

9

Getting Energy from Food— Your Digestive System

The Digestive System

You know how your body gets the oxygen it needs. But how do your body's cells get the nutrients they need?

Nutrients come from the food you eat. But a bite of sandwich can't travel through your blood and get to your cells in its original form. The organs of the digestive system get the nutrients in food into a form your cells can use.

The Parts of Your Digestive System

You can think of your digestive system as a long, twisting tube inside your body. Several different organs make up the tube and each organ has its own job. At one end (your mouth) food enters and at the other end (your anus) waste goes out. In between, your teeth grind your food, muscles knead it, and chemicals turn it into forms your cells can use.

Word Connection

The word **digest** means "to break down."



Think About It!

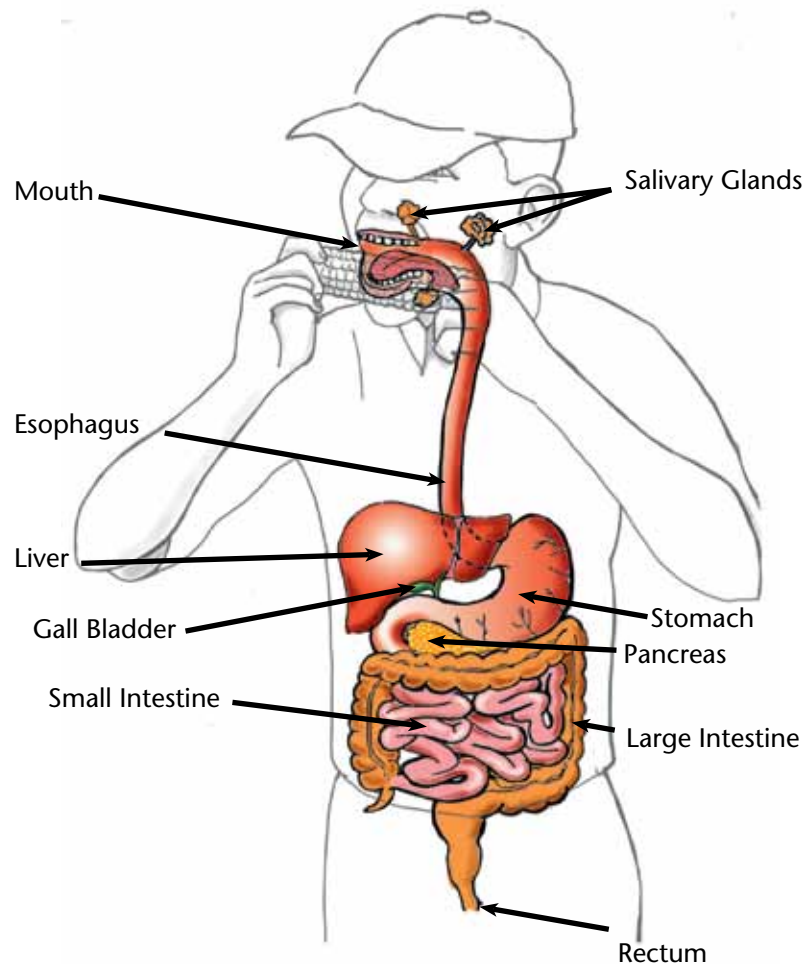
How do you think nutrients from food get to your muscle cells? What needs to happen to these nutrients for them to get to your cells?

Human Body Fact

Your small intestine is so long—20–25 feet—that when you pat your “stomach” you are probably patting your small intestine.

This picture of the digestive system shows the organs that connect to each other to form the digestive “tube”. These organs include the mouth, esophagus (i-SAHF-uh-guhs), stomach, small intestine, large intestine, rectum, and anus. Looking at the picture, start at the mouth and pass your finger over each of these organs. This is the path that food takes as it moves through the digestive system.

