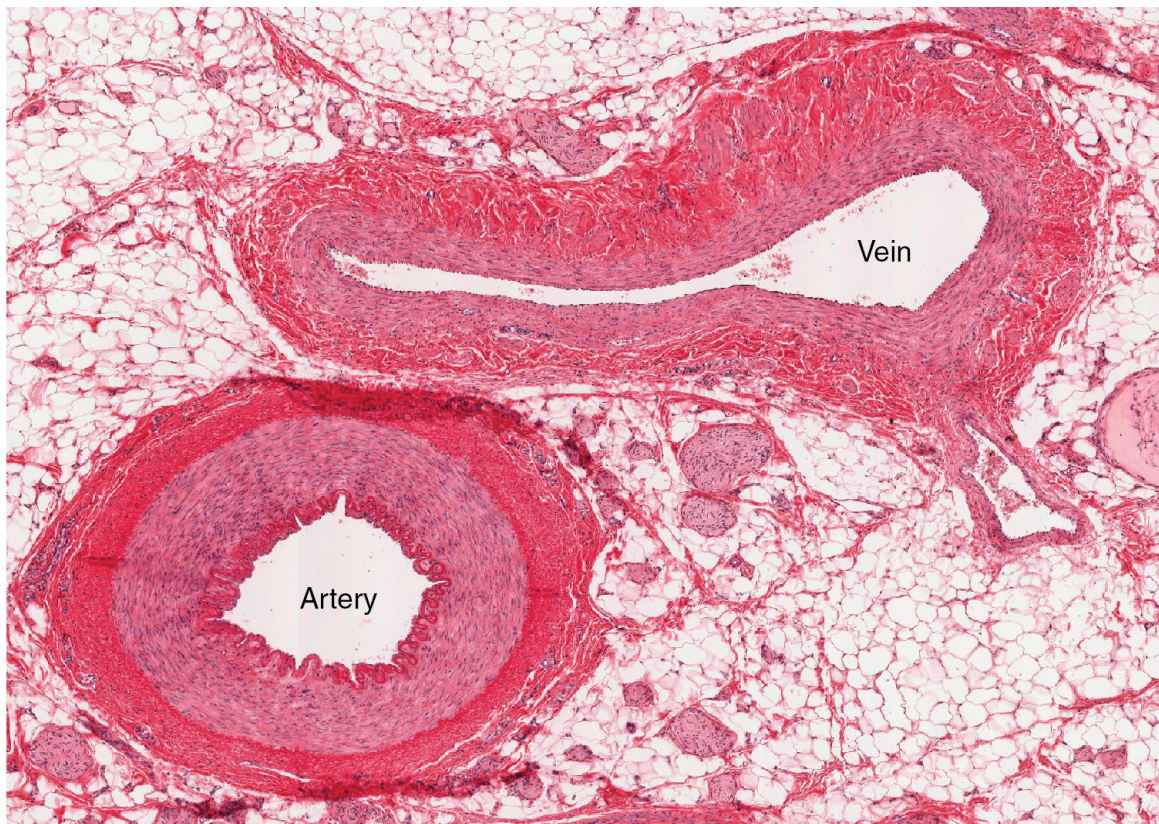


(a)

(b)



(c)

Figure 9.1 Structure of Blood Vessels. (a) Arteries and (b) veins share the same general features, but the walls of arteries are much thicker because of the higher pressure of the blood that flows through them. (c) A micrograph shows the relative differences in thickness. LM $\times 160$. (Micrograph

provided by the Regents of the University of Michigan Medical School © 2012.) From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [\[Image description.\]](#)

Image Descriptions

Figure 9.1 image description: The top left panel of this figure shows the ultrastructure of an artery (labels read from top: tunica externa, tunica media, tunica intima, smooth muscle, internal elastic membrane, vasa vasorum, external elastic membrane, nervi vasorum, endothelium, elastic fiber), and the top right panel shows the ultrastructure of a vein (labels read from top: tunica externa, tunica media, tunica intima, vasa vasorum, smooth muscle, endothelium). The bottom panel shows a micrograph with the cross sections of an artery and a vein. [\[Return to Figure 9.1\]](#).

PHYSIOLOGY OF THE BLOOD VESSELS AND BLOOD

Physiology of the Blood Vessels

Arteries and veins transport blood in two distinct circuits: the **systemic circuit** and the **pulmonary circuit**. Systemic arteries provide blood rich in oxygen to the body's tissues. The blood returned to the heart through systemic veins has less oxygen, since much of the oxygen carried by the arteries has been delivered to the cells. In contrast, in the pulmonary circuit, arteries carry blood low in oxygen exclusively to the lungs for gas exchange. Pulmonary veins then return freshly oxygenated blood from the lungs to the heart to be pumped back out into systemic circulation.

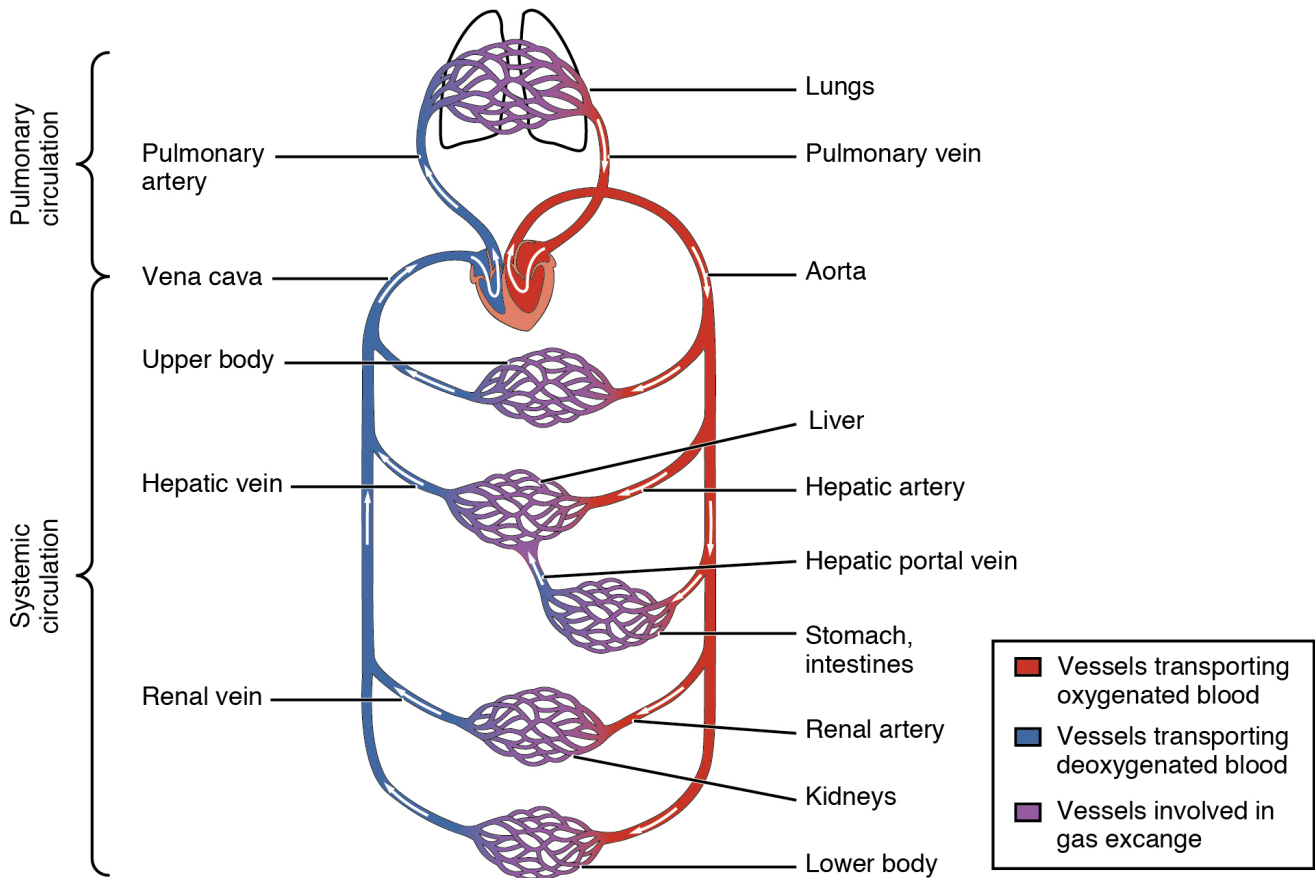


Figure 9.2 Cardiovascular Circulation. The pulmonary circuit moves blood from the right side of the heart to the lungs and back to the heart. The systemic circuit moves blood from the left side of the heart to the head and body and returns it to the right side of the heart to repeat the cycle. The arrows indicate the direction of blood flow, and the colors show the relative levels of oxygen concentration. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [Image description.]

Blood Pressure

Blood pressure is the force exerted by blood upon the walls of the blood vessels or the chambers of the heart. Blood pressure may be measured in capillaries and veins, as well as the vessels of the pulmonary circulation; however, the general term “blood pressure” refers to the pressure of blood flowing in the arteries of the systemic circulation. Blood pressure is one of the critical parameters measured on virtually every patient in every health care setting. The technique used today was developed more than 100 years ago by a pioneering Russian physician, Dr. Nikolai Korotkoff. Turbulent blood flow through the vessels can be heard as a soft ticking while measuring blood pressure; these sounds are known as **Korotkoff sounds**. Blood pressure is measured in mm Hg and is usually obtained from the brachial artery using a **sphygmomanometer** and a **stethoscope**. Blood pressure is recorded as **systolic pressure** over **diastolic pressure**.

The Composition (Anatomy) of Blood and the Functions of the Components

Blood is a connective tissue made up of **cellular elements** and an **extracellular matrix**. The cellular elements are referred to as the **formed elements** and include red blood cells (RBCs), white blood cells (WBCs), and platelets. The extracellular matrix, called **plasma**, makes blood unique among connective tissues because it is fluid. This fluid, which is mostly water, perpetually suspends the formed elements and enables them to circulate throughout the body within the cardiovascular system.

In the laboratory, blood samples are often centrifuged in order to separate the components of blood from one another (see the figure below). **Erythrocytes** are the heaviest elements in blood and settle at the very bottom of the tube. Above the erythrocyte layer, we see the **buffy coat**, a pale, thin layer of **leukocytes** and **thrombocytes**, which together make up less than 1% of the sample of whole blood. Above the buffy coat is the blood plasma, normally a pale, straw-colored fluid, which constitutes the remainder of the sample.

In normal blood, about 45 percent of a sample is erythrocytes, referred to as the **hematocrit**. The hematocrit of any one sample can vary significantly, however, by about 36–50 percent. One of the factors that determines hematocrit is testosterone levels, and so cisgender men tend to have higher hematocrits than cisgender women. Taking synthetic testosterone can elevate it as well. Not counting the buffy coat, which makes up less than 1% of the blood, we can estimate the mean plasma percentage to be the percentage of blood that is not erythrocytes: approximately 55%.

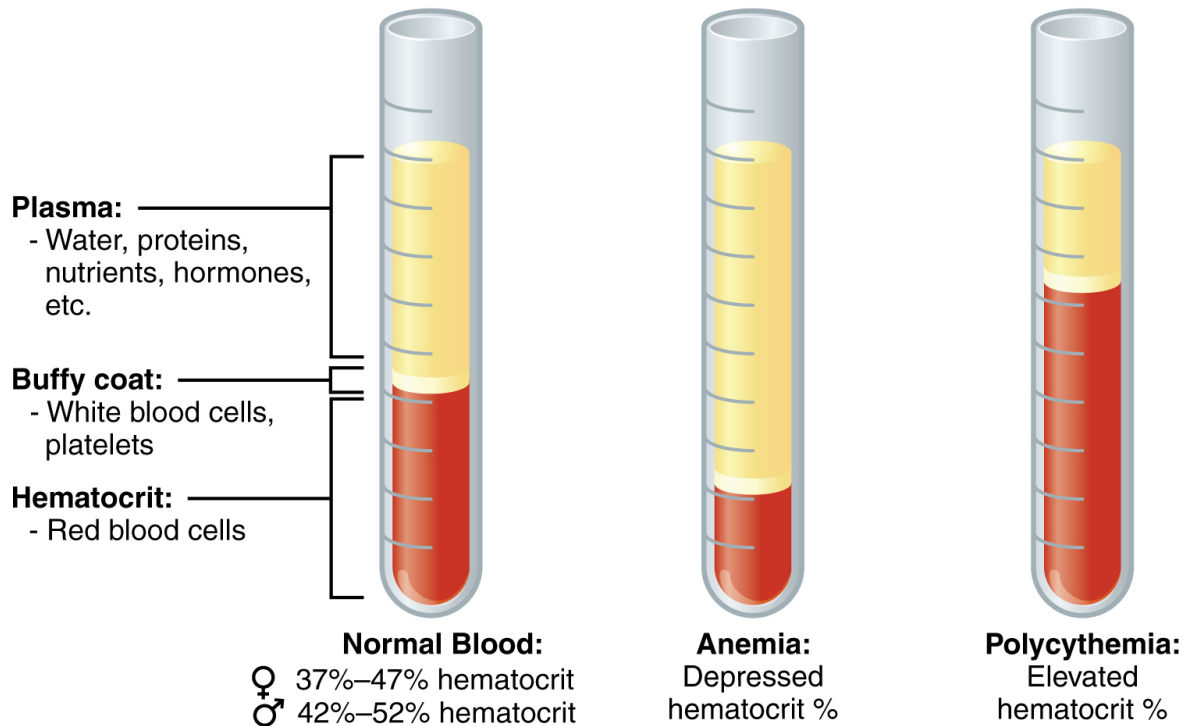


Figure 9.3 Composition of Blood. The cellular elements of blood include a vast number of erythrocytes and comparatively fewer leukocytes and platelets. Plasma is the fluid in which the formed elements are suspended. A sample of blood spun in a centrifuge reveals that plasma is the lightest component. It floats at the top of the tube separated from the heaviest elements, the erythrocytes, by a buffy coat of leukocytes and platelets. Hematocrit is the percentage of the total sample that is composed of erythrocytes. Depressed and elevated hematocrit levels are shown for comparison. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Blood Plasma

Like other fluids in the body, plasma is composed primarily of water. In fact, it is about 92% water. Dissolved or suspended within this water is a mixture of substances, most of which are proteins.

Erythrocytes

The most abundant formed elements in blood, erythrocytes are basically sacs packed with an oxygen-carrying compound called hemoglobin. Production of erythrocytes in the red bone marrow occurs at the staggering rate of more than 2 million cells per second. For this production to occur, raw materials including iron, copper, zinc, B vitamins, glucose, lipids, and amino acids must be present in adequate amounts. Erythrocytes live only 120 days on average and thus must be continually replaced. Worn-out erythrocytes are phagocytized by macrophages, and their hemoglobin is broken down. The breakdown products are recycled or removed as wastes.

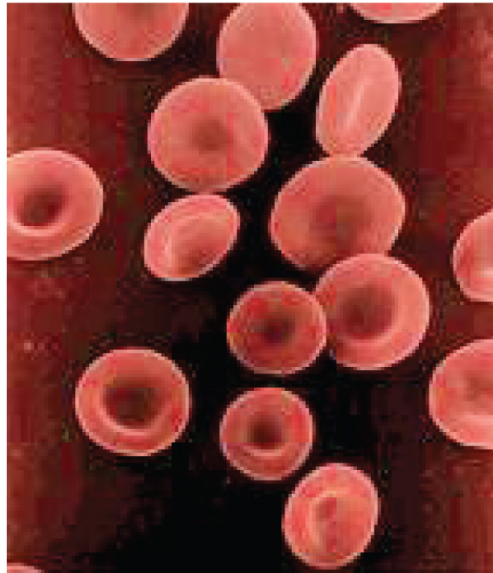


Figure 9.4 Shape of Red Blood Cells. Erythrocytes are biconcave discs with very shallow centers. This shape optimizes the ratio of surface area to volume, facilitating gas exchange. It also enables them to fold up as they move through narrow blood vessels. From Betts, et al., 2013. Licensed under [CC BY 4.0](#).

Leukocytes

Leukocytes protect the body against invading microorganisms and body cells with mutated DNA, and they clean up debris; thus they are a major component of the body's defenses against disease.

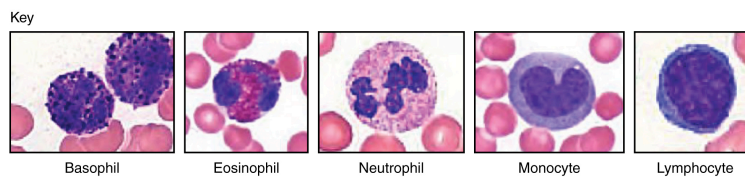


Figure 9.5 Leukocytes. (Micrographs provided by the Regents of University of Michigan Medical School © 2012.) From Betts, et al., 2013. Licensed under [CC BY 4.0](#).

Platelets

After entering the circulation, approximately one-third of the newly formed platelets migrate to the spleen for storage for later release in response to any rupture in a blood vessel. They then become activated to perform their primary function, which is to limit blood loss. Platelets remain only about 10 days, then are phagocytized by macrophages.

Platelets are key players in hemostasis, the process by which the body seals a ruptured blood vessel and prevents further loss of blood. Although rupture of larger vessels usually requires medical intervention, hemostasis is quite effective in dealing with small, simple wounds. There are three steps to the process: vascular spasm, the formation of a platelet plug, and coagulation (blood clotting). Failure of any of these steps will result in **hemorrhage**.

Physiology of Blood

Although carrying oxygen and nutrients to cells and removing wastes from cells is the main function of blood, it is important to realize that blood also serves in defense, distribution of heat, and maintenance of homeostasis.

Transportation

- Nutrients from the foods you eat are absorbed in the digestive tract. Most of these travel in the bloodstream directly to the liver, where they are processed and released back into the bloodstream for delivery to body cells.
- Oxygen from the air you breathe diffuses into the blood, which moves from the lungs to the heart, which then pumps it out to the rest of the body.
- Endocrine glands scattered throughout the body release their products, called hormones, into the bloodstream, which carries them to distant target cells.
- Blood also picks up cellular wastes and byproducts and transports them to various organs for removal. For instance, blood moves carbon dioxide to the lungs for exhalation from the body, and various waste products are transported to the kidneys and liver for excretion from the body in the form of urine or bile.

Defense

- Leukocytes protect the organism from disease-causing bacteria, cells with mutated DNA that could multiply to become cancerous, or body cells infected with viruses.
- When damage to the vessels results in bleeding, blood platelets and certain proteins dissolved in the

plasma interact to block the ruptured areas of the blood vessels involved. This protects the body from further blood loss.

Homeostasis

- If you were exercising on a warm day, your rising core body temperature would trigger several homeostatic mechanisms, including increased transport of blood from your core to your body periphery, which is typically cooler. As blood passes through the vessels of the skin, heat would be dissipated to the environment, and the blood returning to your body core would be cooler. In contrast, on a cold day, blood is diverted away from the skin to maintain a warmer body core. In extreme cases, this may result in frostbite.
- Blood helps to regulate the water content of body cells.
- Blood also helps to maintain the chemical balance of the body. Proteins and other compounds in the blood act as buffers, which thereby help to regulate the pH of body tissues. The pH of blood ranges from 7.35 to 7.45.

Image Descriptions

Figure 9.2 image description: This diagram shows how oxygenated and deoxygenated blood flows through the major organs in the body. Pulmonary circulation involves the lungs, pulmonary artery and vein, vena cava, and aorta. Systemic circulation involves the upper body, hepatic vein, renal vein, aorta, liver, hepatic artery, hepatic portal vein, stomach, intestines, renal artery, kidneys, and lower body. [\[Return to Figure 9.2\].](#)

Figure 9.3 image description: This figure shows three test tubes with a red and yellow liquid in them. The left panel shows normal blood, the center panel shows anemic blood and the right panel shows polycythemic blood. Labels indicate plasma (water, proteins, nutrients, hormones, etc.), buffy coat (white blood cells, platelets), and hematocrit (red blood cells). [\[Return to Figure 9.3\].](#)

WORD PARTS AND STRUCTURAL TERMS

Combining Forms

angi/o: vessel, blood vessel

aort/o: aorta

arteri/o: artery

ather/o: fatty plaque

cyt/o: cell

hemat/o: blood

hem/o: blood

isch/o: deficiency, blockage

lymph/o: lymph, lymph tissue

lymphaden/o: lymph node, lymph tissue

myel/o: bone marrow, spinal cord

phleb/o: vein

plasm/o: plasma

therm/o: heat

thromb/o: clot

thym/o: thymus gland

splen/o: spleen

ven/o: vein

Prefixes

a-: absence of, without

endo-: within, in

epi-: on, upon, over

hypo-: below, deficient

hyper-: above, excessive

inter-: between

pan-: all, total

peri-: surrounding, around

poly-: many, much

Suffixes

- ac**: pertaining to (adjective)
- apheresis**: removal (noun)
- ar**: pertaining to (adjective)
- centesis**: surgical puncture to aspirate fluid (noun)
- ectomy**: excision, surgical removal (noun)
- emia**: in the blood (noun)
- genic**: producing, originating, causing (adjective)
- gram**: record, radiographic image (noun)
- graph**: instrument used to record (noun)
- graphy**: process of recording, radiographic imaging (noun)
- ia**: condition of, diseased state, abnormal state (noun)
- ic**: pertaining to (adjective)
- itis**: inflammation (noun)
- logist**: specialist, physician who studies and treats (noun)
- logy**: specialty (noun)
- lysis**: loosening, dissolution, separating (noun)
- megaly**: enlarged, enlargement (noun)
- oma**: tumor (noun)
- osis**: abnormal condition (noun)
- tomy**: cut into, incision (noun)
- ous**: pertaining to (adjective)
- pathy**: disease (noun)
- penia**: abnormal reduction in number (noun)
- pexy**: surgical fixation, suspension (noun)
- plasty**: surgical repair (noun)
- poiesis**: formation (noun)
- sclerosis**: hardening (noun)
- stenosis**: narrowing, constriction (noun)
- scope**: instrument used to view (noun)
- scopy**: process of viewing (noun)
- stasis**: stop, stopping, controlling (noun)
- stenosis**: narrowing, constriction (noun)

Structural Terms Built from Word Parts

arterial: pertaining to the arteries

intravenous: pertaining to within the veins

venous: pertaining to the veins

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Word Parts

anemia: when the number of RBCs or hemoglobin is deficient

angioma: tumor composed of blood vessels

angiostenosis: abnormal narrowing of a blood vessel

aortic stenosis: abnormal narrowing of the aorta

arteriosclerosis: hardening of the arteries

atherosclerosis: hardening of the arteries that involves the accumulation of plaque

cyanosis: abnormal condition of blue (bluish-color lips and nail beds), typically caused by low oxygenation

hematoma: a collection of blood outside of blood vessels, usually due to trauma, disease, or surgery

hypercholesterolemia: higher than normal levels of cholesterol in the blood

hyperlipidemia: excessive fat in the blood

hypertension: chronic and persistent blood pressure measurements of 140/90 mm Hg or above

hypertriglyceridemia: excessive triglycerides in the blood

hypotension: low blood pressure

hypothermia: low body temperature

hypoxemia: low blood oxygen levels

hypoxia: lower-than-normal amount of oxygen to tissues

ischemia: a condition in which cells receive insufficient amounts of blood and oxygen

leukemia: a cancer involving an abundance of leukocytes

leukocytopenia: lower-than-normal amounts of one or more types of white blood cells

leukocytosis: excessive leukocyte proliferation

myeloma: a tumor of the bone marrow affecting plasma cells (specialized B cells that produce antibodies)

myocarditis: inflammation of the myocardium

pancytopenia: lower-than-normal amounts of all blood cells

pericarditis: inflammation of the pericardium

phlebitis: inflammation of one or more veins

polyarteritis: inflammation of many arteries

polycythemia: an elevated RBC count

thrombocytopenia: lower-than-normal platelet count

thrombophlebitis: inflammation of a vein caused by a blood clot

thrombosis: formation of unwanted blood clots

thrombus: a blood clot; an aggregation of platelets, erythrocytes, and even WBCs typically trapped within a mass of fibrin strands

valvulitis: inflammation of a valve

Disease and Disorder Terms Not Built from Word Parts

aneurysm: weakening of the wall of a blood vessel, causing it to thin and balloon out and possibly eventually burst, resulting in internal bleeding

blood dyscrasia: a pathologic condition of the blood, usually referring to a disorder of the cellular elements of the blood

circulatory shock: a life-threatening condition in which the circulatory system is unable to maintain blood flow to adequately supply sufficient oxygen and other nutrients to the tissues to maintain cellular metabolism

coarctation of the aorta: a congenital condition in which a part of the aorta is narrower than usual

coronary artery disease: the blood vessels that supply blood to the myocardium become hardened and narrowed, impairing the delivery of oxygen to the heart muscle

deep vein thrombosis: a type of venous thrombosis involving the formation of a blood clot in a deep vein, most commonly in the legs

edema: swelling of tissues due to excess interstitial fluid

embolus: a freely moving piece of a substance (plaque or blood clot) that travels through the circulation until it blocks a smaller blood vessel, cutting off the supply of oxygen to the tissue

embolism: when an embolus becomes trapped

extravasation: leakage of blood into surrounding tissues

hemophilia: a group of related genetic disorders in which certain plasma clotting factors are lacking, inadequate, or nonfunctional

hemorrhage: excessive or uncontrolled bleeding from the blood vessels

intermittent claudication: pain in the legs caused by insufficient oxygen delivery in muscle tissue while exercising

peripheral artery disease: when atherosclerosis affects arteries in the legs

sepsis: a potentially life-threatening condition that occurs when the body's response to an infection damages its own tissues; may lead to septic shock

varicose veins: when defective valves allow blood to accumulate within the veins, causing them to distend, twist, and become visible on the surface of the skin

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Careers & Professional Terminology

diagnostic vascular technologist: technologist that images the vascular system

hematologist: specialist physician that diagnoses and treats blood disorders

medical laboratory technologist: performs complex analyses of tissue, blood, and other body fluids

phlebotomist: professional trained to draw blood

vascular surgeon: surgeon that treats diseases of the blood and lymphatic vessels

Imaging Techniques/Procedures for the Organ System

angiogram: the placement of a catheter in a blood vessel and injection of contrast material while taking x-rays of the vessel

angiography: the process of obtaining an angiogram

angioscope: a miniature fiber-optic endoscope that is threaded into the heart through a catheter; it can be used to view thrombi, plaque, arterial dissections, and other vascular abnormalities

angiосcopy: the process of using an angioscope

aortogram: the placement of a catheter in the aorta and injection of contrast material while taking x-rays of the aorta

arteriogram: the placement of a catheter in an artery and injection of contrast material while taking x-rays of the artery

Doppler ultrasound: a noninvasive test that can be used to estimate the blood flow through the blood vessels by bouncing sound waves off circulating red blood cells

venogram: the placement of a catheter in a vein and injection of contrast material while taking x-rays of the vein

Surgical Techniques / Medical Procedures / Diagnostic Procedures / Medications Used with the

Organ System

aneurysmectomy: surgical removal of an aneurysm from a blood vessel

angioplasty: a balloon-tip catheter is fed through a blood vessel up to the site of the narrowing; the balloon is inflated to re-open the artery

anticoagulant: a medication that slows or inhibits blood clotting

arterial blood gas: measures blood pH, oxygen, and CO₂ levels in a sample of arterial blood, usually taken from the wrist

atherectomy: surgical excision of fatty plaque from a blood vessel

bone marrow aspiration: removal of bone marrow via needle

bone marrow biopsy: a diagnostic test of a sample of red bone marrow

bone marrow transplant: a treatment in which a donor's healthy bone marrow and its stem cells replace the faulty bone marrow of a patient

coagulation time: the time required by a blood specimen to clot

complete blood count and differential: a collection of blood tests that count the different blood cells (RBCs, WBCs, platelets) and the different types of WBCs (neutrophils, lymphocytes, monocytes, eosinophils, basophils)

embolectomy: surgical removal of an embolus, usually with a balloon catheter

endarterectomy: surgical removal of plaque from a blood vessel

femoropopliteal bypass: surgery that creates a new route for blood between the femoral and popliteal arteries of the leg

hematocrit: a lab test that measures the percentage of red blood cells in a sample of whole blood; it represents how much of the person's blood is made up of red blood cells by volume

hemoglobin: a protein found in red blood cells that carries oxygen; abnormal amounts indicate a blood disorder

percutaneous transluminal coronary angioplasty: a procedure that opens blocked or stenosed coronary arteries using a balloon catheter

phlebectomy: surgical excision of a vein

phlebotomy: incision or puncture of a vein with a needle

thrombolytic therapy: the use of drugs to break up or dissolve blood clots

vasoconstrictor: a substance that constricts blood vessel walls

vasodilator: a substance that dilates blood vessel walls

venipuncture: puncture of a vein to withdraw blood or administer medication or fluids

Abbreviations Commonly Used with the Organ System

ABG: arterial blood gas

BP: blood pressure

CBC/diff: complete blood count/differential

DVT: deep vein thrombosis

Hct: hematocrit

Hgb: hemoglobin

HTN: hypertension

IV: intravenous

PAD: peripheral artery disease

PTCA: percutaneous transluminal coronary angioplasty

RBC: red blood cell

WBC: white blood cell

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://louis.pressbooks.pub/medicalterminology/?p=1497#h5p-63>

PRACTICE

The following activity will allow you to practice what you've learned in this chapter.

Consultation Report

Click and drag each term from the word bank to its correct place in this exercise.



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PART X

CARDIOVASCULAR SYSTEM—PART III: THE LYMPHATIC AND IMMUNE SYSTEMS

Learning Objectives

When completing this chapter, the learner will be able to do the following:

- Identify the anatomy of the immune and lymphatic systems
- Describe the main functions of the immune and lymphatic systems
- Spell terms relating to the immune and lymphatic systems and use correct abbreviations
- Pronounce terms relating to the immune and lymphatic systems and use correct abbreviations
- Identify the medical specialties associated with the immune and lymphatic systems
- Explore common diseases, disorders, and procedures related to the immune and lymphatic systems

Introduction to the Lymphatic and Immune Systems

The **lymphatic system** is a series of vessels, ducts, and trunks that remove interstitial fluid from the tissues and return it to the blood. The lymphatic vessels are also used to transport dietary lipids and cells of the **immune system**. Cells of the immune system, lymphocytes, all come from the hematopoietic system of the bone marrow. **Primary lymphoid organs**, the bone marrow and thymus gland, are the locations where lymphocytes proliferate and mature. **Secondary lymphoid organs** are the site in which mature lymphocytes

congregate to mount immune responses. Many immune system cells use the lymphatic and circulatory systems for transport throughout the body to search for and then protect against pathogens.

Watch this video:



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://louis.pressbooks.pub/medicalterminology/?p=1411#oembed-1>

Media 10.1 [Lymphatic System: Crash Course A&P #44](#) [Online video]. Copyright 2015 by [CrashCourse](#).

ANATOMY AND PHYSIOLOGY OF THE LYMPHATIC SYSTEM

The **lymphatic vessels** begin as close-ended **lymphatic capillaries**, which feed into larger and larger lymphatic vessels, and eventually empty into the bloodstream. Along the way, the lymph travels through the **lymph nodes**, which are commonly found near the groin, armpits, neck, chest, and abdomen. Humans have about 500–600 lymph nodes throughout the body (see [Figure 10.1](#)). Several organs and tissues that participate in immunity are also part of the lymphatic system.

