other fluids. Fluids that contain electrolytes help maintain the body's fluid and chemical balance. Medical attention should be sought if diarrhea persists for more than 48 hours.

Structural Problems of the Digestive System

Although some digestive system problems are temporary or easily treated, others are very serious, requiring immediate medical attention.

GALLSTONES

Gallstones are formed when cholesterol in bile crystallizes and blocks the bile duct between the small intestine and the gallbladder. Symptoms include pain in the upper right portion of the abdomen, nausea, vomiting, and fever. Treatment includes taking medication that dissolves the stones or having the stones broken down by high-intensity ultrasound waves. Surgical removal of the stones and possibly the gallbladder itself is an option when symptoms are severe.

APPENDICITIS

Appendicitis is the inflammation of the appendix, a tube from 3 to 4 inches long that extends from the beginning portion of the large intestine. The appendix becomes swollen and inflamed if it is blocked or clogged by bacteria or other foreign matter that prevent the release of its secretions. Symptoms of appendicitis include pain in the lower right portion of the abdomen, fever, loss of appetite, nausea and vomiting, and tenderness in the area of the appendix. The appendix may burst, spreading infection throughout the abdomen, making the condition extremely serious. Medical care is essential. Treatment involves surgical removal of the appendix.



GASTRITIS

Gastritis, one of the most common disorders of the digestive system, is an inflammation of the mucous membrane that lines the stomach. An increase in the production of stomach acid, the use of tobacco or alcohol, infections caused by bacteria and viruses, and medications such as aspirin can irritate the stomach lining. Symptoms of gastritis include pain, indigestion, decreased appetite, and nausea and vomiting. Treatment includes avoiding irritants and taking medications or antibiotics to eliminate infection.

LACTOSE INTOLERANCE

Lactose, a type of sugar found in milk and other dairy products, is normally broken down by the enzyme lactase. People who are lactose intolerant do not produce enough lactase, so undigested lactose remains in the small intestine. Bacteria in the digestive tract ferment ingested lactose, producing such symptoms as abdominal cramps, bloating, gas, and diarrhea. Chewing lactase enzyme tablets can reduce symptoms. People who are lactose intolerant should choose alternate sources of calcium including dark green vegetables such as broccoli and kale, fortified soymilk, and yogurt with active cultures.

PEPTIC ULCER


A **peptic ulcer** is a sore in the lining of the digestive tract. Peptic ulcers can be caused by regular use of anti-inflammatory drugs such as aspirin and by a bacterial infection caused by *Helicobacter pylori* (*H. pylori*). Symptoms include nausea, vomiting, and abdominal pain that worsens when the stomach is empty. Ulcers can cause bleeding in the stomach, and without treatment, they may perforate, or break through, the stomach wall. Treatment includes medications that neutralize acid or eliminate infection and avoiding irritants such as aspirin, cigarette smoke, and alcohol.

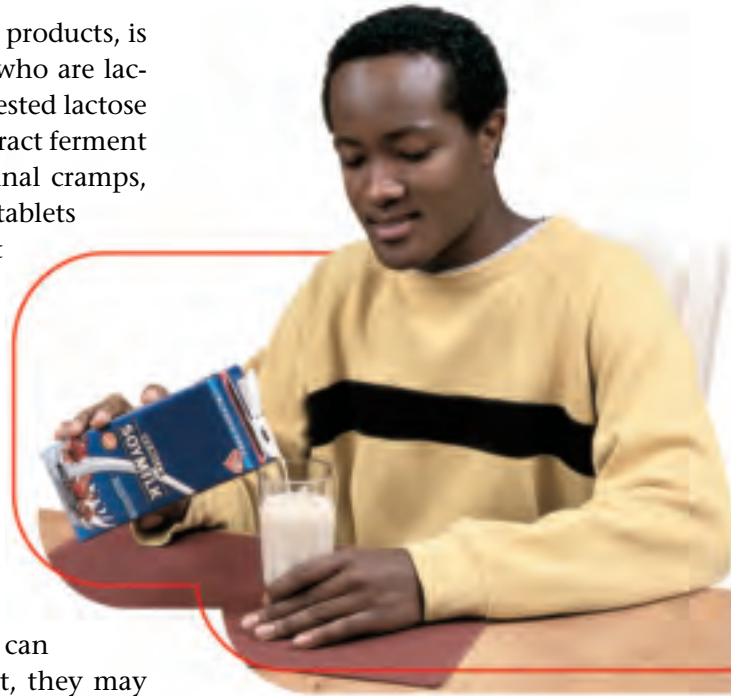
CIRRHOSIS

Destruction of liver tissue, usually caused by prolonged and heavy alcohol use, results in cirrhosis, or scarring of the liver tissue. Alcohol interferes with the liver's ability to break down fats. Excess fat in the liver blocks the flow of blood in the liver cells. Liver tissue is destroyed and replaced with useless scar tissue, preventing normal liver function. Cirrhosis can lead to liver failure and may cause death unless a liver transplant is performed.