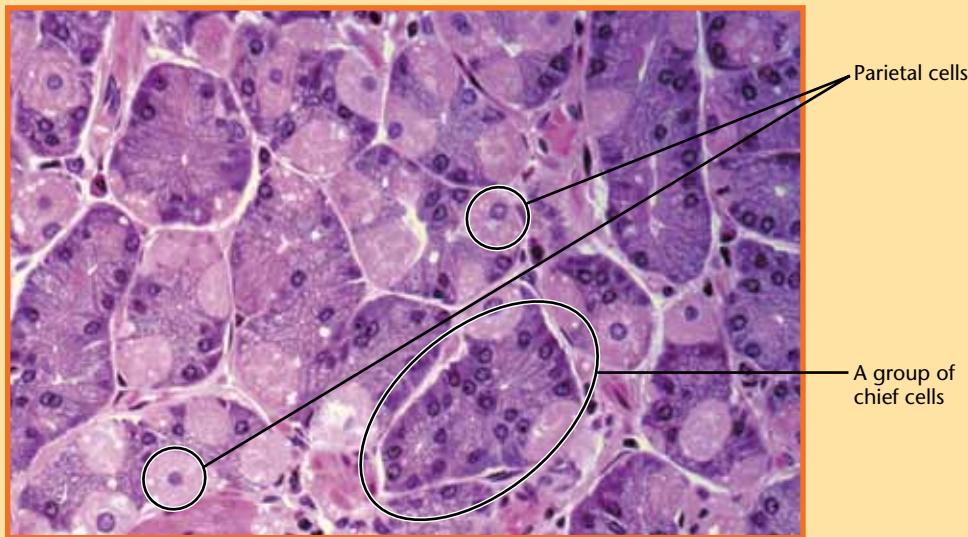
Some other important organs are attached to this “tube”. The salivary glands, liver, and pancreas (pan-KREE-us) produce important substances, called digestive juices. The gall bladder stores the digestive juices the liver produces.



The Teamwork of Cells

Your body has special cells that help with digestion. Chief cells, in your stomach, produce an enzyme that breaks down proteins. This enzyme only works when an acid is present.

Parietal cells are found next to chief cells in your stomach. They produce an acid that “turns on” the enzymes from the chief cells.



How Is Food Broken Down?

Food is broken down in the digestive system in two ways:

- **Chemical digestion**—Special chemicals, called **enzymes**, change the food into forms that are simple enough to pass into your blood. There are enzymes in saliva, in fluids in your stomach (called gastric juices), and in your small intestine.

Human Body Fact

A normal meal stays in the stomach for about 2–3 hours. A really big meal may stay in your stomach for 5 hours or more.



Think About It!

When you chew food, you end up with many small pieces instead of one large piece. Why do you think this helps the enzymes do their work? (Hint: Enzymes work on the exposed parts of the food pieces. Does one large piece of food or many small pieces of food have more surfaces exposed?)