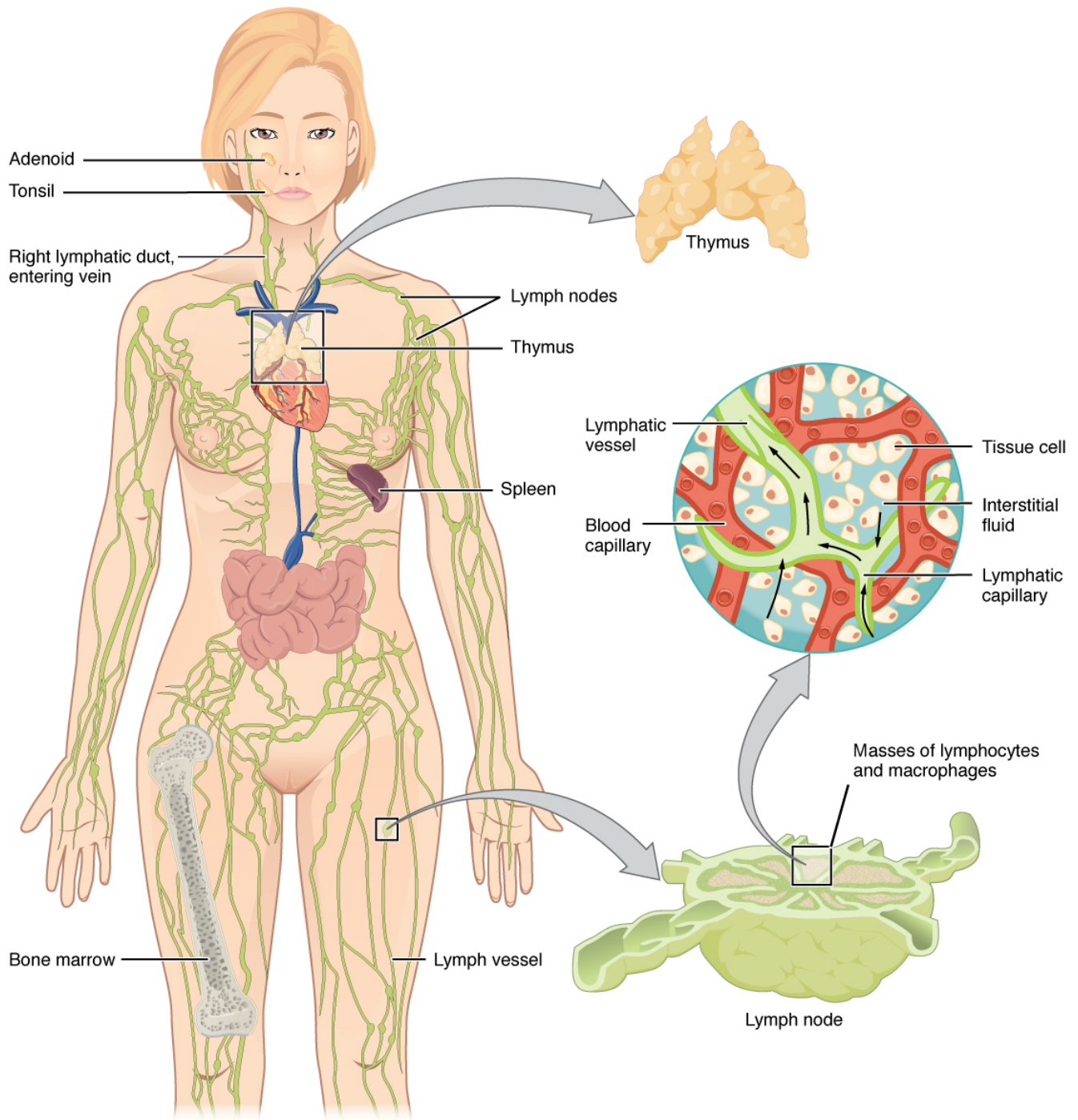


Figure 10.1 Anatomy of the Lymphatic System. Lymphatic vessels in the arms and legs convey lymph to the larger lymphatic vessels in the torso. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [Image description.]

Lymphatic Capillaries

An important function of the lymphatic system is to return the fluid (lymph) to the blood. **Lymph** may be thought of as recycled blood plasma. Blood pressure causes leakage of fluid from the blood capillaries, resulting in the accumulation of fluid in the **interstitial space**. In humans, 20 liters of plasma are released into the interstitial space of the tissues each day due to capillary leakage. The blood vessels reabsorb 17 liters of this **interstitial fluid**, leaving 3 liters in the tissues for the lymphatic system to transport back into the body's circulation. If the lymphatic system is damaged in some way, such as by being blocked by cancer cells or destroyed by injury, interstitial fluid accumulates in the tissue spaces, causing a condition called lymphedema.

Lymphatic capillaries, also called terminal lymphatics, are vessels where interstitial fluid enters the lymphatic system to become lymph. Located in almost every tissue in the body, these vessels are interlaced among the arterioles and venules of the circulatory system in the soft connective tissues of the body. See [Figure 10.2](#). Exceptions are the central nervous system, bone marrow, bones, teeth, and the cornea of the eye, which do not contain lymph vessels.

Lymph capillaries in the tissue spaces

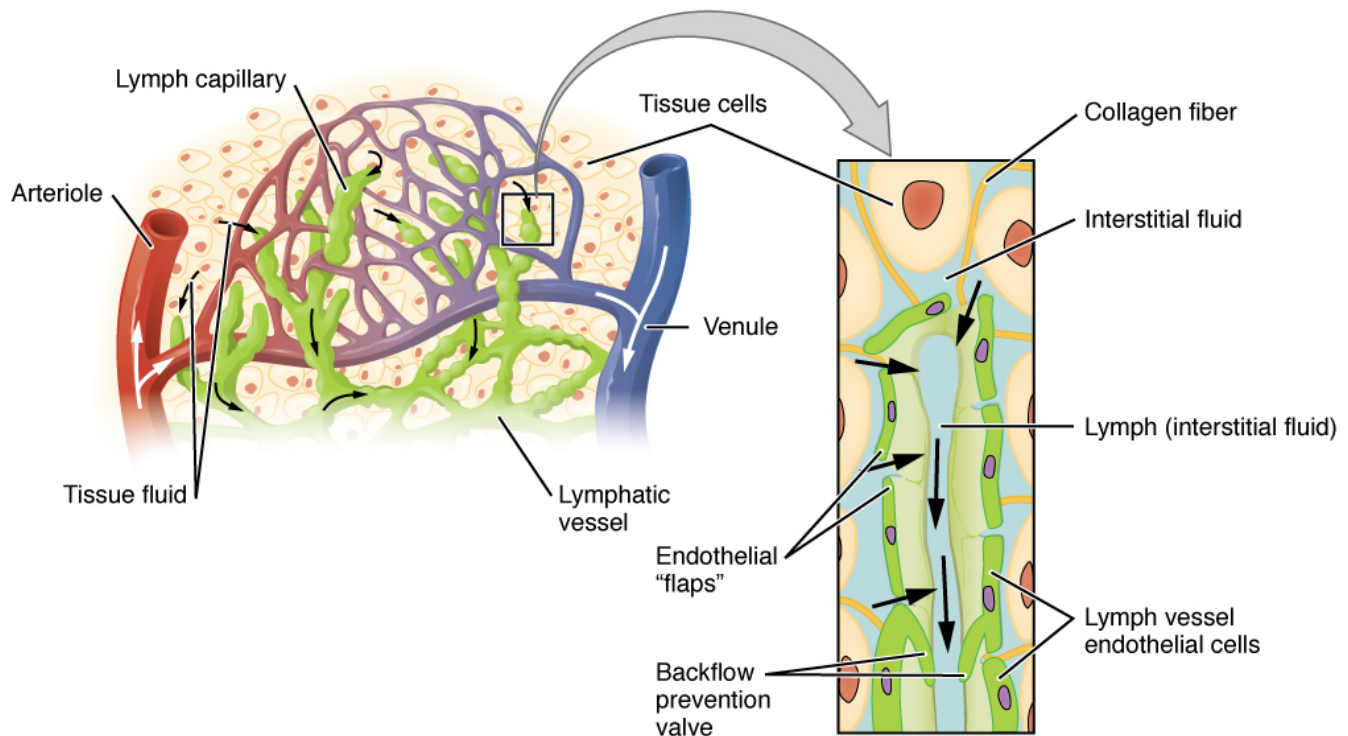


Figure 10.2 Lymphatic Capillaries. Lymphatic capillaries are interlaced with the arterioles and venules of the cardiovascular system. Collagen fibers anchor a lymphatic capillary in the tissue (inset). Interstitial fluid slips through spaces between the overlapping endothelial cells that compose the lymphatic capillary. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [[Image description](#).]

Larger Lymphatic Vessels, Trunks, and Ducts

The lymphatic capillaries empty into larger lymphatic vessels, which are similar to veins in terms of their three-tunic structure and the presence of valves. These one-way valves are located fairly close to one another, and each one causes a bulge in the lymphatic vessel (see [Figure 10.2](#)).

In general, **superficial lymphatics** follow the same routes as veins, whereas **deep lymphatic vessels** of the viscera generally follow the paths of arteries. The superficial and deep lymphatics eventually merge to form larger lymphatic structures known as **lymphatic trunks**. On the right side of the body, the right sides of the head, thorax, and right upper limb trunks drain lymph fluid into the right subclavian vein via the right lymphatic duct (see [Figure 10.3](#)). On the left side of the body, the trunks from the remaining portions of the body drain into the larger thoracic duct, which drains into the left subclavian vein. The thoracic duct itself begins just beneath the diaphragm in the **cisterna chyli**.

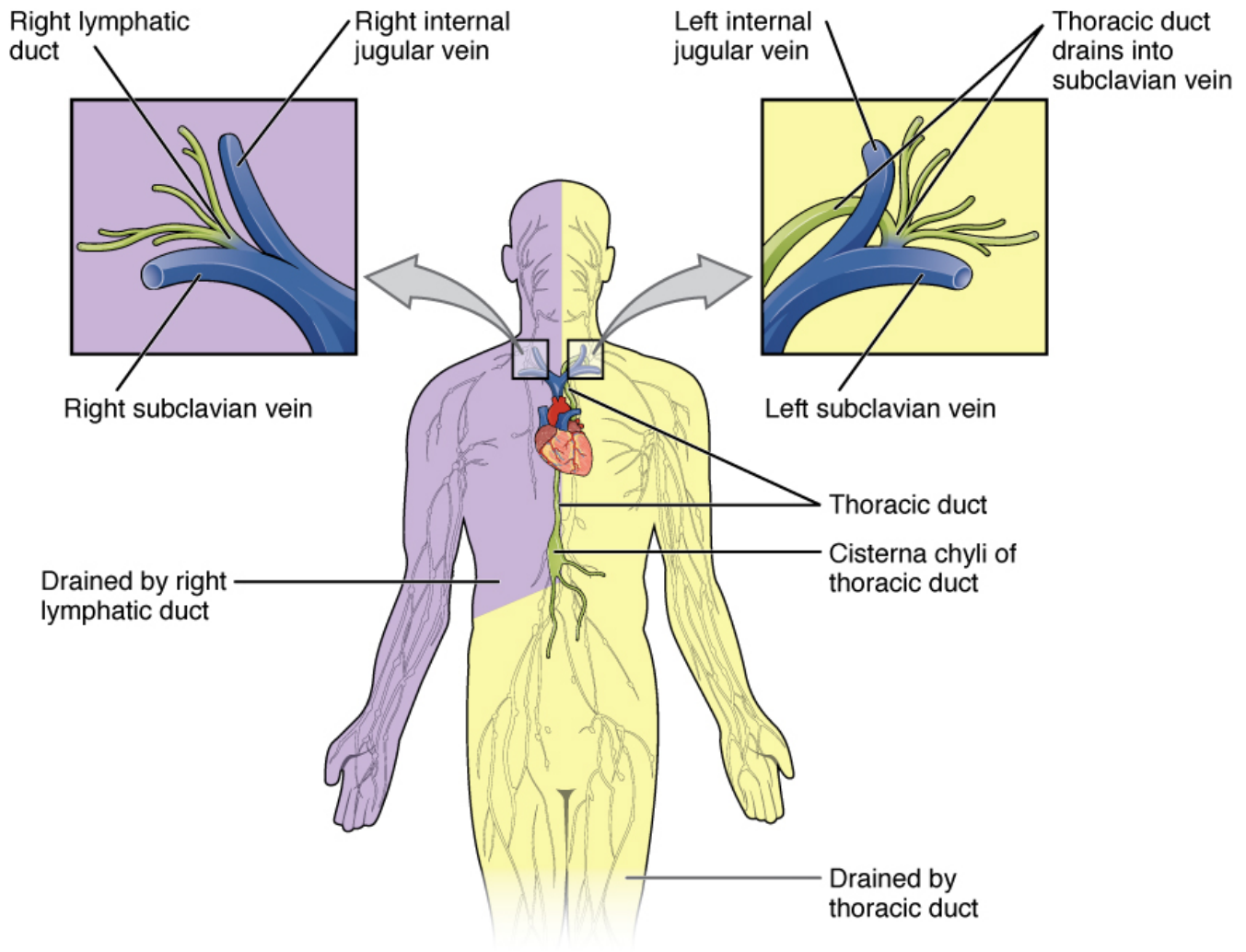


Figure 10.3 Major Trunks and Ducts of the Lymphatic System. The thoracic duct drains a much larger portion of the body than does the right lymphatic duct. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Primary Lymphoid Organs

The primary lymphoid organs are the **bone marrow** and **thymus gland**. The lymphoid organs are where lymphocytes mature, proliferate, and are selected, which enables them to attack pathogens without harming the cells of the body.

Bone Marrow

Recall that all blood cells, including lymphocytes, are formed in the red bone marrow. The B cell undergoes

nearly all of its development in the red bone marrow, whereas the immature T cell, called a thymocyte, leaves the bone marrow and matures largely in the thymus gland.

Thymus

The thymus gland, where T cells mature, is a bilobed organ found in the space between the sternum and the aorta of the heart. Connective tissue holds the lobes closely together but also separates them and forms a capsule.

Secondary Lymphoid Organs

Lymphocytes develop and mature in the primary lymphoid organs, but they mount immune responses from the **secondary lymphoid organs**, which include the **lymph nodes**, **spleen**, and **lymphoid nodules**. A naïve lymphocyte is one that has left the primary organ, where it learned to function immunologically, and entered a secondary lymphoid organ, where it waits to encounter an antigen against which it will mount a response.

Lymph Nodes

Lymph nodes function to remove debris and pathogens from the lymph, and are thus sometimes referred to as the “filters of the lymph.” Any bacteria that infect the interstitial fluid are taken up by the lymphatic capillaries and transported to a regional lymph node. Dendritic cells and macrophages within this organ internalize and kill many of the pathogens that pass through, thereby removing them from the body. The lymph node is also the site of **adaptive immune responses** mediated by T cells, B cells, and accessory cells of the adaptive immune system.

Spleen

The spleen is a vascular organ that is somewhat fragile due to the absence of a capsule. It is about 12 cm long and is attached to the lateral border of the stomach. The spleen is sometimes called the “filter of the blood” because of its extensive vascularization and the presence of macrophages and dendritic cells that remove microbes and other materials from the blood, including dying red blood cells. The spleen also functions as the location of immune responses to blood-borne pathogens.

Lymphoid Nodules

The other lymphoid tissues, the lymphoid nodules, consist of a dense cluster of lymphocytes without a surrounding fibrous capsule. These nodules are located in the respiratory and digestive tracts, areas routinely exposed to environmental pathogens. These include **tonsils**, **bronchus-associated lymphoid tissue (BALT)**, and **mucosa-associated lymphoid tissue (MALT)**.

Image Descriptions

Figure 10.1 image description: The left panel shows a female human body, and the entire lymphatic system is shown. Labels read (clockwise from top): thymus, lymph nodes, thymus, spleen, lymph vessel, bone marrow, right lymphatic duct, entering vein, tonsil, adenoid. The right panel shows magnified images of the thymus and the lymph node. Labels read (clockwise from top): tissue cell, interstitial fluid, lymphatic capillary, blood capillary, lymphatic vessel. Label of lymph node reads masses of lymphocytes and macrophages. [\[Return to Figure 10.1\].](#)

Figure 10.2 image description: This image shows the lymph capillaries in the tissue spaces. Labels read (clockwise, from top): lymph capillary, tissue cells, venule, lymphatic vessel, tissue fluid, arteriole. It also shows a magnified image of the interstitial fluid and the lymph vessels. Labels read (clockwise, from top): collagen fiber, interstitial fluid, lymph, lymph vessel endothelial cells, backflow prevention valve, endothelial flaps. [\[Return to Figure 10.2\].](#)

Figure 10.3 image description: This figure shows the lymphatic trunks and the duct system in the human body. Labels read (clockwise from top) thoracic duct, cisterna chyli of thoracic duct, drained by thoracic duct, drained by right lymphatic duct. Callouts to the left and right show the magnified views of the left and right jugular veins, respectively. Labels read (right lymphatic duct): right internal jugular vein, right subclavian vein, right lymphatic duct; (left jugular vein): left internal jugular vein, thoracic duct drains into subclavian vein, left subclavian vein. [\[Return to Figure 10.3\].](#)

WORD PARTS AND STRUCTURAL TERMS

Combining Forms

immun/o: immune, immunity

lymph/o: lymph, lymph tissue

lymphaden/o: lymph gland, lymph node

myel/o: bone marrow, spinal cord

splen/o: spleen

thym/o: thymus gland

Prefixes

a-: no, not, negates meaning

an-: no, not, negates meaning

Suffixes

-cyte: cell

-ectomy: excision, cut out

-itis: inflammation

-logist: specialist, physician who studies and treats

-logy: study of

-megaly: enlarged, enlargement

-oid: resembling

-oma: tumor, swelling

-osis: abnormal condition

-pathy: disease

-rrhaphy: suturing

Structural/Complementary Terms Built from Word

Parts

lymphoid: relating to the lymphatic tissue

lymphocyte: immune cell commonly found in the lymphatic system; responsible for adaptive and long-term immunity

Structural/Complementary Terms Not Built from Word Parts

antibody: proteins produced by B lymphocytes in response to a non-self antigen; also called immunoglobulins

antigen: a substance that provokes an immune response

immune: possessing immunity to a pathogen

immunity: after an infection, memory cells remain in the body for a long time and can very quickly mount an immune response against the same pathogen if it tries to re-infect

immunization: the process of inducing immunity artificially with weakened or killed pathogens, antigens from the pathogen, or mRNA coding for a protein from a pathogen

vaccine: an agent administered by injection, orally, or by nasal spray that provides active acquired immunity to a particular infectious disease

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Word Parts

lymphadenitis: inflammation of lymph nodes

lymphadenopathy: disease of lymph nodes

lymphoma: a form of cancer in which masses of malignant T and/or B lymphocytes collect in lymph nodes, the spleen, the liver, and other tissues

splenomegaly: enlargement of spleen

thymoma: tumor of the thymus

Disease and Disorder Terms Not Built from Word Parts

acquired immunodeficiency syndrome: a drop in T-cell numbers due to infection with the HIV virus

allergy: inflammatory response due to a hypersensitivity to a substance

anaphylactic shock: an inhaled, ingested, or injected allergen causes a significant drop in blood pressure along with contractions of smooth muscles of the airways; can be fatal within minutes

autoimmune disease: disease in which the immune system begins to attack cells of the patient's own body, causing chronic inflammation and significant damage

Hodgkin disease: a type of lymphoma in which cancer originates from lymphocytes

infectious mononucleosis: a disease caused by the Epstein-Barr virus, characterized by swollen lymph glands, fever, sore throat, and extreme fatigue

severe combined immunodeficiency disease: genetic disease that leads to decreases in both T-cell and B-cell numbers

systemic lupus erythematosus: an autoimmune disease in which the immune system recognizes its own cell antigens as being "non-self" and mounts an immune response against them; as a result, many body tissues and vital organs become chronically inflamed and damaged

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Careers & Professional Terminology

allergist: a physician who specializes in hypersensitivity reactions of the immune system

immunologist: a physician or scientist who specializes in immunology

immunology: the study of the immune system and immunity

Surgical Techniques/Medical Procedures/ Diagnostic Procedures/Medications Used with the Organ System

splenectomy: surgical removal of all or part of the spleen

splenorrhaphy: surgical suturing of the spleen

thymectomy: surgical removal of all or part of the thymus

Abbreviations Commonly Used with the Organ System

AIDS: acquired immune deficiency syndrome

HIV: human immunodeficiency virus

SCID: severe combined immunodeficiency

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://louis.pressbooks.pub/medicalterminology/?p=1510#h5p-69>

PRACTICE

The following activity will allow you to practice what you've learned in this chapter.

Anatomy Labeling Activity

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://louis.pressbooks.pub/medicalterminology/?p=2116#h5p-70>

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[CrashCourse]. (2015, November 30). [Lymphatic system: Crash course A&P #44](https://youtu.be/I7orwMgTQ5I) [Video]. YouTube. <https://youtu.be/I7orwMgTQ5I>

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PART XI

RESPIRATORY SYSTEM

Learning Objectives

When completing this chapter, the learner will be able to do the following:

- Identify the anatomy of the respiratory system
- Describe the main functions of the respiratory system
- Spell the respiratory system medical terms and use correct abbreviations
- Identify the medical specialties associated with the respiratory system
- Explore common diseases, disorders, and procedures related to the respiratory system

Introduction

Can you hold your breath as you continue reading...? How long can you do it? Chances are you are feeling uncomfortable already. A typical human cannot survive without breathing for more than three minutes, and even if you wanted to hold your breath longer, your **autonomic** nervous system would take control. Although oxygen is critical for cells, it is the accumulation of carbon dioxide that primarily drives your need to breathe.

The major structures of the respiratory system function primarily to provide oxygen to body tissues for cellular respiration, remove the waste product carbon dioxide, and help to maintain acid-base balance. Portions of the respiratory system are also used for nonvital functions, such as sensing odors, speech production, and straining, such as coughing.

Watch these videos:



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://louis.pressbooks.pub/medicalterminology/?p=1416#oembed-1>

Media 11.1. [Respiratory System, Part 1: Crash Course A&P #31](#) [Online video]. Copyright 2015 by [CrashCourse](#).



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Media 11.2. [Respiratory System, Part 2: Crash Course A&P #32](#) [Online video]. Copyright 2015 by [CrashCourse](#).



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Media 11.3. [Spirometry](#) [Online video]. Copyright 2009 by [freshwaterl](#).

ANATOMY AND PHYSIOLOGY OF THE RESPIRATORY SYSTEM

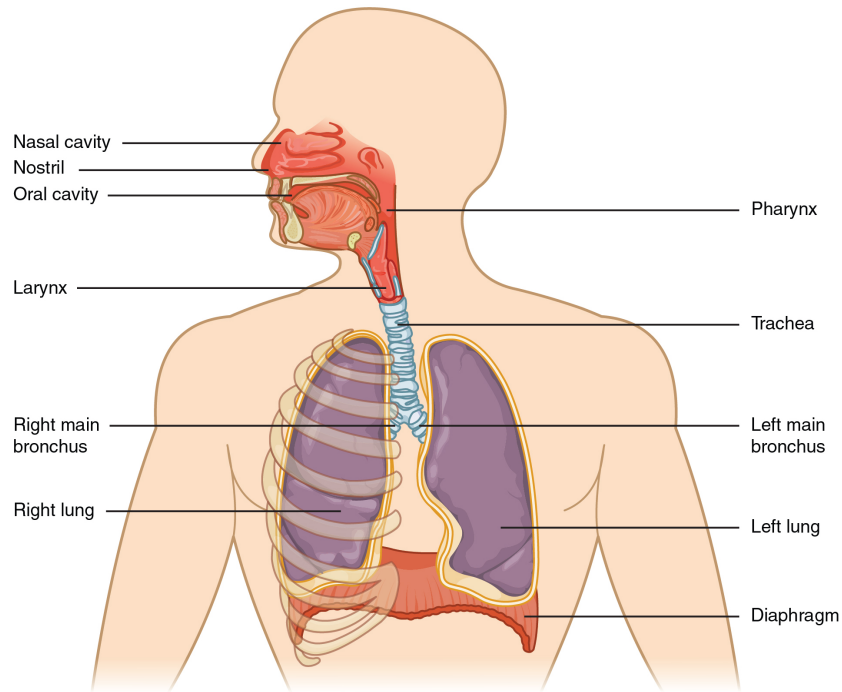


Figure 11.1 Major Respiratory Structures. The major respiratory structures span the nasal cavity to the diaphragm. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

The Nose and Its Adjacent Structures

The major entrance and exit for the respiratory system is through the nose. When discussing the nose, it is helpful to divide it into two major sections: **external nose** and **internal nose**.

The **nares** open into the **nasal cavity**, which is separated into left and right sections by the **nasal septum** ([Figure 11.2](#)). The nasal septum is formed anteriorly by a portion of the **septal cartilage** and posteriorly by the perpendicular plate of the ethmoid bone and the thin vomer bones.

Each lateral wall of the nasal cavity has three bony projections: the **inferior conchae** are separate bones, and the **superior** and **middle conchae** are portions of the ethmoid bone. Conchae increase the surface area of the nasal cavity, disrupting the flow of air as it enters the nose, which causes air to bounce along

the epithelium, where it is cleaned and warmed. The conchae and meatuses trap water during exhalation, preventing dehydration.

The floor of the nasal cavity is composed of the **hard palate** and the **soft palate**. Air exits the nasal cavities via the **internal nares** and moves into the **pharynx**.

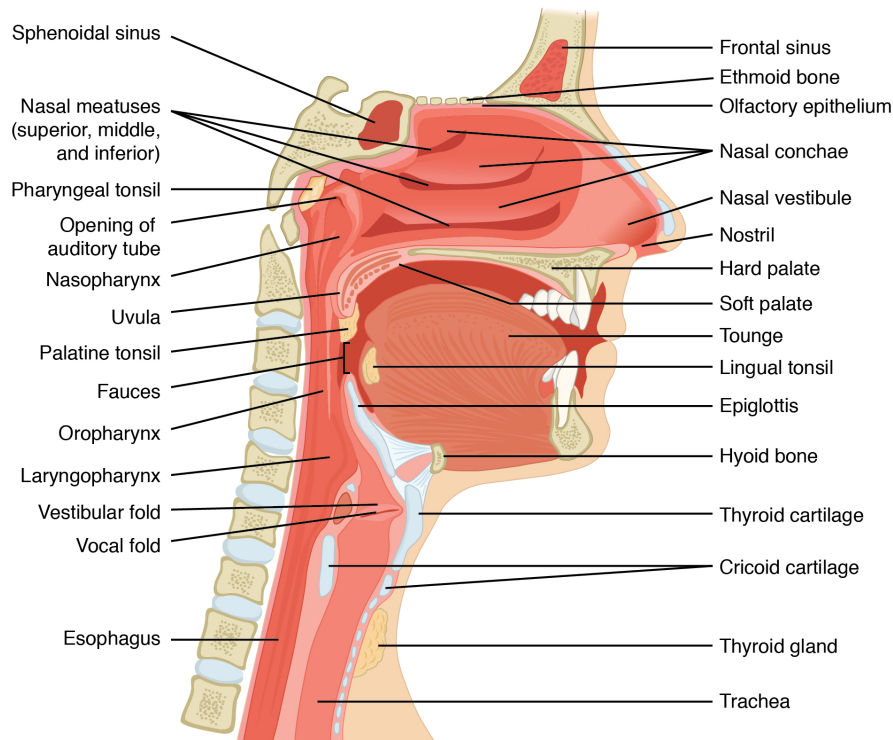


Figure 11.2 Upper Airway. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [Image description.]

Paranasal sinuses serve to warm and humidify incoming air and are lined with a mucosa that produces mucus. Paranasal sinuses are named for their associated bone:

- frontal sinus
- maxillary sinus
- sphenoidal sinus
- ethmoidal sinus

The nares and anterior portion of the nasal cavities are lined with mucous membranes containing sebaceous glands and hair follicles that serve to prevent the passage of large debris, such as dirt, through the nasal cavity. An olfactory epithelium used to detect odors is found deeper in the nasal cavity.

The conchae, meatuses, and paranasal sinuses are lined by respiratory epithelium composed of pseudostratified ciliated columnar epithelium (Figure 11.3). The epithelium contains specialized epithelial cells

that produce mucus to trap debris. The cilia of the respiratory epithelium help to remove mucus and debris with a constant beating motion, sweeping materials toward the throat to be swallowed.

This moist epithelium functions to warm and humidify incoming air. Capillaries located just beneath the nasal epithelium warm the air by convection.

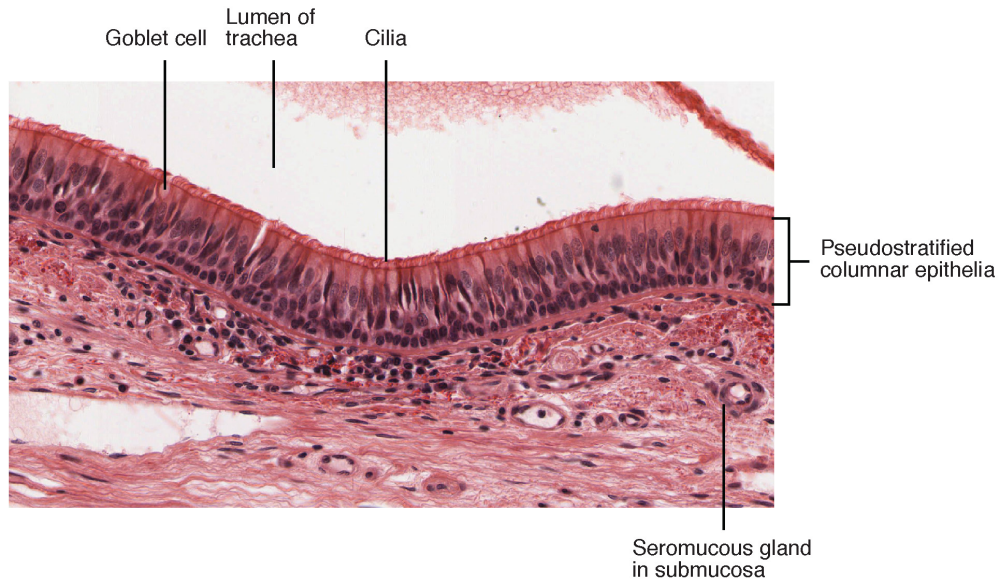


Figure 11.3 Pseudostratified Ciliated Columnar Epithelium. Respiratory epithelium is pseudostratified ciliated columnar epithelium. Seromucous glands provide lubricating mucus. LM \times 680. (Micrograph provided by the Regents of University of Michigan Medical School \textcopyright 2012.) From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [\[Image description.\]](#)

Pharynx

The **pharynx** is divided into three major regions: the **nasopharynx**, the **oropharynx**, and the **laryngopharynx** (see [Figure 11.4](#)).

