

CHAPTER 12: DIGESTIVE SYSTEM (GASTROINTESTINAL)

Building a Medical Terminology Foundation 2e by Kimberlee Carter; Marie Rutherford; and Connie Stevens

- 12.1 – Introduction to the Digestive System
- 12.2 – Anatomy (Structures) of the Digestive System
- 12.3 – Physiology (Function) of the Digestive System
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12.1 - Introduction to the Digestive System

Learning Objectives

- Identify the anatomy and describe the main functions of the digestive system and accessory structures
- Analyze, translate, and define medical terms and common abbreviations of the digestive system
- Practice the spelling and pronunciation of digestive system medical terminology
- Identify the medical specialties associated with the digestive system and explore common diseases, disorders, diagnostic tests and procedures

Digestive System Word Parts

Click on prefixes, combining forms, and suffixes to reveal a list of word parts to memorize for the digestive system.

Prefix

- **hemi-** (half)
- **endo-** (within, in)
- **sub-** (under, below)
- **dys-** (painful, abnormal, difficult, laboured)

Combining Form

- **abdomin/o** (abdomen, abdominal)
- **an/o** (anus)
- **antr/o** (antrum)
- **append/o** (appendix)
- **appendic/o** (appendix)

- **cec/o** (cecum)
- **celi/o** (abdomen, abdominal cavity)
- **cheil/o** (lip)
- **cholangi/o** (bile duct)
- **chol/e** (gall, bile)
- **choledoch/o** (common bile duct)
- **col/o** (colon)
- **colon/o** (colon)
- **diverticul/o** (diverticulum)
- **duoden/o** (duodenum)
- **enter/o** (intestine)
- **esophag/o** (esophagus)
- **gastr/o** (stomach)
- **gingiv/o** (gum)
- **gloss/o** (tongue)
- **hepat/o** (liver)
- **herni/o** (hernia, protrusion of an organ through a membrane or cavity wall)
- **ile/o** (ileum)
- **jejun/o** (jejunum)
- **lapar/o** (abdomen, abdominal cavity)
- **lingu/o** (tongue)
- **or/o** (mouth)
- **palat/o** (palate)
- **pancreat/o** (pancreas)
- **peritone/o** (peritoneum)
- **polyp/o** (polyp, small growth)
- **proct/o** (rectum)
- **pylor/o** (pylorus, pyloric sphincter)
- **rect/o** (rectum)
- **sial/o** (saliva, salivary gland)
- **sigmoid/o** (sigmoid colon)
- **steat/o** (fat)
- **stomat/o** (mouth)
- **uvul/o** (uvula)

Suffix

- **-al** (pertaining to)
- **-cele** (hernia, protrusion)
- **-centesis** (surgical puncture to aspirate fluid)
- **-ectomy** (excision)
- **-gram** (the record, radiographic image)
- **-graph** (instrument used to record)

- **-graphy** (process of recording)
- **-ia** (condition of, diseased state, abnormal state)
- **-iasis** (condition)
- **-itis** (inflammation)
- **-logist** (specialist or physician who studies and treats)
- **-logy** (study of)
- **-malacia** (softening)
- **-oma** (tumour)
- **-sis** (abnormal condition)
- **-pathy** (disease)
- **-pepsia** (digestion)
- **-phagia** (eating or swallowing)
- **-plasty** (surgical repair)
- **-ptosis** (prolapse, drooping)
- **-rrhaphy** (suturing, repairing)
- **-rrhea** (flow, discharge)
- **-scope** (instrument used for visualization)
- **-scopy** (process of viewing, visualization)
- **-stomy** (creation of an artificial opening)
- **-tomy** (incision, cut into)

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Introduction to the Digestive System

The digestive system is continually at work, yet people seldom appreciate the complex tasks it performs in a choreographed biologic symphony. Consider what happens when you eat an apple. Of course, you enjoy the apple's taste as you chew it, but in the hours that follow, unless something goes amiss and you get a stomachache, you don't notice that your digestive system is working. You may be taking a walk or studying or sleeping, having forgotten all about the apple, but your stomach and intestines are busy digesting it and absorbing its vitamins and other nutrients. By the time any waste material is excreted, the body has appropriated all it can use from the apple. In short, whether you pay attention or not, the organs of the digestive system perform their specific functions, allowing you to use the food you eat to keep you going.

This chapter examines the structure and functions of these organs, and explores the mechanics and chemistry of the digestive processes. The function of the digestive system is to break down the foods you eat, release their nutrients, and absorb those nutrients into the body. Although the small intestine is the workhorse of the system, where the majority of digestion occurs, and where most of the released nutrients are absorbed into the blood or lymph, each of the digestive system organs makes a vital contribution to this process (see Figure 12.1).

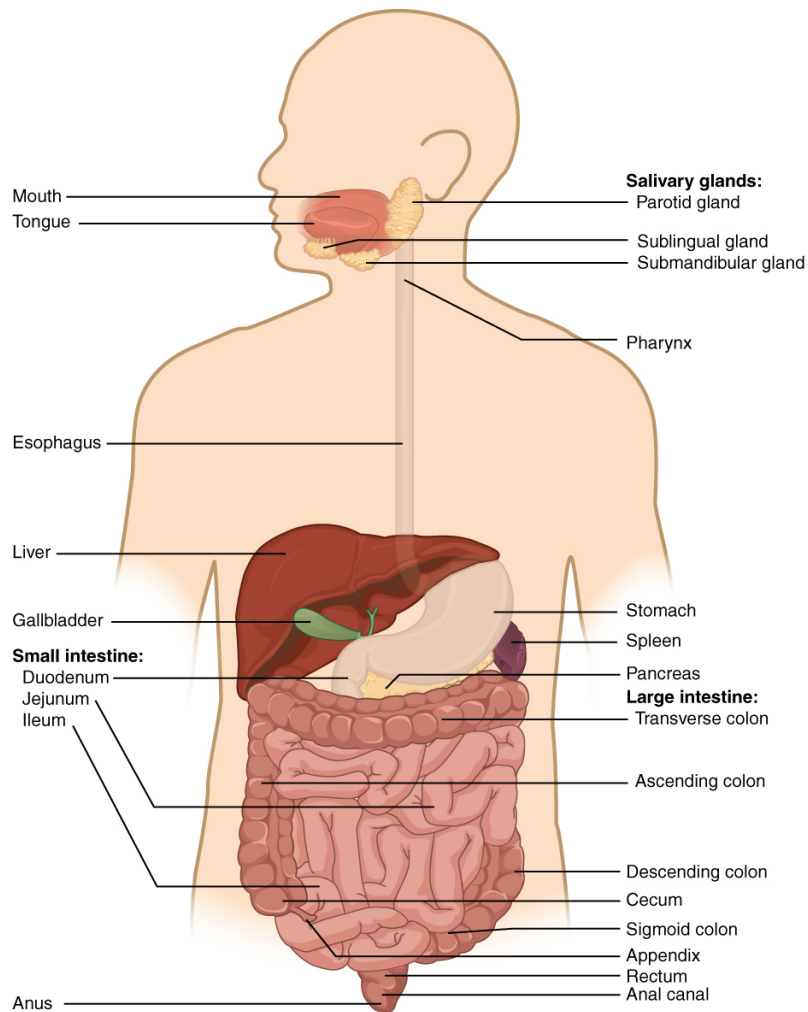


Figure 12.1 Components of the Digestive System. All digestive organs play integral roles in the life-sustaining process of digestion. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.1 Image description.]

Watch Digestive System, Part 1: Crash Course Anatomy & Physiology #33 (11 min) (<https://youtu.be/yIoTRGfcMqM>)

Digestive System Medical Terms

Now that you have memorized the word parts, see if you can break down the following digestive terms and define them.

Digestive System Medical Terms (Text Version)

Practice the following **digestive system** words by breaking into word parts and pronouncing.

1. **gastroenterology (gastr/o/enter/o/logy)**
 - study of the stomach and intestines
2. **cholecystitis (chol/e/cyst/itis)**
 - inflammation of the gallbladder
3. **proctoscope (proct/o/scope)**
 - instrument used to view the rectum
4. **pyloroplasty (pylor/o/plasty)**
 - surgical repair of the pylorus
5. **hepatomegaly (hepat/o/megaly)**
 - enlarged liver
6. **gastric (gastr/ic)**
 - pertaining to the stomach
7. **cholangiography (cholangi/o/graphy)**
 - radiographic imaging of the bile duct
8. **gastroenterologist (gastr/o/enter/o/logist)**
 - specialist who studies and treats stomach and intestines
9. **cholangiogram (cholangi/o/gram)**
 - radiographic image of the bile duct
10. **hepatoma (hepat/oma)**
 - tumour of the liver

11. **pancreatitis (pancreat/itis)**
 - inflammation of the pancreas
12. **esophagogram (esophag/o/gram)**
 - radiographic image of the esophagus
13. **steatosis (steat/osis)**
 - abnormal condition of fat
14. **rectocele (rect/o/cele)**
 - protrusion of the rectum
15. **endoscope (endo/scope)**
 - instrument used to view within (hollow organs)
16. **abdominal (abdomin/al)**
 - pertaining to the abdomen
17. **proctoptosis (proct/o/ptosis)**
 - condition of prolapse of the rectum
18. **diverticulitis (diverticul/itis)**
 - inflammation of the diverticulum
19. **oral (or/al)**
 - pertaining to the mouth
20. **appendectomy (append/ectomy)**
 - excision of the appendix
21. **esophagoscopy (esophag/o/scopy)**
 - process of viewing the esophagus
22. **cheilorrhaphy (cheil/o/rrhaphy)**
 - suturing of the lip
23. **glossorrhaphy (gloss/o/rrhaphy)**
 - suturing of the tongue
24. **pyloromyotomy (pylor/o/my/o/tomy)**

- incision into the pyloric muscle
- 25. **gastroplasty (gastr/o/plasty)**
 - surgical repair of the stomach
- 26. **colectomy (col/ectomy)**
 - excision of the colon
- 27. **sigmoidoscopy (sigmoid/o/scopy)**
 - process of viewing the sigmoid colon
- 28. **palatitis (palat/itis)**
 - inflammation of the palate
- 29. **esophageal (esophag/eal)**
 - pertaining to the esophagus
- 30. **colitis (col/itis)**
 - inflammation of the colon
- 31. **ileocecal (ile/o/cec/al)**
 - pertaining to the ileum and cecum
- 32. **gastrectomy (gastr/ectomy)**
 - excision of the stomach
- 33. **anoplasty (an/o/plasty)**
 - surgical repair of the anus
- 34. **cholelithiasis (chole/lith/iasis)**
 - condition of gallstones
- 35. **gastroscopy (gastr/o/scopy)**
 - process of viewing the stomach
- 36. **colostomy (col/o/stomy)**
 - creation of an artificial opening in the colon
- 37. **polyposis (polyp/osis)**
 - abnormal condition of (multiple) polyps

38. **laparoscopy (lapar/o/scopy)**
 - process of viewing the abdominal cavity
39. **cholecystectomy (chole/cyst/ectomy)**
 - excision of the gallbladder to remove stones
40. **glossitis (gloss/itis)**
 - inflammation of the tongue
41. **cholangioma (cholangi/oma)**
 - tumour of the bile duct
42. **pancreatic (pancreat/ic)**
 - pertaining to the pancreas
43. **stomatitis (stomat/itis)**
 - inflammation of the mouth
44. **ileocecal (ile/o/cec/al)**
 - pertaining to the ileum and cecum
45. **nasogastric (nas/o/gastr/ic)**
 - pertaining to the nose and stomach
46. **proctoscopy (proct/o/scopy)**
 - process of viewing the rectum
47. **herniorrhaphy (herni/o/rrhaphy)**
 - suturing of a hernia
48. **appendicitis (appendic/itis)**
 - inflammation of the appendix
49. **gingivectomy (gingiv/ectomy)**
 - excision of the gums
50. **gastroenterocolitis (gastr/o/enter/o/col/itis)**
 - inflammation of the stomach, intestines, and colon
51. **choledocholithotomy (choledoch/o/lith/o/tomy)**

