

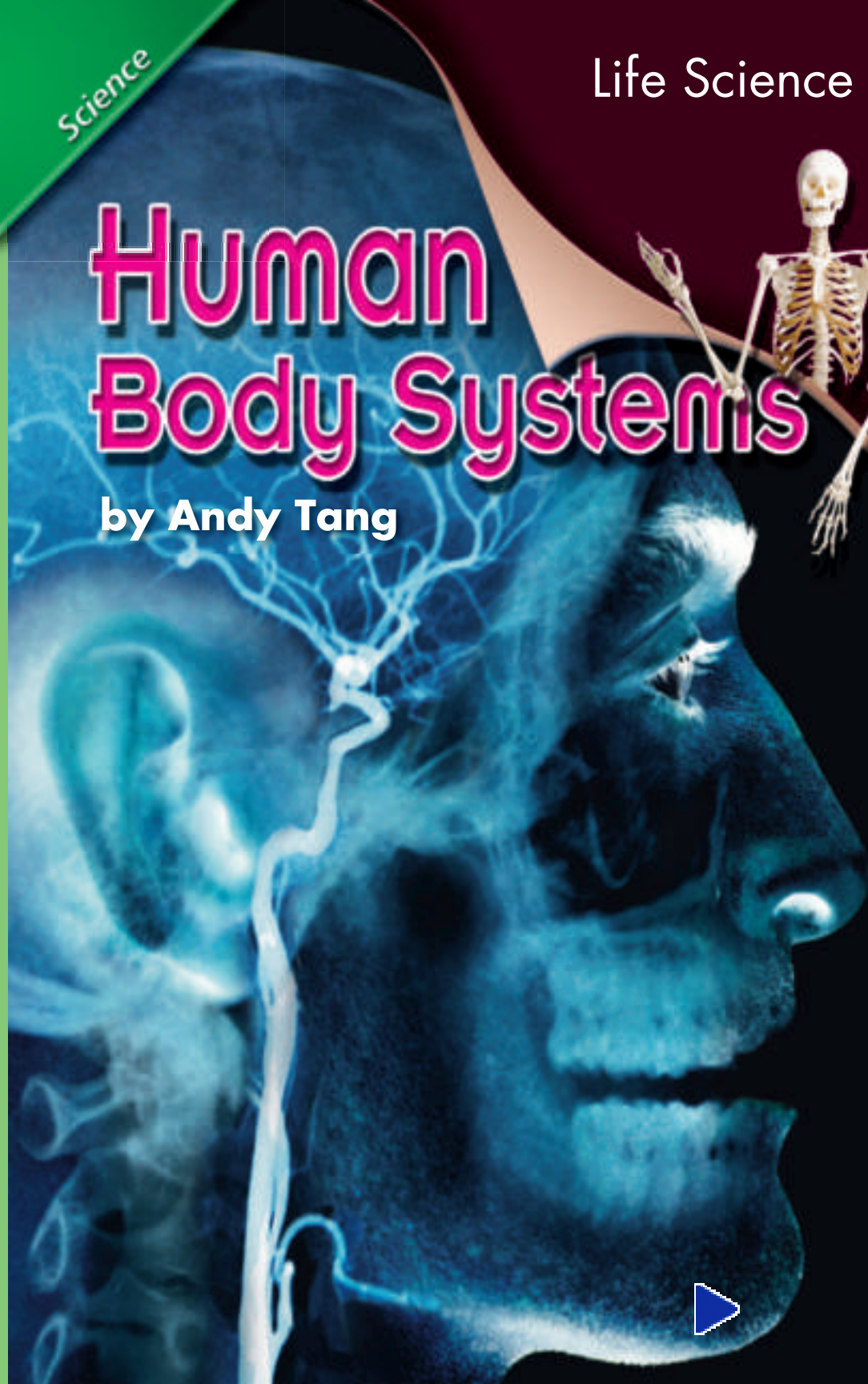
Science

Science

Life Science

Human Body Systems

by Andy Tang



Genre	Comprehension Skill	Text Features	Science Content
Nonfiction	Sequence	<ul style="list-style-type: none"> • Captions • Tables • Diagrams • Glossary 	Human Body Systems

