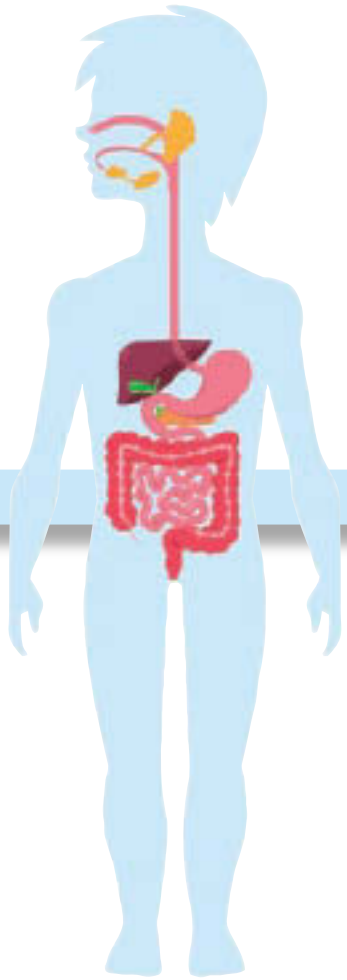
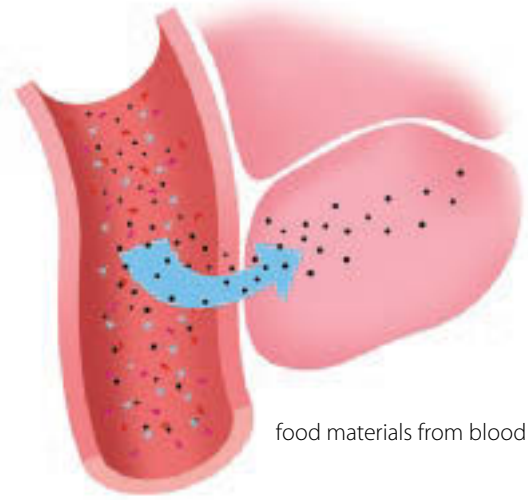
Core Knowledge® SCIENCE

Human Cells and Digestion

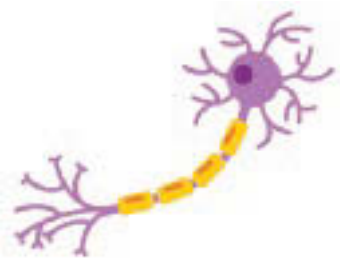


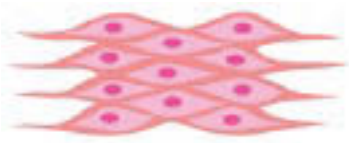


food materials from blood to cells

digestive system

cells of different types





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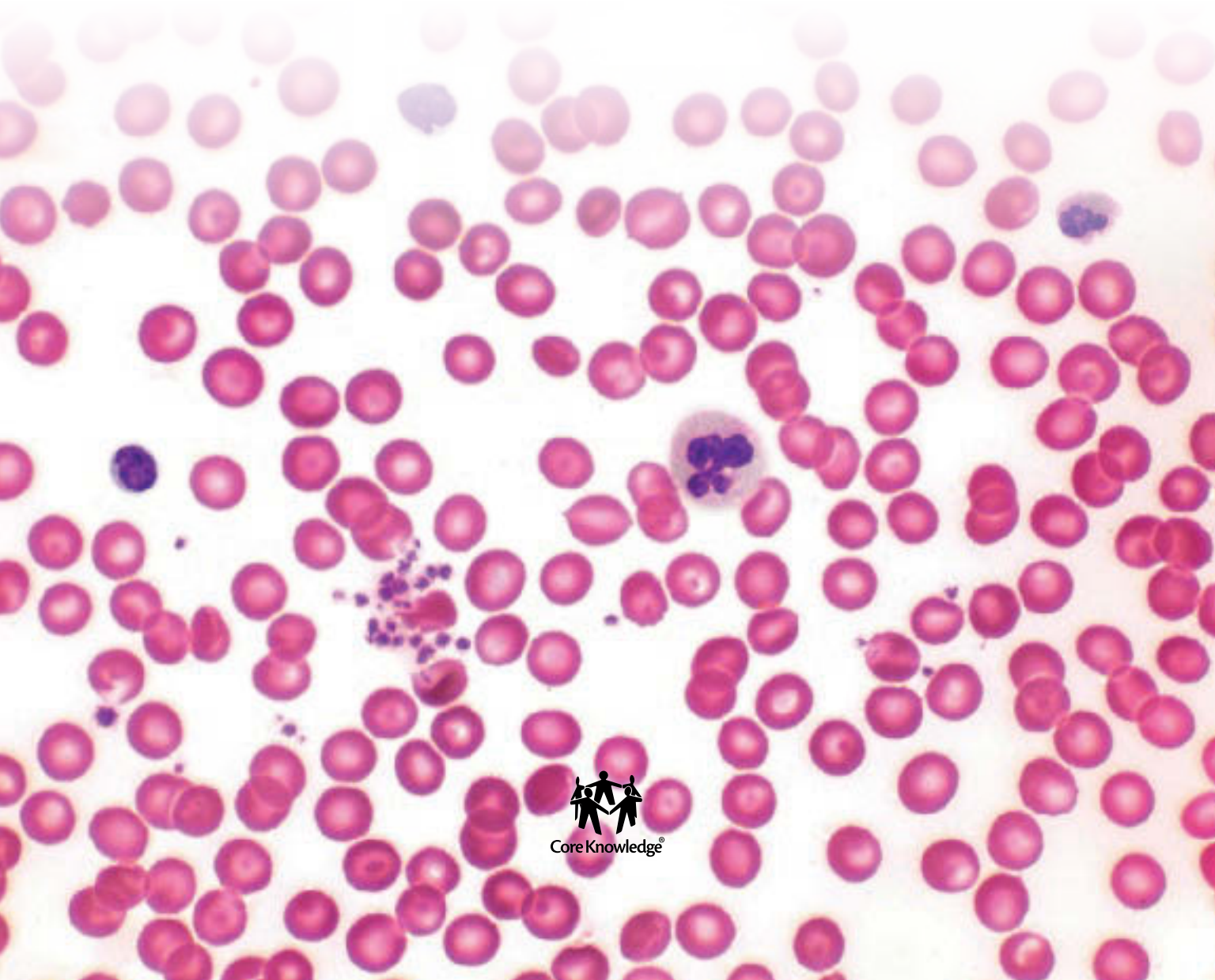
Human Cells and Digestion



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Human Cells and Digestion

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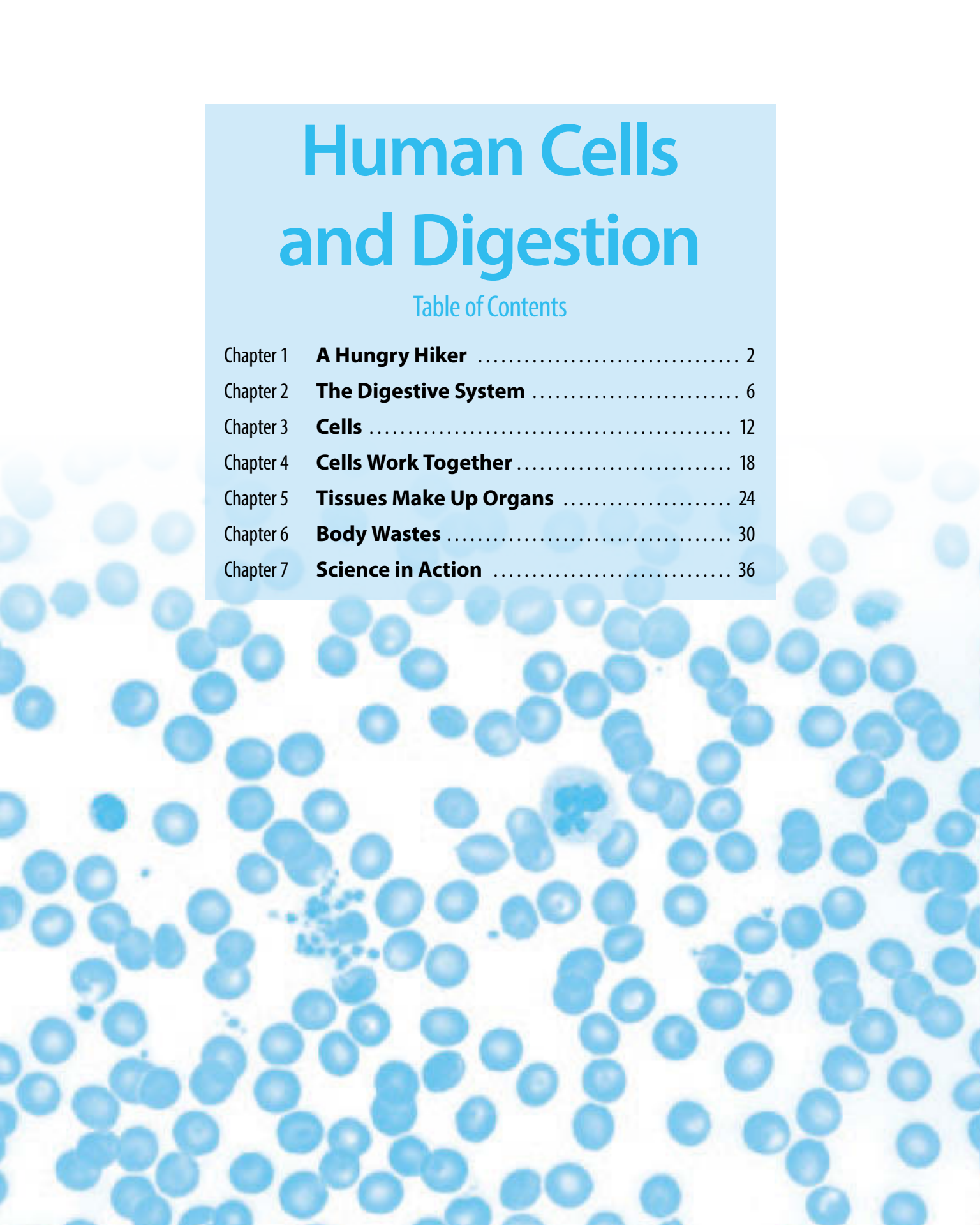


CHAPTER
1

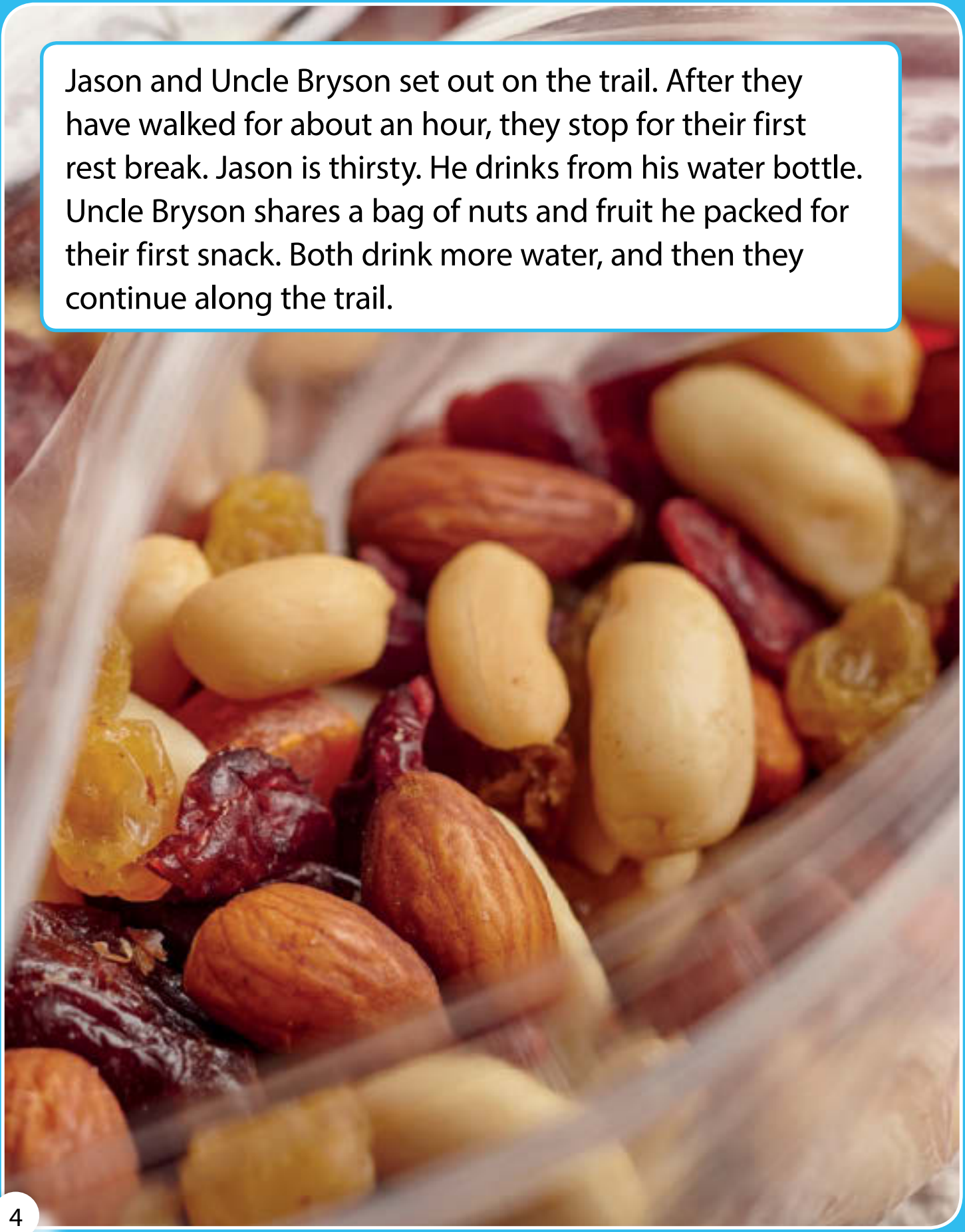
A Hungry Hiker

Jason finishes his cereal, berries, and apple with a glass of orange juice. Then he eats an orange, too. Jason is always hungry in the morning. Uncle Bryson is in the kitchen beside him. He is packing lunch for the two of them. Today Uncle Bryson is taking Jason on a hike at Tall Falls Park. They will hike to see some beautiful waterfalls.