- incision into the common bile duct to remove stones
- 52. **gastroscope (gastr/o/scope)**
 - instrument used to view the stomach
- 53. **diverticulosis (diverticul/osis)**
 - abnormal condition of having diverticula
- 54. **uvulitis (uvul/itis)**
 - inflammation of the uvula
- 55. **dysphagia (dys/phagia)**
 - difficult swallowing
- 56. **gastrostomy (gastr/o/stomy)**
 - creation of an artificial opening in the stomach
- 57. **hemicolectomy (hemi/col/ectomy)**
 - excision of half of the colon
- 58. **choledocholithiasis (choledoch/o/lith/iasis)**
 - condition of stones in the common bile duct
- 59. **uvulectomy (uvul/ectomy)**
 - excision of the uvula
- 60. **peritoneal (periton/eal)**
 - pertaining to the peritoneum
- 61. **ileostomy (ile/o/stomy)**
 - creation of an artificial opening in the ileum
- 62. **steatorrhea (steat/o/rrhea)**
 - discharge of fat
- 63. **sialolith (sial/o/lith)**
 - stone in the salivary gland
- 64. **proctology (proct/o/logy)**
 - study of disease and disorders of the rectum

65. **gastrojejunostomy (gastr/o/jejun/o/stomy)**
 - creation of an artificial opening between the stomach and the jejunum
66. **rectal (rect/al)**
 - pertaining to the rectum
67. **gingivitis (gingiv/itis)**
 - inflammation of the gums
68. **colonoscopy (colon/o/scopy)**
 - process of viewing the colon
69. **colorectal (col/o/rect/al)**
 - pertaining to the colon and rectum
70. **anal (an/al)**
 - pertaining to the anus
71. **duodenal (duoden/al)**
 - pertaining to the duodenum
72. **abdominocentesis (abdomin/o/centesis)**
 - surgical puncture to aspirate fluid from the abdomen
73. **hepatitis (hepat/itis)**
 - inflammation of the liver
74. **laparoscope (lapar/o/scope)**
 - instrument used to view the abdominal cavity
75. **antrectomy (antr/ectomy)**
 - excision of the antrum (of the stomach)
76. **enterorrhaphy (enter/o/rrhaphy)**
 - suturing of the intestine
77. **esophagitis (esophag/itis)**
 - inflammation of the esophagus
78. **uvulopalatopharyngoplasty (UPPP)**

- uvul/o/palat/o/pharyng/o/plasty
 - surgical repair of the uvula, palate, and pharynx
79. **peritonitis (periton/itis)**
- inflammation of the peritoneum
80. **diverticulectomy (diverticul/ectomy)**
- excision of the diverticula
81. **enteropathy (enter/o/pathy)**
- disease of the intestines
82. **proctologist (proct/o/logist)**
- Specialist who studies and treats diseases of the rectum
83. **gastritis (gastr/itis)**
- inflammation of the stomach
84. **abdominoplasty (abdomin/o/plasty)**
- surgical repair of the abdomen
85. **celiotomy (celi/o/tomy)**
- incision into the abdominal cavity
86. **gastroenteritis (gastr/o/enter/itis)**
- inflammation of the stomach and intestines
87. **endoscopy (endo/scopy)**
- process of viewing within (hollow organs)
88. **palatoplasty (palat/o/plasty)**
- surgical repair of the palate
89. **laparotomy (lapar/o/tomy)**
- incision into the abdominal cavity
90. **colonoscope (colon/o/scope)**
- instrument used to view the colon
91. **polypectomy (polyp/ectomy)**
- excision of polyps

92. **gastrojejunostomy (gastr/o/jejun/o/stomy)**
 - creation of an artificial opening between the stomach and the jejunum
93. **CT colonography (CT colon/o/graphy)**
 - radiographic imaging of the colon using computed tomography
94. **esophagogastroduodenoscopy (EGD)**
 - esophag/o/gastr/o/duoden/o/scopy
 - process of viewing the esophagus, stomach and duodenum
95. **stomatogastric (stomat/o/gastr/ic)**
 - pertaining to the mouth and stomach
96. **celiac (celi/ac)**
 - pertaining to the abdomen
97. **gastromalacia (gastr/o/malacia)**
 - softening of the stomach
98. **dyspepsia (dys/pepsia)**
 - difficult digestion
99. **esophagogastroplasty (esophag/o/gastr/o/plasty)**
 - surgical repair of the esophagus and stomach
100. **sublingual (sub/lingu/al)**
 - pertaining to under the tongue
101. **steatohepatitis (steat/o/hepat/itis)**
 - inflammation of liver associated with fat

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Digestive System

Practice with this activity:

Digestive System(Text version)

Fill in the blanks using the following list of words:

- polyp
- palpate
- obesity
- hemorrhoids
- emesis
- melena
- flatus
- ascites
- feces
- reflux
- nausea
- cirrhosis
- dysentery
- adhesion
- stoma

The Physician during an examination will _____[Blank 1] to feel for texture, size, consistency and location of body parts with hands.

A _____[Blank 2] is a small tumour-like growth that extend from the surface of a mucous membrane.

_____ [Blank 3] is an abnormal increase in the proportion of fat cells resulting in excess body weight for height.

Distended and swollen veins in the rectum and anus are called _____[Blank 4].

The medical term for vomiting is _____[Blank 5].

_____ [Blank 6] is black tarry stool that contains blood from the gastrointestinal tract.

_____ [Blank 7] is the medical term for gas in the gastrointestinal tract.

Abnormal intraperitoneal accumulation of fluid with large amount of proteins and electrolytes is _____ [Blank 8].

_____ is fecal matter.

Abnormal backward flow is called _____[Blank 10].

The urge to vomit is _____[Blank 11].

_____ [Blank 12] is a chronic degenerative disease of the liver due to alcohol abuse.

_____ [Blank 13] is an inflammation of the intestine presenting with abdominal pain and bloody diarrhea.

A band of scar tissue that binds anatomic surfaces to each other is called an _____[Blank 14].

The surgical opening between an organ and the surface of the body is called a _____[Blank 15].

Check your answers:¹

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Image Descriptions

Figure 12.1 image description: This diagram shows the digestive system of a human being, with the major organs labeled. Labels read (clockwise, from top): salivary glands: parotid gland, sublingual gland, submandibular gland; pharynx, stomach, spleen, pancreas, large intestine: transverse colon, ascending colon, descending colon, cecum, sigmoid colon, appendix, rectum, anal canal, anus; small intestine: duodenum, jejunum, ileum, gall bladder, liver, esophagus, tongue, mouth. [Return to Figure 12.1].

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Notes

1. 1. palpate, 2. polyp, 3. obesity, 4. hemorrhoids, 5. emesis, 6. melena, 7. flatus, 8. ascites, 9. feces, 10. reflux, 11. nausea, 12. cirrhosis, 13. dysentery, 14. adhesion, 15. stoma

12.2 - Anatomy (Structures) of the Digestive System

The Mouth

The cheeks, tongue, and palate frame the mouth, which is also called the **oral cavity** (or buccal cavity). The structures of the mouth are illustrated in Figure 12.2.

At the entrance to the mouth are the lips, or **labia** (singular = labium). Their outer covering is skin, which transitions to a mucous membrane in the mouth proper. Lips are very vascular with a thin layer of keratin, hence the reason they are red.

The pocket-like part of the mouth that is framed on the inside by the gums and teeth and on the outside by the cheeks and lips is called the **oral vestibule**. Moving farther into the mouth, the opening between the oral cavity and throat (oropharynx) is called the **fauces** (like the kitchen “faucet”). The main open area of the mouth, or oral cavity proper, runs from the gums and teeth to the fauces.

When you are chewing, you do not find it difficult to breathe simultaneously. The next time you have food in your mouth, notice how the arched shape of the roof of your mouth allows you to handle both digestion and respiration at the same time. This arch is called the palate. The anterior region of the palate serves as a wall (or septum) between the oral and nasal cavities as well as a rigid shelf against which the tongue can push food. It is created by the maxillary and palatine bones of the skull and, given its bony structure, is known as the hard palate. If you run your tongue along the roof of your mouth, you'll notice that the hard palate ends in the posterior oral cavity, and the tissue becomes fleshier. This part of the palate, known as the **soft palate**, is composed mainly of skeletal muscle. You can therefore manipulate, subconsciously, the soft palate—for instance, to yawn, swallow, or sing (see Figure 12.2).

Did You Know i?

You can eat upside down. Food doesn't need gravity to reach your stomach. Peristalsis, a wave-like muscle movement, pushes food along.

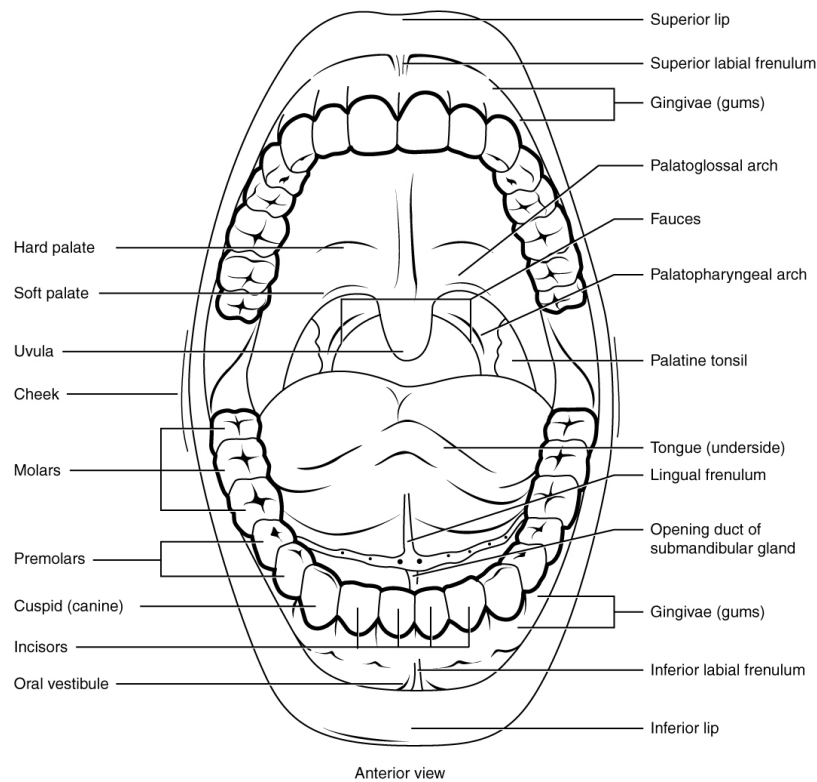


Figure 12.2 Mouth. The mouth includes the lips, tongue, palate, gums, and teeth. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.2 Image description.]

A fleshy bead of tissue called the **uvula** drops down from the center of the posterior edge of the soft palate. Although some have suggested that the uvula is a vestigial organ, it serves an important purpose. When you swallow, the soft palate and uvula move upward, helping to keep foods and liquid from entering the **nasal cavity**. Unfortunately, it can also contribute to the sound produced by snoring. Two muscular folds extend downward from the soft palate, on either side of the uvula. Toward the front, the **palatoglossal arch** lies next to the base of the tongue; behind it, the **palatopharyngeal arch** forms the superior and lateral margins of the fauces. Between these two arches are the **palatine tonsils**, clusters of lymphoid tissue that protect the pharynx. The **lingual tonsils** are located at the base of the tongue.

Tongue

Perhaps you have heard it said that the **tongue** is the strongest muscle in the body. Those who stake this claim cite its strength proportionate to its size. Although it is difficult to quantify the relative strength of different muscles, it remains indisputable that the tongue is a workhorse, facilitating **ingestion**, **mechanical digestion**, **chemical digestion** (lingual lipase), sensation (of taste, texture, and temperature of food), swallowing, and vocalization.