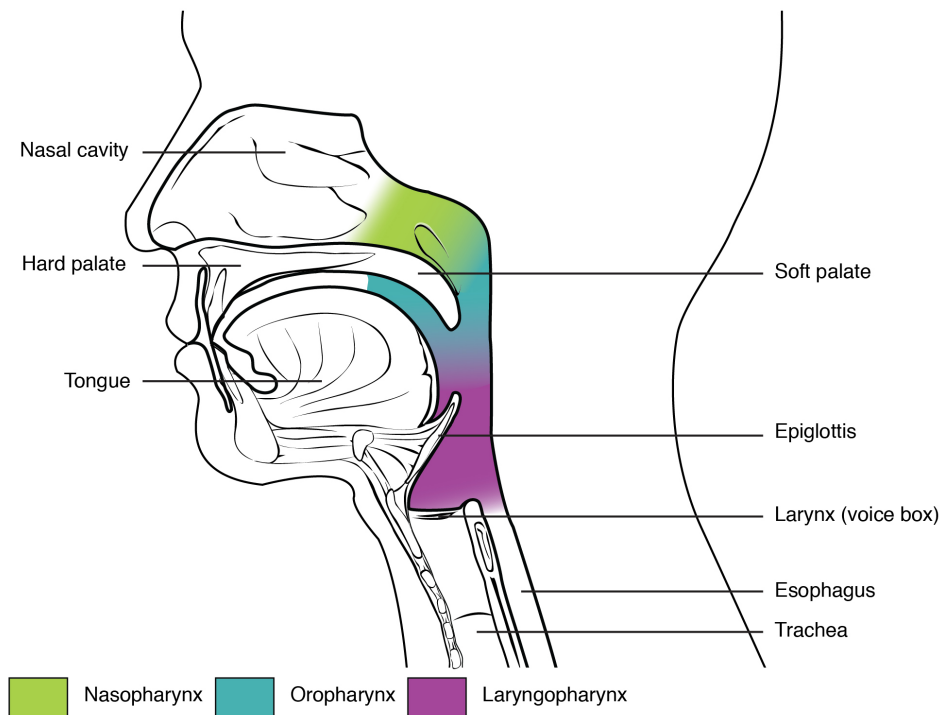


Figure 11.4 Divisions of the Pharynx. The pharynx is divided into three regions: the nasopharynx, the oropharynx, and the laryngopharynx. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [\[Image description.\]](#)

At the top of the **nasopharynx** are the **pharyngeal tonsils**. The function of the tonsil is not well understood, but it contains a rich supply of **lymphocytes** and is covered with ciliated epithelium that traps and destroys invading pathogens that enter during inhalation. The pharyngeal tonsils are large in children but tend to regress with age and may even disappear. The **uvula** and **soft palate** move like a pendulum during swallowing, swinging upward to close off the nasopharynx to prevent ingested materials from entering the nasal cavity. **Auditory (Eustachian) tubes** that connect to each middle ear cavity open into the nasopharynx. This connection is why colds often lead to ear infections.

The **oropharynx** is bordered superiorly by the **nasopharynx** and anteriorly by the oral cavity. The oropharynx contains two distinct sets of tonsils: the **palatine tonsils** and the **lingual tonsils**.

Similar to the pharyngeal tonsil, the **palatine** and **lingual** tonsils are composed of lymphoid tissue and trap and destroy pathogens entering the body through the oral or nasal cavities.

The **laryngopharynx** is **inferior** to the oropharynx and **posterior** to the larynx. It continues the route for ingested material and air until its inferior end, where the digestive and respiratory systems diverge. The stratified squamous epithelium of the oropharynx is continuous with the laryngopharynx. **Anteriorly**, the laryngopharynx opens into the **larynx**, whereas **posteriorly**, it enters the esophagus.

Larynx

The structure of the larynx is formed by several pieces of cartilage. Three large cartilage pieces form the major structure of the larynx:

- **Thyroid cartilage** (anterior):
 - The thyroid cartilage is the largest piece of cartilage that makes up the larynx. The thyroid cartilage consists of the prominence, or “Adam’s apple,” which tends to be more prominent in males.
 - Three smaller, paired cartilages—the arytenoid, corniculate, and cuneiform cartilages—attach to the thyroid cartilage and the vocal cords and muscles that help move the vocal cords to produce speech.
- **Epiglottis** (superior)
- **Cricoid cartilage** (inferior):
 - The thick cricoid cartilage forms a ring with a wide posterior region and a thinner anterior region.

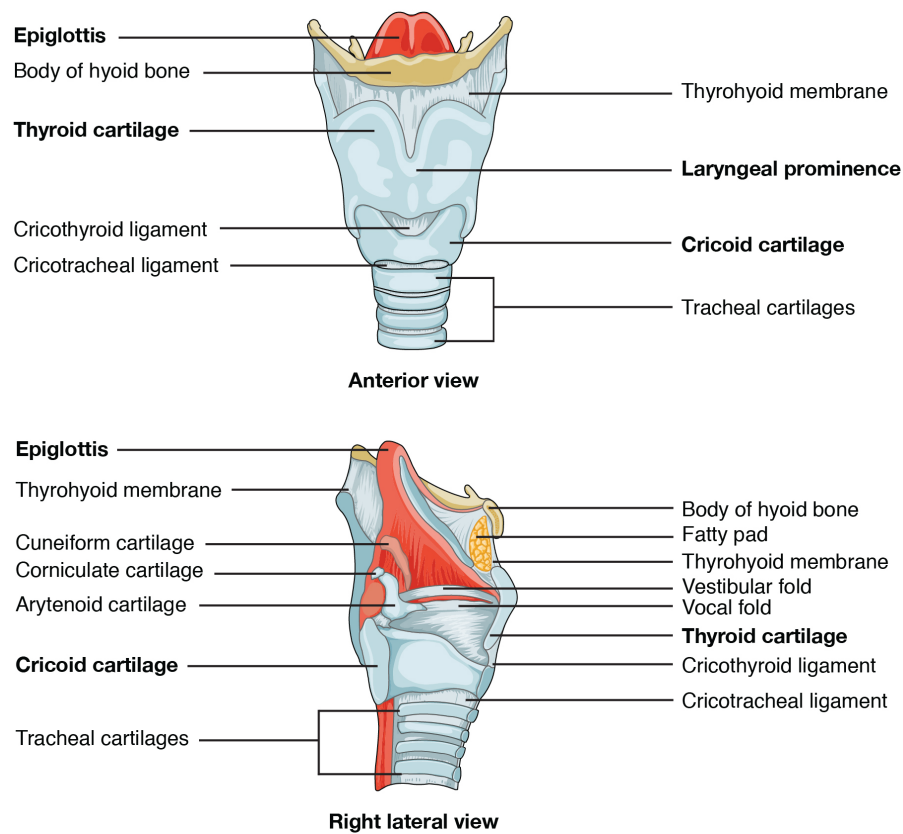


Figure 11.5 Larynx. The larynx extends from the laryngopharynx and the hyoid bone to the trachea. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [Image description.]

When the **epiglottis** is in the “closed” position, the unattached end of the epiglottis rests on the **glottis**. A **vestibular fold**, or **false vocal cord**, is one of a pair of folded sections of mucous membrane. A **true vocal cord** is one of the white, membranous folds attached by muscle to the thyroid and arytenoid cartilages of the larynx on their outer edges. The inner edges of the true vocal cords are free, allowing oscillation to produce sound.

The act of swallowing causes the pharynx and larynx to lift upward, allowing the pharynx to expand and the epiglottis of the larynx to swing downward, closing the opening to the trachea. These movements produce a larger area for food to pass through while preventing food and beverages from entering the trachea.

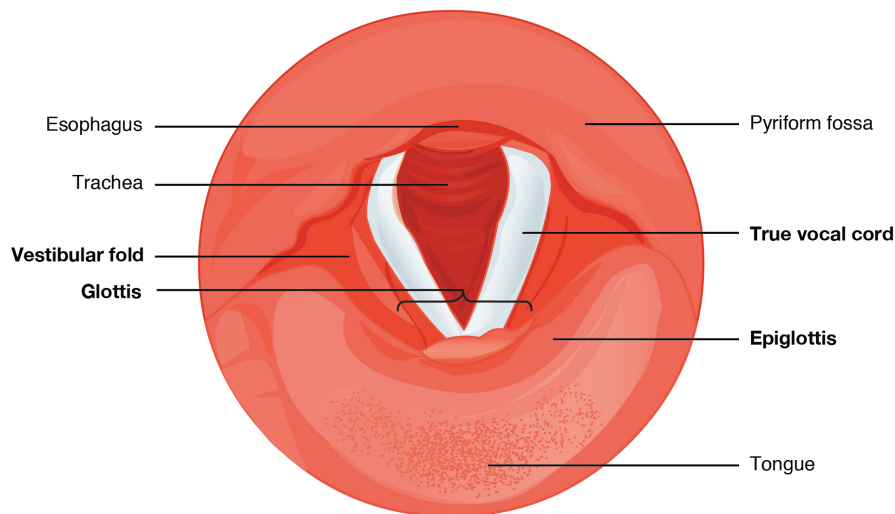


Figure 11.6 Vocal Cords. The true vocal cords and vestibular folds of the larynx are viewed inferiorly from the laryngopharynx. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [Image description.]

Similar to the nasal cavity and nasopharynx, this specialized epithelium produces mucus to trap debris and pathogens as they enter the trachea. The cilia beat the mucus upward toward the laryngopharynx, where it can be swallowed down the esophagus.

Trachea

The **trachea** is formed by 16 to 20 stacked, C-shaped pieces of hyaline cartilage that are connected by dense connective tissue. The trachealis muscle and elastic connective tissue together form the **fibroelastic membrane**. The fibroelastic membrane allows the trachea to stretch and expand slightly during inhalation and exhalation, whereas the rings of cartilage provide structural support and prevent the trachea from collapsing. The trachealis muscle can be contracted to force air through the trachea during exhalation. The trachea is

lined with pseudostratified ciliated columnar epithelium, which is continuous with the larynx. The esophagus borders the trachea **posteriorly**.

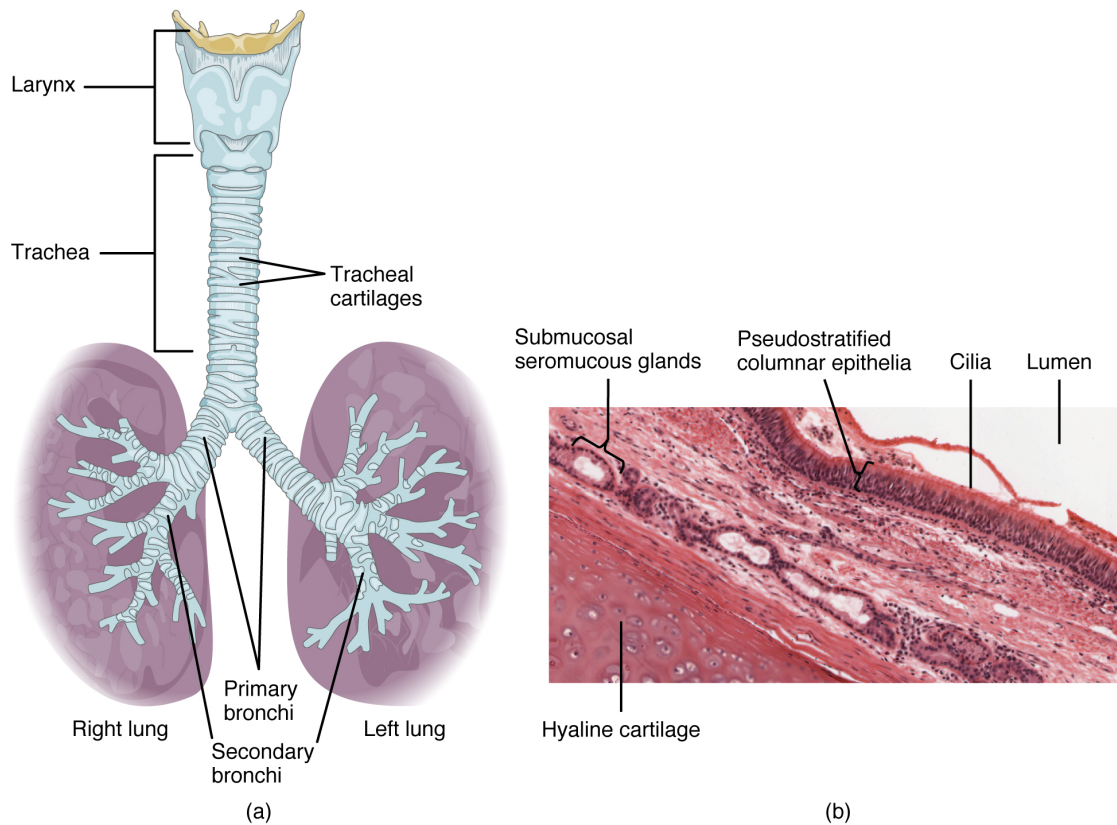


Figure 11.7 Trachea. (a) The tracheal tube is formed by stacked, C-shaped pieces of hyaline cartilage. (b) The layer visible in this cross section of tracheal wall tissue between the hyaline cartilage and the lumen of the trachea is the mucosa, which is composed of pseudostratified ciliated columnar epithelium that contains goblet cells. LM $\times 1220$. (Micrograph provided by the Regents of University of Michigan Medical School \copyright 2012.) From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Bronchial Tree

The trachea branches into the **right** and **left primary bronchi** at the **carina**. These bronchi are also lined by pseudostratified ciliated columnar epithelium containing mucus-producing goblet cells. The carina is a raised structure that contains specialized nervous tissue that induces violent coughing if a foreign body, such as food, is present. Rings of cartilage, similar to those of the trachea, support the structure of the bronchi and prevent their collapse. The primary bronchi enter the lungs at the **hilum**. The bronchi continue to branch into the **bronchial tree**. Bronchial tree (or respiratory tree) is the collective term used for these multiple-branched bronchi. The main function of the bronchi, like other conducting zone structures, is to provide a passageway for air to move into and out of each lung. The mucous membrane traps debris and pathogens.

A **bronchiole** branches from the tertiary bronchi. Bronchioles, which are about 1 mm in diameter, further branch until they become the tiny **terminal bronchioles**, which lead to the structures of gas exchange. There are more than 1,000 terminal bronchioles in each lung. The muscular walls of the bronchioles do not contain cartilage like those of the bronchi. This muscular wall can change the size of the tubing to increase or decrease airflow through the tube.

Respiratory Zone

In contrast to the conducting zone, the respiratory zone includes structures that are directly involved in gas exchange. The respiratory zone begins where the terminal bronchioles join a **respiratory bronchiole**, the smallest type of bronchiole (see [Figure 11.8](#)), which then leads to an **alveolar duct**, opening into a cluster of alveoli.

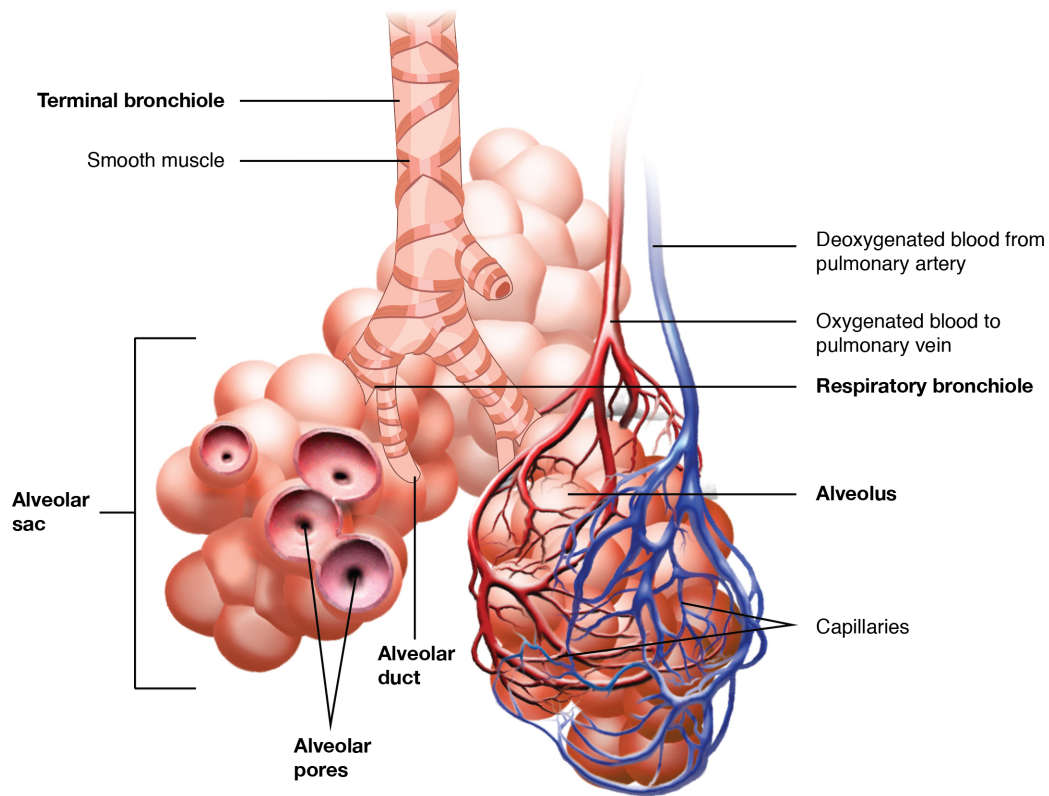


Figure 11.8 Respiratory Zone. Bronchioles lead to alveolar sacs in the respiratory zone, where gas exchange occurs. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [\[Image description.\]](#)

Alveoli

An **alveolar duct** opens into a cluster of alveoli. An **alveolus** is one of the many small, grapelike sacs that are attached to the alveolar ducts. An alveolar sac is a cluster of many individual alveoli that are responsible for gas exchange. An alveolus is approximately 200 μm in diameter with elastic walls that allow the alveolus to stretch during air intake, which greatly increases the surface area available for gas exchange. Alveoli are connected to their neighbors by alveolar pores, which help maintain equal air pressure throughout the alveoli and lung (see [Figure 11.9](#)).

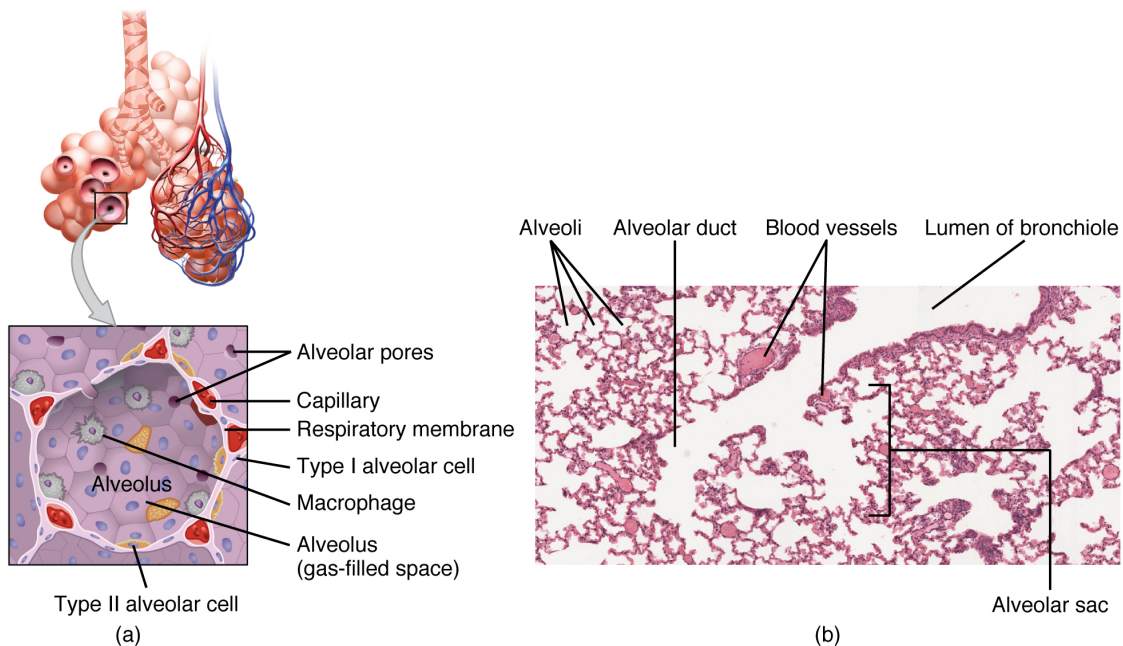


Figure 11.9 Structures of the Respiratory Zone. (a) The alveolus is responsible for gas exchange. (b) A micrograph shows the alveolar structures within lung tissue. LM $\times 178$. (Micrograph provided by the Regents of University of Michigan Medical School \textcopyright 2012.) From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [[Image description.](#)]

Gross Anatomy of the Lungs

The lungs are pyramid-shaped, paired organs that are connected to the trachea by the right and left bronchi; on the inferior surface, the lungs are bordered by the **diaphragm**. The lungs are enclosed by the **pleurae**, which are attached to the **mediastinum**. The right lung is shorter and wider than the left lung, and the left lung occupies a smaller volume than the right. The **cardiac notch** allows space for the heart (see [Figure 11.10](#)). The apex of the lung is the superior region, whereas the base is the opposite region near the diaphragm. The costal surface of the lung borders the ribs. The mediastinal surface faces the midline.

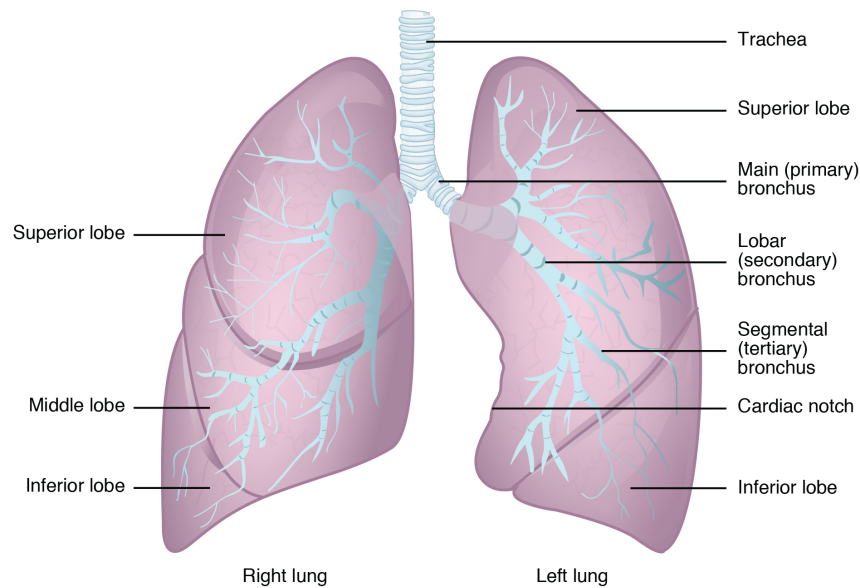


Figure 11.10 Gross Anatomy of the Lungs. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Each lung is composed of smaller units called **lobes**. **Fissures** separate these lobes from each other. The right lung consists of three lobes: the superior, middle, and inferior lobes. The left lung consists of two lobes: the superior and inferior lobes. A pulmonary lobule is a subdivision formed as the bronchi branch into bronchioles. Each lobule receives its own large bronchiole that has multiple branches. An interlobular septum is a wall, composed of connective tissue, which separates lobules from one another.

Pleura of the Lungs

Each lung is enclosed within a cavity that is surrounded by the pleura. The pleura (plural = pleurae) is a serous membrane that surrounds the lung. The right and left pleurae, which enclose the right and left lungs, respectively, are separated by the mediastinum.

The pleurae consist of two layers:

1. The **visceral pleura** is the layer that is superficial to the lungs and extends into and lines the lung fissures (see [Figure 11.11](#)).
2. The **parietal pleura** is the outer layer that connects to the thoracic wall, the mediastinum, and the diaphragm.

The **visceral** and **parietal pleurae** connect to each other at the **hilum**. The **pleural cavity** is the space between the visceral and parietal layers.

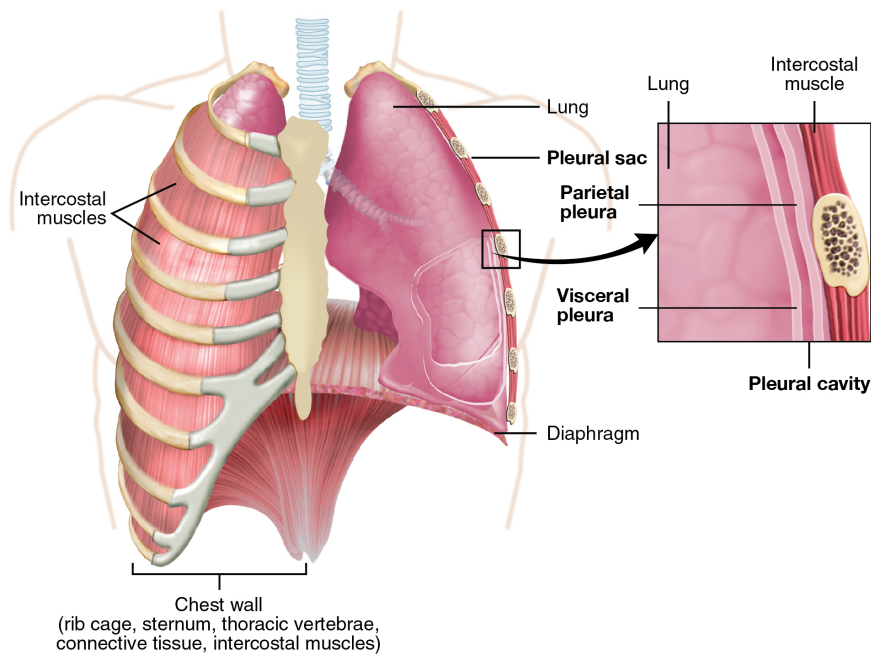


Figure 11.11 Parietal and Visceral Pleurae of the Lungs. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

The pleurae perform two major functions:

1. The pleurae produce pleural fluid that lubricates surfaces, reduces friction to prevent trauma during breathing, and creates surface tension that helps maintain the position of the lungs against the thoracic wall. This adhesive characteristic of the pleural fluid causes the lungs to enlarge when the thoracic wall expands during ventilation, allowing the lungs to fill with air.
2. The pleurae also create a division between major organs that prevents interference due to the movement of the organs while preventing the spread of infection.

Image Descriptions

Figure 11.1 image description: This figure shows the upper half of the human body. The major organs in the respiratory system are labeled. [\[Return to Figure 11.1\].](#)

Figure 11.2 image description: This figure shows a cross section view of the nose and throat. The major parts are labeled. [\[Return to Figure 11.2\].](#)

Figure 11.3 image description: This figure shows a micrograph of pseudostratified epithelium. [\[Return to Figure 11.3\].](#)

Figure 11.4 image description: This figure shows the side view of the face. The different parts of the pharynx are color-coded and labeled (from the top): nasal cavity, hard palate, soft palate, tongue, epiglottis, larynx, esophagus, trachea. [\[Return to Figure 11.4\].](#)

Figure 11.5 image description: The top panel of this figure shows the anterior view of the larynx, and the bottom panel shows the right lateral view of the larynx. [\[Return to Figure 11.5\].](#)

Figure 11.6 image description: This diagram shows the cross section of the larynx. The different types of cartilages are labeled (clockwise from top): pyriform fossa, true vocal cord, epiglottis, tongue, glottis, vestibular fold, trachea, esophagus. [\[Return to Figure 11.6\].](#)

Figure 11.7 image description: The top panel of this figure shows the trachea and its organs. The major parts including the larynx, trachea, bronchi, and lungs are labeled. [\[Return to Figure 11.7\].](#)

Figure 11.8 image description: This image shows the bronchioles and alveolar sacs in the lungs and depicts the exchange of oxygenated and deoxygenated blood in the pulmonary blood vessels. [\[Return to Figure 11.8\].](#)

Figure 11.9 image description: This figure shows the detailed structure of the alveolus. The top panel shows the alveolar sacs and the bronchioles. The middle panel shows a magnified view of the alveolus, and the bottom panel shows a micrograph of the cross section of a bronchiole. [\[Return to Figure 11.9\].](#)

Figure 11.10 image description: Diagram of the lungs with the major parts labeled (from top, clockwise): trachea, superior lobe, main bronchus, lobar bronchus, segmental bronchus, inferior lobe, inferior lobe, middle lobe, superior lobe of the left lung. [\[Return to Figure 11.10\].](#)

Figure 11.11 image description: This figure shows the lungs and the chest wall, which protects the lungs, in the left panel. In the right panel, a magnified image shows the pleural cavity and a pleural sac. [\[Return to Figure 11.11\].](#)

WORD PARTS AND STRUCTURAL TERMS

Combining Forms

adenoid/o: adenoid/pharyngeal tonsil

alveol/o: alveolus

atel/o: incomplete

bronchi/o: bronchus

bronch/o: bronchus

capn/o: carbon dioxide

diaphragmat/o: diaphragm

epiglott/o: epiglottis

hem/o: blood

laryng/o: larynx

lob/o: lobe of lung

muc/o: mucus

nas/o: nose

orth/o: straight

ox/i, ox/o: oxygen

pharyng/o: pharynx

phon/o: sound, voice

phren/o: diaphragm

pleur/o: pleura

pneum/o: lung, air

pneumat/o: lung, air

pneumon/o: lung, air

pulmon/o: lung

py/o: pus

rhin/o: nose

sept/o: septum/dividing wall

sinus/o: sinus

spir/o: breathing

thorac/o: thorax, chest

tonsill/o: tonsil

trache/o: trachea

Prefixes

a-/an-: absence of

dys-: painful, abnormal, difficult, labored

endo-: within, inside

eu-: normal, healthy

hemi-: half

pan-: all

poly-: many

sub-: under, below

tachy-: rapid

Suffixes

-al: pertaining to (adjective)

-algia: pain (noun)

-ar, -ary: pertaining to (adjective)

-cele: hernia (noun)

-centesis: surgical puncture to aspirate fluid (noun)

-ectasis: expansion (noun)

-ectomy: excision (noun)

-gram: the record, radiographic image (noun)

-graph: instrument used to record (noun)

-graphy: process of recording (noun)

-ia: condition of, diseased state, abnormal state (noun)

-iasis: condition (noun)

-itis: inflammation (noun)

-logist: specialist or physician who studies and treats (noun)

-logy: study of (noun)

-meter: instrument for measuring (noun)

-metry: process of measuring (noun)

-oma: tumor (noun)

-osis: abnormal condition (noun)

-pathy: disease (noun)

- pexy**: surgical fixation (noun)
- plasty**: surgical repair (noun)
- pnea**: breathing (noun)
- rrhea**: flow, discharge (noun)
- scope**: instrument used for visualization (noun)
- scopy**: process of viewing, visualization (noun)
- spasm**: involuntary muscular contraction (noun)
- stomy**: creation of an artificial opening (noun)

Structural Terms Built from Word Parts

- adenoidal**: pertaining to the adenoid/pharyngeal tonsil
- alveolar**: pertaining to one or more alveoli
- bronchial**: pertaining to one or more bronchi
- bronchoalveolar**: pertaining to the bronchi and alveoli
- cardiopulmonary**: pertaining to the heart and lungs
- diaphragmatic**: pertaining to the diaphragm
- endotracheal**: pertaining to within the trachea:
- interpleural**: pertaining to between the pleura (space between the pleural membranes)
- laryngeal**: pertaining to the larynx
- lobar**: pertaining to a lobe of a lung
- mediastinal**: pertaining to the mediastinum
- mucous**: pertaining to mucus
- pharyngeal**: pertaining to the pharynx
- phrenic**: pertaining to the diaphragm
- pleural**: pertaining to the pleura
- pulmonary**: pertaining to one or both lungs
- respiratory**: pertaining to the act of breathing
- thoracic**: pertaining to the chest
- tonsillar**: pertaining to one or more tonsils
- tracheal**: pertaining to the trachea

