

Nutrients and Digestion

section ● The Digestive System

What You'll Learn

- the differences between mechanical digestion and chemical digestion
- the organs of the digestive system and what they do
- how homeostasis is maintained in digestion

● Before You Read

Read the title of this chapter above. On the lines below, tell how you think nutrients and digestion are related.

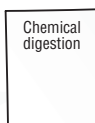
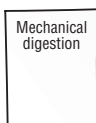


Identify the Main Point

Underline the main idea in each paragraph as you read.



● **Describe** Use quarter sheets of notebook paper, as shown below, to write descriptions of mechanical and chemical digestion.



● Read to Learn

Functions of the Digestive System

Your body processes food in four stages—ingestion, digestion, absorption, and elimination. Ingestion is when food enters your mouth. Digestion begins immediately.

Digestion is the process that breaks down food into small molecules so that they can move into the blood. Absorption occurs when food molecules move from the blood into the cells. Inside the cell, the food molecules break down even further so their energy and nutrients can be used by the cell. Elimination takes place when unused food molecules pass out of the body as wastes.

Digestion is mechanical and chemical. **Mechanical digestion** occurs when food is chewed, mixed, and churned. **Chemical digestion** takes place when chemical reactions occur that break down large molecules of food into smaller molecules.

Enzymes

Enzymes (EN zimez) make chemical digestion possible. An **enzyme** is a type of protein that speeds up the rate of a chemical reaction in your body. Enzymes reduce the energy needed for a chemical reaction to start.

How do enzymes help digestion?

Enzymes help you digest different nutrients. Amylase (AM uh lays) is an enzyme made by glands near the mouth. Amylase helps speed up the breakdown of complex carbohydrates, such as starch, into simpler carbohydrates—sugars. The enzyme pepsin works in the stomach to help the chemical reactions that break down proteins. Enzymes in the small intestine help to break down proteins into amino acids. ✓

The pancreas, an organ on the back side of the stomach, releases enzymes into the small intestine. Some of these enzymes continue the starch breakdown that started in the mouth. The sugars from this breakdown are turned into glucose and are used by the body's cells. Some enzymes from the pancreas help break down fats into fatty acids. Other enzymes from the pancreas aid the breakdown of proteins.

What else do enzymes do?

Enzymes help speed up chemical reactions that help your body grow. Muscle and nerve cells use enzymes to produce energy. Blood needs enzymes to clot.

Organs of the Digestive System

Your digestive system has two parts—the digestive tract and the accessory organs. The parts of the digestive system are shown on the next page.

What are the parts of the digestive tract?

The digestive tract includes the mouth, esophagus (ih SAH fuh guhs), stomach, small intestine, large intestine, rectum, and anus. Food passes through all of these organs. The accessory organs include the tongue, teeth, salivary glands, liver, gallbladder, and pancreas. Food does not pass through these organs. However, the accessory organs help with mechanical and chemical digestion.

What part does the mouth play in digestion?

Both mechanical and chemical digestion take place in the mouth. Mechanical digestion happens when you chew your food. Chemical digestion happens when the tongue moves food around and mixes it with saliva (suh LI vuh).

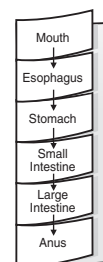
Saliva is made by three glands near the mouth. Saliva contains an enzyme that helps break down starch into sugar. After the food is swallowed, it passes into the esophagus.

✓ Reading Check

1. **Explain** What does amylase do?

FOLDABLES™

- **Sequence** Make a six-tab book, as shown below, to identify how food moves through the digestive system.