The tongue is attached to the mandible, the styloid processes of the temporal bones, and the hyoid bone. The hyoid is unique in that it only distantly/indirectly articulates with other bones. The tongue is positioned over

the floor of the oral cavity. A medial septum extends the entire length of the tongue, dividing it into symmetrical halves.

The top and sides of the tongue are studded with papillae, extensions of lamina propria of the mucosa, which are covered in **stratified squamous epithelium** (see Figure 12.3).

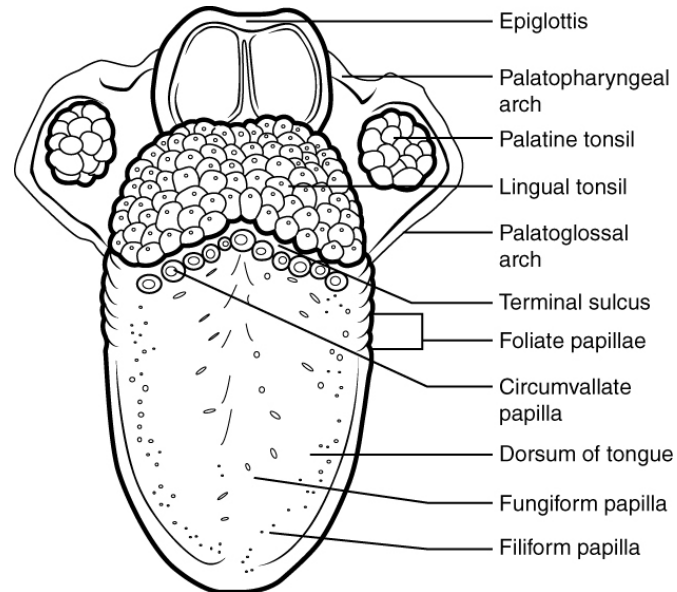


Figure 12.3 Tongue. This superior view of the tongue shows the locations and types of lingual papillae. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.3 Image description.]

Salivary Glands

Many small **salivary glands** are housed within the mucous membranes of the mouth and tongue. These minor **exocrine** glands are constantly secreting **saliva**, either directly into the oral cavity or indirectly through ducts, even while you sleep. In fact, an average of 1 to 1.5 liters of saliva is secreted each day. Usually, just enough saliva is present to moisten the mouth and teeth. Secretion increases when you eat, because saliva is essential to moisten food and initiate the chemical breakdown of **carbohydrates**. Small amounts of saliva are also secreted by the **labial glands** in the lips. In addition, the **buccal glands** in the cheeks, palatal glands in the palate, and lingual glands in the tongue help ensure that all areas of the mouth are supplied with adequate saliva.

Concept Check 1

- Describe how the **anatomy** of the **mouth** permits breathing and chewing at the same time
- Explain the role **saliva** performs in the digestive system

Pharynx

The pharynx (throat) is involved in both digestion and respiration. It receives food and air from the mouth, and air from the nasal cavities. When food enters the pharynx, involuntary muscle contractions close off the air passageways. A short tube of skeletal muscle lined with a **mucous membrane**, the pharynx runs from the posterior oral and nasal cavities to the opening of the esophagus and larynx. It has three subdivisions. The most superior, the nasopharynx, is involved only in breathing and speech. The other two subdivisions, the **oropharynx** and the **laryngopharynx**, are used for both breathing and digestion. The oropharynx begins inferior to the nasopharynx and is continuous below with the laryngopharynx. The inferior border of the laryngopharynx connects to the esophagus, whereas the anterior portion connects to the larynx, allowing air to flow into the bronchial tree.

Esophagus

The esophagus is a muscular tube that connects the pharynx to the stomach. It is approximately 25.4 cm (10 in) in length, located posterior to the trachea, and remains in a collapsed form when not engaged in swallowing. As you can see in Figure 12.4, the esophagus runs a mainly straight route through the mediastinum of the thorax. To enter the abdomen, the esophagus penetrates the diaphragm through an opening called the esophageal hiatus.

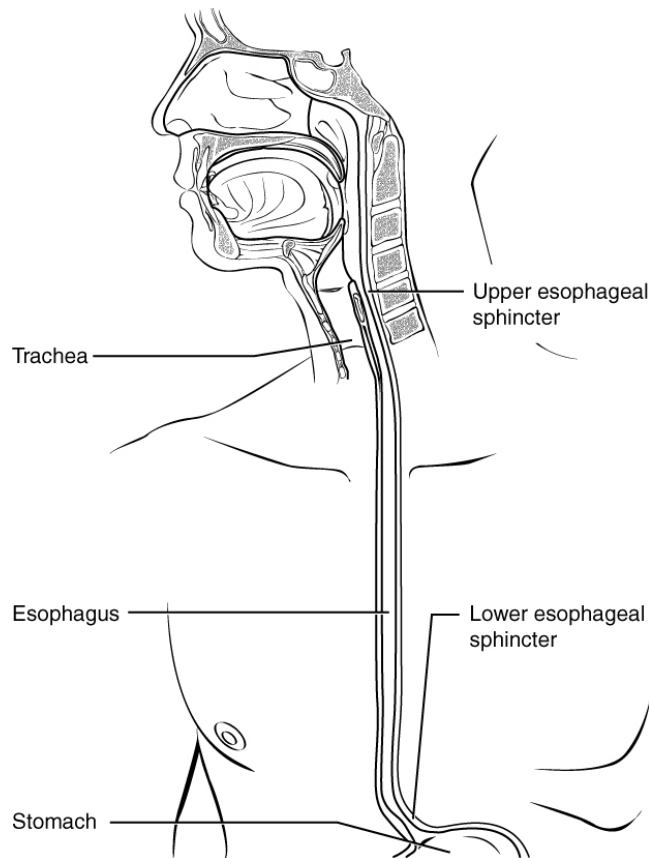


Figure 12.4 Esophagus. The upper esophageal sphincter controls the movement of food from the pharynx to the esophagus. The lower esophageal sphincter controls the movement of food from the esophagus to the stomach. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.4 Image description.]

Passage of Food Through the Esophagus

The upper **esophageal sphincter**, which is continuous with the inferior pharyngeal **constrictor**, controls the movement of food from the pharynx into the esophagus. The upper two-thirds of the esophagus consists of both smooth and skeletal muscle fibers, with the latter fading out in the bottom third of the esophagus. Rhythmic waves of **peristalsis**, which begin in the upper esophagus, propel the bolus of food toward the stomach. Meanwhile, secretions from the esophageal mucosa lubricate the esophagus and food. Food passes from the esophagus into the stomach at the lower esophageal sphincter (also called the gastroesophageal or cardiac sphincter). Recall that sphincters are muscles that surround tubes and serve as valves, closing the tube when the sphincters contract and opening it when they relax.

Stomach

There are four main regions in the **stomach**: the cardia, fundus, body, and pylorus (see Figure 12.5). The **cardia** (or

cardiac region) is the point where the esophagus connects to the stomach and through which food passes into the stomach. Located inferior to the diaphragm, above and to the left of the cardia is the dome-shaped **fundus**. Below the fundus is the **body**, the main part of the stomach. The funnel-shaped **pylorus** connects the stomach to the duodenum. The wider end of the funnel, the **pyloric antrum**, connects to the body of the stomach. The narrower end is called the **pyloric canal**, which connects to the duodenum. The smooth muscle **pyloric sphincter** is located at this latter point of connection and controls stomach emptying. In the absence of food, the stomach deflates inward, and its mucosa and submucosa fall into a large fold called a **ruga**.

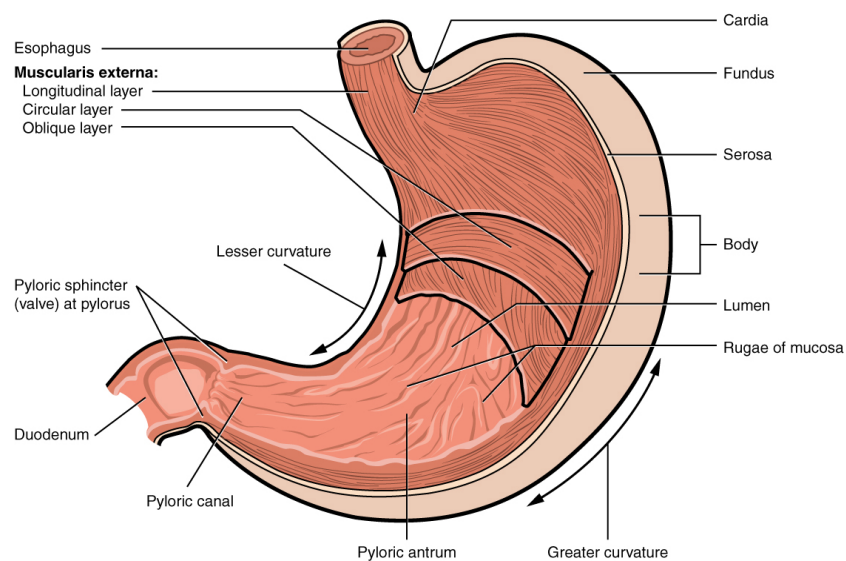


Figure 12.5 Stomach. The stomach has four major regions: the cardia, fundus, body, and pylorus. The addition of an inner oblique smooth muscle layer gives the muscularis the ability to vigorously churn and mix food. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.5 Image description.]

The **convex** lateral surface of the stomach is called the greater curvature; the **concave** medial border is the lesser curvature. The stomach is held in place by the lesser omentum, which extends from the liver to the lesser curvature, and the greater **omentum**, which runs from the greater curvature to the posterior abdominal wall. Partially digested food mixed with digestive juices of the stomach becomes known as chyme.

Small Intestines

Chyme released from the stomach enters the **small intestine**, which is the primary digestive organ in the body. Not only is this where most digestion occurs, it is also where practically all absorption occurs. The longest part of the **alimentary canal**, the small intestine is about 3.05 meters (10 feet) long in a living person (but about twice

as long in a cadaver due to the loss of muscle tone). Since this makes it about five times longer than the large intestine, you might wonder why it is called “small.” In fact, its name derives from its relatively smaller diameter of only about 2.54 cm (1 in), compared with 7.62 cm (3 in) for the large intestine. As we’ll see shortly, in addition to its length, the folds and projections of the lining of the small intestine work to give it an enormous surface area, which is approximately 200 m², more than 100 times the surface area of your skin. This large surface area is necessary for complex processes of digestion and absorption that occur within it.

Did You Know 2?

Your body absorbs 90 per cent of our nutrients through the **small intestine**, into your blood.

The coiled tube of the small intestine is subdivided into three regions. From **proximal** (at the stomach) to **distal**, these are the duodenum, jejunum, and ileum (see Figure 12.6).

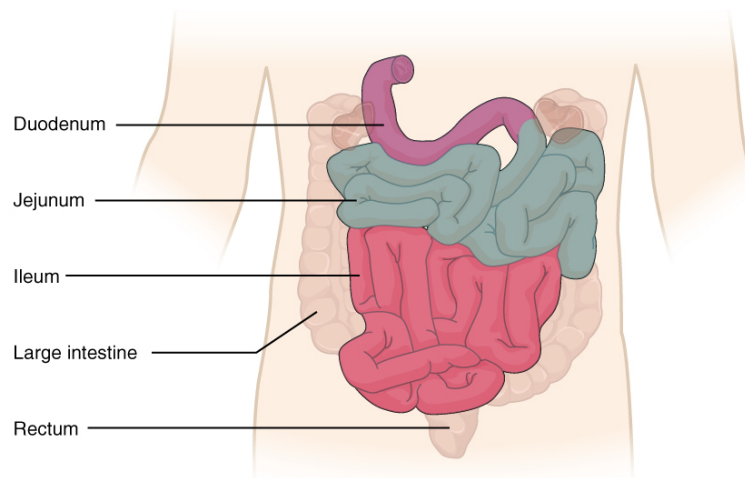


Figure 12.6 Small Intestine. The three regions of the small intestine are the duodenum, jejunum, and ileum. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.6 Image description.]