Uncle Bryson and Jason prepare their backpacks. They pack snacks to eat on their rest breaks. They pack a picnic lunch for when they reach the falls. They also pack water to drink throughout the hike.

"It will take most of the day time to walk to the falls and back," Uncle Bryson says. "The hike to the falls is mostly uphill. It might make us tired. We will stop and rest a few times along the way."

Jason and Uncle Bryson set out on the trail. After they have walked for about an hour, they stop for their first rest break. Jason is thirsty. He drinks from his water bottle. Uncle Bryson shares a bag of nuts and fruit he packed for their first snack. Both drink more water, and then they continue along the trail.



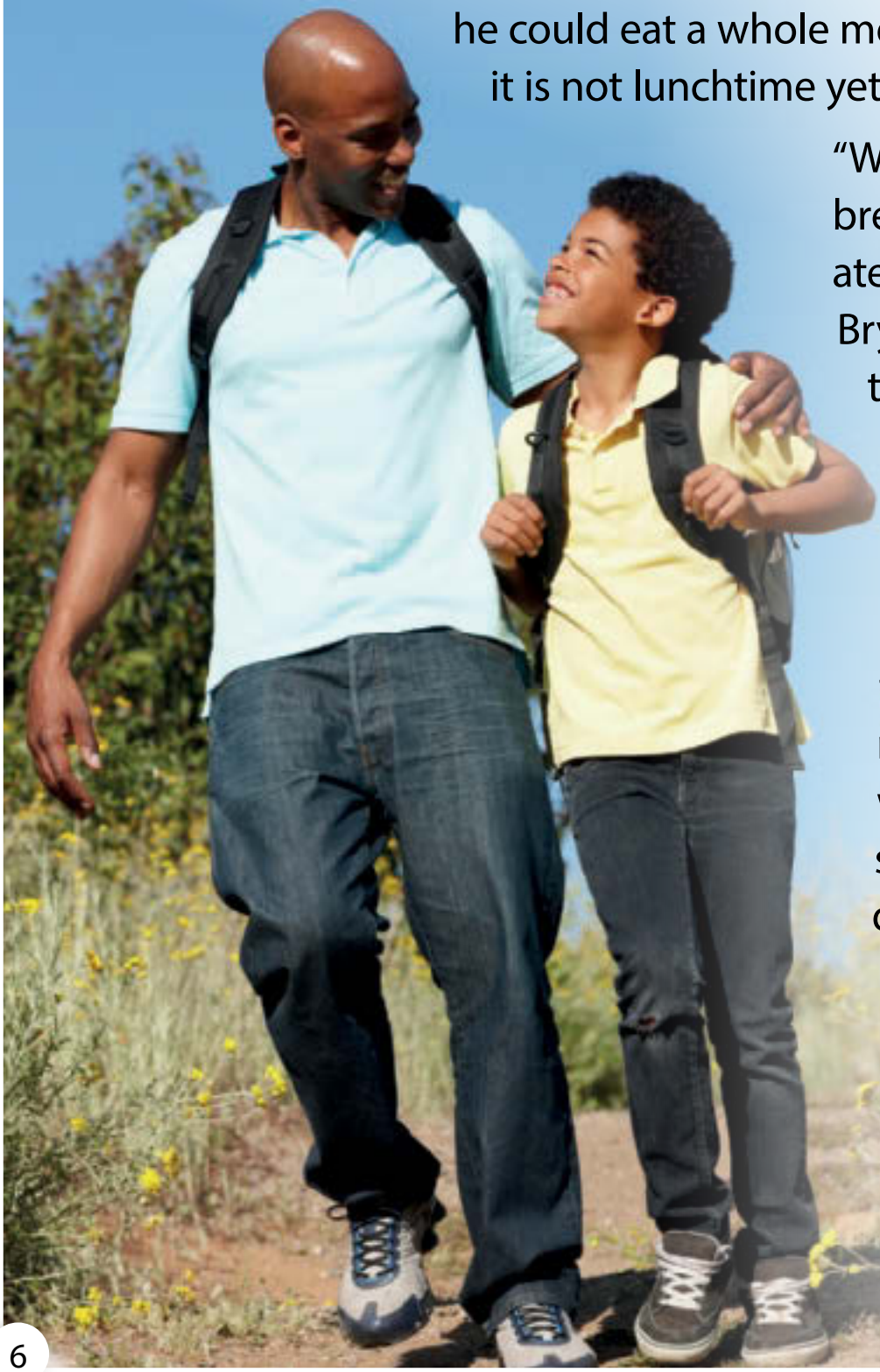
Jason and Uncle Bryson walk for another hour. They are more than halfway to the falls now. They stop again for another rest break. Jason drinks more water. He quickly eats the raisins that he brought in his backpack.

When the two begin walking again, Jason's stomach growls. Even though he ate a big breakfast and two snacks, he wishes it were time for lunch! Why is he hungry again?

CHAPTER 2

The Digestive System

Jason ate a big breakfast. Then he ate two snacks and drank water. Now he wants more to eat. He feels like he could eat a whole meal, even though it is not lunchtime yet.



"What about all that breakfast food you ate?" asks Uncle Bryson. "Where did that go?"

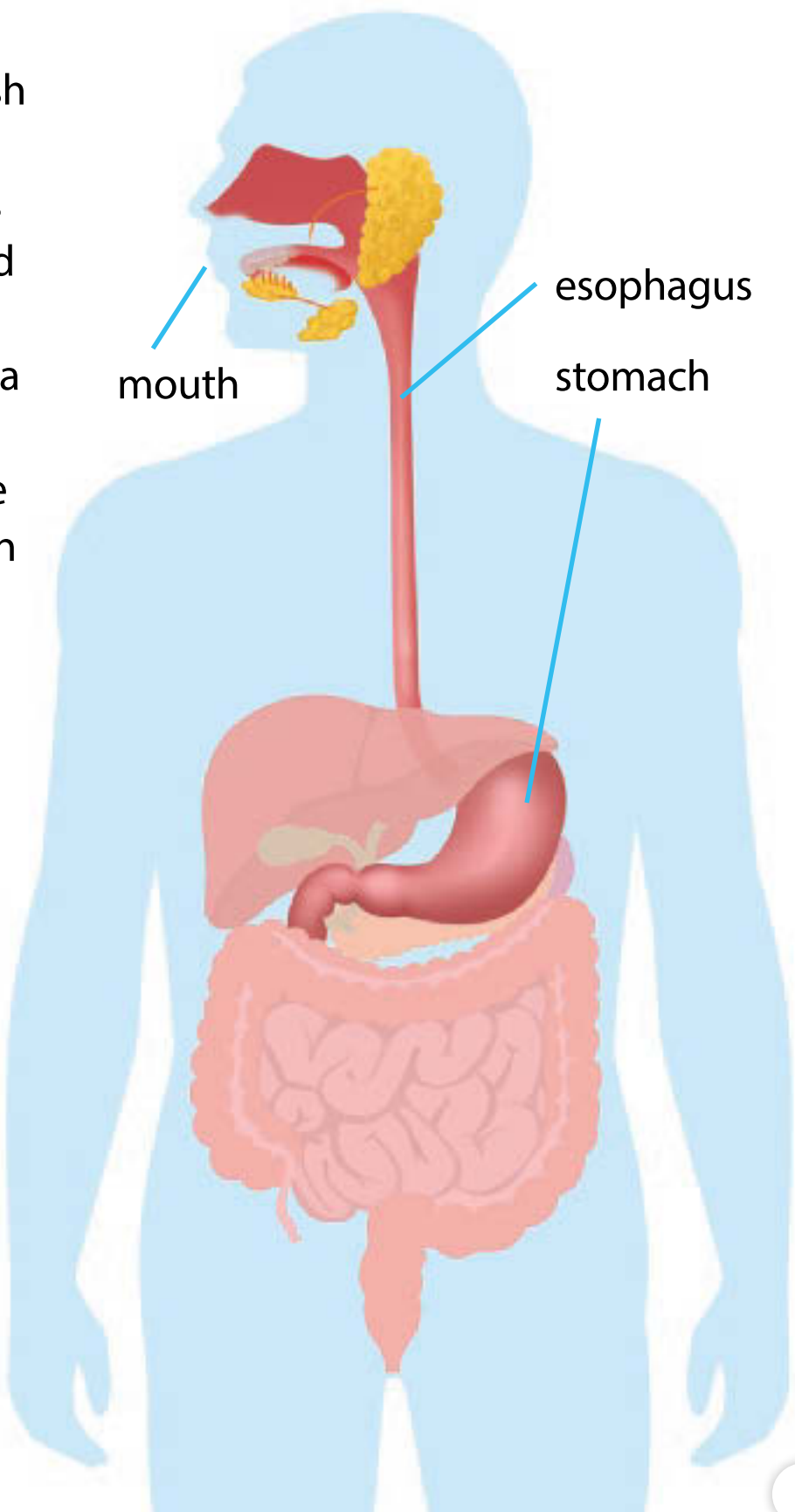
"That's a good question," Jason replies. "I don't know where the nuts and raisins that I ate went either. My stomach just doesn't stay full!"

Jason is right. His stomach does not stay full. Jason's body uses the food he ate for energy. Human bodies need energy to grow, move, and stay alive. You get the energy your body needs from food. To stay healthy, you usually need to eat a few times a day.

The body's process of breaking food down to use for energy is called digestion. The group of body parts that carry out digestion make up the digestive system.

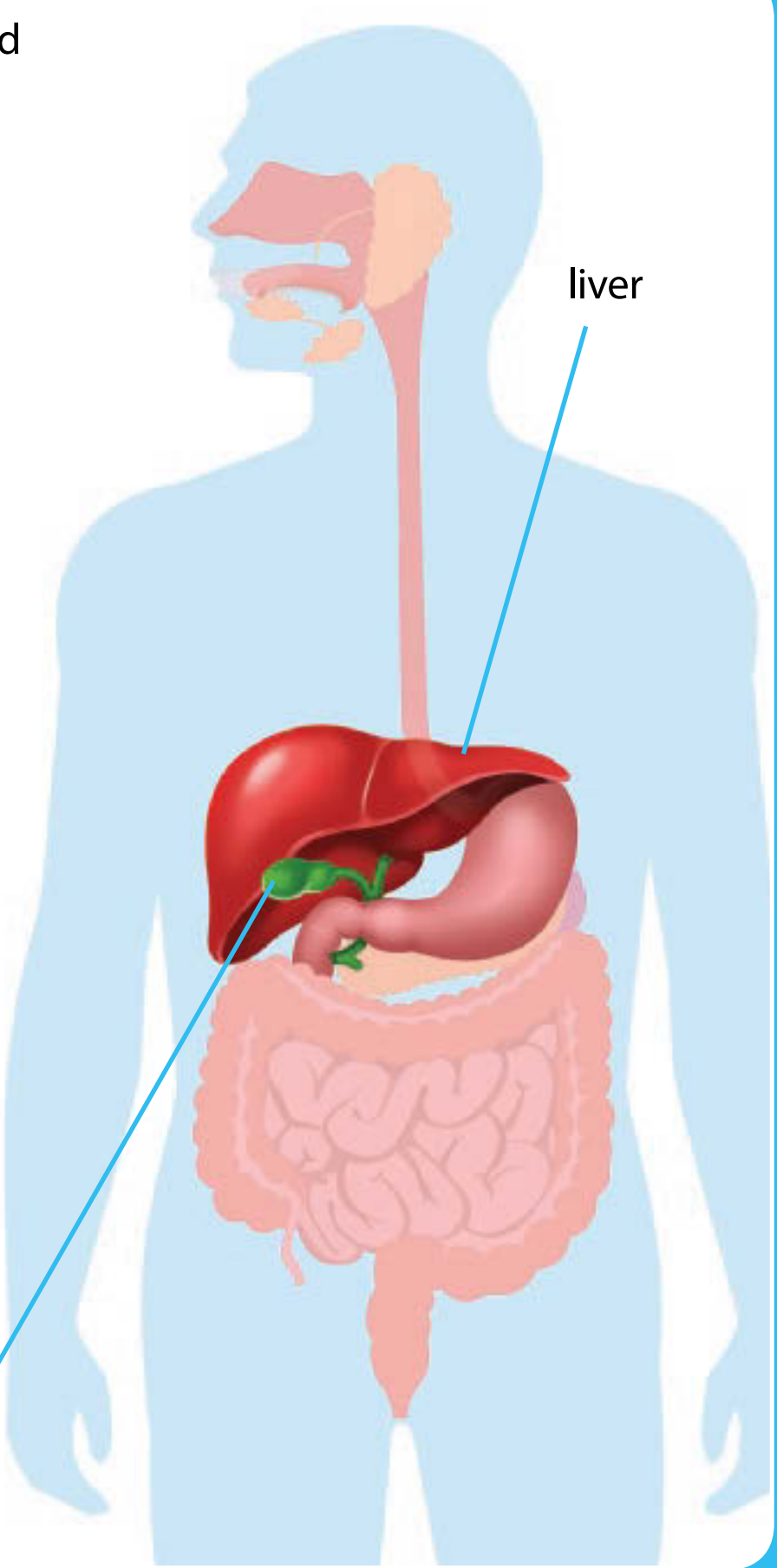
Digestion begins with chewing. When you chew food, you crush it with your teeth. Your tongue pushes the food around and mixes it with saliva in your mouth. Saliva is another name for spit. Saliva starts the chemical breakdown of food.