Picture This

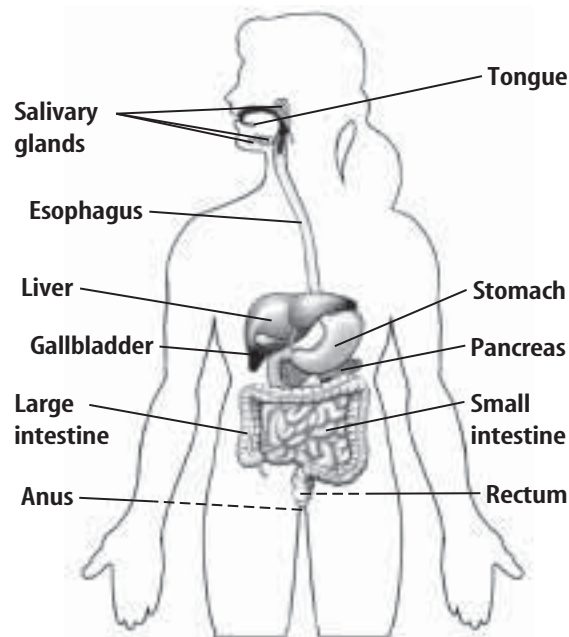
- 2. Identify** Circle the names of the organs of the digestive tract. Highlight the names of the accessory organs.

✓ Reading Check

- 3. Describe** how an acidic solution helps digestion.

What does the esophagus do?

Food passes over the epiglottis (ep uh GLAH tus) as it moves into the esophagus. The epiglottis automatically covers the opening to the windpipe to stop food from entering it. Food moves down the esophagus to the stomach, as shown in the figure below. Mucous glands in the esophagus keep the food moist. Smooth muscles in the esophagus move the food downward with a squeezing action. These muscle contractions, called **peristalsis** (per uh STAHL sus), move food through the entire digestive tract. No digestion happens in the esophagus.



How does the stomach help digestion?

The stomach is a bag of muscle. Both mechanical and chemical digestion take place in the stomach. Mechanical digestion happens when food is mixed in the stomach by peristalsis. Chemical digestion happens when food in the stomach mixes with enzymes and strong digestive acids, such as hydrochloric acid solution.

The acidic solution works with the enzyme pepsin to digest protein. The acidic solution also destroys bacteria present in the food. ✓

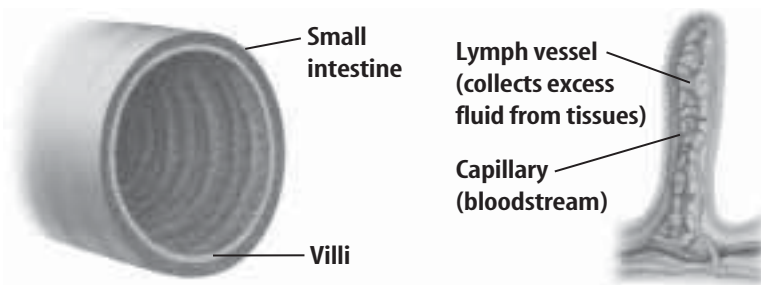
The stomach also produces mucus, which makes food more slippery and protects the stomach from the strong digestive solutions. Food moves through the stomach and is changed into a watery liquid called **chyme** (KIME). Chyme moves out of the stomach into the small intestine.

What fluids are added in the small intestine?

Chyme enters the first part of the small intestine called the duodenum (doo AH duh num). Most digestion takes place there. Bile, a greenish fluid from the liver, is added in the duodenum. Bile breaks the large fat particles in chyme into smaller particles. Chemical digestion of carbohydrates, proteins, and fats occurs when a digestive solution from the pancreas is mixed in. The solution neutralizes the stomach acid in the chyme.

How is food absorbed in the small intestine?

Food is absorbed from the small intestine into the bloodstream. The wall of the small intestine has many ridges and folds that are covered with fingerlike projections called **villi** (VIH li). Villi, shown in the figure below, increase the surface area of the small intestine, giving nutrients in the chyme more places to be absorbed. Nutrients move into the blood vessels in the villi. Peristalsis moves undigested and unabsorbed materials into the large intestine.



What happens in the large intestine?

The main job of the large intestine is to absorb water from the undigested materials. This keeps large amounts of water in the body and helps maintain homeostasis. After the water is absorbed, the remaining undigested materials become more solid. Muscles in the rectum and the anus control the release of the wastes from the body in the form of feces (FEE seez). ✓

Bacteria Are Important

Bacteria live in many parts of the digestive tract. Bacteria in the large intestine feed on undigested material like cellulose. Bacteria make Vitamin K and two B vitamins, niacin and thiamine. Vitamin K is needed for blood clotting. The B vitamins help the nervous system and other body functions.