Large Intestines

The **large intestine** is the terminal part of the alimentary canal. The primary function of this organ is to finish the absorption of nutrients and water, synthesize certain vitamins, form feces, and eliminate feces from the body.

The large intestine runs from the appendix to the anus. It frames the small intestine on three sides. Despite being about one-half as long as the small intestine, it is called large because it is more than twice the diameter of the small intestine, about 3 inches.

The large intestine is subdivided into four main regions: the cecum, the colon, the rectum, and the anus. The ileocecal valve, located at the opening between the ileum and the large intestine, controls the flow of **chyme** from the small intestine to the large intestine.

Cecum

The first part of the large intestine is the **cecum**, a sac-like structure that is suspended inferior to the ileocecal valve. It is about 6 cm (2.4 in) long, receives the contents of the ileum, and continues the absorption of water and salts. The **appendix** (or vermiform appendix) is a winding tube that attaches to the cecum. Although the 7.6-cm (3-in) long appendix contains **lymphoid** tissue, suggesting an immunologic function, this organ is generally considered vestigial. However, at least one recent report assumes a survival advantage conferred by the appendix: in diarrheal illness, the appendix may serve as a bacterial reservoir to repopulate the enteric bacteria for those surviving the initial phases of the illness. Moreover, its twisted anatomy provides a haven for the accumulation and multiplication of enteric bacteria. The **mesoappendix**, the mesentery of the appendix, tethers it to the mesentery of the ileum.

Colon

The cecum blends seamlessly with the **colon**. Upon entering the colon, the food residue first travels up the **ascending colon** on the right side of the abdomen. At the inferior surface of the liver, the colon bends to form the **right colic flexure** (hepatic flexure) and becomes the **transverse colon**. The region defined as hindgut begins with the last third of the transverse colon and continues on. Food residue passing through the transverse colon travels across to the left side of the abdomen, where the colon angles sharply immediately inferior to the spleen, at the **left colic flexure** (splenic flexure). From there, food residue passes through the **descending colon**, which runs down the left side of the posterior abdominal wall. After entering the pelvis inferiorly, it becomes the s-shaped **sigmoid colon**, which extends medially to the midline (see Figure 12.7). The ascending and descending colon and the rectum (discussed next) are located in the retroperitoneum. The transverse and sigmoid colon are tethered to the posterior abdominal wall by the mesocolon.

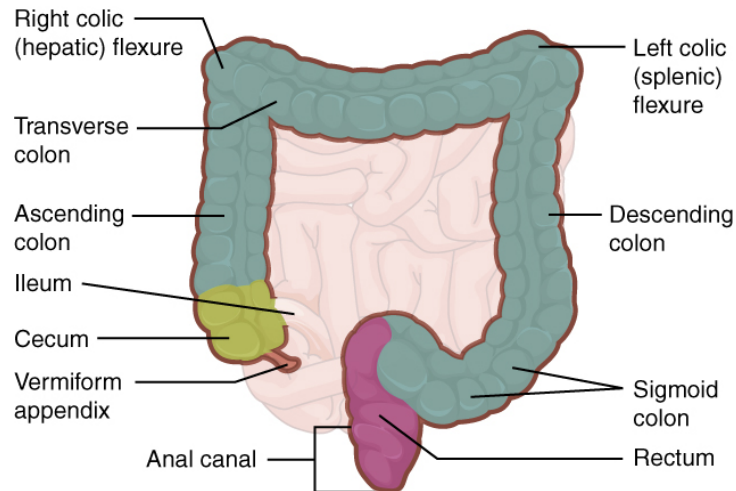


Figure 12.7 Large Intestine. The large intestine includes the cecum, colon, and rectum. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.7 Image description.]

Accessory Organs of Digestion

Chemical digestion in the small intestine relies on the activities of three accessory digestive organs: the liver, pancreas, and gallbladder (see Figure 12.8). The digestive role of the liver is to produce bile and export it to the duodenum. The gallbladder primarily stores, concentrates, and releases bile. The pancreas produces pancreatic juice, which contains digestive enzymes and **bicarbonate** ions, and delivers it to the duodenum.

Concept Check 2

On the Figure 6 diagram, locate the following **anatomical organs** and consider how these organs **support** the digestive process:

- Liver
- Pancreas
- Gallbladder

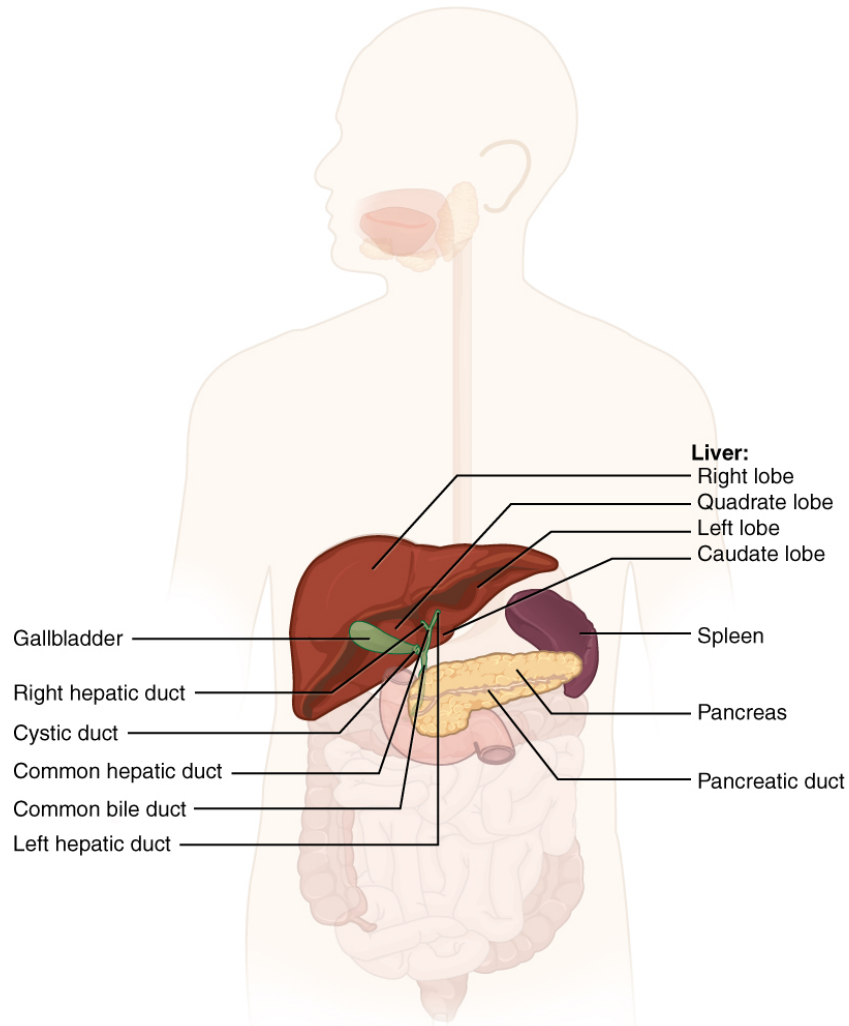


Figure 12.8 Accessory Organs. The liver, pancreas, and gallbladder are considered accessory digestive organs, but their roles in the digestive system are vital. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.8 Image description.]

Liver

The **liver** is the largest gland in the body, weighing about three pounds in an adult. It is also one of the most important organs. In addition to being an accessory digestive organ, it plays a number of roles in metabolism and regulation. The liver lies inferior to the diaphragm in the right upper quadrant of the abdominal cavity and receives protection from the surrounding ribs.

The liver is divided into two primary lobes: a large right lobe and a much smaller left lobe. In the right lobe, some anatomists also identify an inferior **quadrate** lobe and a posterior caudate lobe, which are defined by internal features. The liver is connected to the abdominal wall and diaphragm by five peritoneal folds referred to as ligaments.

The **porta hepatis** (“gate to the liver”) is where the **hepatic artery** and **hepatic portal vein** enter the liver. These

two vessels, along with the common hepatic duct, run behind the lateral border of the lesser omentum on the way to their destinations. The hepatic portal vein delivers partially deoxygenated blood containing nutrients absorbed from the small intestine and actually supplies more oxygen to the liver than do the much smaller hepatic arteries. In addition to nutrients, drugs and toxins are also absorbed. After processing the bloodborne nutrients and toxins, the liver releases nutrients needed by other cells back into the blood, which drains into the central vein and then through the hepatic vein to the inferior vena cava. With this **hepatic** portal circulation, all blood from the alimentary canal passes through the liver. This largely explains why the liver is the most common site for the metastasis of cancers that originate in the alimentary canal.

Bile produced by the liver is a mixture secreted by the liver to accomplish the **emulsification** of lipids in the small intestine.

Bilirubin, the main bile pigment, is a waste product produced when the spleen removes old or damaged red blood cells from circulation. These breakdown products, including proteins, iron, and toxic bilirubin, are transported to the liver via the splenic vein of the hepatic portal system. In the liver, proteins and iron are recycled, whereas bilirubin is excreted in the bile. It accounts for the green color of bile. Bilirubin is eventually transformed by intestinal bacteria into stercobilin, a brown pigment that gives your stool its characteristic color! In some disease states, bile does not enter the intestine, resulting in white ('acholic') stool with a high fat content, since virtually no fats are broken down or absorbed.

Between meals, bile is produced but conserved. The valve-like hepatopancreatic ampulla closes, allowing **bile** to divert to the gallbladder, where it is concentrated and stored until the next meal.

Pancreas

The soft, oblong, glandular **pancreas** lies transversely in the retroperitoneum behind the stomach. Its head is nestled into the "c-shaped" curvature of the duodenum with the body extending to the left about 15.2 cm (6 in) and ending as a tapering tail in the **hilum** of the spleen. It is a curious mix of **exocrine** (secreting digestive enzymes) and endocrine (releasing hormones into the blood) functions (Figure 12.9).

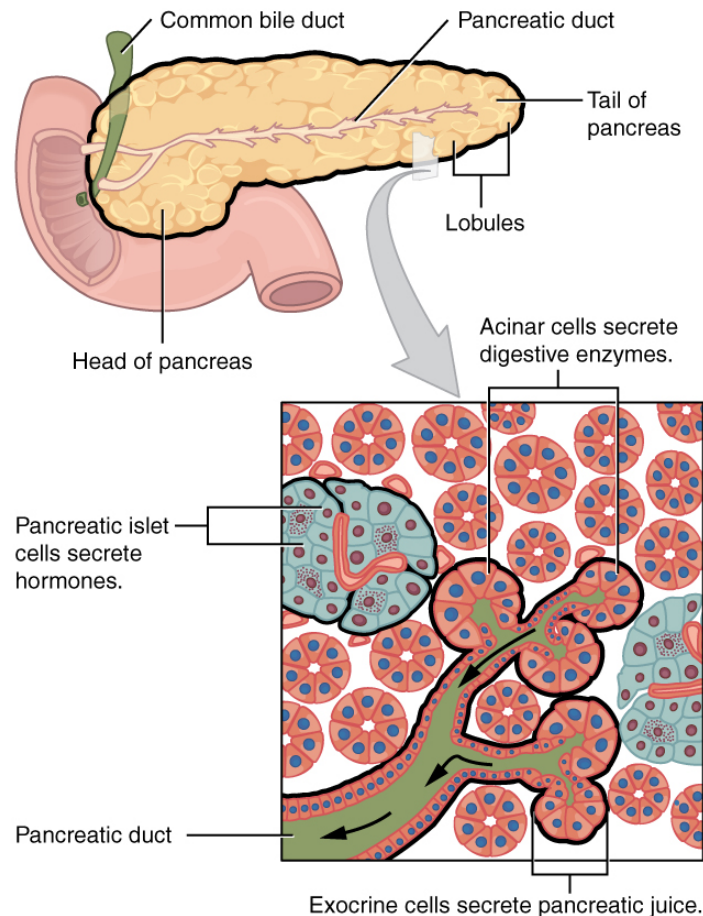


Figure 12.9 Exocrine and Endocrine Pancreas. The pancreas has a head, a body, and a tail. It delivers pancreatic juice to the duodenum through the pancreatic duct. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.9 Image description.]