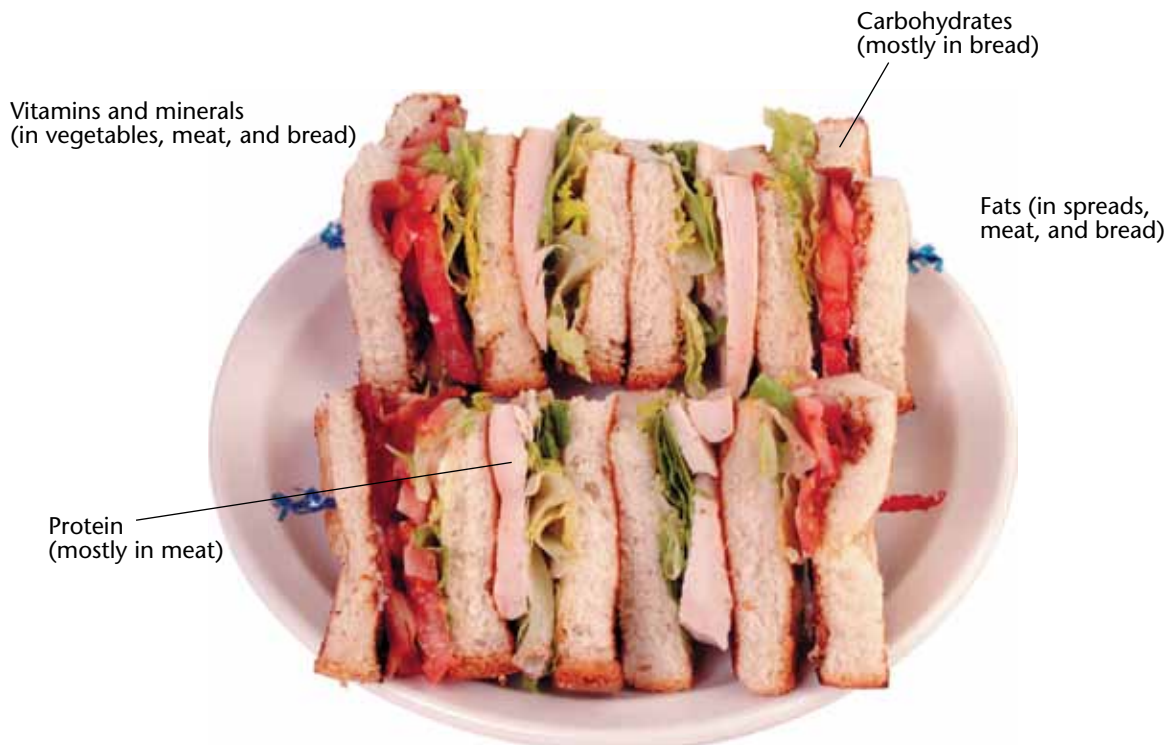
- **Physical digestion**—Muscles in the digestive system break down food into smaller pieces. This also mixes in the enzymes. In your mouth, your teeth and jaw muscles begin this process when you chew your food. Further down, the muscles of your stomach and small intestine squeeze the food in a back-and-forth motion similar to kneading dough.

These two processes work together. Physical digestion breaks food into smaller pieces and mixes in the enzymes. Chemical digestion breaks the food into forms that can pass into the blood.

