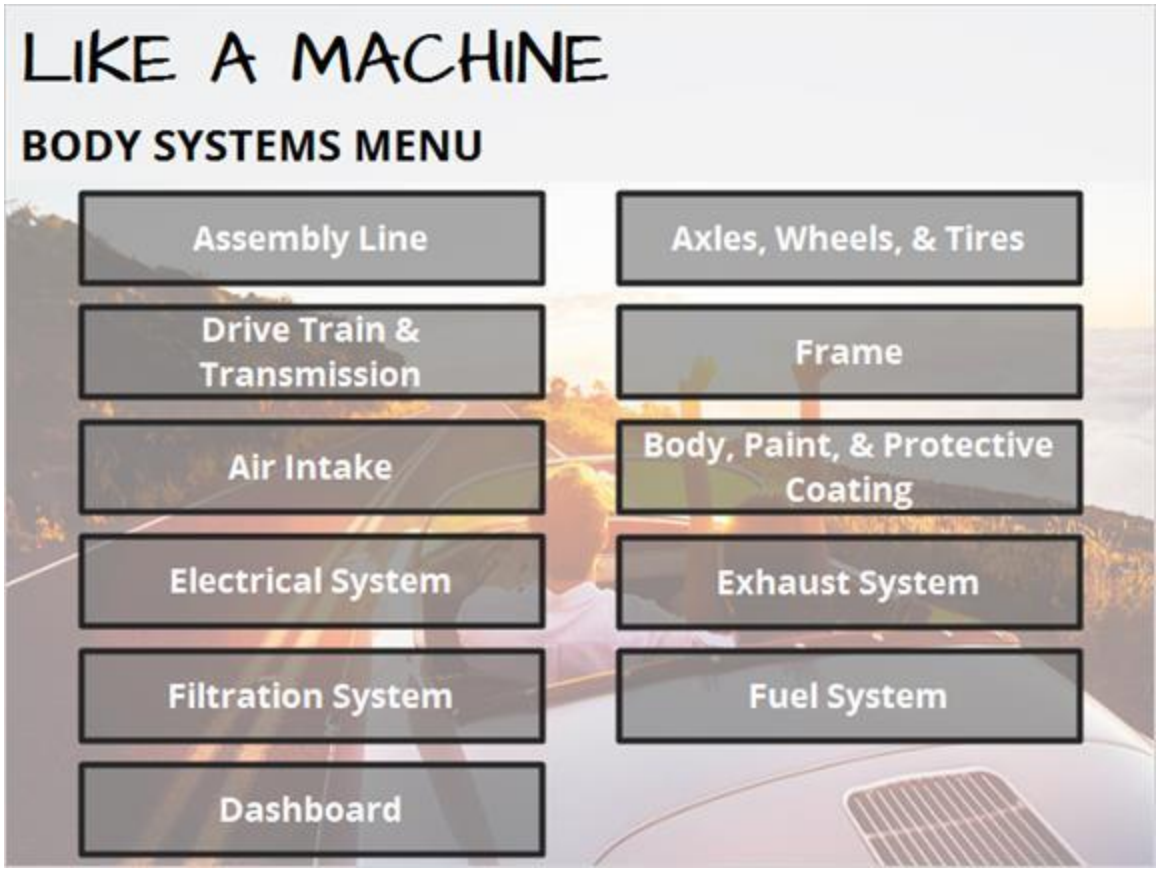
Module 1: The Perfect Machine
Topic 1 Content: Like a Machine – The Human Body and a Car

Introduction

In this interactivity you will explore how the human body is similar to a car. Click the ***NEXT*** button to begin.

Module 1: The Perfect Machine
Topic 1 Content: Like a Machine – The Human Body and a Car

Menu



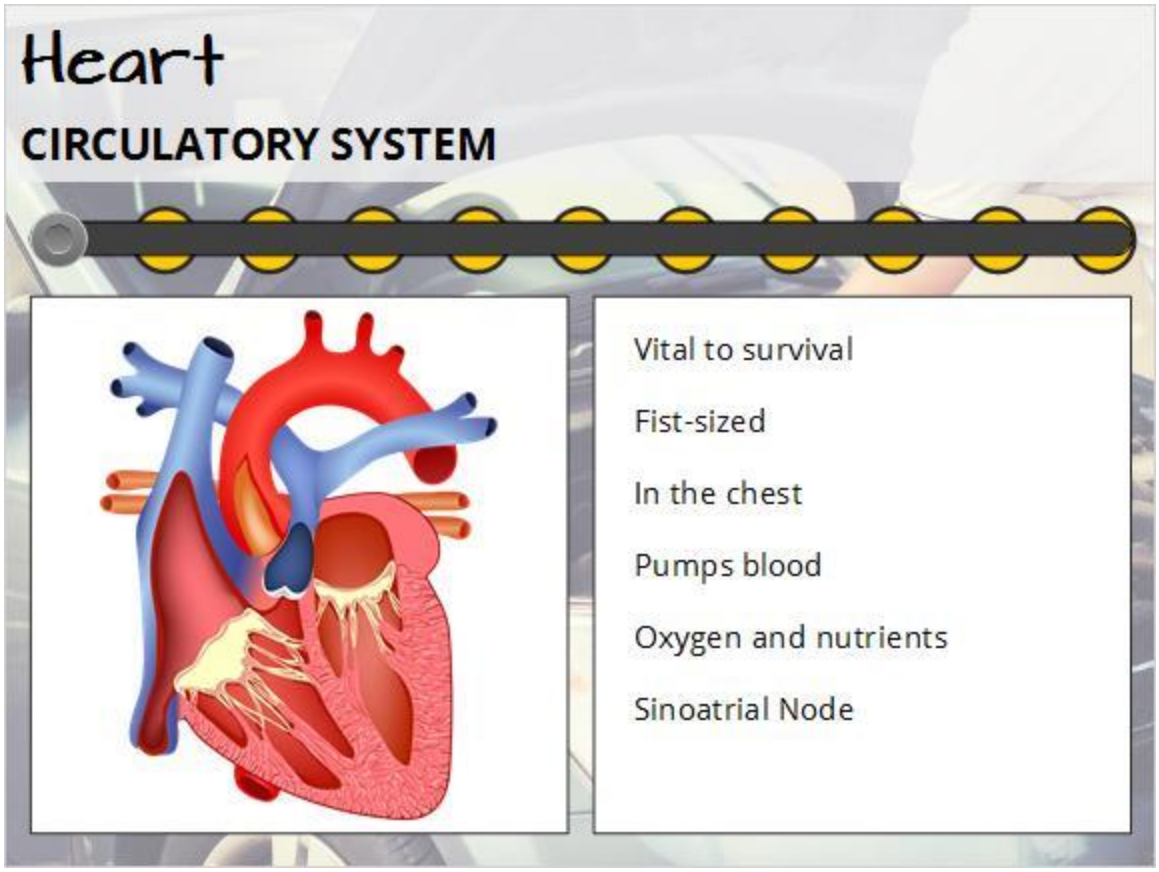
Click each button to explore how the human body is like a machine. Return to this menu once you have completed a body system.

Circulatory System

Like the drive train and transmission on an automobile, the circulatory system is the driving force for the body. This body system delivers oxygen and nutrients to various parts of the body to support their functions.

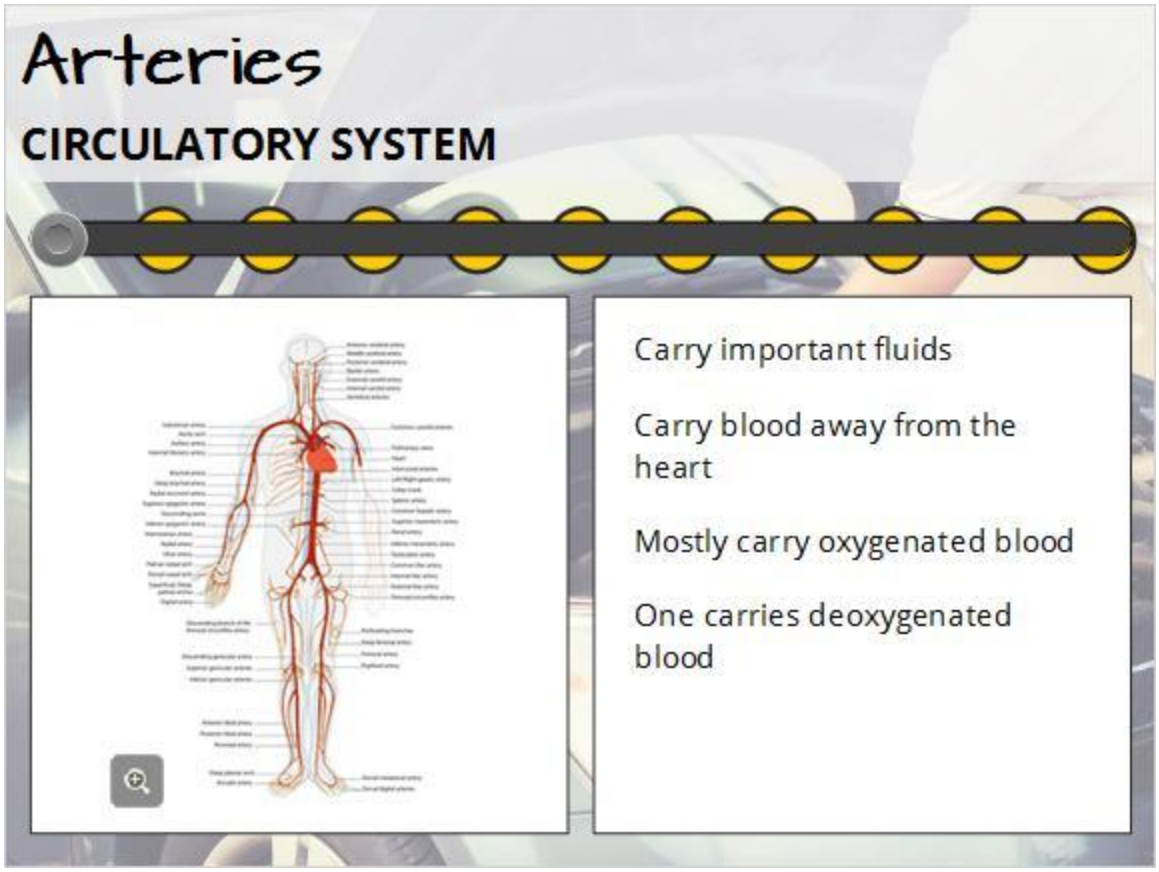
Drag the slider and drop it on each target to explore components of the circulatory system.

Heart



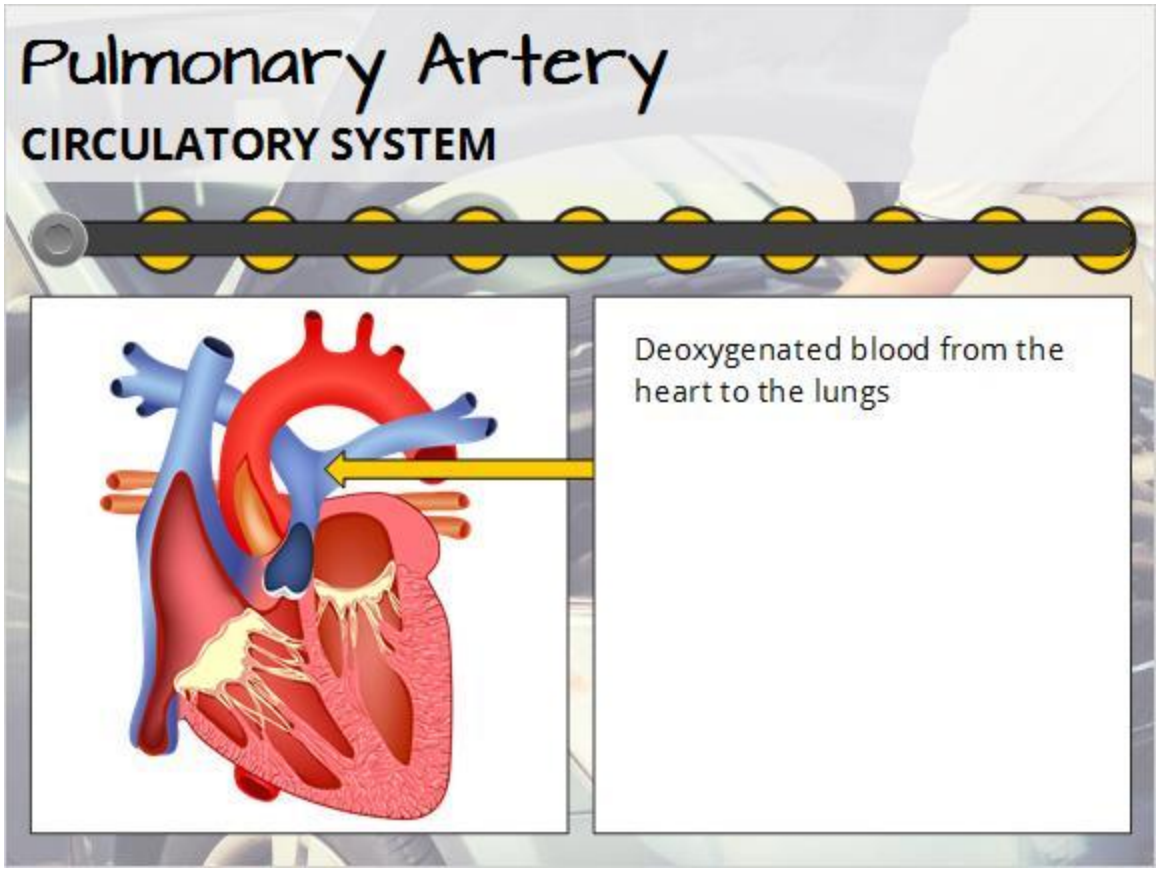
The heart is similar to a car's engine, because without it, a person would not live. This muscle is about the size of a fist, and located inside of your chest. By way of a network of arteries and veins, the heart pumps blood through your body, providing it with oxygen and nutrients. The heart has its own special electrical system that initiates and maintains your pulse, or pumping action. This is called the SA Node (Sinoatrial Node). You may have heard it called the pacemaker.

Arteries



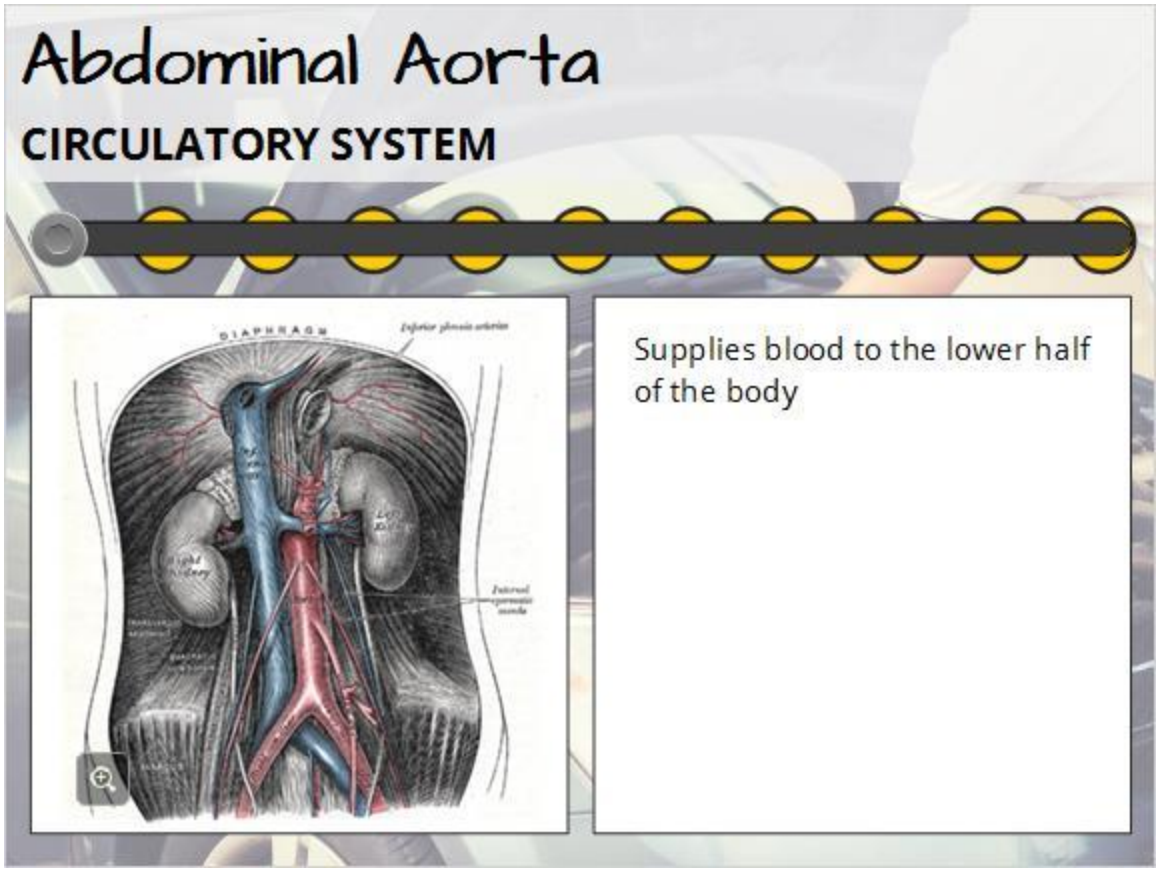
Arteries are equivalent to automobile tubes and hoses that carry important fluids, like oil and fuel, which enable the engine, drive train, and transmission to run. Specifically, arteries are the blood vessels that carry blood away from the heart. Most arteries contain oxygenated blood that transport oxygen to the body. There is one artery, however, that carries deoxygenated blood from the heart to the lungs.

Pulmonary Artery



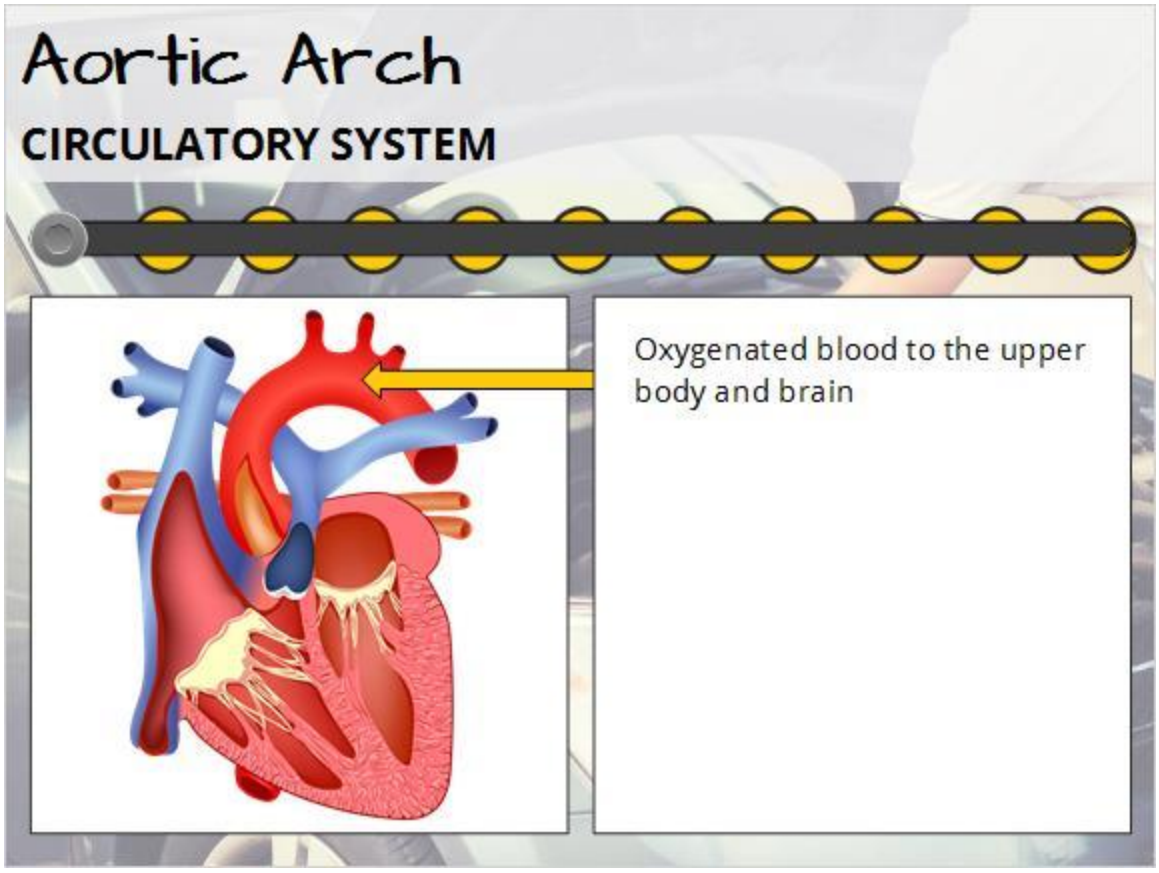
This blood vessel transports deoxygenated blood from the heart to the lungs.

Abdominal Aorta



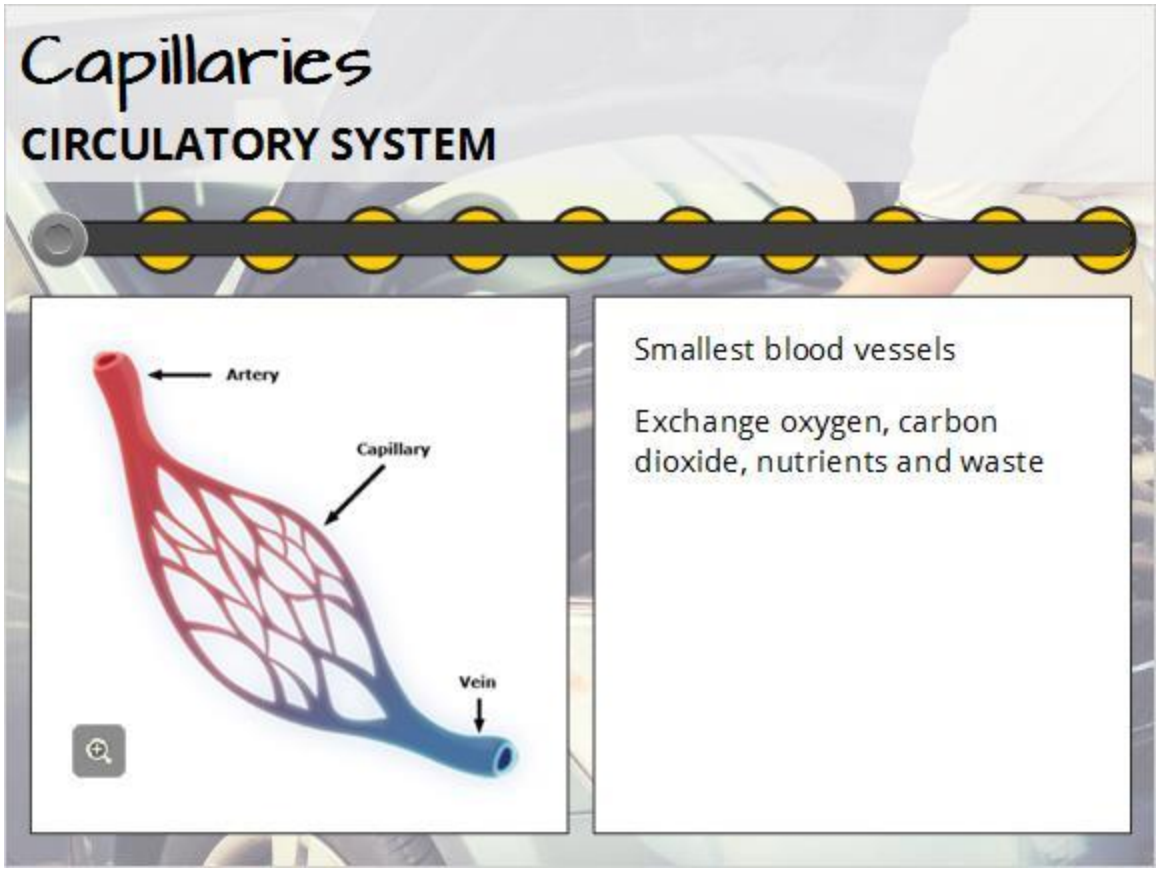
The abdominal aorta is the main artery that supplies blood to the lower half of the body.

Aortic Arch



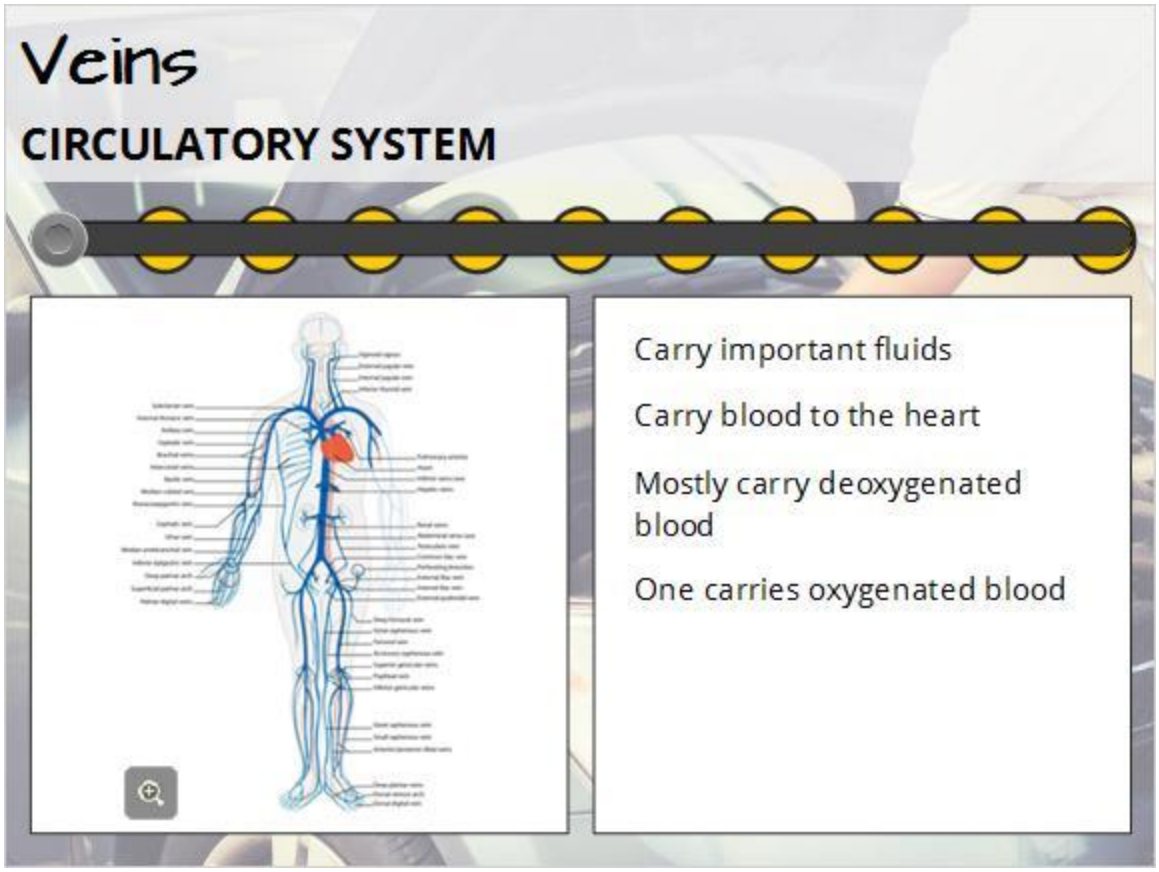
The aortic arch is the largest artery that transports oxygenated blood to the upper body and brain.

Capillaries



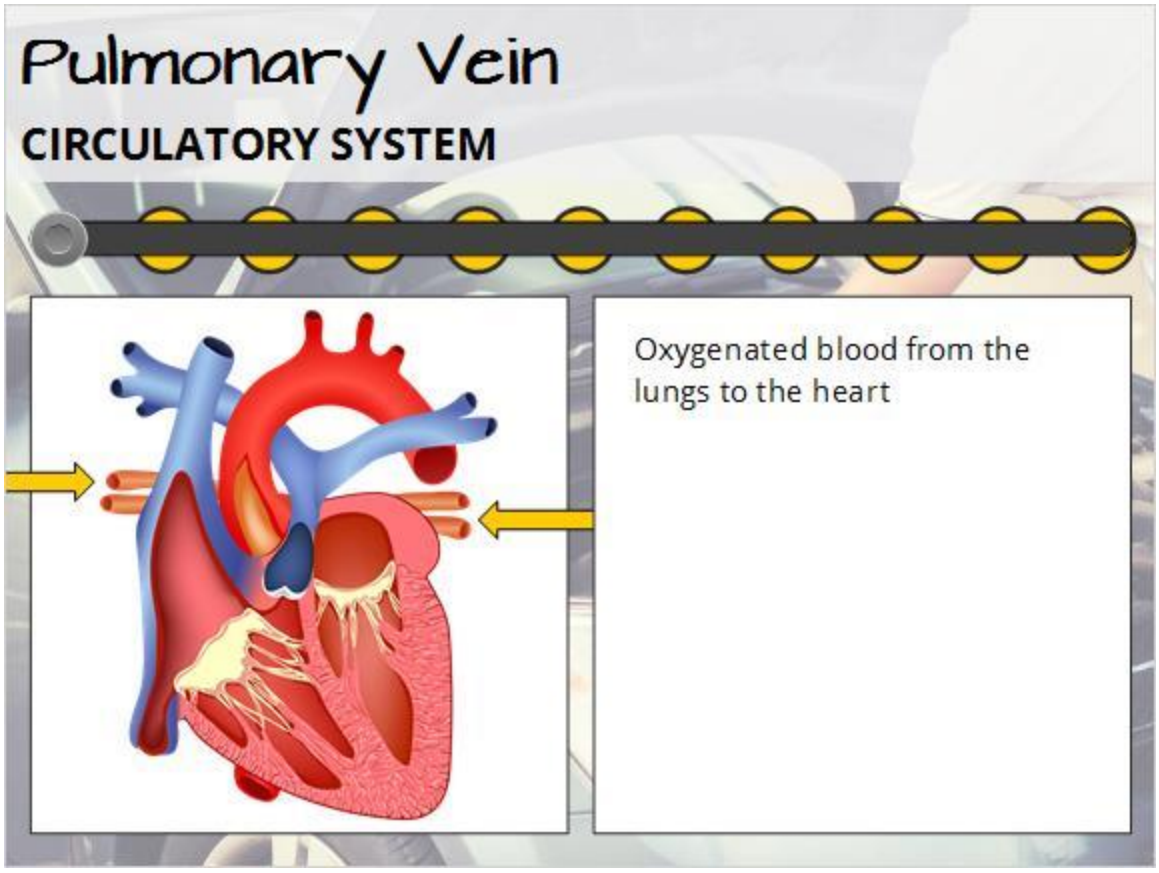
Capillaries are the smallest blood vessels. They exchange oxygen, carbon dioxide, nutrients, and waste with the body's cells.

Veins



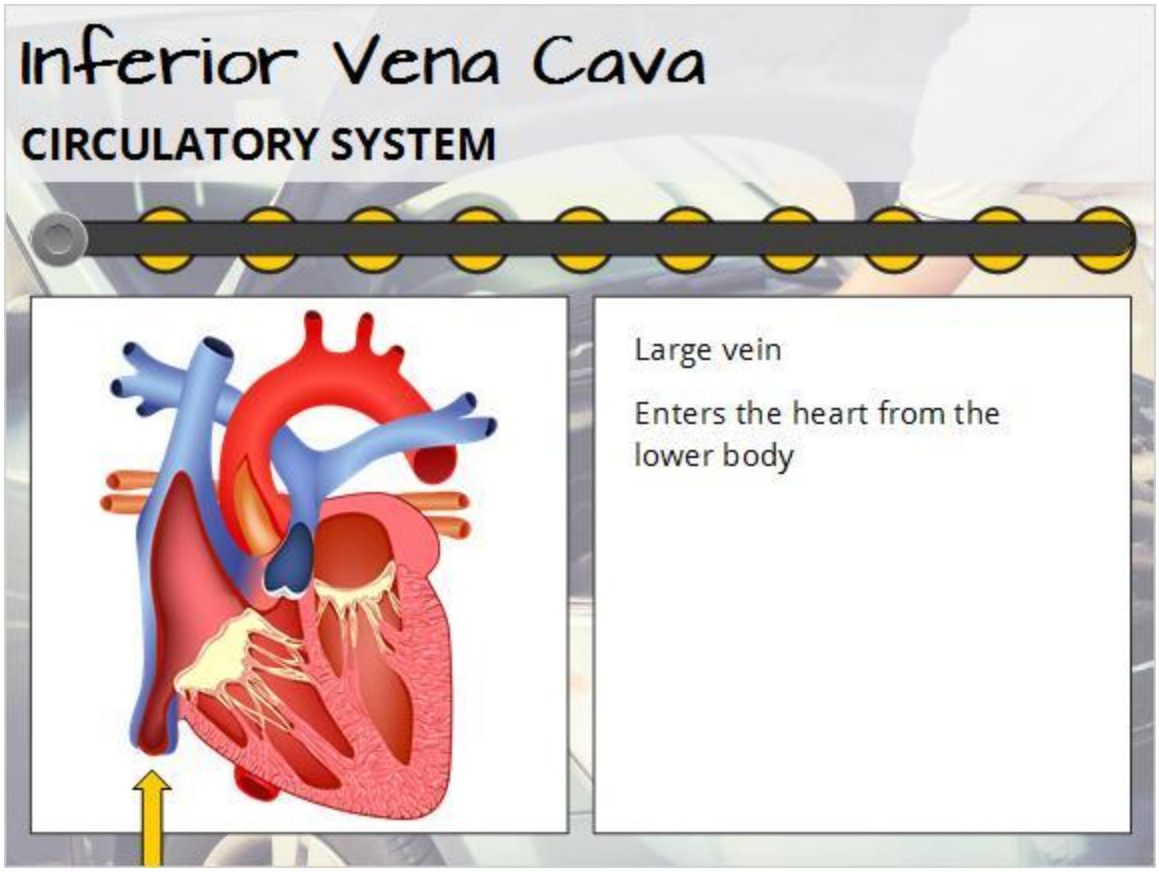
Veins are equivalent to the automobile tubes and hoses that carry important fluids, like oil and fuel, which enable the engine, drive train, and transmission to run. Specifically, veins are the blood vessels that carry blood to the heart. Most veins transport deoxygenated blood away from the body to the heart. There is one vein, however, that carries oxygenated blood from the lungs to the heart.

Pulmonary Vein



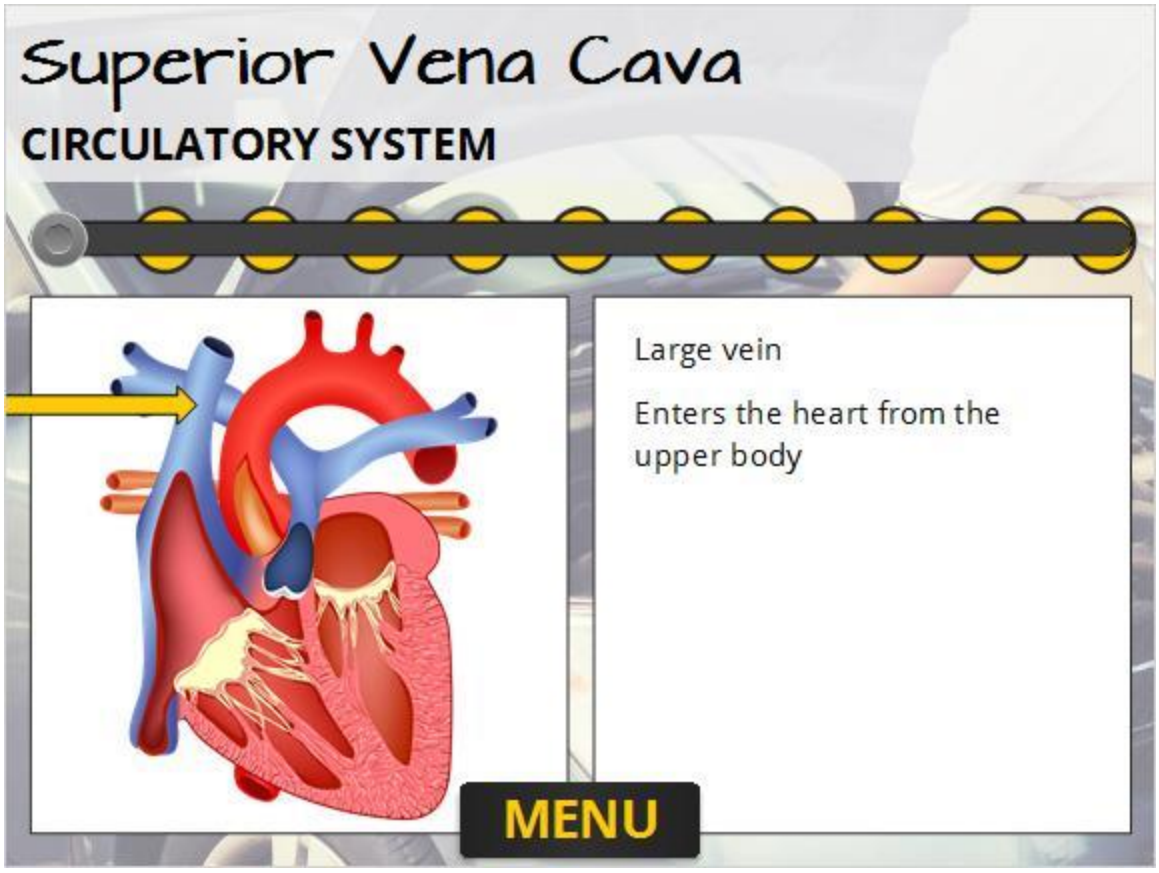
This blood vessel carries oxygenated blood from the lungs to the heart.

