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## CHAPTER

## 1

# Digestive System Organs \*less complex

- Identify the organs and functions of the digestive system.



## Specifically, our energy comes from what?

The respiratory and circulatory systems work together to provide cells with the oxygen they need for cellular respiration. Cells also need glucose for cellular respiration. Glucose is a simple sugar that comes from the food we eat. To get glucose from food, digestion must occur. This process is carried out by the digestive system.

## Overview of the Digestive System

The **digestive system** consists of organs that break down food and absorb nutrients such as glucose. Organs of the digestive system are shown in **Figure 1.1**. Most of the organs make up the **gastrointestinal tract**. The rest of the organs are called **accessory organs**.

The following interactive animation demonstrates the flow of food through the gastrointestinal (GI) system.

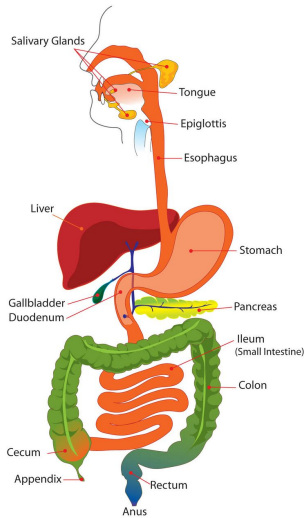


### MEDIA

Click image to the left for more content.

## The Gastrointestinal Tract

The gastrointestinal (GI) tract is a long tube that connects the mouth with the anus. It is more than 9 meters (30 feet) long in adults and includes the esophagus, stomach, and small and large intestines. Food enters the mouth, passes through the other organs of the GI tract, and then leaves the body through the anus.



**FIGURE 1.1**

The digestive system includes organs from the mouth to the anus.

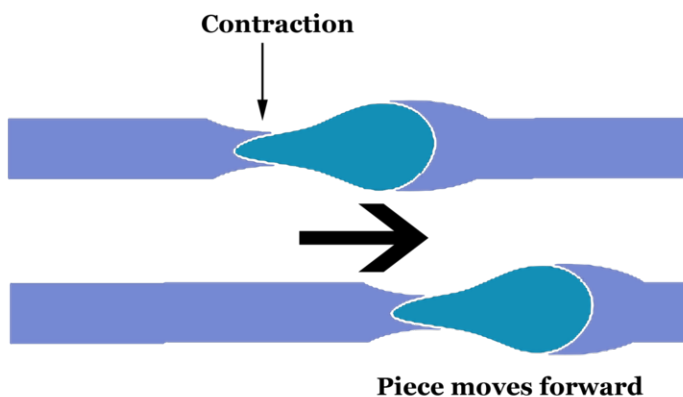
At the link below, you can watch an animation that shows what happens to food as it passes through the GI tract.  
<http://www.youtube.com/watch?v=QtDgQjOGPJM>.



**MEDIA**

Click image to the left for more content.

The organs of the GI tract are lined with **mucous membranes** that secrete digestive enzymes and absorb nutrients. The organs are also covered by layers of muscle that enable peristalsis. **Peristalsis** is an involuntary muscle contraction that moves rapidly along an organ like a wave (see **Figure 1.2**). You can watch an animation of peristalsis at this link:  
<http://en.wikipedia.org/wiki/File:Peristalsis.gif>.



**FIGURE 1.2**

Peristalsis pushes food through the GI tract.

## Accessory Organs of Digestion

Other organs involved in digestion include the liver, gall bladder, and pancreas. They are called accessory organs because food does not pass through them. Instead, they secrete or store substances needed for digestion.

## Functions of the Digestive System

The digestive system has three main functions: digestion of food, absorption of nutrients, and elimination of solid food waste. ■

- is the physical breakdown of chunks of food into smaller pieces. This type of digestion takes place mainly in the mouth and stomach.
- is the chemical breakdown of large, complex food molecules into smaller, simpler nutrient molecules that can be absorbed by the blood. This type of digestion begins in the mouth and stomach but occurs mainly in the small intestine.

After food is digested, the resulting nutrients are absorbed. **Absorption** is the process in which substances pass into the bloodstream, where they can circulate throughout the body. Absorption of nutrients occurs mainly in the small intestine. Any remaining matter from food that cannot be digested and absorbed passes into the large intestine as waste. The waste later passes out of the body through the anus in the process of **elimination**.

## Summary

- The digestive system consists of organs that break down food, absorb nutrients, and eliminate waste.
- The breakdown of food occurs in the process of digestion.

