



The tongue facilitate ingestion, mechanical and chemical digestion, sensation, and swallowing.
Photo courtesy of the National Institute of Dental and Craniofacial Research, NIH.

Overview of the Digestive System

Center for
Educational Outreach
Baylor College of Medicine



Overview of the Digestive System

Reference

OpenStax College. 2014. The Mouth, Pharynx and Esophagus, OpenStax-CNX, 8 May, 2014. <http://cnx.org/content/m46511/>

Image Reference

Photo courtesy of the National Institute of Dental and Craniofacial Research, NIH. <http://www.nidcr.nih.gov/imagegallery/oralhealth/OralCancerExam.htm>

Key Words

digestive system, human, anatomy, body systems

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Major Components of the System

- The digestive system is made up of the digestive tract, a series of hollow organs joined in a long tube.
- Components of the digestive system are the mouth, pharynx, esophagus, stomach, liver, gallbladder, pancreas, small and large intestines, and anus.
- Digestion breaks down food so that it can be used for energy.



Major Components of the System

The digestive tract is a series of hollow organs that extend from the mouth to the anus. It includes the mouth, esophagus, stomach, small intestine, large intestine, rectum and anus. The digestive tract is composed of a series of tissue layers, including a layer of smooth muscle that helps break down food and move it along the tract.

The digestive system also includes the liver and pancreas, which produce enzymes that enter the intestine through ducts. The gallbladder stores enzymes until they are needed by the intestine. In combination, the liver, gallbladder and pancreas are referred to as the accessory digestive organs.

The mucosal lining within the mouth, stomach and small intestine produces enzymes to aid in digestion.

References

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3. The Digestive System and How It Works. Courtesy of the National Digestive Diseases Information Clearinghouse, NIH.

<http://digestive.niddk.nih.gov/ddiseases/pubs/yrdd/>

Key Words

digestive system, digestion, food, energy, human

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The Mouth and Teeth

- Teeth mechanically break down food.
- As food is being chewed, chemical digestion begins with saliva (water and the enzyme salivary amylase), and mucus.
- The tongue mixes and pushes food to the back of the mouth to swallow.

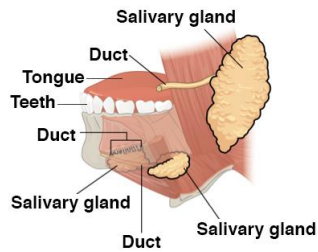


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The Mouth

Human teeth are specialized for eating both plant and animal food. Inside the mouth, the tongue mixes food with a mucous solution called saliva, which contains the hydrolytic enzyme, salivary amylase. Saliva also moistens and lubricates the food, making it easier to swallow. The salivary amylase breaks down polysaccharide starch into disaccharide maltose. However, the digestion occurring in the mouth is minimal because most people don't chew their food very long.

Three pairs of salivary glands are controlled by the nervous system to maintain a continuous secretion of saliva that keeps the mouth moist. These glands react to certain stimuli with increased salivation.

When food is ready to be swallowed, the tongue moves it to the back of the mouth, where it is directed past the pharynx into the esophagus.

Reference

1. OpenStax College, The Mouth, Pharynx, and Esophagus. OpenStax CNX. June 28, 2013. <http://cnx.org/content/m46511/1.4/>
2. Raven, P.H. (2005). *Biology, 7th Edition*. New York, NY: McGraw-Hill.

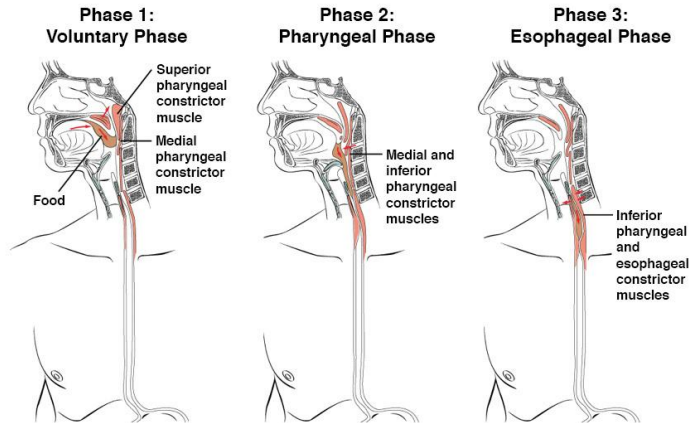
Image Reference

OpenStax College, The Mouth, Pharynx, and Esophagus. OpenStax CNX. June 28, 2013. <http://cnx.org/content/m46511/1.4/>

Key Words

digestive system, digestion, food, mouth, teeth, saliva, salivary amylase

The Pharynx: Swallowing



Muscles of the tongue, pharynx and esophagus move food from the mouth to the stomach.