CROHN'S DISEASE

Crohn's disease causes inflammation of the lining of the digestive tract. Symptoms include diarrhea, weight loss, fever, and abdominal pain. Although no cause has yet been discovered, the disease seems to be associated with problems in the immune system.

 People who are lactose intolerant can meet their calcium needs by choosing yogurt, fortified soymilk, and certain green vegetables that are high in calcium.




HEALTH Online

TOPIC The Digestive System

Go to health.glencoe.com for links to more information about the digestive system.

ACTIVITY Using the information provided at these links, create a checklist of daily behaviors you can adopt to keep your digestive system healthy.



 **The teeth are an important part of your digestive system. What health behaviors do you practice every day to promote the health of your teeth?**

COLON CANCER

Cancer of the colon and rectum is the second leading cause of cancer deaths in the United States. This cancer usually develops in the lowest part of the colon, near the rectum. As the cancer grows larger, it either blocks the colon or causes bleeding, often during elimination. Cancers of this type are usually slow to spread. Seeking early medical help greatly increases a person's chance of survival.

COLITIS

Colitis is an inflammation of the large intestine or colon. It may be caused by bacterial or viral infections. Symptoms may include fever, abdominal pain, and diarrhea, which can contain blood.

HEMORRHOIDS

Hemorrhoids are veins in the rectum and anus that are swollen as a result of increased pressure. Hemorrhoids may occur with constipation, during pregnancy, and after childbirth. Signs of hemorrhoids include itching, pain, and bleeding. Regular physical activity and a diet high in fiber can help prevent hemorrhoids.

TOOTH DECAY

Teeth are very important to the digestive process. Brushing and flossing teeth daily is the best way to prevent tooth decay and to keep your teeth healthy.

REVIEW

LESSON

2

Reviewing Facts and Vocabulary

1. Examine the effects of health behaviors on the digestive system, and list three behaviors that help prevent digestive system problems.
2. Define *indigestion* and describe its symptoms.
3. Name and describe two structural problems of the digestive system.

Thinking Critically

4. **Synthesizing.** How does fiber contribute to the health of the digestive system?
5. **Analyzing.** Why are early detection and treatment of digestive system disorders important?

Applying Health Skills

Goal Setting. Analyze the relationship between health promotion and disease prevention. Make a list of health behaviors you could practice to improve the health of your digestive system. Choose one behavior from your list and use the goal-setting steps to develop a plan to incorporate this behavior into your daily life.

After You Read

Problems and Solutions. Make a T chart. On one side, list the problems of the digestive system. On the other side, list some of the ways to care for the digestive system to avoid illness and disease.



The Urinary System

Guide to Reading

Building Vocabulary

As you read this lesson, write each new highlighted term and its definition in your notebook.

- ▶ urine (p. 453)
- ▶ nephrons (p. 454)
- ▶ ureters (p. 454)
- ▶ bladder (p. 455)
- ▶ urethra (p. 455)
- ▶ cystitis (p. 456)
- ▶ urethritis (p. 456)
- ▶ hemodialysis (p. 457)

Focusing on the Main Ideas

In this lesson, you will learn how to:

- ▶ Describe the structures and functions of the urinary system.
- ▶ Examine the effects of health behaviors on the urinary system.
- ▶ Identify the problems and warning signs of the urinary system.

Reading Strategy

Predict

- ▶ Scan the headings, subheadings, and photo captions. Write a summary describing what you think will be included in this lesson.

Quick Write

Write a short paragraph describing how food and drink affect your urinary system.

While the digestive system removes solid wastes from the body, the urinary system functions to filter and remove liquid waste. A healthy urinary system helps maintain balance within the internal environment of the body. Because of this important role, problems in the urinary system, if left untreated, can affect the entire body and may result in death.

