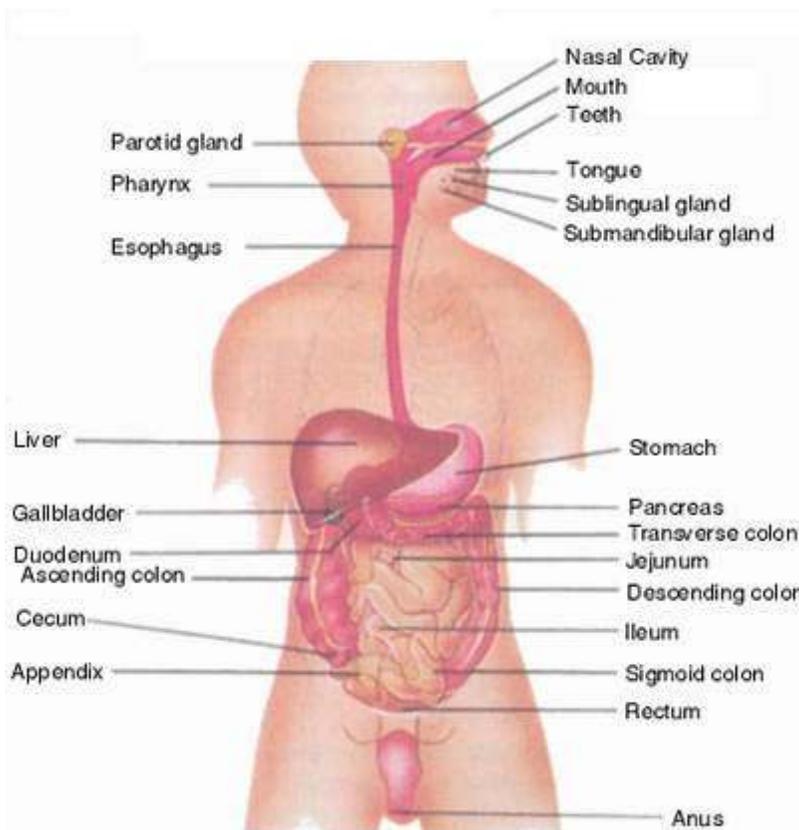


ANATOMY & PHYSIOLOGY ONLINE COURSE - SESSION 13 – THE DIGESTIVE SYSTEM



The digestive system also known as the alimentary canal or gastrointestinal tract consists of a series of hollow organs joined in a long, winding tube from the mouth to the anus, The digestive system carries food through the body, sending nutrients to the bloodstream and waste products through the large intestine to be eliminated.

The digestive system is responsible for the intake and digestion of food, absorption of nutrients, and elimination of solid waste products. The digestive system is the means, by which the body transforms food into the energy it needs to build, repair and fuel itself.

The digestive system begins with the mouth, where food enters the body. Teeth and saliva break up the food into small pieces, allowing it to travel through the esophagus into the stomach. The stomach breaks down the food into smaller

pieces, preparing it for travel to the lower part of the digestive tract.

After leaving the stomach food passes into the small intestine. In the small intestine nutrients from food are further broken down and absorbed into the bloodstream. By the time the food passes through the small intestine and reaches the colon, mainly water and waste products remain.

The colon absorbs excess water from the waste as it begins the process of moving the waste to the rectum.

Digestion

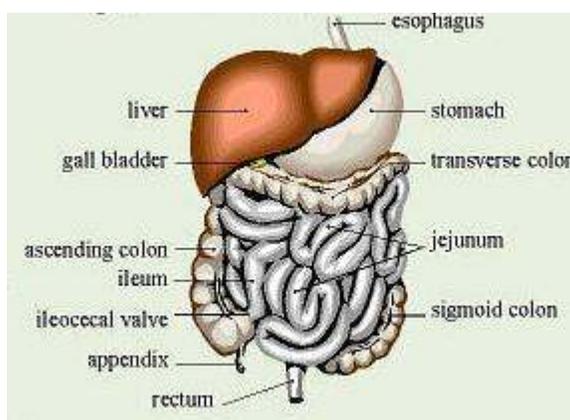
Digestion is the process by which complex foods are broken down into nutrients in a form the body can use. Food material taken into the mouth is digested, or broken down mechanically and chemically, as it travels through the gastrointestinal tract.