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Human Body Systems

by **Andy Tang**

Vocabulary

air sacs
 artery
 bronchioles
 capillary
 esophagus
 mucus
 trachea
 valve
 vein

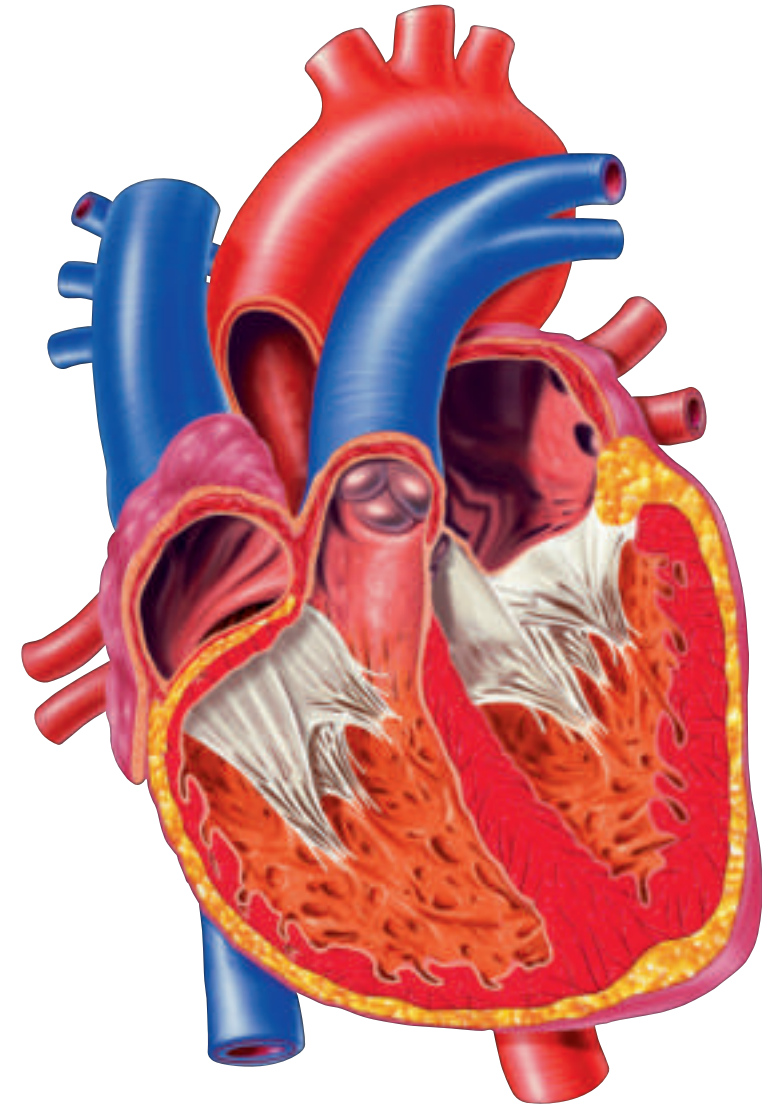


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What is the circulatory system?

The Body's Transportation System

A city needs many systems to keep it working. A city's transportation system has buses, cars, and trucks that use roads to move people and goods. The water system moves water through the city with pipes, pumps, and drains. The garbage system keeps the city clean with trucks and places to dump trash.



Like a city, your body has a transportation system. This system is the circulatory system, which is made up of the heart, blood, and blood vessels. All parts of the circulatory system work together to move food and oxygen to your cells. The same system takes wastes away from the cells in your body.



Your body's circulatory system can be compared to a city's system of roads.



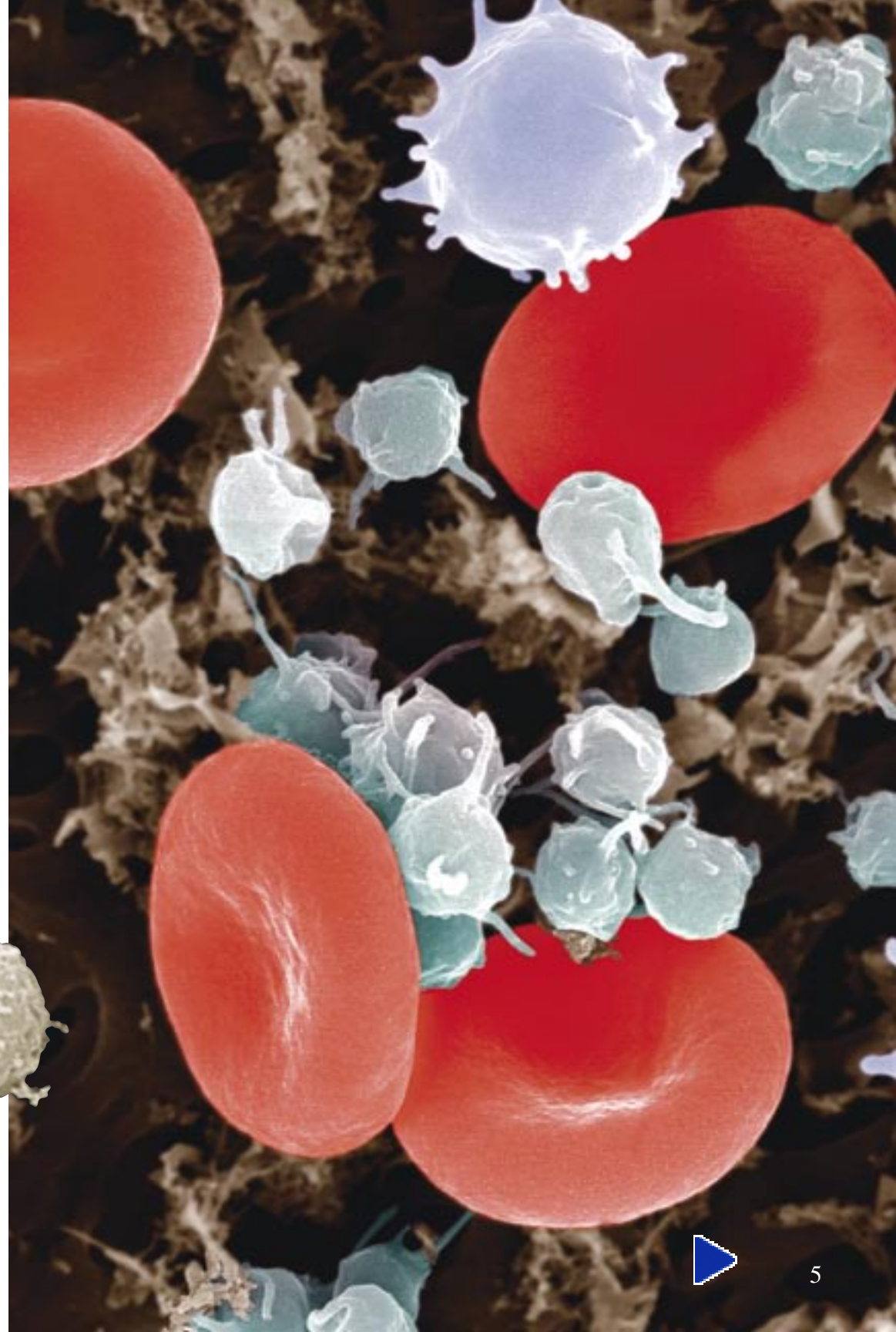
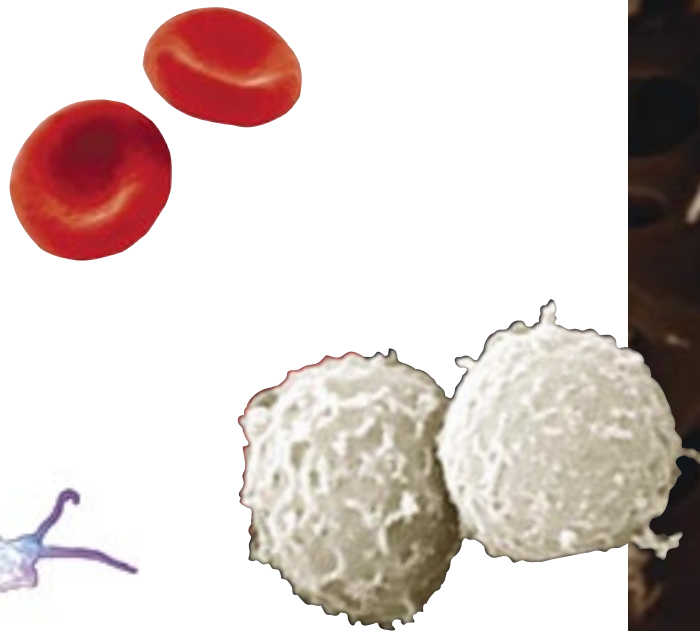