Inferior Vena Cava



The inferior vena cava is the large vein that enters the heart from the lower body.

Superior Vena Cava



The superior vena cava is the large vein that enters the heart from the upper body.

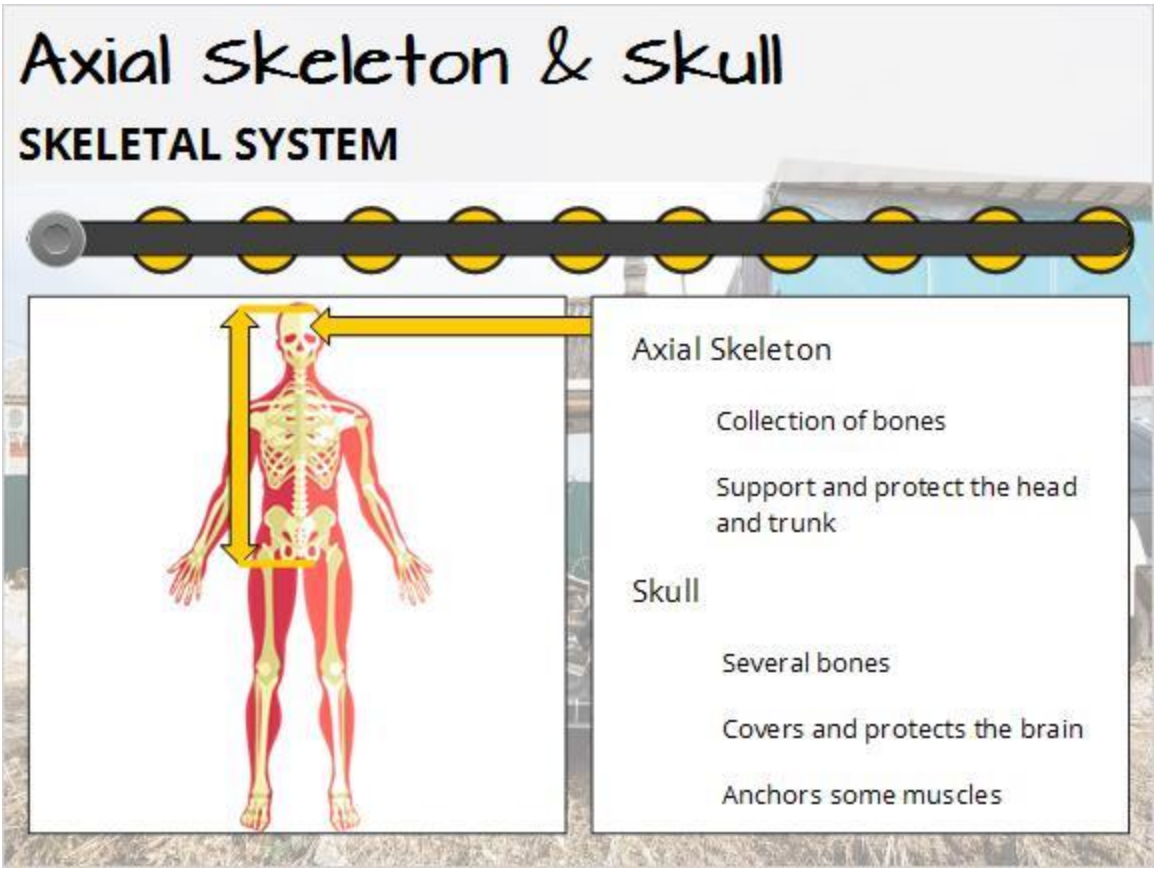
Click the ***MENU*** button to return to the Body Systems Menu.

Skeletal System

Similar to how the frame of a car functions as its support structure, the skeletal system is the support structure of the body.

Drag the slider and drop it on each target to explore components of the skeletal system.

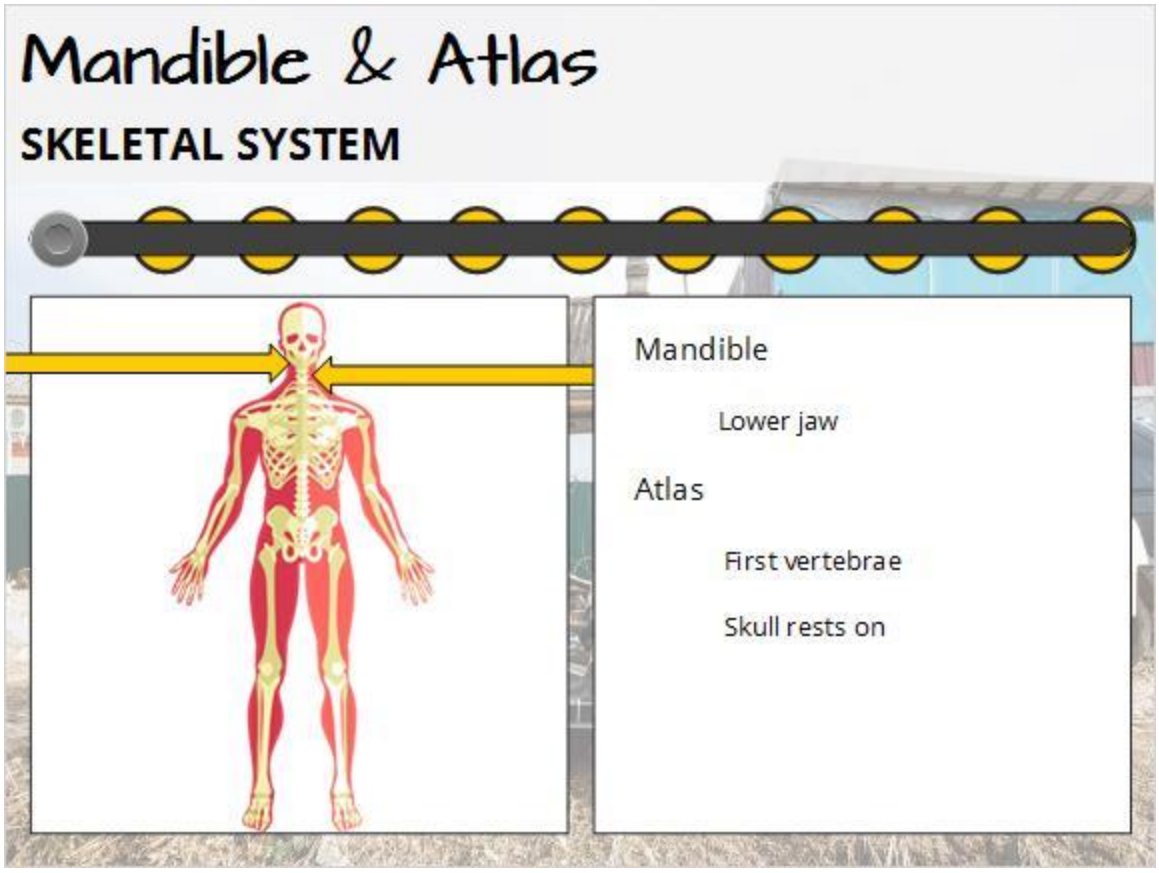
Axial Skeleton and Skull



The axial skeleton is a collection of bones that support and protect the head and trunk of the body.

The skull is a fusion of several bones that look like one. It covers and protects the brain, and provides anchorage for some muscles.

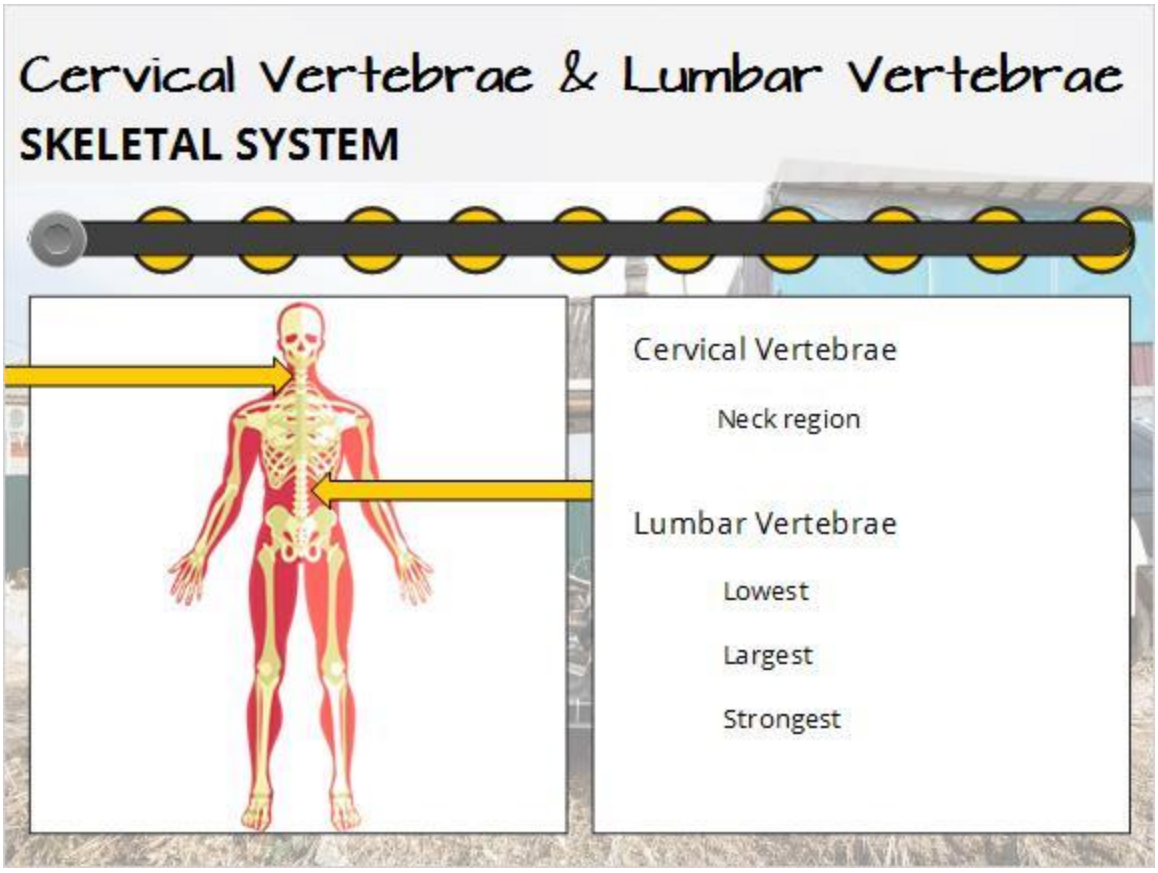
Mandible and Atlas



The mandible is the lower jaw.

The atlas is the very first vertebrae, and it is what the skull rests on.

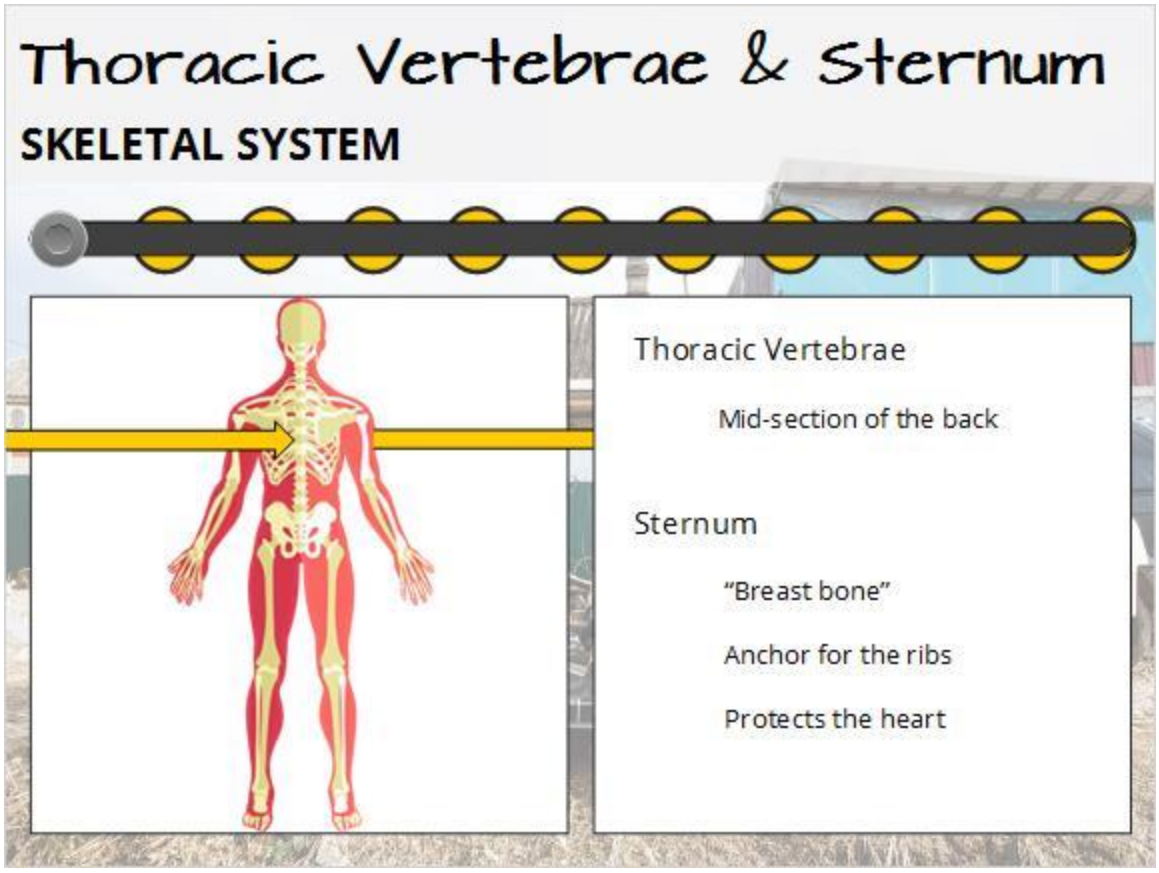
Cervical Vertebrae and Lumbar Vertebrae



Seven bones make up the cervical or neck region.

The lumbar vertebrae is the lowest, largest, and strongest of all of the vertebrae.

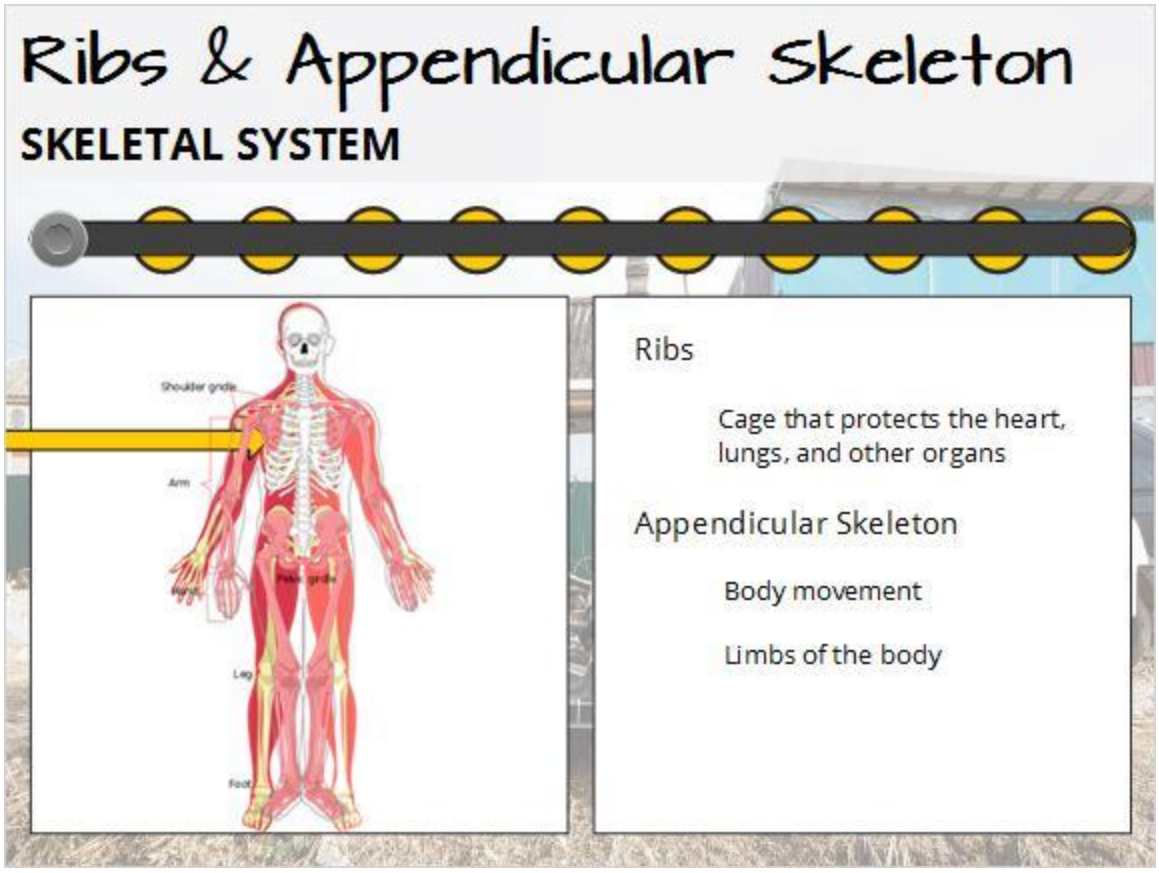
Thoracic Vertebrae and Sternum



The thoracic vertebrae are comprised of twelve bones that create the mid-section of the back.

The sternum is commonly called the "breast bone." It provides an anchor for the ribs, and helps protect the heart.

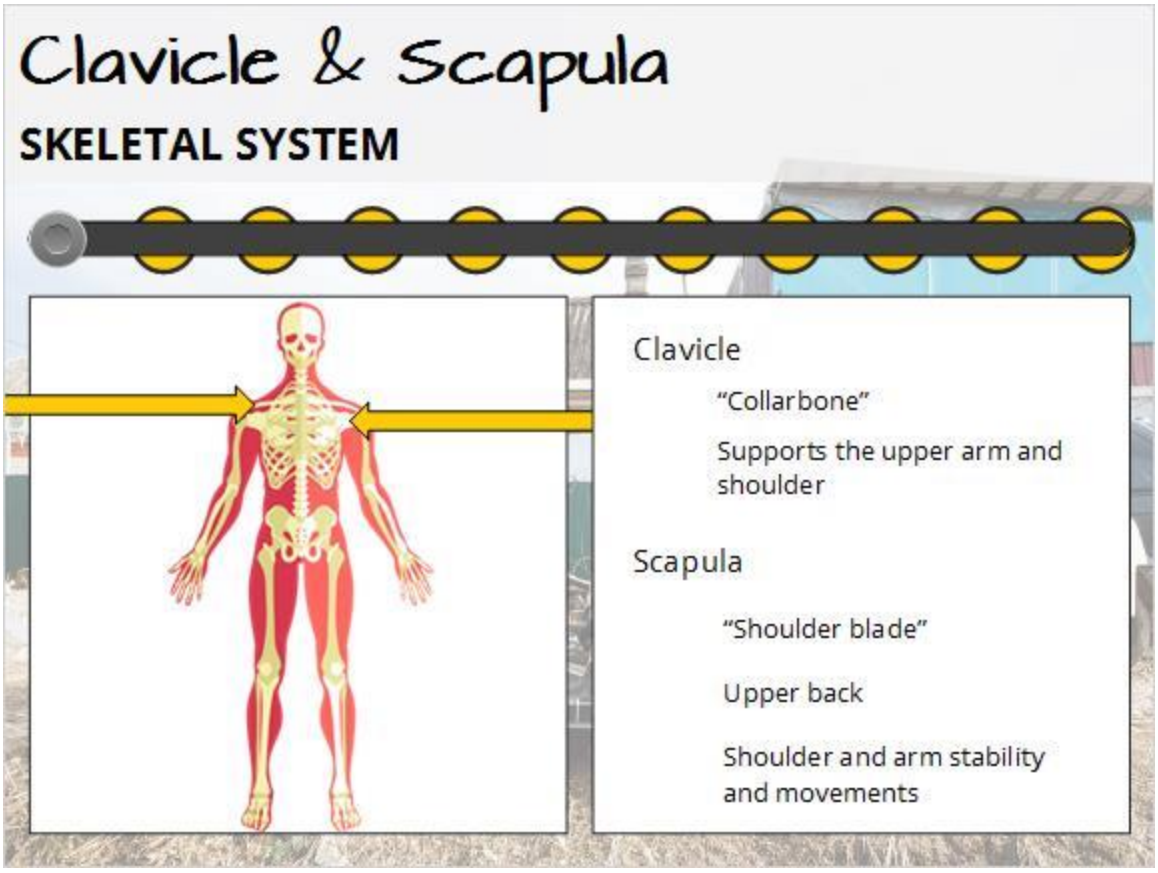
Ribs and Appendicular Skeleton



The ribs are a collection of bones that form a cage to protect the heart, lungs, and a few other organs.

The appendicular skeleton is a collection of bones that are responsible for body movement. It is comprised of the limbs of the body.

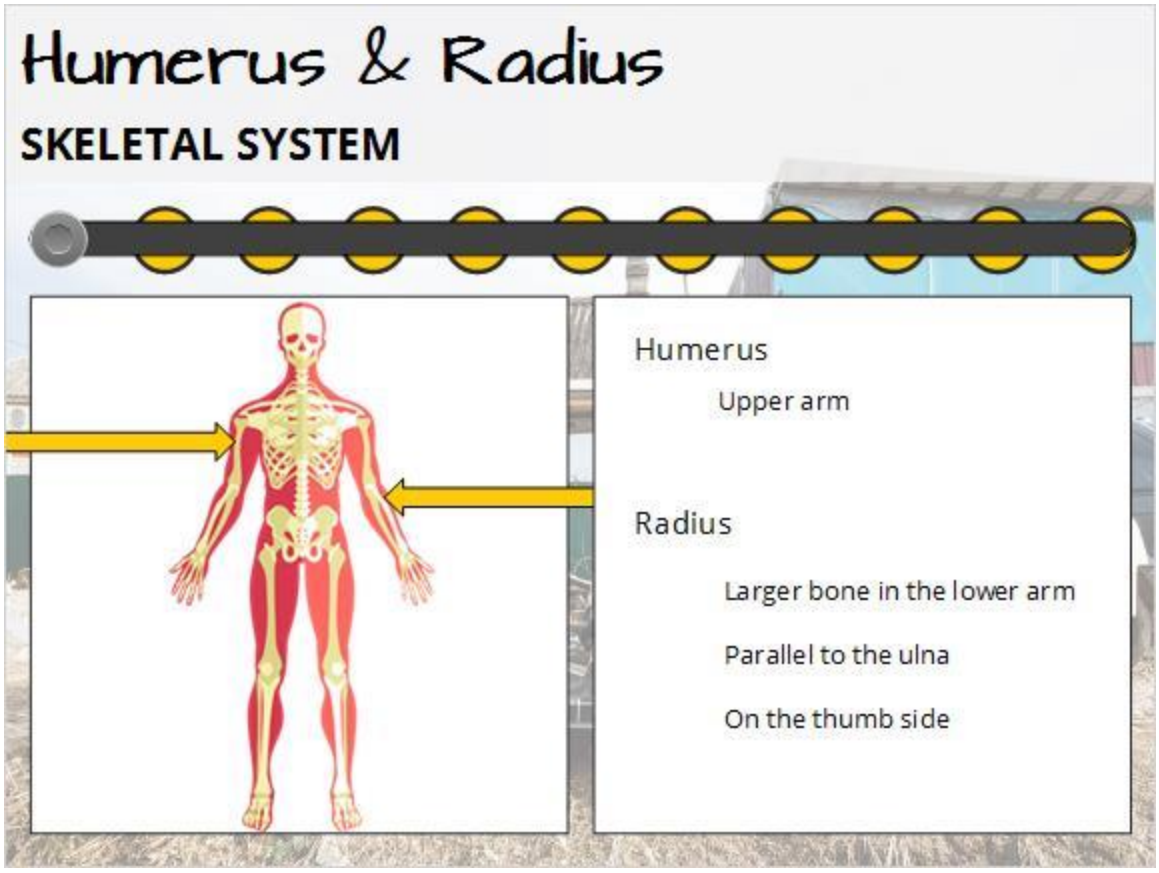
Clavicle and Scapula



The clavicle is often call the “collarbone.” It supports the upper arm in the shoulder joint.

Often called the “shoulder blade,” the scapula is a plate-like bone located in the upper back. It helps with shoulder and arm stability and movement.

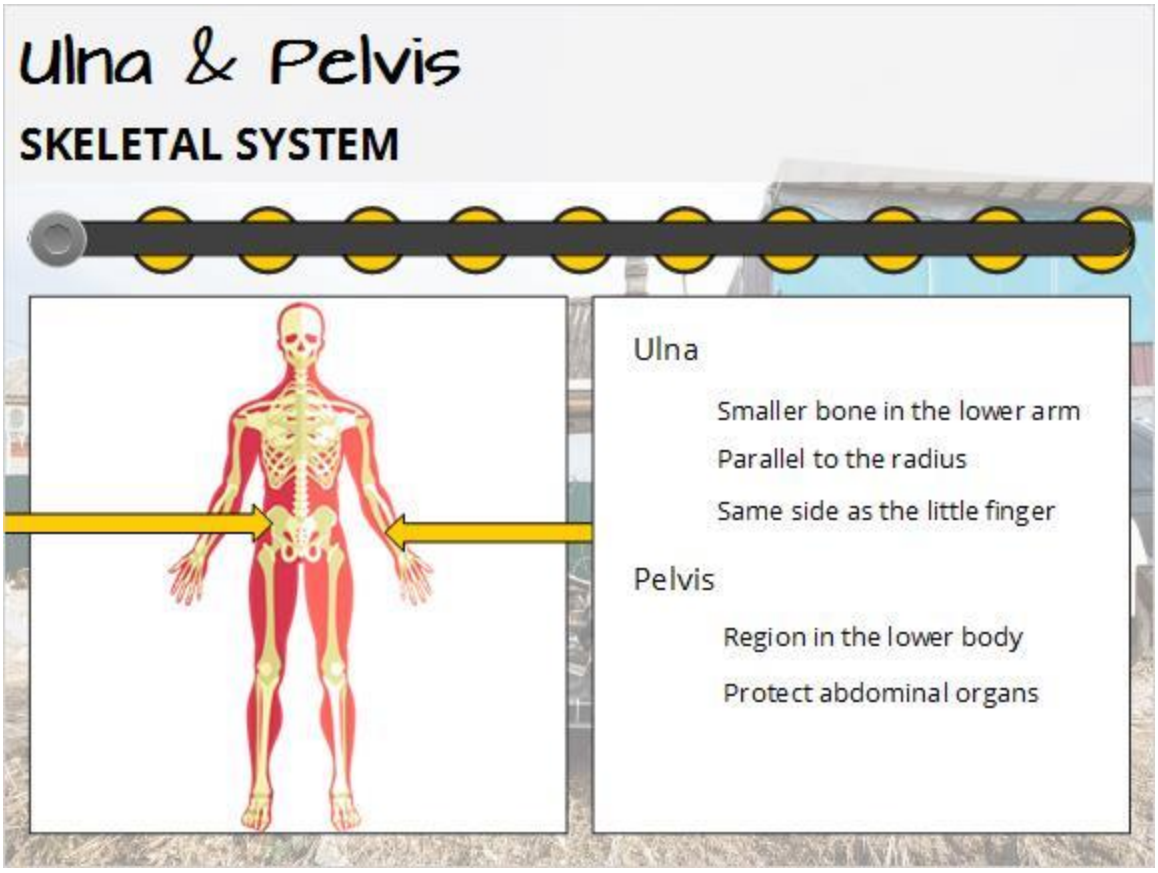
Humerus and Radius



The humerus is the bone of the upper arm.

The radius is the larger of the two bones in the lower arm. It runs parallel to the ulna and is on the same side as the thumb.

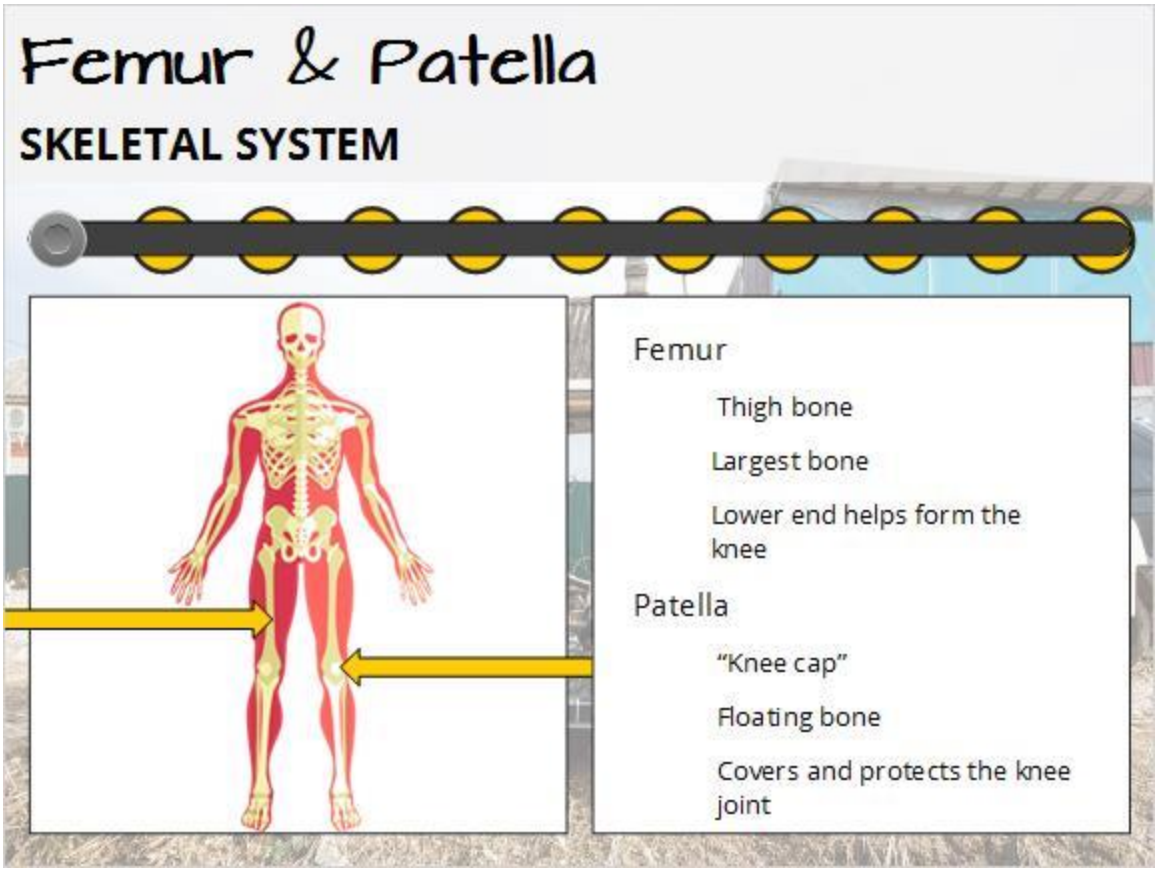
Ulna and Pelvis



The ulna is the smaller of the two bones in the lower arm. It runs parallel to the radius, and is on the same side as your little finger.

The pelvis is a region that makes up the lower body. It is a collection of several bones that protect the abdominal organs.

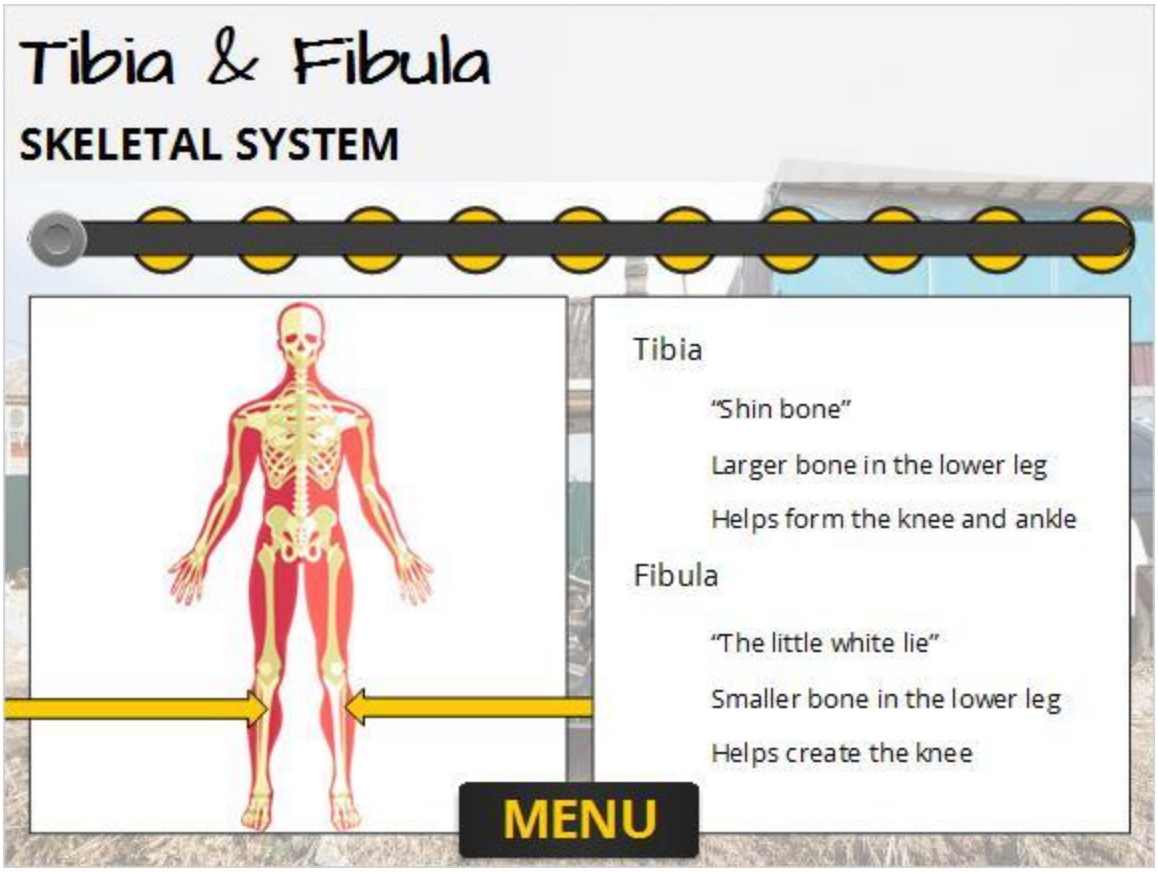
Femur and Patella



The femur is the thigh bone, and is the largest bone in the body. The lower end of the femur helps form the knee.

The patella is also called the "knee cap." It is a floating bone that covers and protects the front of the knee joint.

Tibia and Fibula



Known as the "shin bone," the tibia is the larger of the two bones in the lower leg. The top of the tibia helps form the knee, and the bottom forms the ankle.

Remembered by the title, "the little white lie," the fibula is the smaller bone of the lower leg. It helps create the knee.