When you swallow, the chewed food moves through a tube called the esophagus. Your esophagus extends from your throat, through your neck, inside your chest, to your stomach.



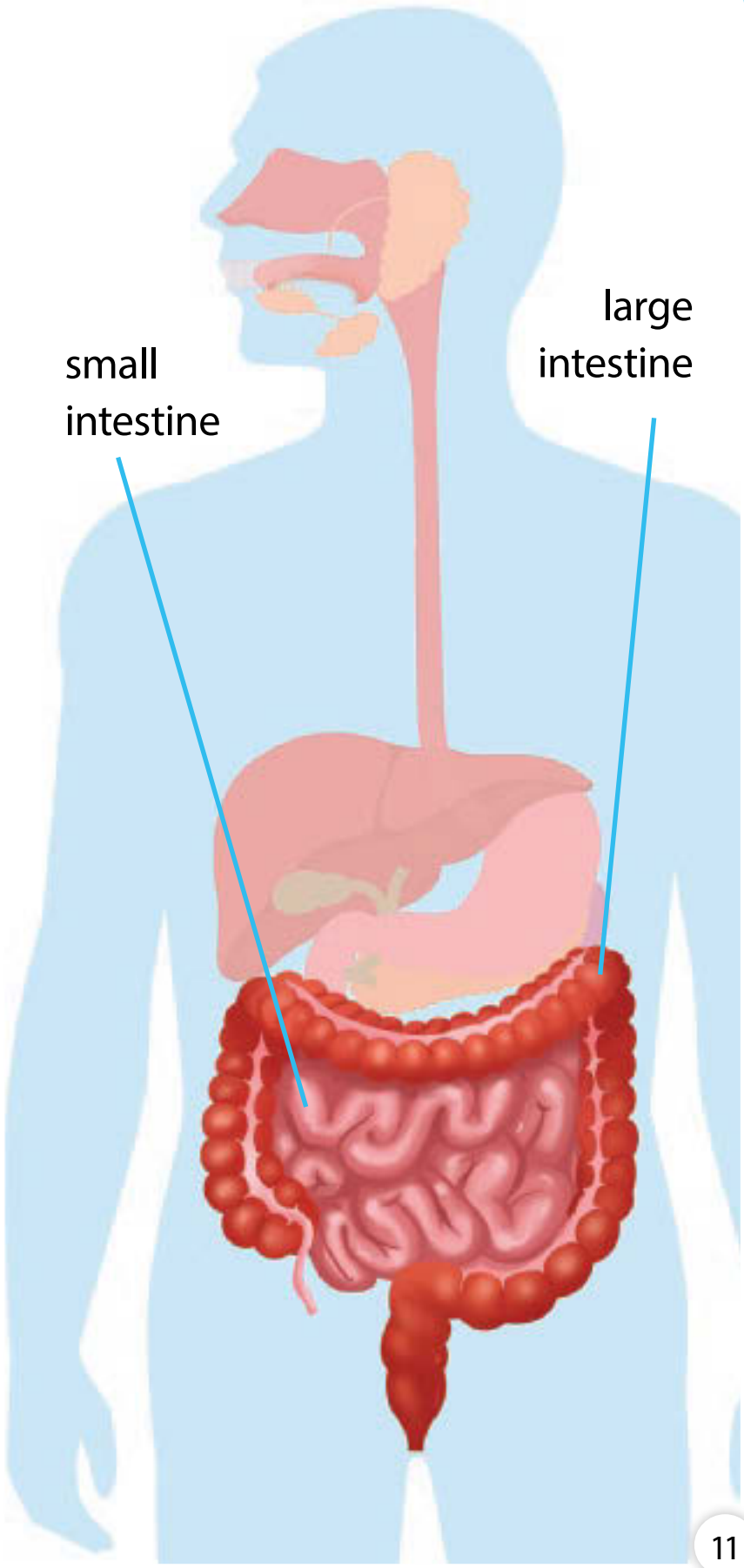
In your stomach, chewed food is broken down further by digestive juices that your body makes. When you hear your tummy gurgle, it is these juices moving around inside your stomach. Body parts called the liver and gallbladder make some of the juices that help you digest food.

The liquid food mixture moves from your stomach into your small intestine. When your stomach moves all its contents into your intestines, you have an empty stomach. And then you might begin to feel hungry again.



Food from the stomach moves into your small intestine first. The small intestine is a long, narrow, folded tube. Food then moves through a shorter, thicker intestine, called the large intestine. The intestines absorb food and water. These are materials that your body needs. Materials move out of the intestines and into your blood and are carried to all parts of your body.

Your intestines do not absorb all the food that you eat. Some material in food passes all the way through your intestines. The leftover food material leaves your body as waste.

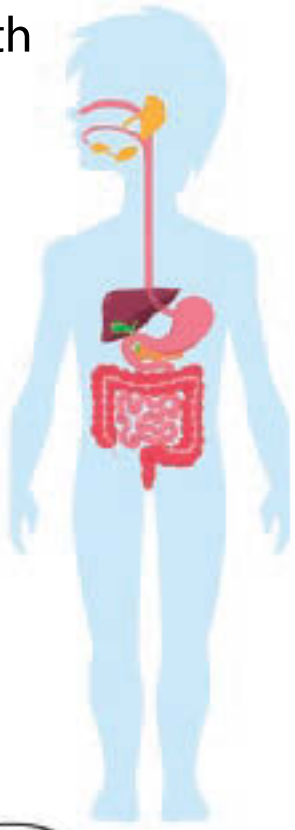


CHAPTER
3

Cells

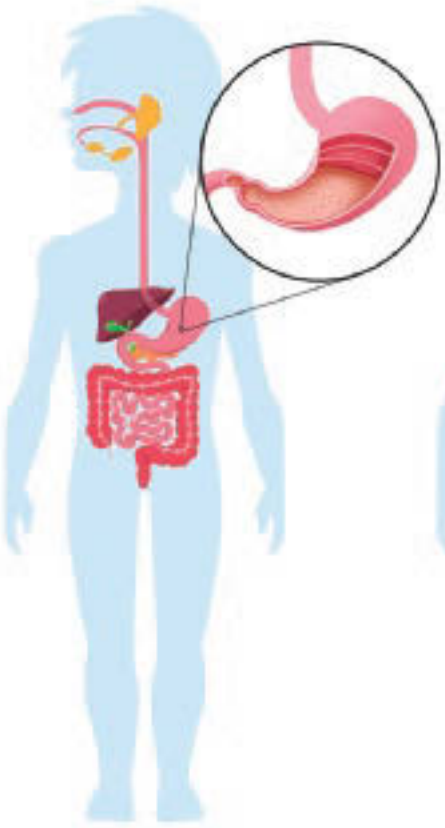
Jason and Uncle Bryson complete their hike to the waterfalls. They see the beautiful scenery. Then they enjoy their picnic lunch. Jason is happy that they brought plenty to eat. He worked up quite an appetite as he hiked toward the falls. After he eats, he starts to feel more lively again. He thinks he will soon be ready to hike some more.

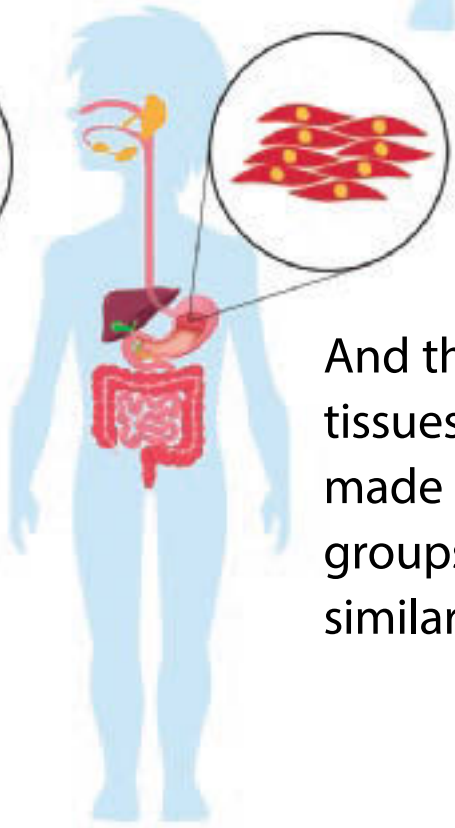
Jason's body worked hard as he hiked to the falls. His body is still working as he rests. Jason's body is made up of different parts. His body parts use food energy for growth and repair even when Jason is not moving.



The digestive system is one example of a set of body parts. It is made up of several organs. The stomach, small intestine, and large intestine are all organs.

Each organ is made up of tissues.



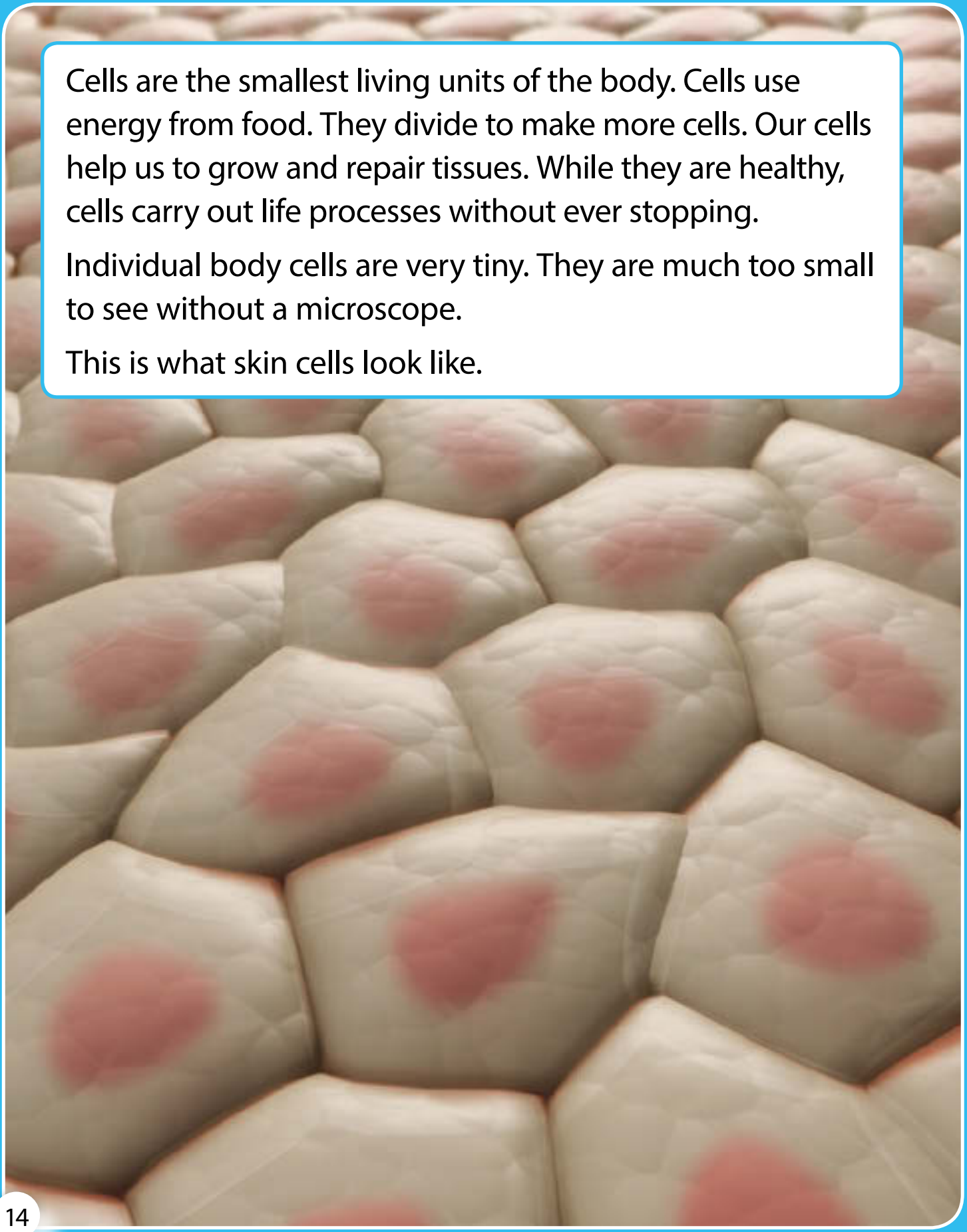


And the tissues are made up of groups of similar cells.