The exocrine part of the pancreas arises as little grape-like cell clusters, each called an **acinus** (plural = acini), located at the terminal ends of pancreatic ducts. These acinar cells secrete enzyme-rich **pancreatic juice** into tiny merging ducts that form two dominant ducts. The larger duct fuses with the common bile duct (carrying bile from the liver and gallbladder) just before entering the duodenum via a common opening (the hepatopancreatic ampulla). The smooth muscle sphincter of the hepatopancreatic **ampulla** controls the release of pancreatic juice and bile into the small intestine. The second and smaller pancreatic duct, the **accessory duct** (duct of Santorini), runs from the pancreas directly into the duodenum, approximately 1 inch above the hepatopancreatic ampulla. When present, it is a persistent remnant of pancreatic development.

Scattered through the sea of exocrine acini are small islands of endocrine cells, the islets of Langerhans. These vital cells produce the hormones pancreatic polypeptide, insulin, glucagon, and somatostatin.

Gallbladder

The **gallbladder** is 8–10 cm (~3–4 in) long and is nested in a shallow area on the posterior aspect of the right lobe of the liver. This muscular sac stores, concentrates, and, when stimulated, propels the bile into the duodenum via the common bile duct. It is divided into three regions. The **fundus** is the widest portion and tapers medially into the body, which in turn narrows to become the neck. The neck angles slightly superiorly as it approaches the hepatic duct. The cystic duct is 1–2 cm (less than 1 in) long and turns inferiorly as it bridges the neck and hepatic duct.

The simple columnar epithelium of the gallbladder mucosa is organized in rugae, similar to those of the stomach. There is no submucosa in the gallbladder wall. The wall's middle, muscular coat is made of smooth muscle fibers. When these fibers contract, the gallbladder's contents are ejected through the **cystic duct** and into the bile duct (Figure 12.10). Visceral peritoneum reflected from the liver capsule holds the gallbladder against the liver and forms the outer coat of the gallbladder. The gallbladder's mucosa absorbs water and ions from bile, concentrating it by up to 10-fold (Betts et al., 2013).

Concept Check 3

- Locate the **cystic duct** on the diagram shown.
- Consider what **complications** could arise if this duct was blocked or obstructed.

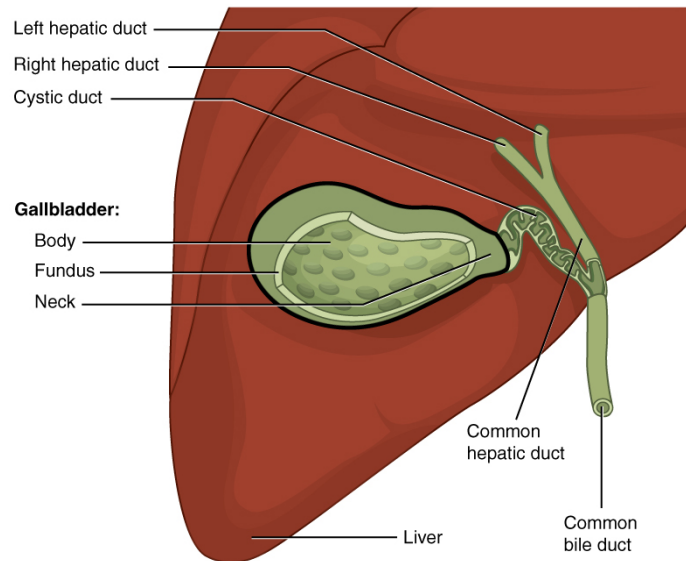


Figure 12.10 Gallbladder. The gallbladder stores and concentrates bile, and releases it into the two-way cystic duct when it is needed by the small intestine. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.10 Image description.]

Watch the following video to see the structure of the liver and how this structure supports the functions of the liver, including the processing of nutrients, toxins, and wastes. At rest, about 1500 mL of blood per minute flow through the liver. What percentage of this blood flow comes from the hepatic portal system? (Betts et al., 2013).

Watch How the Body Works: The Architecture of the Liver (1 min) on YouTube (<https://youtu.be/Gn-ibhGE7PI>)

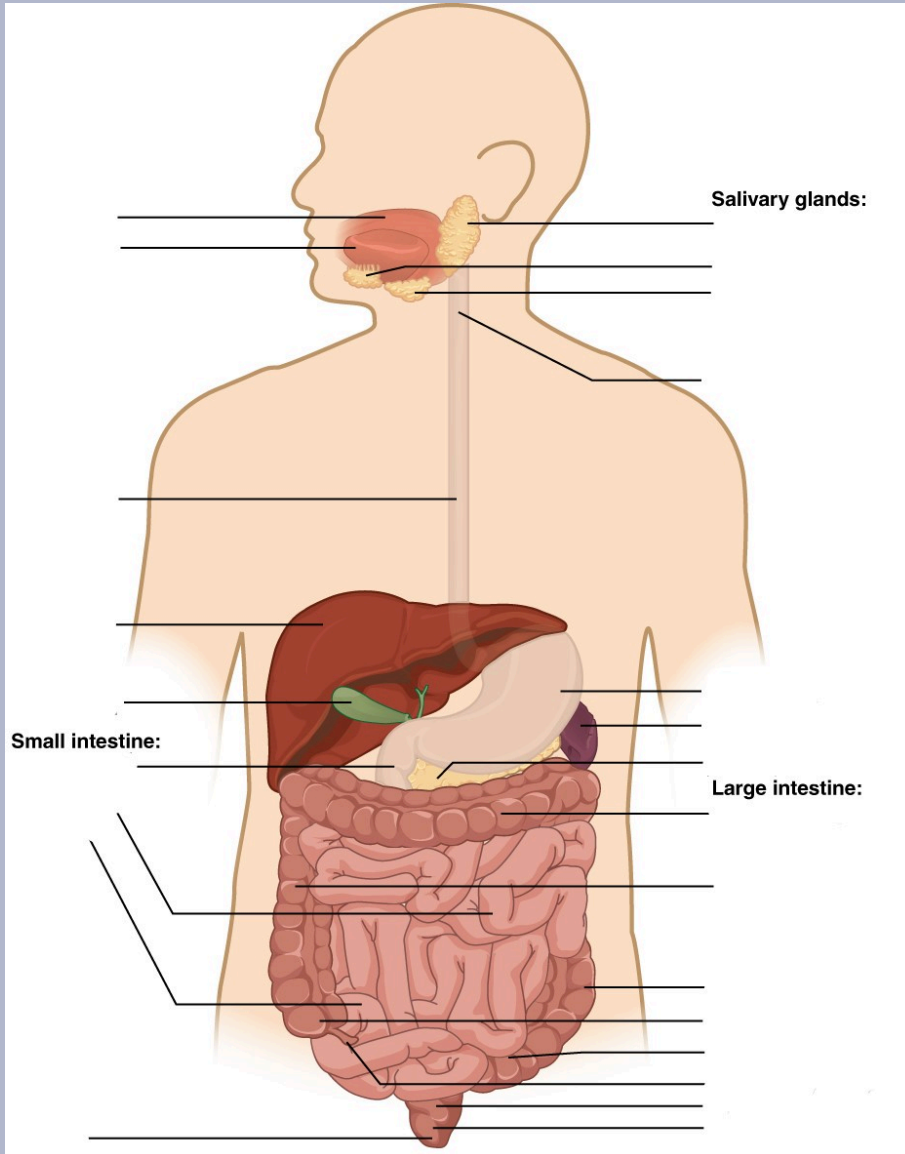
Check Your Knowledge of the Digestive System

Anatomy Labeling Activity

Digestive System Anatomy (Text Version)

Label the diagram with correct words listed below:

- | | | |
|------------------------|----------------------|----------------------|
| 1. Gallbladder | 9. Anal canal | 17. Sublingual gland |
| 2. Mouth | 10. Parotid gland | 18. Ascending colon |
| 3. Jejunum | 11. Descending colon | 19. Cecum |
| 4. Tongue | 12. Duodenum | 20. Stomach |
| 5. Ileum | 13. Esophagus | 21. Spleen |
| 6. Sigmoid colon | 14. Transverse colon | 22. Rectum |
| 7. Liver | 15. Pharynx | 23. Appendix |
| 8. Submandibular gland | 16. Anus | 24. Pancreas |



Digestive System Anatomy Diagram (Text Version)

This diagram shows an anterior view of the head and torso of the human body with the anatomical organs and structures comprising the digestive system identified. From the top working clockwise. Located in the mouth or oral cavity are three glands which secrete saliva containing enzymes to aid in digestion these include: _____[Blank 1], _____[Blank 2], and the _____[Blank 3]. When the ingested food is ready to leave the mouth, it is transferred to the throat to swallow, the throat is also

known as the _____[Blank 4]. The _____[Blank 5] is a muscular hollow organ which aids in the digestive process by breaking down food for digestion. While the _____[Blank 6] located under the left portion of the diaphragm, helps to filter blood. The _____[Blank 7] is an accessory organ responsible for producing a hormone known as insulin and insulin is critical in the metabolism of sugars. The large intestines have many structural components _____[Blank 8], _____[Blank 9], _____[Blank 10], _____[Blank 11], and _____[Blank 12] with these structures responsible for the final stage of digestion known as elimination. A small finger-like projections hangs from the cecum known as the _____[Blank 13] and this structure has a role in the development of the immune system in early human development. As a continuation of the sigmoid colon a hollow structure known as the _____[Blank 14] is identified. Next, is the final segment of the digestive system and is a structure measuring about 3 to 4 cm long known as the _____[Blank 15]. Fecal matter is expelled through the terminal opening in the digestive system called the _____[Blank 16]. The small intestines divided into three distinct parts; the is the third part _____[Blank 17], the _____[Blank 18] is the second part, and the _____[Blank 19] is the first part. The _____[Blank 20] is an accessory organ of digestion and is responsible for storing bile for when it is needed to breakdown fats in the process of digestion. The _____[Blank 21] located in the upper right side of the abdomen is responsible for producing the bile to send to the gallbladder for storage until it the bile is released. The _____[Blank 22] connects the pharynx to the stomach it is responsible for gently moving the food from the pharynx to the stomach. The _____[Blank 23] located in the mouth is responsible for moving the food around in the mouth during the chewing or mastication process. The _____[Blank 24] also known as the oral cavity contains the saliva glands, the teeth and tongue and begins the process of digestion.

Check your answers ¹

Activity source: Digestive System Anatomy by Gisele Tuzon, from *Building a Medical Terminology Foundation*, illustration from *Anatomy and Physiology (OpenStax)*, licensed under CC BY 4.0./ Text version added.

Image Descriptions

Figure 12.2 image description: This diagram shows an anterior view of the structure of the mouth. The teeth, lips, tongue, gums and many other parts are labeled. Labels read (clockwise from top): superior lip, superior labial frenulum, gingivae, palatoglossal arch, fauces, palatopharyngeal arch, palatine tonsil, tongue, lingual frenulum, opening duct of submandibular gland, gingivae, inferior labial frenulum, inferior lip, oral vestibule, incisors, cuspid, premolars, molars, cheek, uvula, soft palate, hard palate. [Return to Figure 12.2].

Figure 12.3 image description: This diagram shows the structures of the tongue and lingual papillae. Labels read (from top): epiglottis, palatopharyngeal arch, palatine tonsil, lingual tonsil, palatoglossal arch, terminal sulcus, foliate papillae, circumvallate papilla, dorsum of tongue, fungiform papilla, filiform papilla. [Return to Figure 12.3].

Figure 12.4 image description: This diagram shows the esophagus, going from the mouth to the stomach. The

upper and the lower esophageal sphincter are labeled. Labels read (from top): upper esophageal sphincter, trachea, esophagus, lower esophageal sphincter, stomach. [Return to Figure 12.4].