Enzymatic Interaction

Digestive enzymes speed up chemical reactions and help breakdown of complex nutrients. Complex proteins are digested to simpler amino acids; complicated sugars are reduced to simple sugars, such as glucose; and large fat molecules (triglycerides) are broken down to fatty acids and glycerol.

Absorption

The digested food must be absorbed into the bloodstream by passing through the walls of the small intestine. In this way, valuable nutrients, such as sugar and amino acids, can travel to all the cells of the body. Cells then burn nutrients in the presence of oxygen to release energy stored within the food. Cells



also use amino acid nutrients to build large protein molecules needed for growth and development. Although the walls of the small intestine also absorb fatty acids and glycerol, these nutrients enter lymphatic vessels rather than blood vessels. Digested fats eventually enter the bloodstream as lymph vessels join with blood vessels in the upper chest region.

The third function of the digestive system is the elimination of the solid waste materials that cannot be absorbed into the bloodstream. The Large intestine concentrates these solid wastes, called feces, and the wastes finally pass out of the body through the anus.

Salivary glands

The basic secretory units of salivary glands are clusters of cells called an acini. These cells secrete a fluid that contains water, electrolytes, mucus and enzymes.

Within the ducts, the composition of the secretion is altered. Much of the sodium is actively reabsorbed, potassium is secreted, and large quantities of bicarbonate ion are secreted.

There are three major pairs of salivary glands that differ in the type of secretion they produce:

- Parotid glands produce a serous, watery secretion
- Submaxillary (mandibular) glands produce a mixed serous and mucous secretion
- Sublingual glands secrete saliva that is predominantly mucous in character

Stomach

The role of the stomach is to prepare the food chemically and mechanically so that it can be received in the small intestine for further digestion and absorption into the bloodstream.

The gastric juices of the stomach contain hydrochloric acid and the enzymes protease, pepsin, and lipase.

The churning action of the stomach works with the gastric juices to convert the food to chyme.

Chyme is the semi-fluid mass of partly digested food that passes from the stomach, through the pyloric sphincter, and into the duodenum.

The stomach controls the passing of foods into the first part of the small intestine so that it proceeds only when it is chemically ready and in small amounts. Food leaves the stomach in 1-5 hours or longer depending on the amount and kind of food eaten.

The stomach is composed of an upper portion called the fundus, a middle section that is known as the body, and a lower portion, the pylorus.

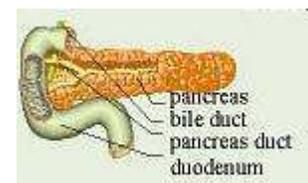
Rings of muscles called sphincters control the openings into and from the stomach.

- The Cardiac sphincter -- relaxes and contracts to move food from the esophagus into the stomach.
- The pyloric sphincter -- allows food to leave the stomach when it has been sufficiently digested.

Rugae- folds in the mucous membrane lining the stomach. Rugae contain digestive glands that produce enzymes and hydrochloric acid.

Pancreas

The pancreas is a long, tongue shaped gland, which is responsible for secreting the hormone insulin and an alkaline fluid, which aids in digestion. The digestive fluid is secreted directly into the duodenum, just below the stomach in the digestive tract.



The Liver

The Liver, located in the right, upper quadrant of the abdomen manufactures a thick, yellowish -brown, sometimes greenish, fluid called bile. Bile contains cholesterol (a fatty substance), bile acids, and several bile pigments. One of these pigments, bilirubin, is produced from the breakdown of hemoglobin in the

liver. The liver combines bilirubin with bile, and then excretes both into the duodenum. They leave the body in feces.

The Liver continuously releases bile, which then travels down the hepatic duct to the cystic duct. The cystic duct leads to the gallbladder, a pear-shaped sac under the liver, which stores and concentrates the bile for later use. After meals, in response to the presence of food in the stomach and duodenum, the gallbladder contracts, forcing the bile out the cystic duct into the common bile duct, which joins with the pancreatic duct just before the entrance to the duodenum. The duodenum receives a mixture of bile and pancreatic juices.