Functions of the Blood

Your blood has several different parts. Each part has a different job. Much of your blood is made up of a tan-colored liquid called plasma.

Your body depends on plasma to carry food to your cells. Plasma also brings water to your cells and takes away their wastes. Plasma moves certain chemicals, such as adrenaline, from one part of the body to another. Adrenaline is a chemical made by glands in your back. It can give your heart and muscle cells extra strength and energy.

Different types
of blood cells do
different jobs.





Blood Cells

Red blood cells carry oxygen to your cells so that they can get energy from food. While they are carrying oxygen, red blood cells are bright red. After they have given the oxygen to the other cells, they turn darker red.

White blood cells protect your body against germs. Some white blood cells wrap around germs and break them down. Others make chemicals that kill germs. To fight an infection, the body makes more white blood cells. Some white blood cells fight germs outside the blood vessels, in the spaces between body cells.

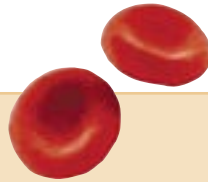


Platelets are pieces of cells that float in the blood. When you get a cut, platelets stop the bleeding. They clump together and stick to the edges of the cut. This makes a clot, or a plug of long sticky threads.

Plasma makes up a little more than half of the blood. Red blood cells make up a little less than half. Platelets and different kinds of white blood cells make up a tiny fraction of the blood.



Types of Blood Cells



	Red Blood Cells	Platelets	White Blood Cells
Form	Red blood cells are shaped like discs with a dimple on each side.	Platelets are not complete cells.	White blood cells have different shapes and sizes. In fact, they may change size and shape as they work.
Function	These cells carry oxygen to the rest of the body.	Platelets form blood clots.	White blood cells protect your body from germs and other harmful things.
Disorder	Sickle-cell anemia is a disease in which the red blood cells have a shape like a crescent moon. Such cells do not carry oxygen as well as normal cells.	An embolism is a clot that floats freely in blood vessels and then blocks a vessel.	In a type of cancer known as leukemia, a person's white blood cells do not form correctly and their numbers increase too quickly.





Arteries, Capillaries, and Veins

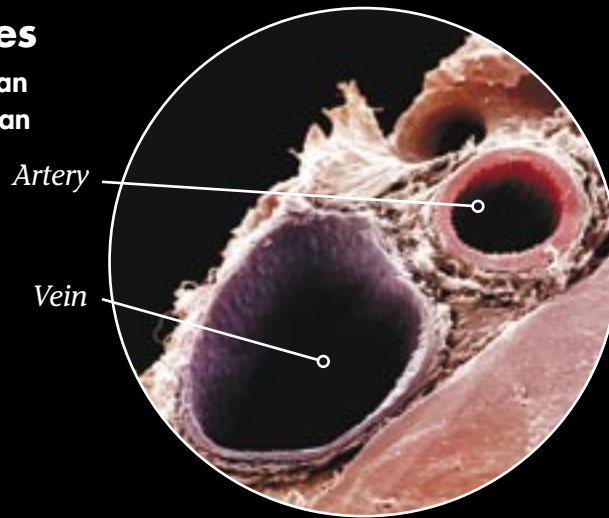
The blood vessels are like highways your blood uses to move through your body. Your circulatory system has a huge number of blood vessels. In fact, if they were set end to end, they would stretch around the Earth more than twice! There are three kinds of blood vessels: arteries, capillaries, and veins.

An **artery** is a vessel that carries blood from your heart to other parts of your body. When the heart pumps blood into arteries, their thick walls stretch. Almost every artery carries blood with lots of oxygen.

Your arteries branch into your smallest blood vessels. This kind of tiny tube is called a **capillary**. Some capillaries are so small that red blood cells must move through them one by one.

Veins and Arteries

Veins have thinner walls than arteries, but thicker ones than capillaries.

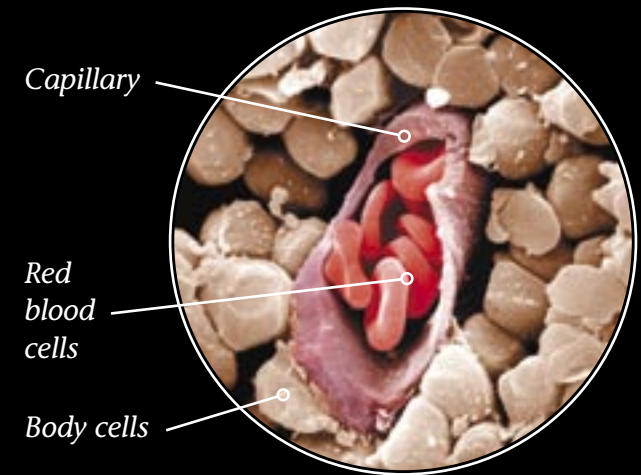


Gases can pass right through the walls of capillaries. This is because the walls are only one cell thick! Oxygen from the blood in your capillaries moves to your cells. Carbon dioxide and other wastes move from your cells to your capillaries.

