

Section 1.1: What is the function of digestion?

When you have completed this section, you should be able to:

- Describe the overall function of the GI tract.
- Describe the processes involved in digestion.
- List the primary and accessory components involved in the digestive processes.
- Describe the layers of the walls of the GI tract.

People need to eat food regularly to fuel their bodies. Most of the food eaten is not in a form the body can use. The digestive system breaks down the food chemically and mechanically before it can be absorbed. Not all the food that is eaten is absorbed, and the body has to rid itself of the indigestible remains along with other waste products.

Overview of digestion

The **gastrointestinal (GI) tract**, also called the **digestive tract** or **alimentary canal** uses six main processes in handling food:

[INSERT VISUAL 1]

- ingestion**: taking food, water, medicine, etc., into the digestive tract through the mouth
- propulsion**: movement of food through the GI tract. The process starts when food is swallowed and it passes from the mouth to the pharynx, or throat. Then **peristalsis** (pare-ih-STALL-sis) takes over, and the muscles in the walls of the esophagus, stomach, and intestines contract and relax sequentially, propelling food from one organ to the next.
- mechanical digestion**: the means by which food is physically broken into smaller pieces. The teeth chew the food, the tongue mixes the food with saliva, and the stomach and intestines churn the food and mix it with digestive juices.
- chemical digestion**: breaks food down into its chemical constituents that are absorbed through the wall of the GI tract; the breakdown is brought about with the help of **enzymes** secreted by glands all along the GI tract
- absorption**: how digested nutrients pass from the GI tract into the bloodstream and are transported to cells throughout the body.
- elimination**: passing of waste products and indigestible substances from the body. Most of these substances are removed in the form of **feces** (FEE-seez) through the anus.

These processes are carried out by six primary components of the digestive system (Figure 1):

- mouth
- pharynx (throat)
- esophagus
- stomach
- small intestine
- large intestine

And by five accessory organs:

- salivary glands
- teeth
- pancreas**
- liver
- spleen

[INSERT FIGURE 1]

Characteristics of the wall of the GI tract

All the walls of the GI tract, from the esophagus to the anus, are made up of the same four layers (Figure 2). The layers in each part of the GI tract are modified, carrying out specific processes.

[INSERT FIGURE 2]

Layer 1: Mucosa

This **mucous** (MYOO-kus) membrane lines the entire GI tract **lumen** (LOO-men). The **mucosa** (myoo-KOE-suh) has three functions:

- to secrete **mucus**, digestive enzymes, chemicals (i.e., **electrolytes**: sodium, potassium, chloride; bicarbonate), and **hormones**
- to absorb digested nutrients, passing them into the bloodstream
- to protect the body from infection

The mucosa performs the three functions to various degrees in different portions of the GI tract. For example, in the stomach, the mucosa has three layers:

- epithelium
- lamina propria
- muscularis mucosae

The **epithelium** (ep-ih-THEE-lee-um) is the surface exposed to the lumen of the GI tract. In the esophagus, it consists of squamous epithelial cells while in the rest of the GI tract, it consists of **columnar epithelial cells**, which secrete mucus. This mucus protects the organs from the harsh substances involved in digestion and also helps food pass through the organs. In some parts of the GI tract, the mucosa also contains cells that secrete enzymes, hormones, and electrolytes.

The **lamina propria** (LAM-ih-nuh PRO-pree-uh) is a layer of **connective tissue** that contains blood vessels that nourish the epithelium and absorb digested substances. It also contains **lymph nodules (nodes)** that help defend the walls from bacteria and other **pathogens** that have access to the digestive tract. Those lymph nodes are particularly prominent in the **appendix**, as tonsils in the throat, and also in the **terminal ileum**, where they are known as Peyer's patches.

The **muscularis mucosae** (mus-kyoo-LAH-ris myoo-KOE-say) is a thin layer of smooth muscle, responsible for mucosal movement. The muscularis mucosae molds the mucosa into a series of small folds that help move food within the small intestine

Layer 2: Submucosa

The **submucosa** is a dense layer of connective tissue containing blood vessels, lymph nodes, nerve fibers, and elastic fibers. The nerve fibers in the submucosa regulate the activity of the glands and smooth muscle of the mucosa.

Layer 3: Muscularis externa

The **muscularis externa**, often simply called the **muscularis**, is responsible for mixing and propelling food through the digestive tract. The muscularis has two layers of muscles: an **outer longitudinal layer** and an **inner circular layer**.

The stomach contains a third additional layer called the **oblique layer**, within the muscularis. In certain locations along the GI tract, that inner circular layer forms a **sphincter** (SFINK-ter), or valve, that controls the passage of food from one organ to the next and prevents backflow. Nerve fibers, which lie between these two layers, help control GI motility.

Layer 4: Serosa

The **serosa** (see-ROE-sah) is the protective outer layer of the GI tract organs. This layer is called an **adventitia** (ad-ven-TISH-ee-uh) in the esophagus. Some experts do not consider this as a separate layer, but as part of the muscularis externa. It binds the esophagus to surrounding structures.

Progress check

1. Describe the function of the GI tract.

2. Match each digestive process with its definition:

- A. Ingestion
- B. Propulsion
- C. Mechanical digestion
- D. Chemical digestion
- E. Absorption
- F. Elimination

__ Passage of digested nutrients from the GI tract into the bloodstream for transportation to cells throughout the body

__ Intake of food, medicine, etc., into the digestive tract through the mouth

__ Enzymatic processes that make food small enough to be absorbed through the walls of the GI tract with the help of enzymes

__ Passage of indigestible substances from the body

__ Physical breakdown of food by chewing, mixing, and churning

__ Movement of food through the GI tract involving processes such as peristalsis

3. List the six primary components of the GI tract.

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

4. List the five accessory organs of the GI tract.

- A. _____
- B. _____
- C. _____
- D. _____
- E. _____

5. Match each layer of the GI wall with its description:

- A. Mucosa
- B. Submucosa
- C. Muscularis externa
- D. Serosa (adventitia)

___Dense layer of connective tissue containing nerve fibers that regulate the activity of the glands and smooth muscle of the mucosa

___Protective outer layer of the GI tract organs

___Layer that secretes mucus, digestive enzymes, hormones, and electrolytes; absorbs end products of digestion and protects the body from infection

___Layer responsible for the mixing and propulsion of food through the digestive tract

6. The mucosa has three layers. The _____ is the mucus-secreting layer.

The _____ is the connective tissue layer that contains lymph nodules that help defend the walls from bacteria and other pathogens. The

_____ is the thin layer of smooth muscle responsible for mucosal movement.

Answers

1. The GI tract processes food into absorbable units and eliminates indigestible wastes.

2. E

- A
- D
- F
- C
- B

3. A. Mouth

- B. Pharynx (throat)
- C. Esophagus
- D. Stomach
- E. Small intestine
- F. Large intestine

4. A. Salivary glands

- B. Liver
- C. Spleen
- D. Teeth
- E. Pancreas

5. B

- D
- A
- C

6. epithelium; lamina propria; muscularis mucosae