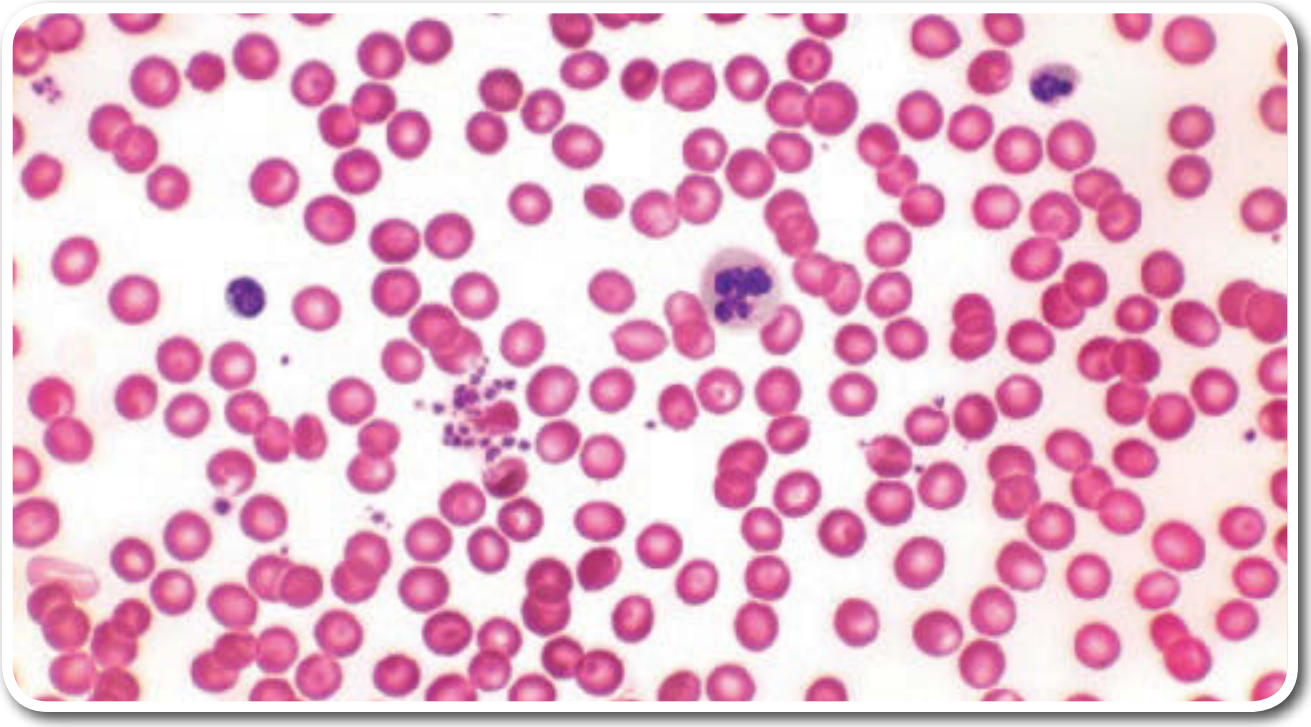
Cells are the smallest living units of the body. Cells use energy from food. They divide to make more cells. Our cells help us to grow and repair tissues. While they are healthy, cells carry out life processes without ever stopping.

Individual body cells are very tiny. They are much too small to see without a microscope.

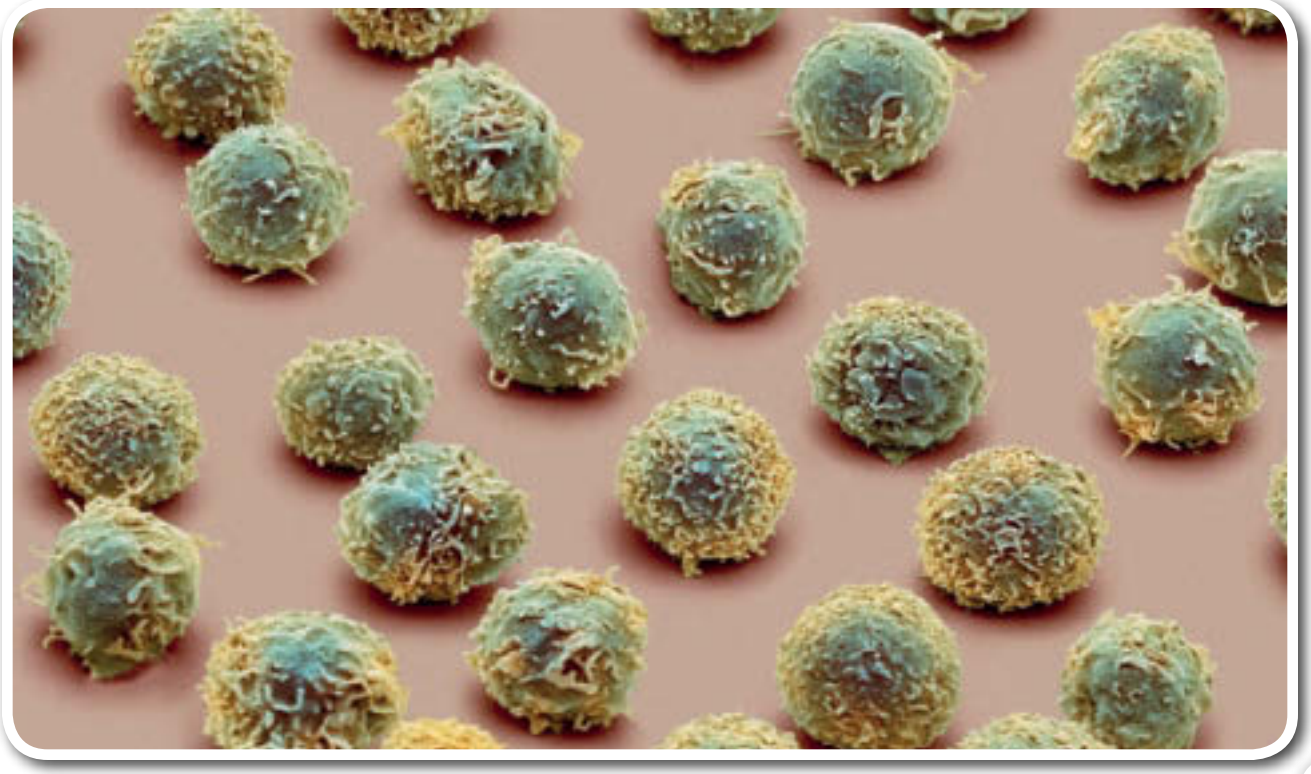
This is what skin cells look like.



This is what red blood cells look like through a microscope.



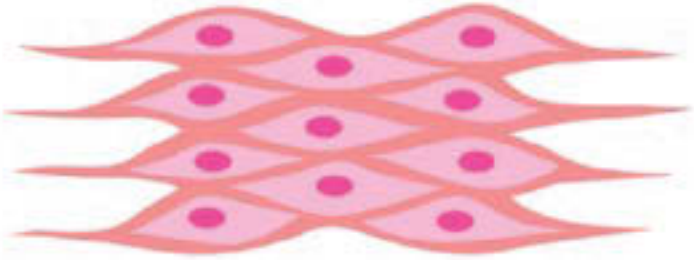
This is what white blood cells look like through a more powerful microscope.



The human body has many different types of cells. They all use materials from food to carry out their different tasks.

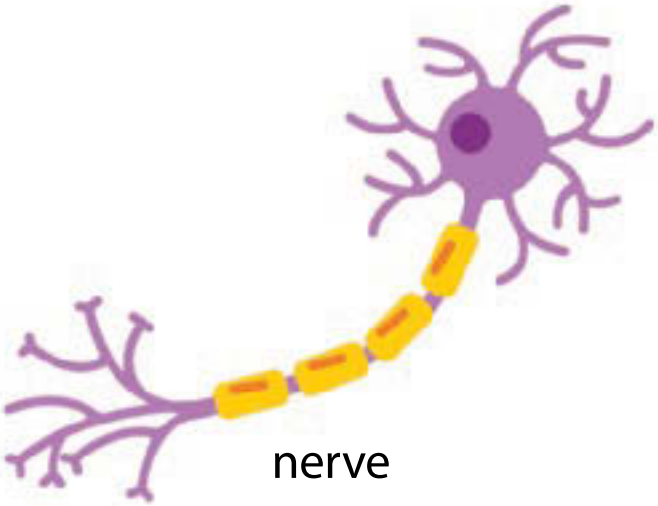
bone

blood



muscle

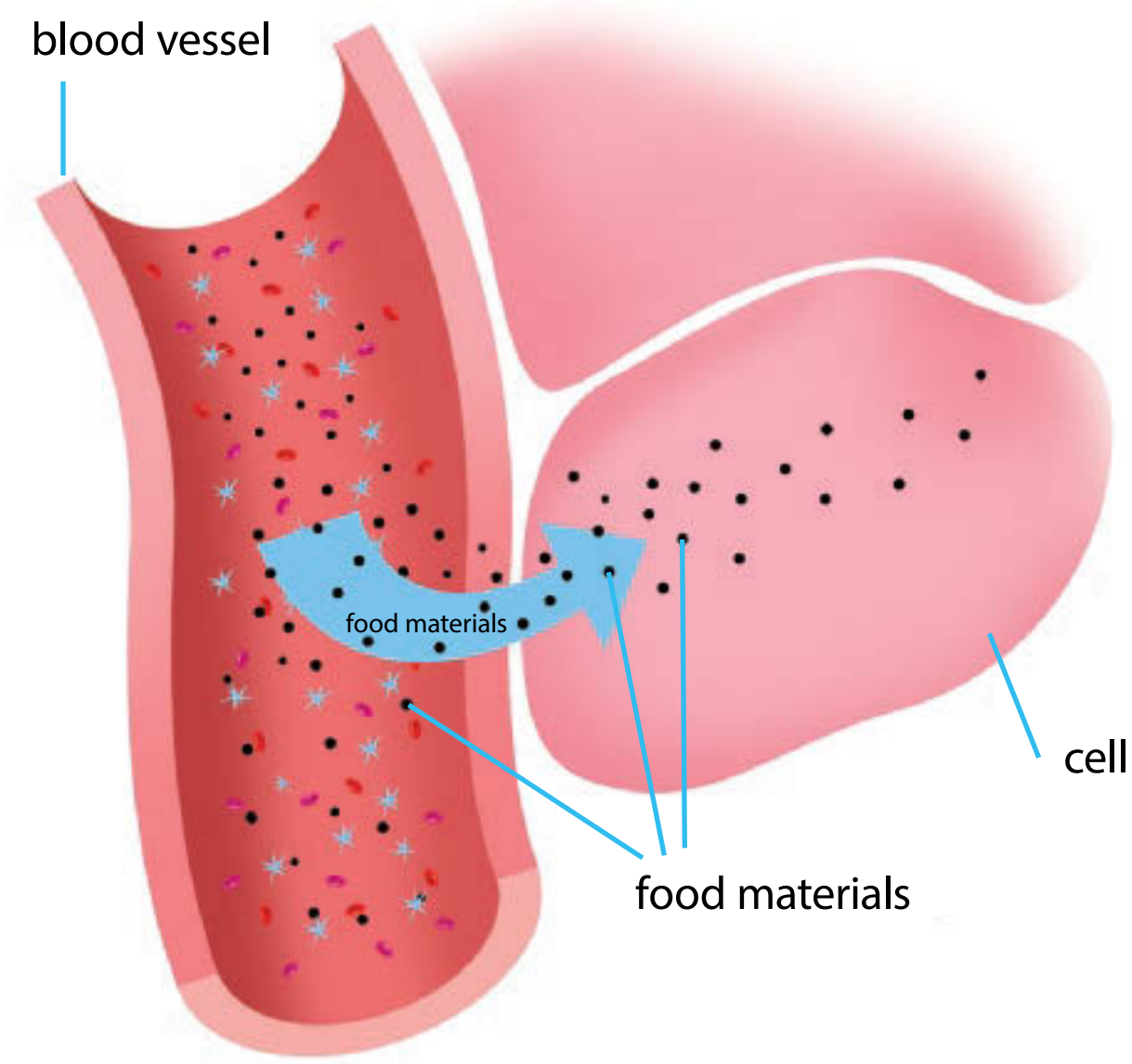
fat



nerve

skin

Blood carries food materials to cells so that cells can function well. Materials move from the blood into cells.



Health Tip

It is very important to drink plenty of water so that cells have what they need to keep your body healthy. Why? Human cells are mostly water. Blood is mostly water, too. Water is essential for human life.