Capillaries join to form tiny veins. A **vein** is a blood vessel that takes blood from cells back to the heart. Small veins join together to become larger and larger veins.

Capillaries

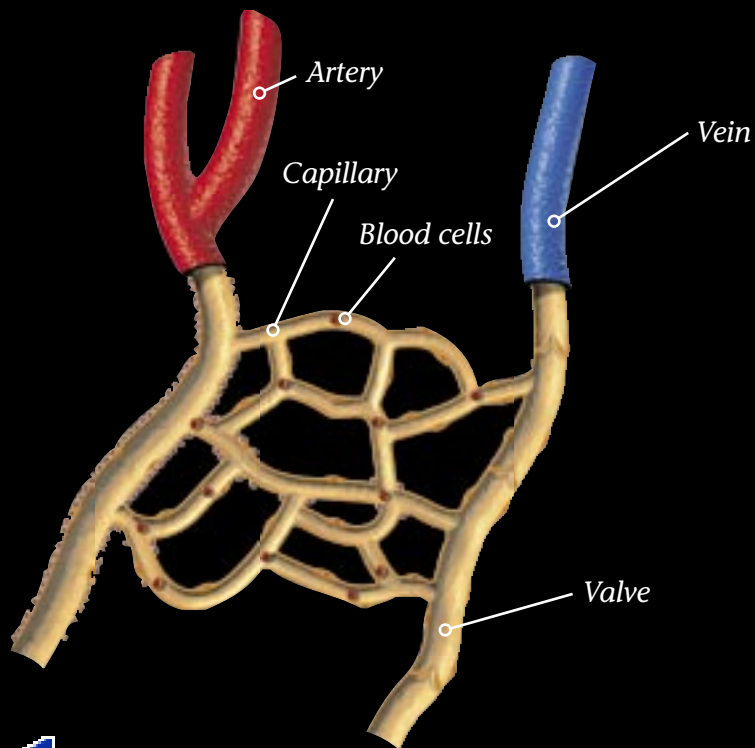
This capillary is as wide as only a few red blood cells.





Veins have valves. A **valve** is a flap that acts like a door. Its job is to keep blood flowing in the right direction. When valves are open, blood flows to the heart. When they are closed, blood flows away from the heart. Arteries and capillaries do not have valves. Blood moves in the right direction through the arteries and capillaries by the pumping of the heart.

The picture on the right shows some of the body's larger blood vessels. It would be impossible to show all the blood vessels in a person's body, because there are so many of them. In this drawing, arteries are colored red. Veins are colored blue. In real life, veins are maroon in color. They are often colored blue in drawings to make it easier to tell them apart from arteries.

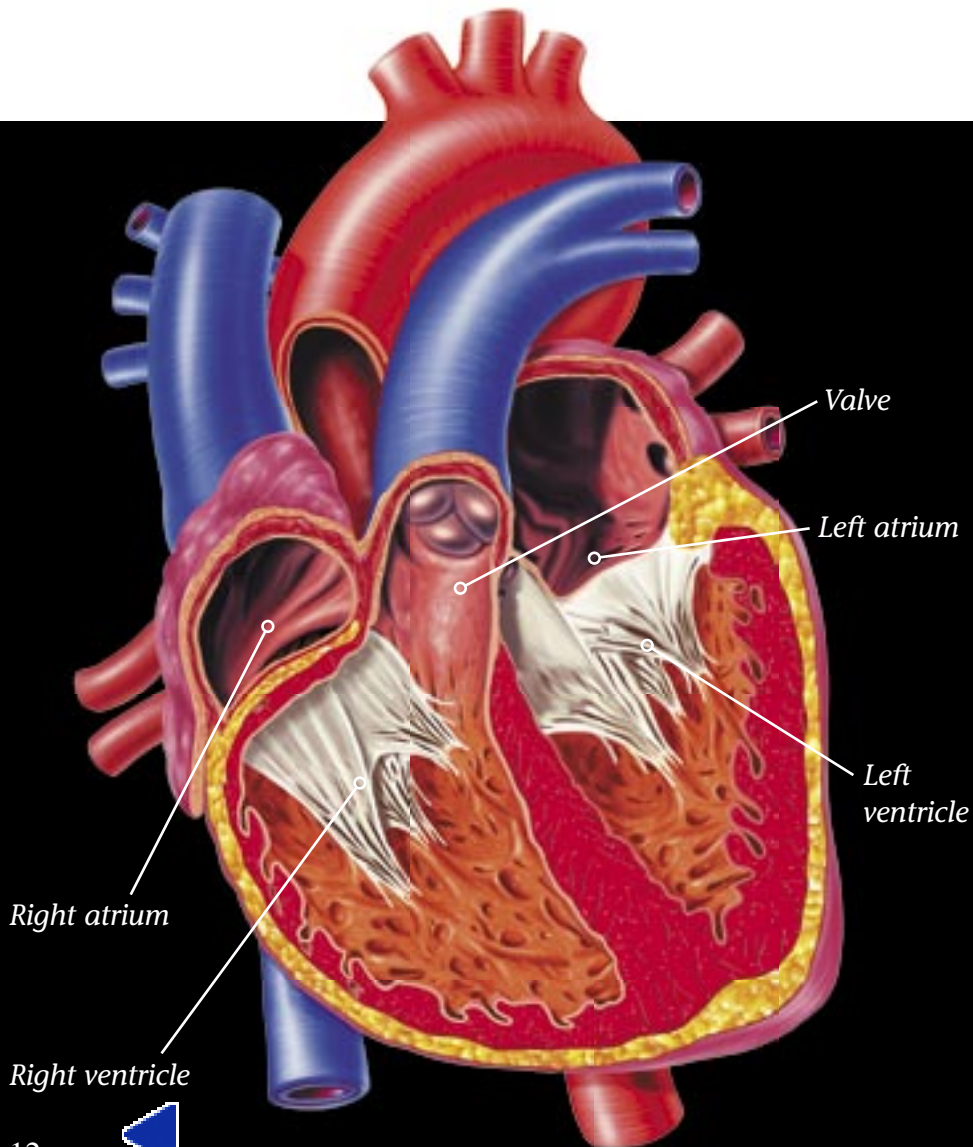




Parts of the Heart

The human heart has two sides. Each side is a separate pump and sends blood on different paths. The right side pumps blood to the lungs to get oxygen. Then the blood flows to the left side of the heart. The left side pumps it through arteries to the body.