Function of the Urinary System

The main function of the urinary system is to filter waste and extra fluid from the blood. **Urine** is liquid waste material excreted from the body through the process of urination. Urine consists of water and body wastes that contain nitrogen. These wastes become toxic to cells if they remain in the body for too long.

The Kidneys

The kidneys, shown in **Figure 17.3** on the next page, are bean-shaped organs about the size of a fist. They are near the middle of the back, just below the rib cage.



- ▶ Avoid caffeine drinks, drink at least eight glasses of water daily, and include other healthful sources of fluids to help maintain the function of your urinary system.

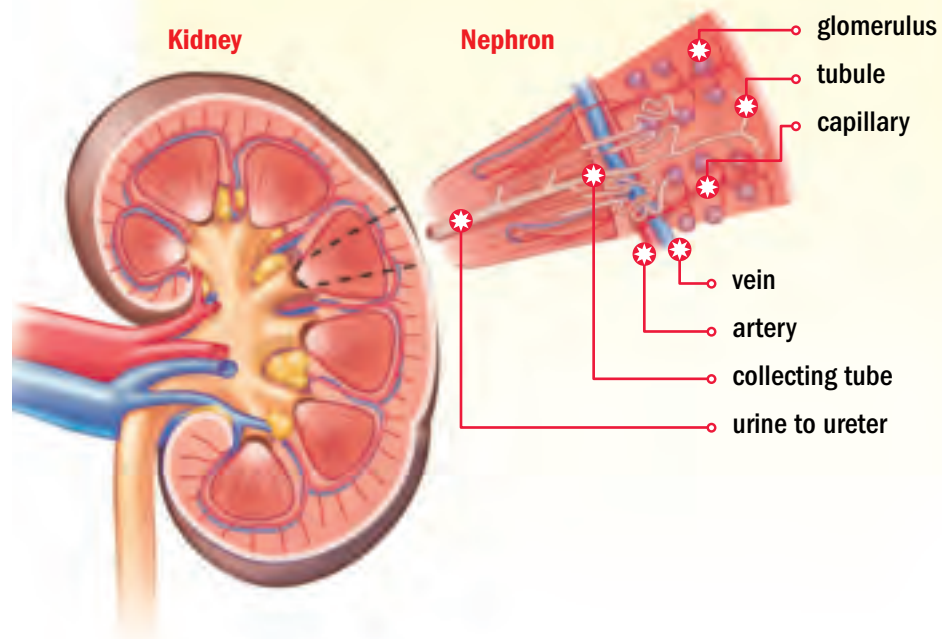
Reading Check

Explain What vital function do the kidneys provide for the body?

FIGURE 17.3

THE KIDNEY

The kidney, part of the urinary system, performs the vital function of removing wastes from the blood.



Did You Know?

The urinary system filters about 50 gallons of blood and produces 1 to 2 quarts of urine each day.

As part of the filtering process, the kidneys adjust the amount of salts, water, and other materials excreted in the urine according to the body's needs. They monitor and maintain the body's acid-base and water balances. When the blood and body fluids become too acidic or too alkaline, the kidneys alter the acidity of the urine to restore the balance. When the body becomes dehydrated, the pituitary gland releases antidiuretic hormone (ADH), stimulating thirst and allowing the kidney to balance the fluid levels in the body.

The Ureters

From the kidneys, urine travels to the bladder through the ureters. The **ureters** are tubes that connect the kidneys to the bladder. Each ureter is 8 to 10 inches long. Muscles in the ureter walls tighten and relax to force urine down and away from the kidneys. The ureters are constantly working. Some amount of urine is passed from the ureters to the bladder about every 15 seconds.

The Bladder and the Urethra

The **bladder** is a hollow muscular organ that acts as a reservoir for urine. Located in the pelvic cavity, the bladder is held in place by ligaments attached to other organs and to the pelvic bones. Until the bladder is ready to be emptied, sphincter muscles close tightly, like a rubber band, around the opening into the **urethra**, the tube that leads from the bladder to the outside of the body.



Infer Which urinary conditions include infection and blockage of urine?

Health Behaviors and the Urinary System

Proper urinary function is important because wastes that are not removed from the body quickly become toxic. There are several health behaviors that can affect your urinary system.

Resilient TEENS

Jennie Bregande has an uncanny knack for finding silver linings in life's darkest clouds. Jennie's Asian features set her apart and she was teased about being adopted. "Kids can be so cruel," says Jennie. "They called me names, and I'd come home crying.