CHAPTER
4

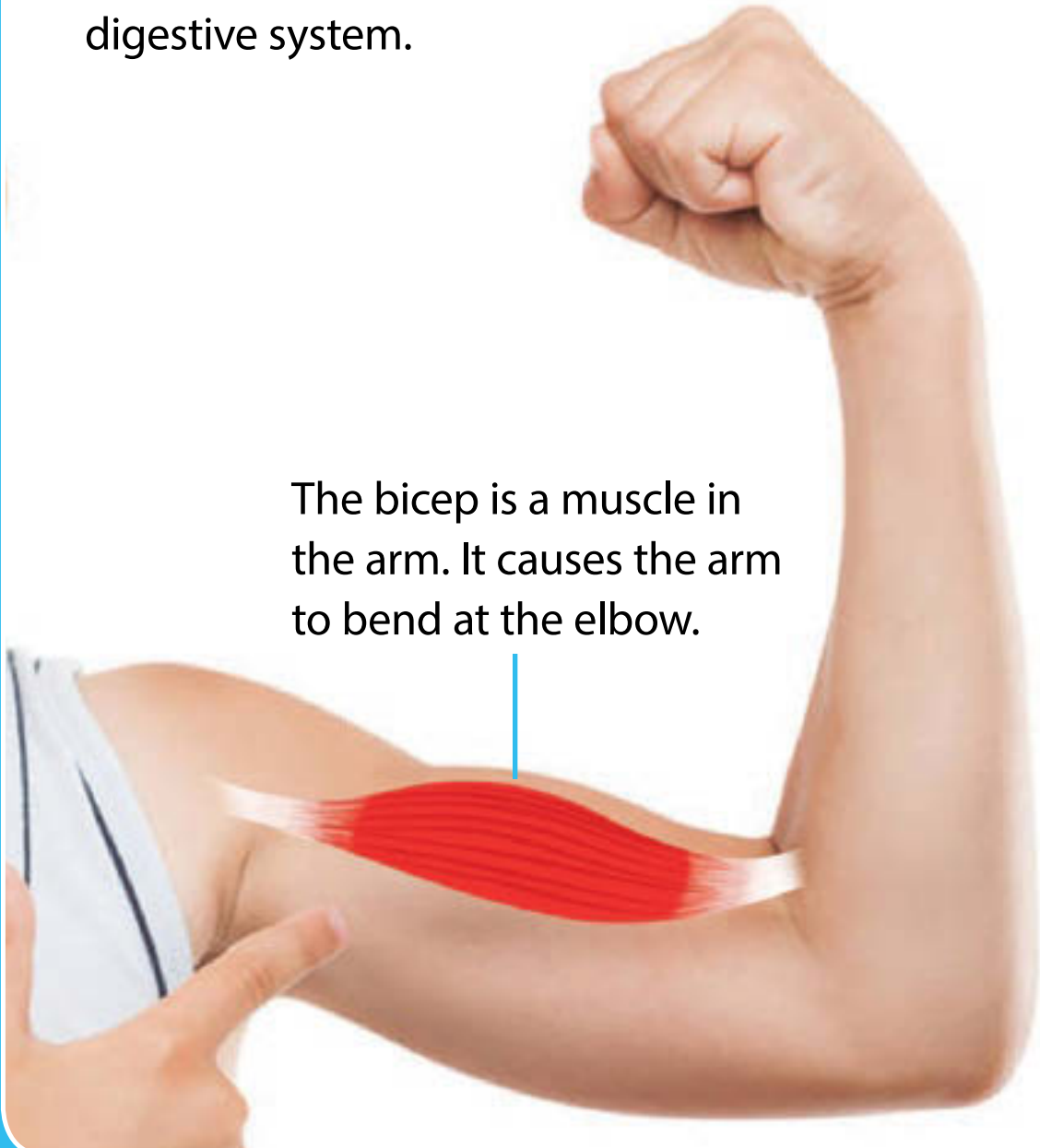
Cells Work Together

Jason's digestive system makes his lunch available to the rest of his body. Nutrients and energy from his food move from his intestines into his blood. His blood carries the materials to all his cells. Cells absorb the materials they need from Jason's blood. Healthy cells mean a healthy body. Also, the cells divide to make more cells so that Jason's body grows and repairs itself.

Cells of specific types work together to form tissues. The body has different types of tissues. For example, your muscles are a type of tissue. Muscle tissue is made from similar kinds of cells.

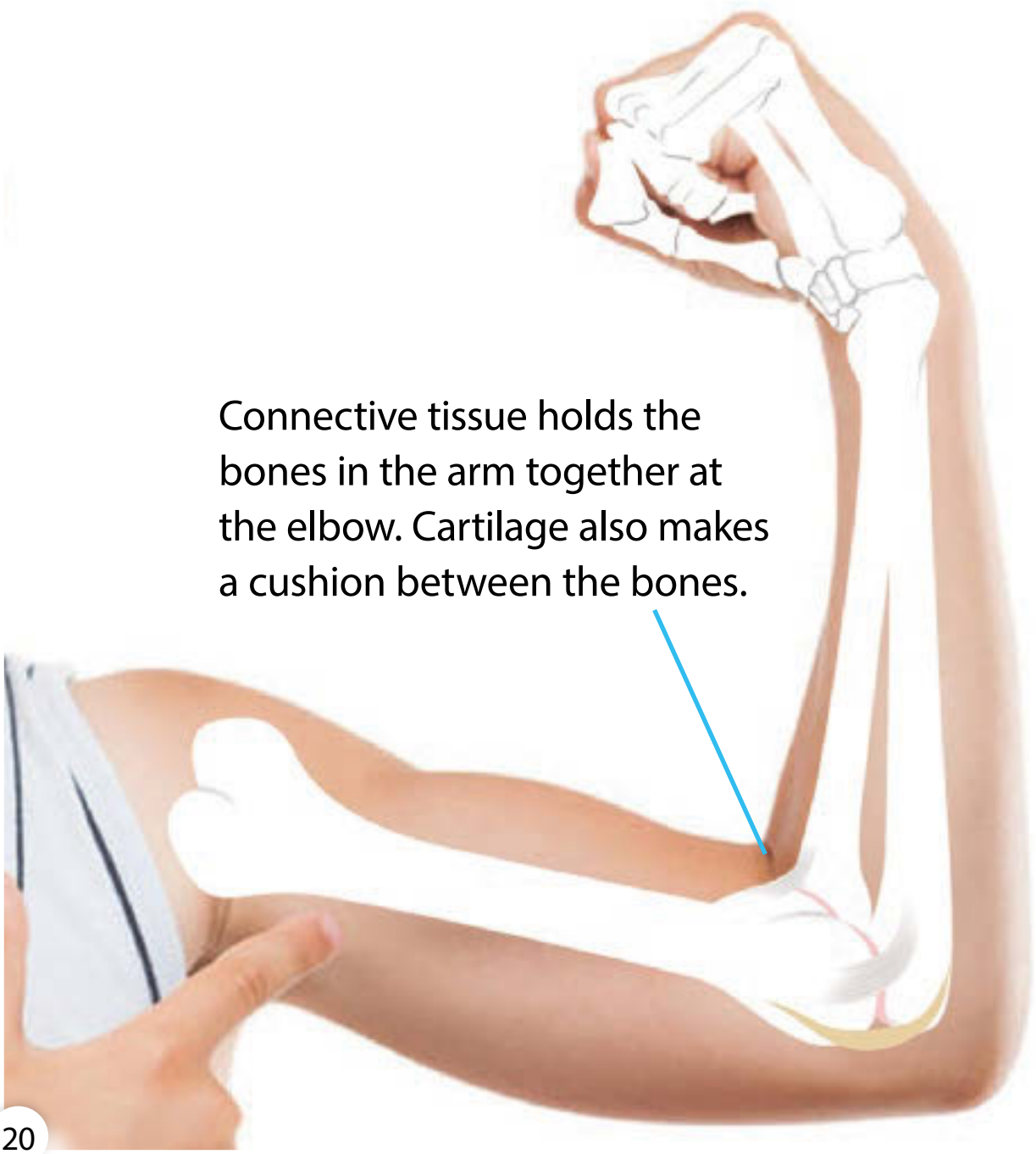
Muscle tissue enables your body's movement. Muscles work by contracting and relaxing, or getting shorter and longer. Muscles that attach to your bones allow you to move around.

Muscle tissues in your digestive system move without you thinking about it. They push the food that you eat through the digestive system.



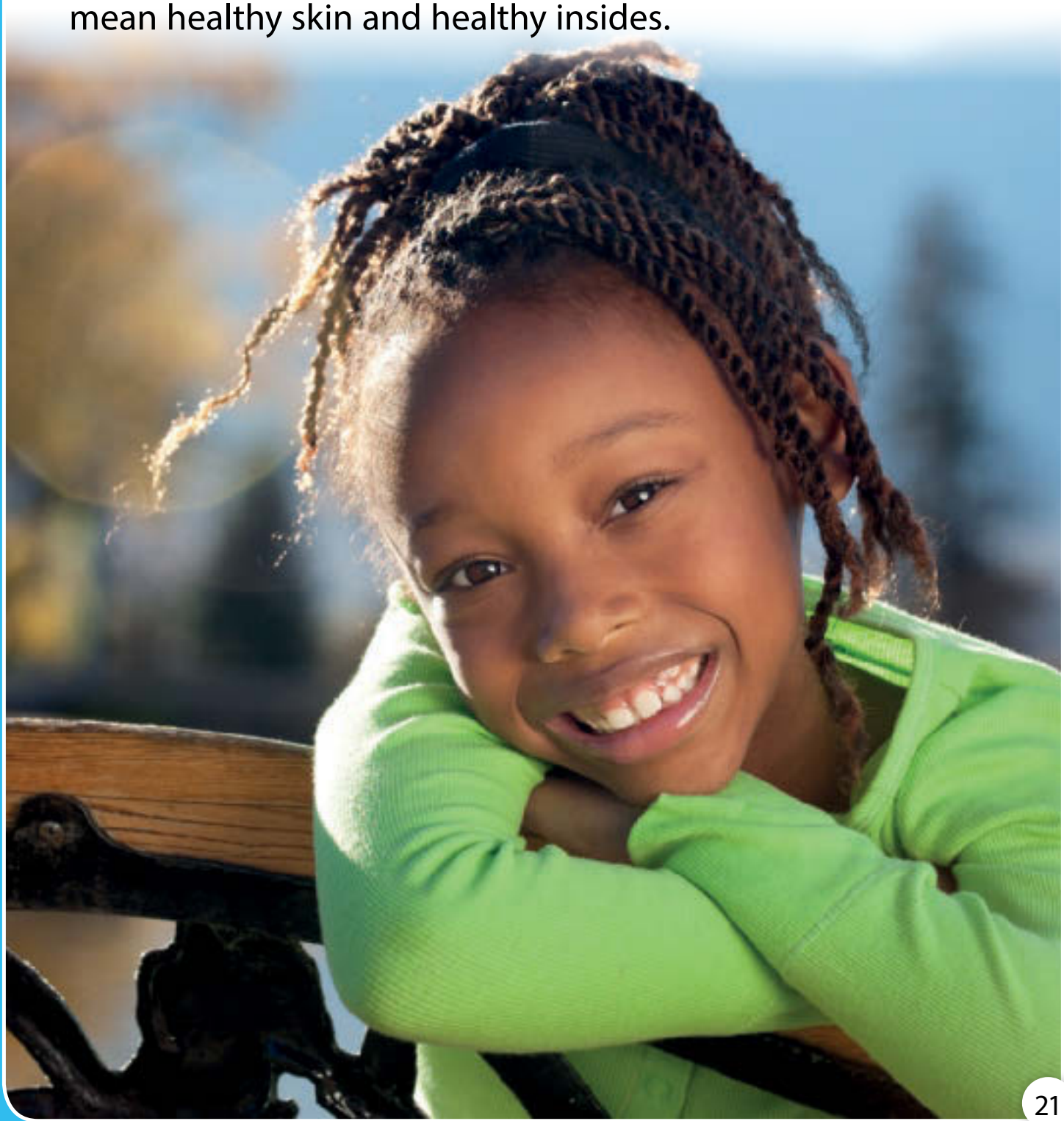
The bicep is a muscle in the arm. It causes the arm to bend at the elbow.

Another type of tissue is connective tissue. Connective tissue joins all the parts of your body together. Connective tissue can connect bones to muscles or even bones to other bones. A connective tissue called cartilage makes up most of your ear, most of your nose, and much of your rib cage.

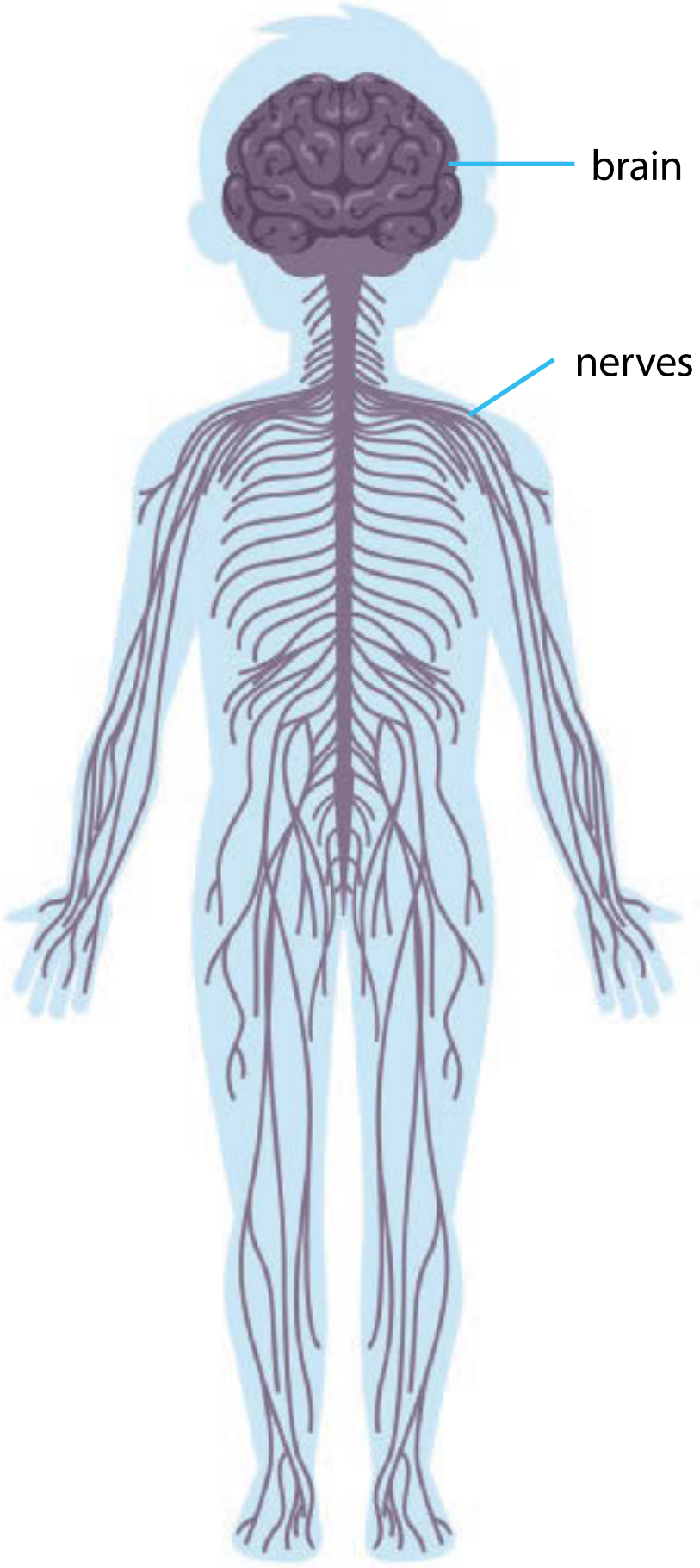


Connective tissue holds the bones in the arm together at the elbow. Cartilage also makes a cushion between the bones.