Each side of the heart has two parts. The top part of each side is called an atrium. The bottom part is called a ventricle. Each ventricle is larger and stronger than an atrium.



The four parts of your heart pump in a certain order. First, the left atrium and the right atrium pump. Then the two ventricles pump. The pattern is repeated after a short rest. If the heart does not follow this pattern, a person can become sick.

The right atrium rests and fills with blood carrying waste and carbon dioxide from body cells. Then it makes itself smaller, squeezing blood into the right ventricle. The right ventricle pumps blood into an artery leading to the lungs.

Blood flows from the lungs into the left atrium. The left atrium pumps blood into the left ventricle.

The left ventricle pumps oxygen-filled blood away from the heart into your body's largest artery. From there, blood flows in smaller arteries to the body cells.

There are many small blood vessels in the heart muscles. They carry oxygen, food, and water to the heart muscles. In one kind of heart disease, the heart muscles do not get enough blood because the vessels are blocked.

Your heart might beat almost three billion times in your life. When you run, your heart pumps faster. When you sleep, it pumps more slowly.

Valves

Like your veins, your heart has valves that keep the blood flowing one way.





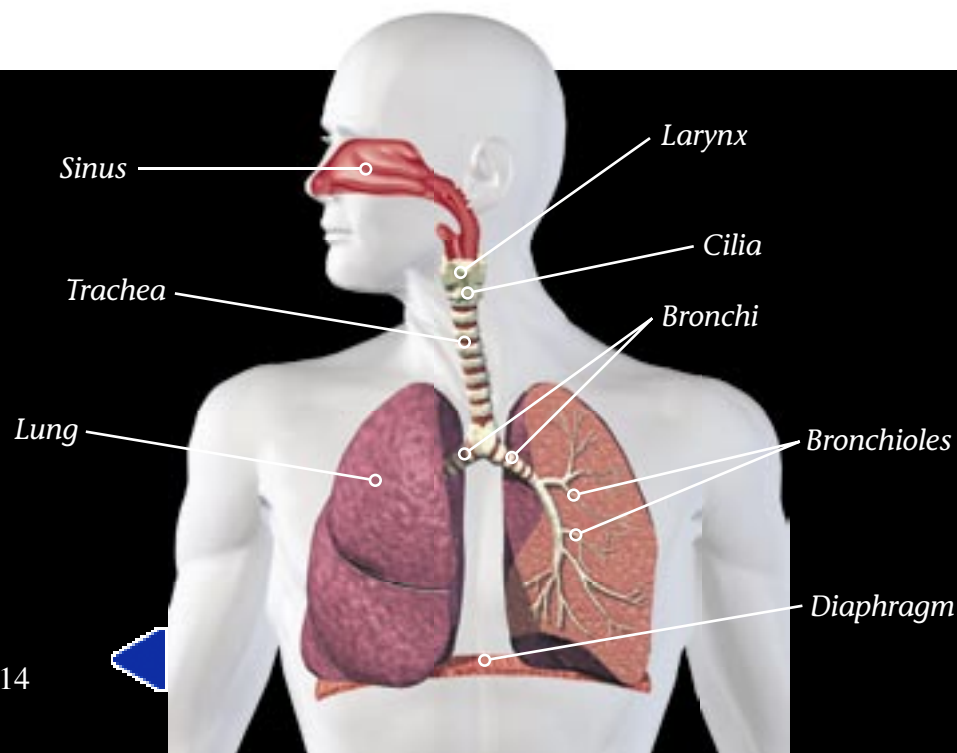
What is the respiratory system?

Parts of the Respiratory System

The respiratory system carries gases between the air and your blood. Many parts of this system are covered in **mucus**, a thick, sticky fluid that traps dust and germs.

Air comes in through the nose or mouth. In the sinuses it becomes warm and damp. Dust and germs that come in through the nose get trapped by hair and mucus.

Air goes from the sinus to the back of the throat and into the larynx. The **trachea** is a tube that moves air from the larynx to the lungs. It ends with two branches called bronchi that go into the lungs. The bronchi branch into smaller tubes called **bronchioles**. Sometimes the bronchioles become too narrow for air to flow easily through the lungs. This is what happens in a disease called asthma.



At the end of the bronchioles are bunches of tiny **air sacs** in the lungs. Air sacs are where the blood picks up oxygen and drops off carbon dioxide.

The diaphragm is a dome-shaped muscle that forms the bottom of the chest area. When the diaphragm moves down and gets flatter, it makes more room in the chest and air rushes in. When the diaphragm returns to its dome shape, it pushes air back out.

There are two vocal cords that stretch across the larynx. The sound of your voice is caused by your breath making the vocal cords vibrate. When muscles stretch the vocal cords tighter, your voice sounds higher.

Cilia are tiny hair-like parts on cells in the trachea and many other parts of the respiratory system. Cilia wave very rapidly. This waving pushes dirty mucus out of the lungs. The mucus enters the throat, where it is swallowed.