But Jennie's toughest challenge was coming to terms with having Attention Deficit Disorder (ADD). "I used to be so ashamed that I couldn't concentrate like other kids," says Jennie. "Then a therapist helped me see it as a gift. There are things I see, connections I make, that other kids don't."

These days Jennie offers advice to kids who call the weekly radio show "Teen Talk" that she hosts. "I've learned to surround myself with positive people," she says. "And that makes all the difference."




"I've learned to surround myself with positive people, and that makes all the difference."

Reading Check

Explain Why was having ADD the toughest challenge Jennie faced?



 A healthy individual who wishes to become an organ donor carries a card stating that preference. An organ donation card such as the one shown here is often carried with the person's driver's license.

- ▶ Drink at least eight 8-ounce glasses of water each day, and limit your intake of caffeine and soft drinks. Caffeine drinks can interfere with kidney function and increase the amount of water lost through urination.
- ▶ Eat a well-balanced diet.
- ▶ Practice good hygiene and personal health care to help prevent harmful bacteria from causing infection.
- ▶ Have regular medical checkups. Reporting to your doctor any changes in the frequency of urination and in the color or odor of urine is important to the early detection and treatment of urinary system disorders.

Health-literate teens are able to determine how heredity, environmental, and lifestyle factors place them at risk for disease.

Problems of the Urinary System

Urinary system problems can result from several different conditions, including infection and blockage of urine. **Cystitis** is an inflammation of the bladder, most often caused by a bacterial infection, which can spread to the kidneys. **Urethritis**, the inflammation of the urethra, can be caused by a bacterial infection. Symptoms of both conditions include burning pain during urination, increased frequency of urination, fever, and the presence of blood in the urine. Seeking medical help for these symptoms shows you know strategies for health enhancement and risk reduction. Health-literate teens can identify prevention, causes, warning signs, and treatments for non-communicable diseases.

Kidney Problems

Kidney disorders, some of which can be life threatening, should be treated and monitored by a medical professional. Kidney problems include the following conditions.

- ▶ **Nephritis** is the inflammation of the nephrons. Symptoms include fever, tissue swelling, and changes in urine production.
- ▶ **Kidney stones** form when salts in the urine crystallize into a solid stone, usually containing calcium. Small stones can pass through the urinary system naturally, with treatment to relieve symptoms. Treatment for larger stones includes a procedure in which high-intensity sound waves are used to break stones apart so they can pass through the urethra.
- ▶ **Uremia** is a serious condition associated with a decrease in blood filtration by the kidneys. As a result of decreased filtration, abnormally high levels of nitrogen waste products remain in the blood and can cause tissue damage.


Did You Know?

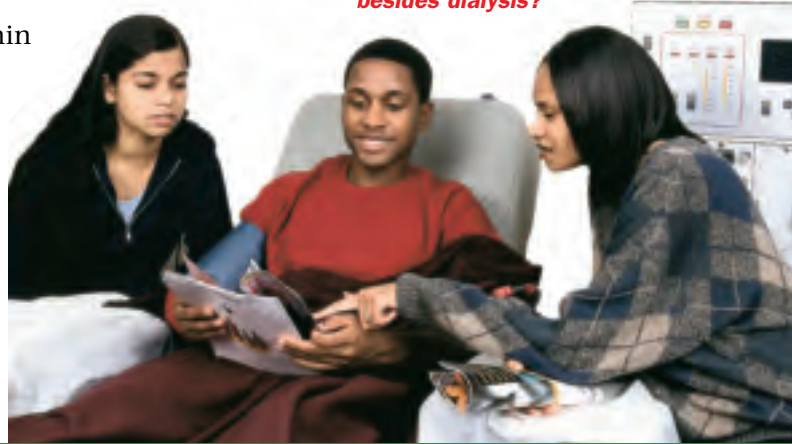
According to the U.S. Department of Health and Human Services, about 27,000 Americans receive a successful organ transplant each year. Most people who wish to do so may become tissue or organ donors. Anyone under the age of 18 must have the consent of a parent or guardian.

KIDNEY FAILURE

Kidney failure can be acute, meaning sudden onset, or chronic, in which case the kidneys progressively lose their ability to function. Treatment includes reducing symptoms and slowing the progression of the disease. If kidney damage is extensive, dialysis or a kidney transplant may be required.