Picture This

4. **Describe** why villi are important to the digestive process.

✓ Reading Check

5. **List** the main job of the large intestine.

● After You Read

Mini Glossary

chemical digestion: digestion that takes place when chemical reactions break down large molecules of food into smaller ones

chyme (KIME): food from the stomach that has been changed into a thin, watery liquid that moves into the small intestine

digestion: the process that breaks down food into small molecules so that they can be moved into the blood and absorbed by the cells

enzyme (EN zime): a type of protein that speeds up the rate of a chemical reaction in the body

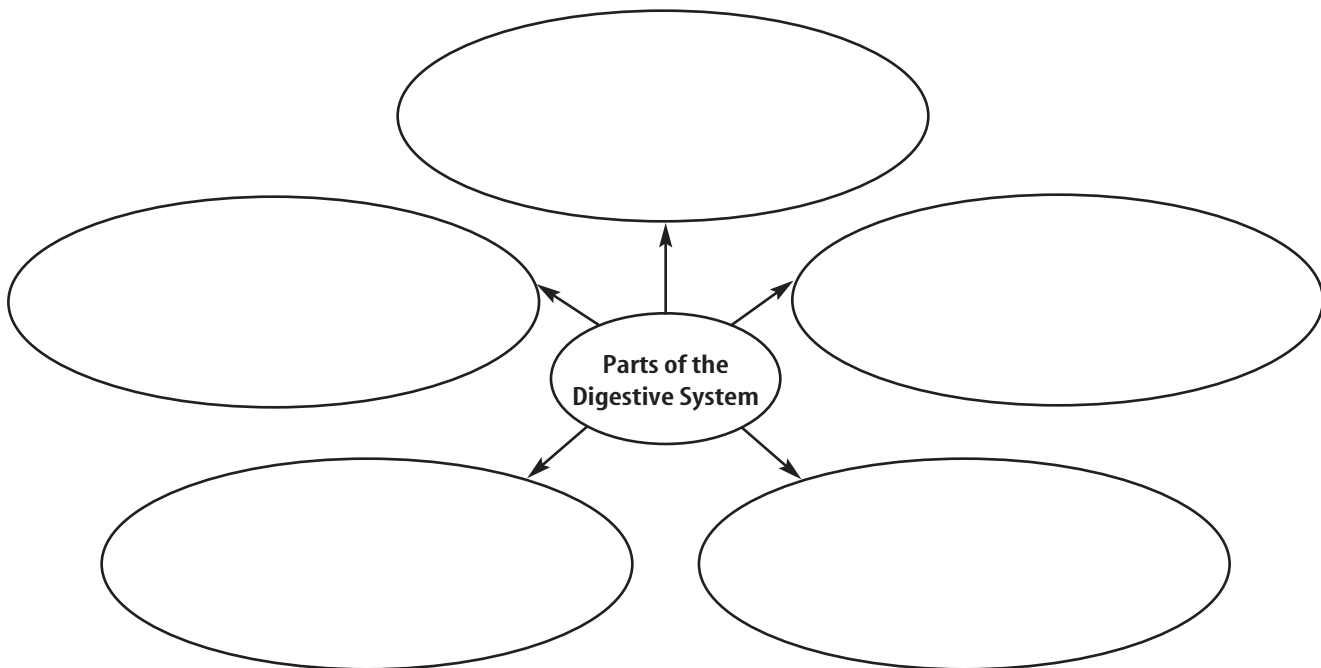
mechanical digestion: digestion that takes place when food is chewed, mixed, and churned

peristalsis (per uh STAHL sus): waves of muscle contractions

villi (VIH li): fingerlike projections in the small intestine

1. Review the terms and their definitions in the Mini Glossary. Write a sentence explaining the difference between mechanical digestion and chemical digestion.

2. Complete the web diagram below by listing the major parts of the digestive system and describing the role of each in digestion.



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Visit life.msscience.com to access your textbook, interactive games, and projects to help you learn more about the digestive system.