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Word Parts

acapnia: lack of carbon dioxide

adenoiditis: inflammation of the adenoid/pharyngeal tonsil

anoxia: lack of oxygen

aphonia: lack of voice

apnea: lack of breathing

atelectasis: incomplete expansion (for example, of an airway)

bronchiectasis: dilation of bronchi

bronchitis: inflammation of bronchi

bronchiolitis: inflammation of bronchioles

bronchogenic carcinoma: cancerous tumor originating in a bronchus (lung cancer)

bronchopneumonia: disease of bronchi and lungs

bronchospasm: spasmodic contraction of the bronchi

diaphragmatocele: herniation of diaphragm

dysphonia: condition of difficult speaking

dyspnea: painful or labored breathing

epiglottitis: inflammation of epiglottis

eupnea: normal breathing

hemothorax: blood in the pleural space / thoracic cavity

hypercapnia: excessive carbon dioxide in the body

hyperpnea: forced breathing or breathing that is excessive

hypopnea: deficient breathing

hypoxemia: deficient oxygen in the blood

hypoxia: condition of deficient oxygen in the tissues

laryngitis: inflammation of the larynx

laryngospasm: spasmodic contraction of the larynx

lobar pneumonia: disease of one lobe of a lung

nasopharyngitis: inflammation of the nose and pharynx

orthopnea: being able to breathe more easily while sitting up straight

pharyngitis: inflammation of the pharynx

phrenalgia: pain in the diaphragm

phrenospasm: spasmodic contraction of the diaphragm

pleuritis: inflammation of pleura (formerly known as **pleurisy**)

pneumoconiosis: abnormal condition of dust in the lungs

pneumonia: disease involving the lung (typically used to indicate a lower respiratory tract infection)

pneumonitis: inflammation of the lung

pneumothorax: air in the thoracic cavity; can lead to lung collapse

pyothorax: pus in the thoracic cavity

rhinitis: inflammation of the nose

rhinomycosis: abnormal condition of fungus in the nose

rhinorrhagia: rapid flow of blood from the nose

rhinorrhea: discharge from the nose

sinusitis: inflammation of one or more sinuses

tachypnea: rapid breathing

thoracalgia: pain in the thoracic cavity

tonsillitis: inflammation of one or more tonsils

tracheitis: inflammation of the trachea

tracheostenosis: narrowing of the trachea

Disease and Disorder Terms Not Built from Word Parts

acute respiratory distress syndrome: a type of respiratory failure characterized by rapid onset of widespread inflammation in the lungs; symptoms include shortness of breath, rapid breathing, and cyanosis

asphyxia: inability to breathe

asthma: a chronic inflammatory disease of the airways of the lungs characterized by reversible airflow obstruction and easily triggered bronchospasms

chronic obstructive pulmonary disease: a chronic lung condition, a combination of emphysema and chronic bronchitis

coccidioidomycosis: an infection caused by *Coccidioides* fungus, which lives in the soil of dry, low-rainfall areas

crackles: clicking, rattling, or crackling noises that may be made by lungs of a human with a respiratory disease during inhalation

croup: an infection of the upper airway that obstructs breathing and causes a characteristic barking cough

cystic fibrosis: genetic disorder that affects mostly the lungs but also the pancreas, liver, kidneys, and intestine; can lead to difficulty breathing and coughing up mucus as a result of frequent lung infections

deviated septum: a displacement of the nasal septum

emphysema: a lung condition that causes shortness of breath due to damaged alveoli

epistaxis: nosebleed

hyperventilation: breathing too quickly or too much

hypoventilation: breathing too slowly or not enough

influenza: an upper respiratory tract infection with influenza virus

lower respiratory infection: an infection of the trachea, bronchi, bronchioles, and/or alveoli

lung cancer: malignant cancer originating within lung tissue

obstructive sleep apnea: a sleep disorder in which pauses in breathing or periods of shallow breathing during sleep occur more often than normal

pertussis: an upper respiratory tract infection with *Bordetella pertussis* bacteria

pleural effusion: accumulation of excessive fluid in the pleural space

pulmonary embolism: an embolism (a free-moving blood clot, air bubble, atherosclerotic plaque, etc.) within a blood vessel of a lung

pulmonary edema: edema (fluid accumulation) within one or both lungs

sputum: mucus originating in the lower respiratory tract

tuberculosis: a lower respiratory tract infection with *Mycobacterium tuberculosis* bacteria

upper respiratory infection: an infection of the nose, pharynx, and/or larynx

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Specialties Related to the Respiratory System

pulmonologist: physician who specializes in pulmonology

pulmonology: medical specialty that deals with diseases involving the respiratory tract

respiratory therapist: a medical specialist who cares for patients who have breathing disorders

thoracic surgeon: a surgeon who has specialized in either thoracic surgery or cardiothoracic surgery

Imaging Techniques / Diagnostic Procedures for the Organ System

acid-fast bacilli smear: a microscope slide containing a sputum sample, stained to detect *Mycobacterium tuberculosis* bacteria

arterial blood gas analysis: a blood test that measures the pH and the levels of oxygen and carbon dioxide within an artery

bronchoscope: device used to view inside of the bronchi

bronchoscopy: procedure used to view inside of the bronchi

capnometer: instrument used to measure

laryngoscope: device used to view inside of the larynx

laryngoscopy: procedure used to view inside of the larynx

oximeter: instrument used to measure oxygen

pulmonary function tests: noninvasive tests that measure lung volume, capacity, rates of flow, and gas exchange within the lungs

spirometer: instrument used to measure lung capacity

spirometry: procedure to determine lung capacity

thoracoscope: device used to view inside of the thoracic cavity

thoracoscopy: procedure used to view inside of the thoracic cavity

Medical and Surgical Techniques/Procedures Used for the Organ System

- adenoidectomy:** surgical excision of the adenoid/pharyngeal tonsil
- aspirate:** to suction out a substance, such as from the airways
- bronchoconstrictor:** substance that constricts the bronchi and bronchioles
- bronchodilator:** substance that dilates the bronchi and bronchioles
- bronchoplasty:** surgical repair of a bronchus
- laryngectomy:** surgical excision of all or part of the larynx
- laryngoplasty:** surgical repair of the larynx
- laryngostomy:** artificial opening into the larynx
- laryngotracheotomy:** incision into the larynx and trachea
- lobectomy:** surgical removal of a lobe of a lung
- nebulizer:** device used to administer medication in the form of a mist inhaled into the lungs
- pneumonectomy:** surgical removal of a lung
- rhinoplasty:** surgical repair of the nose
- septoplasty:** surgical repair of the (nasal) septum
- septotomy:** incision into the (nasal) septum
- thoracocentesis:** aspiration of fluid from the thoracic cavity
- thoracotomy:** incision into the chest cavity
- tracheoplasty:** surgical repair of the trachea
- tracheostomy:** artificial opening into the trachea
- tracheotomy:** incision into the trachea
- ventilator:** machine that provides mechanical ventilation by moving air into and out of the lungs of a patient who is unable to breathe unassisted

Abbreviations Commonly Used with the Respiratory System

- ABGs:** arterial blood gases
- AFB:** acid-fast bacilli
- ARDS:** acute respiratory distress syndrome
- BiPAP:** bilevel positive airway pressure
- C&S:** culture and sensitivity
- CAP:** community-acquired pneumonia

CF: cystic fibrosis
CO₂: carbon dioxide
COPD: chronic obstructive pulmonary disease
CPAP: continuous positive airway pressure
CPT: chest physiotherapy
CT: computed tomography, computerized tomography
CXR: chest x-ray
DPI: dry powder inhaler
flu: influenza
IPPB: intermittent positive-pressure breathing
IPF: idiopathic pulmonary fibrosis
LLL: left lower lobe
LTB: laryngotracheobronchitis
LUL: left upper lobe
MDI: metered-dose inhaler
NIPPV: noninvasive positive-pressure ventilator
O₂: oxygen
OSA: obstructive sleep apnea
PE: pulmonary embolism
PEP: positive expiratory pressure
PFM: peak flow meter
PFTs: pulmonary function tests
RLL: right lower lobe
RML: right middle lobe
RUL: right upper lobe
SOB: shortness of breath
SVN: small-volume nebulizer
TB: tuberculosis
URI: upper respiratory infection
VAP: ventilator-associated pneumonia

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



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<https://louis.pressbooks.pub/medicalterminology/?p=1716#h5p-16>

PRACTICE

The following activities will help you practice what you learned in this chapter.

Respiratory System Anatomy Labeling Activity

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



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Vocabulary Reinforcement Activity

Click the term that correctly answers each question or completes each sentence.



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<https://louis.pressbooks.pub/medicalterminology/?p=2119#h5p-23>

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PART XII

DIGESTIVE SYSTEM

Learning Objectives

When completing this chapter, the learner will be able to do the following:

- Identify the anatomy of the digestive system
- Describe the main functions of the digestive system
- Spell the medical terms of the digestive system and use correct abbreviations
- Pronounce the medical terms of the digestive system and use correct abbreviations
- Identify the medical specialties associated with the digestive system
- Explore common diseases, disorders, and procedures related to the digestive system

Introduction

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.

Watch this video:



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://louis.pressbooks.pub/medicalterminology/?p=1418#oembed-1>

Media 12.1 [Digestive System, Part 1: Crash Course A&P #33](#). Copyright 2015 by [CrashCourse](#).

ANATOMY OF THE DIGESTIVE SYSTEM

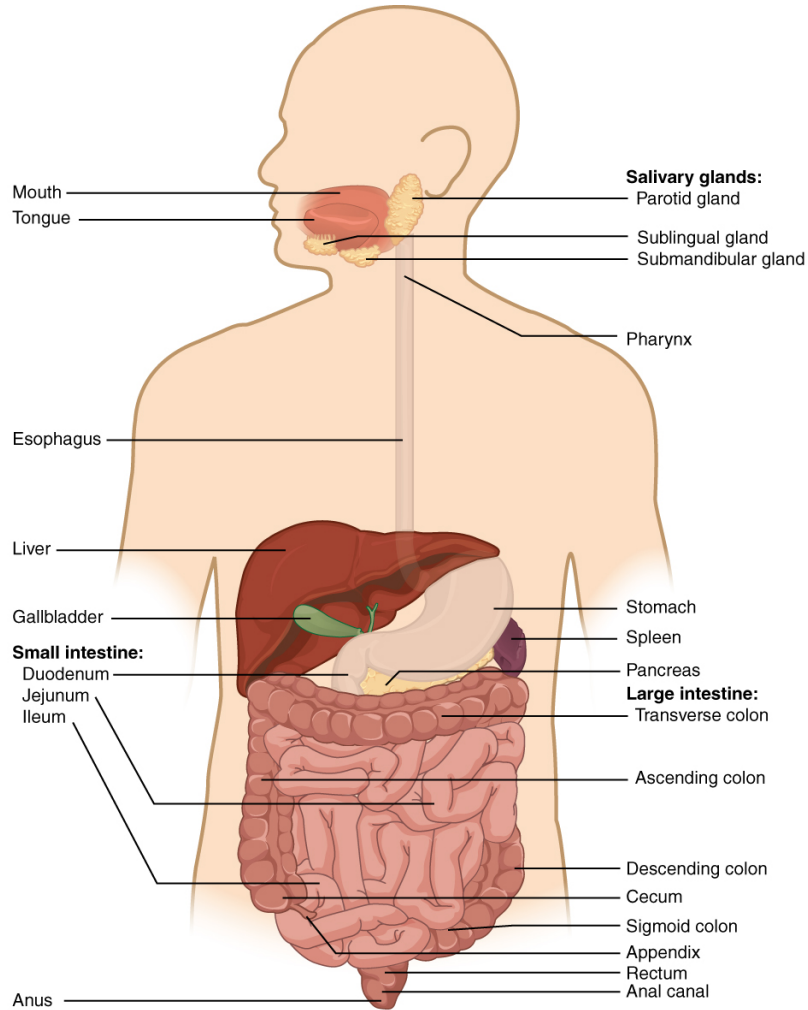


Figure 12.1 Components of the Digestive System. All digestive organs play integral roles in the life-sustaining process of digestion. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

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](#).

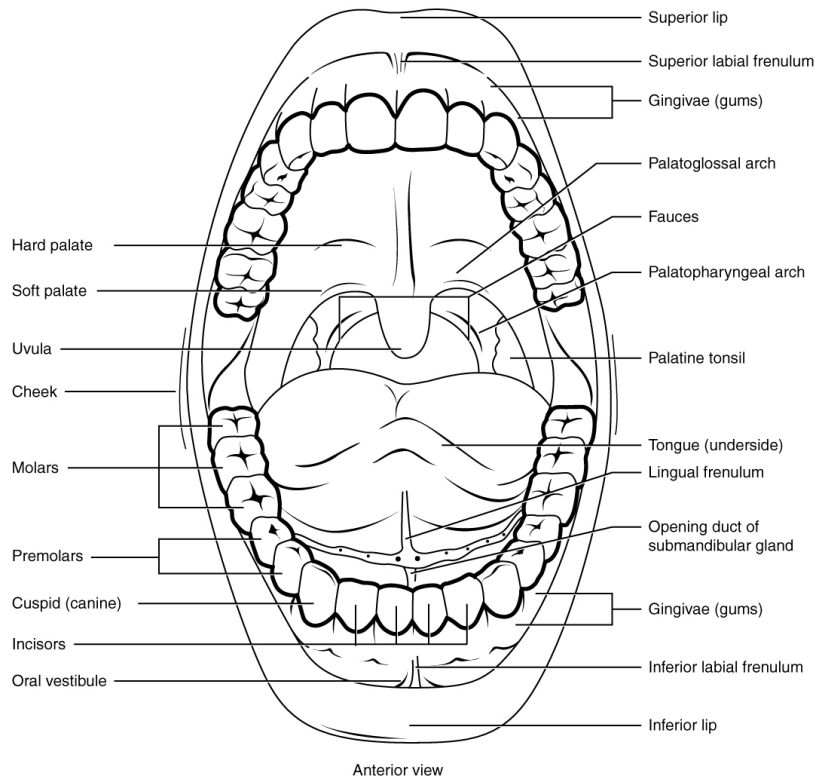


Figure 12.2 Mouth. The mouth includes the lips, tongue, palate, gums, and teeth. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [Image description.]

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](#)).

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.

Tongue

Perhaps you have heard it said that the tongue is the strongest muscle in the body. 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.

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**.

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 12.3](#), 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.

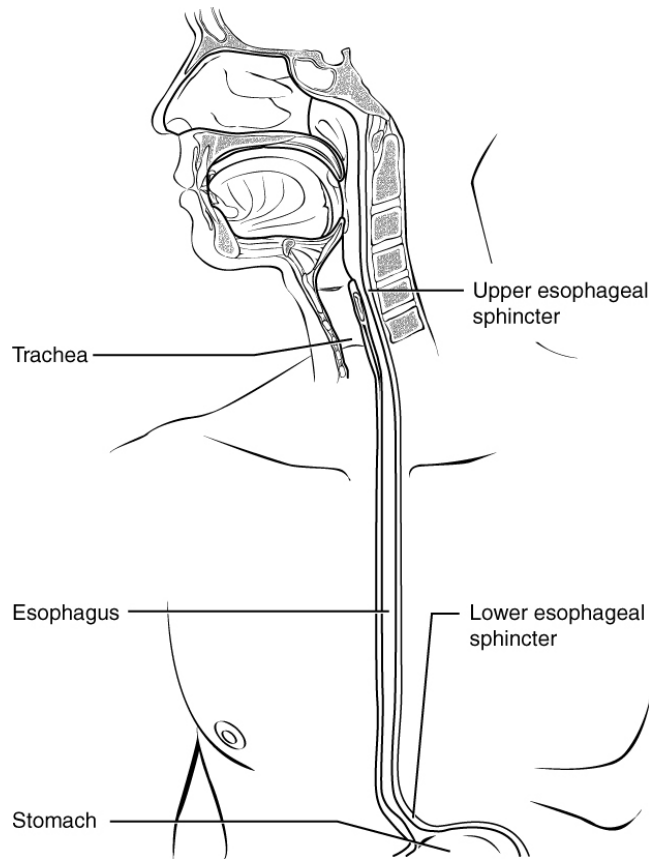


Figure 12.3 Esophagus. The upper esophageal sphincter controls the movement of food from the pharynx to the esophagus. The lower esophageal sphincter controls the movement of food from the esophagus to the stomach. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [Image description.]

Stomach

There are four main regions in the **stomach**: the **cardia**, **fundus**, **body**, and **pylorus** (see [Figure 12.4](#)). 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.

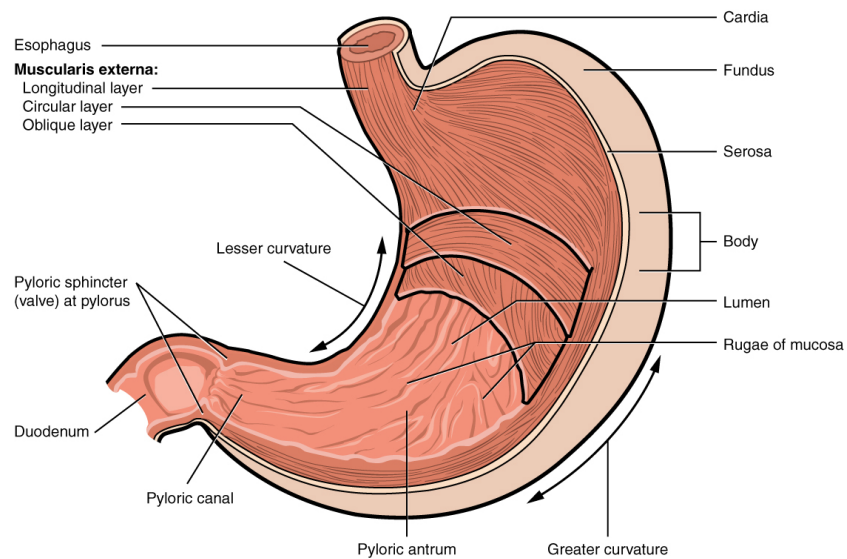


Figure 12.4 Stomach. The stomach has four major regions: the cardia, fundus, body, and pylorus. The addition of an inner oblique smooth muscle layer gives the muscularis the ability to vigorously churn and mix food. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [\[Image description.\]](#)

Small Intestine

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, but 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.

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 12.5](#)).

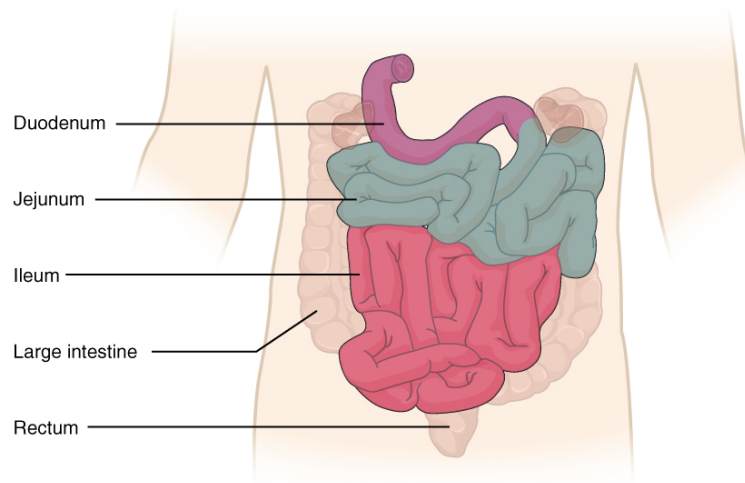


Figure 12.5 Small Intestine. The three regions of the small intestine are the duodenum, jejunum, and ileum. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [\[Image description.\]](#)

Large Intestine

The **large intestine** is the terminal part of the alimentary canal. The primary function of this organ is to finish 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 its 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 (see [Figure 12.6](#)).

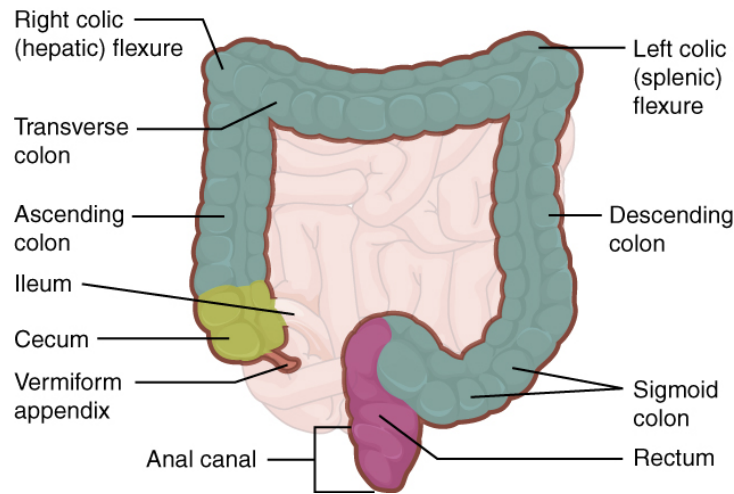


Figure 12.6 Large Intestine. The large intestine includes the cecum, colon, and rectum. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Accessory Organs of Digestion

Chemical digestion in the small intestine relies on the activities of three accessory digestive organs: the **liver**, **pancreas**, and **gallbladder**. 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.

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.

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 blood-borne 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.

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.

Gallbladder

The gallbladder is 8–10 cm (~3–4 in) long and is nestled 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**. The **cystic duct** is 1–2 cm (less than 1 in) long and turns inferiorly as it bridges the neck and **hepatic duct**.

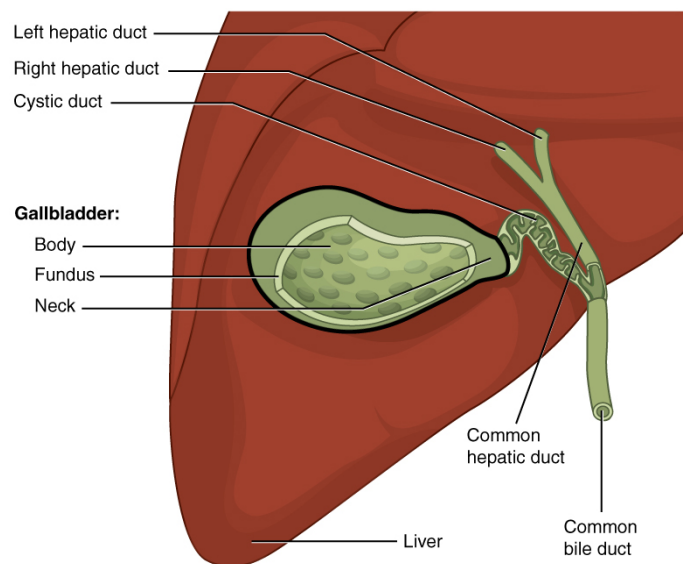


Figure 12.7 Gallbladder. The gallbladder stores and concentrates bile and releases it into the two-way cystic duct when it is needed by the small intestine. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Pancreas

The soft, oblong, glandular pancreas lies transversely in the retroperitoneum behind the stomach. It has a mix of **exocrine** (secreting digestive enzymes) and **endocrine** (releasing hormones into the blood) functions ([Figure 12.8](#)).

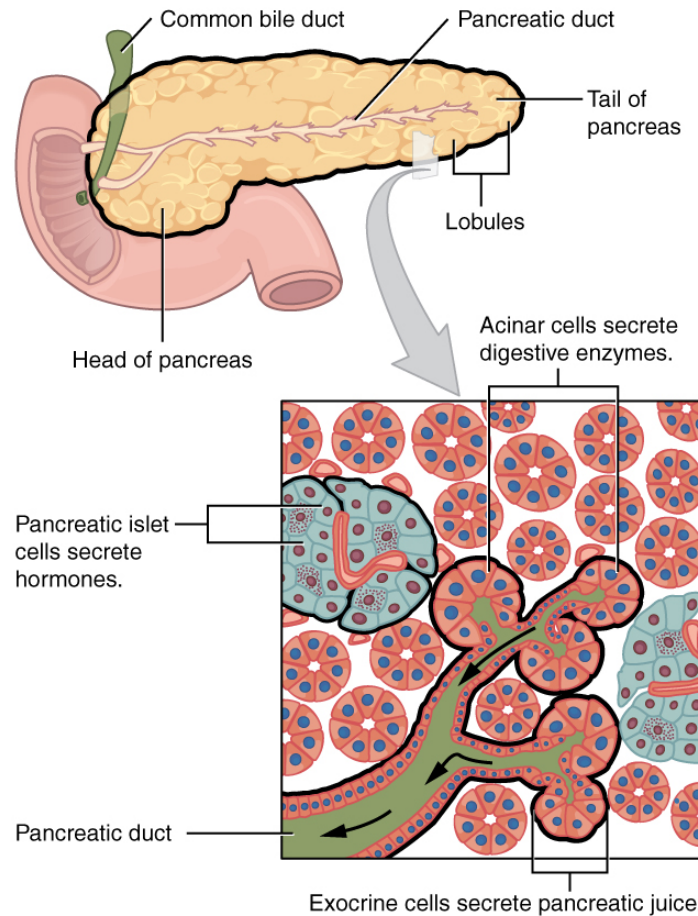


Figure 12.8 Exocrine and Endocrine Pancreas. The pancreas has a head, a body, and a tail. It delivers pancreatic juice to the duodenum through the pancreatic duct. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

The exocrine part of the pancreas arises as little grapelike 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.

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.

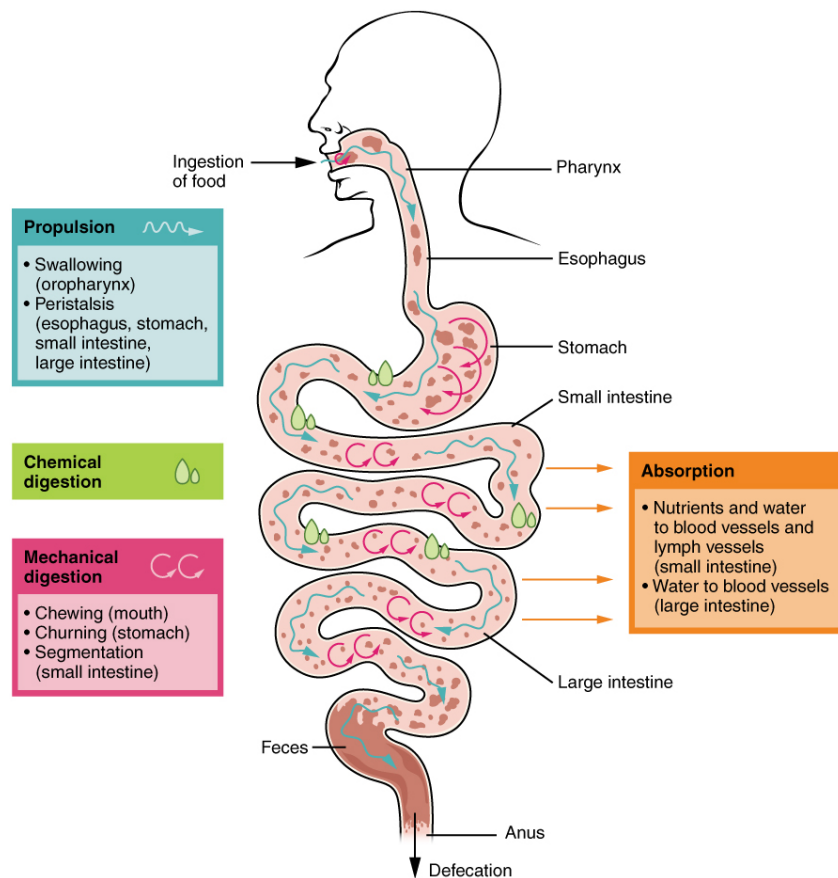


Figure 12.9 Digestive Processes. The digestive processes are ingestion, propulsion, mechanical digestion, chemical digestion, absorption, and defecation. From Betts, et al., 2013. Licensed under CC BY 4.0. [\[Image description.\]](#)

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, gallbladder, liver, esophagus, tongue, mouth. [\[Return to Figure 12.1\].](#)

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 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. [\[Return to Figure 12.3\]](#).

Figure 12.4 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. [\[Return to Figure 12.4\]](#).

Figure 12.5 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. [\[Return to Figure 12.5\]](#).

Figure 12.6 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. [\[Return to Figure 12.6\]](#).

Figure 12.7 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, gallbladder right hepatic duct, cystic duct, common hepatic duct, common bile duct, left hepatic duct. [\[Return to Figure 12.7\]](#).

Figure 12.8 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. [\[Return to Figure 12.8\]](#).

Figure 12.9 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 labeled: ingestion of food, pharynx, esophagus, stomach, small intestine, large intestine, feces, anus, defecation. [\[Return to Figure 12.9\]](#).

PHYSIOLOGY OF THE DIGESTIVE SYSTEM

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. 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.

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. 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.

