34.1E: Digestive System: Mouth and Stomach

Animal digestion begins in the mouth, then moves through the pharynx, into the esophagus, and then into the stomach and small intestine.

Learning Objectives

• Describe the parts of the digestive system from the oral cavity through the stomach

Key Points

• Mechanical and chemical digestion begin in the mouth with the chewing of food and the release of saliva, which starts carbohydrate digestion.
• The epiglottis covers the trachea so the bolus (ball of chewed food) does not go down into the trachea or lungs, but rather into the esophagus.
• The tongue positions the bolus for swallowing and then peristalsis pushes the bolus down the esophagus into the stomach.
• In the stomach, acids and enzymes are secreted to break down food into its nutrient components.
• The churning of the stomach helps to mix the digestive juices with the food, turning it into a substance called chyme.

Key Terms

• bolus: a round mass of something, especially of chewed food in the mouth or alimentary canal
• peristalsis: the rhythmic, wave-like contraction and relaxation of muscles which propagates in a wave down a
• **muscular tube**

• **pepsin**: a digestive enzyme that chemically digests, or breaks down, proteins into shorter chains of amino acids

• **chyme**: the thick semifluid mass of partly digested food that is passed from the stomach to the duodenum

## Parts of the Digestive System

The vertebrate digestive system is designed to facilitate the transformation of food matter into the nutrient components that sustain organisms. The upper gastrointestinal tract includes the oral cavity, esophagus, and stomach.

## Oral Cavity

The oral cavity, or mouth, is the point of entry of food into the digestive system. The food is broken into smaller particles by mastication, the chewing action of the teeth. All mammals have teeth and can chew their food.

![Figure 1: Digestion begins in the oral cavity](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/34%3A_A...)

The extensive chemical process of digestion begins in the mouth. As food is chewed, saliva, produced by the salivary glands, mixes with the food. Saliva is a watery substance produced in the mouths of many animals. There are three major glands that secrete saliva: the parotid, the submandibular, and the sublingual. Saliva contains mucus that moistens food and buffers the pH of the food. Saliva also contains immunoglobulins and lysozymes, which have antibacterial action to reduce tooth decay by inhibiting growth of some bacteria. In addition, saliva contains an enzyme called salivary amylase that begins the process of converting starches in the food into a disaccharide called maltose. Another enzyme, lipase, is produced by the cells in the tongue. It is a member of a class of enzymes that can break down triglycerides. Lingual lipase begins the breakdown of fat components in the food. The chewing and wetting action provided by the teeth and saliva shape the food into a mass called the bolus for swallowing. The tongue aids in swallowing by moving the bolus from the mouth into the pharynx. The pharynx opens to two passageways: the trachea, which leads to the lungs, and the esophagus, which leads to the stomach. The tracheal opening, the glottis, is covered by a cartilaginous flap, the epiglottis. When swallowing, the epiglottis closes the glottis, allowing food to pass into the esophagus, not into the trachea, preventing food from reaching the lungs.
Esophagus

The esophagus is a tubular organ connecting the mouth to the stomach. The chewed and softened food passes through the esophagus after being swallowed. The smooth muscles of the esophagus undergo a series of wave-like movements called peristalsis that push the food toward the stomach. The peristalsis wave is unidirectional: it moves food from the mouth to the stomach; reverse movement is not possible. The peristaltic movement of the esophagus is an involuntary reflex, taking place in response to the act of swallowing.

Figure 1: Esophagus: The esophagus transfers food from the mouth to the stomach through peristaltic movements.

Stomach

A large part of digestion occurs in the stomach. The stomach, a saclike organ, secretes gastric digestive juices. The pH in the stomach is between 1.5 and 2.5. This highly-acidic environment is required for the chemical breakdown of food and the extraction of nutrients. When empty, the stomach is a rather small organ; however, it can expand to up to 20 times its resting size when filled with food. This characteristic is particularly useful for animals that need to eat when food is available.
Figure \(\PageIndex{1}\): **Stomach digestion**: The human stomach has an extremely acidic environment where most of the protein gets digested.

The stomach is also the major site for protein digestion in animals other than ruminants. Protein digestion is mediated in the stomach chamber by an enzyme called pepsin, which is secreted by the chief cells in the stomach in an inactive form called pepsinogen. Another cell type, parietal cells, secrete hydrogen and chloride ions, which combine in the lumen to form hydrochloric acid, the primary acidic component of the stomach juices. Hydrochloric acid helps to convert the inactive pepsinogen to pepsin. The highly-acidic environment also kills many microorganisms in the food and, combined with the action of the enzyme pepsin, results in the hydrolysis of protein in the food. Chemical digestion is facilitated by the churning action of the stomach. Contraction and relaxation of smooth muscles mixes the stomach contents about every 20 minutes. The partially-digested food and gastric juice mixture is called chyme. Chyme passes from the stomach to the small intestine. Further protein digestion takes place in the small intestine. Gastric emptying occurs within two to six hours after a meal. Only a small amount of chyme is released into the small intestine at a time. The movement of chyme from the stomach into the small intestine is regulated by the pyloric sphincter.