Another type of tissue forms the coverings of your body parts. This type of tissue is called epithelial tissue. Your skin is made of different types of epithelial tissue. Epithelial tissue covers parts that are inside your body, too. Healthy cells mean healthy skin and healthy insides.

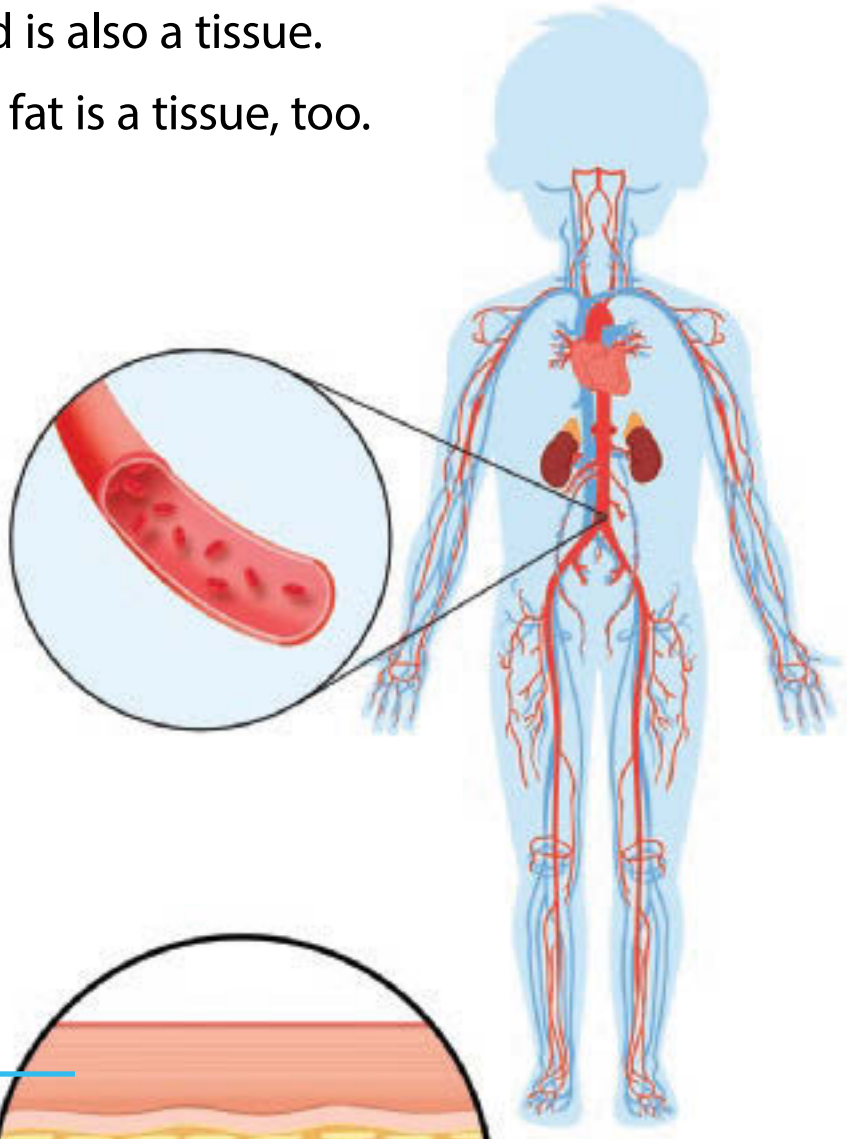


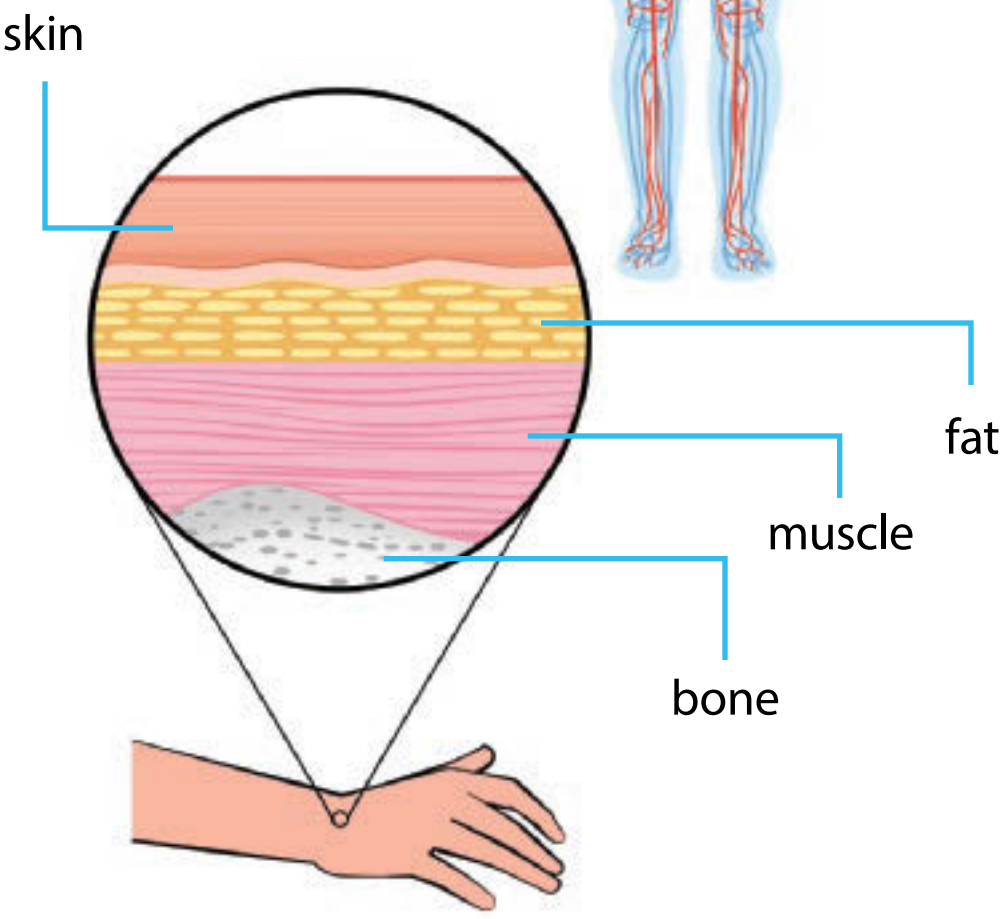
A fourth type of tissue in your body is nervous tissue. Nervous tissue carries signals to and from parts of your body. Nervous tissue sends signals to and from muscles. Nervous tissues are part of all your senses. Nervous tissue also carries messages that keep your body parts working without you having to think about them. Digestion, breathing, and your heartbeat are examples of these types of processes.



Blood is also a tissue.

Body fat is a tissue, too.





CHAPTER 5

Tissues Make Up Organs

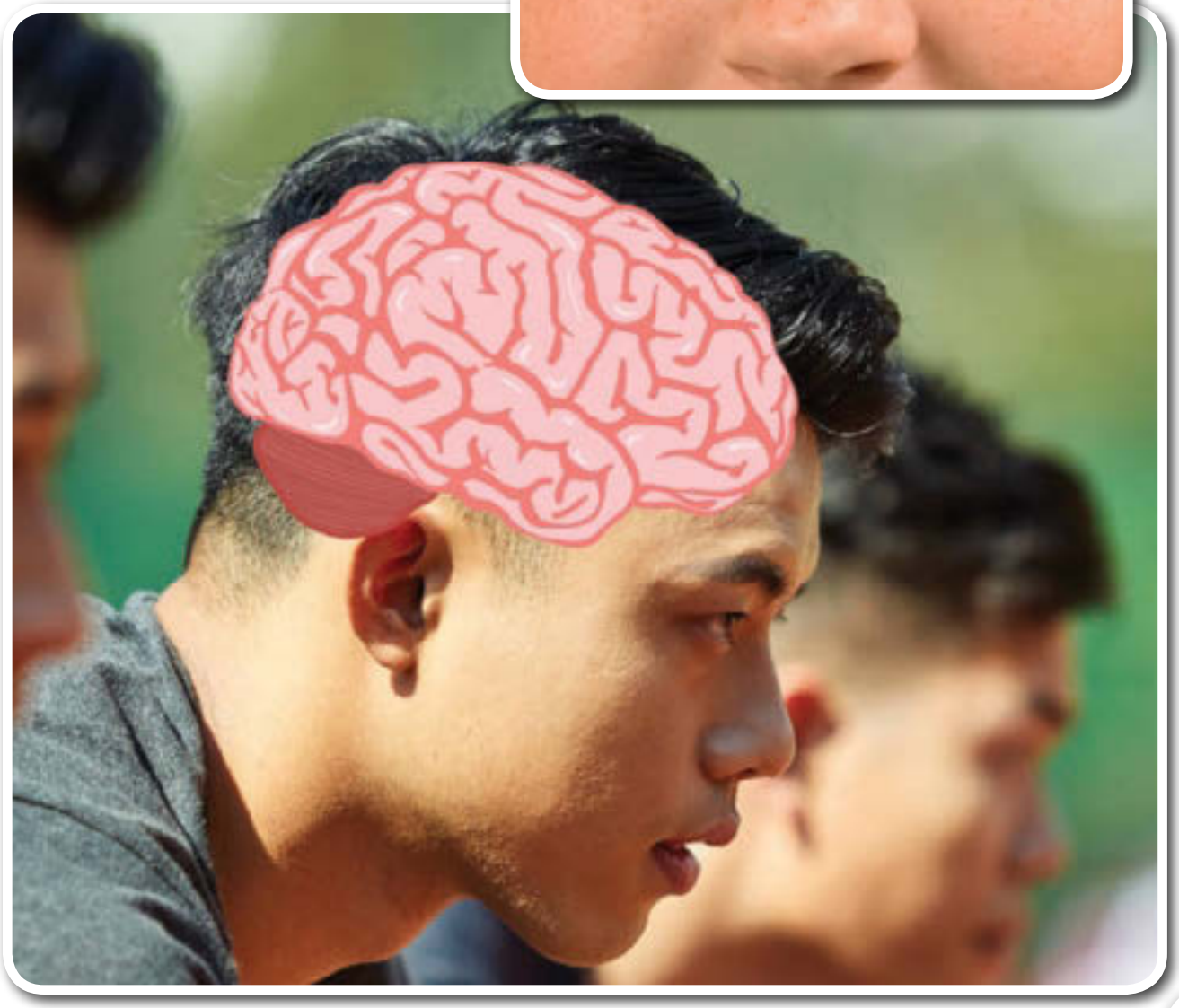
Jason and Uncle Bryson are hiking back down from the falls. They have been walking on the trail for a few hours. Even though they had a nice picnic lunch, Jason is already thinking about the snack he will have when they stop for a short break.

Uncle Bryson smiles when Jason asks if it is time for a snack break yet. "I remember when I was your age," Uncle Bryson says. "When you are growing, it seems like you are hungry most of the time!"

Jason's digestive system is supporting other parts in his body. His digestive system breaks down everything he eats and makes the materials available to his body's cells. Similar kinds of cells working together form tissues. Different kinds of tissues work together to form organs.

Your heart and stomach are organs. Each is made of different kinds of tissues. Your intestines and liver are organs, too.

Your eyes and brain are organs, too. They also are made of different kinds of tissues. All the cells in all the tissues in your eyes and brain need energy and nutrients to stay healthy. The cells get the materials they need from the food that your body digests. The energy used by the cells in your eyes and brain enables the tissues and organs to do their jobs.