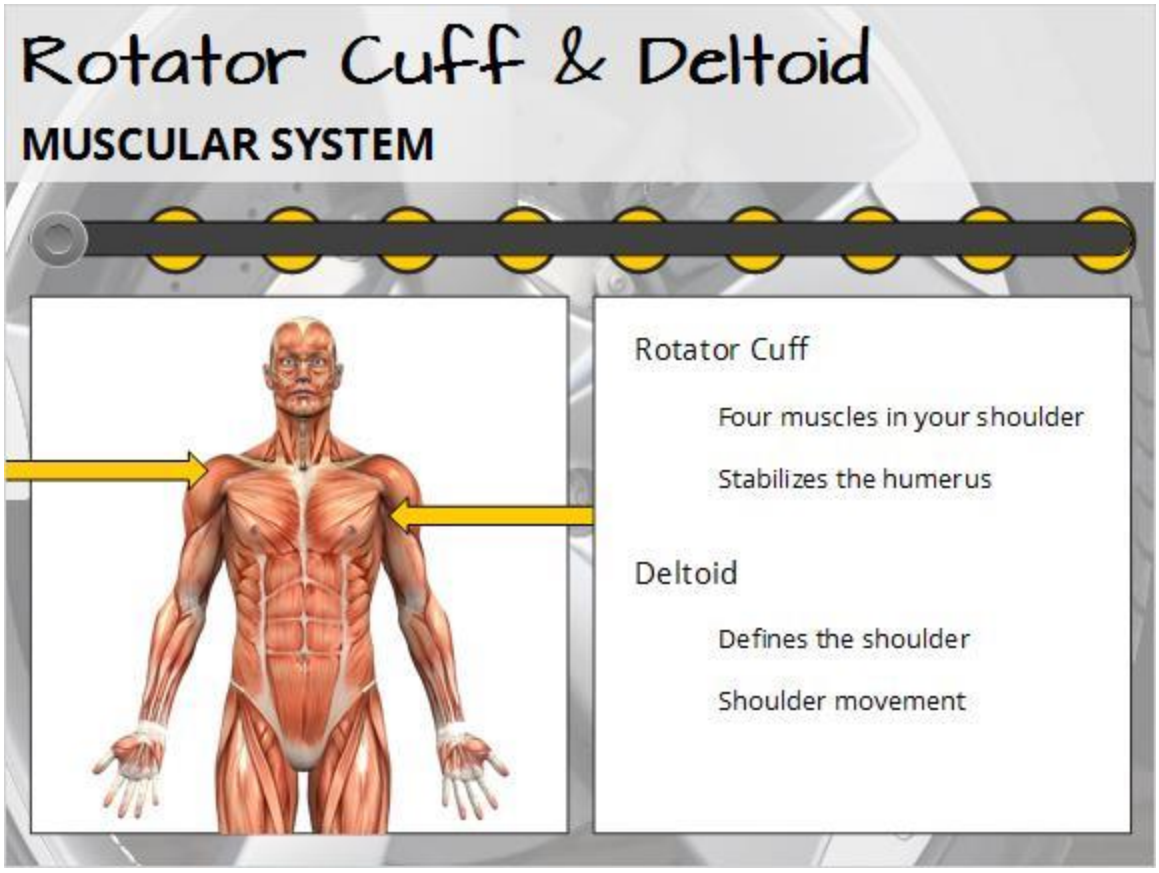
Click the ***MENU*** button to return to the Body Systems Menu.

Muscular System

A car moves once the axles, wheels, and tires begin to turn. Similarly, when your muscles start to move, so does your body. More than six-hundred skeletal muscles cause your bones to move at the joints.

Drag the slider and drop it on each target to explore components of the muscular system.

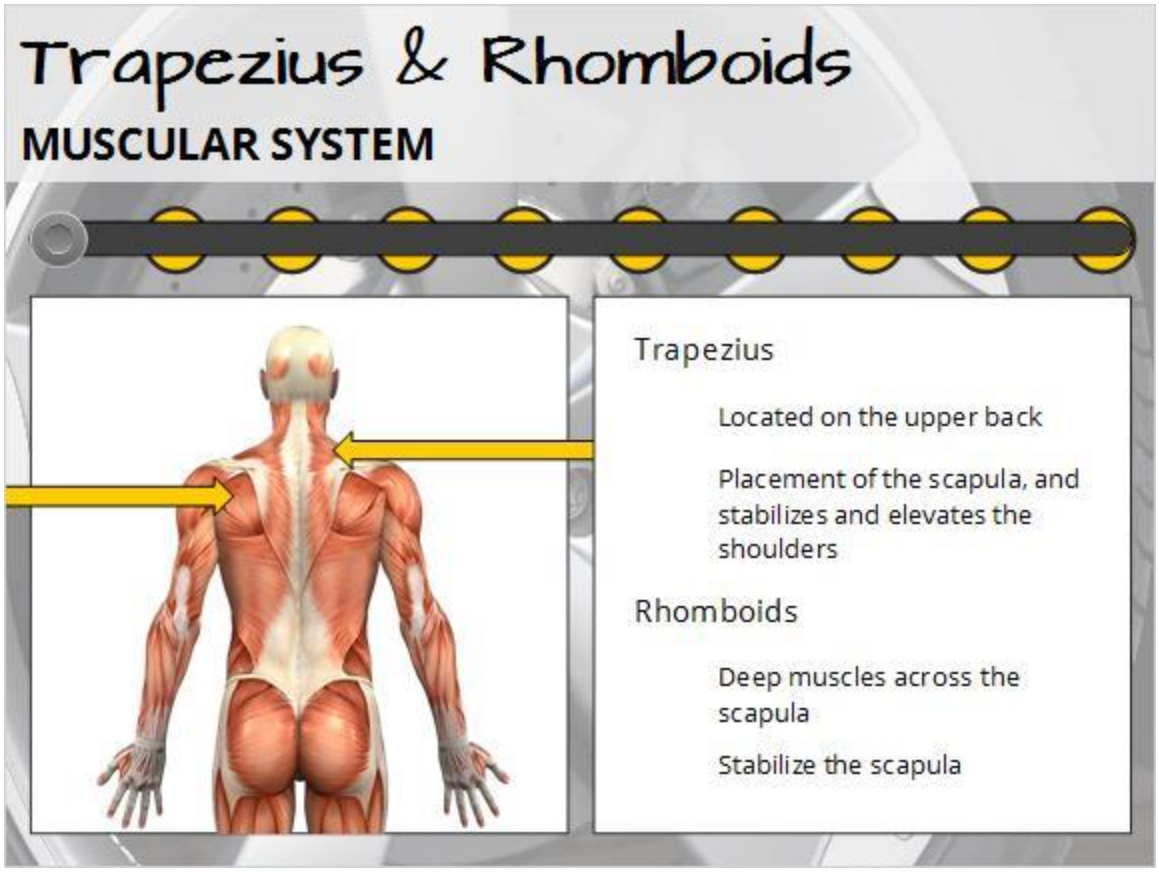
Rotator Cuff and Deltoid



The rotator cuff is comprised of four small muscles in your shoulder. It stabilizes the humerus in your shoulder's girdle. Parts of the rotator cuff include the teres minor, teres major, infraspinatus, subscapularis, and supraspinatus.

The deltoid is a large muscle that defines your shoulder. It is responsible for shoulder movement.

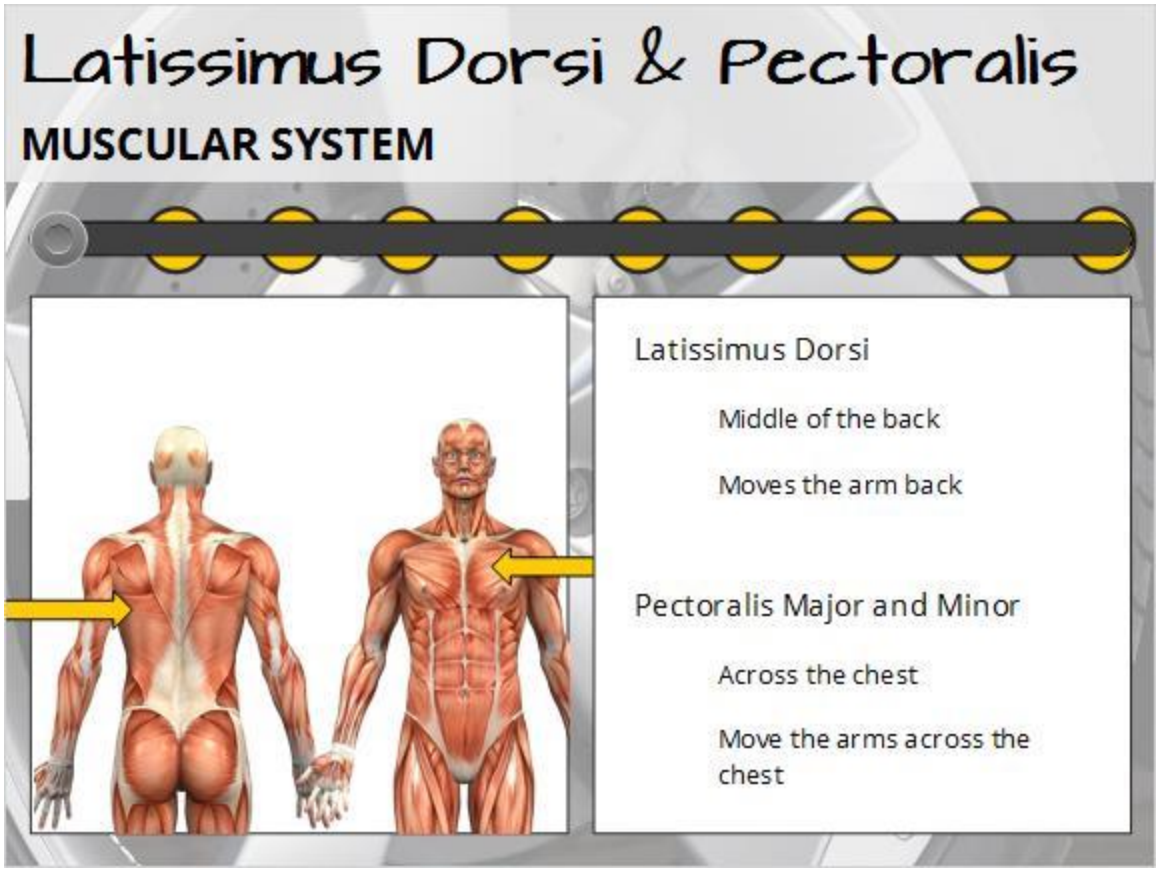
Trapezius and Rhomboids



The trapezius is a flat fan-like muscle located on your upper back. It is responsible for the placement of the scapula, stabilizes the shoulders when they are under stress, and elevates the shoulders.

The rhomboids are deep muscles located across the scapula. They stabilize the scapula.

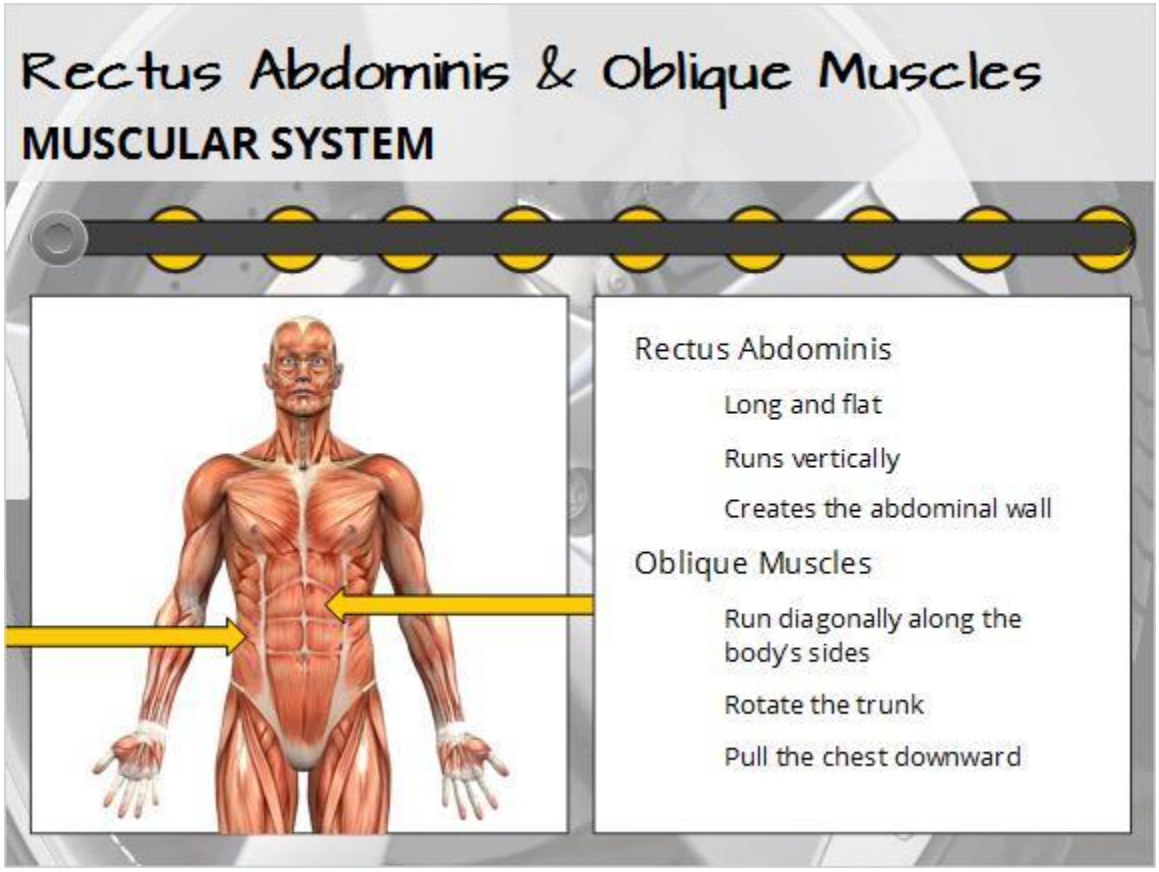
Latissimus Dorsi and Pectoralis



The latissimus dorsi is a large muscle that forms in the middle back. It primarily moves the arm back when doing motions like swimming or rowing.

The pectoralis major and pectoralis minor are fan-shaped muscles that run across the chest. They primarily move the arms across the chest.

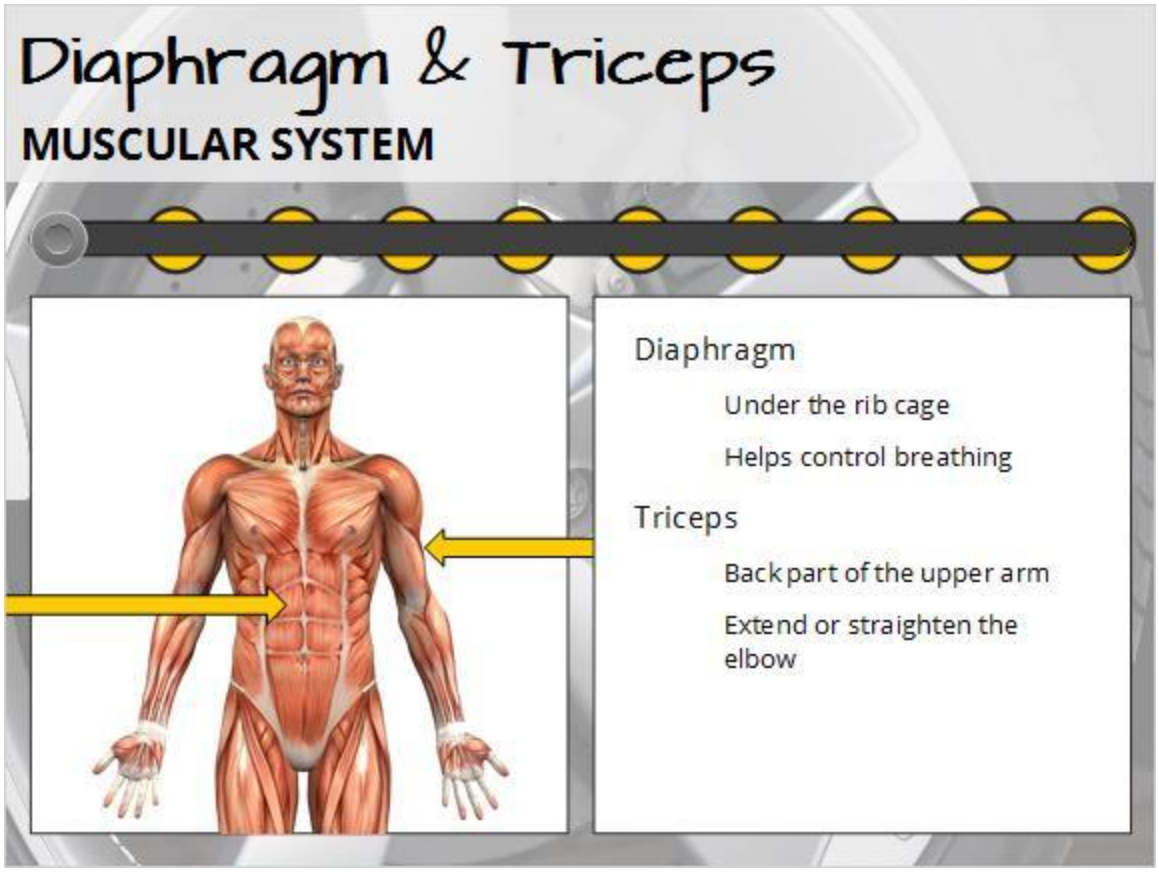
Rectus Abdominis and Oblique Muscles



The rectus abdominis is a long, flat muscle that runs vertically, and creates the abdominal wall. It is enclosed in a sheath that helps hold it into place. When someone has abs that are a "six-pack," it means he or she has a well-defined rectus abdominis.

Oblique muscles run diagonally on the sides of the body. These muscles help rotate the body's trunk, pull the whole chest downward, and rotate the spine.

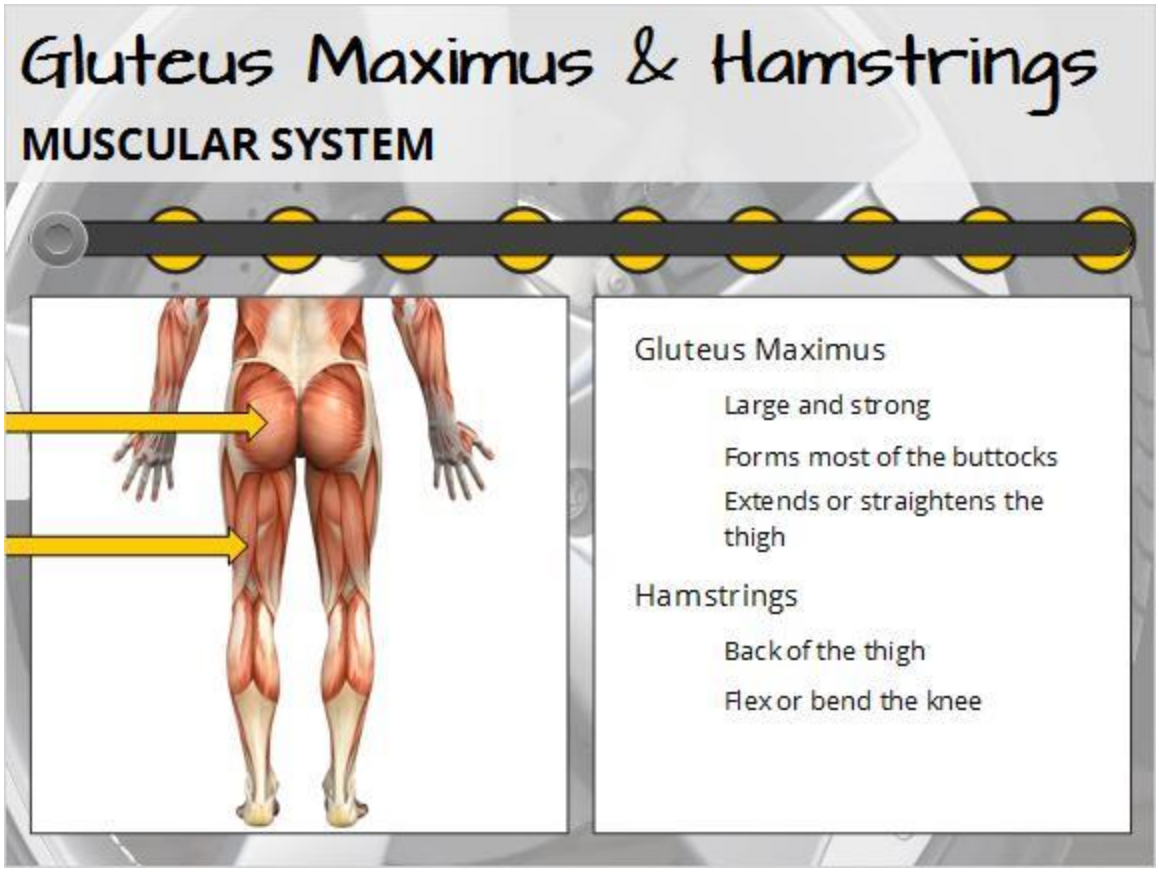
Diaphragm and Triceps



The diaphragm is located under the rib cage. It helps control breathing.

Triceps create the back part of the upper arm. They extend or straighten the elbow.

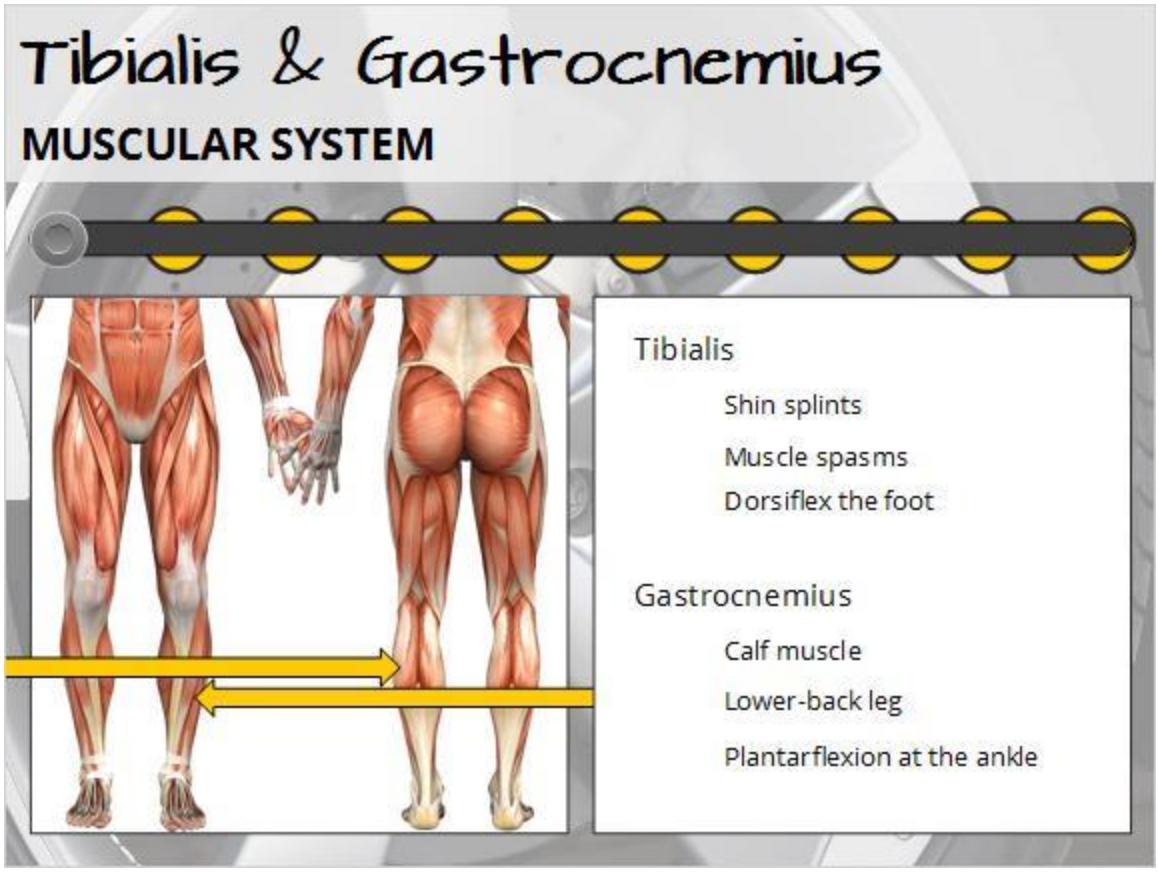
Gluteus Maximus and Hamstrings



The gluteus maximus is the largest and strongest skeletal muscle. It forms the majority of the buttocks. The primary job of the gluteus maximus is to extend or straighten the thigh.

Hamstrings are a group of muscles on the back of the thigh, opposite to the quadriceps. They flex or bend the knee, which is a reason they are often called the “biceps of the thigh.”

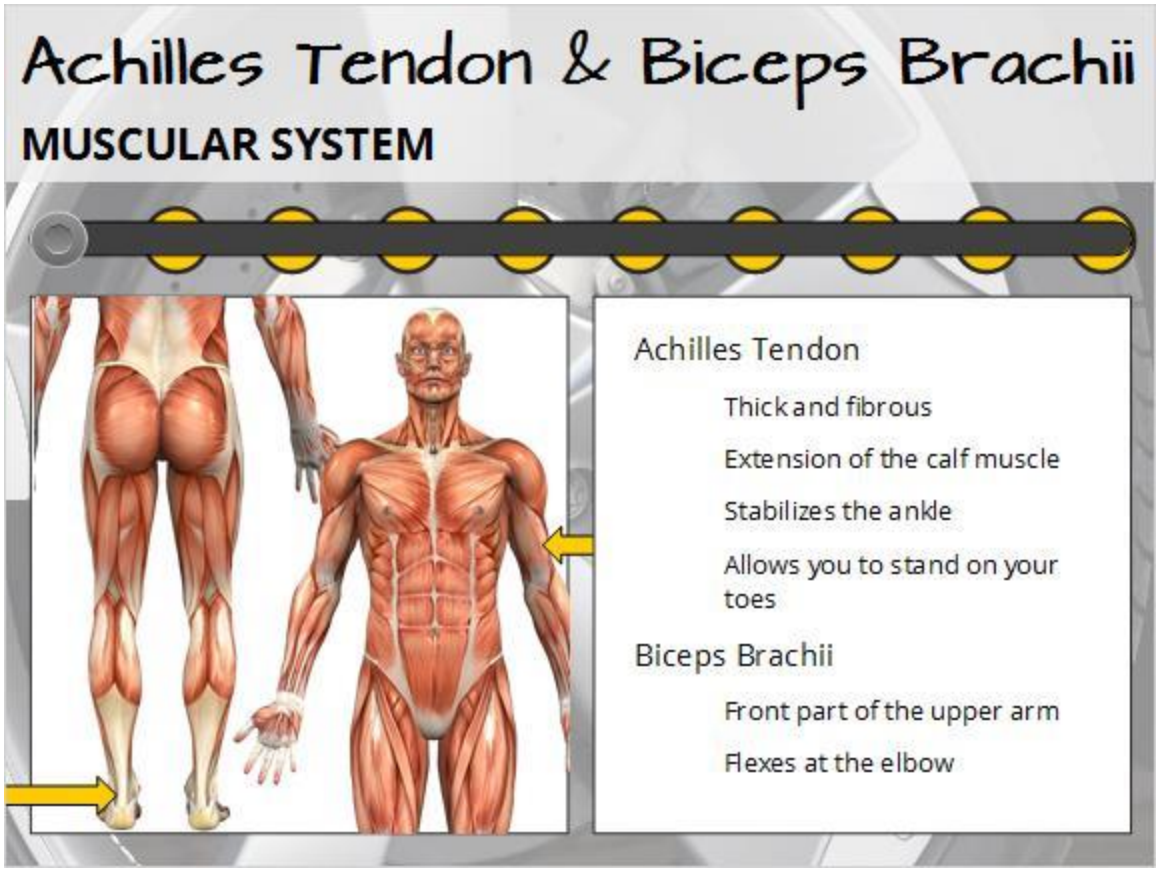
Tibialis and Gastrocnemius (Calf Muscles)



If you get “shin splints” or have a muscle spasm, the pain is caused because the tibialis is over exerted from an exercise like running. The shin muscle acts to dorsiflex the foot, or pull the foot upward.

The gastrocnemius, also known as the calf muscle, helps create the lower-back part of the leg. The calf muscles point your toes, which is referred to as plantarflexion at the ankle.

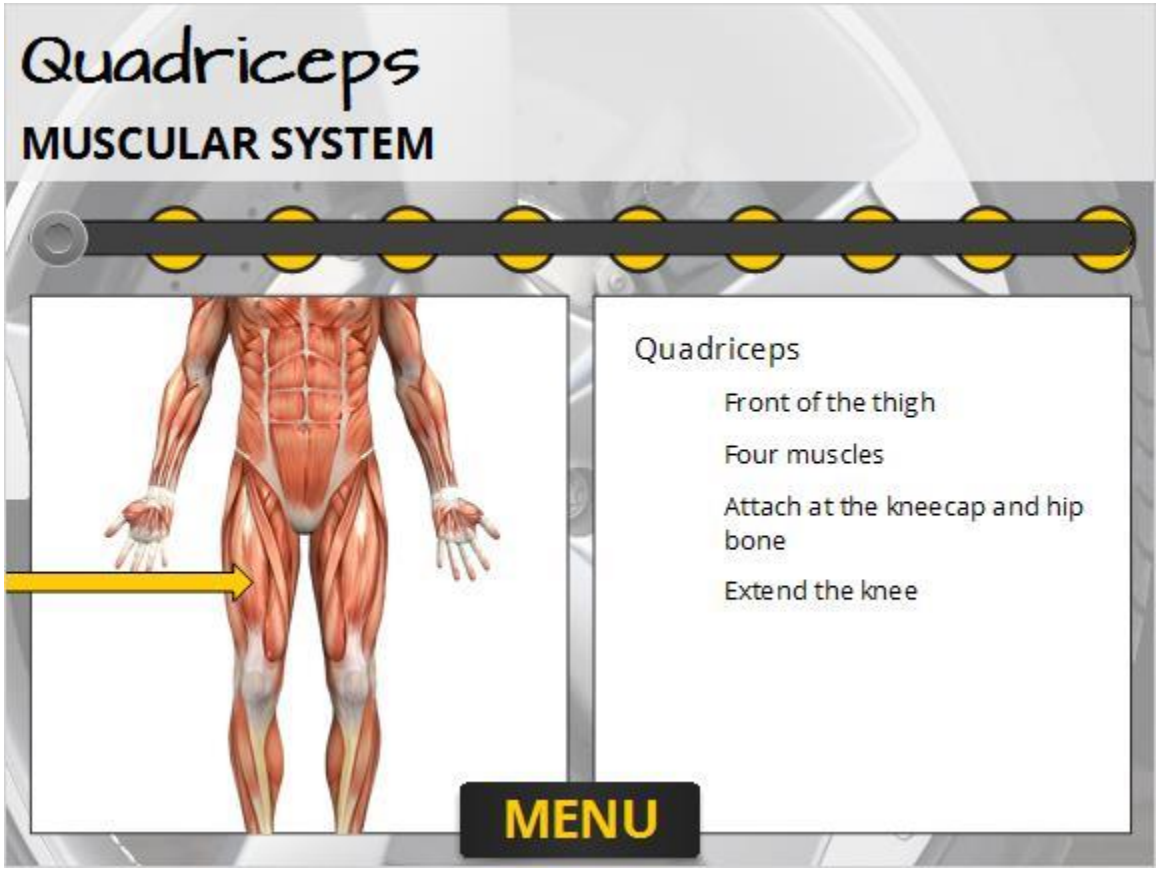
Achilles Tendon and Biceps Brachii



The achilles tendon is a thick, fibrous extension of the calf muscles. It stabilizes the ankle, and allows you to stand on your toes.

The biceps brachii creates the front part of your upper arm. It flexes, or bends, the elbow.

Quadriceps



Located in the front of the thigh, the quadriceps contain four different muscles. Three muscles attach to the kneecap, and the fourth attaches to the hip bone. These muscles help extend the knee when you do physical activities like running, walking, and standing.

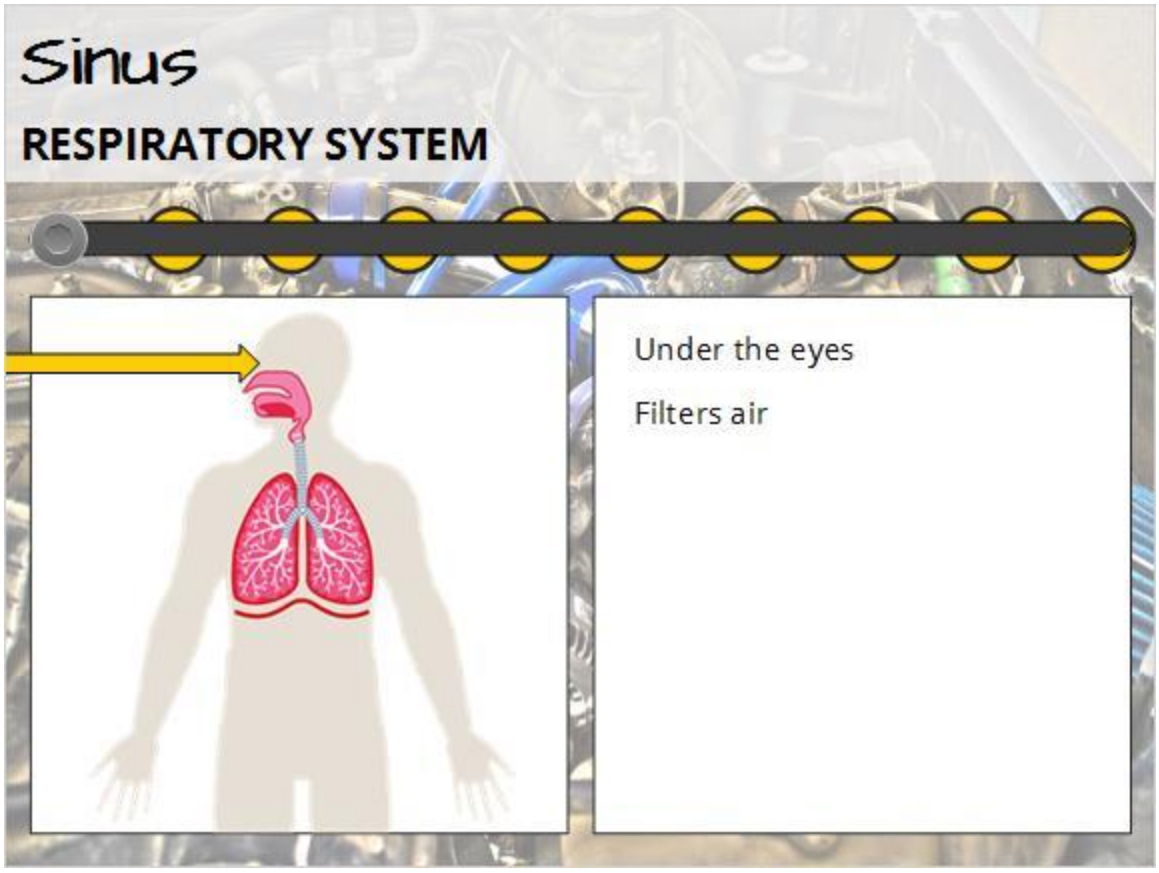
Click the ***MENU*** button to return to the Body Systems Menu.

Respiratory System

Automobiles need clean air to help gasoline combust so the engine can run. Similarly, your body needs clean air to burn fuel, move muscles, think, and run smoothly. The respiratory system allows your body to obtain clean air.

