The Digestive System

Undergraduate researcher: Nancy D. Bergerson (2010).¹

The Digestive System breaks down and absorbs food. When food is eaten, it is not in a form the body can use. It must be changed for the body to absorb it into the blood and carry it to cells. Digestion is how food and drink are broken down into nutrients the body needs to supply energy and to build and maintain its cells.

The digestive tract is the mouth, the esophagus, the stomach, the small intestine, the large intestine (colon), the rectum, and the anus. **Figure 1** is a diagram of the digestive tract.

![Figure 1. The Digestive Tract.](image)


¹The Digestive System educational unit was researched and compiled by University of Maine undergraduate, Nancy D. Bergerson, under the supervision of Stephen F. Gilson, Ph.D., Coordinator and Professor of Interdisciplinary Disability Studies and Professor of Social Work; and Elizabeth DePoy, Ph.D., Professor of Interdisciplinary Disability Studies and Professor of Social Work; in partial fulfillment of her Disability Studies Internship during the Spring 2010 semester.

Important! Each educational unit contains words that are defined in the *Know Your Body Glossary*. Please remember to include the *Glossary* when downloading the educational unit(s) in PDF format.
The Mouth

The mouth is the beginning of the digestive tract. Salivary glands in the mouth start digestion. Saliva has enzymes that begin to digest the starch in food. Chewing breaks food into smaller pieces and mixes it with saliva.

The Esophagus

The esophagus is found in the throat near the trachea (windpipe). It receives food from your mouth when you swallow. Swallowing is voluntary, but after food is swallowed smooth muscles push it down esophagus to the stomach using peristalsis. Peristalsis is shown in Figure 2. At the entry to the stomach, a ring of muscle relaxes to allow food to pass through.

The Stomach

The stomach is muscular sac with three jobs. It stores food and liquids. It makes strong acids and mixes them with the stored food and liquids. Glands in the stomach lining make stomach acids. These glands also make an enzyme to digest protein. The stomach has a thick layer of mucous to stop the acids from dissolving the tissue of the stomach itself. After mixing food and acids, the stomach slowly empties itself into the small intestine.
Different foods spend different lengths of time in the stomach. **Carbohydrates** pass through the stomach quickly. **Proteins** stay in the stomach longer. Fats stay in the longest.

**The Small Intestine**

The small intestine is approximately 22 feet long and has three sections:

- **the duodenum**
- **the jejunum**
- **the ileum**

Contents of the stomach move into the first part of the small intestine called the **duodenum**. In this section of the small intestine, food mixes with **enzymes** from the pancreas and the liver.

The pancreas makes an **enzyme** to break down **carbohydrates**, fats, and **proteins**. It also makes insulin, which goes into the blood. Insulin regulates sugar in the blood. For more information about the pancreas, see the **Endocrine System**.

The liver produces bile. It stores bile in the gallbladder. During digestion, bile ducts in the gallbladder release bile to mix with fats. Bile dissolves fat. After fat dissolves, enzymes from the pancreas and the lining of the small intestine digest it. The liver builds helpful chemicals needed by the body from raw materials absorbed by the small intestine. The liver detoxifies harmful chemicals and drugs and eliminates them from the body.

The walls of the small intestine produce digestive **enzymes** that work with the pancreas and liver.

In the **jejunum** and **ileum**, nutrients are absorbed into the blood and carried to cells. To learn more about the blood, see the **Circulatory System**.

Undigested parts of food and dead cells shed from the mucosa are pushed into the large intestine, also called the colon.
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Undigested parts of food and dead cells shed from the mucosa are pushed into the large intestine, also called the colon.
The Large Intestine (Colon)

The colon connects the small intestine to the rectum. It is about six feet long. The large intestine has five sections:

- the cecum
- the ascending (right) colon
- the transverse (across) colon
- the descending (left) colon
- the sigmoid colon

The appendix attaches to the cecum. Figure 3 is a diagram of the large intestine (colon).

Figure 3. Diagram of the Large Intestine (Colon).

CDC - Colorectal Cancer Glossary. (n.d.). *Centers for Disease Control and Prevention.*
http://www.cdc.gov/cancer/colorectal

Left over waste from the small intestine passes into the large intestine (colon) by peristalsis. It enters as a liquid and leaves as a solid. As waste passes through the colon, water is removed. Waste (stool) is stored in the sigmoid colon and empties into
the rectum once or twice a day. It normally takes about 36 hours for waste to move through the colon.

Waste is mostly food bits and bacteria. Bacteria in the colon do several jobs. They build some vitamins. They break down food waste. They also protect against harmful bacteria.