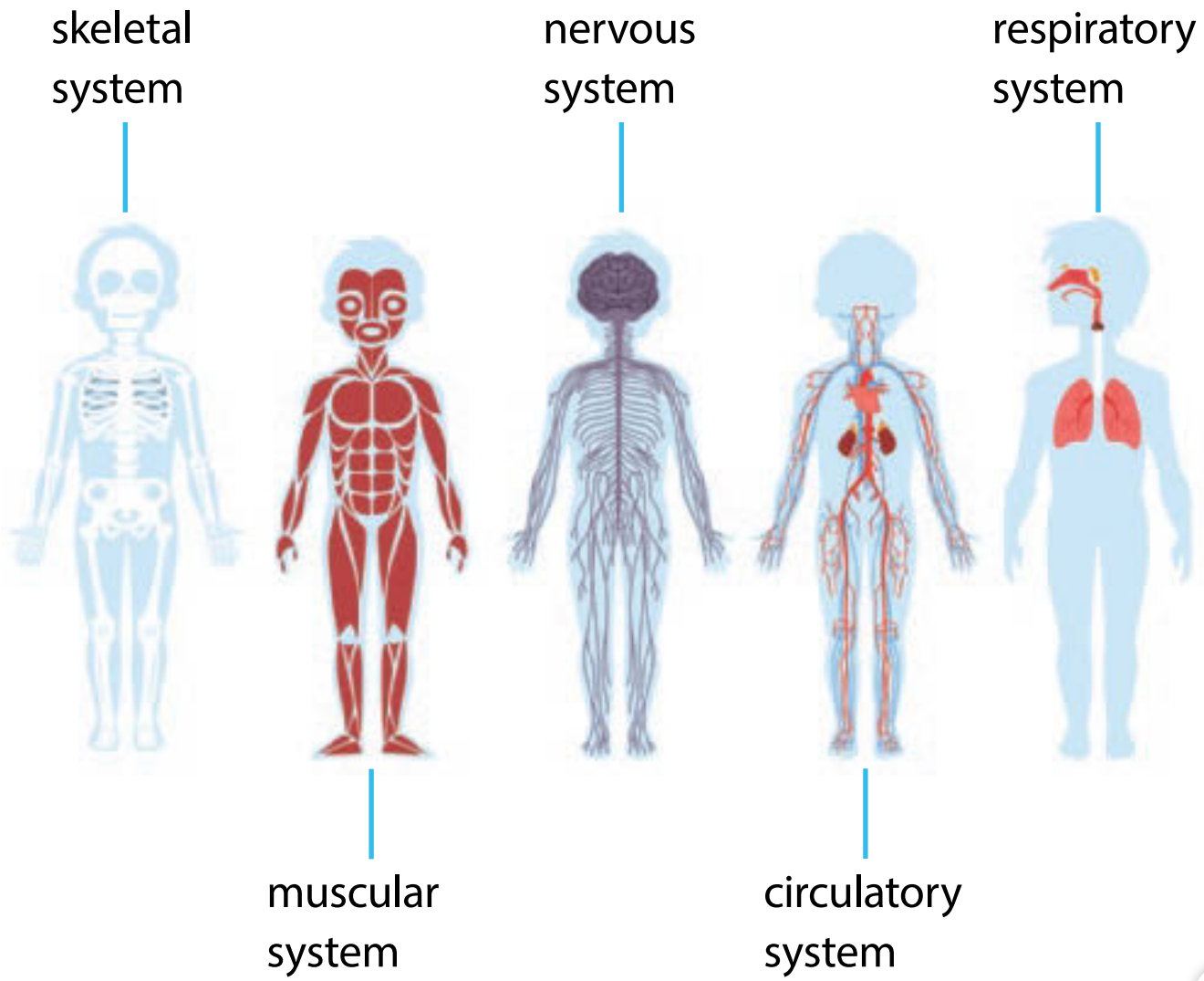


Your bones and skin are also organs. They are made of different kinds of tissue. The cells of these tissues need food energy and nutrients to stay healthy. The materials cells get from food enable organs to do their jobs.

Similar kinds of cells make up tissues. → Different kinds of tissues working together are organs. → Different kinds of organs working together are organ systems.

The digestive system is one example of an organ system. What is the function that the digestive system performs?

The skeletal system, muscular system, nervous system, circulatory system, and respiratory system are other organ systems. What functions do these organ systems perform?



CHAPTER
6

Body Wastes

Uncle Bryson and Jason are reaching the end of their hike at Tall Falls Park. Jason can see the end of the trail. He can see the roof of the park shelter beside the lot where Uncle Bryson parked the car.

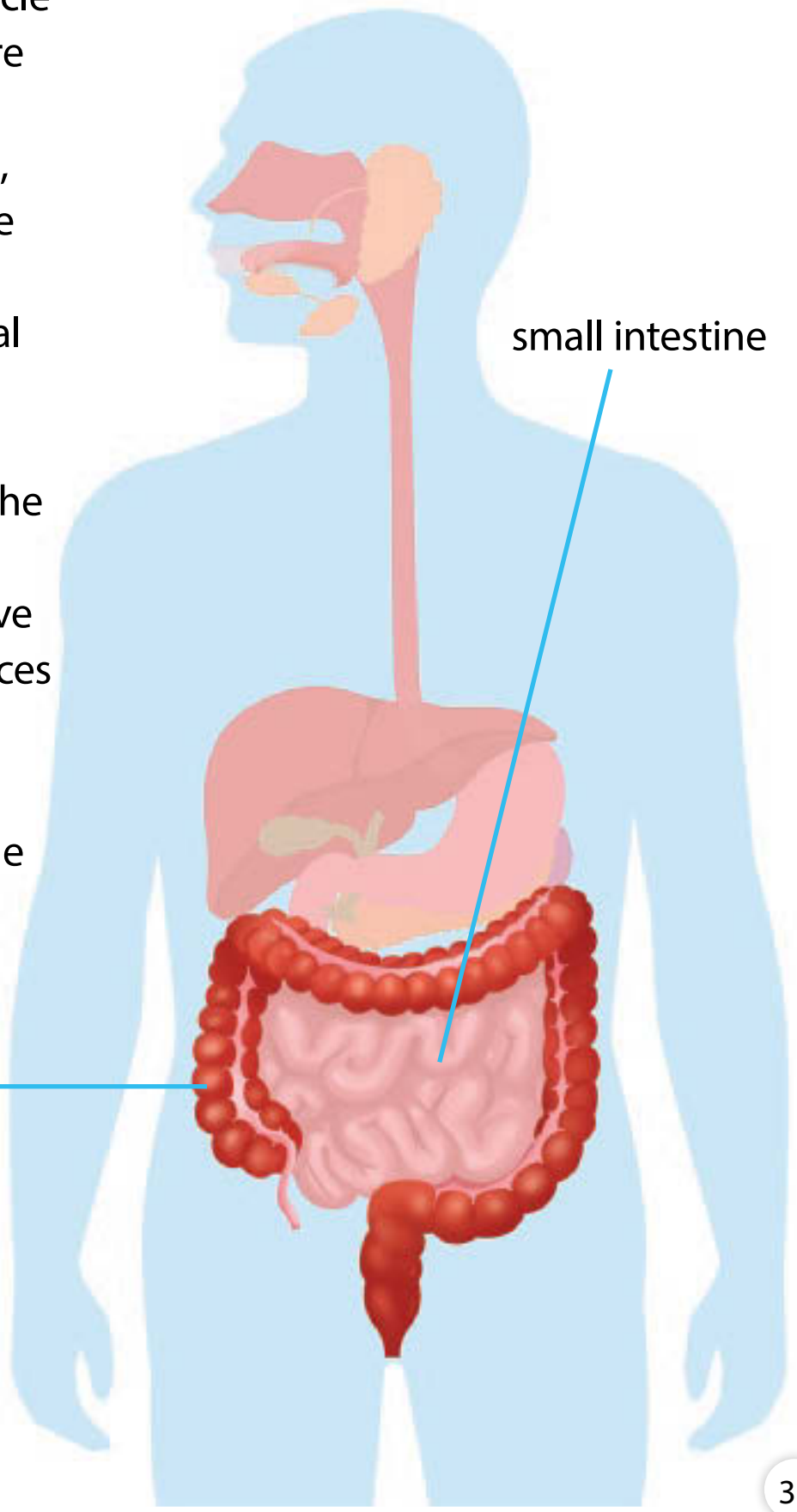
"It's a good thing we are back to the park entrance," Jason says in a hurried voice. "I really have to go to the restroom!"

"So do I," Uncle Jason replies.

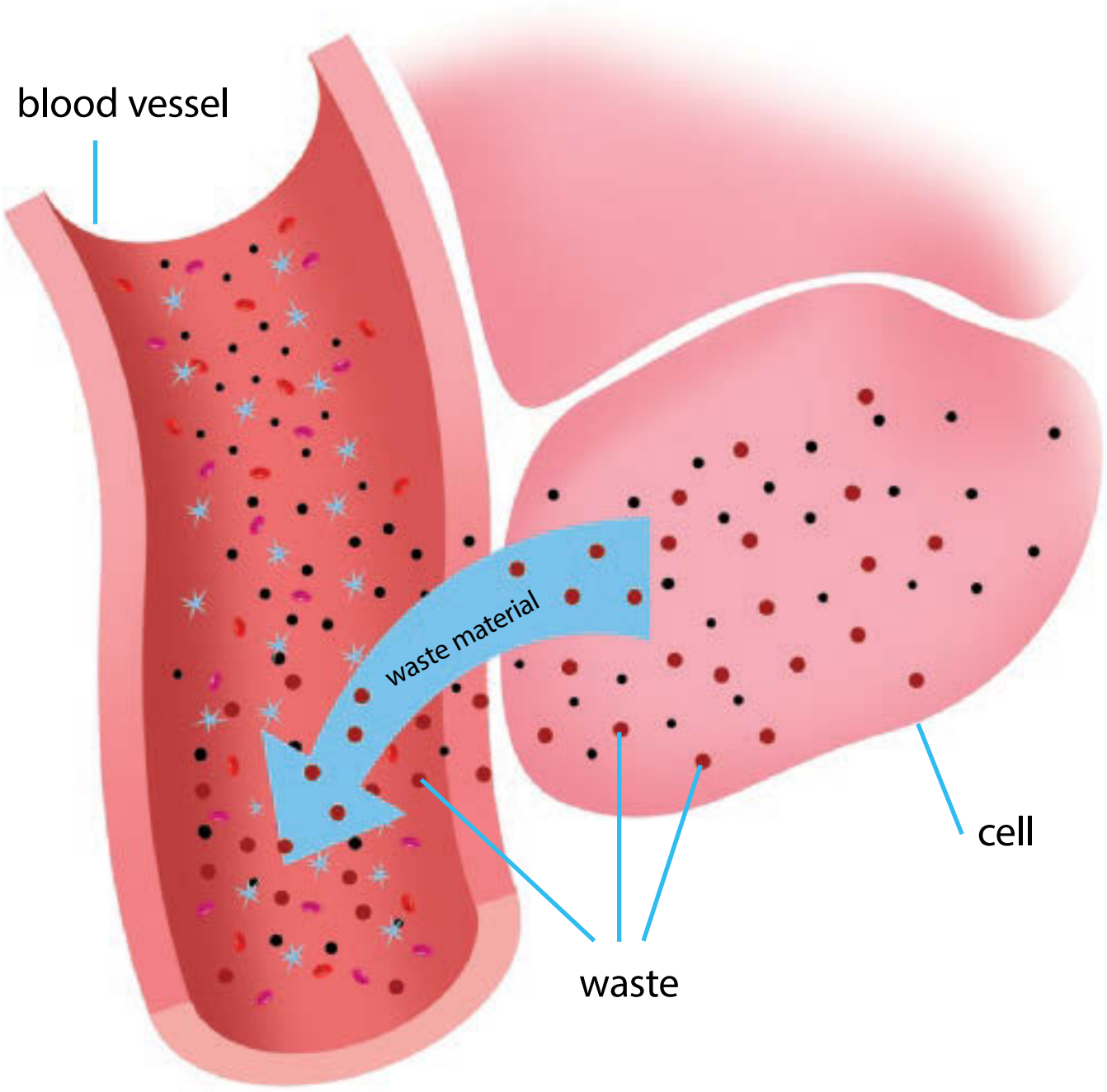
The two of them run the last few yards to find the toilets in the park building.

While Jason and Uncle Bryson's bodies were using energy and nutrients from food, some material in the food was not used. Some of the material in solid food passes through the large intestine and exits the body as waste. The body's solid digestive wastes are called feces or stool (or poop).