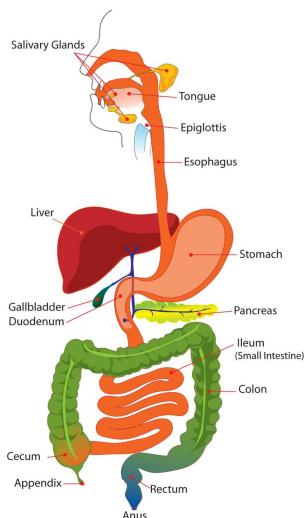
# CHAPTER 2

## Digestive System Organs/Functions

- Describe the digestive organs and their functions.

### Organs of the Digestive System

The mouth and stomach are just two of the organs of the digestive system. Other digestive system organs are the esophagus, small intestine, and large intestine. From the **Figure 2.1**, you can see that the digestive organs form a long tube. In adults, this tube is about 30 feet long! At one end of the tube is the mouth. At the other end is the anus. Food enters the mouth and then passes through the rest of the digestive system. Food waste leaves the body through the anus.



**FIGURE 2.1**

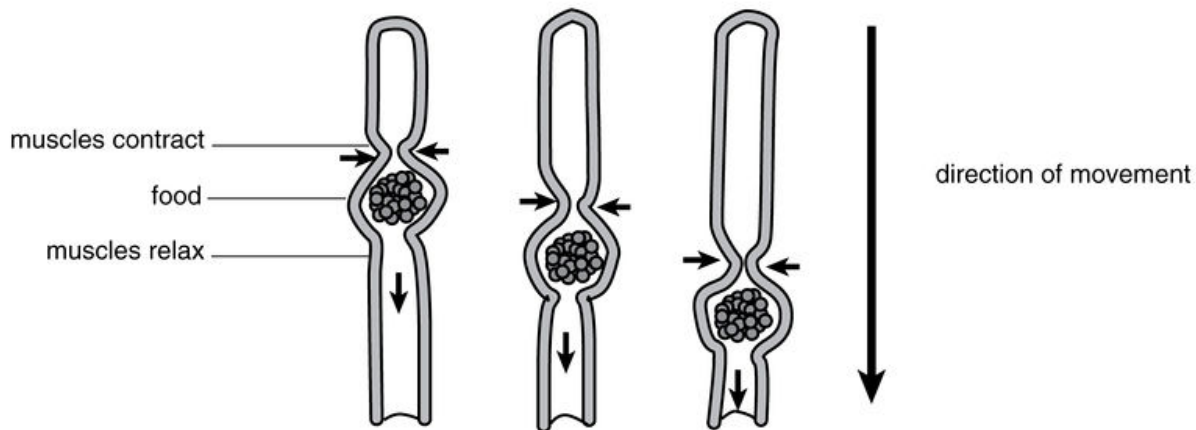
This drawing shows the liver, gall bladder, and pancreas. These organs are part of the digestive system. Food does not pass through them, but they secrete substances needed for chemical digestion.

The organs of the digestive system are lined with muscles. The muscles contract, or tighten, to push food through the system. This is shown in **Figure 2.2**. The muscles contract in waves. The waves pass through the digestive system like waves through a slinky. This movement of muscle contractions is called . Without peristalsis, food would not be able to move through the digestive system. Peristalsis is an involuntary process, which means that it occurs without your conscious control.

The liver, gall bladder, and pancreas are also organs of the digestive system. They are shown in **Figure 2.1**. Food does not pass through these three organs. However, these organs are important for digestion. They secrete or store enzymes or other chemicals that are needed to help digest food chemically.

### Mouth, Esophagus, and Stomach

The mouth is the first organ that food enters. But digestion may start even before you put the first bite of food into your mouth. Just seeing or smelling food can cause the release of saliva and digestive enzymes in your mouth.

**FIGURE 2.2**

This diagram shows how muscles push food through the digestive system. Muscle contractions travel through the system in waves, pushing the food ahead of them. This is called peristalsis.

Once you start eating, saliva wets the food, which makes it easier to break up and swallow. Digestive enzymes, including the enzyme amylase, start breaking down starches into sugars. Your tongue helps mix the food with the saliva and enzymes.

Your teeth also help digest food. Your front teeth are sharp. They cut and tear food when you bite into it. Your back teeth are broad and flat. They grind food into smaller pieces when you chew. Chewing is part of mechanical digestion. Your tongue pushes the food to the back of your mouth so you can swallow it. When you swallow, the lump of chewed food passes down your throat to your esophagus.