Figure 12.5 image description: This image shows a cross-section of the stomach, and the major parts: the cardia, fundus, body and pylorus are labeled. Labels read (from top of stomach): esophagus, muscular externa (longitudinal layer, circular layer, oblique layer), cardia, fundus, serosa, lesser and greater curvatures, lumen, rugae of mucosa, pyloric antrum, pyloric canal, pyloric sphincter valve at pylorus, duodenum. [Return to Figure 12.5].

Figure 12.6 image description: This diagram shows the small intestine. The different parts of the small intestine are labeled. Labels read (from top of small intestine): duodenum, jejunum, ileum, large intestine, rectum. [Return to Figure 12.6].

Figure 12.7 image description: This image shows the large intestine; the major parts of the large intestine are labeled. Labels read (from start of large intestinal tract): vermiform complex, cecum, ileum, ascending colon, transverse colon, right colic hepatic flexure, left colic splenic flexure, descending colon, sigmoid colon, rectum, anal canal. [Return to Figure 12.7].

Figure 12.8 image description: This diagram shows the accessory organs of the digestive system. The liver, spleen, pancreas, gallbladder and their major parts are shown. Labels read: liver (right lobe, quadrate lobe, left lobe, caudate lobe), spleen, pancreas, pancreatic duct, gall bladder right hepatic duct, cystic duct, common hepatic duct, common bile duct, left hepatic duct. [Return to Figure 12.8].

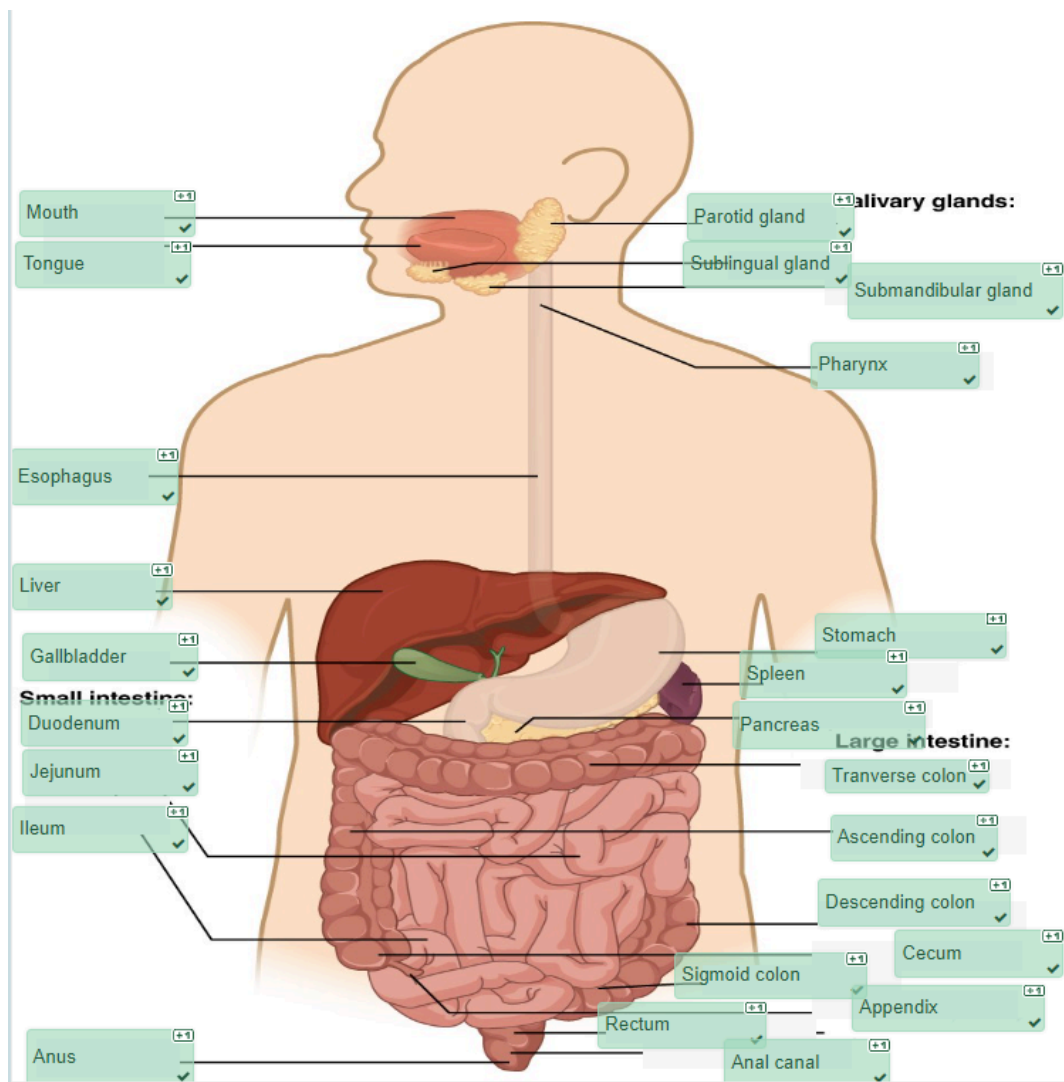
Figure 12.9 image description: This figure shows the pancreas and its major parts. Labels read (from left to right): common bile duct, head of pancreas, pancreatic duct, lobules, tail of pancreas. A magnified view of a small region of the pancreas shows the pancreatic islet cells, the acinar cells, exocrine cells, and the pancreatic duct. [Return to Figure 12.9].

Figure 12.10 image description: This figure shows the gallbladder and its major parts are labeled. Labels read (starting in gallbladder): body, fundus, neck, cystic duct, common hepatic duct, common bile duct, left and right hepatic ducts, liver. [Return to Figure 12.10].

Attribution

Except where otherwise noted, this chapter is adapted from “Digestive System (<https://ecampusontario.pressbooks.pub/medicalterminology/chapter/digestive-systems/>)” In *Building a Medical Terminology Foundation* by Kimberlee Carter and Marie Rutherford, licensed under CC BY 4.0. / A derivative of Betts et al., which can be accessed for free from *Anatomy and Physiology (OpenStax)* (<https://openstax.org/books/anatomy-and-physiology/pages/1-introduction>). Adaptations: dividing Digestive System chapter content into sub-chapters.

Notes



1.

Check

your answers: Digestive System Anatomy Diagram (Text Version) This diagram shows an anterior view of the head and torso of the human body with the anatomical organs and structures comprising the digestive system identified. From the top working clockwise Located in the mouth or oral cavity are three glands which secrete saliva containing enzymes to aid in digestion these include: **parotid gland**, **sublingual gland**, and the **submandibular gland**. When the ingested food is ready to leave the mouth, it is transferred to the throat to swallow, the throat is also known as the **pharynx**. The **stomach** is a muscular hollow organ which aids in the digestive process by breaking down food for digestion. While the **spleen** located under the left portion of the diaphragm, helps to filter blood. The **pancreas** is an accessory organ responsible for producing a hormone known as insulin and insulin is critical in the metabolism of sugars. The large intestines have many structural components **transverse colon**, **ascending colon**, **descending colon**, **cecum**, and **sigmoid colon** with these structures responsible for the final stage of digestion known as elimination. A small finger-like projections hangs from the cecum known as the **appendix** and this structure has a role in the development of the immune system in early human development. As a continuation of the sigmoid colon a hollow structure known as the **rectum** is identified. Next, is the final segment of the digestive system and is a structure measuring about 3 to 4 cm long known as the **anal canal**. Fecal matter is expelled through the terminal opening in the digestive system called the **anus**. The small intestines divided into three distinct parts; the is the third part **ileum**, the **jejunum** is the second part, and the **duodenum** is the first part. The **gall bladder** is an accessory organ of digestion and is responsible for storing bile for when it is needed to breakdown fats in the process of digestion. The **liver** located in the upper right side of the abdomen is responsible for producing the bile to send to the gallbladder for storage until it the bile is released. The **esophagus** connects the pharynx to the stomach it is responsible for gently moving the food from the pharynx to the stomach. The **tongue** located in the mouth is responsible

for moving the food around in the mouth during the chewing or mastication process. The **mouth** also known as the oral cavity contains the saliva glands, the teeth and tongue and begins the process of digestion.

12.3 - Physiology (Function) of the Digestive System

The main functions of the digestive system are:

- Ingesting food
- Digesting food
- Absorbing nutrients
- Elimination of waste products

Digestive Processes

The processes of digestion include six activities: ingestion, **propulsion**, mechanical or physical digestion, chemical digestion, absorption, and **defecation**.

The first of these processes, **ingestion**, refers to the entry of food into the alimentary canal through the mouth. There, the food is chewed and mixed with saliva, which contains enzymes that begin breaking down the carbohydrates in the food plus some lipid digestion via lingual lipase. Chewing increases the surface area of the food and allows an appropriately sized bolus to be produced.

Food leaves the mouth when the tongue and pharyngeal muscles propel it into the esophagus. This act of swallowing, the last voluntary act until defecation, is an example of **propulsion**, which refers to the movement of food through the digestive tract. It includes both the voluntary process of swallowing and the involuntary process of peristalsis. **Peristalsis** consists of sequential, alternating waves of contraction and relaxation of alimentary wall smooth muscles, which act to propel food along (see Figure 12.11). These waves also play a role in mixing food with digestive juices. Peristalsis is so powerful that foods and liquids you swallow enter your stomach even if you are standing on your head.

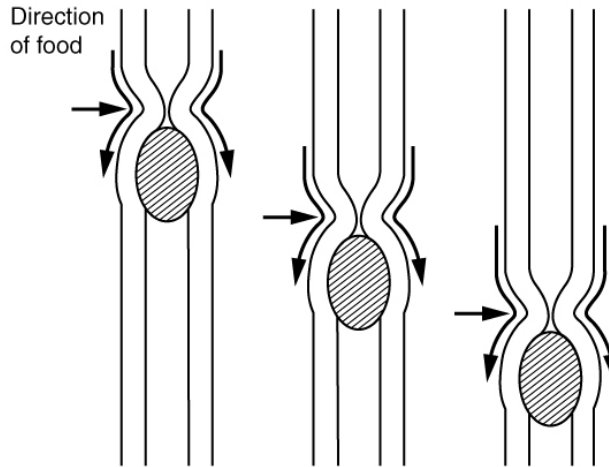


Figure 12.11. Peristalsis. Peristalsis moves food through the digestive tract with alternating waves of muscle contraction and relaxation. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.11 Image description.]

Digestion includes both mechanical and chemical processes. **Mechanical digestion** is a purely physical process that does not change the chemical nature of the food. Instead, it makes the food smaller to increase both surface area and mobility. It includes **mastication**, or chewing, as well as tongue movements that help break food into smaller bits and mix food with saliva. Although there may be a tendency to think that mechanical digestion is limited to the first steps of the digestive process, it occurs after the food leaves the mouth as well. The mechanical churning of food in the stomach serves to further break it apart and expose more of its surface area to digestive juices, creating an acidic “soup” called **chyme**. **Segmentation**, which occurs mainly in the small intestine, consists of localized contractions of circular muscle of the muscularis layer of the alimentary canal. These contractions isolate small sections of the intestine, moving their contents back and forth while continuously subdividing, breaking up, and mixing the contents. By moving food back and forth in the intestinal lumen, segmentation mixes food with digestive juices and facilitates absorption.

In **chemical digestion**, starting in the mouth, digestive secretions break down complex food molecules into their chemical building blocks (for example, proteins into separate amino acids). These secretions vary in composition but typically contain water, various enzymes, acids, and salts. The process is completed in the small intestine.

Food that has been broken down is of no value to the body unless it enters the bloodstream and its nutrients are put to work. This occurs through the process of **absorption**, which takes place primarily within the small intestine. There, most nutrients are absorbed from the lumen of the alimentary canal into the bloodstream through the epithelial cells that make up the mucosa. Lipids are absorbed into **lacteals** and are transported via the lymphatic vessels to the bloodstream.