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The Pharynx: Swallowing

Swallowing occurs after chewing has stopped. It is self-controlled and takes about 4 to 8 seconds to swallow solid food, and about 1 second to swallow liquids and very soft food. This action is aided by the presence of mucus and saliva.

The pharynx (throat) is involved in both digestion and respiration. It receives food and air from the mouth, and air from the nasal cavities. When food enters the pharynx, involuntary muscle contractions close off the air passageways.

Reference

OpenStax College, The Mouth, Pharynx, and Esophagus. OpenStax CNX. June 28, 2013. <http://cnx.org/content/m46511/1.4/>

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June 28, 2013. <http://cnx.org/content/m46511/1.4/>

Key Words

digestive system, digestion, food, mouth, saliva, pharynx, esophagus, muscles, autonomic nervous system, neurons, muscles, neuromuscular

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Esophagus and Stomach

- The esophagus is a muscular tube that connects the pharynx to the stomach.
- Food moves along the esophagus by muscular contractions.
- The stomach churns food and mixes it with gastric juices.

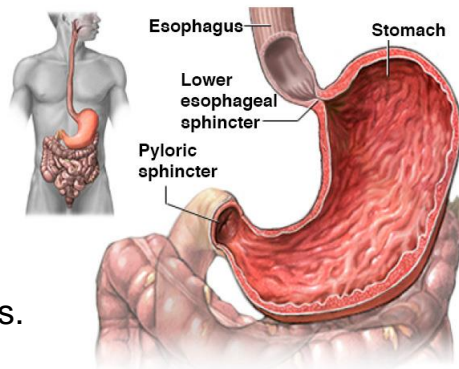


Illustration courtesy of MedlinePlus, U.S. National Library of Medicine, NIH.

Esophagus and Stomach

Food moves through the esophagus in rhythmic waves caused by muscular contractions, referred to as peristalsis. The lower esophageal sphincter controls the movement of food from the esophagus into the stomach, and also prevents a backflow of food from the stomach.

The inner surface of the stomach is highly convoluted, enabling the stomach to fold when empty and distend when filled with food. The stomach has an extra layer of smooth muscle that protects it from the acidic juices it produces. In the stomach, only proteins are partially digested. No significant digestion of carbohydrates or fats occurs.

Reference

Raven, P.H. (2005). *Biology, 7th Edition*. New York, NY: McGraw-Hill.

Image Reference

Illustration courtesy of MedLine Plus, U.S. National Library of Medicine, NIH.
<http://www.nlm.nih.gov/medlineplus/ency/imagepages/19223.htm>

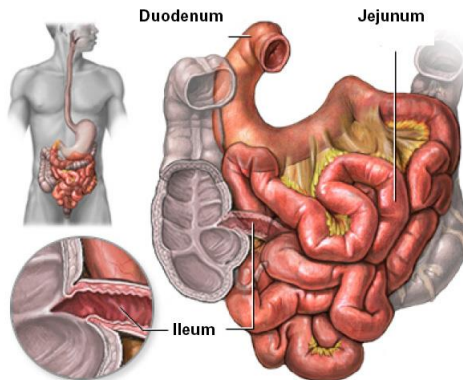
Key Words

digestive system, digestion, esophagus, stomach, peristalsis

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Small Intestine

- The small intestine is divided into three sections:
 - Duodenum
 - Jejunum
 - Ileum
- Most absorption of nutrients takes place in the small intestine.



Small Intestine

The duodenum receives acidic chyme from the stomach, digestive enzymes and bicarbonate from the pancreas, and bile from the liver and gallbladder. The pancreatic enzymes digest larger food molecules into smaller fragments. This stage of digestion occurs primarily in the duodenum and jejunum. Bile salts, which are secreted from the liver, play an important role in the digestion of fats.