- ▶ **Hemodialysis** (HEE-moh-dy-AL-uh-suhs) is a technique in which an artificial kidney machine removes waste products from the blood. A needle connected to plastic tubing passes blood from the patient to a machine that filters the blood and returns it in much the same manner that a healthy kidney would.
- ▶ **Peritoneal dialysis** uses the peritoneum, a thin membrane that surrounds the digestive organs, to filter the blood. A catheter, a tube that provides a passageway for fluids, is inserted into the abdominal cavity to remove toxins.
- ▶ **Kidney transplant** is a third treatment option for chronic kidney failure. This involves the replacement of a nonfunctional kidney with a healthy kidney from a donor.

 **Kidney failure is treated by using medical technology to filter the blood artificially. What options might a person with kidney failure have besides dialysis?**



LESSON

3

REVIEW

Reviewing Facts and Vocabulary

1. Describe the main function of the urinary system.
2. What is a *ureter* and what is a *urethra*?
3. Examine the effects of three health behaviors on the urinary system, and explain how these behaviors help reduce the risk of developing a urinary system disorder.

Thinking Critically

4. **Analyzing.** Explain why coffee, tea, and cola drinks should not be counted as part of your daily recommended eight glasses of water.
5. **Applying.** Relate the importance of early detection and warning signs that prompt individuals of all ages to seek health care for urinary system problems. What might a change in the appearance of one's urine indicate?

Applying Health Skills

Accessing Information. Research and discuss the health-related social issues of organ donation and kidney transplants. How are donors matched with potential recipients? What type of follow-up care is needed? Share with your classmates what you learned about organ donation and transplants.

After You Read

Explain. Write a brief paragraph describing the role of the kidneys. What vital function do they perform to maintain your health?

Think Drink

You know drinking lots of water is good for you—but what other fluids will help you stay healthy? Consider these options.

Sports Drinks

PROS: Most contain ideal levels of electrolytes, which reduce the chances you will cramp during workouts that last for more than an hour. Their simple sugars are easily converted to glycogen, giving your muscles much-needed fuel. Plus, the drink's added sodium stimulates the urge to drink, so you guzzle more often.

CONS: You may not love the taste—nor the calories (about 50 to 70 calories in 8 ounces), sugar, artificial flavorings, and cost (water and fruit tend to be much cheaper).

Water

PROS: Water is suitable for any type of activity, whether you're walking the dog or racing a friend. It's also cheap compared to sports drinks.

CONS: Water doesn't replenish all the electrolytes that you lose through sweat or help refuel muscle tissue during endurance activities. It also goes through your system faster, so you may find yourself taking more breaks than you'd like.

Fruits and Vegetables with High Water Content

PROS: Oranges, watermelon, grapes, cucumbers, celery, and many other fruits and vegetables are bursting with fluids. (Oranges, for example, are 87 percent water.) Plus, most produce is packed with such vital nutrients as fiber, folate, magnesium, potassium, and vitamin C.

CONS: Eating may be impractical or inconvenient during heavy exercise. Normal portions of fruits and veggies don't always provide enough fluid. On average, whole foods like these work best as a supplement to water or a sports drink. ■



TIME
to THINK...

About Drinks
with Caffeine

Imagine that you're the coach of your school soccer team. The team members ask if they can each have a caffeinated cola drink at half time. What three reasons can you give them for saying they should drink water instead? (*Hint: Research the effects of caffeine on the body and dehydration.*)

Health Skills Application



1. Goal Setting. Examine the effects and benefits of physical activity for coping with stress and helping reduce the risk of developing certain digestive disorders. Use the steps of goal setting to develop a plan to incorporate 30 minutes of physical activity into each day. Make a table to help you organize your time to fit the activity into your day. (LESSON 1)



2. Communicating. You are worried about a close family member who appears to be using food as a coping mechanism for dealing with his or her emotions. Write a dialogue that includes how you could encourage this person to use more positive health behaviors to manage his or her emotions. Use “I” messages and active listening techniques in your dialogue. (LESSON 2)



3. Accessing Information. Research more about the elimination of waste products from the body. Identify the different types of wastes and which organs and body functions are responsible for eliminating each type. Make a poster that shows the results of your research. (LESSON 3)

CAREER Corner

Urologist

A urologist is a doctor who specializes in treating diseases of the urinary tract. About 99,000 Americans die every year from causes related to kidney failure. This number is expected to grow in the near future as the American population ages. In order to meet this demand for medical services, more young people will be needed to pursue careers in this special field.