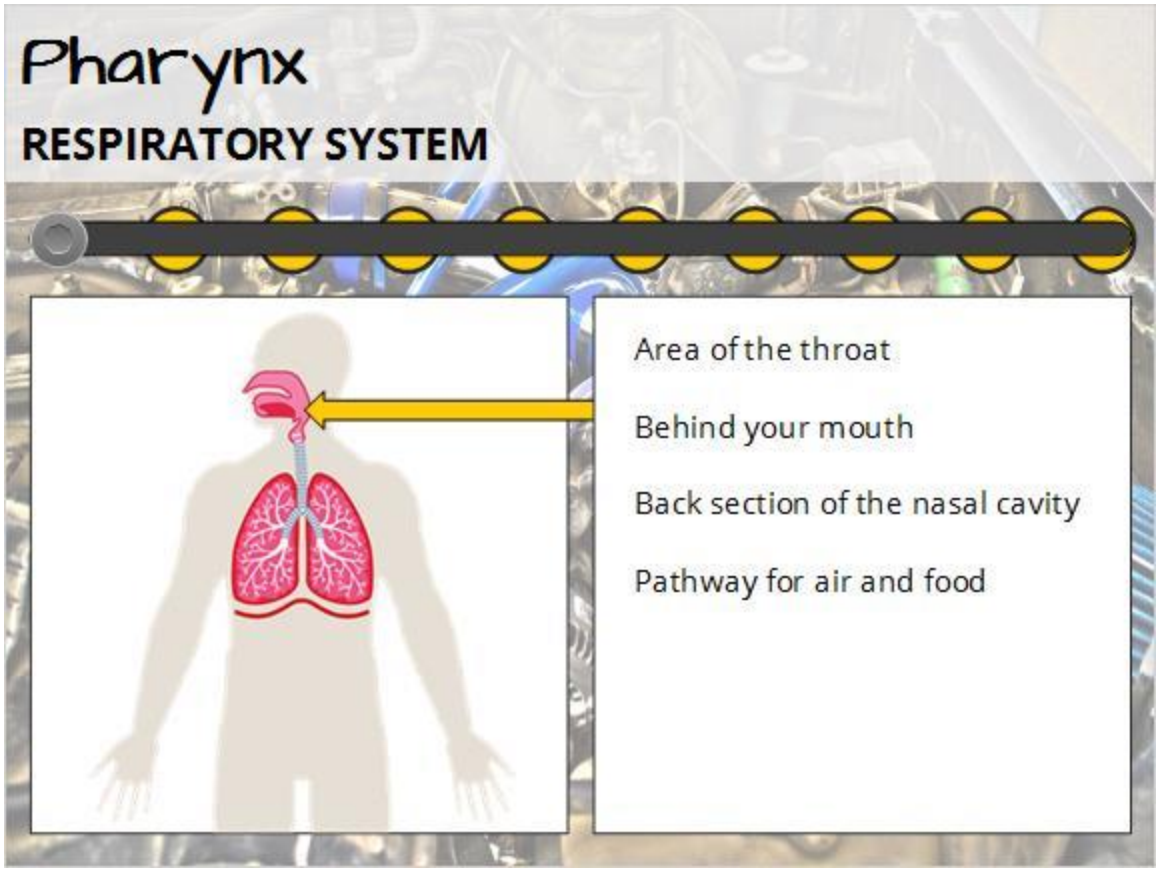
Drag the slider and drop it on each target to explore components of the respiratory system.

Sinus



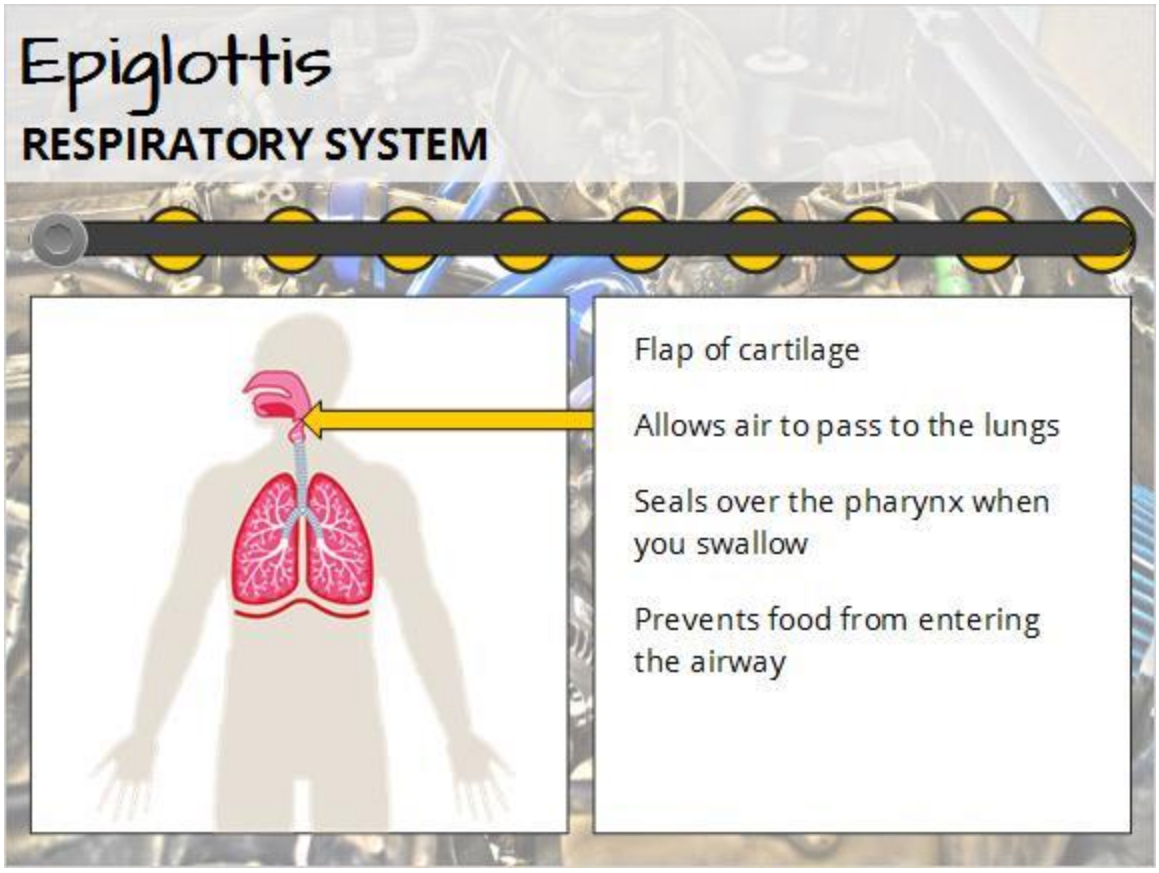
Located just under your eyes, the sinus provides filtration for air as it passes to the lungs.

Pharynx



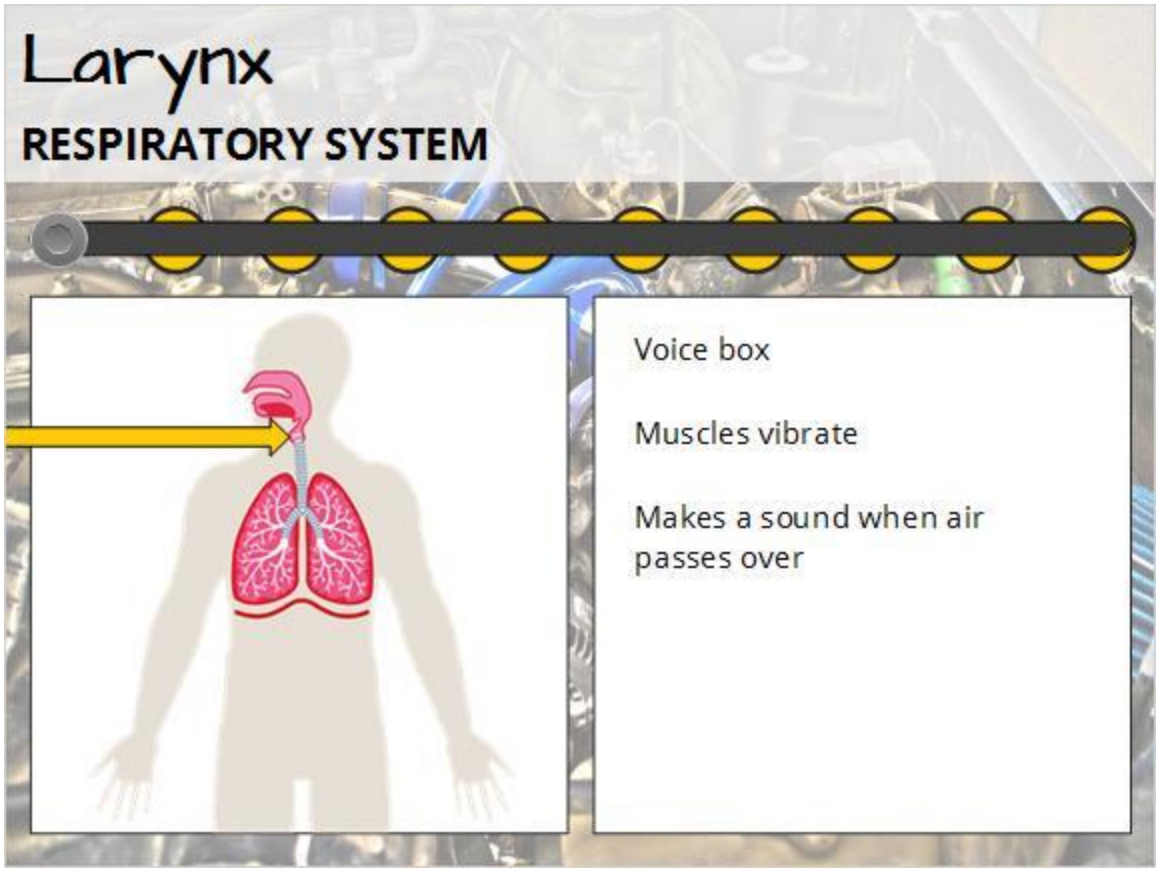
The pharynx is the area of your throat behind your mouth, and toward the back section of your nasal cavity. It is a pathway for air and food.

Epiglottis



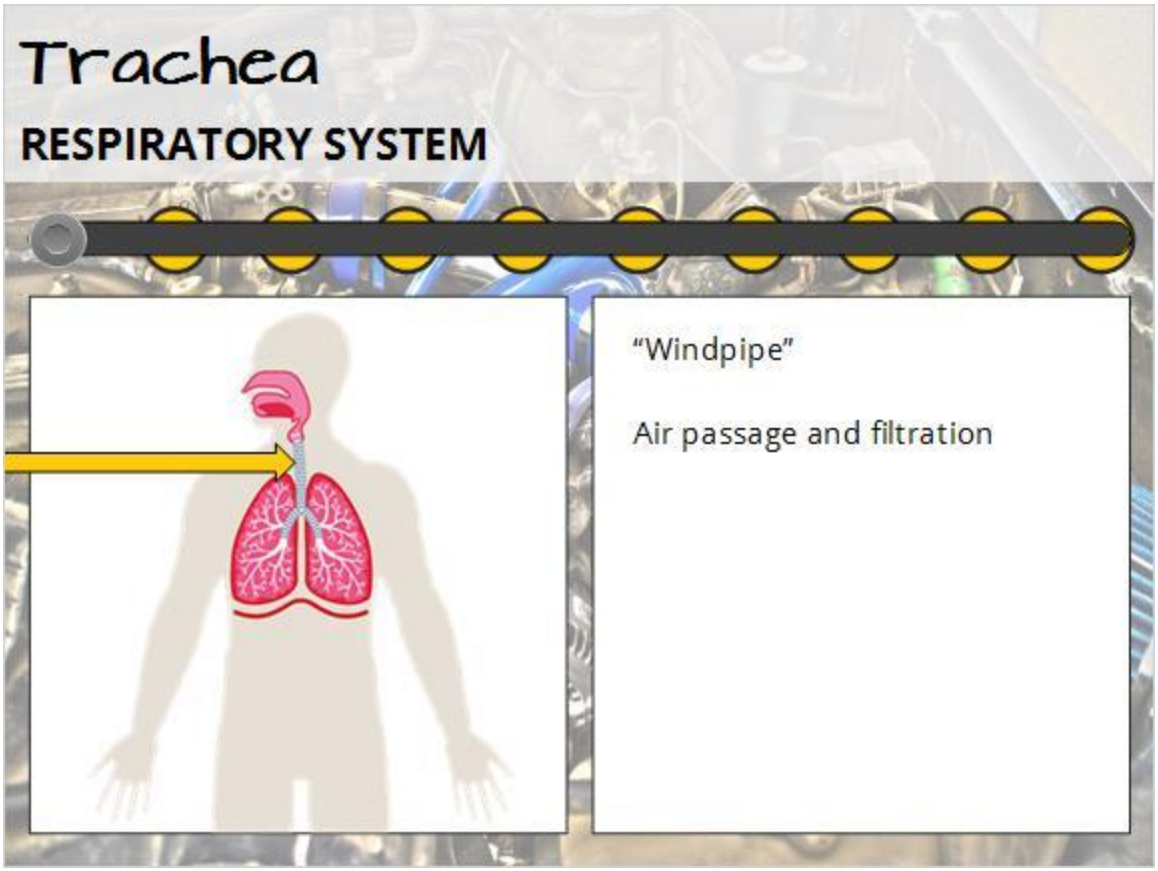
The epiglottis is a flap of cartilage that remains open to allow air to pass to the lungs. When you swallow, the epiglottis seals over the pharynx to prevent food from entering the airway.

Larynx



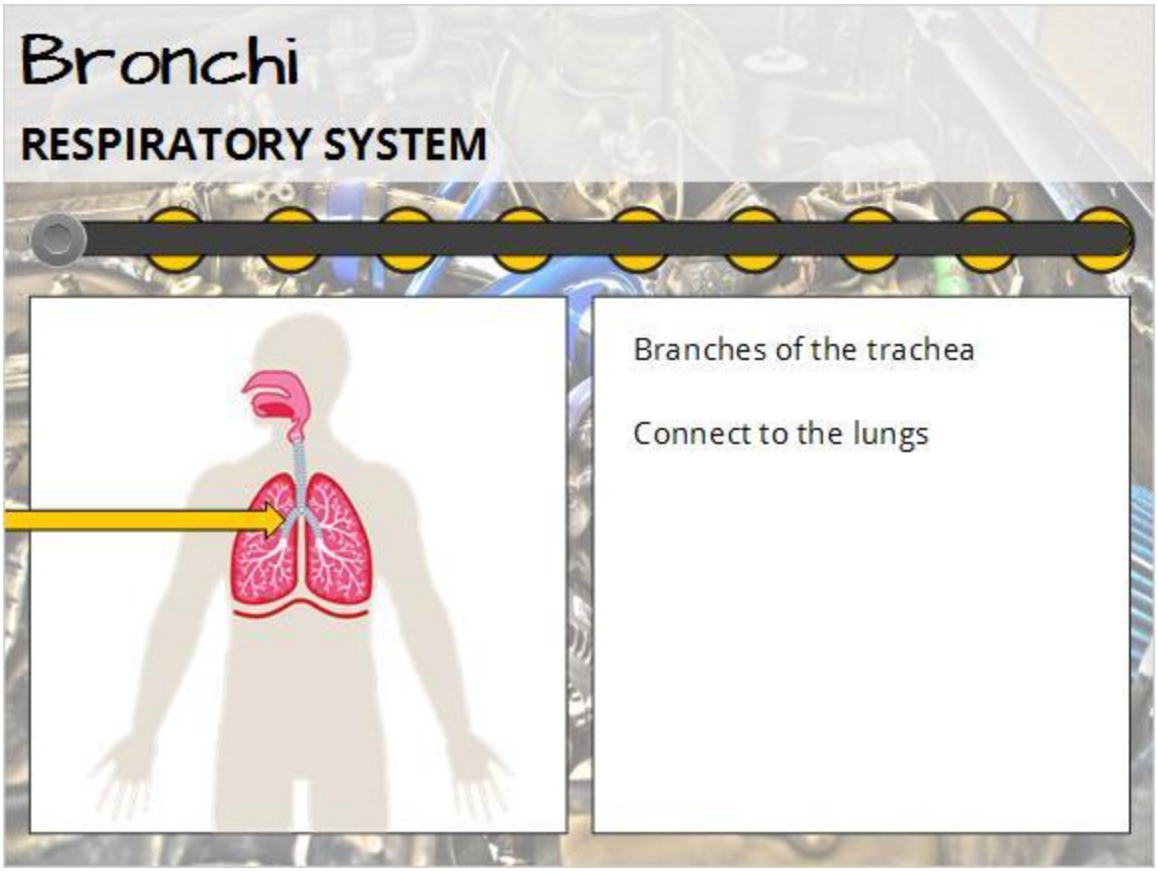
The larynx is your voice box. It is made of long, thick muscles that vibrate to create a sound when air passes over them.

Trachea



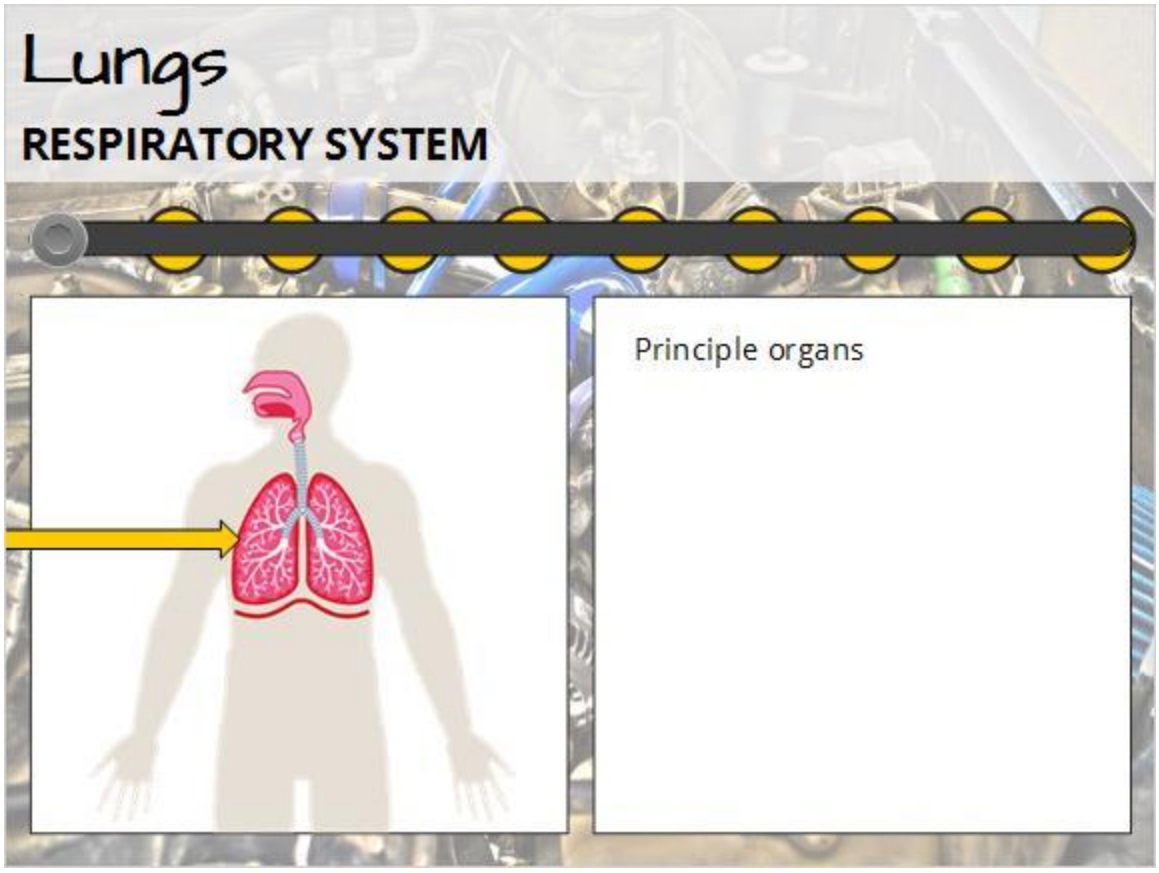
Commonly called the "windpipe," the trachea is a tube that provides air passage and filtration toward the lungs.

Bronchi



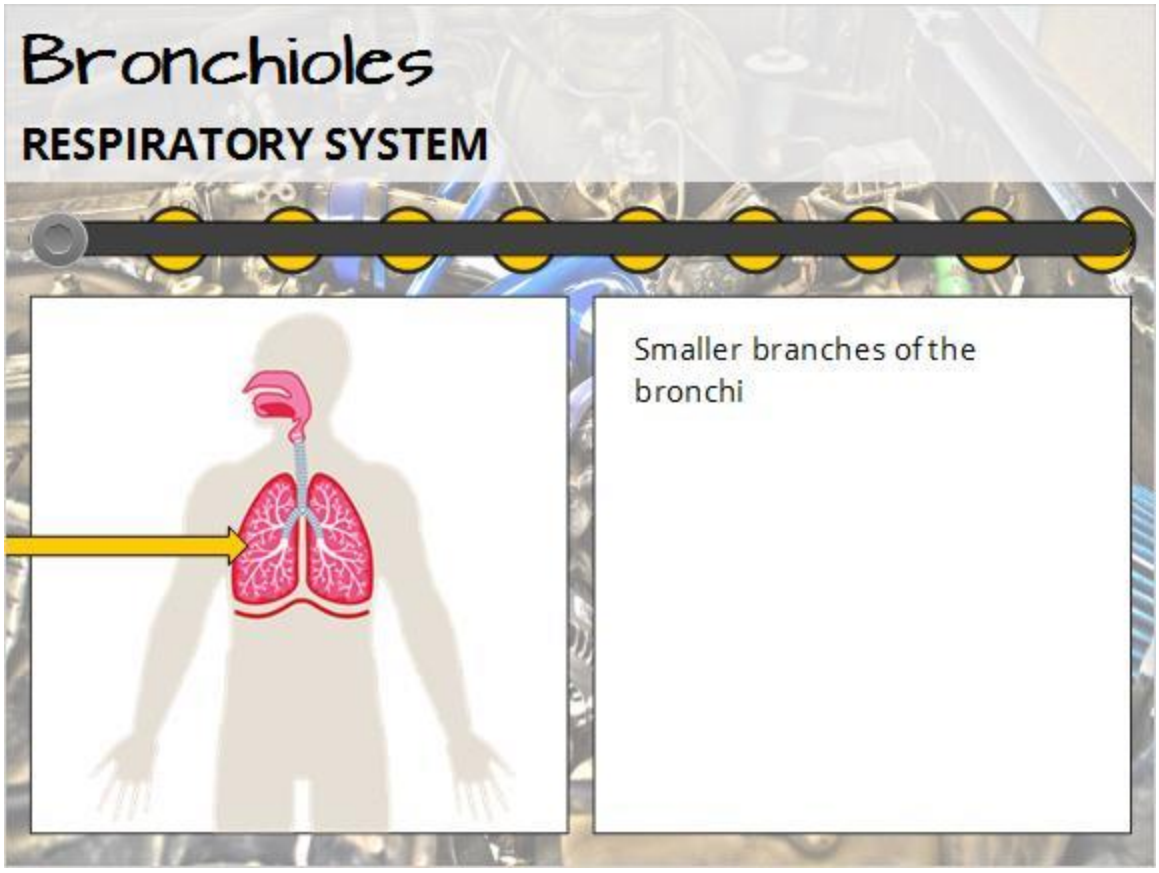
The trachea branches off into two columns called the bronchi. They are tubes that connect to the lungs.

Lungs



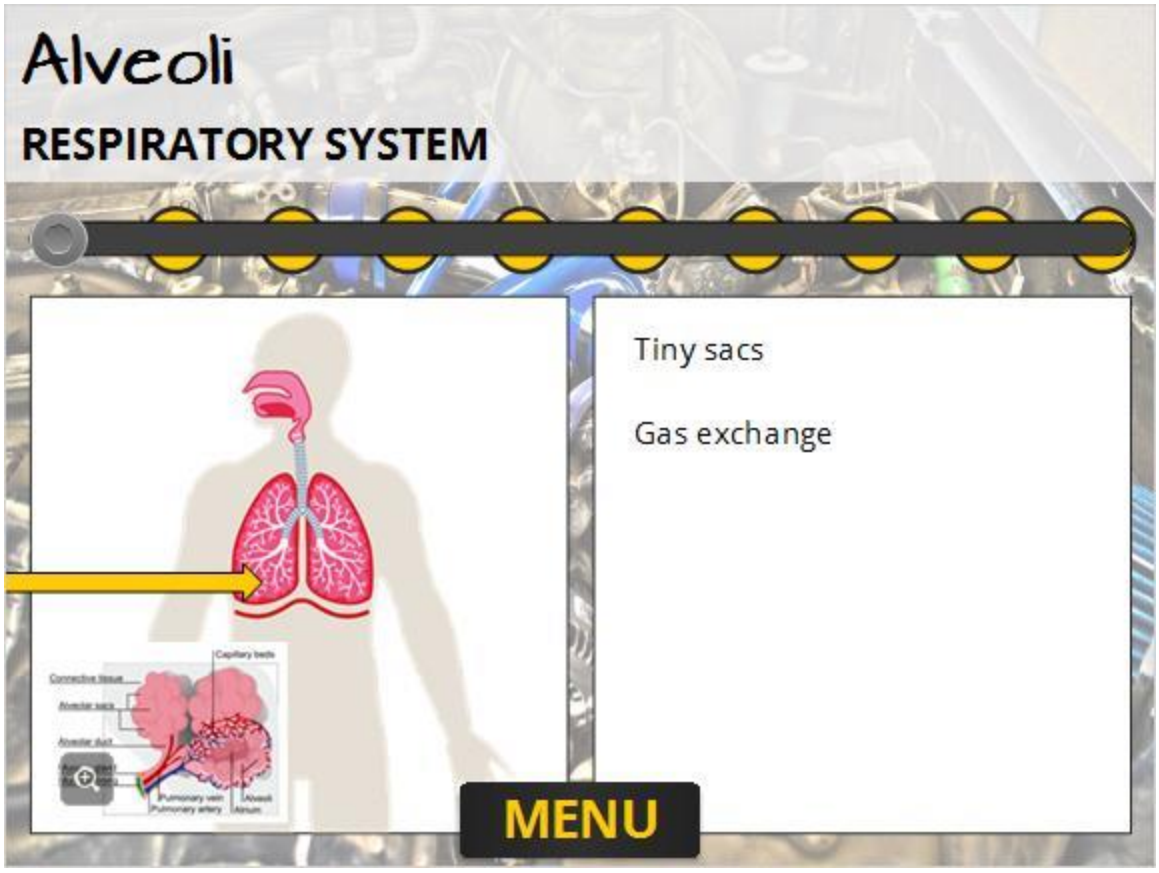
The lungs are the principle organs of the respiratory system.

Bronchioles



Bronchioles are smaller branches of the bronchi.

Alveoli



Alveoli are tiny, thin-walled sacs where gas exchange takes place.

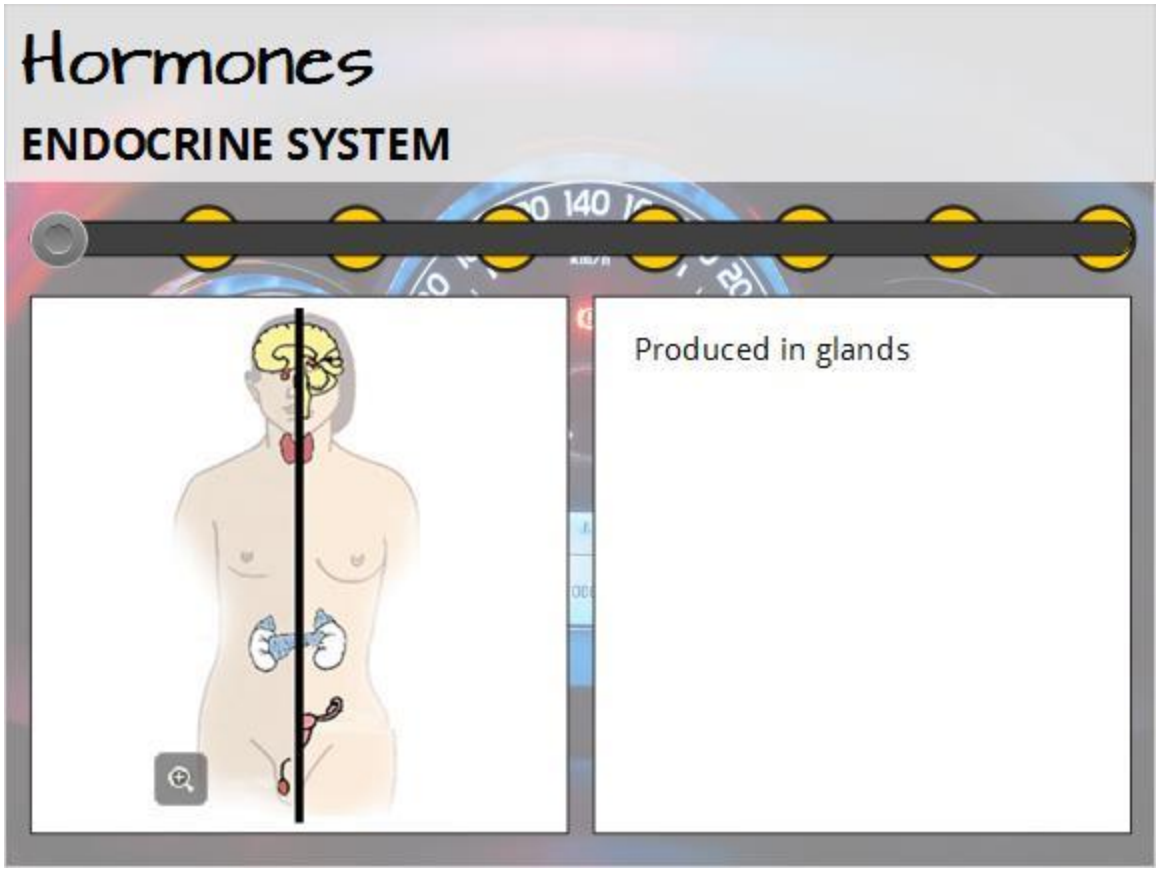
Click the ***MENU*** button to return to the Body Systems Menu.

Endocrine System

Like the dashboard that houses the controls of an automobile, the endocrine system of the body is a collection of glands that produce hormones that control various functions of the body.

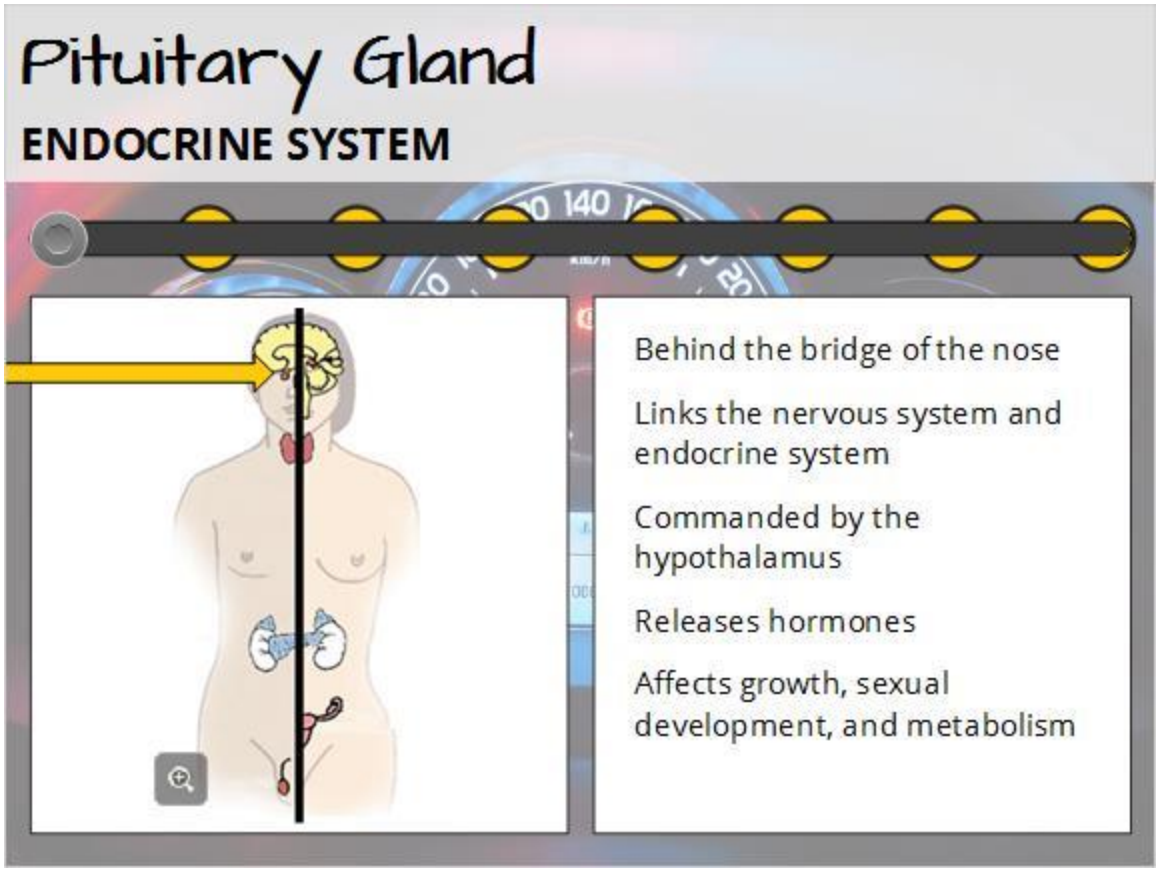
Drag the slider and drop it on each target to explore components of the endocrine system.

Hormones



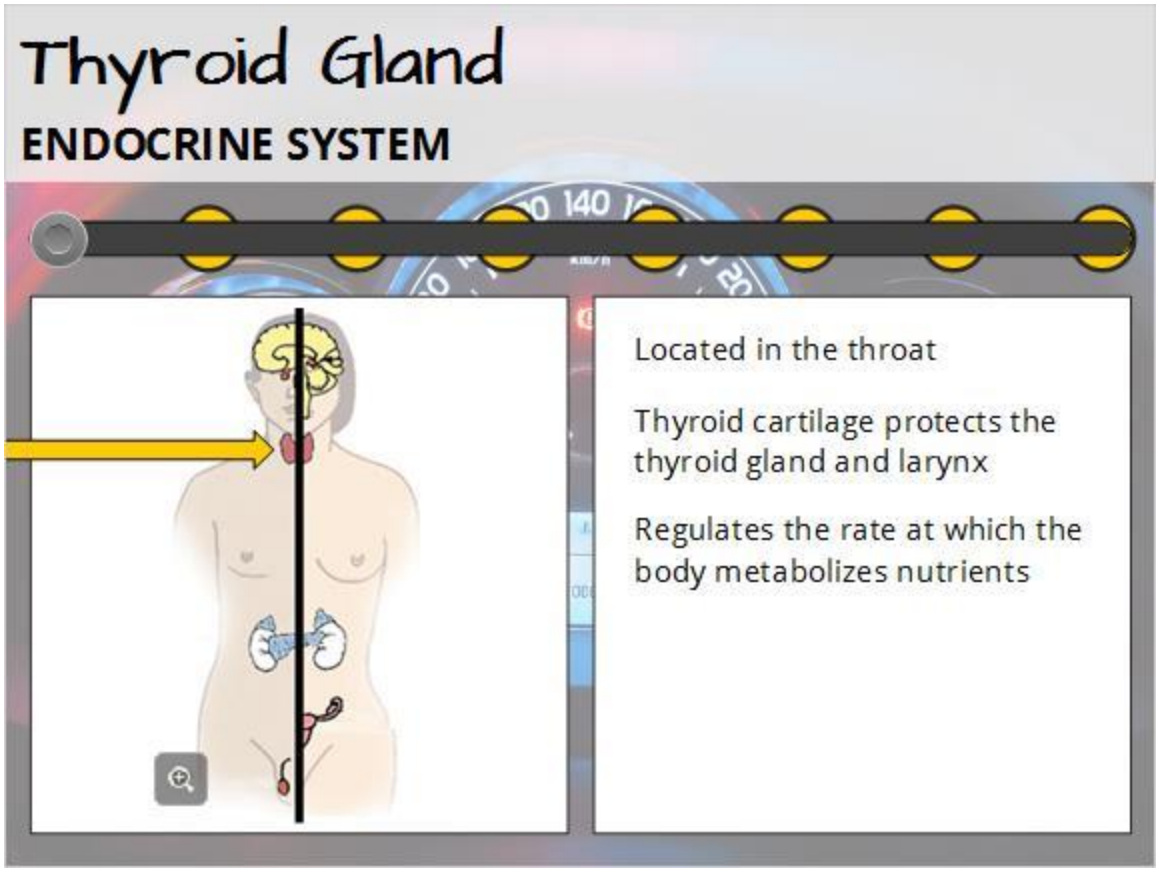
Glands regulate activities of different cells in your body. Hormones are produced in glands.