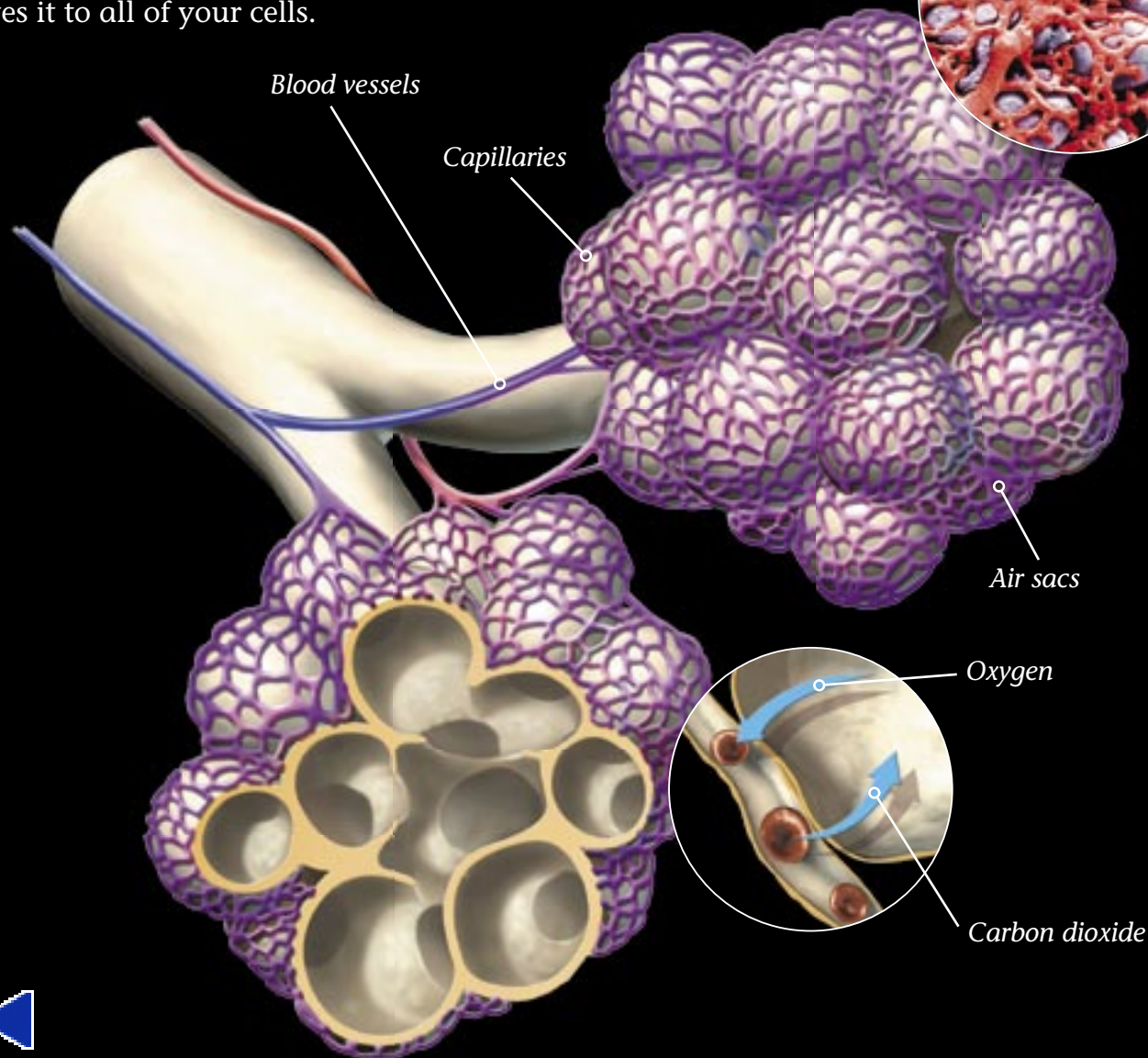
Cilia, magnified many times





Respiratory and Circulatory Systems Work Together

Living things that have more than one cell need oxygen for their cells. Some have simple ways of getting it. Human bodies are not simple. Your respiratory and circulatory systems need to work together to get oxygen to your cells. The respiratory system gets the oxygen from the air and brings it into your lungs. The blood takes the oxygen there and moves it to all of your cells.



These capillaries are magnified.



When air enters your lungs, it goes into tiny air sacs. This is where your respiratory and circulatory systems meet. Arteries that go from the heart into the lungs branch into tiny capillaries that wrap all around the air sacs. Oxygen moves from the air sacs into the blood of capillaries. At the same time, carbon dioxide goes from the blood into the air sacs. The air sacs have very thin walls to let the gases pass through. After these gases trade places, the air moves out of the lungs.

If you hold your breath, carbon dioxide builds up in the blood. When this happens, your brain sends a message to your diaphragm and rib muscles telling them to breathe. Your brain makes you start breathing again. This is a good example of several systems working together. Your brain, your muscles, and your lungs are all helping your cells to get oxygen.





What are the digestive and urinary systems?

Digestive System

Food must be changed before your cells can use it. First your body digests, or breaks down, food into very small pieces. The food can then enter the blood to get to the cells. Digestion takes many organs working together. Each organ has certain parts to help it do its job.

The Mouth and Esophagus

The first step of digestion is chewing. Chewing food makes it small enough to swallow. Front teeth have a thin shape to cut food when you bite. Flatter teeth in the back of the mouth crush food as you chew. Teeth are not just solid pieces of hard material. They also contain live cells, blood vessels, and nerves.