The **esophagus** is a narrow tube that carries food from the throat to the stomach. Food moves through the esophagus because of peristalsis. At the lower end of the esophagus, a circular muscle controls the opening to the stomach. The muscle relaxes to let food pass into the stomach. Then the muscle contracts again to prevent food from passing back into the esophagus.

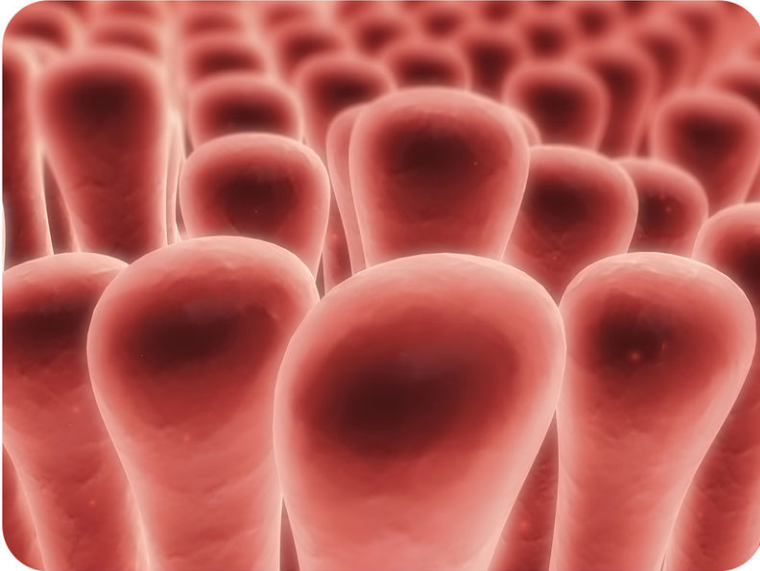
Some people think that gravity moves food through the esophagus. If that were true, food would move through the esophagus only when you are sitting or standing upright. In fact, because of peristalsis, food can move through the esophagus no matter what position you are in—even upside down! Just don't try to swallow food when you upside down—you could choke!

The **stomach** is a sac-like organ at the end of the esophagus. It has thick muscular walls. The muscles contract and relax. This moves the food around and helps break it into smaller pieces. Mixing the food around with the enzyme pepsin and other chemicals helps digest proteins.

Water, salt, and simple sugars can be absorbed into the blood from the stomach. Most other substances are broken down further in the small intestine before they are absorbed. The stomach stores food until the small intestine is ready to receive it. A circular muscle controls the opening between the stomach and small intestine. When the small intestine is empty, the muscle relaxes. This lets food pass from the stomach into the small intestine.

## Small Intestine

The **small intestine** is narrow tube that starts at the stomach and ends at the large intestine (**Figure 2.1**). In adults, the small intestine is about 23 feet long. Chemical digestion takes place in the first part of the small intestine. Many enzymes and other chemicals are secreted here. The small intestine is also where most nutrients are absorbed into the blood. The later sections of the small intestines are covered with tiny projections called **villi**. A magnified picture of villi is shown in **Figure 2.3**. Villi contain very tiny blood vessels. Nutrients are absorbed into the blood through these tiny vessels. There are millions of villi, so altogether there is a very large area for absorption to take place. In fact, villi make the inner surface area of the small intestine 1,000 times larger than it would be without them. The entire inner surface area of the small intestine is about as big as a basketball court!



**FIGURE 2.3**

This is what the villi lining the intestine look like when magnified. Each one is actually only about 1 millimeter long. Villi are just barely visible with the unaided eye.

The small intestine is much longer than the large intestine. So why is it called “small”? If you compare the small and large intestines in **Figure 2.1**, you will see why. The small intestine is smaller in width than the large intestine.

## Large Intestine

The **large intestine** is a wide tube that connects the small intestine with the anus. In adults, it is about 5 feet long. Waste enters the large intestine from the small intestine in a liquid state. As the waste moves through the large intestine, excess water is absorbed from it. After the excess water is absorbed, the remaining solid waste is called feces.

Circular muscles control the anus. They relax to let the feces pass out of the body through the anus. After feces pass out of the body, they are called stool. Releasing the stool from the body is referred to as a bowel movement.

## Vocabulary

- **esophagus:** The narrow tube that carries food from the throat to the stomach.
- **large intestine:** Wide tube in which water is extracted to form feces; connects the small intestine with the anus.
- **peristalsis:** Muscle contractions that help food move through the digestive system.