In **defecation**, the final step in digestion, undigested materials are removed from the body as feces.

Digestive System: From Appetite Suppression to Constipation

Age-related changes in the digestive system begin in the mouth and can affect virtually every aspect of the digestive system. Taste buds become less sensitive, so food isn't as appetizing as it once was. A slice of pizza is a challenge, not a treat, when you have lost teeth, your gums are diseased, and your salivary glands aren't producing enough saliva. Swallowing can be difficult, and ingested food moves slowly through the alimentary canal because of reduced strength and tone of muscular tissue. **Neurosensory** feedback is also dampened, slowing the transmission of messages that stimulate the release of enzymes and hormones.

Pathologies that affect the digestive organs—such as **hiatal hernia**, **gastritis**, and **peptic ulcer** disease—can occur at greater frequencies as you age. Problems in the small intestine may include duodenal ulcers, **maldigestion**, and **malabsorption**. Problems in the large intestine include hemorrhoids, diverticular disease, and constipation. Conditions that affect the function of accessory organs—and their abilities to deliver pancreatic enzymes and bile to the small intestine—include jaundice, acute pancreatitis, cirrhosis, and gallstones.

In some cases, a single organ is in charge of a digestive process. For example, ingestion occurs only in the mouth and defecation only in the anus. However, most digestive processes involve the interaction of several organs and occur gradually as food moves through the alimentary canal (see Figure 12.12).

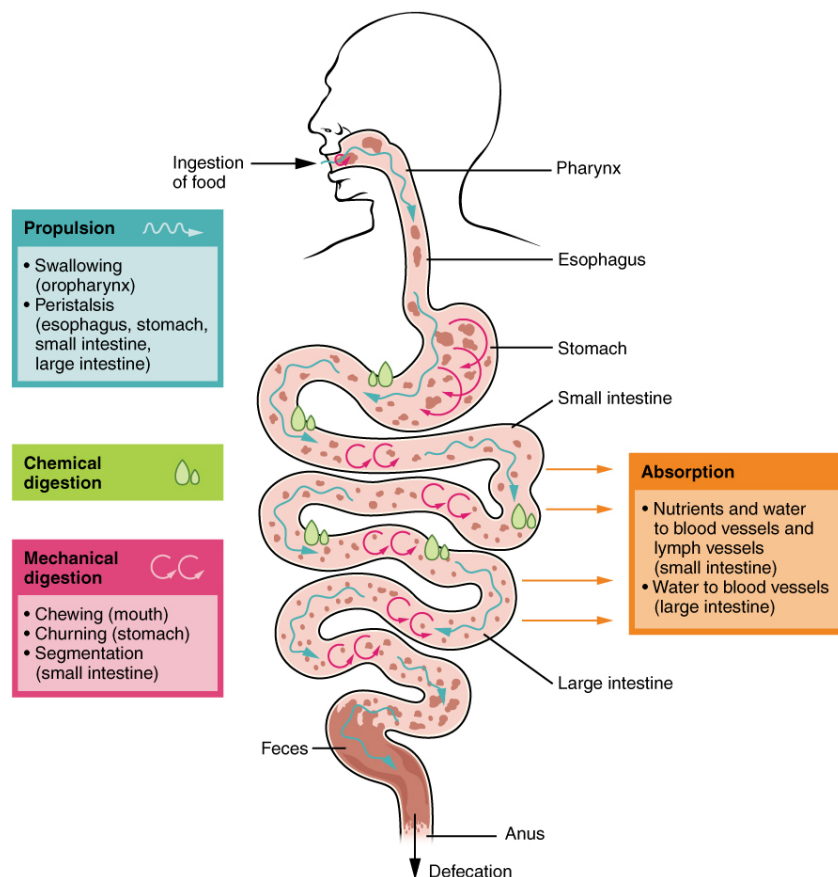


Figure 12.12. Digestive Processes. The digestive processes are ingestion, propulsion, mechanical digestion, chemical digestion, absorption, and defecation. From Betts et al., 2013. Licensed under CC BY 4.0. [Fig. 12.12 Image description.]

Some chemical digestion occurs in the mouth. Some absorption can occur in the mouth and stomach, for example, alcohol and aspirin.

Regulatory Mechanisms

Neural and endocrine regulatory mechanisms work to maintain the optimal conditions in the lumen needed for digestion and absorption. These regulatory mechanisms, which stimulate digestive activity through mechanical and chemical activity, are controlled both extrinsically and intrinsically.

Watch Digestive System, Part 3: Crash Course Anatomy & Physiology #35 (11 min) on YouTube
(<https://youtu.be/jGme7BRkpuQ>)

Digestive System Medical Terms and Abbreviations

Medical Terms Not Easily Broken into Word Parts

Digestive System terms (Text Version)

Practice the following **digestive system** medical terms that are not easily broken into word parts.

1. **ascites**
 - abnormal intraperitoneal accumulation of fluid with large number of proteins and electrolytes
2. **hemorrhoids**
 - distended and swollen veins in the rectum and anus
3. **nausea**
 - urge to vomit
4. **stoma**
 - surgical opening between an organ and the surface of the body
5. **adhesion**

- band of scar tissue that binds anatomic surfaces to each other
6. **emesis**
 - vomiting
 7. **cirrhosis**
 - chronic degenerative disease of the liver
 8. **polyp**
 - small tumour-like growth that extends from the surface of a mucous membrane
 9. **feces**
 - stool, fecal matter
 10. **obesity**
 - abnormal increase in the proportion of fat cells resulting in excess body weight for height
 11. **dysentery**
 - inflammation of the intestine presenting with abdominal pain and bloody diarrhea
 12. **melena**
 - black tarry stool that contains blood from the GI tract
 13. **flatus**
 - gas in the GI tract
 14. **reflux**
 - abnormal backward flow
 15. **palpate**
 - physical examination technique: The examiner feels for texture, size, consistency, and location of body parts with hands.

Activity source: Digestive System terms not easily broken down into word parts by Kimberlee Carter, from *Building a Medical Terminology Foundation* by Kimberlee Carter and Marie Rutherford, licensed under CC BY- 4.0. /Text version added.

Common Digestive Abbreviations

Digestive System Abbreviations

- **APR** (abdominoperineal resection)
- **BE** (barium enema)
- **EGD** (esophagogastroduodenoscopy)
- **ERCp** (endoscopic retrograde cholangiopancreatography)
- **EUS** (endoscopic ultrasound)
- **FOBT** (fecal occult blood test)
- **GERD** (gastroesophageal reflux disease)
- **GI** (gastrointestinal)
- **H.pylori** (*Helicobacter pylori*)
- **IBS** (irritable bowel syndrome)
- **N&V** (nausea and vomiting)
- **PEG** (percutaneous endoscopic gastrostomy)
- **UC** (ulcerative colitis)
- **UGI** (upper gastrointestinal)
- **UPPP** (uvulopalatopharyngoplasty)

Activity source: Digestive System Abbreviations by Kimberlee Carter, from *Building a Medical Terminology Foundation* by Kimberlee Carter and Marie Rutherford, licensed under CC BY- 4.0. / Converted to text.

Image Descriptions

Figure 12.11 image description: This image shows the peristaltic movement of food. In the left image, the food bolus is towards the top of the esophagus and arrows pointing downward show the direction of movement of the peristaltic wave. In the center image, the food bolus and the wave movement are closer to the center of the esophagus and in the right image, the bolus and the wave are close to the bottom end of the esophagus. [Return to Figure 12.11].

Figure 12.12 image description: This image shows the different processes involved in digestion. The image shows how food travels from the mouth through the major organs. Associated textboxes list the various digestive processes: Absorption (nutrients and water to blood vessels and lymph vessels (small intestine), water to blood vessels (large intestine)), propulsion (swallowing (oropharynx), peristalsis (esophagus, stomach, small intestine, large intestine), chemical digestion, mechanical digestion (chewing (mouth), churning (stomach), segmentation

(small intestine)). Parts of the digestive tract are labelled: ingestion of food, pharynx, esophagus, stomach, small intestine, large intestine, feces, anus, defecation. [Return to Figure 12.12].

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12.4 - Digestive Diseases, Disorders and Diagnostic Testing

Gastroesophageal Reflux Disease

This condition is largely caused by gastric acid flowing upwards from the stomach into the esophagus. Those suffering from the condition will often feel a burning sensation radiating near the top of the stomach (Mayo Clinic Staff, 2023). To learn more about GERD, visit the Mayo Clinic's Gastroesophageal Reflux Disease (GERD) page [New Tab] (<https://www.mayoclinic.org/diseases-conditions/gerd/symptoms-causes/syc-20361940>).

Cholecystitis

This condition is known as inflammation of the gall bladder. Gallstone development can block the gall bladder's release of bile leading to an inflammatory response. Surgical removal (cholecystectomy) or laser stone crushing known as lithotripsy are often the treatment options ("Cholecystitis", 2023). To learn more about cholecystitis, visit the Radiology Info's cholecystitis web page [New Tab] (<https://www.radiologyinfo.org/en/info.cfm?pg=cholecystitis>).

Cirrhosis

Cirrhosis is a condition whereby the liver scars. Advanced cirrhosis is life-threatening. It generally can not be reversed. It is caused by different forms of liver disease and chronic alcoholism (Mayo Clinic Staff, 2023).

Cirrhosis often has no signs or symptoms until liver damage is extensive and may include:

- Fatigue
- Easily bleeding or bruising
- Loss of appetite
- Nausea
- Edema
- Weight loss
- Itchy skin
- Jaundice
- Ascitis (Mayo Clinic Staff, 2023).

To learn more about cirrhosis, visit the Mayo Clinic's Cirrhosis web page [New Tab] (<https://www.mayoclinic.org/diseases-conditions/cirrhosis/symptoms-causes/syc-20351487>).

Esophageal Cancer

This is cancer of the esophagus. The cancer can occur anywhere along the esophageal tube, and can be caused by factors including tobacco use, alcohol, and chronic acid reflux (Canadian Digestive Health Foundation, 2020). To learn more about esophageal cancer, visit the CDHF's Esophageal Cancer web page [New Tab] (<https://cdhf.ca/digestive-disorders/esophageal-cancer/what-is-esophageal-cancer/>).

Hepatitis A, B and C

Inflammation of the liver is referred to as hepatitis. This condition can be caused by several factors such as viruses, alcohol consumption, toxins, and drug interactions. In some cases it can also be caused by an autoimmune response in the body. There are five types of viral hepatitis: A, B, C, D, and E (Booth, 2018). To learn more, visit Healthline's article on Hepatitis [New Tab] (<https://www.healthline.com/health-news/everything-you-need-to-know-about-hepatitis#1>).

Celiac Sprue (Celiac Disease)

Individuals with celiac disease have an immune sensitivity reaction occurring in the small intestines when they consume gluten. Typically, people with this condition are genetically predisposed to the condition. Damage to the small intestine will occur if continued consumption of gluten occurs. Once diagnosed, individuals eat a gluten-free diet as the best approach for the management of the condition (Celiac Disease Foundation, n.d.). To learn more, visit the Celiac Disease Foundation's *What is Celiac Disease?* article [New Tab] (<https://celiac.org/about-celiac-disease/what-is-celiac-disease/>).

Crohn's Disease and Ulcerative Colitis

Crohn's disease and ulcerative colitis are chronic inflammatory bowel diseases (IBD) whereby a section or segments of the digestive tract experience inflammation. Crohn's disease can occur anywhere along the digestive tract from the mouth to the anus, although it is most often found in the small intestines. This often leads to the malabsorption of nutrients from food. Ulcerative colitis is localized inflammation and ulcers in the colon (Crohn's and Colitis Canada, n.d.). To learn more, visit Crohn's and Colitis Canada's page about Crohn's and Colitis diseases [New Tab] (<https://crohnsandcolitis.ca/About-Crohn-s-Colitis>).