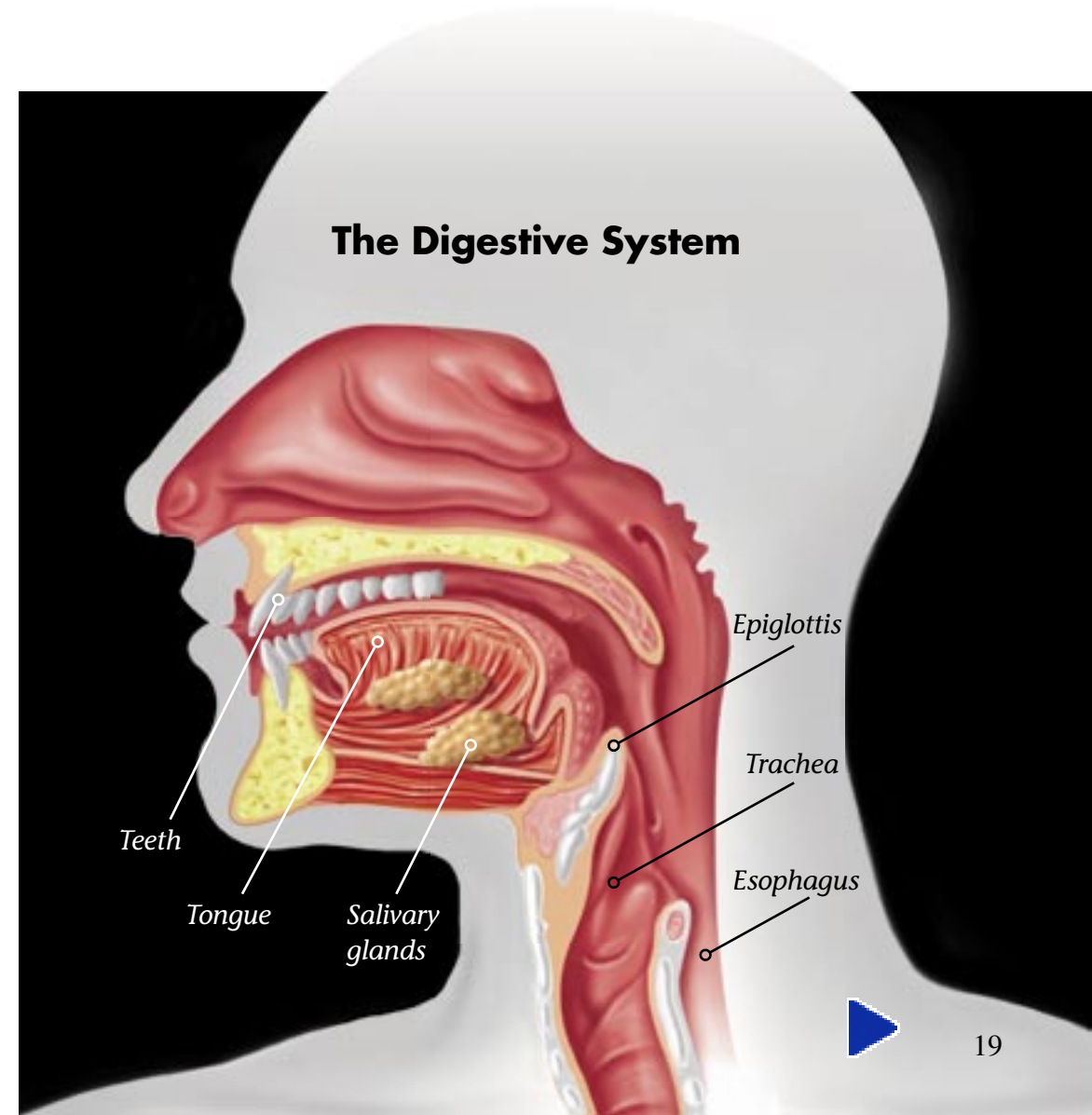
Other parts of your mouth help your teeth to break up food. The tongue moves food so it can be chewed. It also moves food to the back of the mouth where it is swallowed. Tiny taste buds on the tongue have special nerves in them. These nerves send signals of taste to your brain. Salivary glands help to digest food by making saliva. Saliva has chemicals that break down food. It also makes food easier to swallow.



These taste buds are magnified.



The **esophagus** is a tube that moves food to the stomach. Near the top of the esophagus is the epiglottis, which covers your windpipe when you swallow. This makes sure the food goes down the esophagus instead of the windpipe. Food does not just fall down the esophagus because of gravity. It is pushed down to the stomach by rings of muscles. As the food passes each ring of muscle, the muscles behind the food close up. This pushing moves the food from the esophagus to the stomach in about two to three seconds.



The Digestive System



Stomach

The stomach is behind the lower left ribs. At the bottom of the esophagus is a tight, round muscle. When you swallow, this muscle opens to let food into your stomach. Then it closes to keep food from going back up the esophagus. The stomach has walls that can stretch to hold all the food from a meal. To help digest food, the stomach makes fluids. The muscles in the stomach's walls squeeze to mix food and its fluids into a soupy paste.

Intestines

The stomach then squeezes this paste into a narrow, winding tube called the small intestine. Its muscles move the food along. The liver and pancreas are organs. They send chemicals to the small intestine to help digestion. When the food is digested, it has been broken up enough to pass through the walls of the small intestine and into the blood.

Rings of muscles squeeze the top and bottom of the stomach closed. This keeps food in the stomach.

Esophagus

Stomach

Small intestine



Villi are tiny finger-shaped parts on the inside walls of the small intestine. They give the small intestine more surface area to take in food.

Some food that cannot be digested is left over at the end of the small intestine. This food waste moves to a wider tube called the large intestine. The lower part of the large intestine is called the colon. Helpful bacteria live here. Some of the bacteria make vitamins for your body to use. Other bacteria keep out the bacteria that cause disease. The large intestine takes water and salts from the waste, making it more solid. Muscles finally push the waste out of the body.

Villi, magnified



Mucus covers the walls of the stomach and other digestive organs. This keeps them from being harmed by their own fluids.

The many folds in the stomach make it able to get larger when you eat a big meal.

Under the villi's thin walls is a web of capillaries that absorbs food.