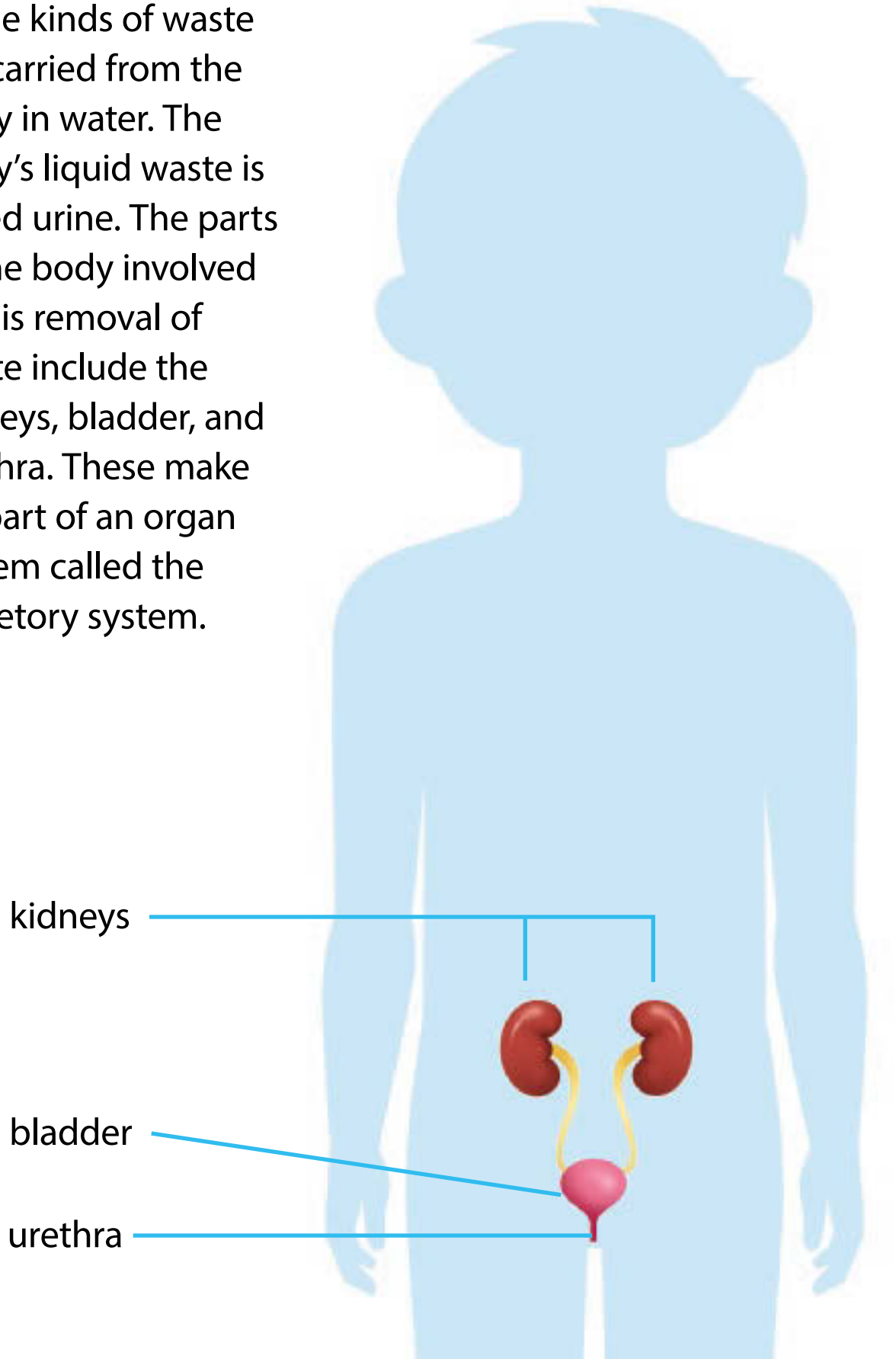
Waste must leave the body to keep the body healthy.



When living cells take in the materials that they use, they also give off waste materials. The waste materials are carried away from cells by the blood stream. The wastes leave the blood and are gotten rid of by the body in a number of ways.

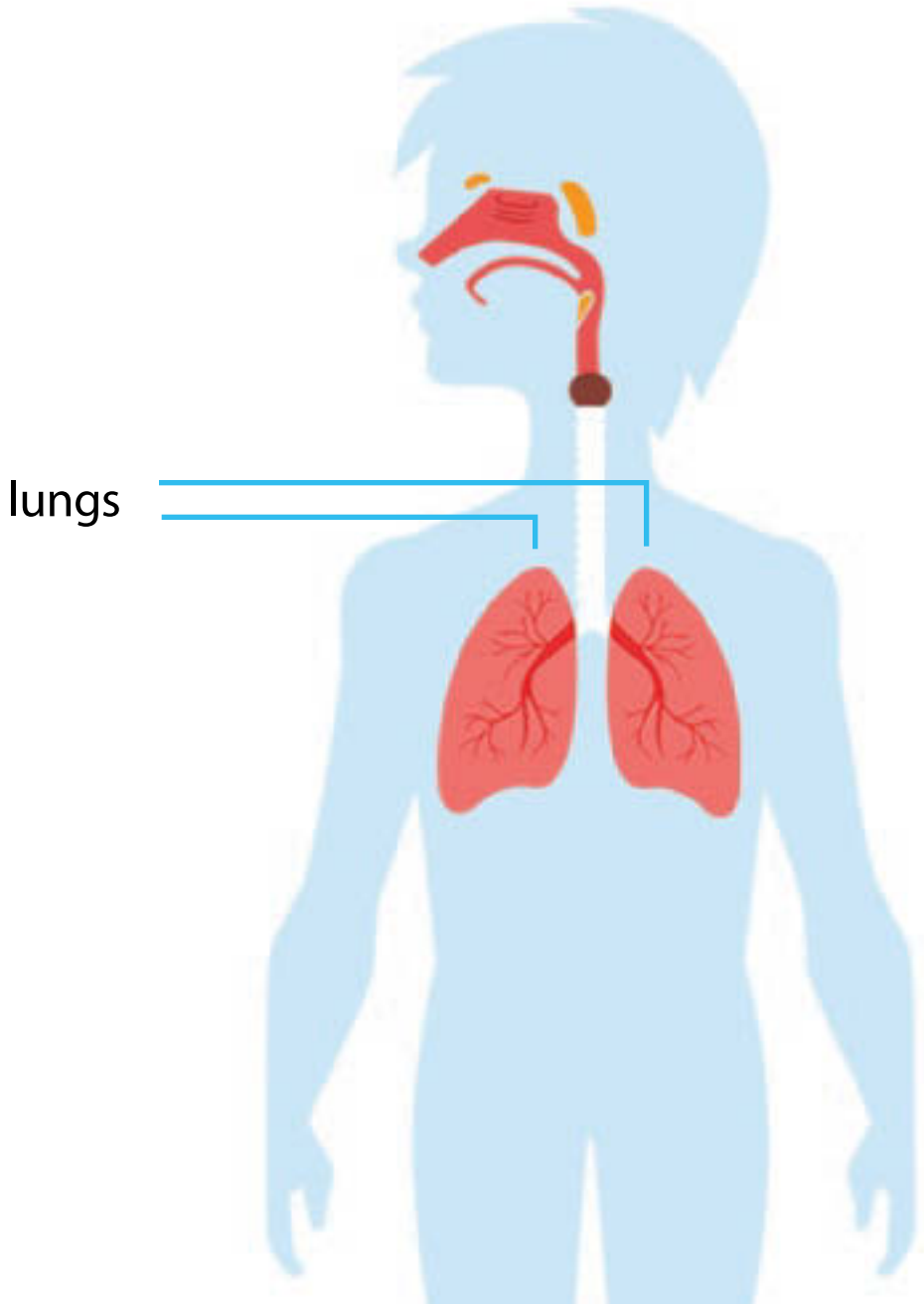


Some kinds of waste are carried from the body in water. The body's liquid waste is called urine. The parts of the body involved in this removal of waste include the kidneys, bladder, and urethra. These make up part of an organ system called the excretory system.



Even before they reached the restroom, Jason's and Uncle Bryson's bodies were getting rid of waste materials during the entire hike. Both hikers were breathing heavily and sweating. The body gets rid of some of the waste from cells through sweat.

Lungs get rid of waste from the body, too. You inhale fresh air that has oxygen in it. Oxygen is a gas that your cells need. Your cells use the oxygen and give off a different gas called carbon dioxide. Your body needs to get rid of the carbon dioxide. Carbon dioxide leaves your body through your lungs when you exhale.

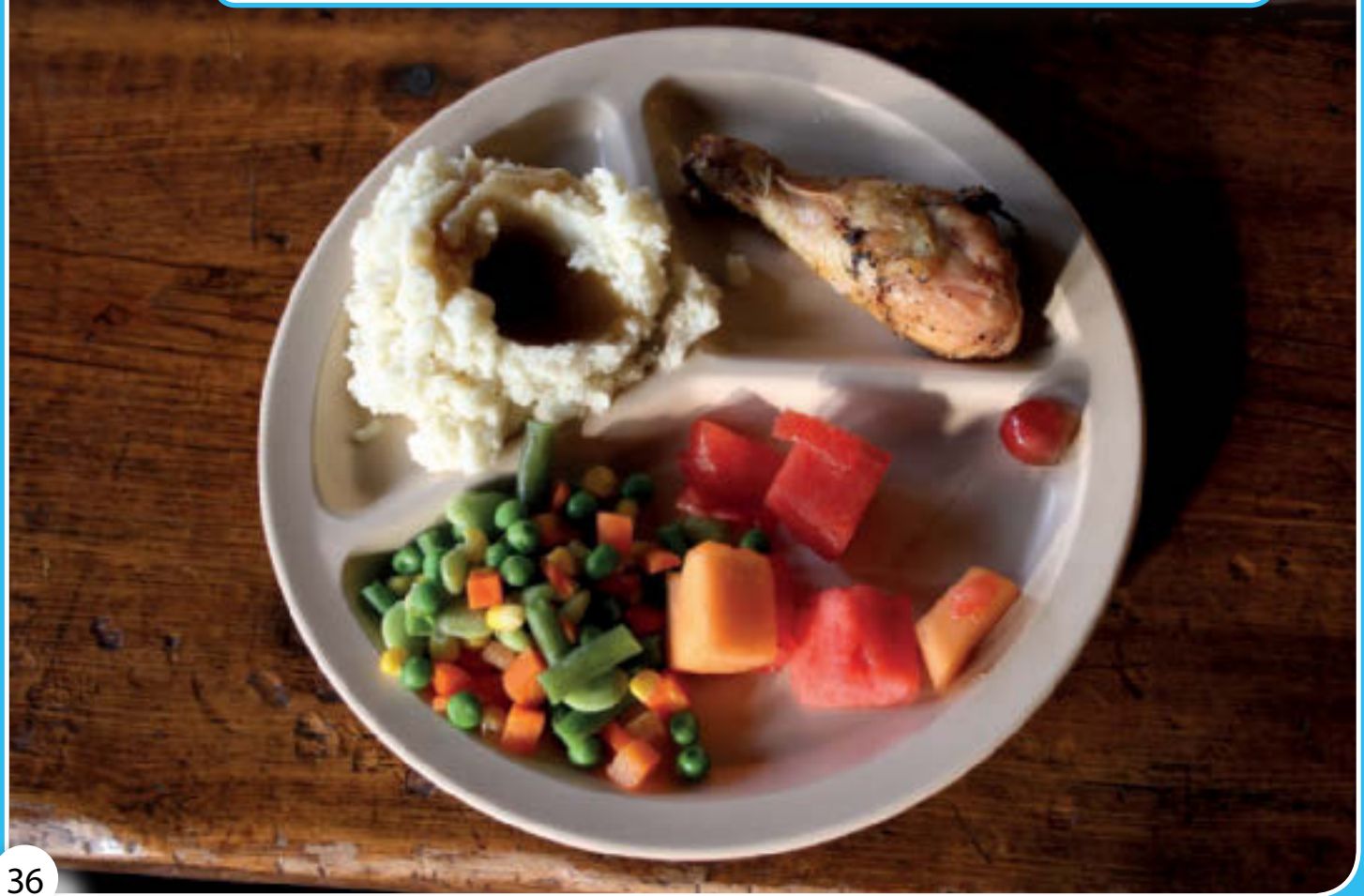


Science in Action

Nutrition and Staying Well

Uncle Bryson planned the hike for Jason mostly because it was fun but also because exercise is good for both of their bodies. Uncle Bryson also packed healthful foods for their snacks and lunch. Uncle Bryson is a nutritionist. He plans meals to help people be healthy.

He helps people identify and eat nutritious foods. Uncle Bryson also helps people know how much food they need to maintain a healthy body weight.



Food choices are important. Too much or too little of some substances in food can make you sick. For example, leafy green vegetables contain vitamins that cells need to repair tissues. Eating too few vegetables can make your body slow to heal from an injury.

An occasional sweet treat is fun to eat. However, foods with too much sugar are not good for our bodies. An orange is naturally sweet. It also contains substances the body needs. A cookie is sweet because it has a lot of sugar. Cookies do not contain the natural vitamins that fresh fruit does.

Nutritionists like Uncle Bryson group foods by different types. The MyPlate diagram shows portions of food types on a plate. The diagram shows the combination of foods your body needs each day. Of which food types should you eat the most?

Food safety is also important. Any substance that you put into your body affects the health of your cells, tissues, organs, and organ systems. Food can become contaminated with harmful substances that can make you sick.

Germs that make food unsafe to eat are called pathogens. Sometimes you can see or smell when food is spoiled. You can see when mold makes fruit or vegetables rotten. Unseen bacteria can grow in food, too. You often cannot see or smell pathogens.

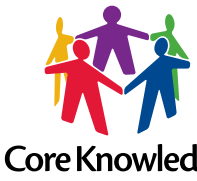
Louis Pasteur

Louis Pasteur was a French scientist who lived in the 1800s. He investigated the idea that tiny organisms made food decay and could cause illnesses and disease. Pasteur studied how to keep dangerous germs out of food. He developed a heating process to kill germs in some types of food. The process is called pasteurization, after Pasteur's name. Many of the foods you buy today in the grocery store are pasteurized. Milk is the most familiar example. Pasteurization makes foods safer, and it can make foods last longer.

Edward Jenner

Germs can also enter the body in other ways besides in the food that we eat. Some germs get into our bodies in air that we breathe. Germs from surfaces we touch can get on our hands and then into our eyes, nose, or mouth. We can protect our bodies from many illnesses caused by germs that we cannot see.

Edward Jenner was one scientist who studied a process called vaccination. In the late 1700s, Dr. Jenner figured out that exposing people to small amounts of mild germs could make their bodies able to fight off more dangerous germs. Now there are vaccines to prevent many illnesses.



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