Pituitary Gland



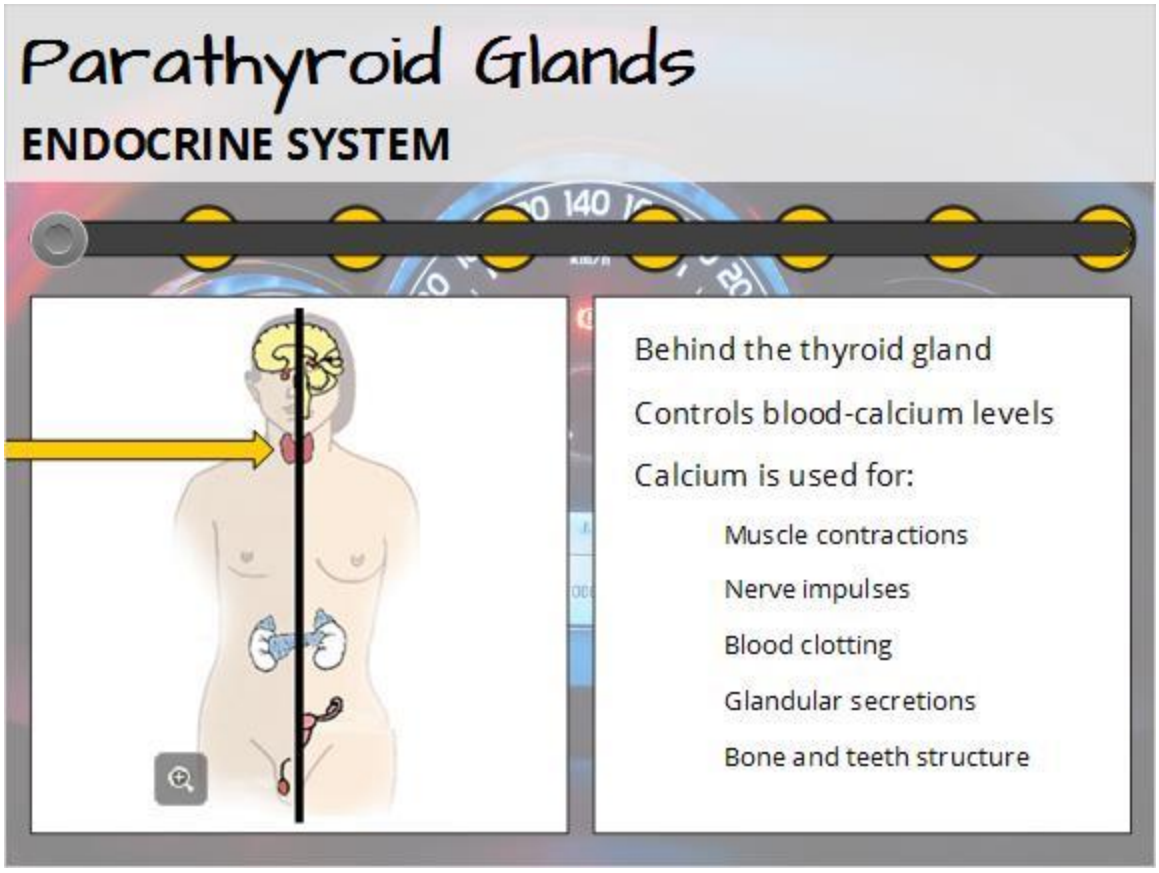
This small powerful gland is located just behind the bridge of your nose. The pituitary gland links the nervous system and the endocrine system, and is commanded by the hypothalamus (a cluster of brain cells just behind the pituitary gland). It also releases hormones, which affect growth, sexual development, and metabolism.

Thyroid Gland



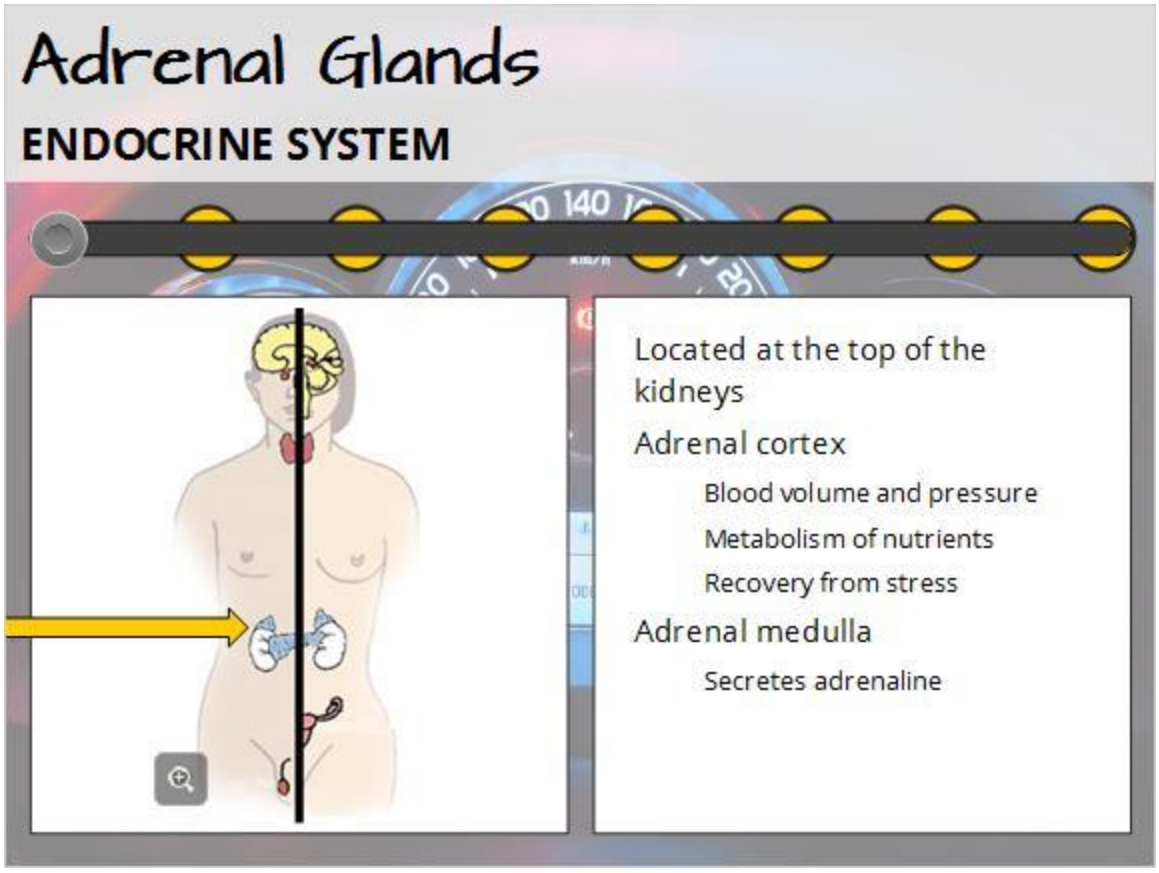
This butterfly-shaped gland is located in your throat. The thyroid cartilage, also called the Adam's Apple, protects the thyroid gland and larynx. The thyroid regulates the rate at which the body metabolizes nutrients into energy.

Parathyroid Glands



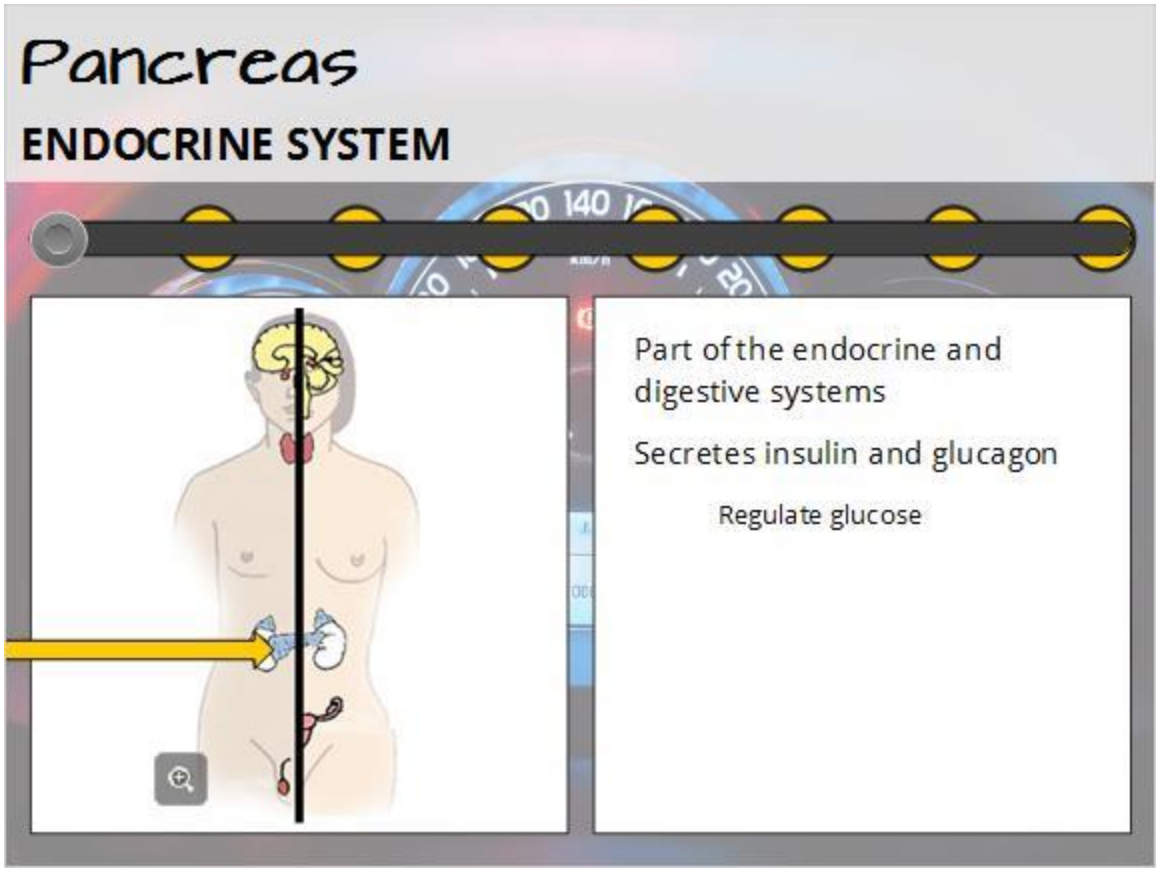
Located behind the thyroid gland, the four parathyroid glands control blood-calcium levels. Calcium is needed for muscle contraction, nerve impulses, blood clotting, glandular secretions, and bone and teeth structure.

Adrenal Glands



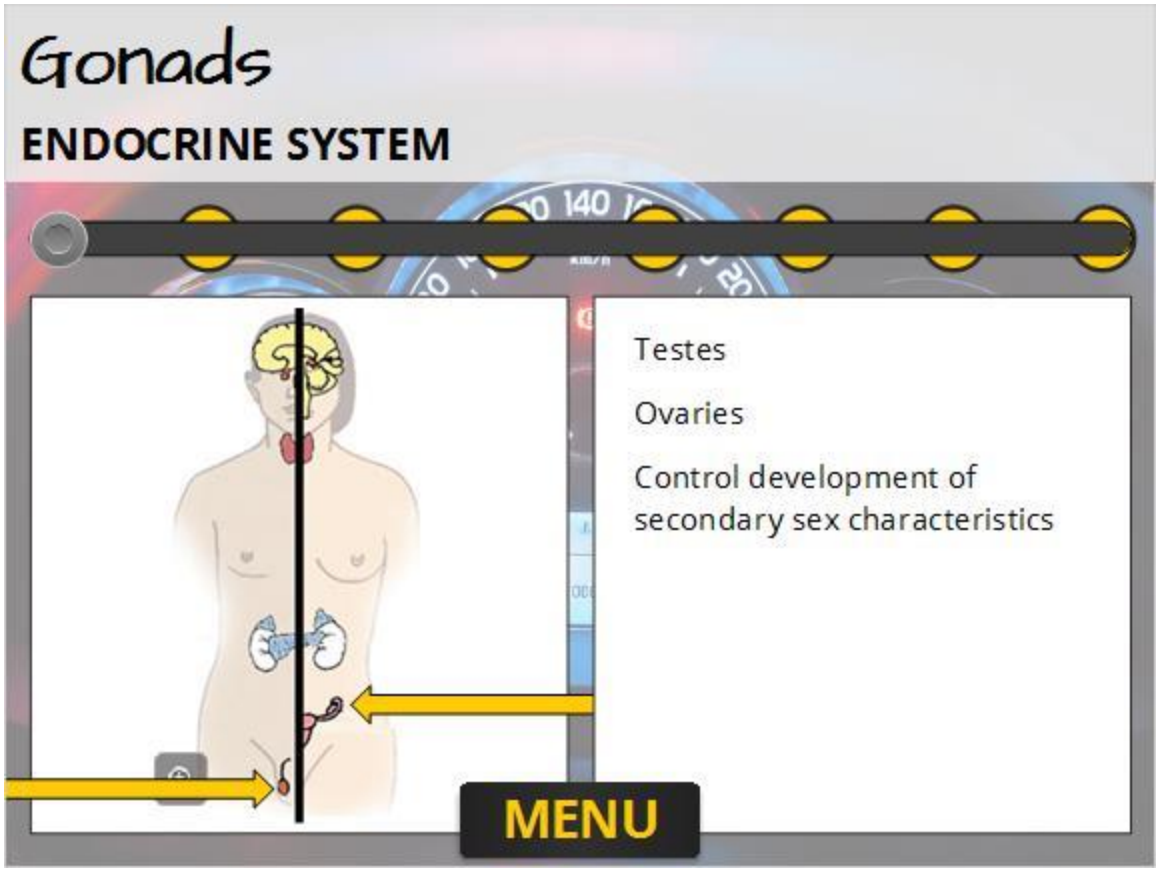
The two adrenal glands, the adrenal cortex and adrenal medulla, are located at the top of the kidneys. The adrenal cortex controls blood volume and pressure, metabolism of nutrients, and helps the body recover from stress. The adrenal medulla secretes adrenaline, which increases heart rate, breathing rate, and blood pressure, and decreases digestion rate.

Pancreas



The pancreas is part of the endocrine system and the digestive system. Its function in the endocrine system is to secrete insulin and glucagon. Theses hormones regulate the amount of glucose, or blood sugar, in your blood.

Gonads



In males, gonads are the testes; and in females, gonads are the ovaries. The hormones released by these glands control the development of secondary sex characteristics such as breasts and facial hair.

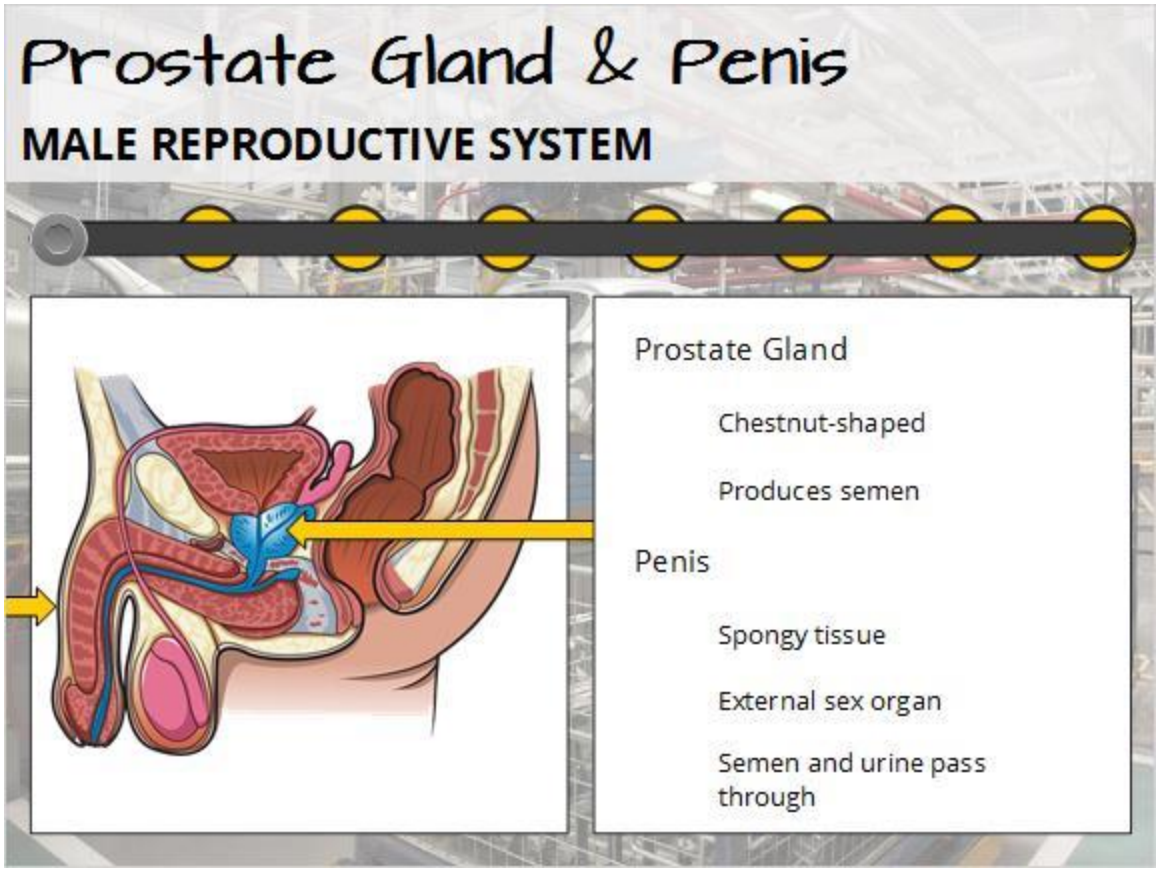
Click the ***MENU*** button to return to the Body Systems Menu.

Reproductive System

Automobiles are reproduced on the manufacturer's assembly line. By comparison, sexual organs for males and females produce sperm in males and eggs in females so humans can reproduce.

Drag the slider and drop it on each target to explore components of the reproductive system.

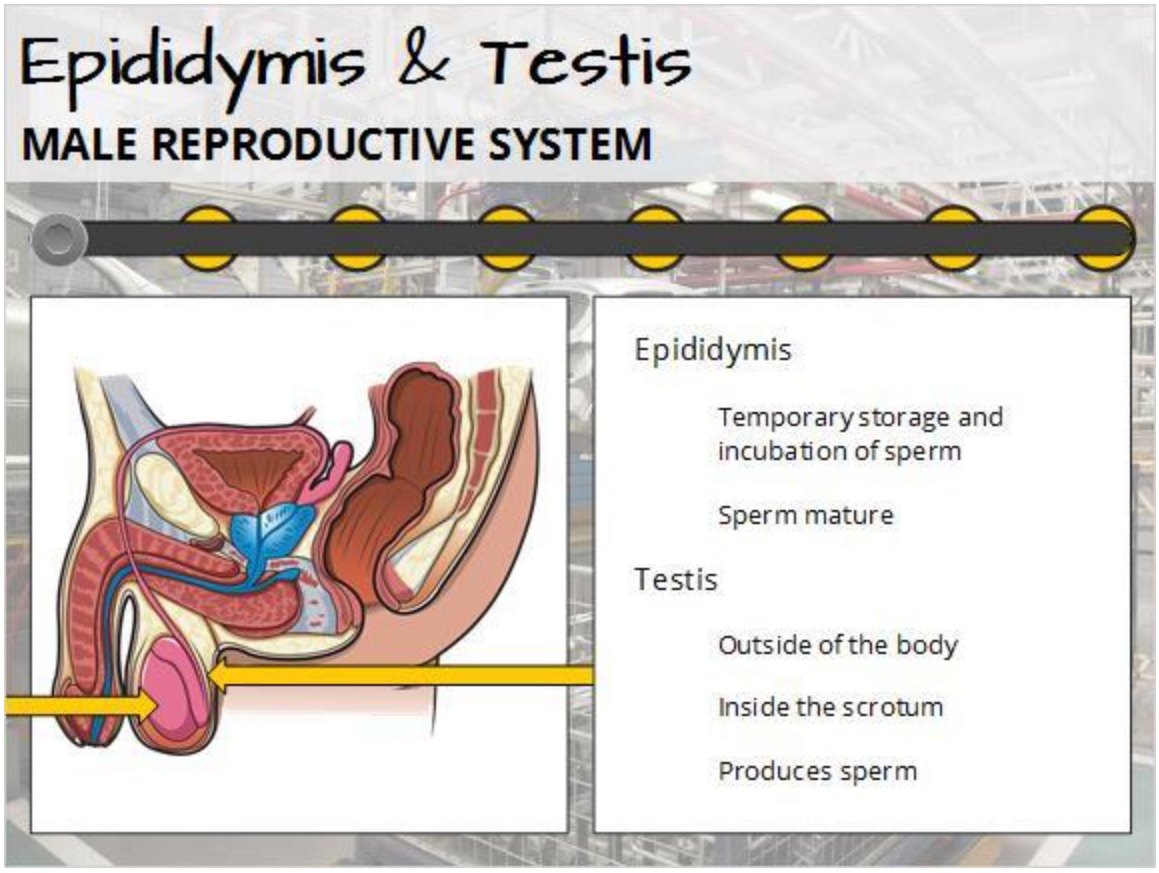
Prostate Gland and Penis



The prostate gland is a chestnut-shaped organ that produces semen.

The penis is a spongy tissue. This organ is the external sex organ of a male through which semen and urine pass.

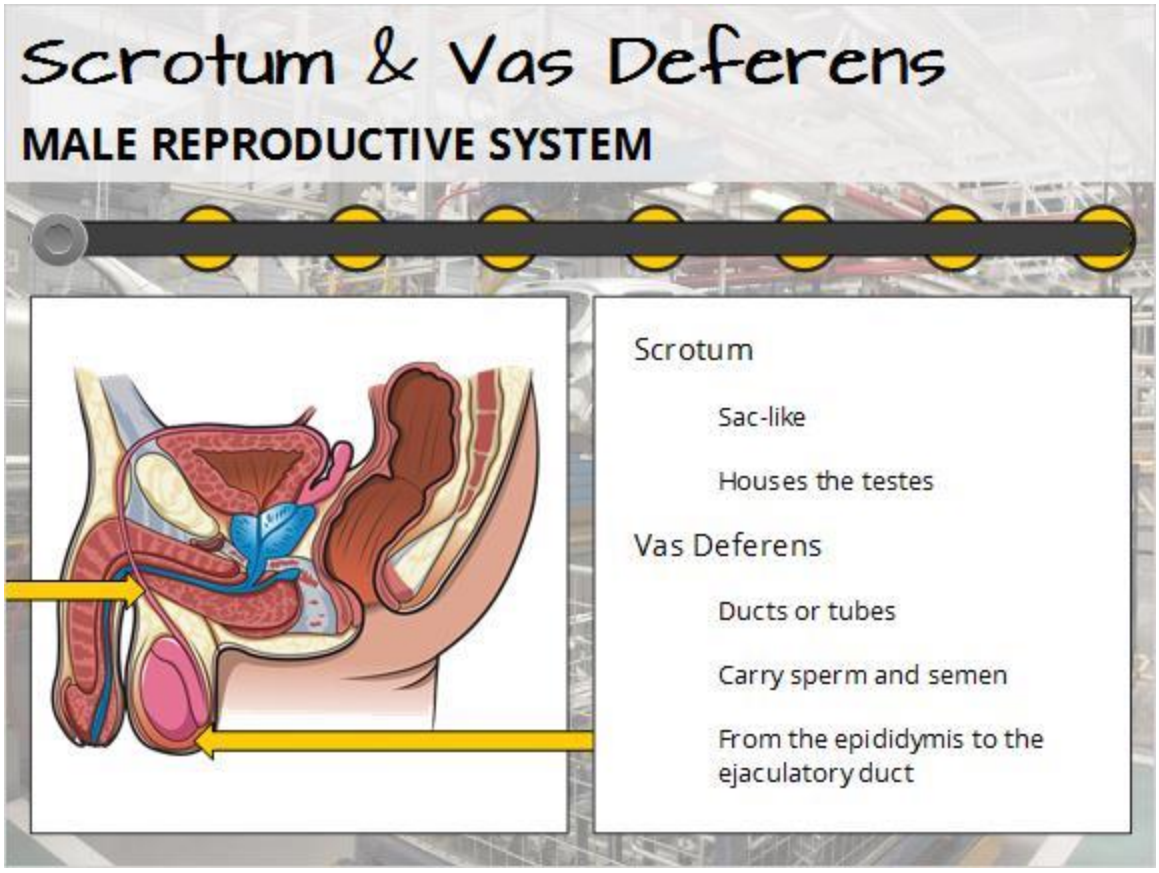
Epididymis and Testis



The epididymis is a temporary storage and incubation place for sperm to mature.

The testis is located outside of the body, within a sac called the scrotum. This organ produces sperm.

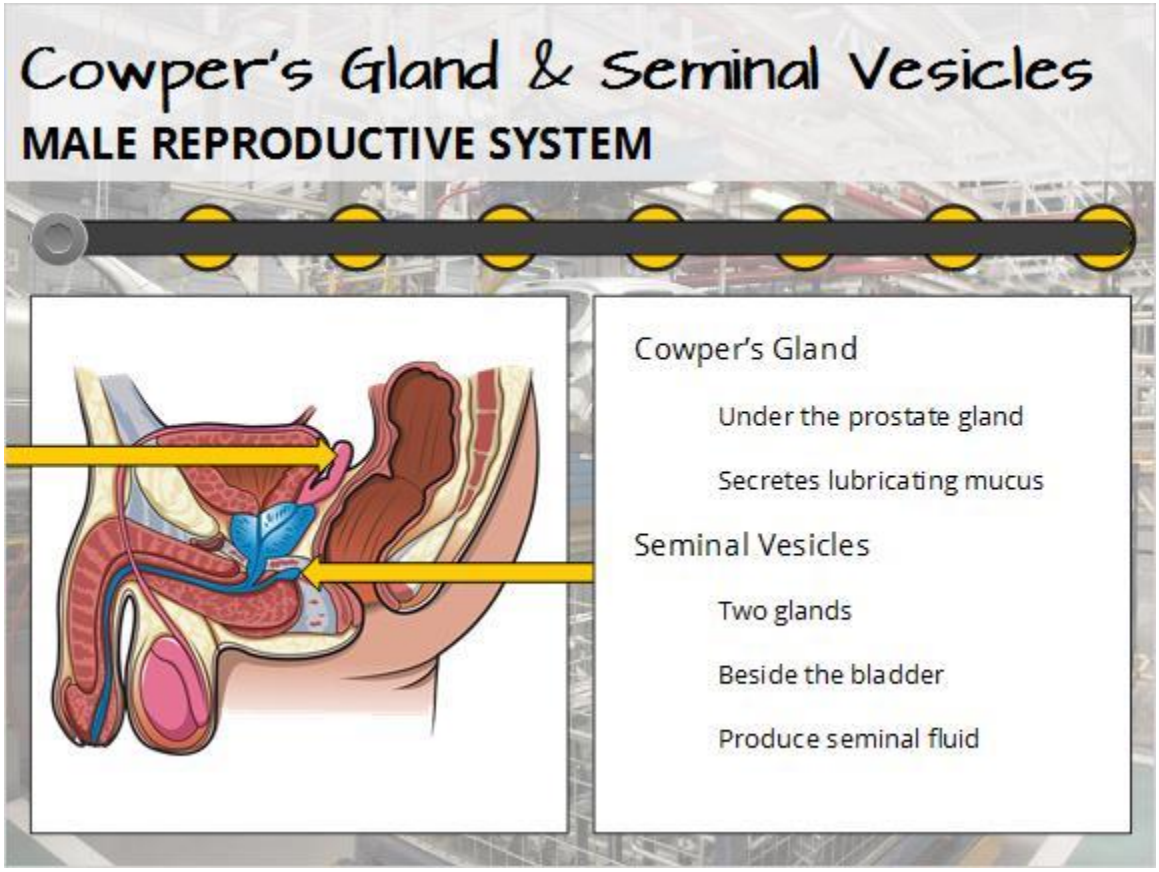
Scrotum and Vas Deferens



The scrotum is a sac-like structure that houses the testes.

The vas deferens are ducts or tubes that carry sperm and semen. They lead from the epididymis to the ejaculatory duct.

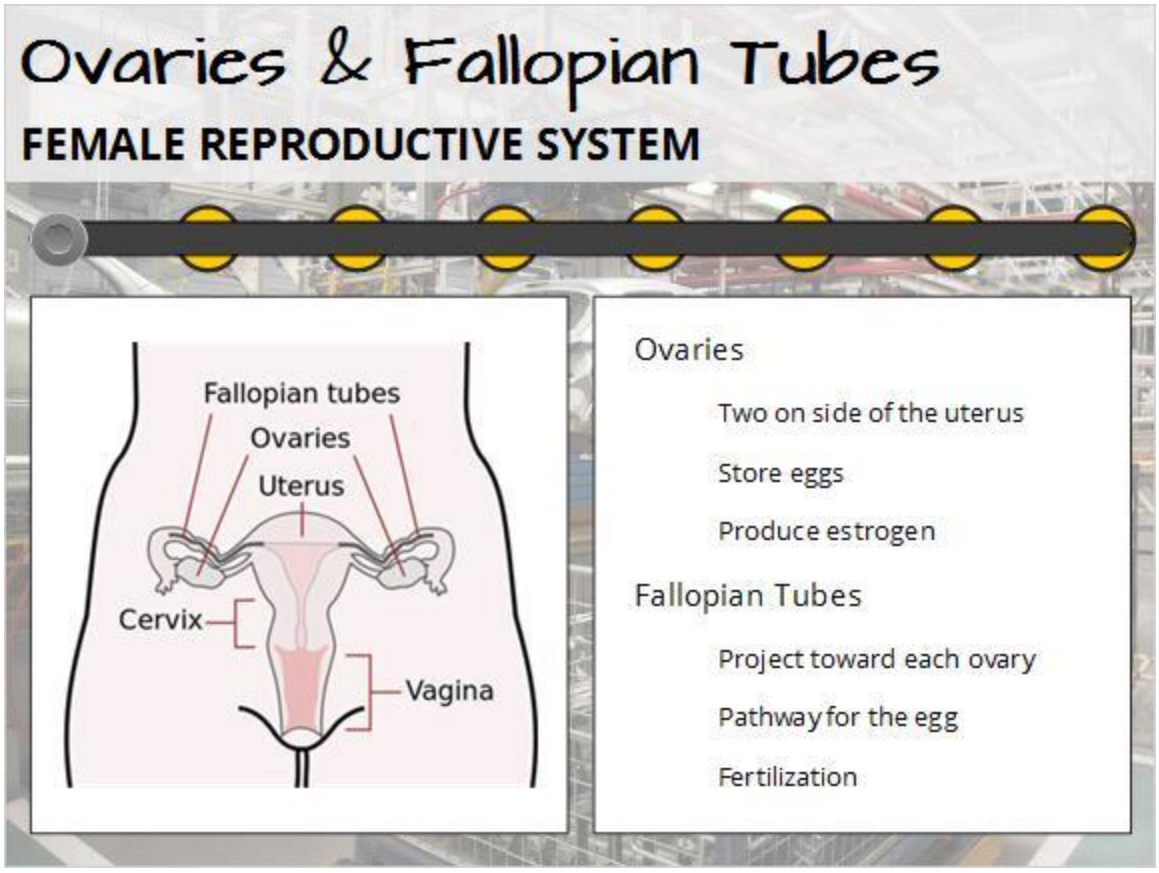
Cowper's Gland and Seminal Vesicles



The Cowper's gland is located under the prostate gland. It secretes lubricating mucus before and during ejaculation.

Seminal vesicles are the two glands located beside the male's urinary bladder. They produce seminal fluid.

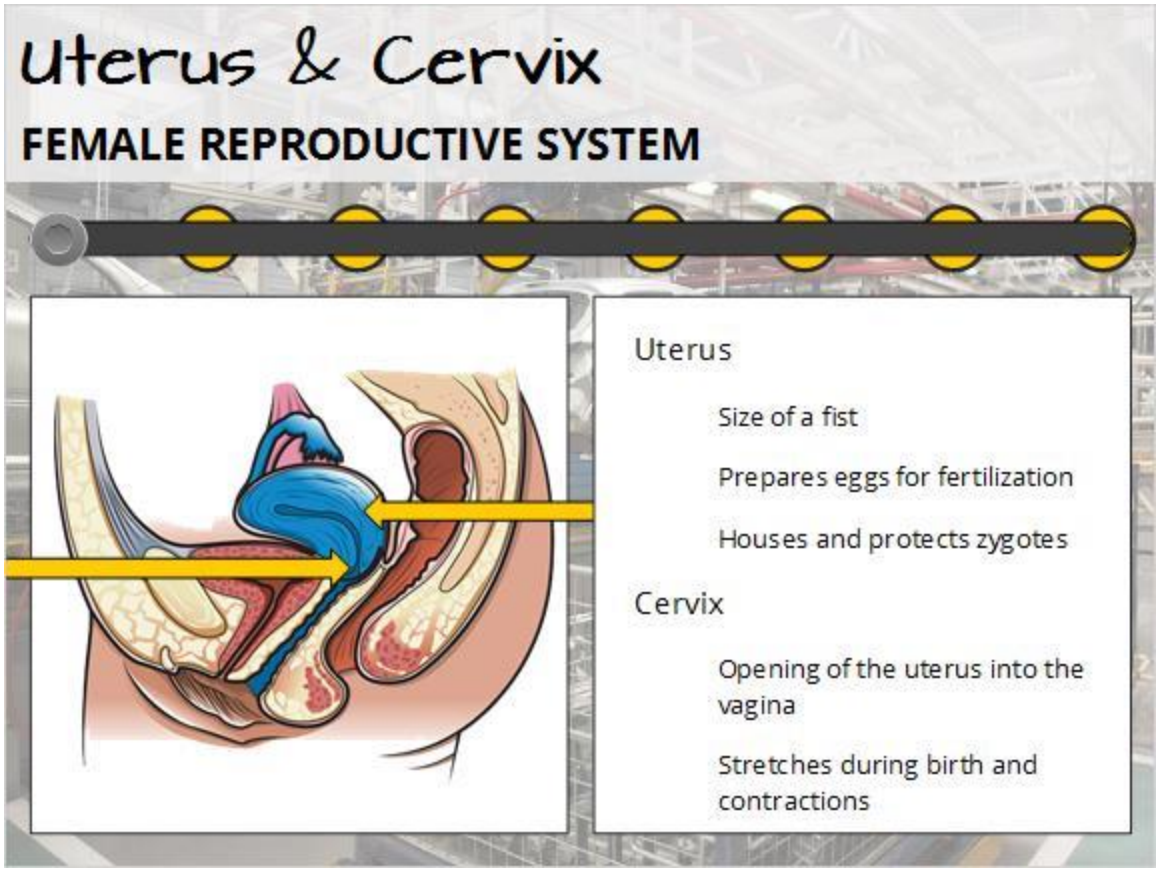
Ovaries and Fallopian Tubes



Females have two ovaries, one on either side of the uterus. Ovaries store a woman's eggs; and one egg gets released once a month. Ovaries also produce the female sex hormone estrogen.

Fallopian tubes are long, thin tubes that project from the uterus in a sideways fashion, toward each ovary. They provide a pathway for the egg to travel. In fact, eggs become fertilized by sperm in the fallopian tubes.