WORD PARTS AND STRUCTURAL TERMS

Combining Forms

abdomin/o: abdomen, abdominal

an/o: anus

antr/o: antrum

append/o, 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

lith/o: stone

or/o: mouth

palat/o: palate

pancreat/o: pancreas

peritone/o: peritoneum

polyp/o: polyp, small growth

proct/o: rectum

pylor/o: pylorus

rect/o: rectum

sial/o: saliva, salivary gland

sigmoid/o: sigmoid colon

steat/o: fat

stomat/o: mouth

uvul/o: uvula

Prefixes

hemi-: half

endo-: within, in

sub-: under, below

dys-: painful, abnormal, difficult, labored

Suffixes

-ac: pertaining to (adjective)

-al: pertaining to (adjective)

-cele: hernia, protrusion (noun)

-centesis: surgical puncture to aspirate fluid (noun)

-ectomy: excision (noun)

-gram: the record, radiographic image (noun)

-graph: instrument used to record (noun)

-graphy: process of recording (noun)

-ia: condition of, diseased state, abnormal state (noun)

-iasis: condition (noun)

-itis: inflammation (noun)

-logist: specialist or physician who studies and treats (noun)

-logy: study of (noun)

-malacia: softening (noun)

-osis: abnormal condition (noun)

-pathy: disease (noun)

-pepsia: digestion (noun)

- phagia**: eating or swallowing (noun)
- plasty**: surgical repair (noun)
- ptosis**: prolapse, drooping (noun)
- rrhaphy**: suturing, repairing (noun)
- rrhea**: flow, discharge (noun)
- scope**: instrument used for visualization (noun)
- scopy**: process of viewing, visualization (noun)
- stomy**: creation of an artificial opening (noun)
- tomy**: incision, cut into (noun)

Structural Terms Built from Word Parts

- abdominal**: pertaining to the abdomen
- anal**: pertaining to the anus
- celiac**: pertaining to the abdomen
- colorectal**: pertaining to the colon and rectum
- duodenal**: pertaining to the duodenum
- esophageal**: pertaining to the esophagus
- gastric**: pertaining to the stomach
- ileocecal**: pertaining to the ileum and cecum
- lingual**: pertaining to the tongue
- nasogastric**: pertaining to the nose and stomach
- oral**: pertaining to the mouth
- pancreatic**: pertaining to the pancreas
- peritoneal**: pertaining to the peritoneum
- rectal**: pertaining to the rectum
- stomatogastric**: pertaining to the mouth and stomach
- sublingual**: pertaining to under the tongue

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Known Word Parts

aphagia: lack of ability to swallow

appendicitis: inflammation of the appendix

cholangioma: tumor of a bile duct

cholecystitis: inflammation of the gallbladder

choledocholithiasis: condition of having gallstones in the common bile duct

cholelithiasis: condition of having gallstones

colitis: inflammation of the colon

diverticulitis: inflammation of one or more diverticula

diverticulosis: the condition of having diverticulitis

dyspepsia: difficult or painful digestion

dysphagia: difficulty swallowing

enteropathy: disease of the intestines

esophagitis: inflammation of the esophagus

gastritis: inflammation of the stomach

gastroenteritis: inflammation of the stomach and intestines

gastroenterocolitis: inflammation of the stomach and intestines, including the colon

gastromalacia: softening of the stomach

gingivitis: inflammation of the gums

glossitis: inflammation of the tongue

hepatitis: inflammation of the liver

hepatoma: benign tumor of the liver

hepatocarcinoma: malignant tumor of the liver

hepatomegaly: enlargement of the liver

palatitis: inflammation of the palate

pancreatitis: inflammation of the pancreas

peritonitis: inflammation of the peritoneum

polyposis: condition of having polyps

proctoptosis: drooping/falling of the rectum

rectocele: herniation of the rectum

sialolith: stone in a salivary gland or duct

steatohepatitis: inflammation of the liver with fatty tissue present

steatorrhea: discharge of undigested/partially digested fats

steatosis: abnormal condition of fat retention within a cell or organ

uvulitis: inflammation of the uvula

Disease and Disorder Terms Not Built from Known Word Parts

adhesion: fibrous bands of scar tissue that form between internal organs and tissues, joining them together abnormally

ascites: abnormal fluid collection within the abdominal cavity

celiac sprue (celiac disease): disease that occurs due to an immune reaction to gluten in the intestines; can lead to malabsorption and damage to the intestinal lining

cirrhosis: chronic liver disease that leads to destruction of hepatocytes and formation of scar tissue

cleft lip: congenital cleft in lip

cleft palate: congenital cleft in either the hard palate, soft palate, or both

Crohn disease: chronic disease of the GI tract that leads to cobblestone ulcerations and formation of scar tissue

colon cancer: malignant tumor of the colon

diarrhea: liquid or semisolid feces

dysentery: large amount of diarrhea containing blood or mucus due to damage to the intestinal lining

emesis: vomit

emetic: substance that induces vomiting

esophageal cancer: malignant tumor of the esophagus

feces: solid/semisolid waste from digestive system

flatus: intestinal gas

gastroesophageal reflux disease (acid reflux/heartburn): disease featuring pain/discomfort caused by acid being ejected from the stomach into the esophagus

hematemesis: blood in vomit

hematochezia: visible blood in stool

hemochromatosis: genetic disease that leads to increased absorption of iron in the GI tract, overproduction of red blood cells, and deposition of iron within various body tissues

hemorrhoid: varicose vein in the rectum and/or anal canal

ileus: lack of effective peristalsis in the intestines, which can lead to obstruction

intussusception: telescoping of the intestines, which can lead to obstruction

irritable bowel syndrome: disturbances in bowel function not due to another diagnosable bowel disease; can lead to periods of constipation, diarrhea, or both

melena: black, tarry stool that contains digested blood from the upper GI tract

nausea: feeling of the urge to vomit

obesity: excess body fat and increase in body weight in which BMI is over 30

peptic ulcer: erosion of the mucous membrane of the stomach, leading to pain/discomfort

polyp: tumorlike outgrowth of a mucous membrane; usually benign, but may become cancerous if not removed

reflux: GI fluids being ejected backward

stoma: surgical opening between an organ and the outside of the body, between body structures, or between intestinal portions

ulcerative colitis: chronic disease of the large intestine with inflammation of the colon and the formation of ulcers, which can cause bloody diarrhea

volvulus: twisting or kinking of an intestine, which can lead to an obstruction

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Careers & Professional Terminology

gastroenterologist: a physician specializing in diseases of the digestive system, including esophagus, stomach, and intestines

hepatologist: a physician specializing in diseases of the liver

proctologist: a physician specializing in diseases of the rectum and anus

Imaging and Diagnostic Techniques/Procedures for the Organ System

abdominal sonography: using sound waves to visualize the abdominal cavity

barium enema/lower gastrointestinal series: procedure in which barium is introduced rectally and x-rays are taken to visually examine the lower GI tract

cholangiogram: visual record of the bile ducts

cholangiography: process of obtaining visual record of the bile ducts

CT colonography: visual record of the colon obtained through computed tomography

colonoscope: instrument used to visually examine the colon

colonoscopy: process of visually examining the colon

endoscope: instrument used to visually examine a hollow body organ/structure

endoscopic retrograde cholangiopancreatography: procedure in which contrast media is introduced into the biliary and pancreatic ducts to detect liver, gallbladder, or pancreatic disease

endoscopic ultrasound: using sound waves to probe the GI tract for tumors or cystic growths

endoscopy: process of visually examining a hollow body organ/structure

esophagogastroduodenoscopy: process of visually examining the esophagus, stomach, and duodenum

esophagogram: visual record of the esophagus

esophagoscopy: process of visually examining the esophagus

fecal occult blood test: test that detects hidden or invisible blood in the feces

gastroscope: instrument used to visually examine the stomach

gastroscopy: process of visually examining the stomach

***Helicobacter pylori* antibodies test:** detects the presence of *H. pylori* bacteria in the stomach, which may cause ulcers

laparoscope: instrument used to visually examine the abdomen

laparoscopy: process of visually examining the abdomen

proctoscope: instrument used to visually examine the rectum

proctoscopy: process of visually examining the rectum

sigmoidoscope: instrument used to visually examine the sigmoid colon

sigmoidoscopy: process of visually examining the sigmoid colon

stool culture: microscopic examination and laboratory tests performed on feces

upper gastrointestinal series: procedure in which barium is introduced orally and X-rays are taken to visually examine the upper GI tract

Medical and Surgical Techniques/Procedures Used for the Organ System

abdominocentesis: removing fluid from the abdominal cavity for testing

abdominoplasty: surgical repair of the abdomen

anastomosis: joining together of two

anoplasty: surgical repair of the anus

antrectomy: surgical removal of all or part of the pyloric antrum of the stomach

appendectomy: surgical removal of the vermiform appendix

bariatric surgery: surgery that temporarily or permanently reduces the size of the stomach to reduce appetite and cause weight loss

celiotomy: surgical incision into the abdomen

cheiloplasty: surgical repair of a lip

cheilorrhaphy: surgical suturing/repair of a lip

cholecystectomy: surgical removal of the gallbladder

choledocholithotomy: incision to remove gallstones from the common bile duct

cholelithotripsy: removal of gallstones through sound waves

colectomy: surgical removal of all or part of the colon

colostomy: creation of a stoma between the colon and the outside of the body

diverticulectomy: surgical removal of one or more diverticula

enterorrhaphy: surgical suturing/repair of an intestine

gastrectomy: surgical removal of all or part of the stomach

gastric lavage: washing of the stomach to remove contents

gastroplasty: surgical repair of the stomach

gastrostomy: creation of a stoma between the stomach and the outside of the body

gastrojejunostomy: creation of a stoma between the stomach and the jejunum

gavage: feeding by means of a tube leading to the stomach

gingivectomy: surgical removal of all or part of a gum

glossorrhaphy: surgical suturing/repair of the tongue

hemicolectomy: surgical removal of part of the colon

hemorrhoidectomy: surgical removal of one or more hemorrhoids

herniorrhaphy: surgical suturing/repair of a hernia

ileostomy: creation of a stoma between the ileum and the outside of the body

laparotomy: surgical incision into the abdomen

palatoplasty: surgical repair of the palate

percutaneous endoscopic gastrostomy: creation of a stoma between the stomach and the outside of the body in which a tube is inserted for feeding purposes

polypectomy: surgical removal of one or more polyps

pyloromyotomy: surgical incision into the muscle of the pylorus of the stomach

pyloroplasty: surgical repair of the pylorus of the stomach

uvulectomy: surgical removal of all or part of the uvula

uvulopalatopharyngoplasty: surgical repair of the uvula, palate, and pharynx, usually done to correct snoring / sleep apnea

vagotomy: surgical incision of the vagus nerve, done to reduce acid production in the stomach

Abbreviations Commonly Used with the Organ System

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

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



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<https://louis.pressbooks.pub/medicalterminology/?p=1529#h5p-78>

PRACTICE

The following activities will help you practice what you learned in this chapter.

Medical Terms Practice

Click and drag each term from the word bank to its correct place in this exercise.



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Digestive System Anatomy

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



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Consultation Report

Click and drag each term from the word bank to its correct place in this exercise.



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Operative Report

Click and drag each term from the word bank to its correct place in this exercise.



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Vocabulary Reinforcement Activity

Click the term that correctly answers each question or completes each sentence.



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<https://louis.pressbooks.pub/medicalterminology/?p=2126#h5p-85>

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PART XIII

URINARY SYSTEM

Learning Objectives

When completing this chapter, the learner will be able to do the following:

- Identify the anatomy of the urinary system
- Describe the main functions of the urinary system
- Spell and pronounce the urinary system medical terms and use correct abbreviations
- Identify the medical specialties associated with the urinary system
- Explore common diseases, disorders, and procedures related to the urinary system

Introduction

The urinary system has roles you may be well aware of. Cleansing the blood and ridding the body of wastes probably come to mind. However, there are additional, equally important functions played by the system. Take, for example, the regulation of pH, a function shared with the lungs and the buffers in the blood. Additionally, the regulation of blood pressure is a role shared with the heart and blood vessels. What about regulating the concentration of solutes in the blood? Did you know that the kidney is important in determining the concentration of red blood cells? Eighty-five percent of the erythropoietin (EPO) produced to stimulate red blood cell production is produced in the kidneys. The kidneys also perform the final synthesis step of vitamin D production, converting calcidiol to calcitriol, the active form of vitamin D. If the kidneys fail, these functions are compromised or lost altogether, with devastating effects on homeostasis.

Watch this video:



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://louis.pressbooks.pub/medicalterminology/?p=1420#oembed-1>

Media 13.1. [Urinary System, Part 1: Crash Course A&P #38](#) [Online video]. Copyright 2015 by [CrashCourse](#).

ANATOMY AND PHYSIOLOGY OF THE URINARY SYSTEM

Kidney(s)

The **kidneys** lie on either side of the spine in the retroperitoneal space between the parietal peritoneum and the posterior abdominal wall, well protected by muscle, fat, and ribs. They are roughly the size of your fist. The male kidney is typically a bit larger than the female kidney. The kidneys are well vascularized, receiving about 25 percent of the cardiac output at rest. [Figure 13.1](#) displays the location of the kidneys.

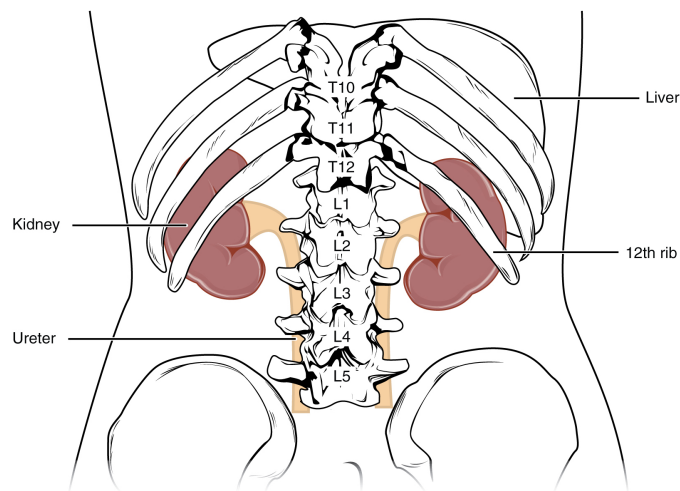


Figure 13.1 Kidneys. The kidneys are slightly protected by the ribs and are surrounded by fat for protection (not shown). From Betts, et al., 2013. Licensed under [CC BY 4.0](#).

Kidneys' Internal Structure

A frontal section through the kidney reveals an outer region called the **renal cortex** and an inner region called the **medulla** (see [Figure 13.2](#)). The **renal columns** are connective tissue extensions that radiate downward from the cortex through the medulla to separate the most characteristic features of the medulla, the **renal pyramids** and **renal papillae**. The papillae are bundles of collecting ducts that transport urine made by nephrons to the **calyces** of the kidney for excretion. The renal columns also serve to divide the kidney into 6–8

lobes and provide a supportive framework for vessels that enter and exit the cortex. The pyramids and renal columns taken together constitute the kidney **lobes**.

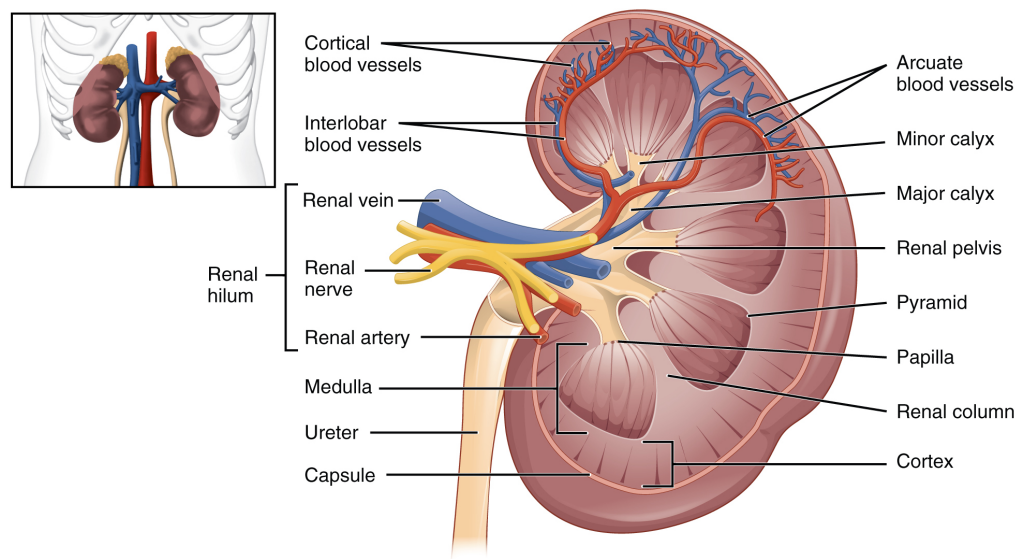


Figure 13.2 Left Kidney. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Renal Hilum

The **renal hilum** is the entry and exit site for structures servicing the kidneys: vessels, nerves, lymphatics, and ureters. The medial-facing hila are tucked into the sweeping convex outline of the cortex. Emerging from the hilum is the **renal pelvis**, which is formed from the major and minor calyces in the kidney. The smooth muscle in the renal pelvis funnels urine via peristalsis into the **ureter**. The **renal arteries** form directly from the descending aorta, whereas the **renal veins** return cleansed blood directly to the inferior vena cava. The artery, vein, and renal pelvis are arranged in an anterior-to-posterior order.

Nephrons and Vessels

The renal artery first divides into segmental arteries, followed by further branching to form interlobar arteries that pass through the renal columns to reach the cortex (see [Figure 13.3](#)). The interlobar arteries, in turn, branch into arcuate arteries, cortical radiate arteries, and then afferent arterioles. The afferent arterioles service about 1.3 million nephrons in each kidney.

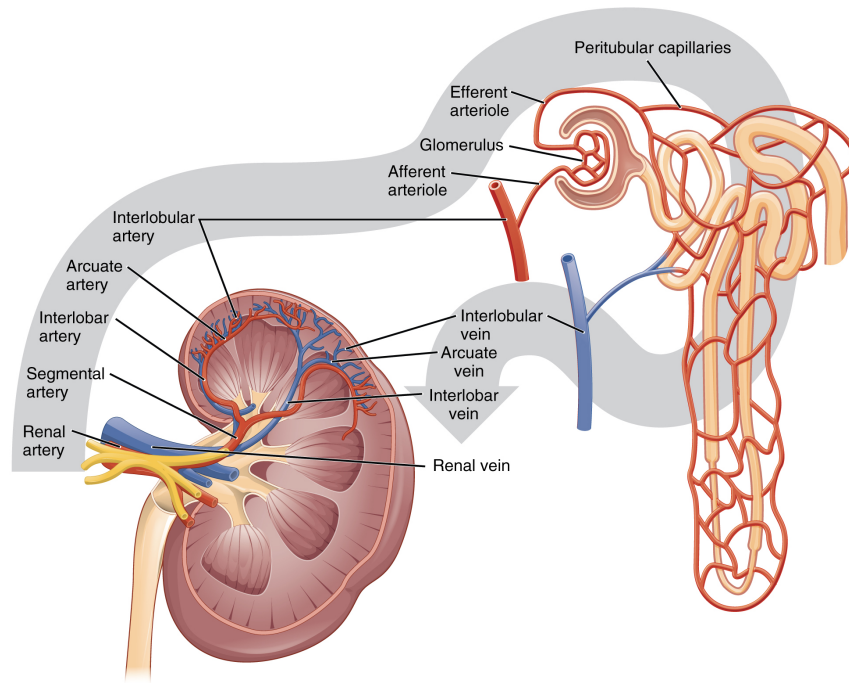


Figure 13.3 Blood Flow in the Kidney. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/).

Nephrons are the “functional units” of the kidney; they cleanse the blood and balance the constituents of the circulation. The afferent arterioles form a tuft of high-pressure capillaries about 200 μm in diameter, the **glomerulus**. The rest of the nephron consists of a continuous sophisticated tubule whose proximal end surrounds the glomerulus in an intimate embrace—this is **Bowman’s (glomerular) capsule**. The glomerulus and Bowman’s capsule together form the **renal corpuscle**. As mentioned earlier, these glomerular capillaries filter the blood based on particle size. After passing through the **renal corpuscle**, the capillaries form a second arteriole, the **efferent arteriole** (see [Figure 13.4](#)). These will next form a capillary network around the more distal portions of the nephron tubule, the **peritubular capillaries** and **vasa recta**, before returning to the venous system. As the glomerular filtrate progresses through the nephron, these capillary networks recover most of the solutes and water and return them to the circulation.

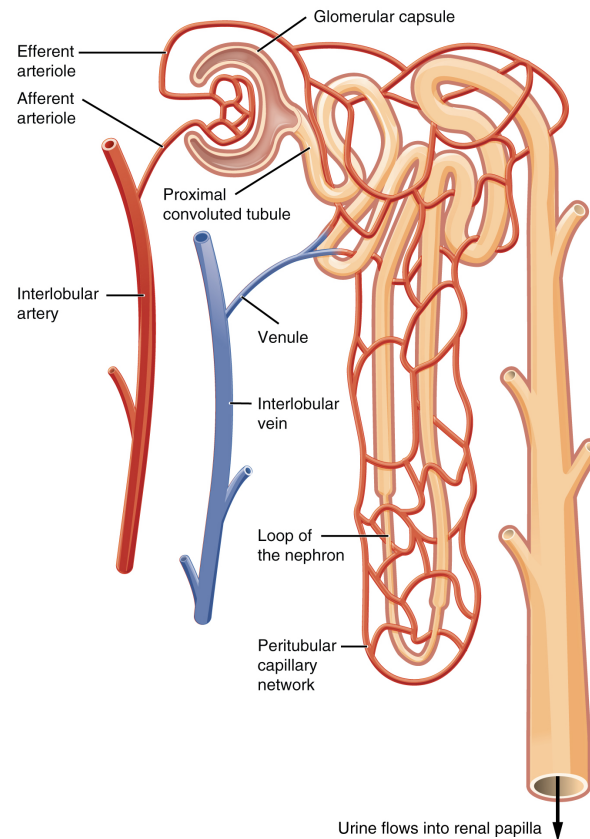


Figure 13.4 Blood Flow in the Nephron. The two capillary beds are clearly shown in this figure. The efferent arteriole is the connecting vessel between the glomerulus and the peritubular capillaries and vasa recta. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/).

Ureter(s)

As urine is formed, it drains into the calyces of the kidney, which merge to form the funnel-shaped renal pelvis in the hilum of each kidney. The hilum narrows to become the **ureter** of each kidney. As urine passes through the ureter, it does not passively drain into the bladder but rather is propelled by waves of peristalsis. The ureters are approximately 30 cm long.

Bladder

The **urinary bladder** collects urine from both ureters (see [Figure 13.5](#)). The bladder lies anterior to the uterus in females, posterior to the pubic bone and anterior to the rectum. In males, the anatomy is similar, minus the uterus, and with the addition of the prostate inferior to the bladder. The bladder is partially retroperitoneal

(outside the peritoneal cavity) with its peritoneal-covered “dome” projecting into the abdomen when the bladder is distended with urine.

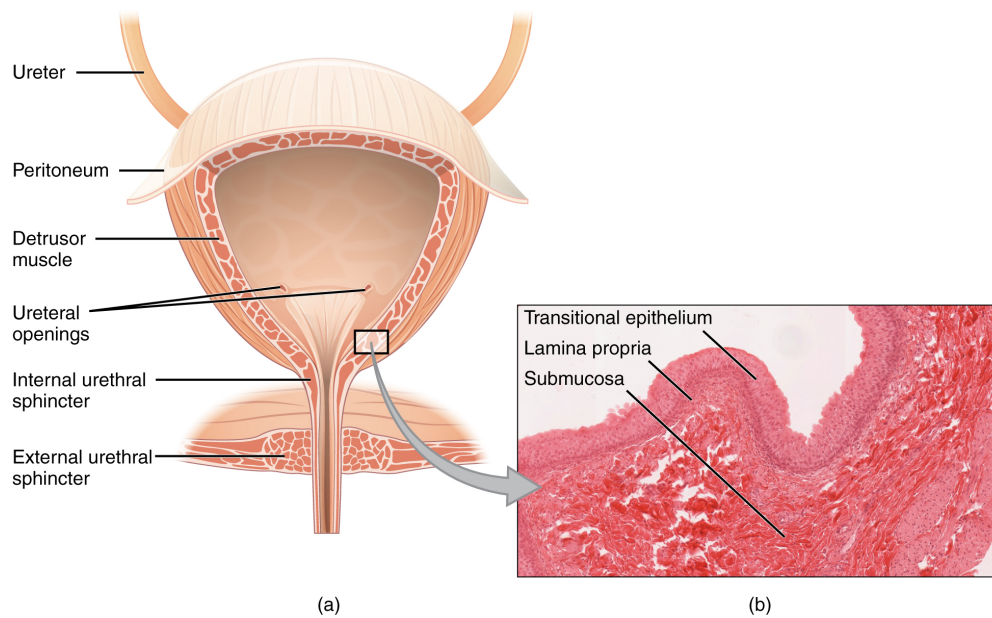


Figure 13.5 Bladder. (a) Anterior cross section of the bladder. (b) The detrusor muscle of the bladder (source: monkey tissue) LM \times 448. (Micrograph provided by the Regents of the University of Michigan Medical School \copyright 2012.) From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [[Image description.](#)]

Urethra

The **urethra** transports urine from the bladder to the outside of the body for disposal. The urethra is the only urologic organ that shows any significant anatomic difference between males and females; all other urine transport structures are identical (see [Figure 13.6](#)).

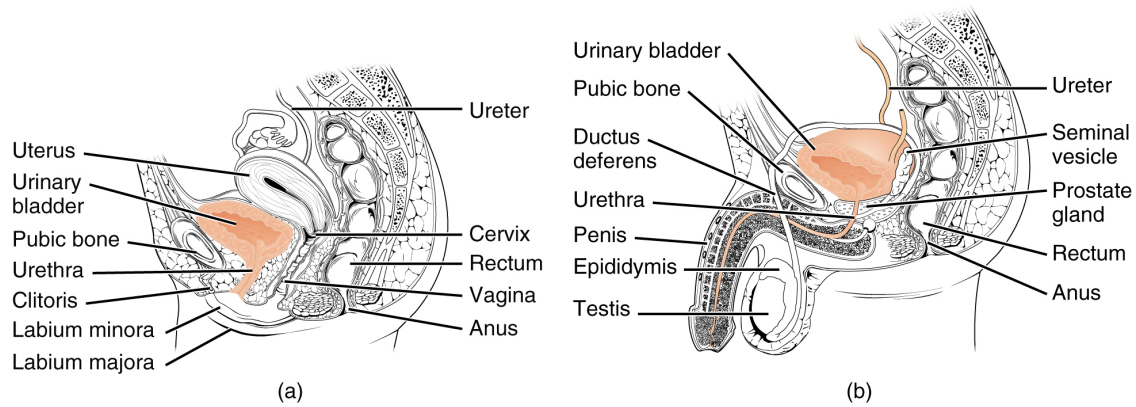


Figure 13.6 Female and Male Urethras. The urethra transports urine from the bladder to the outside of the body. This image shows (a) a female urethra and (b) a male urethra. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

The urethra in both males and females begins inferior and central to the two ureteral openings forming the three points of a triangular-shaped area at the base of the bladder called the trigone (Greek tri- = “triangle” and the root of the word “trigonometry”). The urethra tracks posterior and inferior to the pubic symphysis. **Voiding** is regulated by an involuntary autonomic nervous system-controlled internal urinary sphincter consisting of smooth muscle and voluntary skeletal muscle that forms the external urinary sphincter below it.

Image Descriptions

Figure 13.2 image description: The left panel of this figure shows the location of the kidneys in the abdomen. The right panel shows the cross section of the kidney. [\[Return to Figure 13.2\].](#)

Figure 13.5 image description: The left panel of this figure shows the cross section of the bladder and the major parts are labeled. The right panel shows a micrograph of the bladder. [\[Return to Figure 13.5\].](#)

Figure 13.6 image description: Diagrams of the (a) female and (b) male genitalia highlighting the respective urethras. [\[Return to Figure 13.6\].](#)

WORD PARTS AND STRUCTURAL TERMS

Combining Forms

albumin/o: albumin

azot/o: nitrogen or urea

cyst/o: bladder

glomerul/o: glomerulus

glyc/o, glycos/o: glucose, sugar

hydr/o: water, urine

lith/o: stone

meat/o: meatus

nephr/o: kidney

noct/i: night

olig/o: scanty, very small amount

pyel/o: pelvis

ren/o: kidney

ureter/o: ureter

urethr/o: urethra

ur/o, urin/o: urine

vesic/o: bladder

Suffixes

-esis: condition (noun)

-iasis: condition (noun)

-lysis: breakdown, dissolution (noun)

-ptosis: drooping, sagging (noun)

-rrhaphy: suturing, surgically repairing (noun)

-tripsy: crushing (noun)

-trophy: growth (noun)

-uria: urine (noun)

Structural Terms Built from Word Parts

meatal: pertaining to the meatus

renal: pertaining to the kidney

urinary: pertaining to the urine

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Word Parts

albuminuria: condition of albumin in the urine

anuria: condition of producing no urine

azotemia: condition of urea in the blood

cystitis: inflammation of the bladder

cystocele: a dropped or prolapsed bladder that bulges into the vaginal space

cystolith: stone in the bladder

diabetic nephropathy: kidney disease caused by complications of diabetes mellitus

diuresis: excessive urination

dysuria: condition of painful urination

glomerulonephritis: inflammation of the glomeruli of the kidney

glycosuria: condition of glucose in the urine

hematuria: condition of blood in the urine

hydronephrosis: dilation of the renal pelvis and calyces due to buildup of urine; caused by an obstruction to urine flow downstream

nephritis: inflammation of a kidney

nephrohypertrophy: excessive growth of a kidney

nephrolithiasis: condition of stone formation in the kidney

nephroma: tumor of the kidney

nephromegaly: enlarged kidney

nephroptosis: dropping or sagging kidney

nocturia: condition of nighttime urination; feeling the urge to wake during the night in order to urinate

oliguria: condition of scanty or deficient urine production

polyuria: condition of excessive urine production

pyelitis: inflammation of the renal pelvis

pyelonephritis: inflammation of the renal pelvis and the rest of the kidney

pyuria: condition of pus in the urine

ureteritis: inflammation of a ureter

ureterocele: a birth defect that causes a ballooning of the end of the ureter inside the bladder

ureterolithiasis: condition of stones in a ureter

ureterostenosis: narrowing of a ureter

urethrocystitis: inflammation of the urethra and bladder

uremia: condition of urea in the blood

Disease and Disorder Terms Not Built from Word Parts

acute kidney injury: a sudden decrease in kidney function that develops within a week

chronic kidney disease: a loss of kidney function over a long period of time

distension: swelling of an organ

end-stage renal disease: a complete loss of kidney function as a result of chronic kidney disease; patient subsequently requires hemodialysis

enuresis: bed-wetting

epispadias: a condition in which the urethral opening is located on the upper side of the penis

hypospadias: a condition in which the urethral opening is located on the underside of the penis

incontinence: inability to control urination

micturate: to urinate

overactive bladder: a group of symptoms that can include the urge to urinate more frequently, greater urgency to urinate, urinary incontinence, and nocturia

polycystic kidney disease: a genetic disorder that causes fluid-filled cysts to develop within the kidneys, leading to a gradual loss of kidney function and hypertension

renal calculus: an individual stone in the urinary tract

renal cell carcinoma: malignant tumor of the kidney

renal hypertension: hypertension caused by a narrowing in the arteries that deliver blood to the kidney

stricture: a narrowing of a tube or opening, such as the urethra

urinary retention: inability to void urine

urinary suppression: inability to produce urine

urinary tract infection: an infection anywhere in the urinary tract

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Careers & Professional Terminology

nephrology: study of the kidneys

nephrologist: physician specializing in kidney disorders and treatment

urology: study of the urinary system

urologist: physician specializing in urinary system disorders and treatment

Imaging Techniques / Diagnostic Procedures for the Organ System

blood urea nitrogen: a laboratory test that measures the amount of urea nitrogen in the blood; indicates kidney function

cystogram: an x-ray image obtained after contrast media injected into the bladder

cystography: the process of obtaining a cystogram

cystoscope: a thin tube with a camera or lens, used to visualize the bladder

cystoscopy: visual examination of the bladder using a cystoscope

intravenous urogram: an x-ray image obtained after injecting contrast media to visually evaluate the entire urinary tract

nephrography: the process of obtaining a radiographic image of the kidney

nephroscopy: visual examination of the kidney

nephrosonography: obtaining a visual recording of the kidney via ultrasound waves

nephrotomogram: an image obtained via intravenous contrast media and x-ray tomography

renogram: an x-ray image obtained after injecting contrast media to evaluate blood flow in the kidney

specific gravity: a measurement of the density of a fluid (such as urine) compared to water

ureteroscopy: visual examination of the ureter

urethroscopy: visual examination of the urethra

urinalysis: analyzing the composition of urine via laboratory tests

urodynamics: any procedure that measures how well the bladder and urethra store and release urine

voiding cystourethrogram: a procedure that uses x-rays and a contrasting agent to evaluate the size, shape, and capacity of the bladder and urethra

Medical/Surgical Techniques & Procedures

cystectomy: surgical removal of the bladder

cystolithotomy: surgical incision to remove a bladder stone

cystorrhaphy: surgical suturing of the bladder

cystostomy: surgical creation of an opening in the bladder to void urine outside the body

cystotomy: surgical incision of the bladder

extracorporeal shock wave lithotripsy: administering a series of shock waves to break apart a kidney stone

fulguration: using a laser to destroy living tissue, such as bladder lesions

hemodialysis: purifying the blood of a patient whose kidneys no longer function properly; can utilize a dialysis machine or the patient's peritoneum

meatotomy: surgical incision of the urinary meatus

nephrectomy: surgical removal of a kidney

nephrolithotripsy: surgical crushing and removal of a kidney stone

nephropexy: surgical suspension of a kidney

nephrostomy: surgical creation of an opening in the kidney to void urine outside the body

pyelolithotomy: surgical incision to remove stone from the renal pelvis

pyeloplasty: surgical repair of the renal pelvis

renal transplant: transplanting a donor kidney into a recipient when their own kidneys no longer function

ureterectomy: surgical removal of a ureter

urethroplasty: surgical repair of a ureter

urinal: a device for collecting urine

urinary catheterization: placing a catheter inside the urethra for collecting urine

vesicourethral suspension: surgical suspension of the bladder and urethra; often performed to treat stress incontinence

void: to empty urine from the body

Abbreviations

ARF: acute renal failure

BUN: blood urea nitrogen

cath: catheter, catheterization

CKD: chronic kidney disease

ESRD: end-stage renal disease

ESWL: extracorporeal shock wave lithotripsy

HD: hemodialysis

KUB: kidney, ureter, and bladder radiographic image

OAB: overactive bladder

SG: specific gravity

UA: urinalysis

UTI: urinary tract infection

VCUG: voiding cystourethrogram

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



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<https://louis.pressbooks.pub/medicalterminology/?p=1465#h5p-25>

PRACTICE

The following activities will allow you to practice what you've learned in this chapter.