The Liver has several other vital functions. They are:

- Keeps the amount of glucose in the blood at normal level. The liver removes excess glucose also known as blood sugar, from the bloodstream and stores it as glycogen (starch)
- Destroys old erythrocytes (red blood cells)
- Manufactures some blood proteins, particularly those necessary for blood clotting.
- Manufactures bile, which is a digestive juice. Bile has a detergent-like effect on fats in the duodenum. It breaks apart large fat globules so that enzymes from the pancreas can digest the fats. This is called emulsification. Without bile, most of the fat taken into the body would remain undigested.
- Removal of poisons (toxins) from the blood

Gallbladder

The gallbladder is a blue-green organ, about three inches long, located on the underside of the liver. It serves the function of concentrating and storing bile, produced by the liver, and secreting the bile through the cystic ducts into the duodenum where it can help in digestion. The gallbladder is not critical to the survival of the human, and may be removed without severely adverse effects.

Duodenum

The duodenum is the first part of the small intestine. It is located between the stomach and the ileum. It is C shaped and approximately 10" long, curving around the head of the pancreas. After foods combine with stomach acid, they descend into the duodenum where they mix with bile from the gall bladder and digestive juices from the pancreas.

Small Intestine

Over 90 percent of digestion and absorption takes place here.

Food is moved through the intestines by peristaltic action (rhythmic, wavelike contractions of the smooth musculature of the digestive tract), and digestion is completed in the duodenum after the chyme (the semi fluid mass of partly digested food) has been mixed with bile and pancreatic juice.

Pancreatic juice contains the enzymes Trypsin, lipase, and amylase.

Bile breaks apart large fat globules into smaller particles so enzymes from the pancreatic juice can digest the fats. This action is called emulsification and must be completed before nutrients can be absorbed into the body.

Large Intestine

The primary functions of the large intestine are to store food residues and to absorb water. Approximately 5 gallons of fluid is deposited in the large intestine daily. Most of this fluid has to be reabsorbed to prevent the body from becoming dehydrated.

This process takes time, and as a result, approximately 95% of the contractions of the colon are unsynchronized (non-peristaltic). These contractions mix the contents of the large intestine but do not move them forward. As a consequence of this pattern of motility, food residues remain in the colon on average about 30 hours, where bacteria quickly form. The amount of bacteria varies depending on diet, but can make up more than half of the weight of fecal material.

A second and very important type of motility that occurs in the large intestine is the high amplitude propagating contraction (HAPC). These contractions only occur 6-8 times per day in healthy people, but

they are extremely strong contractions, which begin in the first part of the large intestine and sweep around all the way to the rectum, stopping just above the rectum. These contractions move the contents of the large intestine ahead of them, and they will often trigger a bowel movement.

The large intestine is divided into eight sections:

- The colon constitutes the majority of the length of the large intestine and is sub-classified into ascending, transverse and descending segments.
- The ascending colon is the first part of the colon. It starts in the right lower quadrant of the abdomen and ends at the transverse colon.
- The transverse colon is located between the ascending colon and the descending colon and crosses the abdomen from right to left.
- The descending colon is in the left side of the lower abdomen
- The sigmoid colon is the portion of the colon that connects above to the descending colon and below the rectum.
- The cecum is the part of the colon where the small intestine expels its contents into the colon in liquid form. It is the part of the colon with the largest diameter.
- The appendix is a small, worm-like attachment at the apex of the cecum. Evidence has shown that the appendix once may have taken a part in the digestion of durable matter, such as tree bark, but now is apparently unnecessary.
- The rectum is one of the last portions of the large intestine. The rectum is approximately five inches long, extending from the sigmoid colon to join the anal canal. Fecal wastes are stored in the rectum until they are expelled through the anal canal and out of the anus.
- The anus, a ring of muscle, is the external sphincter. This sphincter muscle keeps the anus closed, opening it during excretion to allow feces to pass through.

ANATOMY AND PHYSIOLOGY ONLINE COURSE - SESSION 13 - QUESTION & ANSWERS

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Please be sure to fill out the information above, complete the test and e-mail or fax it back to us at iridology@netzero.net or 530-878-1119. We will grade your question & answer session and will let you know if we have questions or comments.

- 1) _____ is responsible for secreting the hormone insulin
- 2) _____ produce a serous, watery secretion
- 3) _____ keeps the amount of glucose in the blood at normal level.
- 4) _____ is the process by which complex foods are broken down into nutrients in a form the body can use
- 5) _____ constitutes the majority of the length of the large intestine
- 6) _____ manufactures a thick, yellowish -brown, sometimes greenish, fluid
- 7) The role of the _____ is to prepare the food chemically and mechanically
- 8) _____ speed up chemical reactions and help breakdown of complex nutrients.
- 9) After leaving the stomach food passes into the _____
- 10) _____ constitutes the majority of the length of the large intestine