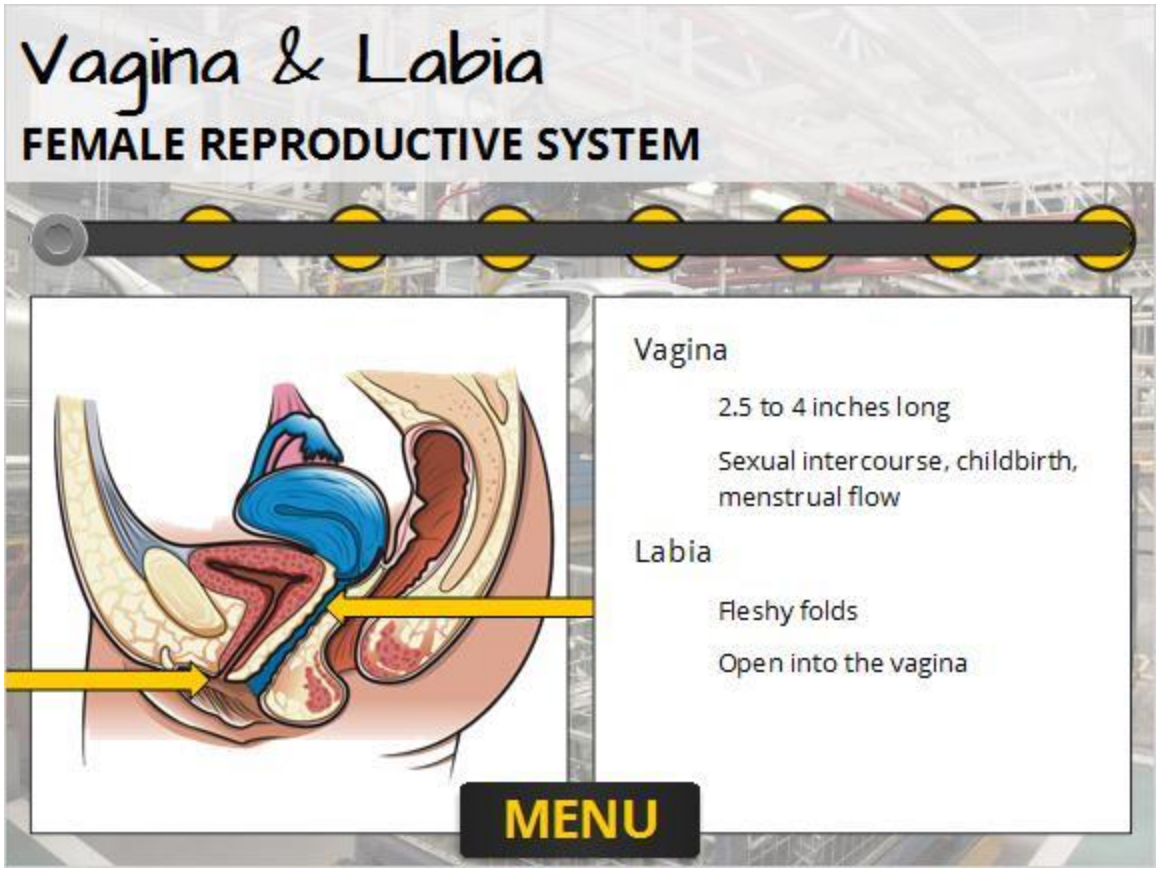
Uterus and Cervix



The uterus is a pear-shaped organ about the size of your fist. It prepares for egg fertilization once a month. If fertilization occurs, the uterus will house the growing zygote, and provide protection and nourishment for nine months.

The cervix is the narrow opening of the uterus into the vagina. It stretches when a baby is being born, and when the mother is having contractions.

Vagina and Labia

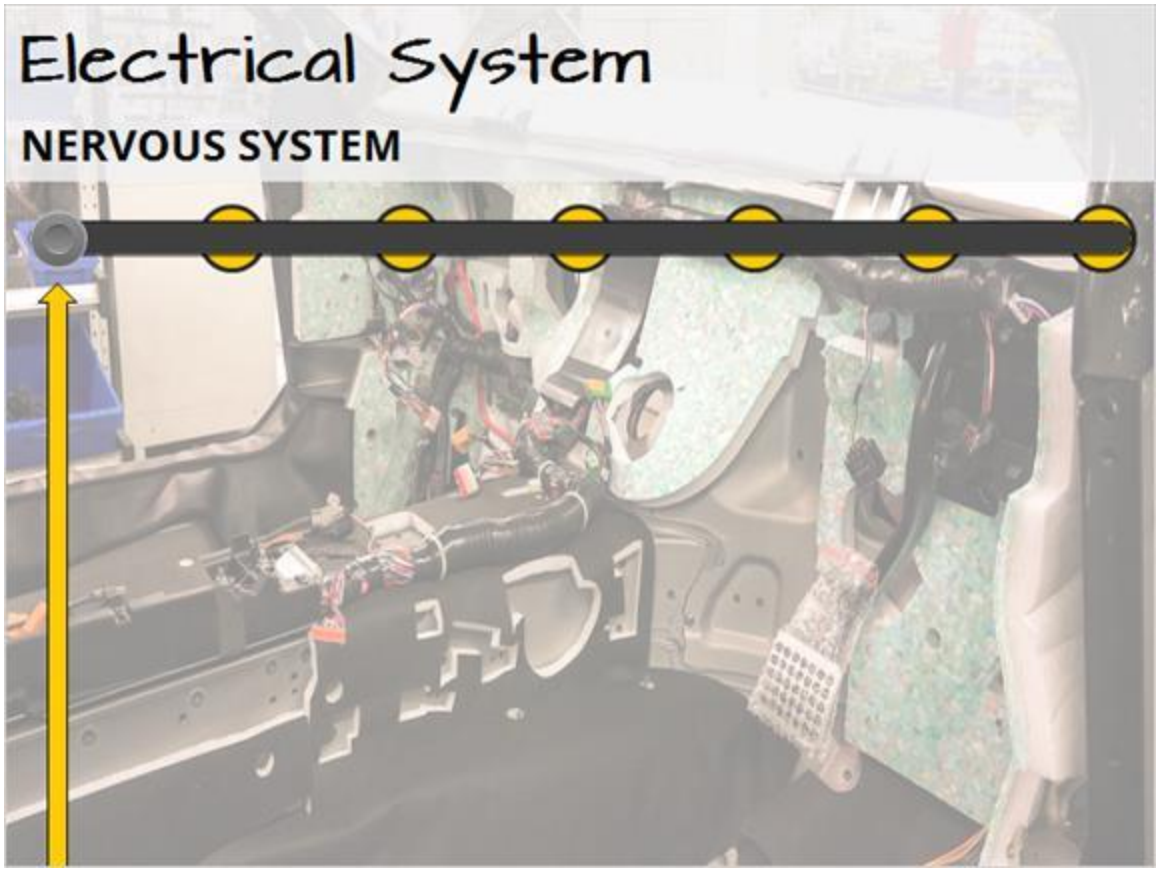


The vagina is a two-and-one-half to four inch long tube that runs from the uterus to the outside of the body. It enables sexual intercourse and childbirth, and provides a pathway for menstrual flow.

The labia are fleshy folds that open into the vagina.

Click the ***MENU*** button to return to the Body Systems Menu.

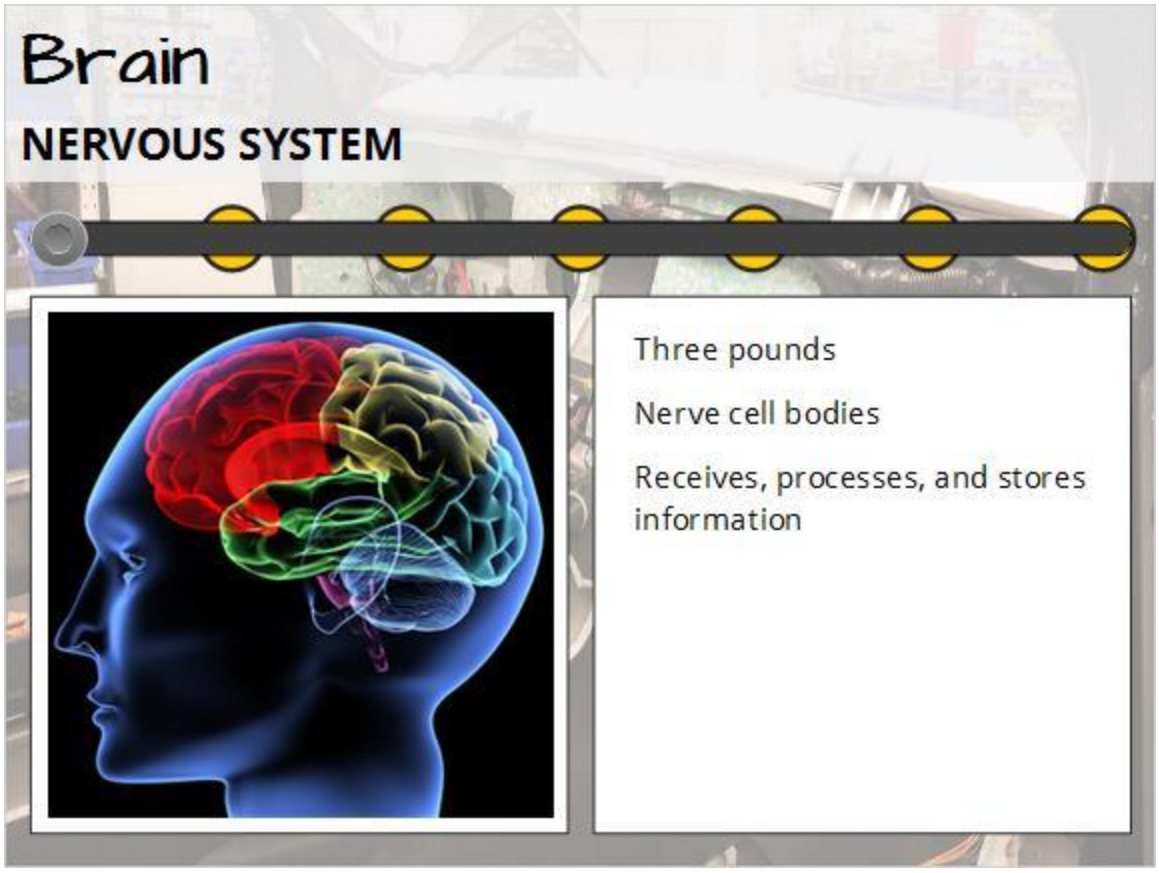
Nervous System



Like the electrical system of an automobile, the nervous system is your communication system and control panel. It controls all body movement and functions related to stimuli received from your surroundings.

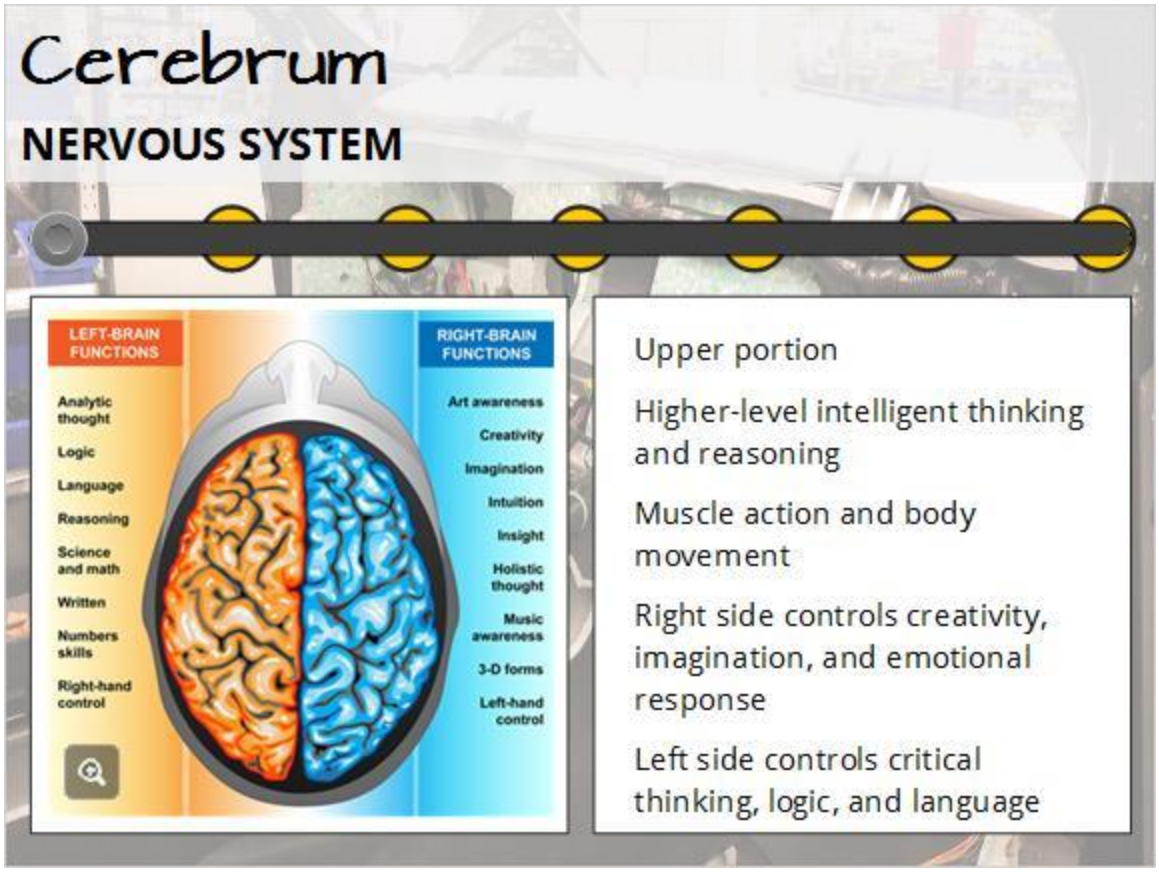
Drag the slider and drop it on each target to explore components of the nervous system.

Brain



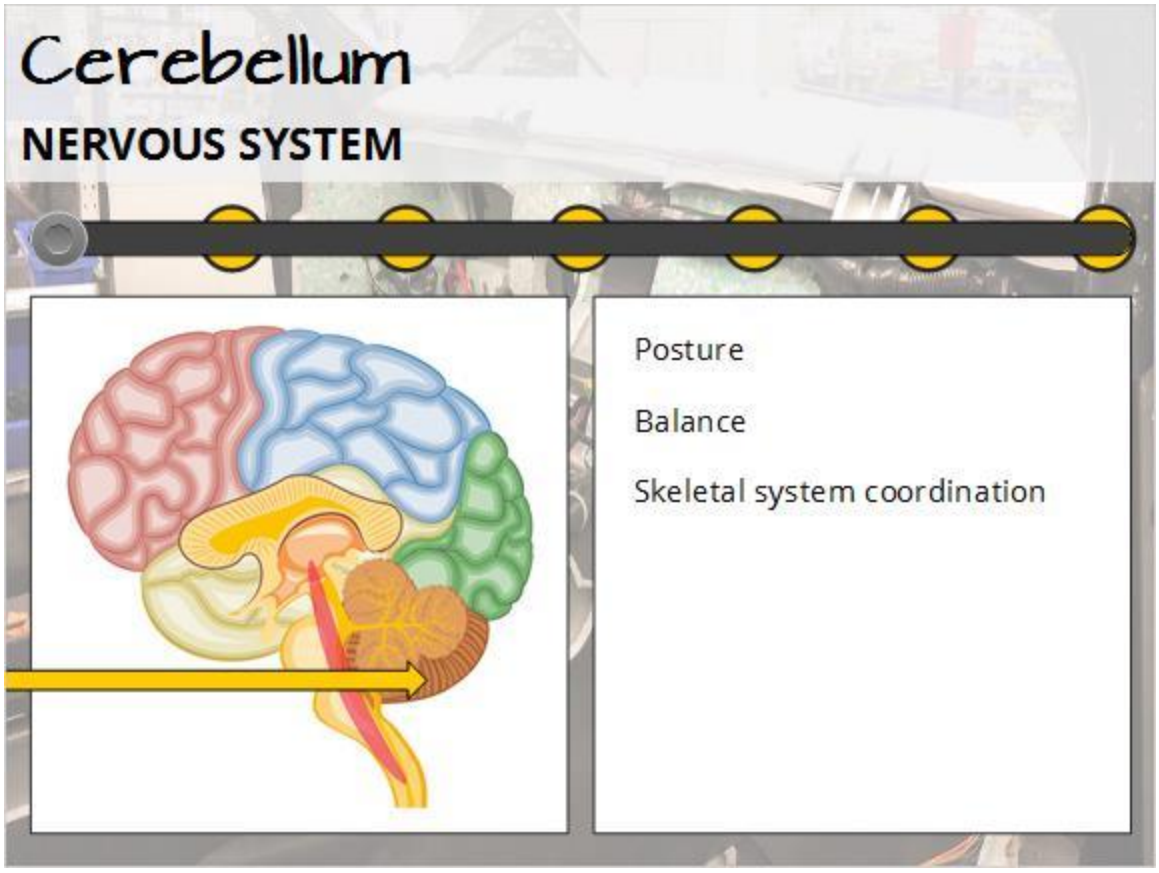
The brain is approximately three pounds, and is comprised of nerve cell bodies that form a jelly-like mass. It is the central control panel that constantly receives, processes, and stores information.

Cerebrum



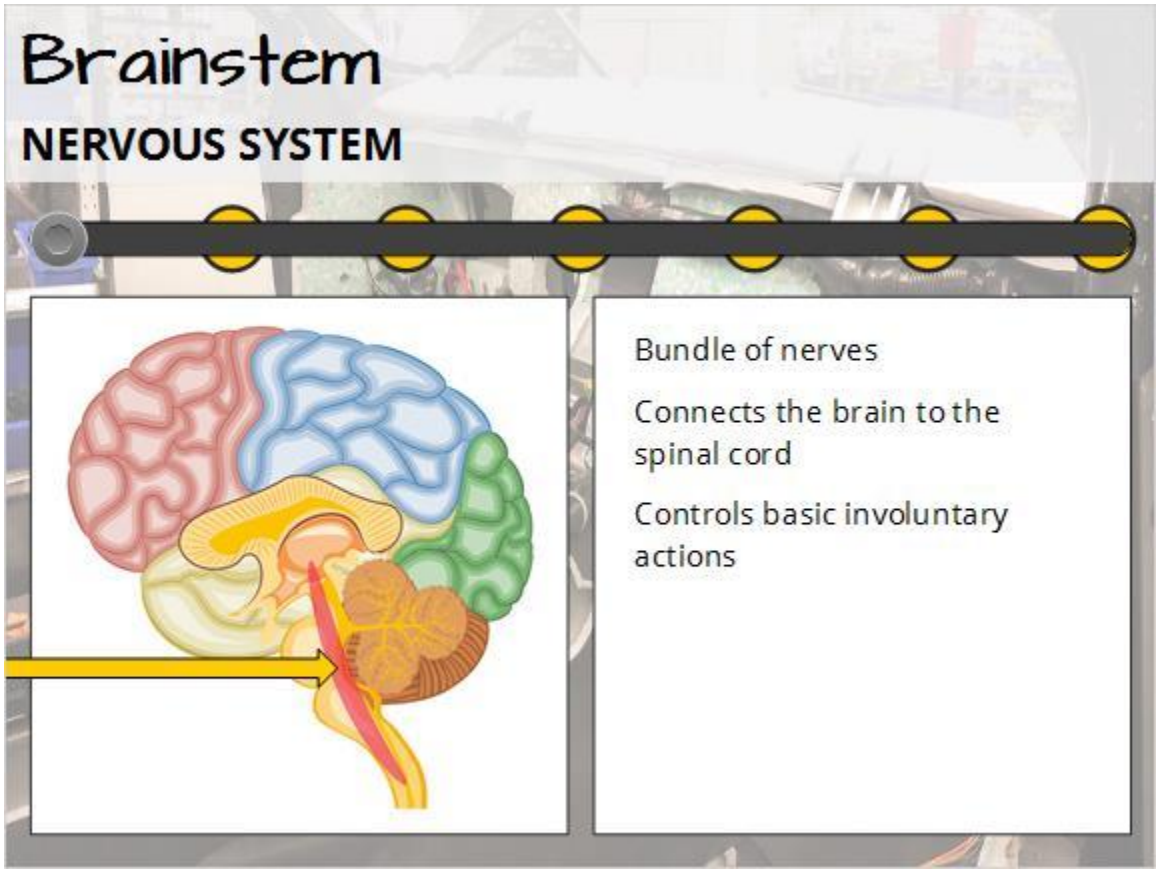
The cerebrum, located in the upper portion of the brain, is the largest and most complex part. It controls higher-intelligent thinking and reasoning. It also initiates muscle action. Specifically, the right side of the cerebrum controls left-body movement, and the left side controls right-body movement. Additionally, the right side is mainly responsible for creativity, imagination, and emotional responses. The left side, however, controls critical thinking, logic, and language.

Cerebellum



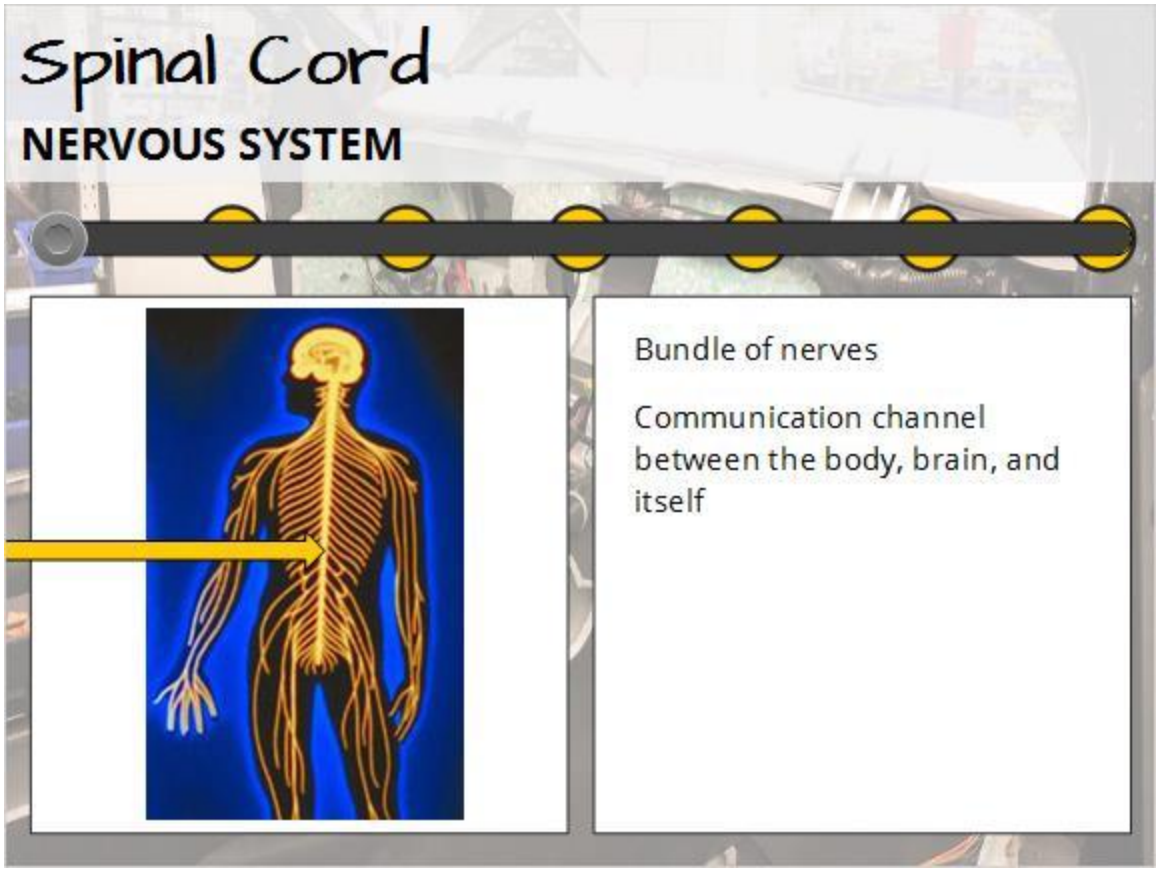
The cerebellum is the second-largest part of the brain. It functions to control posture, balance, and skeletal system coordination.

Brainstem



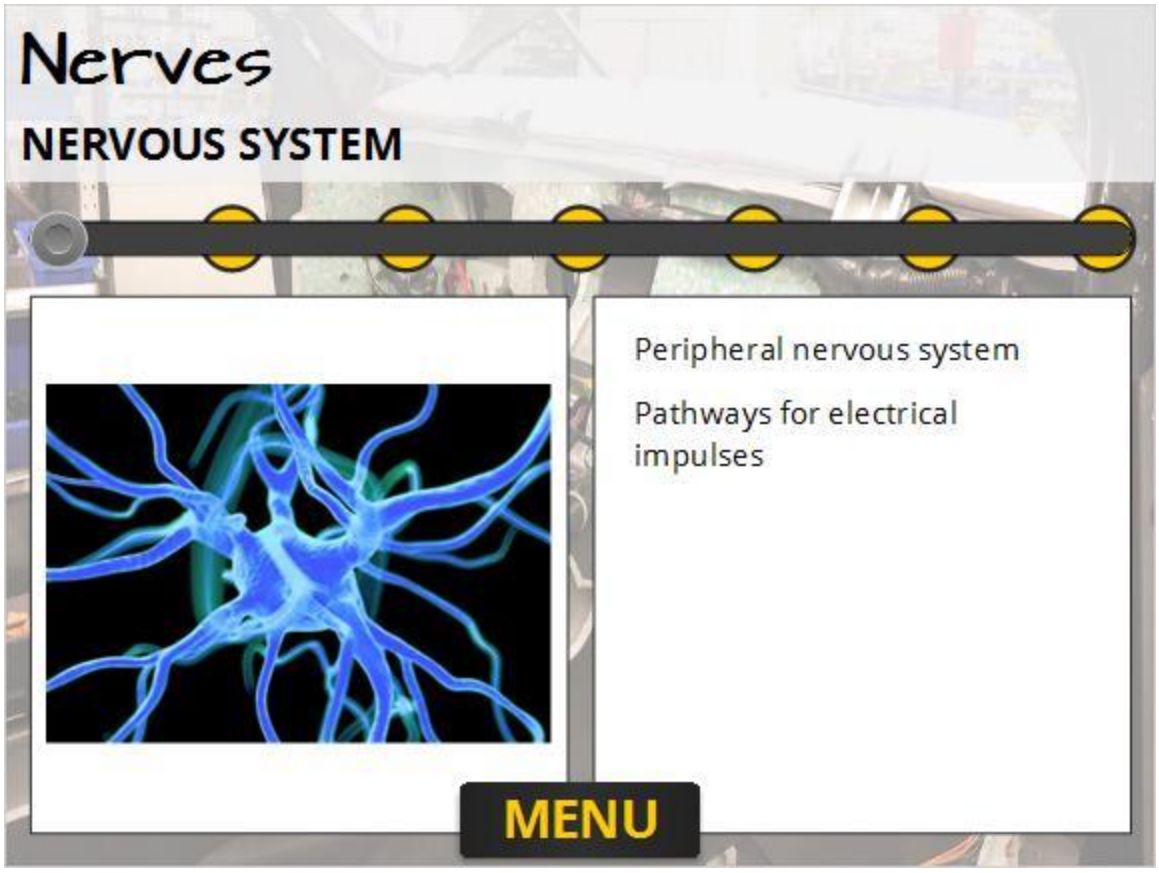
The brainstem is a tight bundle of nerves that connects the brain to the spinal cord. It controls basic involuntary actions such as heartbeat, breathing, and reflexes.

Spinal Cord



The spinal cord is a bundle of nerves that acts as a two-way communication channel between the body, brain, and itself.

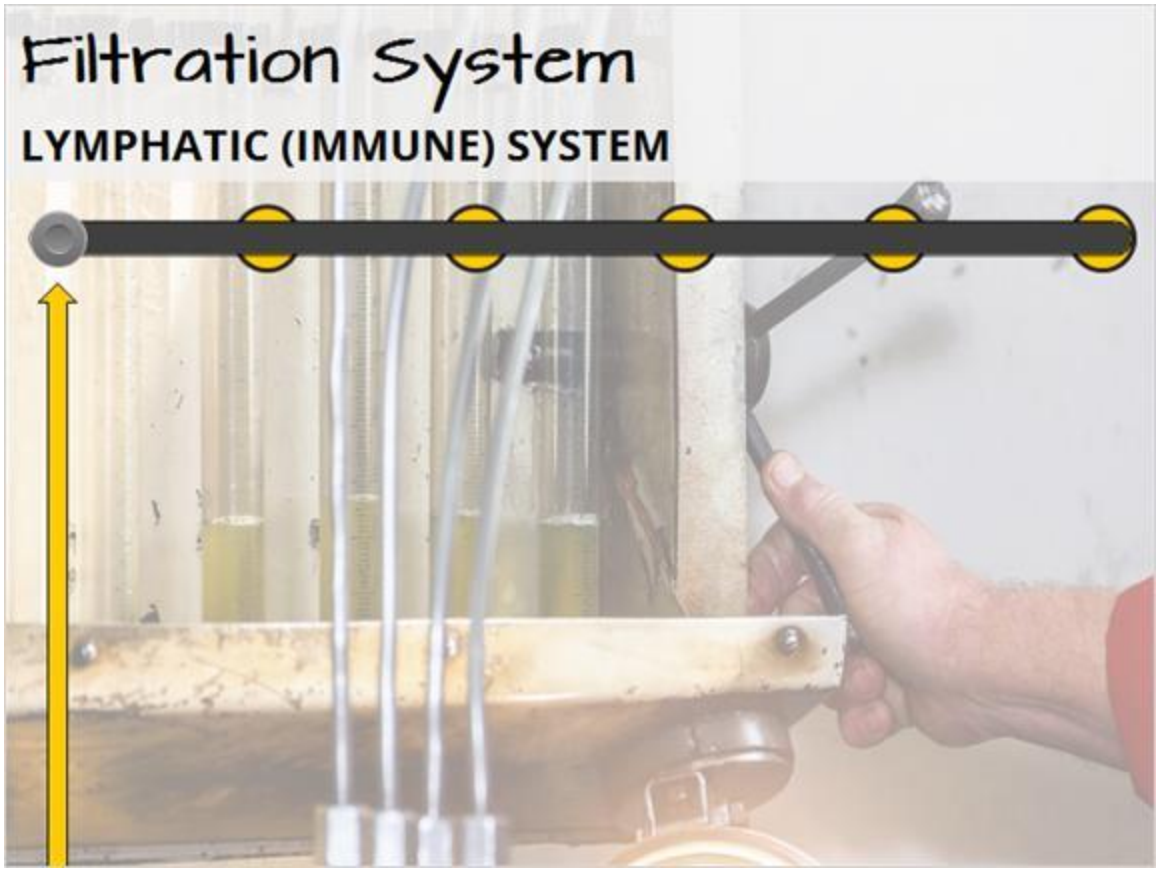
Nerves



Nerves are part of the peripheral nervous system, and provide pathways for electrical impulses to travel to and from the central nervous system.

Click the ***MENU*** button to return to the Body Systems Menu.

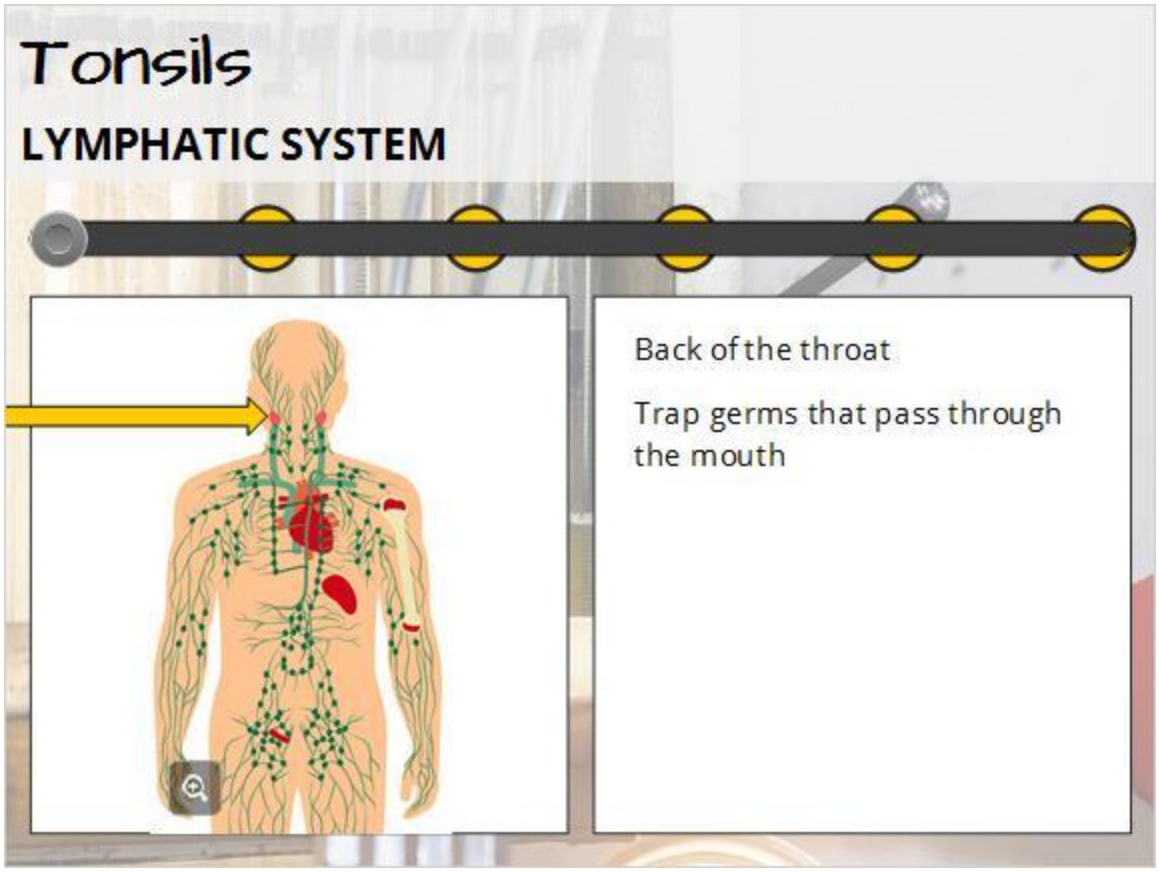
Lymphatic System



Similar to how the filtration system in a car wards off particles that could harm the system, the lymphatic system provides the body with immunity to fight off pathogens.

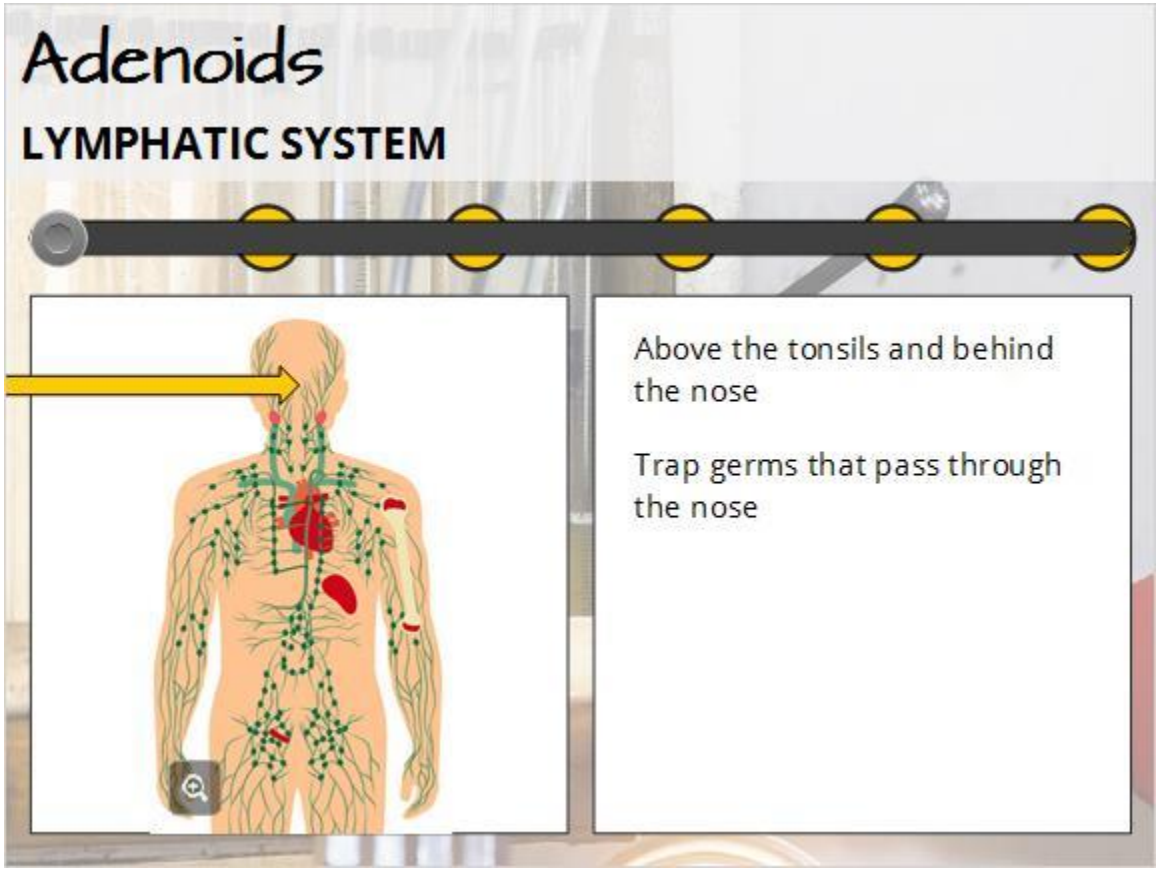
Drag the slider and drop it on each target to explore components of the lymphatic system.