Urinary System Activity

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



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<https://louis.pressbooks.pub/medicalterminology/?p=2140#h5p-26>

Operative Report

Click and drag each term from the word bank to its correct place in this exercise.



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<https://louis.pressbooks.pub/medicalterminology/?p=2140#h5p-29>

Consultation Report

Click and drag each term from the word bank to its correct place in this exercise.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

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PART XIV

MALE REPRODUCTIVE SYSTEM

Learning Objectives

When completing this chapter, the learner will be able to do the following:

- Identify the anatomy of the male reproductive system
- Describe the main functions of the male reproductive system
- Spell the male reproductive system medical terms and use correct abbreviations
- Identify the medical specialties associated with the male reproductive system
- Explore common diseases, disorders, and procedures related to the male reproductive system

Introduction to Male Reproductive System

The male reproductive system produces **gametes**. Gametes are the reproductive cells that combine to form a zygote and, later, an embryo and fetus. Organs called **gonads** produce the gametes along with the hormones that regulate human reproduction. The male gametes are called **spermatozoa** (sperm) and are produced by the **testes**. **Spermatogenesis** occurs within the **seminiferous tubules** that make up most of a testis. The scrotum is a sac that holds the testes outside of the body cavity.

Watch this video:



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://louis.pressbooks.pub/medicalterminology/?p=1422#oembed-1>

Media 14.1. [Reproductive System, Part 2—Male Reproductive System: Crash Course A&P 41](#)
[Online video]. Copyright 2015 by [CrashCourse](#).

ANATOMY AND PHYSIOLOGY OF THE MALE REPRODUCTIVE SYSTEM

Anatomy of the Male Reproductive System

The anatomy of the male reproductive system consists of structures that include the testes, the epididymis, the penis, and the ducts and glands that produce and carry **semen**. Sperm exit the scrotum through the **vas deferens**. The **spermatic cord** is an enclosed sheath that includes the vas deferens, arteries, veins, and nerves. The **seminal vesicles** and **prostate gland** add fluids to the sperm to create semen.

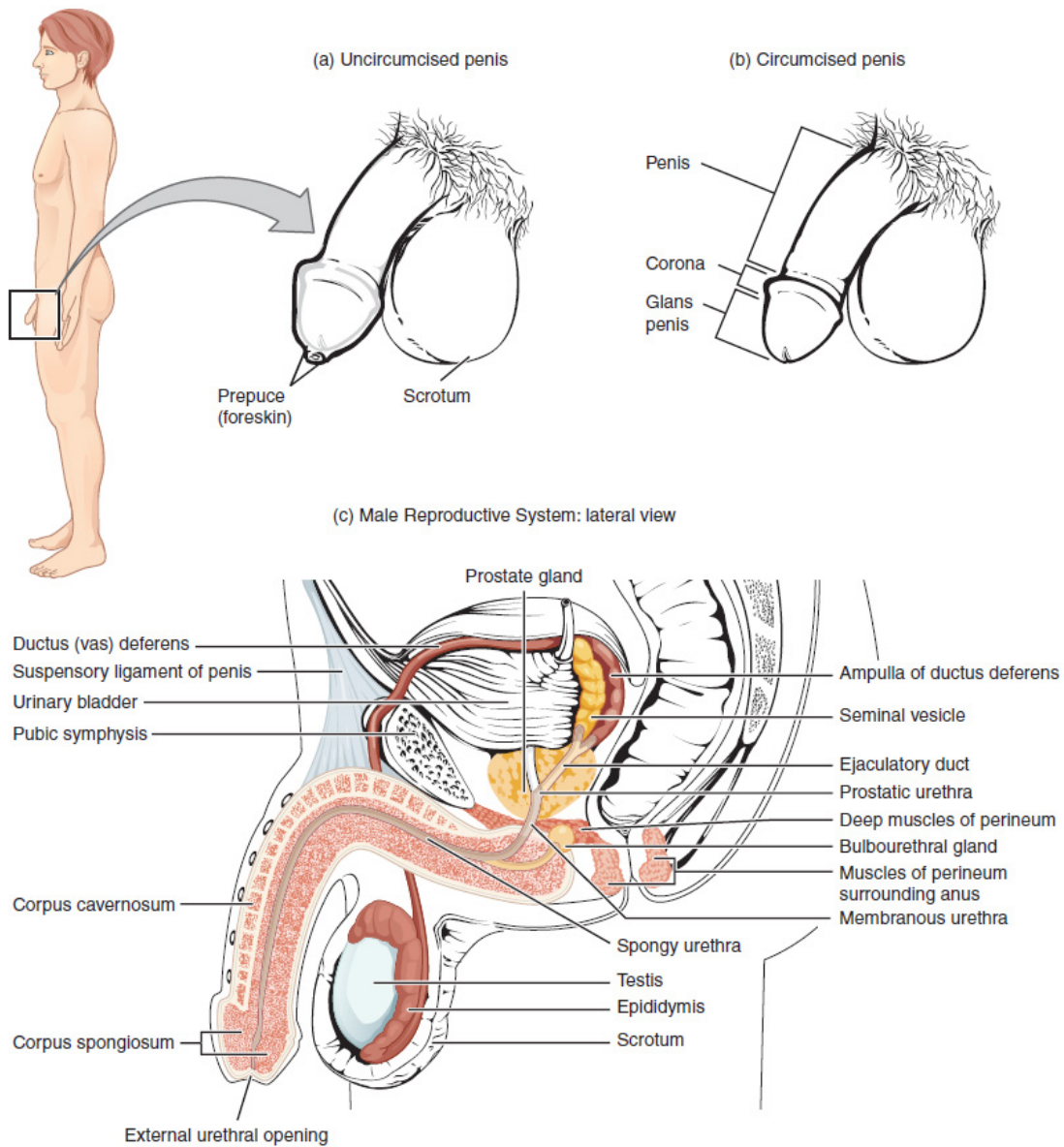


Figure 14.1 Male Reproductive System. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Physiology of the Male Reproductive System

The anatomy of the male reproductive system consists of structures that include spermatogenesis, sperm, sperm transport, epididymis, ducts, prostate gland, and bulbourethral glands.

Spermatogenesis

Spermatogenesis occurs in the seminiferous tubules that form the bulk of each testis. The process begins at

puberty, after which time sperm are produced constantly throughout a man's life. One production cycle takes approximately 64 days. One production cycle is considered from spermatogonia through to formed sperm. A new cycle starts approximately every 16 days, although this timing is not synchronous across the seminiferous tubules.

Sperm

Sperm are smaller than most cells in the body; in fact, the volume of a sperm cell is 85,000 times less than that of the female gamete. Approximately 100 to 300 million sperm are produced each day, whereas women typically ovulate only one oocyte per month. As is true for most cells in the body, the structure of sperm cells speaks to their function. Sperm have a distinctive head, mid-piece, and tail region (see [Figure 14.2](#)).

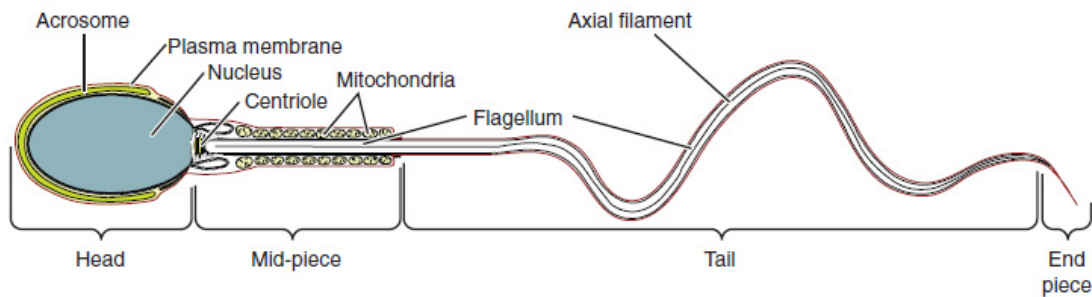


Figure 14.2 Structure of Sperm. Sperm cells are divided into a head, containing DNA; a mid-piece, containing mitochondria; and a tail, providing motility. The acrosome is oval and somewhat flattened. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [\[Image description.\]](#)

Sperm Transport

To fertilize an egg, sperm must be moved from the seminiferous tubules in the testes, through the epididymis, and—later during **ejaculation**—along the length of the penis and out into the female reproductive tract. It takes an average of 12 days for sperm to move through the coils of the epididymis, with the shortest recorded transit time in humans being one day.

Epididymis

Sperm enter the head of the epididymis and are moved by the contraction of smooth muscles lining the epididymal tubes. As the sperm mature, they acquire the ability to move under their own power. Once inside

the female reproductive tract, they will use this ability to move independently toward the unfertilized egg. The more mature sperm are then stored in the tail of the epididymis until ejaculation occurs.

Ducts

During ejaculation, sperm exit the tail of the epididymis and are pushed by smooth muscle contraction to the vas deferens (also called the ductus deferens). The vas deferens is a thick, muscular tube that is bundled together inside the scrotum with connective tissue, blood vessels, and nerves into a structure called the spermatic cord. From each epididymis, each vas deferens extends through the inguinal canal in the abdominal wall and continues to a region called the ampulla. The sperm is mixed with fluid from the paired seminal vesicles and moves into its associated **ejaculatory duct**. The ejaculatory ducts transport the seminal fluid to the prostate gland.

Prostate Gland

The prostate gland secretes an alkaline, milky fluid to the passing seminal fluid (referred to as semen) to first coagulate and then decoagulate the semen following ejaculation. The temporary thickening of semen helps retain it within the female reproductive tract. Once decoagulated, the sperm can pass farther into the female reproductive tract.

Bulbourethral Glands

Bulbourethral glands release a thick, salty fluid that lubricates the end of the urethra and vagina and helps to clean urine residues from the penile urethra.

Image Descriptions

Figure 14.1 image description: This figure shows the different organs in the male reproductive system. The top panel shows the side view of a man and an uncircumcised and a circumcised penis. The bottom panel shows the lateral view of the male reproductive system and the major parts are labeled. [\[Return to Figure 14.1\]](#).

Figure 14.2 image description: This diagram shows the structure of sperm; the major parts are labeled (from left to right): head section (acrosome, plasma membrane, nucleus), mid-piece (centriole, mitochondria, flagellum), tail (flagellum, axial filament), end piece (end piece). [\[Return to Figure 14.2\]](#).

WORD PARTS AND STRUCTURAL TERMS

Combining Forms

andr/o: male

balan/o: glans penis

epididym/o: epididymis

gonad/o: gonad

orch/o: testis, testicle

orchi/o: testis, testicle

orchid/o: testis, testicle

pen/i: penis

pen/o: penis

phall/o: penis

preputi/o: prepuce, foreskin

posth/o: prepuce, foreskin

prostat/o: prostate gland

scrot/o: scrotum

semin/i: semen

sperm/o: sperm, spermatozoon

spermat/o: sperm, spermatozoon

test/o: testis, testicle

testicular/o: testis, testicle

urethr/o: urethra

vas/o: vas deferens, vessel, duct

vesicul/o: seminal vesicle

Prefixes

a-: absence of, without

an-: absence of, without

crypt-: hidden

dys-: painful, difficult

en-: in

epi-: above

hydro-: water

hyper-: above, excessive

hypo-: below

par-: near

poly-: much or many

trans-: through, across, beyond

Suffixes

-al: pertaining to

-algia: pain

-ar: pertaining to

-atic: pertaining to

-cision: processing of cutting

-ectomy: excision or surgical removal

-ferous: pertaining to

-genesis: production

-gram: record

-graphy: process of recording

-ia: diseased state, abnormal state, condition of, condition

-ic: pertaining to

-ile: pertaining to

-ism: state of, condition

-itis: inflammation

-logy: study of

-lysis: loosening, dissolution, separating

-oma: tumor, mass

-ous: pertaining to

-pathy: disease

-pexy: surgical fixation, suspension

-plasia: development, growth

-plasty: surgical repair

-rrhea: flow, discharge

-sis: condition

-stomy: creation of new opening, process of new opening

-tion: process of

-tomy: cut into, incision

Structural Terms Built from Word Parts

epididymal: pertaining to the epididymis

penile: pertaining to the penis

prostatic: pertaining to the prostate

scrotal: pertaining to the scrotum

seminiferous: pertaining to semen

testicular: pertaining to the testicle or testicles

urethral: pertaining to the urethra

Medical Terms Not Built from Word Parts

coitus: sexual intercourse between male and female

condom: sheath or cover for the penis worn during coitus to prevent conception and spread of sexually transmitted infection

gamete: haploid reproductive cell that contributes genetic material to form an offspring

gonads: reproductive organs (testes in men and ovaries in women) that produce gametes and reproductive hormones

infertility: inability to achieve pregnancy

semen: ejaculatory fluid composed of sperm and secretions from the seminal vesicles, prostate, and bulbourethral glands

sperm (spermatozoon): male gamete

spermatogenesis: formation of new sperm; occurs in the seminiferous tubules of the testes

spermatogonia: diploid precursor cells that become sperm (singular = spermatogonium)

sterility: a condition of being unable to conceive or reproduce

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Word Parts

andropathy: disease specific to males

anorchism: lack of a testis or testes

aspermia: condition of no spermatozoa or inability to produce spermatozoa

balanitis: inflammation of the glans penis

balanorrhoea: discharge from the glans penis

benign prostatic hyperplasia: overgrowth of the prostate; common in older men

cryptorchidism: “state of hidden testis”; condition where one or both testes have not descended into the scrotum

dysuria: painful urination

epididymitis: inflammation of the back of the testicle that carries sperm

oligospermia: condition of having few or scanty spermatozoa

orchiditis: inflammation of a testis

orchiepididymitis: inflammation of a testis and epididymis

orchitis: inflammation of a testis

prostatitis: inflammation of the prostate gland

prostatocystitis: inflammation of the prostate gland and bladder

prostatolith: small stone or crystal that forms within the prostate gland

prostatorrhoea: discharge from the prostate gland

prostatovesiculitis: inflammation of the prostate gland and one or both seminal vesicles

Disease and Disorder Terms Not Built from Word Parts

chlamydia: one of the most common sexually transmitted infections (STIs) caused by bacteria that infect the cervix, urethra, and other reproductive organs

erectile dysfunction disorder: a condition in which a male has difficulty either initiating or maintaining an erection

gonorrhoea (gonococcus): a sexually transmitted infection caused by bacteria that infects the cervix, urethra, and other reproductive organs; infections can also infect the throat and anus

herpes simplex virus: a sexually transmitted infection that causes genital herpes

human papillomavirus: a common sexually transmitted infection that can cause visible genital warts and can sometimes lead to the development of some genital cancers

hydrocele: fluid-filled sac around the testicle

male infertility: inability to produce children after at least one year of unprotected intercourse or artificial insemination

penile cancer: a cancer in which tumors usually appear on the end of the penis or on the foreskin

Peyronie's disease: causes scar tissue or hard lump inside of the penis

phimosis: occurs when the foreskin remains unusually tight and cannot be drawn back

priapism: persistent erection that lasts at least 4 hours; may not be related to sexual stimulation but can be painful; if left untreated, it can cause lasting damage

prostate cancer: a cancer that is caused in the prostate; it is the second most common cancer occurring in men

spermatocele: distension of the epididymis, containing fluid and spermatozoa

testicular cancer: a cancer that begins in the testicle or testis; it is most often found in men aged 15 to 44 years, although it can be diagnosed at any age

testicular torsion: twisting of a testis and spermatic cord within the scrotum; this is a medical emergency and must be reversed immediately

varicocele: varicose veins within the spermatic cord; can lead to decreased sperm production

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Careers & Professional Terminology

andrologist: a physician specializing in andrology

andrology: a medical specialty that is responsible for treating genitourinary conditions that are faced by males

reproductive endocrinologist: a physician who has special training in the diagnosis and treatment of infertility

urologist: a physician specializing in urology

urology: a medical specialty that is responsible for treating conditions that affect the urinary tract in males

Diagnostic and Imaging Techniques/Procedures for the Organ System

computerized tomography: series of x-ray images taken to detect bone and joint problems

digital rectal examination: palpation of the prostate with a gloved finger through the wall of the rectum

magnetic resonance imaging: uses strong magnetic field and radio waves to detect problems with the tissue and the nervous system

positron emission tomography: an imaging test that can detect cancer and how far it has spread

prostate-specific antigen: a protein produced by the prostate that can be detected via a blood test; a sudden rise may indicate prostate cancer

transrectal ultrasound: an imaging test that uses sound waves to view the prostate gland

Medical and Surgical Techniques/Procedures Used for the Organ System

ablation: destruction of abnormal or excessive tissue by eroding, vaporization, or melting

artificial insemination: introduction of spermatozoa into the vagina or cervix by artificial means

balanoplasty: surgical repair of the glans penis

circumcision: surgical removal of the prepuce (foreskin)

enucleation: excision of a whole organ or mass without cutting into it

epididymectomy: excision of part or all of an epididymis

HPV vaccine: a vaccine called Gardasil® 9, available for 9 HPV strains; this vaccine assists the immune system in protecting the body against infections and diseases caused by HPV

hydrocelectomy: surgical removal of a fluid-filled sac around the testicle causing scrotal swelling (hydrocele)

no-scalpel vasectomy (NSV): a minimally invasive vasectomy procedure with a shorter recovery time

orchiectomy: removal of part or all of a testis; the most common procedure for diagnosing and treating testicular cancer

orchiotomy: incision into a testis

prostatectomy: excision of all or part of the prostate gland

transurethral incision of the prostate gland: a surgical procedure that widens the urethra where it meets the bladder and prostate

vasectomy: a sterilization procedure in which a small section of the ductus (vas) deferens is removed from the scrotum; this cuts off the path taken by sperm through the ductus deferens

vasovasostomy: vasectomy reversal; creation of an opening within a vas deferens

vesiculectomy: excision of one or both seminal vesicles

Abbreviations Commonly Used with the Male Reproductive System

AIDS: acquired immunodeficiency syndrome

BPH: benign prostatic hyperplasia, benign prostatic hypertrophy

Bx: biopsy

CT: chlamydia

DRE: digital rectal examination

ED: erectile dysfunction

FTA-ABS: fluorescent treponemal antibody absorption test

GC: gonococcus

GU: genitourinary

HIV: human immunodeficiency virus

HoLEP: holmium laser enucleation of the prostate gland

HPV: human papillomavirus

HSV: herpes simplex virus

LUTS: lower urinary tract symptoms

NGU: nongonococcal urethritis

- NSV:** no-scalpel vasectomy
- PSA:** prostate-specific antigen
- PVP:** photoselective vaporization of the prostate gland
- RP:** radical prostatectomy
- STD:** sexually transmitted disease
- STI:** sexually transmitted infection
- TRUS:** transrectal ultrasound
- TSE:** testicular self-examination
- TUIP:** transurethral incision of the prostate gland
- TUMT:** transurethral microwave thermotherapy
- TURP:** transurethral resection of the prostate gland
- VD:** venereal disease

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

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PRACTICE

The following activities will allow you to practice what you've learned in this chapter.

Male Reproductive System Anatomy

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://louis.pressbooks.pub/medicalterminology/?p=2143#h5p-34>

Medical Report

Click and drag each term from the word bank to its correct place in this exercise.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://louis.pressbooks.pub/medicalterminology/?p=2143#h5p-38>

Vocabulary Reinforcement Activity

Click the term that correctly answers each question or completes each sentence.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://louis.pressbooks.pub/medicalterminology/?p=2143#h5p-39>

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PART XV

FEMALE REPRODUCTIVE SYSTEM

Learning Objectives

When completing this chapter, the learner will be able to do the following:

- Identify the anatomy of the female reproductive system
- Describe the main functions of the female reproductive system
- Spell the medical terms of the female reproductive system and use correct abbreviations
- Identify the medical specialties associated with the female reproductive system
- Explore common diseases, disorders, and procedures related to the female reproductive system

Introduction to Female Reproductive System

This chapter examines the structure and function of how the female reproductive system operates. The female reproductive system functions to produce gametes and reproductive hormones. In addition, the female reproductive system supports the developing **fetus** and delivers it to the outside world. The female reproductive system is located primarily inside the pelvic cavity. The female gonads are called **ovaries**, and the gamete they produce is called an **oocyte**.

Watch this video:



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://louis.pressbooks.pub/medicalterminology/?p=1424#oembed-1>

Media 51.1 [The Female Reproductive System, Part 1: Crash Course A&P #40](#) [Online video].

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ANATOMY AND PHYSIOLOGY OF THE FEMALE REPRODUCTIVE SYSTEM

Anatomy of the Female Reproductive System

The anatomy of the female reproductive system consists of structures that include the external female genitals and internal female reproductive organs. They are described below.

External Female Genitals

The external female reproductive structures are referred to collectively as the **vulva** and include the **mons pubis**, the **labia majora**, and the **labia minora**.

The **mons pubis** is a pad of fat that is located at the anterior, over the pubic bone. After puberty, it becomes covered in pubic hair.

The **labia majora** (labia = “lips”; majora = “larger”) are folds of hair-covered skin that begin just posterior to the mons pubis.

The **labia minora** (labia = “lips”; minora = “smaller”) is thinner and more pigmented and extends medially to the labia majora. Although they naturally vary in shape and size from woman to woman, the labia minora serve to protect the female urethra and the entrance to the female reproductive tract.

The superior, anterior portions of the labia minora come together to encircle the **clitoris** (or glans clitoris), an organ that originates from the same cells as the glans penis and has abundant nerves that make it important in sexual sensation and orgasm. The **hymen** is a thin membrane that sometimes partially covers the entrance to the vagina.

The **vaginal opening** is located between the opening of the urethra and the anus. It is flanked by outlets to the **Bartholin’s glands**.

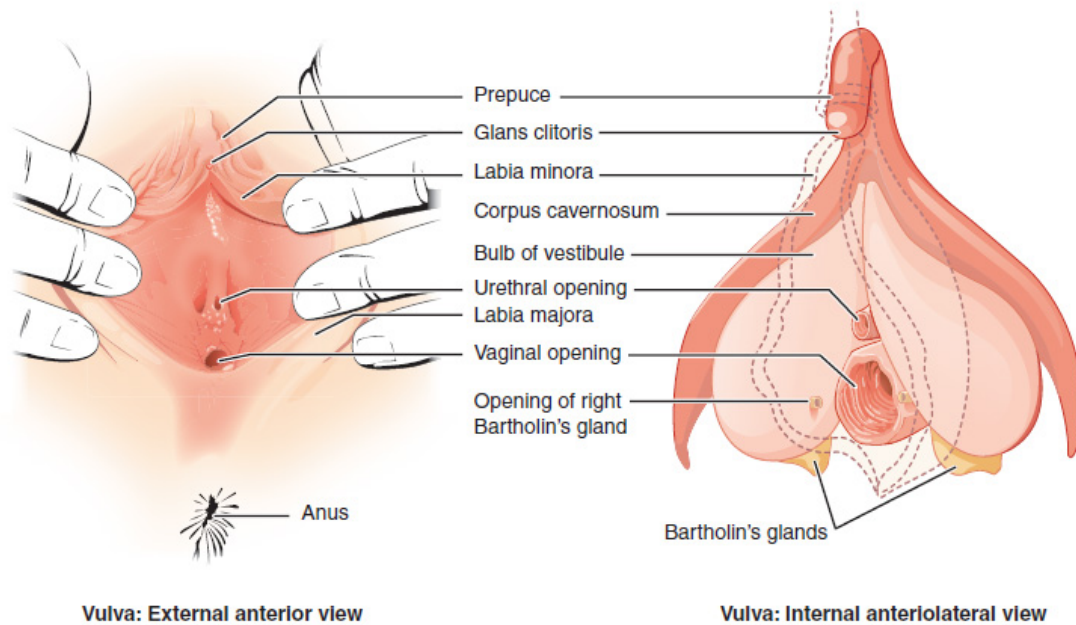


Figure 15.1 The Vulva. The external female genitalia are referred to collectively as the vulva. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [Image description.]

Internal Female Reproductive Organs

Vagina

The **vagina** is a muscular canal (approximately 10 cm long) that is the entrance to the reproductive tract. It also serves as the exit from the uterus during menses and childbirth. The outer walls of the anterior and posterior vagina are columns with ridges. The superior fornix meets the uterine cervix. The cervix is the opening to the uterus.

The walls of the vagina are lined with:

- An outer, fibrous adventitia
- A middle layer of smooth muscle
- An inner mucous membrane with transverse folds (called rugae)

Together, the middle and inner layers allow the expansion of the vagina to accommodate intercourse and childbirth. The thin, perforated hymen can partially surround the opening to the vaginal orifice. The **Bartholin's glands** and the **lesser vestibular glands** (located near the clitoris) secrete mucus, which keeps the vestibular area moist.

The vagina has a normal population of microorganisms that help to protect against infection. There are both pathogenic bacteria and yeast in the vagina. In a healthy woman, the most predominant type of

vaginal bacteria is from the genus *Lactobacillus*, which secretes lactic acid. Lactic acid protects the vagina by maintaining an acidic pH (below 4.5).

Lactic acid, in combination with other vaginal secretions, makes the vagina a self-cleansing organ. However, douching can disrupt the normal balance of healthy microorganisms and increase a woman's risk for infections and irritation. It is recommended that women do not douche and that they allow the vagina to maintain its normal healthy population of protective microbial flora.

Ovaries

The **ovaries** are the female gonads. There are two, one at each entrance to the fallopian tube. They are each about 2 to 3 cm in length, about the size of an almond. The ovaries are located within the pelvic cavity. The ovary itself is attached to the uterus via the ovarian ligament. The ovarian stroma forms the bulk of the adult ovary. **Oocytes** develop within the outer layer of this stroma, each surrounded by supporting cells. This grouping of an oocyte and its supporting cells is called a **follicle**.

The Fallopian Tubes

The **fallopian tubes** are the conduit of the oocyte from the ovary to the uterus. Each of the two fallopian tubes is close to, but not directly connected to, the ovary.

- The isthmus is the narrow medial end of each uterine tube that is connected to the uterus.
- The wide distal infundibulum flares out with slender, finger-like projections called fimbriae.
- The middle region of the tube, called the **ampulla**, is where fertilization often occurs.

The fallopian tubes have three layers:

- An outer serosa
- A middle smooth muscle layer
- An inner mucosal layer

In addition to its mucus-secreting cells, the inner mucosa contains ciliated cells that beat in the direction of the uterus, producing a current that will be critical to moving the oocyte.

The Uterus and Cervix

The **uterus** is the muscular organ that nourishes and supports the growing embryo. Its average size is approximately 5 cm wide by 7 cm long, and it has three sections:

- The portion of the uterus superior to the opening of the uterine tubes is called the fundus.
- The middle section of the uterus is called the body of the uterus (or corpus).
- The cervix is the narrow inferior portion of the uterus that projects into the vagina.

The **cervix** produces mucus secretions that become thin and stringy under the influence of high systemic plasma estrogen concentrations, and these secretions can facilitate sperm movement through the reproductive tract.

The wall of the uterus is made up of three layers:

- **Perimetrium:** the most superficial layer and serous membrane.
- **Myometrium:** a thick layer of smooth muscle responsible for uterine contractions.
- **Endometrium:** the innermost layer containing a connective tissue lining covered by epithelial tissue that lines the lumen. It provides the site of implantation for a fertilized egg and sheds during menstruation if no egg is fertilized.

Physiology of the Female Reproductive System

Following ovulation, the fallopian tube receives the oocyte. Oocytes lack flagella and therefore cannot move on their own.

High concentrations of estrogen that occur around the time of ovulation induce contractions of the smooth muscle along the length of the fallopian tube. These contractions occur every 4 to 8 seconds, causing the oocyte to flow toward the uterus through the coordinated beating of the cilia that line the outside and lumen of the length of the fallopian tube which pulls the oocyte into the interior of the tube. Once inside, the muscular contractions and beating cilia move the oocyte slowly toward the uterus. When fertilization does occur, sperm typically meet the egg while it is still moving through the ampulla.

Watch this [video on ovulation from MedlinePlus](#) to observe ovulation and its initiation in response to the release of FSH and LH from the pituitary gland.

Media 10.2. Ovulation. From Betts, et al., 2013. Licensed under [CC BY 4.0](#).

The Menstrual Cycle

The three phases of the menstrual cycle are:

- The **menses phase** of the menstrual cycle is the phase during which reproductive hormone levels are low, the woman menstruates, and the lining is shed. The menses phase lasts between 2–7 days with an average of 5 days.
- The **proliferative phase** is when menstrual flow ceases and the endometrium begins to proliferate (regrow). During this phase, reproductive hormones are working in homeostasis to trigger ovulation on approximately day 14 of a typical 28-day menstrual cycle. Ovulation marks the end of the proliferative phase.
- The **secretory phase** is when the endometrial lining prepares for the implantation of a fertilized egg. If no pregnancy occurs within approximately 10–12 days, the endometrium will grow thinner and shed starting the first day of the next cycle.

Image Descriptions

Figure 15.1 image description: This figure shows the parts of the vulva. The right panel shows the external anterior view and the left panel shows the internal anterolateral view. The major parts are labeled (from top): prepuce, glans clitoris, labia minora, corpus cavernosum, bulb of vestibule, urethral opening, labia majora, vaginal opening, opening of right Bartholin's gland, Bartholin's glands, anus. [\[Return to Figure 15.1\]](#).