To become a urologist, you'll need a four-year college degree followed by five years of medical school. You can find out more about this and other health careers by clicking on Career Corner at health.glencoe.com.



BEYOND the Classroom

Parent Involvement

Advocacy. With a parent, learn more about the services available in your community for patients suffering from digestive or urinary problems. Are there groups for people with colitis or irritable bowel syndrome, for example? Where do patients receive dialysis? Investigate programs that raise awareness of these services, and ask how you and your parents can participate.



School and Community

Tooth Care. Contact a dentist, and ask him or her to talk to your class about oral health. Ask the dentist to describe the specific role of teeth in digestion and how different teeth are shaped to carry out different functions.



After You Read

Use your Foldable to review chapter material by recalling what you have learned and then checking your knowledge by reviewing your notes under the tabs.



► **EXPLORING HEALTH TERMS** Answer the following questions on a sheet of paper.

Lesson 1 Replace the underlined words with the correct term.

absorption	bile
chyme	digestion
elimination	gastric juices
peristalsis	mastication

- The mechanical and chemical breakdown of foods for use by the body's cells is peristalsis.
- The process of elimination is the passage of food from the digestive tract into the cardiovascular and lymphatic systems.
- Chyme is a yellow-green, bitter fluid important in the breakdown and absorption of fats.
- Digestion is the expulsion of undigested food or body wastes.

Lesson 2 Match each definition with the correct term.

appendicitis	indigestion
heartburn	peptic ulcer
hiatal hernia	

- A burning sensation in the center of the chest that may rise from the bottom, or tip, of the breastbone up to the throat.
- A condition in which part of the stomach pushes through an opening in the diaphragm.
- An inflammation of the appendix.
- A sore in the lining of the digestive tract.

Lesson 3 Fill in the blanks with the correct term.

cystitis	urethra
hemodialysis	urethritis
nephrons	bladder
urine	ureters

(9) are the functional units of the kidneys. The (10) produced in the kidneys is carried to the (11), where it is stored until it exits the body through the (12).

► **RECALLING THE FACTS** Use complete sentences to answer the following questions.

- Where does the process of digestion begin, and which digestive juice is involved?
- Define the term *chyme*. In which part of the digestive process is it formed?
- What is the purpose of villi?
- What is the main function of the large intestine?
- What is constipation? What causes it?
- What are some problems that can be caused by overusing laxatives?
- How do gastritis and a peptic ulcer differ?
- Explain the causes and risks of cirrhosis of the liver.
- Define the term *urine*. What are the main components of urine?
- What is the function of the bladder?
- Compare and contrast cystitis and urethritis.
- Describe the two types of dialysis available for patients with chronic kidney failure.



▶ WRITING CRITICALLY

- 1. Expository.** Write a public service announcement describing how stress can affect digestion. Provide advice about what to do to avoid stress-related digestive problems and what to do if they should occur.
- 2. Descriptive.** Write a one-page summary of why it is important to drink about 6 to 8 cups of water per day. Include information on how water helps the urinary system, including the kidneys, and other benefits of drinking water.

Standardized Test Practice



Read the paragraph below and then answer the questions.

Liquids Fight Flu Symptoms

(1) Have you ever heard of the influenza epidemic of 1918–1919? (2) Many people died worldwide. (3) In the United States, nearly 800,000 people died. (4) That’s more than the number of Americans who died in World War I, World War II, Korea, and Vietnam combined. (5) Influenza viruses still exist. (6) Why doesn’t the flu kill as many people today?

(7) People in the health-care industry today know that they need to tell flu patients some things about how to feel better. (8) One of the most important treatments is simple – liquids. (9) People with the flu should drink lots of water, juice, and clear soups.

- Which sentence below should be added after sentence (5) to support the ideas in the first paragraph?
 - A** Sick people should not drink liquids.
 - B** Washing your hands often is important.
 - C** Even young kids can learn to wash their hands.
 - D** You’ve probably had the flu yourself.
- Which revision of sentence 7 is the most coherent and focused?
 - F** Doctors and nurses need to know how to talk to sick people.
 - G** Follow these logical and new rules of flu treatment to be safe.
 - H** Health-care professionals understand better how to treat the flu.
 - I** To keep you safe from catching the flu, follow simple, new steps.
- Create a multimedia poster that uses familiar children’s book characters, words, and pictures to teach young flu patients to drink lots of liquids.