Tonsils



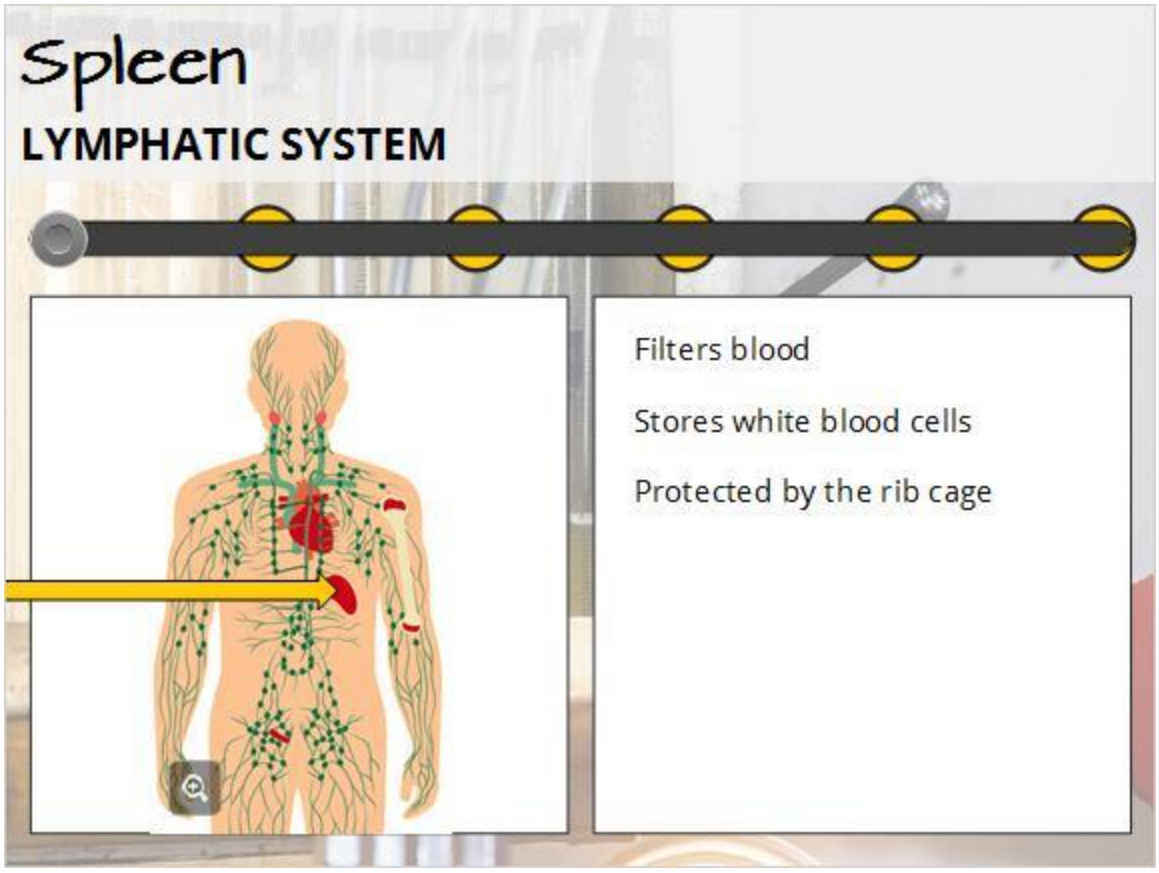
Located in the back of the throat, the tonsils trap germs that enter the body through your mouth.

Adenoids



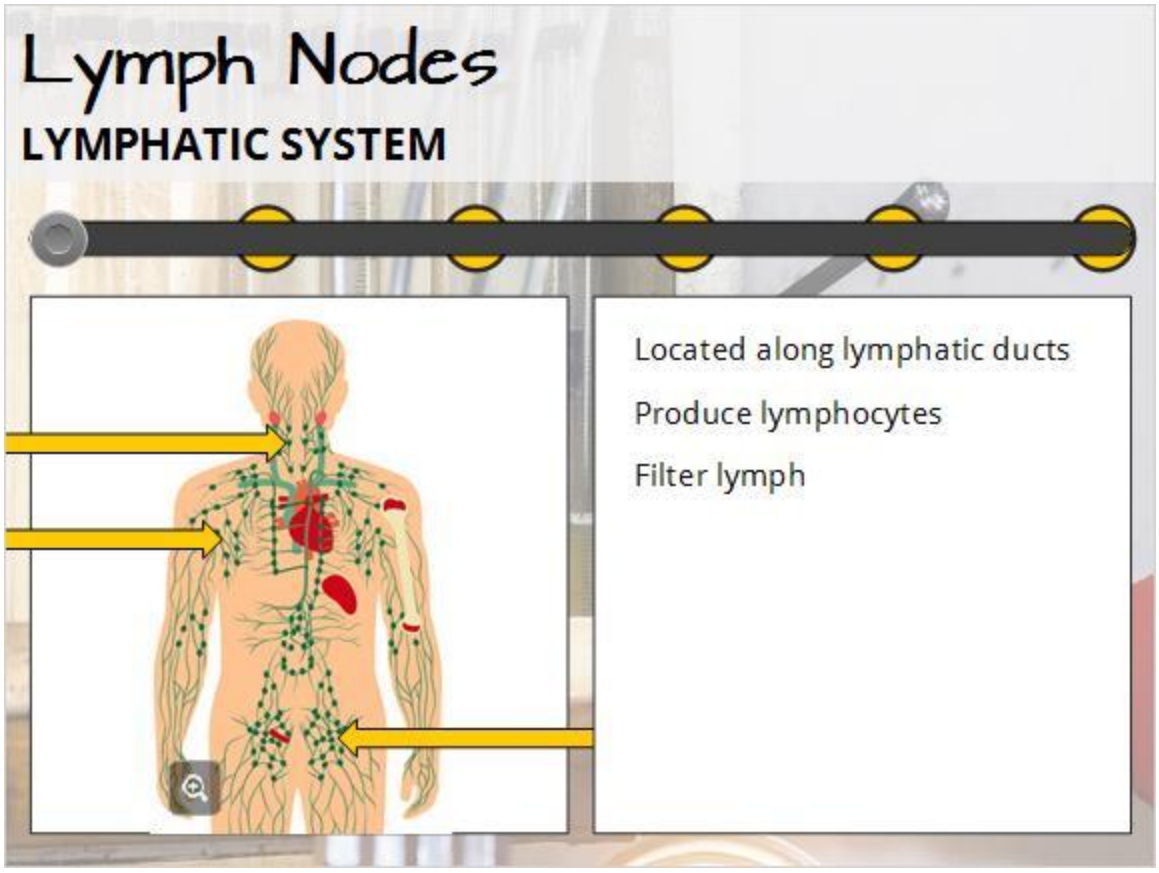
Located just above the tonsils, behind the nose, the adenoids trap germs that pass through your nose.

Spleen



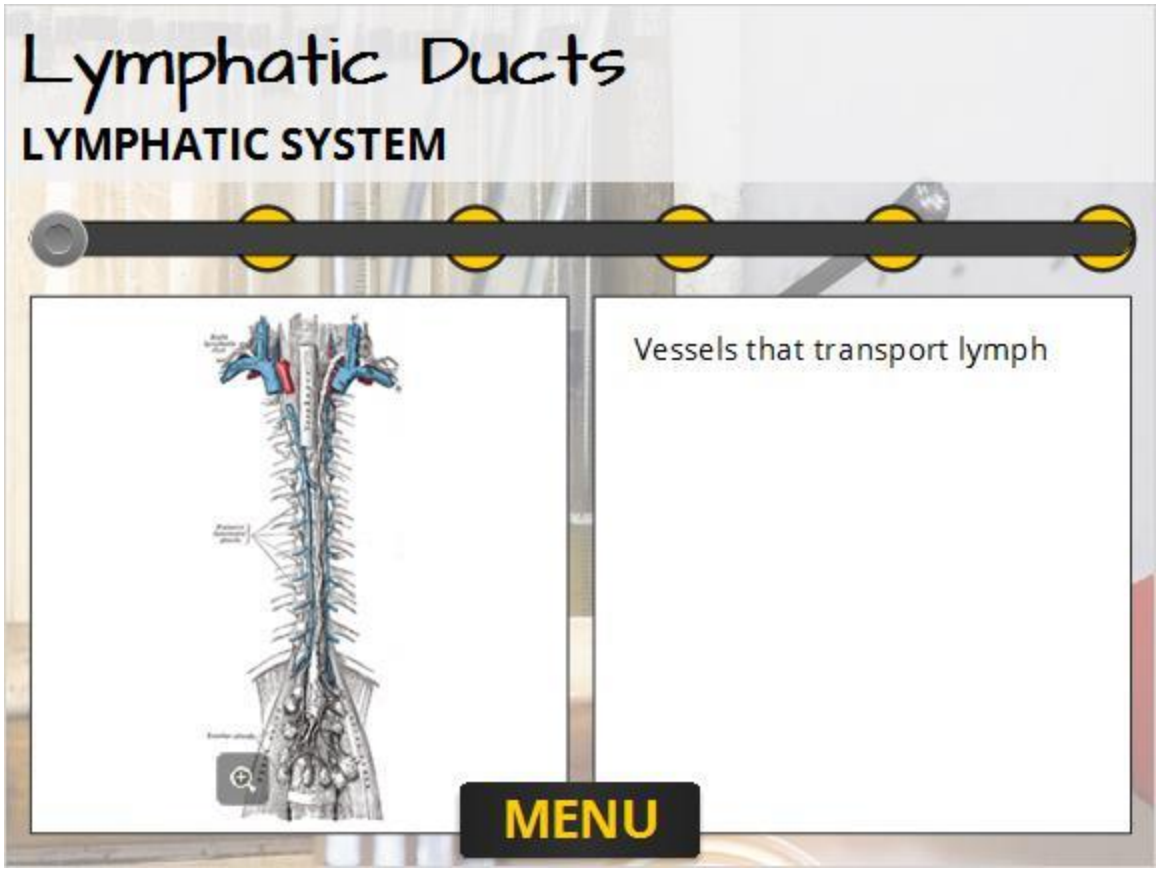
The spleen filters blood, and stores lymphocytes, or white blood cells. On the left side of your body, the rib cage protects spleen.

Lymph Nodes



Lymph nodes are located along the lymphatic ducts in the groin, armpits, and the neck regions. They produce lymphocytes, and filter lymph before it returns to the blood.

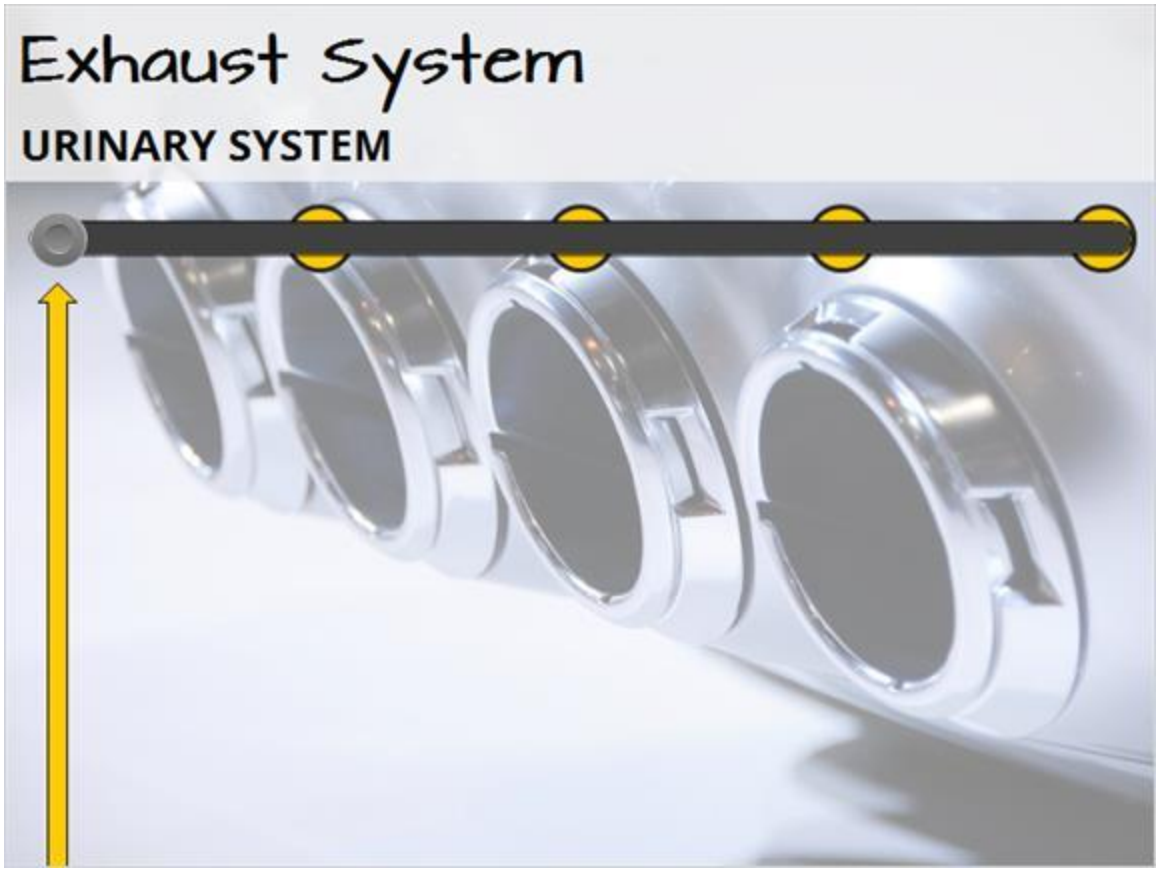
Lymphatic Ducts



Lymphatic ducts are vessels that transport lymph.

Click the ***MENU*** button to return to the Body Systems Menu.

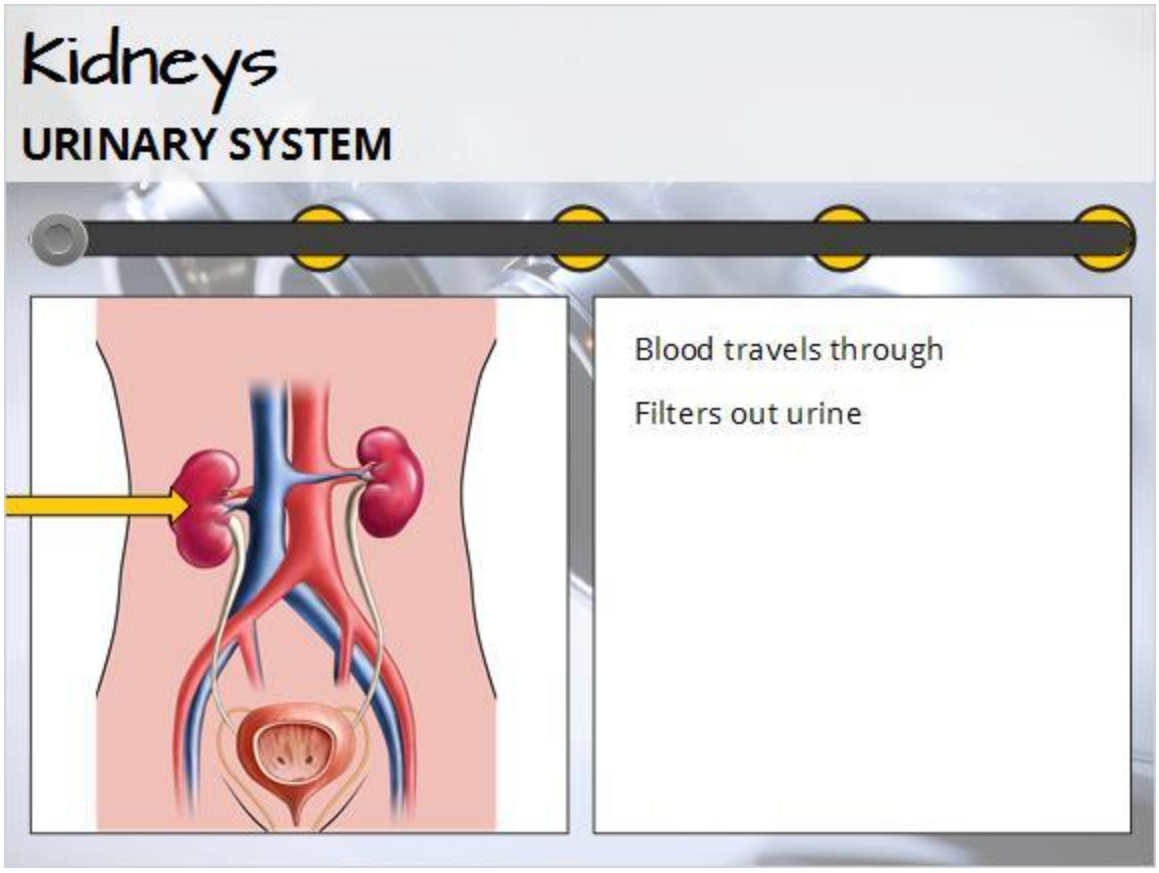
Urinary System



Similar to how the exhaust system in a car moves gases out of the vehicle and away from the passengers, the urinary system in the body filters and eliminates waste after all of the other systems have used the nutrients or destroyed the germs.

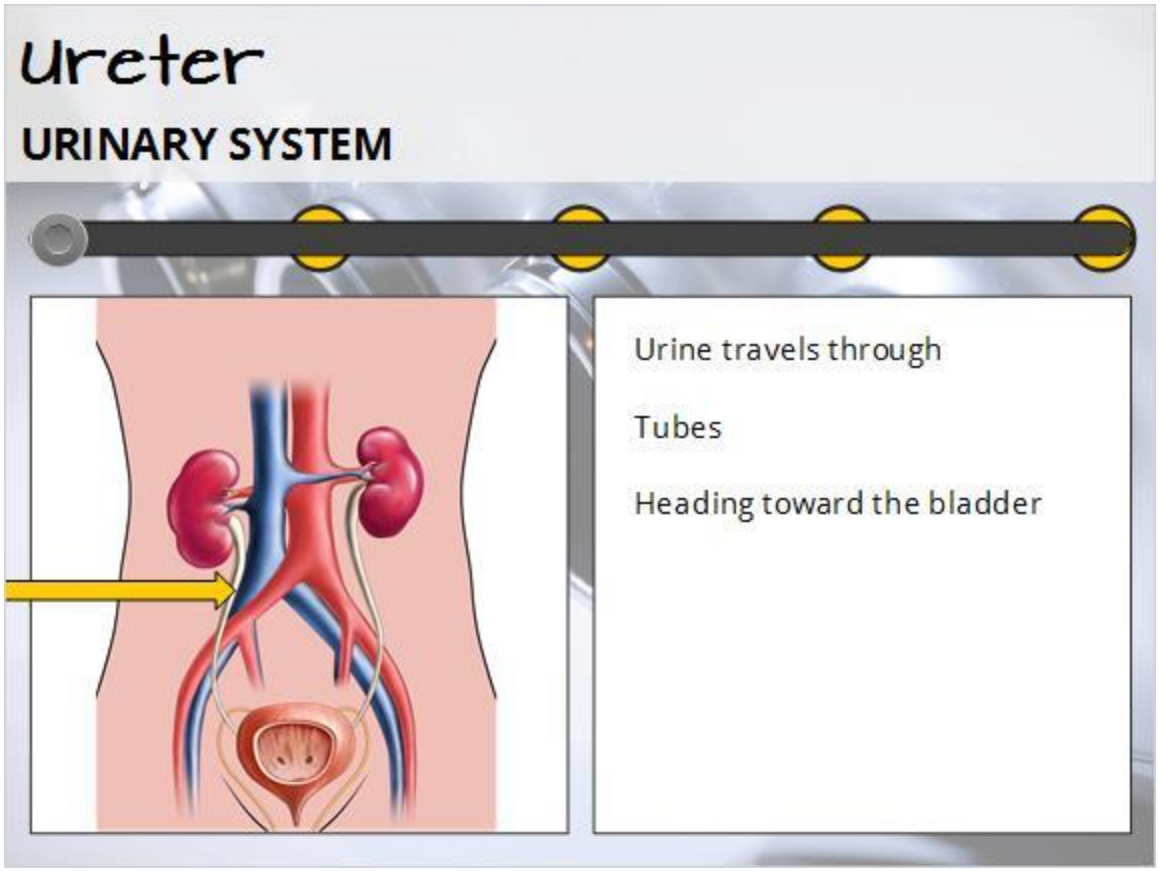
Drag the slider and drop it on each target to explore components of the urinary system.

Kidneys



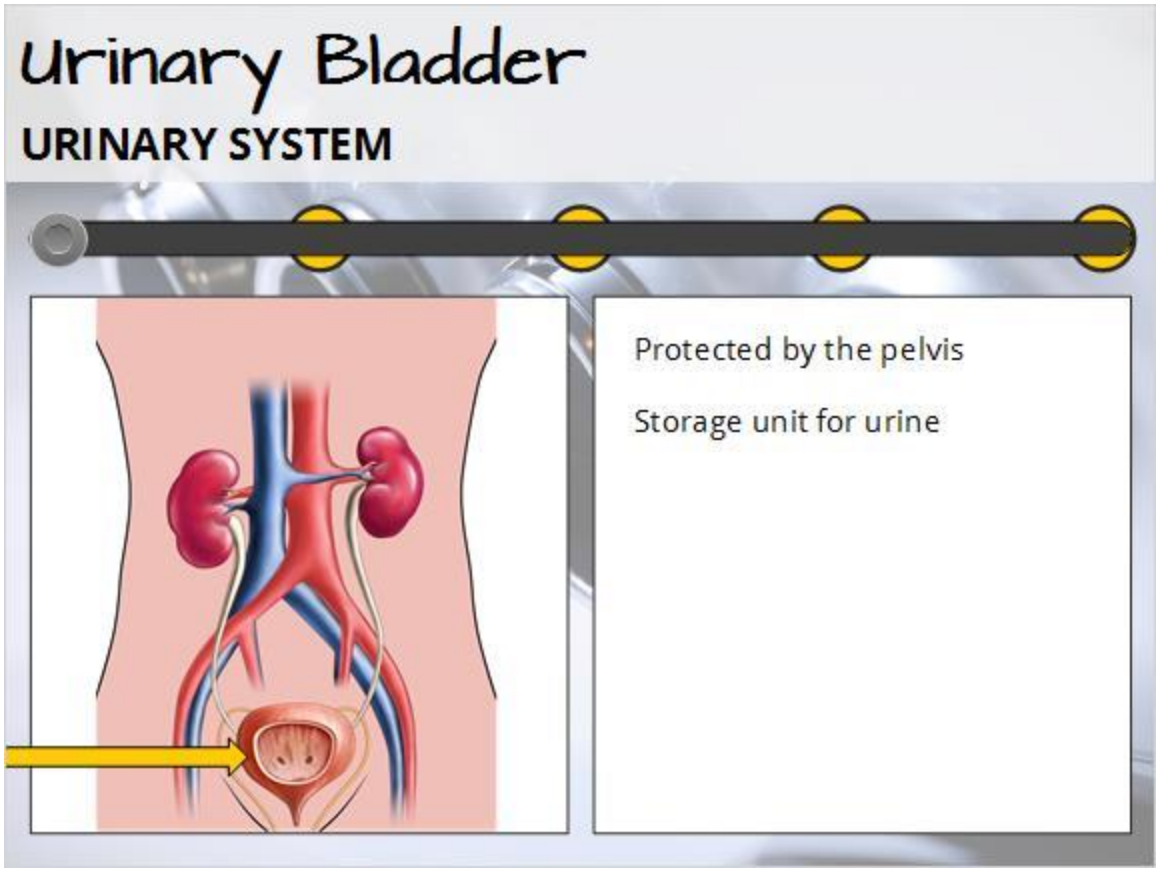
Blood travels through the kidneys to filter out all of the toxic waste called urine.

Ureter



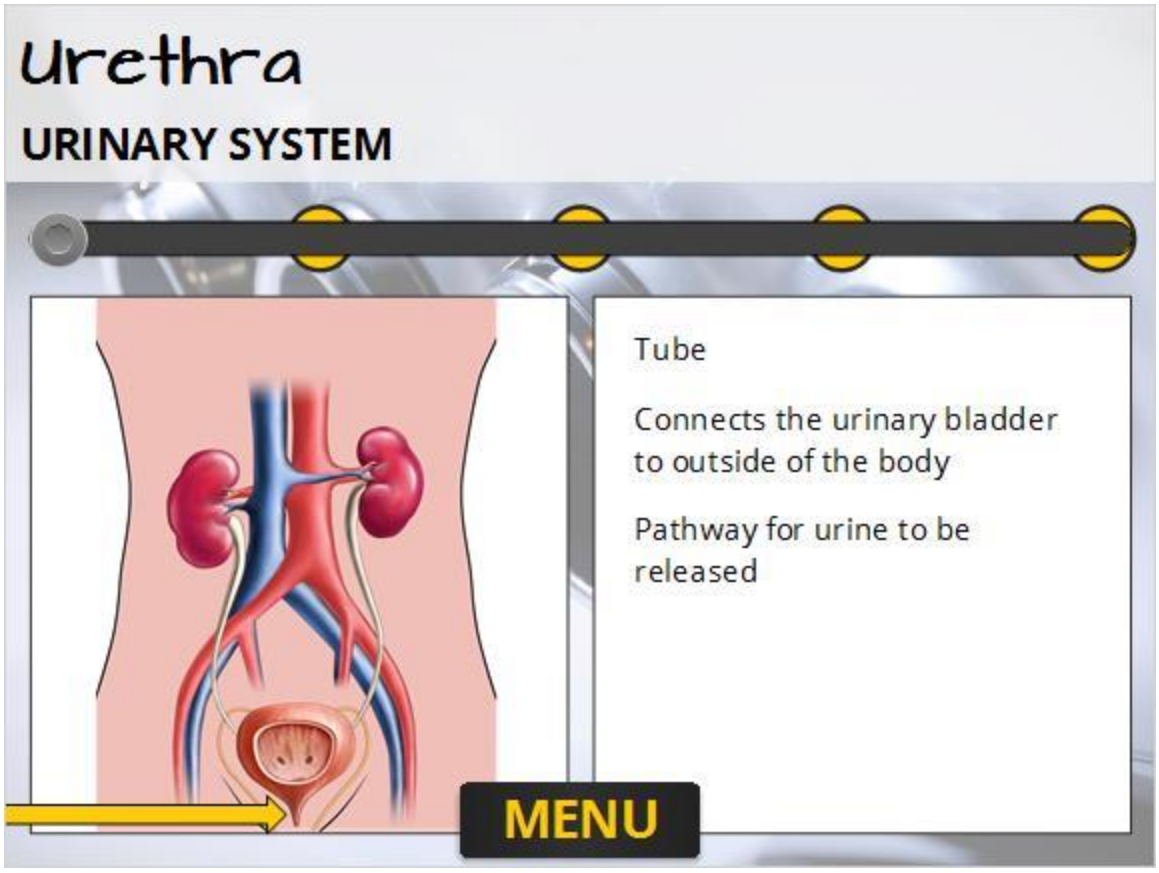
Urine travels through the tubes of the ureter on its way to the bladder.

Urinary Bladder



Protected by the pelvis, the urinary bladder is a storage unit that holds urine until it can be released out of the body.

Urethra



The urethra is a tube that connects the urinary bladder to outside of the body. It provides a pathway for urine to be released.

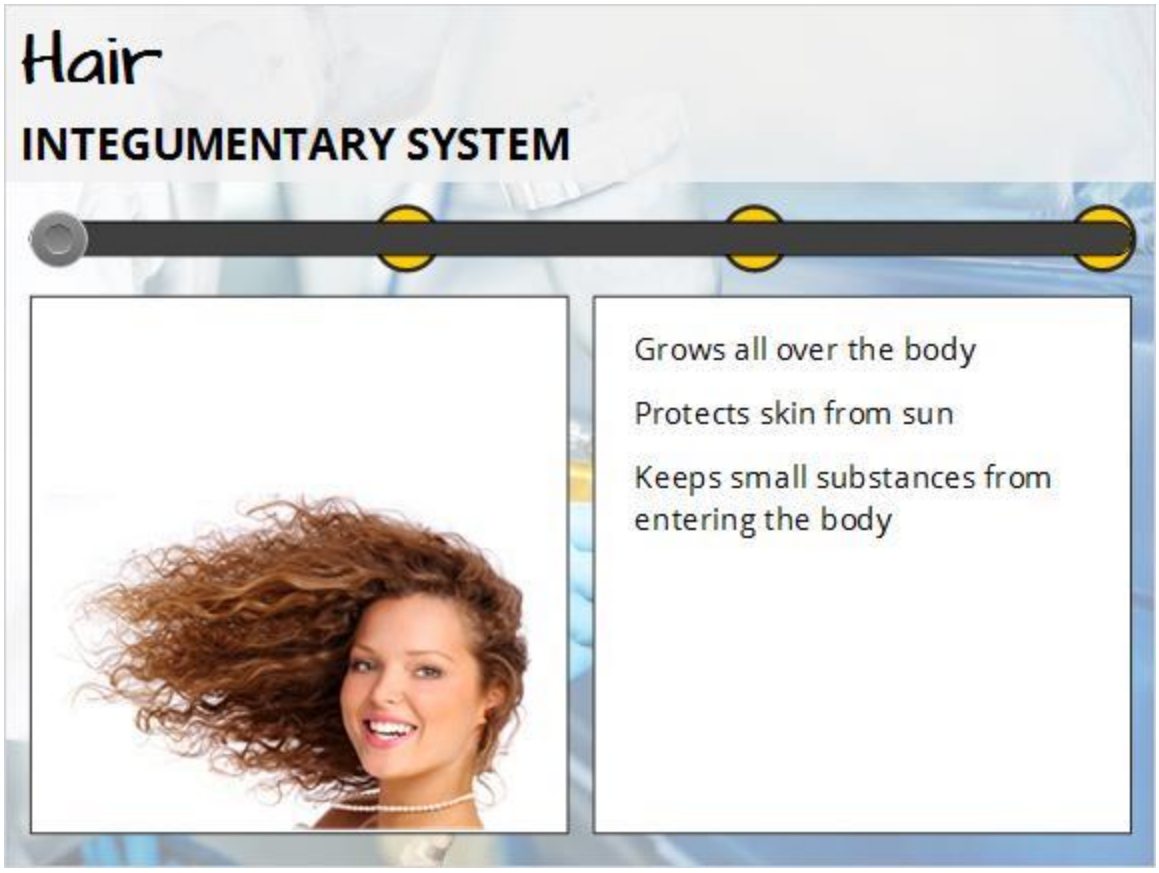
Click the ***MENU*** button to return to the Body Systems Menu.

Integumentary System

Similar to the way automobiles are protected by body work, paint, and a clear coat, the integumentary system provides protection from invaders, water loss, and damage.

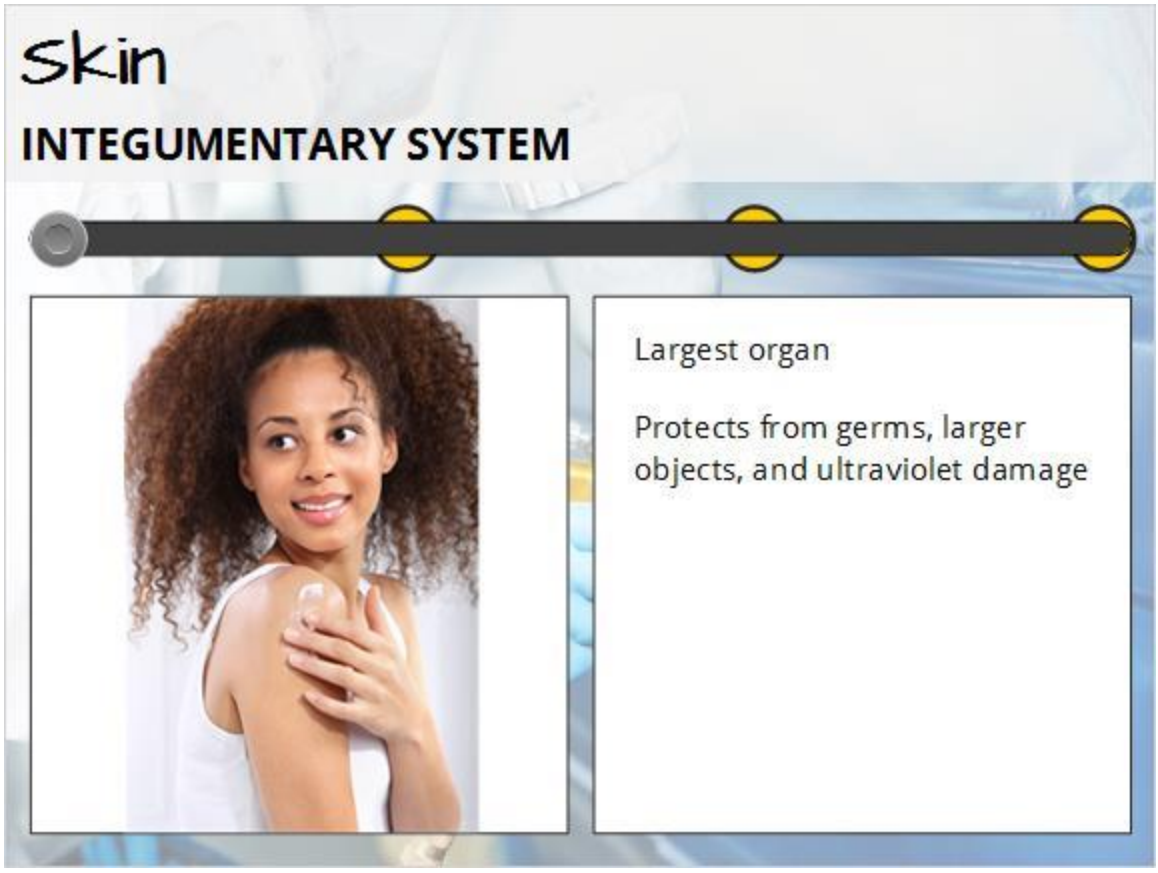
Drag the slider and drop it on each target to explore components of the integumentary system.

Hair



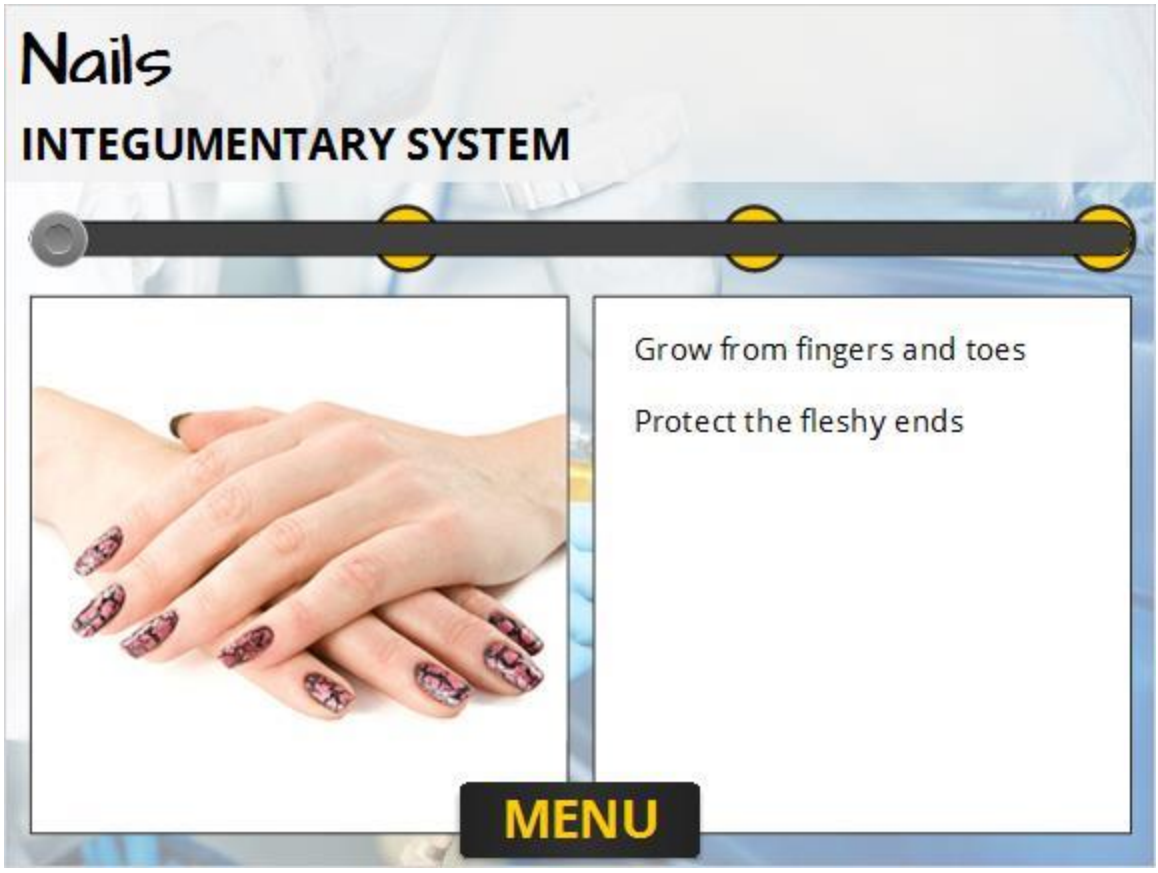
Although most evident on your head, hair grows all over the body. It insulates your body, and protects your skin from exposure to too much sun. In addition, hair helps keep small particles and substances from entering your body.