WORD PARTS AND STRUCTURAL TERMS

Combining Forms

arche/o: first, beginning

cervic/o: cervix

colp/o: vagina

endometri/o: endometrium

episi/o: vulva

gyn/o: woman

gynec/o: woman

hymen/o: hymen

hyster/o: uterus

mamm/o: breast

mast/o: breast

men/o: menstruation

metr/o: uterus

metr/i: uterus

oophor/o: ovary

pelv/i: pelvis, pelvic bones, pelvic cavity

perine/o: perineum

salping/o: uterine tube, fallopian tube

trachel/o: cervix

vagin/o: vagina

vulv/o: vulva

Prefixes

a-: absence of, without

an-: absence of, without

anti-: opposed to, against

dys-: painful, difficult, abnormal, labored

endo-: within

peri-: surrounding

poly-: much or many

Suffixes

-al: pertaining to

-atresia: occlusion, closure

-clesis: surgical closure

-ectomy: excision, surgical removal

-gram: record, image

-graphy: process of recording or imaging

-itis: inflammation

-logist: specialist or physician who studies and treats

-logy: study of

-osis: abnormal condition

-pexy: surgical fixation, suspension

-plasty: surgical repair

-rrhaphy: suturing, repairing

-rrhea: flow, discharge

-salpinx: uterine tube

-scope: instrument used for visual examination

-scopy: visually examining

-tomy: cut into, incision

Structural Terms Built from Word Parts

cervical: pertaining to the cervix

ovarian: pertaining to one or both ovaries

tubal: pertaining to one or both fallopian tubes

uterine: pertaining to the uterus

vaginal: pertaining to the vagina

vulval: pertaining to the vulva

Female Reproductive System Medical Terms

androgens: male hormones.

antiandrogens: a group of medications that counteract the effects of male hormones

contraception: intentional prevention of conception (pregnancy)

menarche: first menstrual period

oocyte: female gamete

ovulation: release of ovum from a mature Graafian follicle

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Word Parts

amenorrhea: absence of periods

Bartholin adenitis: inflammation of a Bartholin gland

cervicitis: irritation or infection of the cervix

colpitis: inflammation of the vagina

dysmenorrhea: painful periods

dyspareunia: painful intercourse

endocervicitis: inflammation of the cervical lining

endometriosis: a condition resulting from the appearance of endometrial tissue outside the uterus and causing pelvic pain

endometritis: inflammation of the uterine lining

hematosalpinx: blood in a fallopian tube

hydrosalpinx: fluid trapped within a swollen fallopian tube

hysteratresia: closure of the uterus

mastitis: inflammation of a breast or breast tissue

menometrorrhagia: heavy flow of blood, both during menstruation and between menstrual periods

menorrhagia: heavy flow of blood during menstruation

metrorrhagia: heavy flow of blood between menstrual periods

myometritis: inflammation of the myometrium

oligomenorrhea: infrequent or irregular periods

oophoritis: inflammation of one or both ovaries

perimetritis: inflammation of the perimetrium

polymenorrhea: excessive bleeding during one's period

pyosalpinx: pus in a fallopian tube

salpingitis: inflammation of one or both fallopian tubes

vaginitis: inflammation of the vagina

vulvovaginitis: inflammation of the vulva and vagina

Disease and Disorder Terms Not Built from Word Parts

acanthosis nigricans: a disorder that causes darkening and thickening of the skin on the neck, groin, underarms, or skin folds

adenomyosis: growth of endometrial tissue into the myometrium

breast cancer: a disease in which cells in the breast grow out of control

cervical cancer: a disease in which cells in the cervix grow out of control

ectopic pregnancy: a pregnancy in which the fetus develops outside of the uterus

fibrocystic breast disease: benign cysts that grow within breast tissue; can grow and shrink with different phases of the menstrual cycle

fibroid tumor: benign tumor of uterine muscle

fistula: abnormal passageway between two organs or an internal organ and the body surface

ovarian cancer: a disease in which cells in the ovary grow out of control

pelvic inflammatory disease: inflammation of the female reproductive tract usually caused by untreated gonorrhea or chlamydia; major cause of infertility and ectopic pregnancy

polycystic ovarian syndrome (PCOS): a hormonal disorder in which the ovaries produce an abnormal amount of androgens

prolapsed uterus: displacement of the uterus from its normal position

toxic shock syndrome: infection by certain *Staphylococcus aureus* strains in the vagina; can lead to sepsis and septic shock

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Careers & Professional Terminology

gynecologist: a physician who deals with the function and diseases specific to women's and girls' reproductive systems

gynecology: the study of the female reproductive system

obstetrician: a physician qualified to deliver children

obstetrics: the medical specialty concerned with childbirth

reproductive endocrinologist: a physician who has special training in the diagnosis and treatment of infertility

Imaging Techniques/Procedures for the Organ System

colposcope: device for viewing the vagina

endoscopy: process of viewing internally

hysterosalpingography: an x-ray exam of the uterus and fallopian tubes

laparoscopy: a surgical procedure in which a fiber-optic instrument is inserted through the abdominal wall to view the organs in the abdomen or to permit a surgical procedure

mammogram: an image obtained through mammography

mammography: a technique using x-rays to diagnose and locate tumors of the breasts

pelvic sonography: using ultrasound to visualize the pelvic organs, such as during pregnancy

transvaginal sonography: using an ultrasound wand inserted into the vagina to visualize the pelvic organs

Medical and Surgical Techniques/Procedures Used for the Organ System

cervicectomy: excision of all or part of the cervix

colpoplasty: surgical repair of the vagina

colporrhaphy: surgical suturing of the vagina

douching: washing the vagina with fluid

endometrial ablation: removal of endometrial tissue through use of a laser

episiotomy: surgical incision of the vulva

episiorrhaphy: surgical repair of the vulva

hysterectomy: surgical removal of the uterus

hysteropexy: surgical fixation of the uterus

hysterosalpingo-oophorectomy: excision of the uterus, uterine tubes, and ovaries

mammoplasty: surgical repair of the breast, particularly after a mastectomy

mastectomy: excision of breast(s) and or breast tissue

myomectomy: surgical removal of a fibroid tumor

oophorectomy: surgical removal of one or both ovaries

Papanicolaou smear (Pap smear): a smear method for examining cells that is used to detect cancers of the cervix

perineorrhaphy: surgical repair of the perineum

salpingectomy: surgical removal of one or both uterine tubes

salpingo-oophorectomy: surgical removal of one or both uterine tubes and ovaries

salpingostomy: creation of an opening within a fallopian tube

speculum: instrument for opening a body cavity to allow visual inspection

tubal ligation: surgical closure of the fallopian tubes for sterilization

Abbreviations Commonly Used with the Organ System

BC: birth control

Cx: cervix

D&C: dilation and curettage

FBD: fibrocystic breast disease

GYN: gynecology

HPV: human papillomavirus

HRT: hormone replacement therapy

HSG: hysterosalpingogram

IUD: intrauterine device

LAVH: laparoscopically assisted vaginal hysterectomy

PCOS: polycystic ovarian syndrome

PID: pelvic inflammatory disease

PMS: premenstrual syndrome

SGH: sonohysterography

TAH/BSO: total abdominal hysterectomy/bilateral salpingo-oophorectomy

TLH: total laparoscopic hysterectomy

TSS: toxic shock syndrome

TVH: total vaginal hysterectomy

TVS: transvaginal sonography

UAE: uterine artery embolization

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

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PRACTICE

The following activities will allow you to practice what you've learned in this chapter.

Female Reproductive Anatomy

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

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Medical Report—1

Click and drag each term from the word bank to its correct place in this exercise.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://louis.pressbooks.pub/medicalterminology/?p=2147#h5p-45>

Medical Report—2

Click and drag each term from the word bank to its correct place in this exercise.



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<https://louis.pressbooks.pub/medicalterminology/?p=2147#h5p-46>

Consultation Report

Click and drag each term from the word bank to its correct place in this exercise.



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<https://louis.pressbooks.pub/medicalterminology/?p=2147#h5p-47>

Vocabulary Reinforcement Activity

Click the term that correctly answers each question or completes each sentence.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://louis.pressbooks.pub/medicalterminology/?p=2147#h5p-48>

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PART XVI

EMBRYOLOGY, PREGNANCY, AND NEONATOLOGY

Learning Objectives

When completing this chapter, the learner will be able to do the following:

- Identify the common processes in obstetrics
- Describe the specialty of obstetrics
- Spell and pronounce the medical terms used in obstetrics and use correct abbreviations
- Identify the medical specialties associated with obstetrics and neonatology
- Explore common complications and procedures related to obstetrics and neonatology

Introduction

Obstetrics is a specialty that is concerned with the mother and fetus during pregnancy, childbirth, and the immediate postpartum period. Obstetricians study obstetrics and gynecology and are referred to as OB/GYNs (obstetrics and gynecology).

Watch this video:



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Media 16.1. [Reproductive System, Part 4—Pregnancy & Development: Crash Course A&P #43](#)
[Online video]. Copyright 2015 by [CrashCourse](#).

FERTILIZATION AND CHILDBIRTH

Fertilization

Fertilization occurs when a sperm and an oocyte (egg) combine. Because each of these reproductive cells is a **haploid** cell containing half of the genetic material needed to form a human being, their combination forms a **diploid** cell. This new single cell is called a **zygote**. Most of the time, a woman releases a single egg during an ovulation cycle. In approximately 1 percent of ovulation cycles, two eggs are released and both are fertilized. Two zygotes form, implant, and develop, resulting in the birth of **dizygotic** (or fraternal) twins. Because dizygotic twins develop from two eggs fertilized by two sperm, they are no more identical than siblings born at different times. Less common, one zygote can divide into two separate offspring during early development. This results in the birth of **monozygotic** (or identical) twins.

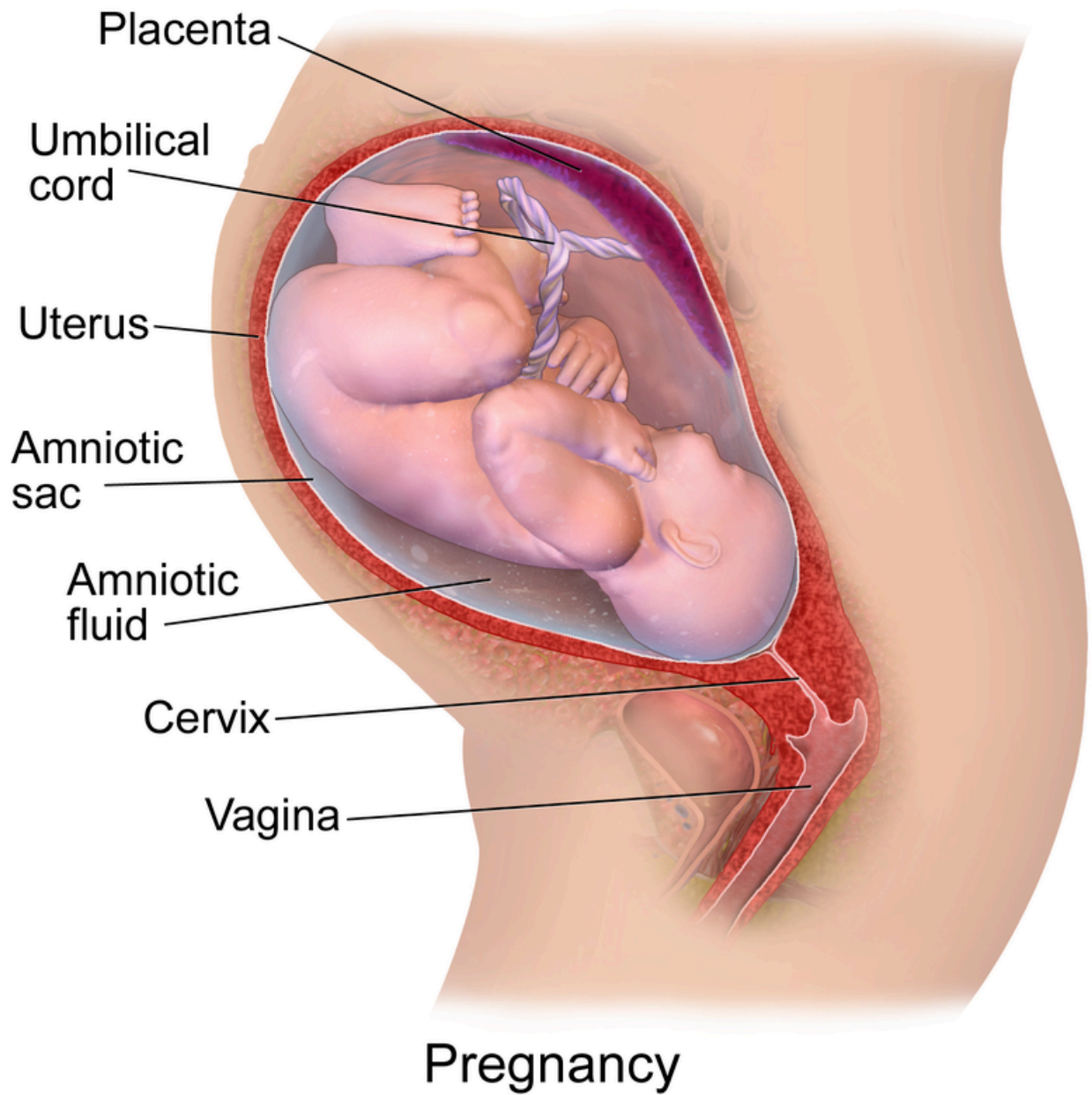


Figure 16.1 A gravid uterus and fetus during the last trimester of pregnancy. From Blausen.com staff, 2014. Licensed under [CC BY 3.0](https://creativecommons.org/licenses/by/3.0/). [\[Image description.\]](#)

Stages of Childbirth

The process of childbirth can be divided into three stages (see [Figure 16.2](#)):

1. Cervical dilation
2. Expulsion of the newborn
3. After birth

For vaginal birth to occur, the cervix must dilate fully to 10 cm in diameter, wide enough to deliver the newborn's head. The dilation stage is the longest stage of labor and typically takes 6–12 hours. However, it varies widely and may take minutes, hours, or days, depending in part on whether the mother has given birth before. In each subsequent labor, this stage tends to be shorter.

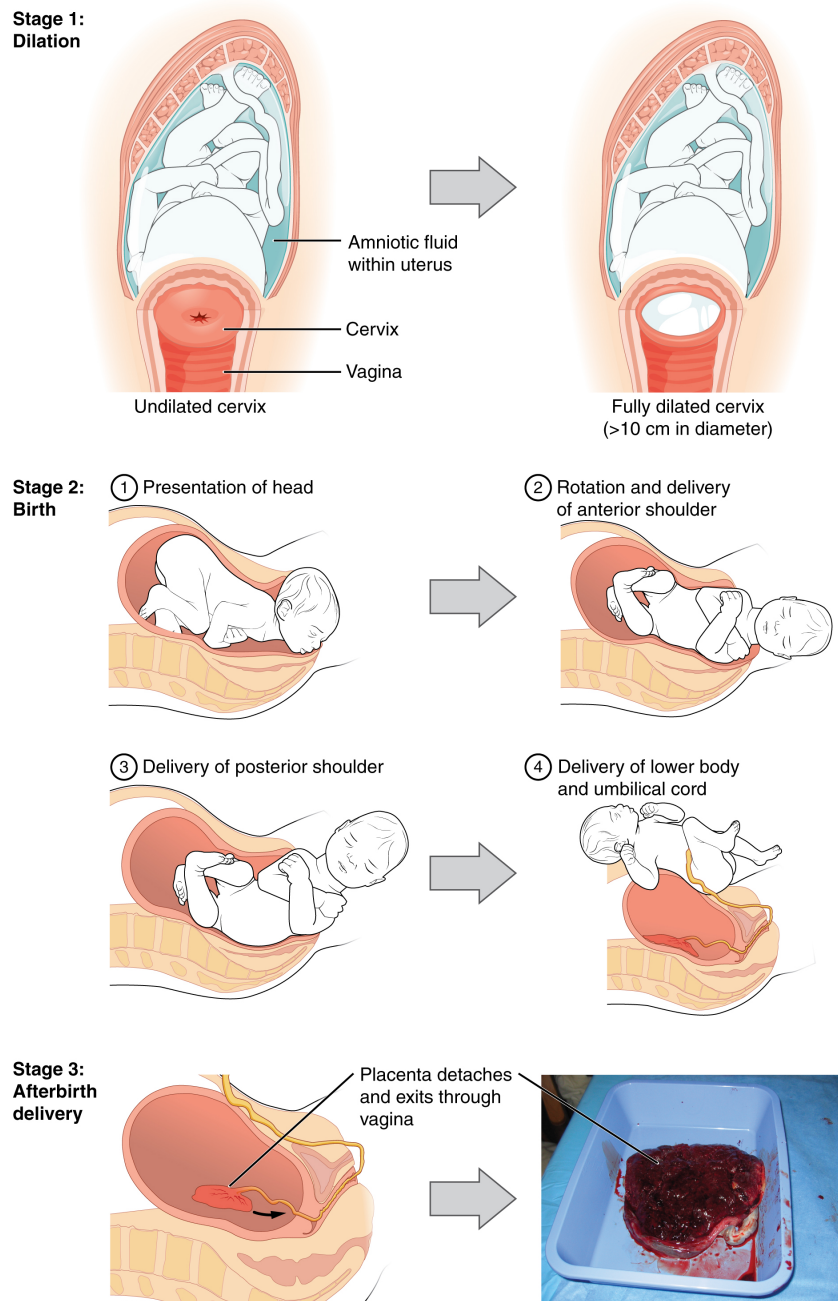


Figure 16.2 Stages of Childbirth. The stages of childbirth include Stage 1, early cervical dilation; Stage 2, full dilation and expulsion of the newborn; and Stage 3, delivery of the placenta and associated fetal membranes. (The position of the newborn’s shoulder is described relative to the mother.) From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [Image description.]

Homeostasis in the Newborn: Apgar Score

In the minutes following birth, a newborn must undergo dramatic systemic changes to be able to survive

outside the womb. An obstetrician, midwife, or nurse can estimate how well a newborn is doing by obtaining an Apgar score. The Apgar score was introduced in 1952 by the anesthesiologist Dr. Virginia Apgar as a method to assess the effects on the newborn of anesthesia given to the laboring mother. Health care providers now use it to assess the general well-being of the newborn, whether or not analgesics or anesthetics were used.

The five criteria—skin color, heart rate, reflex, muscle tone, and respiration—are assessed, and each criterion is assigned a score of 0, 1, or 2. Scores are taken at 1 minute after birth and again at 5 minutes after birth. Each time scores are taken, the five scores are added together. High scores (out of a possible 10) indicate the baby has made the transition from the womb well, whereas lower scores indicate that the baby may be in distress.

The technique for determining an Apgar score is quick and easy, is painless for the newborn, and does not require any instruments except for a stethoscope. A convenient way to remember the five scoring criteria is to apply the mnemonic APGAR:

1. Appearance (skin color)
2. Pulse (heart rate)
3. Grimace (reflex)
4. Activity (muscle tone)
5. Respiration

Of the five Apgar criteria, heart rate and respiration are the most critical. Poor scores for either of these measurements may indicate the need for immediate medical attention to resuscitate or stabilize the newborn. In general, any score lower than 7 at the 5-minute mark indicates that medical assistance may be needed. A total score below 5 indicates an emergency situation. Normally, a newborn will get an intermediate score of 1 for some of the Apgar criteria and will progress to a 2 by the 5-minute assessment. Scores of 8 or above are normal.

Image Descriptions

Figure 16.1 image description: This figure shows a gravid uterus and fetus during the last trimester of pregnancy. It shows the placenta, umbilical cord, uterus, amniotic sac, amniotic fluid, cervix, and vagina. [\[Return to Figure 16.1\].](#)

Figure 16.2 image description: This multi-part figure shows the different stages of childbirth. The top panel shows dilation of the cervix (undilated vs. fully dilated), the middle panel shows birth (presentation of the head, rotation and delivery of anterior shoulder, delivery of posterior shoulder, delivery of lower body and umbilical cord), and the bottom panel shows afterbirth delivery. [\[Return to Figure 16.2\].](#)

WORD PARTS AND OBSTETRIC & NEONATOLOGY TERMS

Combining Forms

amni/o: amnion, amniotic fluid

cephal/o: head

chori/o: chorion

embry/o: embryo

esophag/o: esophagus

fet/i: fetus, unborn offspring

fet/o: fetus, unborn offspring

gravid/o: pregnancy

lact/o: milk

nat/o: birth

omphal/o: umbilicus, navel

par/o, part/o: to bear, labor, childbirth, give birth to

prim/i: first

pseud/o: false

puerper/o: childbirth

pylor/o: pylorus, pyloric sphincter

terat/o: malformation

Prefixes

ante-: before

dys-: painful, labored, difficult

micro-: small

multi-: many

neo-: new

nulli-: none

post-: after

pre-: before

Suffixes

- a:** no meaning, noun ending
- al:** pertaining to (adjective)
- amnios:** amnion, amniotic fluid (noun)
- cyesis:** pregnancy (noun)
- e:** noun ending, no meaning
- gen:** substance that produced, agent that produced (noun)
- genic:** producing, originating, causing (adjective)
- graphy:** process of recording (noun)
- ic:** pertaining to (adjective)
- is:** noun suffix, no meaning
- itis:** inflammation (noun)
- logist:** specialist who studies and treats, physician who studies and treats (noun)
- logy:** study of (noun)
- oid:** resembling (adjective)
- oma:** tumor (noun)
- rrhea:** discharge, flow (noun)
- rrhexis:** rupture (noun)
- stenosis:** constriction, narrowing (noun)
- tocia:** birth, labor (noun)
- tomy:** incision, cut into (noun)
- um:** noun ending, no meaning
- us:** noun ending, no meaning

Obstetric and Neonatology Terms Built from Word Parts

- amniochorial:** pertaining to the amnion and chorion
- amniorrhoea:** flow of amniotic fluid
- amniotic:** pertaining to the amnion
- amniorrhexis:** rupture of the amnion
- antepartum:** before childbirth (referring to the gestational parent)

embryogenic: pertaining to producing an embryo

embryoid: resembling an embryo

embryonic: pertaining to the embryo

fetal: pertaining to the fetus

gravida: pregnant gestational parent

gravidopuerperal: pertaining to the time period around pregnancy and childbirth

intrapartum: occurring during labor or delivery

lactic: pertaining to milk

lactogenic: pertaining to milk production

lactorrhea: flow of milk

multigravida: a gestational parent who has had two or more pregnancies

multipara: a gestational parent who has given birth two or more times

natal: pertaining to birth

neonate: a newborn infant

neonatal: pertaining to a newborn infant

nulligravida: a gestational parent who has never been pregnant

nullipara: a gestational parent who has never given birth

para: a gestational parent who has given birth to an offspring after the point of viability, whether alive or stillborn

postpartum: pertaining to after childbirth (referring to the gestational parent)

prenatal: pertaining to before childbirth

primigravida: a gestational parent who is pregnant for the first time

primipara: a gestational parent who has given birth to their first offspring after the point of viability, whether alive or stillborn

puerpera: a gestational parent who has just given birth

puerperal: pertaining to a puerpera

puerperium: the time period between childbirth and when the reproductive organs return to normal (about six weeks)

teratogen: a substance capable of causing malformations in a developing embryo or fetus

teratogenic: pertaining to a teratogen

Obstetric and Neonatology Terms Not Built from Word Parts

breech presentation: when the full-term fetus is positioned with its feet or buttocks pointing down in the uterus

cephalic presentation: when the full-term fetus is positioned with its head pointing down in the uterus

embryo: the unborn child during weeks 5–10 of pregnancy

fetus: the unborn child beginning at week 11 of pregnancy

gestation: pregnancy

lactation: production of breastmilk

lochia: vaginal discharge consisting of blood, mucus, and uterine tissue that is shed for 4–6 weeks after childbirth

meconium: the first stool of a neonate

parturition: childbirth

premature infant: an infant born before 36 weeks' gestation

quickening: movement of the fetus in the uterus that can be felt by the gestational parent

zygote: the cell that forms when the genetic material of a sperm and an ovum combine during conception

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Word Parts

amenorrhea: lack of menstrual flow

amnionitis: inflammation of the amnion

chorioamnionitis: inflammation of the chorion and amnion

choriocarcinoma: a malignant cancer of the chorion

dystocia: excessive pain or discomfort during labor

hysterorrhexis: rupture of the uterus

microcephalus: an infant born with a smaller head circumference than normal

oligohydramnios: a smaller amount of amniotic fluid than normal

omphalitis: inflammation of the umbilical cord stump of the newborn

omphalocele: a congenital anomaly; herniation of the area around the umbilicus of the newborn

polyhydramnios: a greater amount of amniotic fluid than normal

pseudocyesis: false pregnancy

pyloric stenosis: a pyloric sphincter that is smaller than normal in the newborn; can cause projectile vomiting

tracheoesophageal fistula: a condition where the trachea and esophagus are joined together in the newborn

Disease and Disorder Terms Not Built from Word Parts

abruptio placentae: occurs when the placenta prematurely becomes detached from the uterine wall; this is a medical emergency and requires an immediate C-section

cephalopelvic disproportion: a condition where the infant's head is larger than the pelvic outlet and therefore will require a C-section

cleft lip / cleft palate: a congenital anomaly; an opening or fissure in the lip, hard palate, and/or soft palate

congenital anomaly: a defect present at birth

eclampsia: a very serious condition in pregnancy with hypertension; patients are at high risk of coma, convulsions, and even death

ectopic pregnancy: the embryo implants and starts developing in any other place but the inner uterine lining

erythroblastosis fetalis / hemolytic disease of the newborn: a condition where an Rh- gestational parent makes antibodies against an Rh+ fetus, leading to the destruction of the fetus's red blood cells and possible miscarriage, stillbirth, or severe anemia

fetal alcohol syndrome: a condition caused by the gestational parent drinking too much alcohol during pregnancy; leads to characteristic facial features and often developmental disabilities and personality changes as well

gastroschisis: a congenital anomaly in which the infant's intestines extend outside of the abdomen through a hole next to the umbilicus

gestational diabetes: the condition of developing diabetes during pregnancy; the newborn tends to be large at delivery, and the gestational parent is monitored closely for weight gain and glucose testing

gestational hypertension: a condition where there is an increase in blood pressure during pregnancy; blood pressure is monitored closely during pregnancy for the safety of the gestational parent and infant

hyperemesis gravidarum: excessive vomiting during pregnancy

meconium aspiration: when the fetus inhales meconium during delivery

placenta previa: when the placenta partially or completely covers the cervical os (opening)

preeclampsia: an abnormal condition in pregnancy where the patient experiences hypertension, edema, and proteinuria

respiratory distress syndrome: a common breathing disorder in premature infants where they are unable to produce enough surfactant in their lungs

spina bifida: a congenital anomaly in which there is incomplete closing of the spine and the membranes around the spinal cord during early development in pregnancy

stillbirth: when an infant is born dead

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Careers & Professional Terminology

doula: a trained non–health care professional who provides physical, emotional, and informational support to parents before, during, and after childbirth

lactation consultant: a health professional who helps new parents and infants with lactation and breastfeeding

midwife: a health professional who cares for mothers and newborns around childbirth

midwifery: the practice of being a midwife

neonatologist: a physician who specializes in newborn infant care

neonatology: the study or medical specialization of newborn care

obstetrician: a physician who specializes in delivering infants

obstetrics: the study or medical specialization of delivering infants

teratologist: a scientist or physician who specializes in abnormal fetal development

teratology: the study or medical specialization of abnormal fetal development

Imaging Techniques/Procedures for the Organ System

amnioscope: the device used to visually examine the amnion

amniocopy: the process of using an amnioscope to visually examine the amnion

pelvic sonography: visual examination of the pregnancy using ultrasound

Medical, Diagnostic, and Surgical Techniques/Procedures Used for the Organ System

abortion: a miscarriage or elective ending of a pregnancy

alpha-fetoprotein test: a test to measure the amount of alpha-fetoprotein, produced in the liver of the developing fetus, in the gestational parent’s blood

amniocentesis: a procedure that uses a needle to aspirate amniotic fluid for prenatal testing

artificial insemination: introducing semen into the vagina by mechanical/artificial means

cesarean section: delivery of a baby via abdominopelvic surgery

cephalic version: a procedure performed to turn a fetus from a breech or transverse presentation to a cephalic presentation prior to birth

cerclage: stitching the cervix to maintain a pregnancy

chorionic villus sampling: a biopsy taken of a chorionic villus for prenatal testing

dilation & curettage: dilating the cervix and scraping the uterine wall; used after a miscarriage or for obtaining tissue samples for testing purposes

episiotomy: a cut made in the vulva to facilitate a vaginal delivery

gamete intrafallopian transfer: injection of sperm cells and oocytes into a fallopian tube to aid in conception

induction: a medical process that causes labor to begin

in vitro fertilization: fertilization of oocytes with sperm that takes place in a Petri dish (see Figure 16.3)

intrauterine insemination: injecting washed semen directly into the uterus to aid in conception

non-stress test: test to measure fetal heart rate and movement in the latter stages of pregnancy

vaginal birth after cesarean section: delivering a baby vaginally after having a previous cesarean section

zygote intrafallopian transfer: injection of a zygote into a fallopian tube, after which implantation in the uterus may occur (see [Figure 16.3](#))

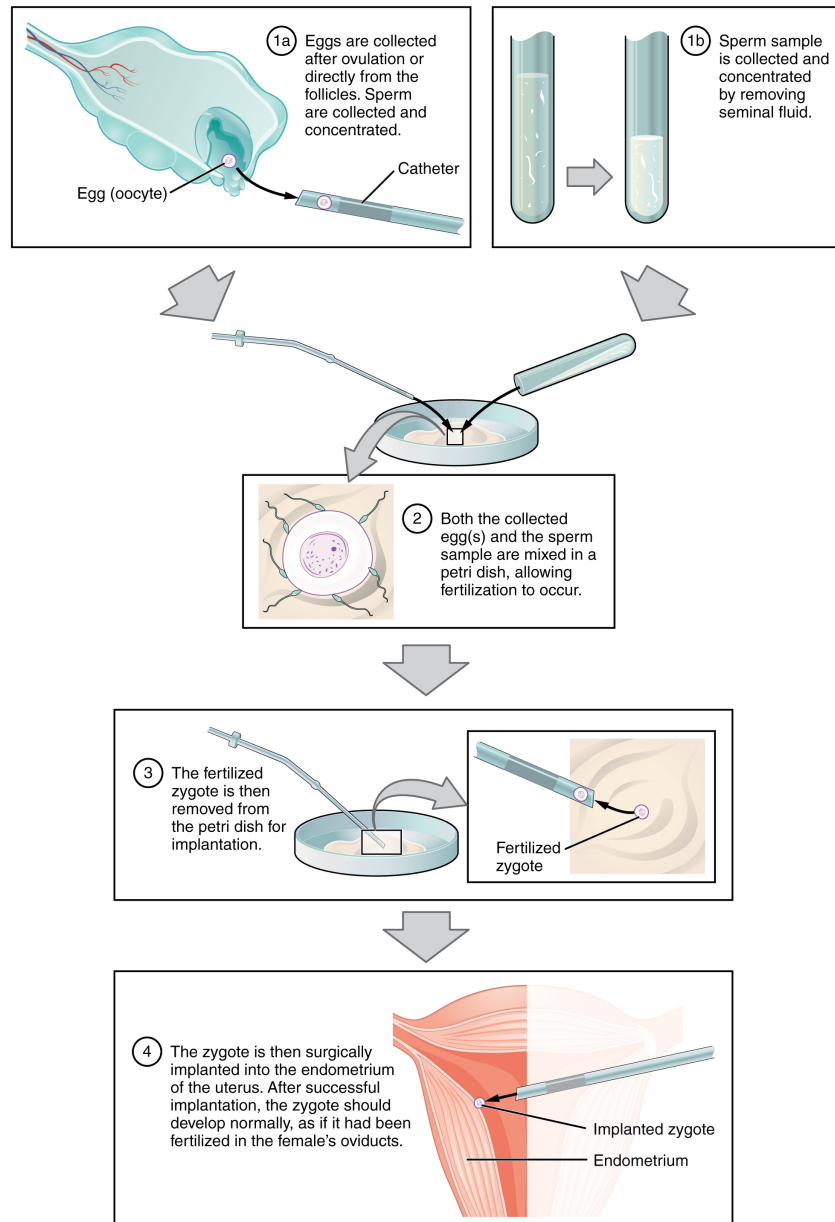


Figure 16.3 IVF. In vitro fertilization involves egg collection from the ovaries, fertilization in a petri dish, and the transfer of embryos into the uterus. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Abbreviations Commonly Used with the Organ System

AB: abortion

AFP: alpha-fetoprotein test

AI: artificial insemination

CS, C-section: cesarean section
CVS: chorionic villus sampling
D&C: dilation and curettage
DOB: date of birth
EDD: expected or estimated date of delivery
FAS: fetal alcohol syndrome
GIFT: gamete intrafallopian transfer
HDN: hemolytic disease of the newborn
HG: hyperemesis gravidarum
IUI: intrauterine insemination
IVF: in vitro fertilization
LMP: last menstrual period
multip: multipara
NB: newborn
OB: obstetrics
primip: primipara
RDS: respiratory distress syndrome
VBAC: vaginal birth after cesarean section
ZIFT: zygote intrafallopian transfer

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



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Image Descriptions

Figure 16.3 image description: This multi-part figure shows the different steps in in vitro fertilization. The

top panel shows how the oocytes and the sperm are collected and prepared. (text label reads: 1a) Eggs are collected after ovulation or directly from the follicles. Sperm are collected and concentrated. (text label reads: 1b) Sperm sample is collected and concentrated by removing seminal fluid. The next panel shows the sperm and oocytes being mixed in a petri dish. (text label reads: 2) Both the collected eggs and the sperm sample are mixed in a petri dish, allowing fertilization to occur. The panel below that shows the fertilized zygote being prepared for implantation. (text label reads: 3a) The fertilized zygote is then removed from the petri dish for implantation. (text label reads: 3b) Fertilized zygote. The last panel shows the fertilized zygote being implanted into the uterus. (text label reads: 4) The zygote is then surgically implanted into the endometrium of the uterus. After successful implantation, the zygote should develop normally, as if it had been fertilized in the female's oviducts. [\[Return to Figure 16.3\]](#)

PRACTICE

The following activities will allow you to practice what you've learned in this chapter.