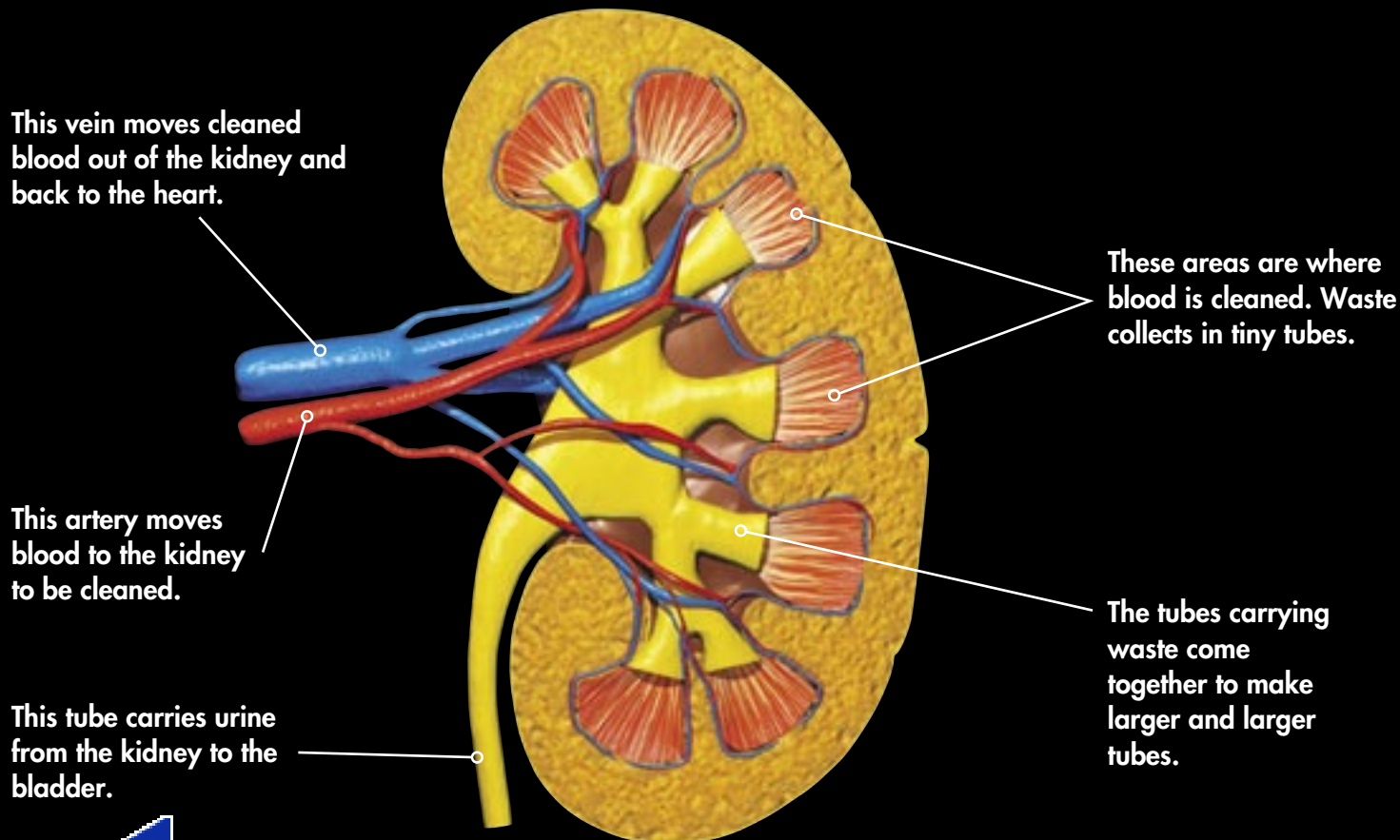


The Urinary System

The cells in your body make waste and dump it into the blood. This waste can poison you, so your body must get rid of it. Your body does this through the urinary system.

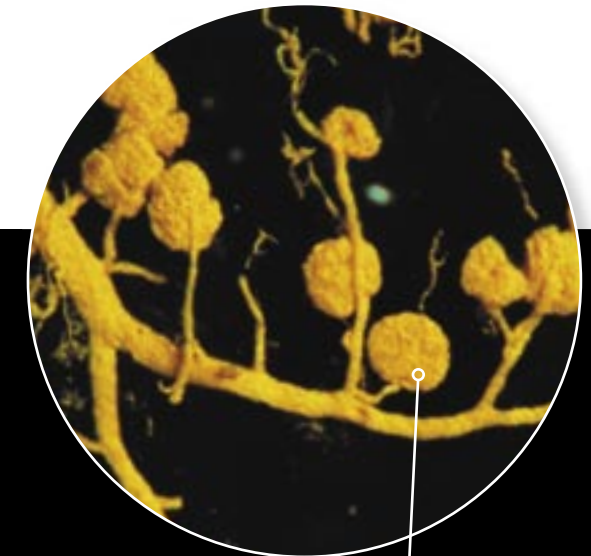
The kidneys are a pair of organs that get rid of waste from the blood. They are the same shape and dark red color as kidney beans. The kidneys are under the lowest ribs, on each side of the backbone.

When waste is taken out of the blood, helpful materials such as water, salt, and calcium are also taken out. The kidneys put the right amounts of these things back into the blood. This keeps the amounts of these materials from getting too low or too high.



The mixture of waste and extra water removed by the kidneys is called urine. A tube carries urine from the kidneys to the urinary bladder. The bladder holds the urine until it leaves the body. A tight round muscle at the bottom of the bladder holds the urine inside.

The kidneys are not the only organs that remove the cells' waste. The lungs get rid of carbon dioxide, another waste product. A small amount of waste is also released in sweat.



Ball-shaped filters take waste out of the blood. The waste goes into the tubes and leaves the kidney.



Glossary

air sacs	tiny thin-walled pouches in the lungs
artery	a type of blood vessel that carries blood away from the heart to other parts of the body
bronchioles	tubes that branch out from the bronchi
capillary	the smallest kind of blood vessel
esophagus	a tube that moves food to your stomach
mucus	a thick, sticky liquid that protects against dust and germs
trachea	a tube that carries air from the throat to the lungs
valve	a flap that keeps blood flowing in one direction
vein	a type blood vessel that takes blood from the body cells back to the heart

What did you learn?

1. How is the circulatory system like a transportation system?
2. What are the two gases that are carried through the respiratory system?
3. What do the kidneys do?
4. **Writing in Science** There are different kinds of blood cells. Each has a certain job in the circulatory system. On your own paper, write to describe how each kind of blood cell is different and how it helps the body. Include details from the book to support your answer.
5. **Sequence** What is the order in which food moves through the digestive system?