Skin



Skin is the largest organ. It protects the body from foreign invaders like germs and larger objects, and ultraviolet sun damage.

Nails



Nails grow from your fingers and toes, and help protect their fleshy ends.

Click the ***MENU*** button to return to the Body Systems Menu.

Digestive System

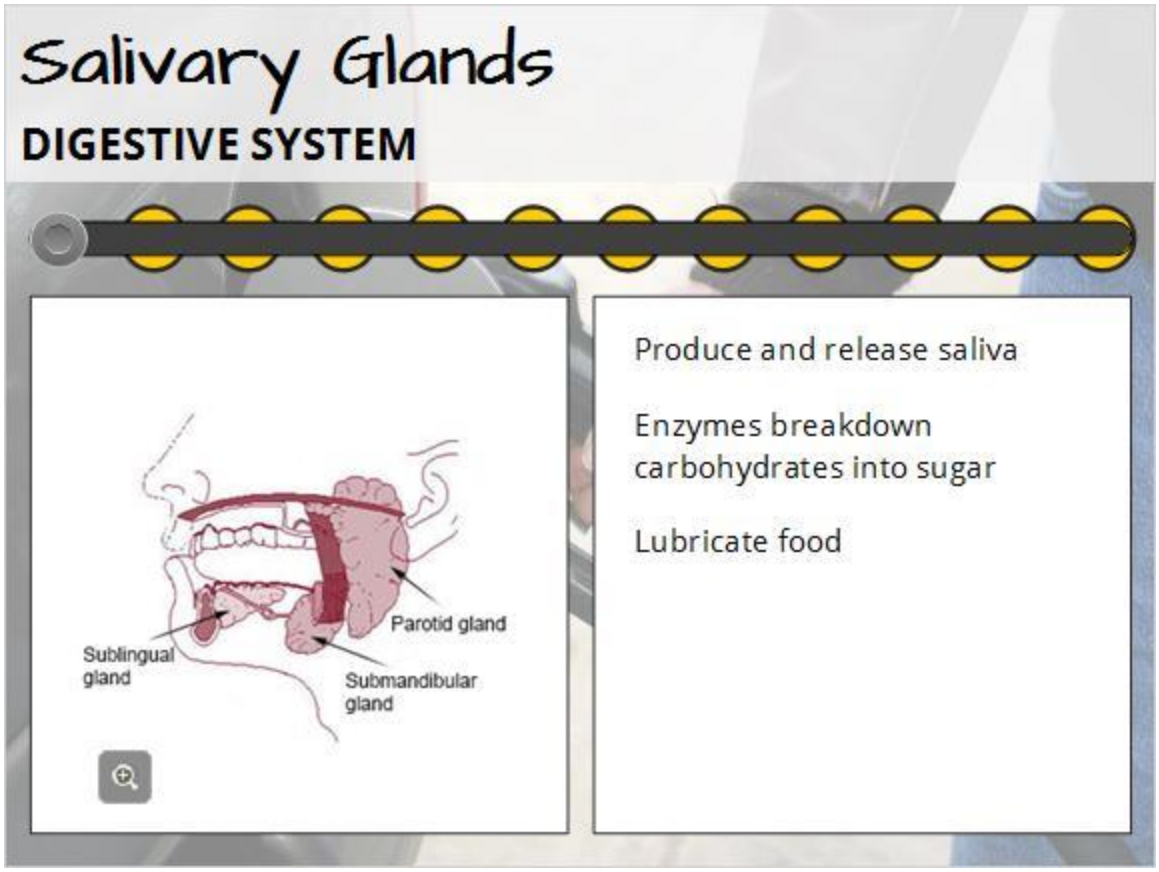
Like an automobile, your body needs fuel to function. The digestive system is responsible for the ingestion, digestion, and absorption of food -- your form of fuel. It is also responsible for the elimination of solid waste.

Drag the slider and drop it on each target to explore components of the digestive system.

Mouth

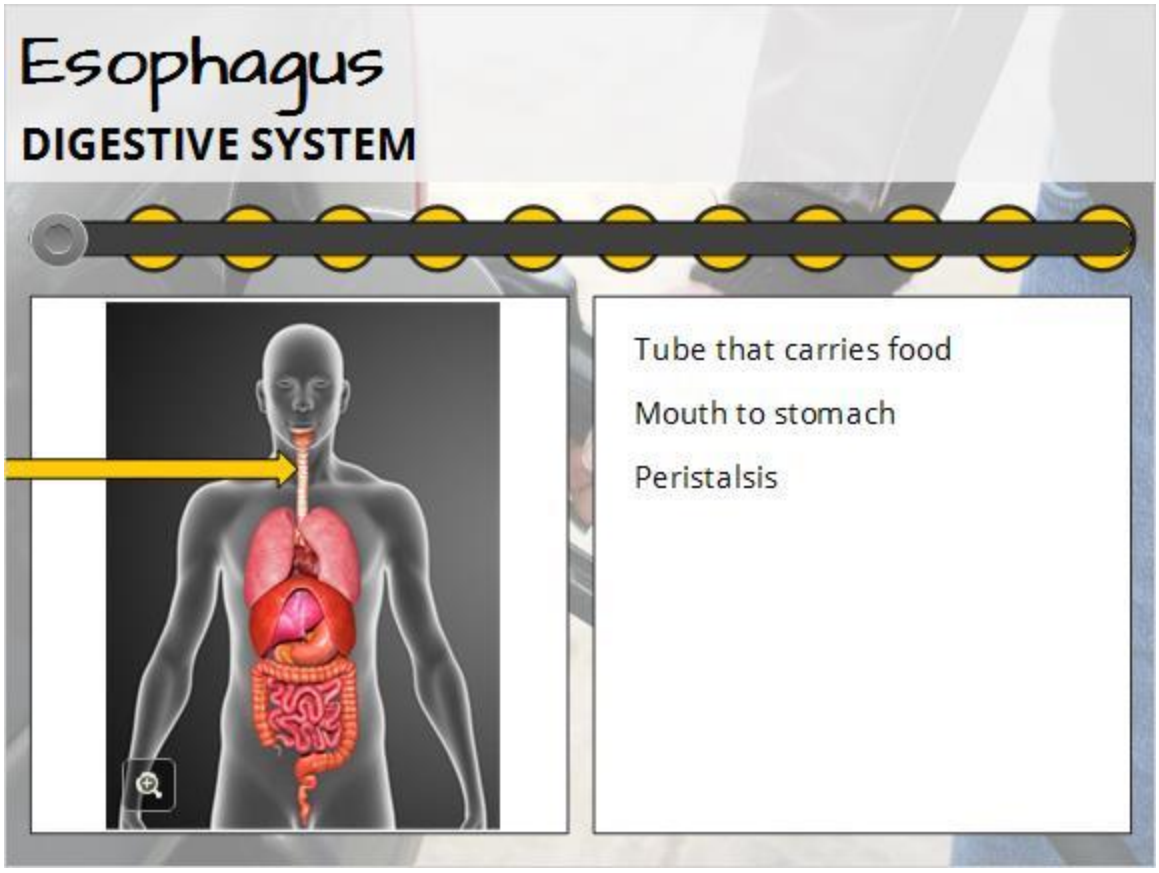
Similar to how cars have an opening for gasoline to go into the fuel tank, your mouth acts as a receptacle, and the beginning stage for food digestion. Specifically, it receives food, crushes it, and mixes it with saliva. This marks the beginning of food breakdown into useable nutrients.

Salivary Glands



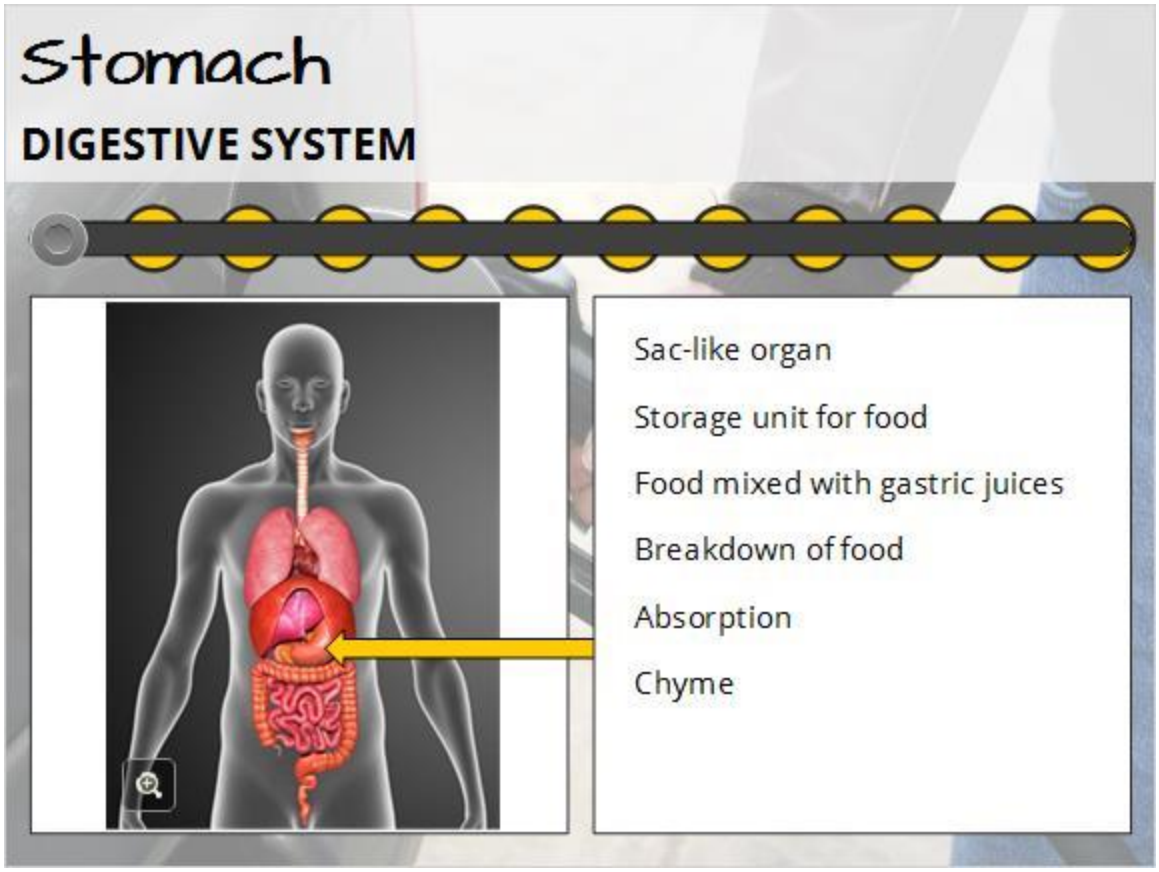
Salivary glands produce and release saliva. Enzymes in saliva break down carbohydrates into useable forms of sugar. Saliva also lubricates food, which makes it easier to swallow.

Esophagus



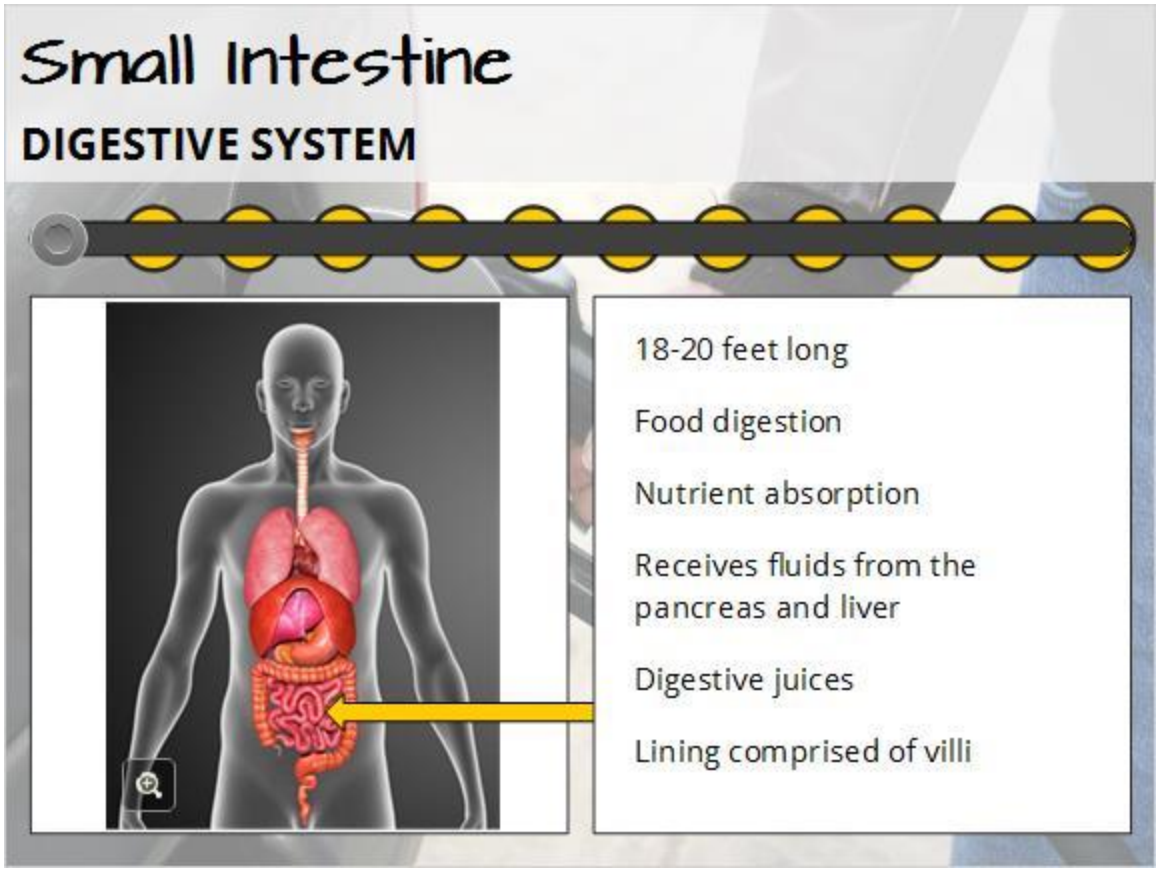
The esophagus is a tube that carries food from the mouth to the stomach through a series of contractions called peristalsis.

Stomach



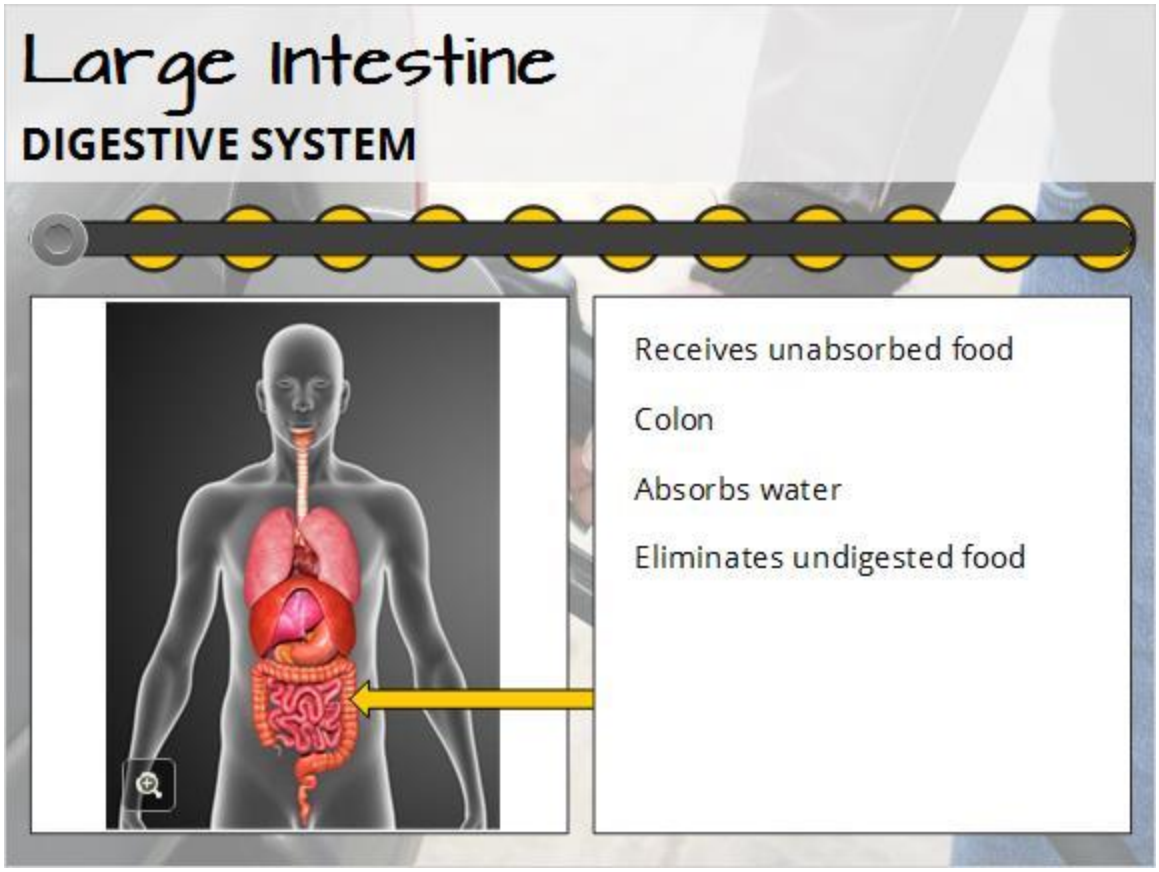
The stomach is a sac-like organ that provides a storage unit for food. While in the stomach, food is mixed with gastric juices that break down the food, and prepare it for absorption. The food-enzyme mixture is called chyme.

Small Intestine



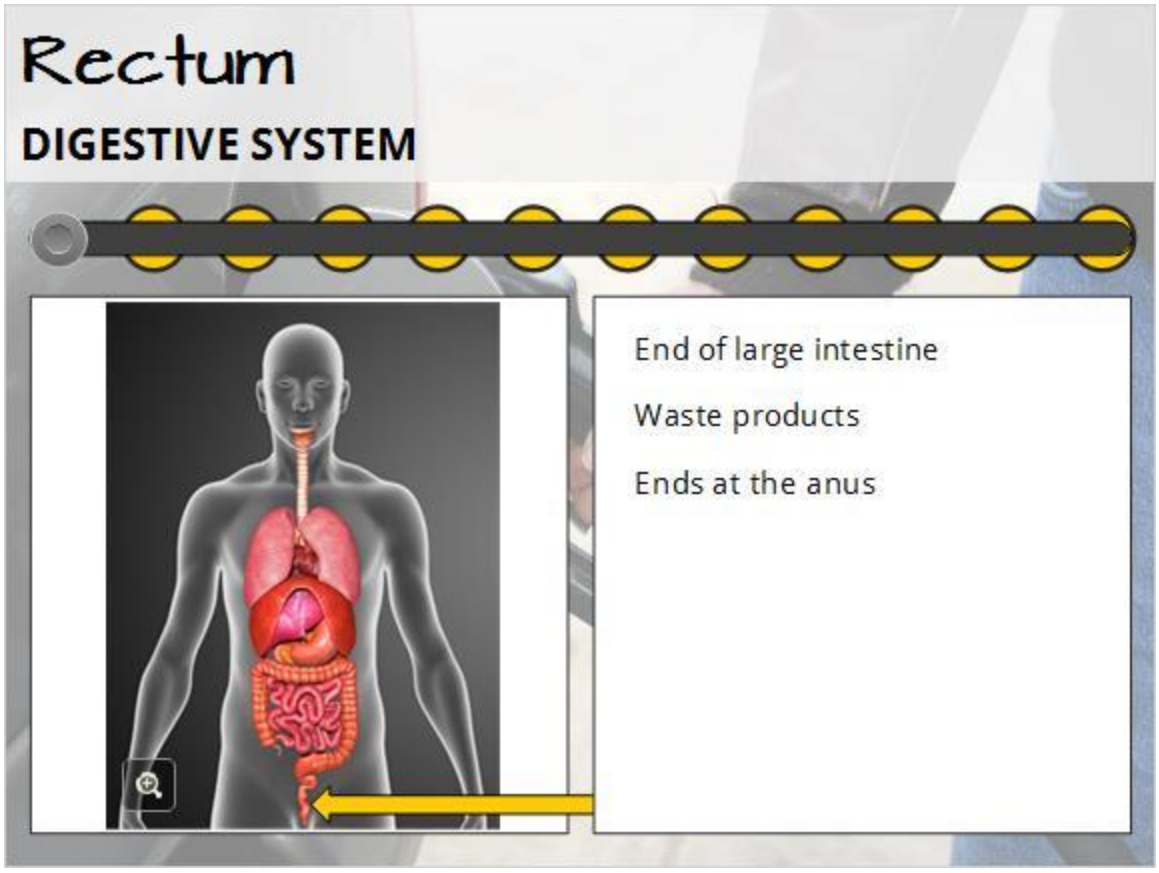
This eighteen to twenty-three foot long organ supports the major part of food digestion and nutrient absorption into the bloodstream. Specifically, the small intestine receives fluids from the pancreas and liver. It also produces its own digestive juices that finish the breakdown of chyme. The lining of the small intestine is made of finger-like projections called villi that contain a network of capillaries.

Large Intestine



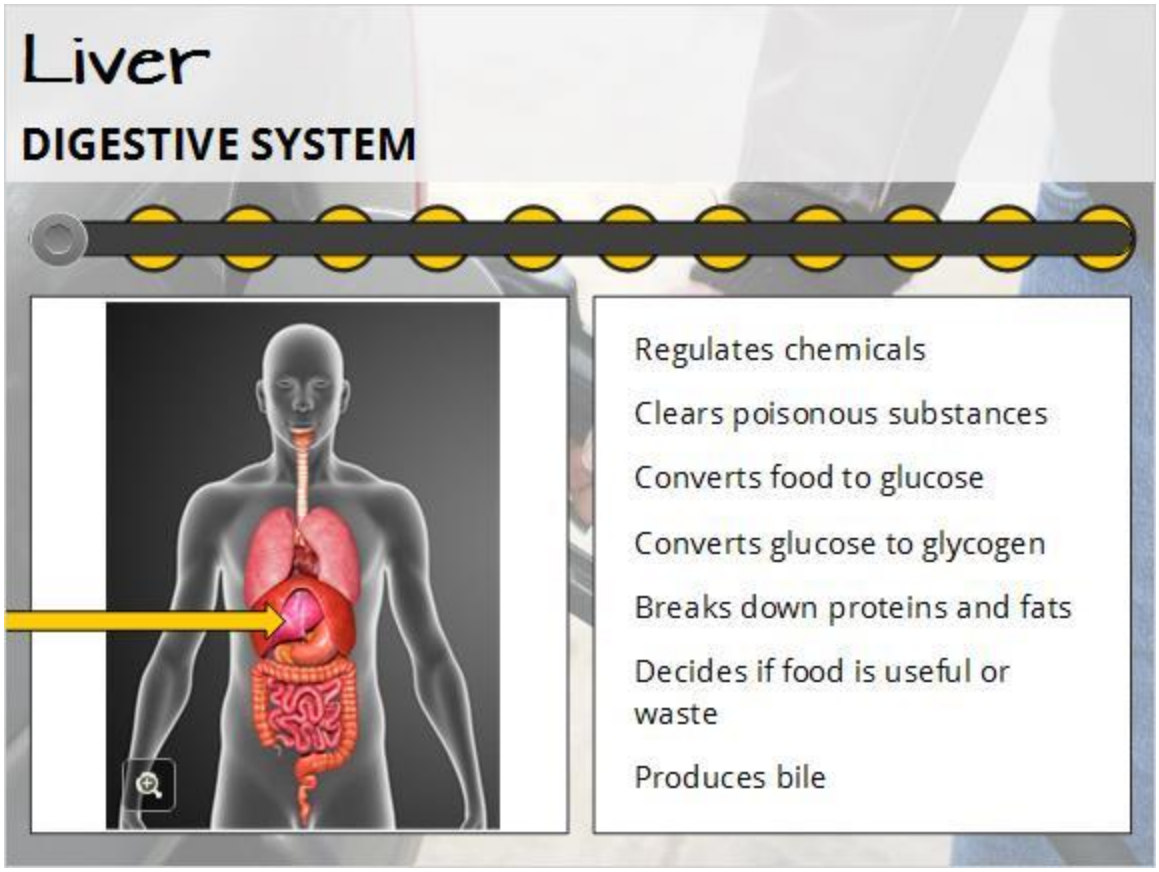
The large intestine receives unabsorbed solid food from the small intestine. The main function of this organ, often called the colon, is to absorb remaining water and eliminate undigested food.

Rectum



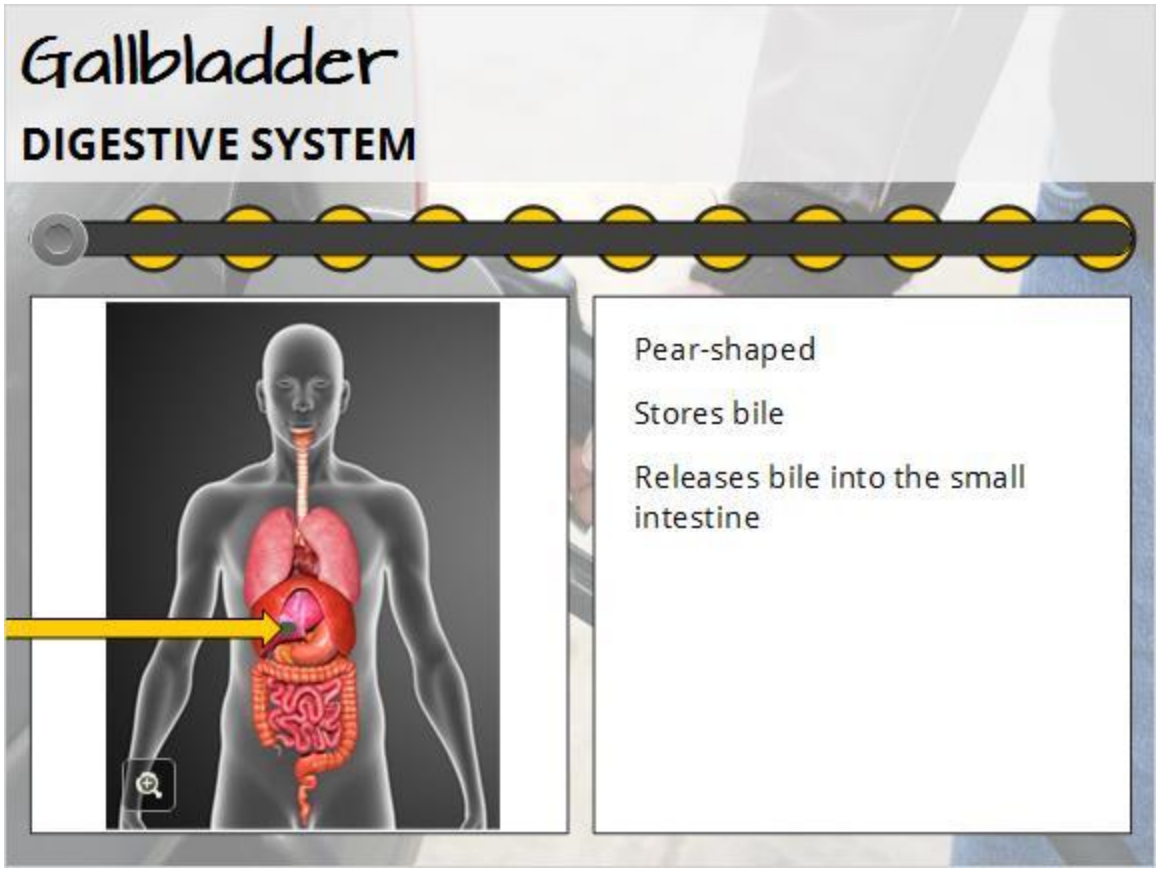
The rectum is a short tube at the end of the large intestine. It houses waste products, or feces, until it is expelled through the anus by way of muscular contraction.

Liver



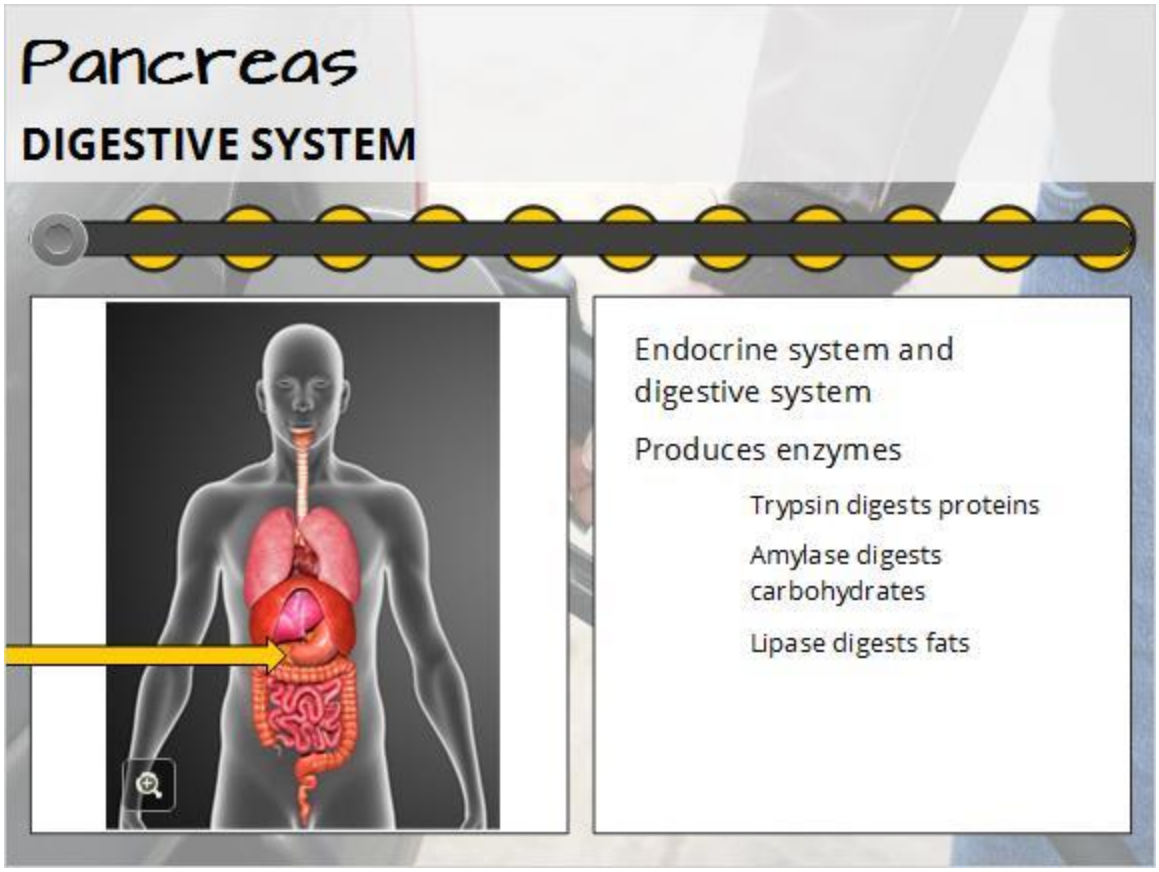
The liver regulates most of the chemicals in your body. It also clears poisonous substances, converts food to glucose (useable sugar) and glucose to glycogen (storable sugar), breaks down proteins and fats, decides if incoming foods are useful or waste, and produces bile to be stored in the gallbladder.

Gallbladder



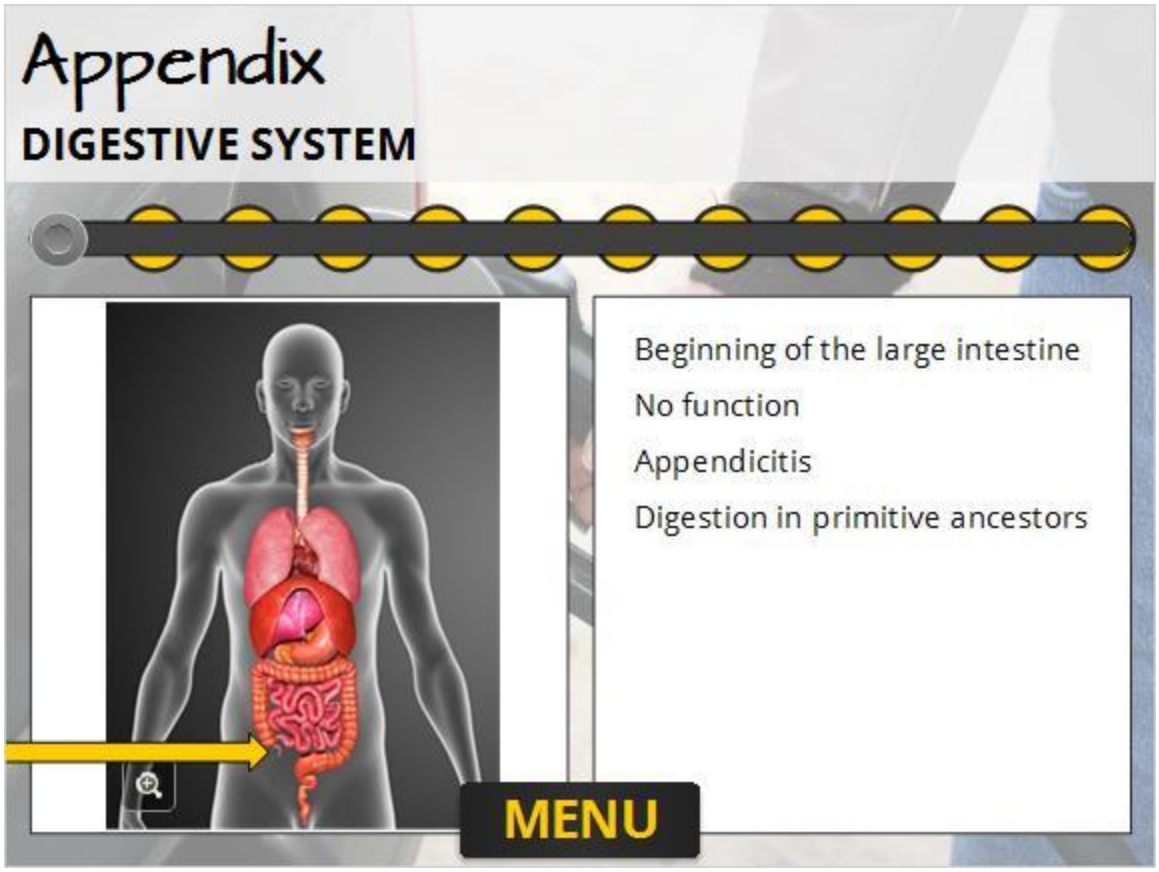
This small pear-shaped organ stores bile and releases it into the small intestine. Bile is the enzyme that breaks down fats contained in food.

Pancreas



The pancreas is part of the endocrine system and the digestive system. As part of the digestive system, the pancreas produces three enzymes called trypsin, amylase, and lipase. Trypsin digests proteins, amylase digests carbohydrates, and lipase digests fats.

Appendix



The appendix is located at the beginning of the large intestine. In modern humans, the appendix has no function. However, it can become inflamed and cause pain, leading to a diagnosis of appendicitis. A theory exists that the appendix helped with digestion in primitive ancestors.

Click the ***MENU*** button to return to the Body Systems Menu.