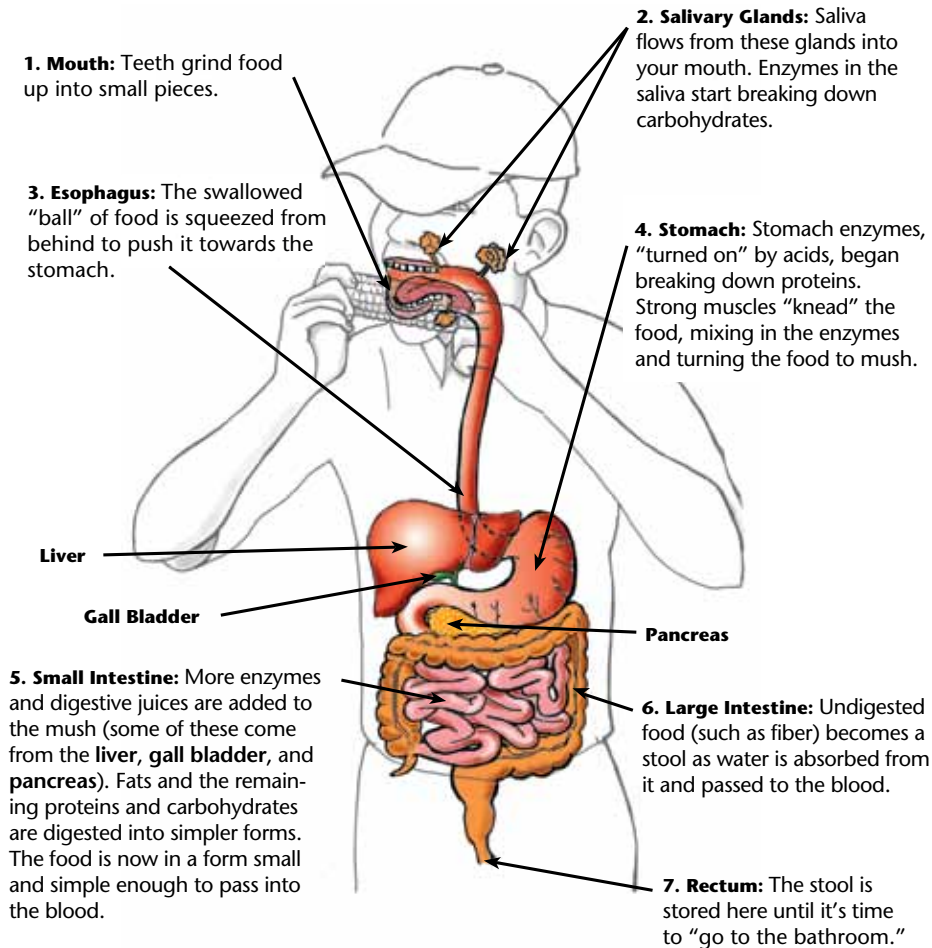
A Sandwich's Journey

How does eating a sandwich at lunch help you run a race hours later? How do the nutrients in it get to the muscles in your legs? How do these nutrients help your muscles work hard to carry you across the finish line?

WHAT'S IN A TURKEY SANDWICH?



WHAT HAPPENS WHEN YOU EAT A TURKEY SANDWICH?



What Happens to the Food Our Bodies Can't Use?

Your large intestine helps you get rid of the parts of food your body can't use. How does it do this? Any food that hasn't been broken down passes into your large intestine.

As the undigested food moves through the large intestine, water and minerals are pulled from it and passed to the blood.

By the time the remains reach the end of the large intestine, enough water has been removed that a firm stool has formed. This stool is stored in your rectum until it is ready to be passed out through the anus.

Human Body Facts

- An adult's large intestine is around 25 feet long!
- It takes 18 hours to 2 days for food to travel through the large intestine.

Eat Those Fruits and Vegetables!

Most of the food that passes into your large intestine is **fiber**. Fiber comes from plant foods (fruits, vegetables, and grains). Your body needs fiber. It helps you have regular bowel movements—so you can get rid of the parts of food your body can't use.

Digestion and Exercise

Why Do You Feel Hungry After You've Been Active?

Have you ever noticed how hungry you get when you play sports, ski, or hike? Your muscle cells need a steady supply of oxygen and nutrients to create the energy they need for these activities. While you're playing, your cells use nutrients they have stored up. Afterwards, your body needs to fill up on these stored nutrients. The feeling of hunger you have is your body's way of letting you know that it's time to get nutrients again.

Why Do You Feel Thirsty During and After Exercise?

You may have also noticed how your throat feels dry during a long run, or how welcome a tall glass of ice water is after a game of basketball. Active muscles use up your body's supply of water, as well as nutrients and oxygen. When water is in short supply your body sends you a message to "drink up" to replace the water your muscles have used.

Fitness Fact

You can keep muscle fatigue from happening by building up endurance. The hearts and lungs of people who exercise regularly work better. And they get more oxygen and nutrient-rich blood to their muscles than people who don't exercise as often.

Why Do Your Muscles Feel Tired?

Muscle fatigue is another sign that your muscle cells have used up your body's supplies of nutrients, oxygen, and water. Your muscles are giving you a signal that they don't have enough oxygen and nutrients to create the energy they need to keep contracting. Resting gives your muscles a chance to "stock up" again on the oxygen and nutrients they need to keep you moving.



When the Body Can't Digest Food

Some conditions prevent people from digesting certain foods properly.

Lactose Intolerance

You may know someone who can't eat milk or other dairy products. Milk has a sugar in it called lactose. Some people's bodies don't make enough of the enzyme (called lactase) that breaks down this sugar. When it isn't digested, lactose goes into the large intestine and gives people cramps and other problems. People with this problem can get lactose-free milk and dairy products. Next time you are at the grocery store see how many "Lactose-Free" food labels you notice.



Celiac Disease

This disease damages the small intestine so it can't pass some nutrients on to the blood. People with celiac disease often become malnourished (don't get the nutrition they need) and weak because the nutrients in the food they eat don't reach their cells. This happens because their bodies react to a protein (called gluten) that is found in wheat, rye, and barley. People with celiac disease need to avoid these foods to prevent more damage to their small intestines. They do this by shopping for foods labeled "Gluten Free."