Colon Cancer

Colon cancer is a cancer formation in the colon portion of the digestive tract. It is typically found in older adults.

Colon cancer is often diagnosed through a colonoscopy (Canadian Digestive Health Foundation, 2020). To learn more, visit the CDHF's page on colon cancer [New Tab] (<https://cdhf.ca/digestive-disorders/colon-cancer/>).

Hernia

A hernia occurs when an organ or fatty tissue squeezes through a weak spot in a surrounding muscle or connective tissue. A hiatal hernia is found in the upper stomach region.

Irritable Bowel Syndrome

Irritable bowel syndrome (IBS) is a common disorder affecting the large intestines. IBS often involves abdominal pain as sensitive nerve tissue within the colon reacts to the movement of food and waste through the digestive tract. Along with the abdominal pain individuals often experience gas and bloating. Diet and lifestyle modifications often help in the management of the condition (Canadian Digestive Health Foundation, 2020). To learn more about irritable bowel syndrome, visit the CDHF's web page on IBS [New Tab] (<https://cdhf.ca/digestive-disorders/irritable-bowel-syndrome-ibs/>).

Polyps

A polyp is a small growth of tissue protruding outward from the intestinal wall. Some cancers in the intestines start off as a polyp. Typically, they are found in people over the age of 50. Polyps start as a small collection of cells found within the colon. Most are harmless but can transition over time into cancerous growth (Mayo Clinic Staff, 2023). To learn more about polyps, review the Mayo Clinic's patient information page on polyps [New Tab] (<https://www.mayoclinic.org/diseases-conditions/colon-polyps/symptoms-causes/syc-20352875>).

Digestive System Medical Terms in Use

Digestive System – Consultation Report

Digestive System – Consultation Report (Text version)

Use the words below to fill in the consultation report:

- | | | |
|-----------------|--------------------|----------|
| 1. diarrhea | 5. resists walking | 9. eyes |
| 2. treatment | 6. session | 10. gait |
| 3. electrolytes | 7. vomiting | |
| 4. Glucose | 8. stools | |

PATIENT NAME: Alex WEBB

AGE: 30

DOB: November 10

SEX: Male

CONSULTANT: Louis D. Wainwright, MD, Gastroenterology

REQUESTING PHYSICIAN: Trevor Sharpe, MD, Family Medicine

REASON FOR CONSULTATION: Please evaluate GI distress.

I was asked to see this 30-year old male in consultation because of unremitting nausea, _____[Blank 1], _____[Blank 2], abdominal pain, dizziness, and low-grade fever. The patient has a poor appetite but reports no weight loss. He has noted some postprandial cramping, midepigastic pain, and unremitting diarrhea but no blood in the _____[Blank 3]. He states he is “healthier,” but he still has some dizziness.

Initial treatment consisted of IV fluids and control of _____[Blank 4]. Thereafter, the patient was progressed to clear fluids and soft diet. He has done well on this routine; however, his dizziness has persisted. Fever has resolved.

On admission, the patient’s lab data revealed CBC with hematocrit of 142, hemoglobin 25 with differential of neutrophils 51%, bands 8%, lymphocytes 26%, monocytes 6%, basophils none. Serum electrolytes were normal. Potassium was low at 3.5, BUN: creatinine ratio was normal. _____[Blank 5] was within normal range. Stool studies were within normal.

On examination, I find the patient to be lethargic and uncomfortable with mild nausea and dizziness. He prefers to keep his eyes closed. On examination of the _____[Blank 6], I find no nystagmus. There is pallor to the skin, and he seems cool to the touch. Upon standing by the bedside, the patient is unsteady. Although he _____[Blank 7], when he attempts to walk, his _____[Blank 8] is halting, and he tends to fall to the left side. Abdomen is flat and nontender. Bowel sounds are WNL. Rectal exam deferred.

RECOMMENDATIONS: I think we should continue essential _____[Blank 9] of this gentleman. Because of the symptoms of dizziness on admission, we may want to consider a CT scan to rule out an intracerebral bleed or subdural hematoma. My opinion at this time is that we are dealing with a resolving _____[Blank 10] of gastritis.

Thank you for asking me to see this patient. I will be glad to follow him with you throughout his hospital stay.

Louis D. Wainwright, MD, Gastroenterology

Note: Report samples (H5P and Pressbooks) are to encourage learners to identify correct medical terminology and do not represent the Association for Health Documentation Integrity (AHDI)

formatting standards.

Check your answers: ¹

Activity source: Digestive System – Consultation Report by Heather Scudder, from *Building a Medical Terminology Foundation* by Kimberlee Carter and Marie Rutherford, licensed under CC BY- 4.0. / Text version added.

Digestive System – Operative Report

Digestive System – Operative Report (Text version)

Use the words listed below to fill in the operative report:

- esophagitis
- ulceration
- lateral
- stomach
- GE
- sporadic
- retroflexion
- bleeding
- antrum
- duodenum
- lidocaine
- duodenitis

PATIENT NAME: Bruce WEBSTER

AGE: 48

SEX: Male

DOB: September 23

DATE OF ADMISSION: July 2

DATE OF PROCEDURE: July 2

ADMITTING PHYSICIAN: Trevor Sharpe, MD, Family Medicine

SURGEON: Louis D. Wainwright, MD, Gastroenterology

PREOPERATIVE DIAGNOSIS: GI Bleed.

POSTOPERATIVE DIAGNOSES:

1. Severe _____[Blank 1].
2. Gastroesophageal _____[Blank 2].
3. No Significant bleeding seen in the stomach.

OPERATIVE PROCEDURE: Gastrointestinal endoscopy.

ANESTHESIA: _____[Blank 3] 1%.

PROCEDURE: The patient was placed into the left _____[Blank 4] position. A scope was introduced from the mouth, under visualization and advanced to the upper part of the _____[Blank

5], upper part of esophagus, middle of esophagus, _____[Blank 6] junction, and some _____[Blank 7] bleeding was seen at the GE junction. The scope was moved through the upper part of the stomach into the _____[Blank 8]. The _____[Blank 9] showed some inflammation and the scope was then brought out. _____[Blank 10] was not performed. The scope was then brought back slowly. Mild _____[Blank 11] was also seen and a little bit of ulceration noted at GE junction.

CONCLUSION: Severe esophagitis, may be some source of _____[Blank 12] from there, but no active bleeding at this time.

Louis D. Wainwright, MD, Gastroenterology

Note: Report samples (H5P and Pressbooks) are to encourage learners to identify correct medical terminology and do not represent the Association for Health Documentation Integrity (AHD) formatting standards.

Check your answers: ²

Activity source: Digestive System – Operative Report by Heather Scudder, from *Building a Medical Terminology Foundation* by Kimberlee Carter and Marie Rutherford, licensed under CC BY- 4.0. /Text version added.

Medical Specialties and Procedures Related to the Digestive System

Gastroenterology

This specialty is focused on the diagnosis and treatment of conditions afflicting the digestive system. Gastroenterology is a branch of internal medicine. A physician who specializes in this area is known as a gastroenterologist (Canadian Medical Association, 2019). To learn more about gastroenterology, visit the Canadian Medical Association's Gastroenterology profile page [PDF] (<https://www.cma.ca/sites/default/files/2019-01/gastronenterology-e.pdf>).

Procedures

Upper and Lower Gastrointestinal Series

This is a diagnostic procedure involving the introduction of a contrast medium known as barium. Barium can

be introduced by ingesting or by enema. After induction of the barium, x-rays can be taken of the upper and lower gastrointestinal system structures (Johns Hopkins Medicine, 2020). To learn more, visit Johns Hopkins Medicine's web page on barium x-rays [New Tab] (<https://www.hopkinsmedicine.org/health/conditions-and-diseases/barium-xrays-upper-and-lower-gi>).

Fecal Occult Blood Test

This is a test for hidden blood in a fecal sample. A patient is provided with a card to place a small segment of fecal output. The sample is viewed under a microscope to look for blood. Blood detection can be an indicator of an abnormal growth occurring in the intestines (Johns Hopkins Medicine, 2020).

Stool Culture

This procedure involves the collection of a small sample of feces which is analyzed for abnormal bacterial growth through a culture check (Johns Hopkins Medicine, 2020).

Esophagogastroduodenoscopy

An EGD (upper endoscopy) is a procedure by which a physician examines the upper gastrointestinal tract (esophagus, stomach, duodenum) using a special instrument called an endoscope. The physician examines the tissues and is able to take a biopsy, if needed (Johns Hopkins Medicine, 2020).

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Notes

1. diarrhea, 2. vomiting, 3. stools, 4. electrolytes, 5. Glucose, 6. eyes, 7. resists walking, 8. gail 9. treatment, 10. session
1. esophagitis, 2. ulceration, 3. lidocaine, 4. lateral, 5. stomach, 6. GE, 7. sporadic, 8. antrum, 9. duodenum, 10. retroflexion, 11. duodenitis, 12. bleeding

Vocabulary & Check Your Knowledge

Digestive System Vocabulary

Ampulla

A sac-like enlargement of a canal or duct.

Bicarbonate

A by-product of the body's metabolism.

Carbohydrates

The sugars, starches and fibers found in fruits, grains, vegetables and milk products.

Convex

Curved outwards.

Distal

Away from the center of the body or from the point of attachment.

Emulsification

The process of breaking down the fat into smaller blood cells which makes it easy for enzymes to function and digest food.

Exocrine

To secrete externally, directly or through a duct.

Fundus

A part of a hollow organ.

Hiatal

Location where the diaphragm has a small opening (hiatus) through which the esophagus passes before connecting.

Hilum

A concave region where blood vessels, lymphatic vessels, and nerves also enter the lungs.

Labia

Lips of the mouth.

Lacteals

The lymphatic vessels of the small intestine which absorb digested fats.

Lingual Tonsils

A collection of lymphatic tissue located in the lamina propria of the root of the tongue.

Lymphoid

Resembling lymph or lymphatic tissues.

Malabsorption

A disorder that occurs when people are unable to absorb nutrients from their diets.

Maldigestion

Poor breakdown of food.

Nasal Cavity

The inside of your nose.

Neurosensory

Relating to afferent nerves.

Omentum

Fatty tissue that stretches over the abdomen, plays a role in immune response and the growth of certain cancers.

Palatine Tonsils

A pair of soft tissue masses located at the rear of the throat (pharynx).

Proximal

Situated nearer to the center of the body or the point of attachment.

Pyloric Sphincter

A band of smooth muscle at the junction between the pylorus of the stomach and the duodenum of the small intestine.

Quadrangle

A square or rectangular shape.

Stratified Squamous Epithelium

Cells arranged in layers upon a basal membrane.

Digestive System Glossary Reinforcement Activity

Digestive System Glossary Reinforcement Activity (Text version)

- _____ [Blank 1] is a band of smooth muscle at the junction between the pylorus of the stomach and the duodenum of the small intestine.
 - Ampulla
 - Quadrante
 - Pyloric sphincter
- Fatty tissue that stretches over the abdomen, plays a role in immune response and the growth of certain cancers is called _____[Blank 2].
 - Fundus
 - Convex
 - Omentum
- The process of breaking down the fat into smaller blood cells which makes it easy for enzymes to function and digest food is called _____[Blank 3].
 - Bicarbonate
 - Malabsorption
 - Emulsification
- _____ [Blank 4] is the location where the diaphragm has a small opening through which the esophagus passes before connecting.
 - Hiatal
 - Lacteals
 - Hilum
- Situated nearer to the center of the body or the point of attachment is the _____ [Blank 5].
 - Proximal
 - Distal
 - Quadrante

Check your answers: ¹

Activity source: Digestive System Glossary Reinforcement Activity by Gisele Tuzon, from *Building a Medical Terminology Foundation* by Kimberlee Carter and Marie Rutherford, licensed under CC BY- 4.0. /Text version added.

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Notes

1. 1. Pyloric sphincter, 2. Omentum, 3. Emulsification, 4. Hiatal, 5. Proximal,

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