**The Rectum**

The rectum gets its name from the Latin work for "straight". It is eight inches long and connects the colon to the anus. The rectum receives stool from the colon. When anything (gas or stool) comes into the rectum, nerves send a message to the brain. The brain decides if the rectal contents can be released or not. If they can, the sphincters relax and the rectum releases its contents. If the contents cannot be released, the sphincter contracts. The sensation temporarily goes away.

**The Anus**

The anus is the end of the digestive tract. It is two inches long. It contains the pelvic floor muscles and the two anal sphincters (internal and external). There are special nerves in the upper anus that can tell if the contents are liquid, gas, or solid. The sphincter muscles allow control of stool. The pelvic floor muscles stop stool from coming out when it is not supposed to. The internal sphincter is always tight and keeps stool from coming out when we are asleep or unaware of its presence. When we feel the need to go to the bathroom, the external sphincter holds the stool until reaching a toilet. Then it relaxes.

**Keeping the Digestive System Healthy**

It is important to maintain healthy habits to keep the digestive system healthy.

- Eat foods low in fat (especially saturated fat), low in cholesterol, and high in fiber
- Drink lots of fluids, especially water
• Exercise regularly
• Don't smoke
• Limit alcohol
• Take medicines in pill or capsule form with plenty of water
• Brush teeth at least twice a day, floss daily and get regular dental check-ups

**Diseases of the Digestive System**

Below is a list of the most common diseases of the digestive system:

**Appendicitis** is swelling and infection of the appendix. An inflamed appendix can burst if not removed. A burst appendix will spread infection into the abdomen and can be fatal.

**Cirrhosis** is scarring of the liver. Scar tissue forms due to injury or disease. Scar tissue cannot do the job healthy liver tissue must do. Severe cirrhosis can be deadly.

**Colon polyps** are growths on the surface of the large intestine (colon). A person can have more than one colon polyp. They can be cancerous or non-cancerous. A biopsy is needed to tell the difference.

**Constipation** is three or fewer bowel movements per week or hard, dry, painful and difficult bowel movements. It is often helped by drinking more fluids.

**Crohn’s Disease** causes inflammation of parts of the digestive tract. Sores called ulcers cause the inflammation. It can cause pain and diarrhea. It is a chronic disease.

**Diarrhea** is bowel movements with unusually loose stools. People with diarrhea often have many bowel movements and may pass more than a quart of watery stool a day.

**Diverticular Disease** affects the colon. Diverticular disease can be either diverticulosis or diverticulitis. Diverticulosis happens when pouches, called diverticula, form in the colon. These pouches bulge out like weak spots in a tire. Diverticulitis happens when the pouches become inflamed.
**Gallstones** are small stones that form in the gallbladder. They form from bile that hardens into pieces of stone-like material.

**Gastroesophageal Reflux (GER)** or "heartburn" happens when the ring of muscles between the esophagus and stomach open at the wrong time or do not close properly. This allows stomach contents to rise into the esophagus. This causes pain and/or a burning sensation.

**Hepatitis** is an inflammation of the liver. There are three types of hepatitis: A, B and C. Hepatitis C is the most common chronic liver disease in the United States. The most common risk factors for hepatitis C are:

- injection drugs
- a blood transfusion before June 1992
- clotting factor concentrates received before 1987
- dialysis treatments
- child of an hepatitis C infected mother
- needle-stick accident from a person infected with hepatitis C

**Irritable Bowel Syndrome (IBS)** has symptoms of cramping, bloating, gas, diarrhea, and/or constipation. IBS affects the large intestine (colon).

**Pancreatitis** is inflammation of the pancreas. When the pancreas is inflamed, the enzymes inside it attack and damage its tissues. Severe cases can cause bleeding, infection and permanent damage.

**Peptic Ulcer** is a sore in the lining of the stomach or duodenum. Certain bacterial infections, smoking and some anti-inflammatory drugs can cause peptic ulcers.

**Ulcerative colitis** causes inflammation and sores, called ulcers, in the lining of the rectum and colon. Ulcers bleed and produce pus. This inflammation can cause diarrhea.

**Viral Gastroenteritis** is an intestinal infection caused by different viruses. It is the second most common illness in the United States. It can be serious when people cannot drink enough fluids to replace what is lost through vomiting and diarrhea.
Case Study of Disease of the Digestive System

A 26-year-old woman suffered from abdominal pain, nausea and constipation alternating with periods of diarrhea. She also had pain in her joints, skin lesions, tiredness and depression. She saw her doctor who ordered tests. She was diagnosed with Crohn's disease.

She began diet therapy. She kept a record of the foods she ate and her body's reaction to foods. She found her condition got worse when she ate fried foods and some fruits and vegetables. She ate small, frequent meals and followed the advice of her doctor.

Soon, she noticed her symptoms came less often. By following her doctor's instructions, her symptoms have not appeared for the last two years.

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![Diagram of the Colon and Rectum](image)

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