Pathology Report

Click and drag each term from the word bank to its correct place in this exercise.



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Vocabulary Reinforcement Activity

Click the term that correctly answers each question or completes each sentence.



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<https://louis.pressbooks.pub/medicalterminology/?p=2151#h5p-54>

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PART XVII

EYE AND EAR

Learning Objectives

When completing this chapter, the learner will be able to do the following:

- Identify the anatomy of the eye and ear system
- Describe the main functions of the eye and ear
- Spell the eye and ear medical terms and use correct abbreviations
- Identify the medical specialties associated with the eye and ear (sight and sound)
- Explore common diseases, disorders, and procedures related to the eye and ear

Introduction

Two of the major senses are **hearing** and **sight**. However, these are not all of the senses. Within the realm of physiology, senses can be classified as either general or special. A general sense is one that is distributed throughout the body and has **receptor cells** within the structures of other organs. **Mechanoreceptors** in the skin, the muscles, or the walls of blood vessels are examples of this type. General senses often contribute to the sense of touch, which is most important to autonomic functions. A special sense is one that has a specific organ devoted to it—namely, the **eye** and **inner ear**.

VISION

Anatomy and Physiology of the Eye

Watch this video:



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://louis.pressbooks.pub/medicalterminology/?p=1438#oembed-1>

Media 17.1 [Vision: Crash Course A&P #18](#) [Online video]. Copyright 2015 by [CrashCourse](#).

Vision is the special sense of sight that is based on the transduction of light stimuli received through the eyes. The eyes are located within either orbit in the skull. The bony orbits surround the eyeballs, protecting them and anchoring the soft tissues of the eye (see [Figure 17.1](#)). The eyelids, with lashes at their leading edges, help to protect the eye from abrasions by blocking particles that may land on the surface of the eye.

The inner surface of each lid is a thin membrane known as the palpebral **conjunctiva**. The conjunctiva extends over the **sclera**, connecting the **eyelids** to the **eyeball**. Tears are produced by the lacrimal gland, located beneath the lateral edges of the nose. Tears produced by this gland flow through the lacrimal duct to the medial corner of the eye, where the tears flow over the conjunctiva, washing away foreign particles.

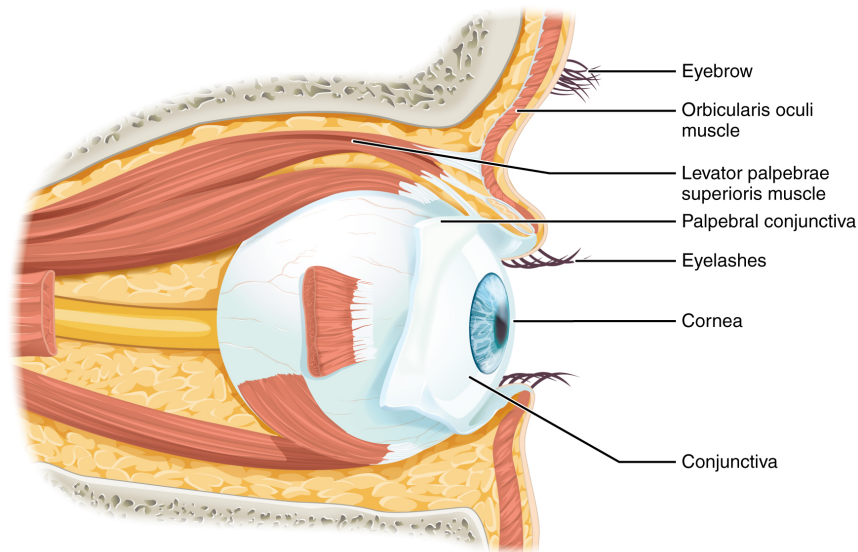


Figure 17.1 The Eye in the Orbit. The eye is located within the orbit and surrounded by soft tissues that protect and support its function. The orbit is surrounded by cranial bones of the skull. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Movement of the eye within the orbit is accomplished by the contraction of six extraocular muscles that originate from the bones of the orbit and insert into the surface of the eyeball. Four of the muscles are arranged at the cardinal points around the eye and are named for those locations:

- superior rectus
- medial rectus
- inferior rectus
- lateral rectus

When each of these muscles contract, the eye moves toward the contracting muscle. For example, when the superior rectus contracts, the eye rotates to look up.

Tissue Layers

The eye itself is a hollow sphere composed of three layers of tissue.

The **outermost layer** is the fibrous tunic, which includes the white sclera and clear **cornea**. The sclera accounts for five-sixths of the surface of the eye, most of which is not visible, though humans are unique compared with many other species in having so much of the “white of the eye” visible (see [Figure 17.2](#)). The transparent cornea covers the anterior tip of the eye and allows light to enter the eye.

The **middle layer** of the eye is the vascular tunic, which is mostly composed of the **choroid, ciliary body,**

and **iris**. The choroid is a layer of highly vascularized connective tissue that provides a blood supply to the eyeball. The choroid is posterior to the ciliary body, a muscular structure that is attached to the lens by zonule fibers. These two structures bend the lens, allowing it to focus light on the back of the eye. Overlaying the ciliary body, and visible in the anterior eye, is the iris—the colored part of the eye. The iris is a smooth muscle that opens or closes the **pupil**, which is the hole at the center of the eye that allows light to enter. The iris constricts the pupil in response to bright light and dilates the pupil in response to dim light.

The **innermost layer** of the eye is the neural tunic, or **retina**, which contains the nervous tissue responsible for photoreception.

Cavities

The eye is also divided into two cavities: the **anterior cavity** and the **posterior cavity**.

The anterior cavity is the space between the cornea and lens, including the iris and ciliary body. It is filled with a watery fluid called the **aqueous humor**.

The posterior cavity is the space behind the lens that extends to the posterior side of the interior eyeball, where the retina is located. The posterior cavity is filled with a more viscous fluid called the **vitreous humor**.

Retina

The retina is composed of several layers and contains specialized cells for the initial processing of visual stimuli. The **photoreceptors (rods and cones)** change their membrane potential when stimulated by light energy. There are no photoreceptors at the very back of the eye, where the optic nerve begins. This creates a “blind spot” in the retina and a corresponding blind spot in our visual field.

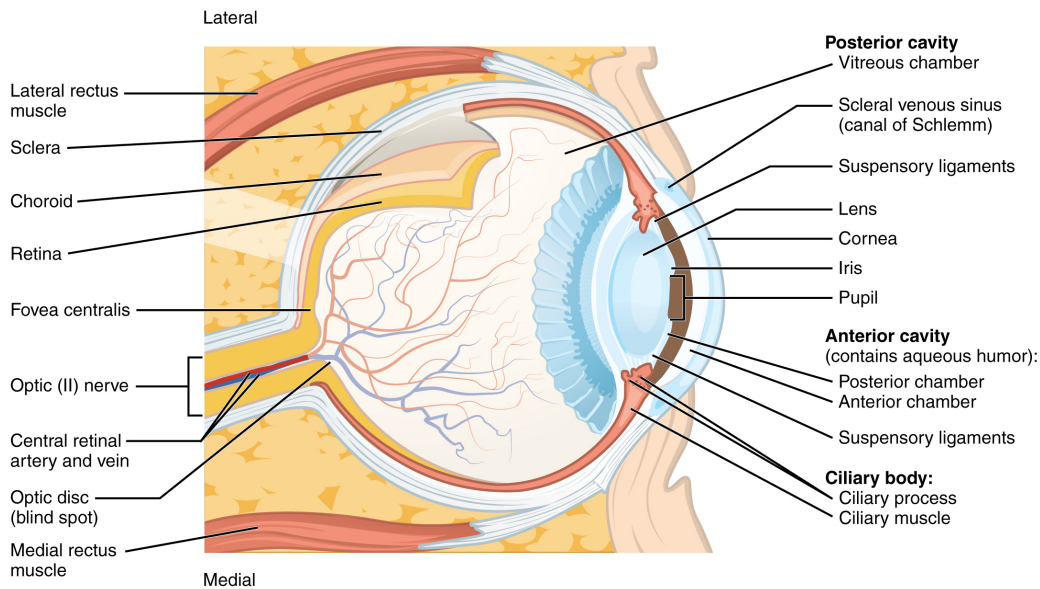


Figure 17.2 Structure of the Eye. The sphere of the eye can be divided into anterior and posterior chambers. The wall of the eye is composed of three layers: the fibrous tunic, vascular tunic, and neural tunic. Within the neural tunic is the retina, with three layers of cells and two synaptic layers in between. The center of the retina has a small indentation known as the fovea. From Betts, et al., 2013. Licensed under [CC BY 4.0](#). [\[Image description.\]](#)

Photoreceptors in the retina (rods and cones) are located behind the axons, RGCs (retinal ganglion cell), bipolar cells, and retinal blood vessels. A significant amount of light is absorbed by these structures before the light reaches the photoreceptor cells. At the exact center of the retina is a small area known as the **fovea**. At the fovea, the retina lacks the supporting cells and blood vessels and only contains photoreceptors. Therefore, **visual acuity** is greatest at the fovea. This is because the fovea is where the least amount of incoming light is absorbed by other retinal structures. As one moves in either direction from this central point of the retina, visual acuity drops significantly.

Image Descriptions

Figure 17.1 image description: This diagram shows the lateral view of the eye. The major parts are labeled. Labels read (from top): eyebrow, orbicularis oculi muscle, levator palpebrae superioris muscle, palpebral conjunctiva, eyelashes, cornea, conjunctiva. [\[Return to Figure 17.1\].](#)

Figure 17.2 image description: This diagram shows a lateral and medial view of the eyeball. The major parts are labeled. Labels read (from top, clockwise): posterior cavity (vitreous chamber, scleral venous sinus (canal of Schlemm), suspensory ligaments, lens, cornea, iris, pupil); anterior cavity (contains aqueous humor, posterior chamber, anterior chamber, suspensory ligaments); Ciliary body (ciliary process and muscle), medial

rectus muscle, optic disc (blind spot), central retinal artery and vein, fovea centralis, retina, choroid, sclera, lateral rectus muscle. [\[Return to Figure 17.2\].](#)

AUDITION

Anatomy and Physiology of the Ear

Watch this video:



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://louis.pressbooks.pub/medicalterminology/?p=1570#oembed-1>

Media 17.2 [Hearing & Balance: Crash Course A&P #17](#) [Online video]. Copyright 2015 by [CrashCourse](#).

Hearing, or **audition**, is the transduction of sound waves into a neural signal that is made possible by the structures of the ear (see [Figure 17.3](#)).

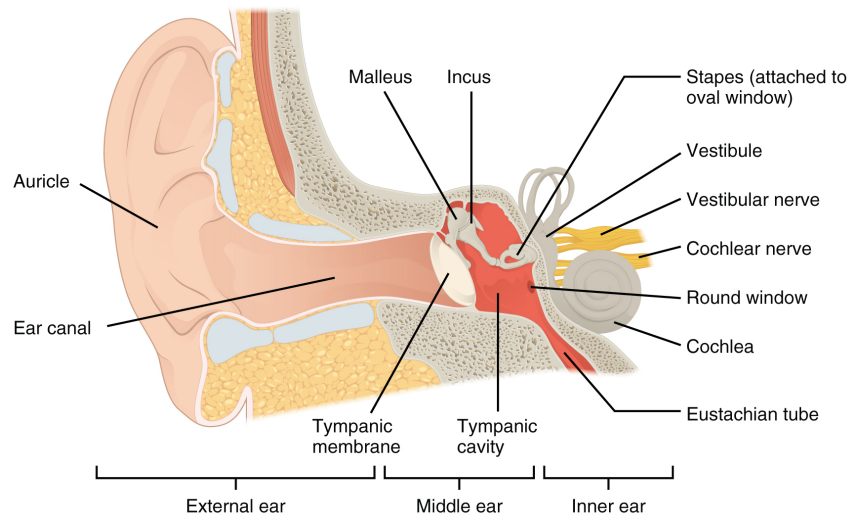


Figure 17.3 Structures of the Ear. The external ear contains the auricle, ear canal, and tympanic membrane. The middle ear contains the ossicles and is connected to the pharynx by the Eustachian tube. The inner ear contains the cochlea and vestibule, which are responsible for audition and equilibrium, respectively. From Betts, et al., 2013. Licensed under [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/). [\[Image description.\]](#)

Structure of the Ear

The structure of the ear can be divided into three parts:

The **external ear** consists of the **auricle**, sometimes referred to as the **pinna**, and the **ear canal**. The C-shaped curves of the auricle direct sound waves toward the auditory canal. This canal enters the skull through the external auditory meatus of the temporal bone. At the end of the auditory canal is the **tympanic membrane**, a structure that vibrates when struck by sound waves and separates the ear canal from the middle ear space.

The **middle ear** consists of the **ossicles**, the **oval window**, and the **Eustachian tube**. The three ossicles are the **malleus**, **incus**, and **stapes**, which are Latin names that roughly translate to hammer, anvil, and stirrup. The malleus is attached to the tympanic membrane on one end and articulates with the incus on the other. The incus, in turn, articulates with the stapes. The stapes is then attached to the inner ear, where the sound waves are transduced into a neural signal. Vibrations of the ossicles travel through the **oval window**, moving fluid in a wave-like motion. The frequencies of the fluid waves match the frequencies of the sound waves. The middle ear is connected to the pharynx through the **Eustachian tube**, which helps equilibrate air pressure across the tympanic membrane. The tube is normally closed but will pop open when the muscles of the pharynx contract during swallowing or yawning.

The **inner ear** is often described as a **bony labyrinth**, as it is composed of a series of canals embedded within the temporal bone. It consists of the **cochlea**, which is responsible for hearing, and the **vestibule**, which is responsible for balance. The neural signals from these two regions are relayed to the **brain stem** through

separate fiber bundles. However, these two distinct bundles travel together from the **inner ear** to the brain stem as the **vestibulocochlear nerve**. Sound is transduced into neural signals within the **cochlear** region of the inner ear, which contains the sensory neurons of the spiral ganglia. These ganglia are located within the spiral-shaped cochlea of the inner ear.

Image Descriptions

Figure 17.3 image description: This image shows the structure of the ear with the major parts labeled. The ear is divided up into 3 parts from left to right: external ear, middle ear, and inner ear. Labels for each part read: external ear (auricle, ear canal), middle ear (tympanic membrane, malleus, incus, tympanic cavity), inner ear (stapes, vestibule, vestibular nerve, cochlear nerve, cochlea, round window, eustachian tube). [\[Return to Figure 17.3\]](#).

WORD PARTS AND STRUCTURAL TERMS

Combining Forms

Eye

blephar/o: eyelid

conjunctiv/o: conjunctiva

cor/o: pupil

core/o: pupil

corne/o: cornea

dacry/o: tear, tear duct

dipl/o: two, double

ir/o: iris

irid/o: iris

is/o: equal

kerat/o: cornea

lacrim/o: tear, tear duct

leuk/o: white

myc/o: fungus

ocul/o: eye

ophthalm/o: eye

opt/o: vision

phac/o, phak/o: lens

phot/o: light

presby/o: old age

pupill/o: pupil

retin/o: retina

scler/o: sclera

ton/o: pressure, tension

xer/o: dry

Ear

audi/o: hearing

aur/o, aur/i: ear

cochle/o: cochlea

labyrinth/o: labyrinth, inner ear

mastoid/o: mastoid bone

myring/o: tympanic membrane, eardrum

ot/o: ear

staped/o: stapes, middle ear

tympan/o: can mean tympanic membrane, but usually means middle ear

vestibul/o: vestibular system—responsible for the sense of balance

Prefixes

a-, an-: absence of, without, no, not; negates meaning

bi-, bin-: two

endo-: within, in

pseudo-: false

Suffixes

-al: pertaining to (adjective)

-algia: pain (noun)

-ar: pertaining to (adjective)

-ary: pertaining to (adjective)

-ectomy: excision or surgical removal (noun)

-eal: pertaining to (adjective)

-gram: record, radiographic image (noun)

-graphy: process of recording (noun)

-ia: condition of, diseased or abnormal state (noun)

-ic: pertaining to (adjective)

-itis: inflammation (noun)

-logist: specialist or physician who studies and treats (noun)

-logy: study of (noun)

- malacia**: softening (noun)
- meter**: instrument used to measure (noun)
- metry**: process of measuring (noun)
- oma**: tumor, swelling (noun)
- opia**: vision, as it relates to a condition (noun)
- osis**: abnormal condition (noun)
- ptosis**: prolapse, drooping, sagging (noun)
- pathy**: disease (noun)
- pexy**: surgical fixation (noun)
- phobia**: abnormal fear, aversion to specific things, intense fear or dislike (noun)
- plasty**: surgical repair (noun)
- plegia**: paralysis (noun)
- rrhea**: flow, discharge (noun)
- sclerosis**: hardening (noun)
- scope**: instrument used to view (noun)
- scopy**: process of viewing (noun)
- stenosis**: abnormal narrowing (noun)
- stomy**: creation of artificial opening (noun)
- tomy**: incision, cut into (noun)

Structural/Functional Terms Built from Word Parts

Eye Terms

- binocular**: pertaining to both eyes
- corneal**: pertaining to the cornea
- emmetropia**: normal refractive condition of the eye
- intraocular**: pertaining to within the eye
- lacrimal**: pertaining to the tear duct
- nasolacrimal**: pertaining to the nose and tear ducts
- ocular**: pertaining to the eye
- ophthalmic**: pertaining to the eye
- optical**: pertaining to the sense of vision
- pupillary**: pertaining to the pupil
- retinal**: pertaining to the retina
- visual acuity**: sharpness of vision

Ear Terms

aural: pertaining to the ear

auricular: pertaining to the ear

cochlear: pertaining to the cochlea

vestibular: pertaining to the vestibule or the sense of balance

vestibulocochlear: pertaining to the vestibule and cochlea

DISEASES AND DISORDERS

Disease and Disorder Terms Built from Word Parts

Eye Terms

- anisocoria:** condition of absence of equal pupil size
- aphakia:** condition of the absence of a lens
- blepharitis:** inflammation of eyelid
- blepharoptosis:** drooping of the eyelid
- conjunctivitis:** inflammation of the conjunctiva; pinkeye
- dacryocystitis:** inflammation of the tear (lacrimal) sac
- dacryostenosis:** abnormal narrowing of a tear duct; blocked tear duct
- diplopia:** double vision
- endophthalmitis:** inflammation inside of the eye
- iridoplegia:** paralysis of the iris
- iritis:** inflammation of the iris
- keratitis:** inflammation of the cornea
- keratomalacia:** softening of the cornea
- leukocoria:** condition of having a white pupil
- oculomycosis:** fungal disease of the eye
- ophthalmalgia:** pain in the eye
- ophthalmopathy:** disease of the eye
- ophthalmoplegia:** paralysis of the eye
- phacomalacia:** softening of the lens
- photophobia:** sensitivity to light
- pseudophakia:** the condition of having a false lens (after cataract surgery)
- retinoblastoma:** malignant tumor of retina
- retinopathy:** disease of the retina
- sclerokeratitis:** inflammation of the sclera and cornea
- scleromalacia:** softening of the sclera
- xerophthalmia:** dry eye

Ear Terms

- labyrinthitis:** inflammation of the inner ear
- mastoiditis:** inflammation of the mastoid process
- myringitis:** inflammation of the tympanic membrane
- otalgia:** pain in the ear
- otomastoiditis:** inflammation of the ear and mastoid bone
- otomycosis:** fungus in the ear
- otopyorrhea:** pus discharge from the ear
- otorrhea:** any discharge from the ear
- otosclerosis:** hardening of the stapes bone
- tympanitis:** inflammation of the middle ear

Disease and Disorder Terms Not Built from Word Parts

Eye Terms

- amblyopia:** “lazy eye”; an eye that is not facing the same direction as the other eye
- astigmatism:** irregular curvature of a cornea or lens
- blindness:** lack of vision
- cataract:** cloudiness of a lens
- chalazion:** obstruction of an oil gland in an eyelid
- diabetic retinopathy:** disease of the retina due to diabetes complications
- glaucoma:** increased pressure within the eye
- hyperopia:** farsightedness; near objects look blurred but distant objects are more clearly visible
- macular degeneration:** loss or blurring of central vision due to deterioration of the central portion of the retina
- myopia:** nearsightedness; near objects are clear but far objects are not
- nyctalopia:** night blindness
- nystagmus:** involuntary jerking movement of the eyes
- ophthalmia neonatorum:** conjunctivitis in newborns
- pinguecula:** yellow mass on the conjunctiva
- presbyopia:** age-related loss of near vision
- pterygium:** thin tissue growing into the conjunctiva from the cornea; “eyeweb”

retinal detachment: when a retina separates partially or totally from the underlying chorion

strabismus: crossed eyes or eyes looking in different directions

sty: acute infection of eyelash hair follicle

Ear Terms

acoustic neuroma: a benign tumor in the internal auditory canal

ceruminoma: tumor of the ceruminous (earwax) gland

cholesteatoma: abnormal growth of skin in the middle ear

conductive hearing loss: occurs when there is a problem transferring sound waves anywhere along the pathway through the outer ear, tympanic membrane, or middle ear

Meniere disease: inflammation of the vestibulocochlear nerve; leads to vertigo and hearing loss

otitis externa: inflammation of the outer ear

otitis media: inflammation of the middle ear

presbycusis: hearing loss that takes place in old age

sensorineural hearing loss: hearing loss in which the root cause lies in the inner ear or the vestibulocochlear nerve

tinnitus: ringing or buzzing sound in the ears

vertigo: severe dizziness

MEDICAL, SURGICAL, & VIEWING TERMS AND ABBREVIATIONS

Medical Careers & Professional Terminology

Eye Terms

ophthalmologist: physician who can diagnose, treat, and manage eye diseases

ophthalmology: study of the eye

optician: medical specialist who fills prescriptions for lenses

optometrist: health professional who prescribes corrective lenses

optometry: the measurement of visual acuity

Ear Terms

audiologist: a medical specialist who studies hearing and hearing disorders

audiology: study of hearing

otologist: physician who diagnoses and treats ear diseases

otology: study of ear diseases

otorhinolaryngologist: physician who diagnoses and treats diseases and disorders of the ears, nose, and throat

Imaging/Audiology Techniques/Procedures for the Organ System

Eye Techniques/Procedures

keratometer: instrument used to measure the curvature of the eye

miotic: an agent that causes the pupil to constrict

mydriatic: an agent that causes the pupil to dilate

ophthalmoscope: instrument used to view the eye

ophthalmoscopy: visual exam of the eye

optometry: measuring vision

pupillometer: instrument that measures pupil diameter

pupilloscope: instrument used for visual examination of the pupil

retinoscopy: process of viewing the retina

tonometer: instrument that measures intraocular pressure

tonometry: the measurement of intraocular pressure

Ear Techniques/Procedures

audiogram: graphic record of hearing

audiometry: the process of measuring hearing

electrocochleography: process of recording the electrical activity in the cochlea

otoscope: instrument used to visually examine the ear

otoscopy: the process of visual examination of the ear

tympanometer: instrument used to measure the middle ear

tympanometry: measurement of the tympanic membrane

Medical and Surgical Techniques/Procedures Used for the Organ System

Eye Techniques/Procedures

blepharoplasty: surgical repair of eyelid

cryoretinopexy: surgical fixation of the retina using extreme cold

dacryocystorhinostomy: creation of an artificial opening between the lacrimal sac and the nose (to restore drainage)

enucleation: surgical removal of an eyeball

intraocular lens: an artificial lens implanted in the eye during cataract surgery

iridectomy: excision of part of an iris

iridotomy: incision into the iris

keratoplasty: surgical repair of the cornea

LASIK (laser-assisted in situ keratomileusis): reshaping the cornea with a laser to correct vision problems

phacoemulsification: removal of a cataract with an ultrasonic needle probe

photorefractive keratectomy: using a laser to flatten the cornea to correct nearsightedness

scleral buckling: surgical procedure to repair a detached retina

sclerotomy: incision into the sclera

trabeculectomy: surgical creation of a drain to reduce intraocular pressure in glaucoma

vitrectomy: surgical removal of all or part of the vitreous humor

Ear Techniques/Procedures

cochlear implant: surgically implanted device that partially restores hearing

labyrinthectomy: excision of the inner ear (labyrinth)

mastoidectomy: excision of the air cells of the mastoid process

mastoidotomy: incision into the mastoid process

myringoplasty: surgical repair of the tympanic membrane

myringotomy: incision in the tympanic membrane

stapedectomy: excision of the stapes bone (to be replaced with a prosthetic bone)

tympanoplasty: surgical repair of the eardrum and ossicles

Abbreviations Commonly Used with the Organ System

Eye Abbreviations

ARMD: age-related macular degeneration

Ast: astigmatism

Em: emmetropia

IOL: intraocular lens

IOP: intraocular pressure

LASIK: laser-assisted in situ keratomileusis

Ophth: ophthalmology

PHACO: phacoemulsification

PRK: photorefractive keratectomy

VA: visual acuity

Ear Abbreviations

AOM: acute otitis media

ENT: ears, nose, throat

EENT: eyes, ears, nose, and throat

OM: otitis media

Medical Terms Practice

For each card, click the speaker icon to hear the correct pronunciation of the listed term. Practice saying the term to yourself, then attempt to define the term from memory. Click “Turn” to flip the card and see the definition. Use the right and left arrows to toggle through the cards in each set.



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<https://louis.pressbooks.pub/medicalterminology/?p=1577#h5p-99>

PRACTICE

The following activities will allow you to practice what you've learned in this chapter.

Ear Anatomy Labeling Activity

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



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Eye Anatomy Labeling Activity—1

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



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Eye Anatomy Labeling Activity—2

Click and drag each term to the box corresponding with the anatomic structure, body part, body plane, or body region for that term.



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<https://louis.pressbooks.pub/medicalterminology/?p=2154#h5p-102>

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APPENDIX A: CHECKLIST FOR ACCESSIBILITY

This title has been reviewed to meet these accessibility practices:

Organizing Content

- Content is organized under headings and subheadings.
- Headings and subheadings are used sequentially (e.g., Heading 1, Heading 2).

Images

- Images that convey information include alternative text (alt text) descriptions of the image's content or function.
- Graphs, charts, and maps also include contextual or supporting details in the text surrounding the image.
- Images do not rely on color to convey information.
- Images that are purely decorative do not have alt text descriptions. (Descriptive text is unnecessary if the image doesn't convey contextual content information.)

Links

- The link text describes the destination of the link and does not use generic text such as “click here” or “read more.”
- If a link will open or download a file (like a PDF or Excel file), a textual reference is included in the link information (e.g., [PDF]).
- Links do not open in new windows or tabs.
- If a link must open in a new window or tab, a textual reference is included in the link information (e.g., [NewTab]).
- For citations and references, the title of the resource is hyperlinked, and the full URL is not hyperlinked.

Tables

- Tables are used to structure information and not for layout.
- Tables include row and column headers.
- Row and column headers have the correct scope assigned.
- Tables include a caption.
- Tables avoid merged or split cells.
- Tables have adequate cell padding.

Multimedia

- All audio content includes a transcript. The transcript includes all speech content and relevant descriptions of non-speech audio and speaker names/headings where necessary.
- Videos have captions of all speech content and relevant non-speech content that has been edited by a human for accuracy.
- All videos with contextual visuals (graphs, charts, etc.) are described audibly in the video.

Formulas

- Equations written in plain text use proper symbols (i.e., $-$, \times , \div).¹
- For complex equations, one of the following is true:
 - They were written using LaTeX and are rendered with MathJax (Pressbooks).
 - They were written using Microsoft Word's equation editor.
 - They are presented as images with alternative text descriptions.
- Written equations are properly interpreted by text-to-speech tools.²

Font Size

- Font size is 12 point or higher for body text in Word and PDF documents.
- Font size is 9 point for footnotes or endnotes in Word and PDF documents.

1. For example, a hyphen (-) may look like a minus sign ($-$), but it will not be read out correctly by text-to-speech tools.

2. Written equations should prioritize semantic markup over visual markup so text-to-speech tools will read out an equation in a way that makes sense to auditory learners. This applies to both equations written in LaTeX and equations written in Microsoft Word's equation editor.

- Font size can be enlarged by 200 percent in webbook or ebook formats without needing to scroll side to side.

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