Villi and microvilli (also called the brush border) greatly increase the surface area of the small intestine, allowing the products of digestion to be absorbed. The brush border enzymes complete the digestive process initiated by the pancreatic enzymes.

Reference

Raven, P.H. (2005). *Biology, 7th Edition*. New York, NY: McGraw-Hill.

Image Reference

Illustration courtesy of MedLine Plus, U.S. National Library of Medicine, NIH.
<http://www.nlm.nih.gov/medlineplus/ency/imagepages/19221.htm>

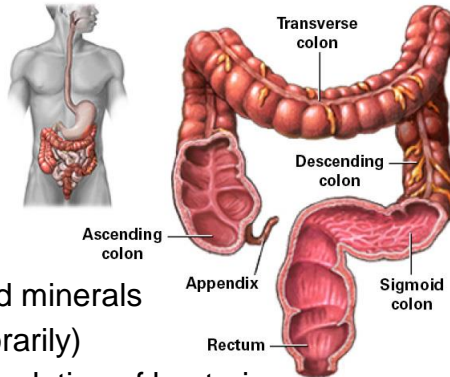
Key Words

digestive system, digestion, small intestine, absorption, enzyme

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Large Intestine

- The large intestine is divided into the:
 - Ascending colon
 - Transverse colon
 - Descending colon
 - Sigmoid colon
- Functions are to:
 - Reabsorb water and minerals
 - Store waste (temporarily)
 - Maintain a large population of bacteria that break down undigested foods, such as fiber



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Large Intestine

The large intestine is called “large” because of its greater diameter, compared to the small intestine, not its length. The small intestine empties into the large intestine at the junction of the cecum and appendix. Some water, sodium, vitamin K, and other products of bacterial metabolism are absorbed across its wall. However, the large intestine’s main function is to concentrate waste material by compacting and storing undigested material.

Bacteria living within the large intestine are incorporated into the body’s refuse material, called feces. Compacted feces are driven by peristaltic contractions into the rectum and then expelled through the anus.

Reference

Raven, P.H. (2005). *Biology, 7th Edition*. New York, NY: McGraw-Hill.

Image Reference

Illustration courtesy of MedlinePlus, U.S. National Library of Medicine, NIH.
<http://www.nlm.nih.gov/medlineplus/ency/imagepages/19220.htm>

Key Words

digestive system, large intestine, colon, waste, peristalsis

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Gut Bacteria

- 100 trillion bacteria are found in the intestines.
- The bacteria in the large intestine (microbiome) have important roles in digestion of fiber and overall health.
- Kinds of gut bacteria that are present depend at least partially on diet and on exposures early in life.
- Gut bacteria have roles in regulating inflammation and the immune system.



Gut Bacteria

Approximately 100 trillion bacteria, approximately 10 times the number of cells in the human body, are found in the intestines.

Bacteria in the large intestine make many contributions to health.

Called gut flora, or the microbiome, the large numbers and kinds of bacteria in the large intestine break down undigested carbohydrates into short-chain fatty acids. In addition, gut bacteria release molecules that signal and regulate aspects of the immune system, prevent the growth of disease-causing bacteria (pathogens) and produce compounds such as biotin and vitamin K for the host.

Composition of gut flora changes with diet, and also depends on postnatal and early childhood exposures to different kinds of bacteria.

References

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Key Words

digestion, intestines, microbiome, microflora, gut flora, bacteria, immune system

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Functions of the System

- Digestion breaks down food into molecules that can be absorbed into cells.
- In the small intestine, nutrients are absorbed from food.
- The large intestine removes water, concentrates waste for excretion and houses a large population of bacteria.
- Bacteria (gut flora) in the large intestine have important roles in breaking down molecules that are difficult to digest, such as fiber; and produce other molecules needed by the body.



Functions of the System

The esophagus delivers food to the stomach, which mixes it with gastric juices to form chyme. Chyme is delivered into the small intestine, the major region of digestion and absorption. The large intestine plays a role in absorption and also forms, stores and expels feces.

Reference

Raven, P.H. (2005). *Biology, 7th Edition*. New York, NY: McGraw-Hill.

Key Words

digestive system, digestion, food, nutrients, energy, absorption, excretion, microbiome, microflora, gut flora, bacteria

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