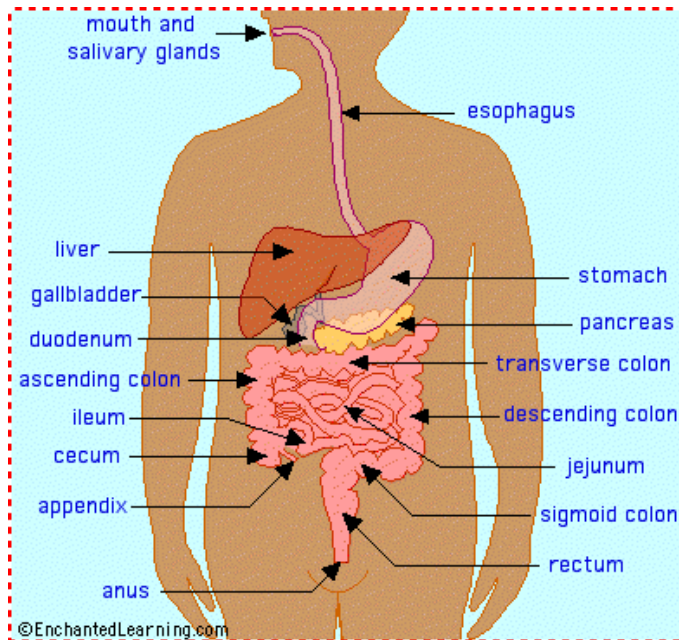


Review packet DIGESTIVE SYSTEM

The human digestive system is a complex series of organs and glands that processes food. In order to use the food we eat, our body has to break the food down into smaller molecules that it can process; it also has to excrete waste. Most of the digestive organs (like the stomach and intestines) are tube-like and contain the food as it makes its way through the body. The digestive system is essentially a long, twisting tube that runs from the mouth to the anus (called the digestive tract or the **Gastro Intestinal tract**), plus a few other organs (like the liver and pancreas) that produce or store digestive chemicals.



Vocabulary

abdomen - the part of the body that contains the digestive organs. In human beings, this is between the diaphragm and the pelvis

alimentary canal - the passage through which food passes, including the mouth, esophagus, stomach, intestines, and anus.

appendix - a small sac located on the cecum.

colon - large intestine

bile - a digestive chemical that is produced in the liver, stored in the gall bladder, and secreted into the small intestine.

cecum - the first part of the large intestine; the appendix is connected to the cecum.

chyme - food in the stomach that is partly digested and mixed with stomach acids. Chyme goes on to the small intestine for further digestion.

digestive system - (also called the gastrointestinal tract or GI tract) the system of the body that processes food and gets rid of waste.

duodenum - the first part of the small intestine; it is C-shaped and runs from the stomach to the jejunum.

epiglottis - the flap at the back of the tongue that keeps chewed food from going down the windpipe to the lungs. When you swallow, the epiglottis automatically closes. When you

breathe, the epiglottis opens so that air can go in and out of the windpipe.

esophagus - the long tube between the mouth and the stomach. It uses rhythmic muscle movements (called peristalsis) to force food from the throat into the stomach.

gall bladder - a small, sac-like organ located by the duodenum. It stores and releases bile (a digestive chemical which is produced in the liver) into the small intestine.

gastrointestinal tract - (also called the GI tract or digestive system) the system of the body that processes food and gets rid of waste.

ileum - the last part of the small intestine before the large intestine begins.

intestines - the part of the alimentary canal located between the stomach and the anus.

jejunum - the long, coiled mid-section of the small intestine; it is between the duodenum and the ileum.

liver - a large organ located above and in front of the stomach. It filters toxins from the blood, and makes bile (which breaks down fats) and some blood proteins.

mouth - the first part of the digestive system, where food enters the body. Chewing and salivary enzymes in the mouth are the beginning of the digestive process (breaking down the food).

pancreas - an enzyme-producing gland located below the stomach and above the intestines. Enzymes from the pancreas help in the digestion of carbohydrates, fats and proteins in the small intestine.

peristalsis - rhythmic muscle movements that force food in the esophagus from the throat into the stomach. Peristalsis is involuntary - you cannot control it. It is also what allows you to eat and drink while upside-down.

rectum - the lower part of the large intestine, where feces are stored before they are excreted.

salivary glands - glands located in the mouth that produce saliva. Saliva contains enzymes (amylase) that break down carbohydrates (starch) into smaller molecules.

stomach - a sack-like, muscular organ that is attached to the esophagus. Both chemical and mechanical digestion takes place in the stomach. When food enters the stomach, it is churned in a bath of acids and enzymes (Hydrochloric acid, enzyme pepsin).

The digestive process

Organ	Movement	Digestive Juices Used	Food Particles Broken Down
Mouth	Chewing	Saliva	Starches
Esophagus	Swallowing	None	None
Stomach	Upper muscle in stomach relaxes to let food enter and lower muscle mixes food with digestive juice	Stomach acid	Protein
Small intestine	Peristalsis	Small intestine digestive juice	Starches, protein, and carbohydrates
Pancreas	None	Pancreatic juice	Starches, fats, and protein
Liver	None	Bile acids	Fats

How does food move through the GI tract?

The large, hollow organs of the GI tract contain a layer of muscle that enables their walls to move. The movement of organ walls—called peristalsis—propels food and liquid through the GI tract and mixes the contents within each organ. Peristalsis looks like an ocean wave traveling through the muscle as it contracts and relaxes.

Esophagus. When a person swallows, food pushes into the esophagus, the muscular tube that carries food and liquids from the mouth to the stomach. Once swallowing begins, it becomes involuntary and proceeds under the control of the esophagus and brain. The lower esophageal sphincter, a ring like muscle at the junction of the esophagus and stomach, controls the passage of food and liquid between the esophagus and stomach. As food approaches the closed sphincter, the muscle relaxes and lets food pass through to the stomach.

Stomach. The stomach stores swallowed food and liquid, mixes the food and liquid with digestive juice it produces, and slowly empties its contents, called chyme, into the small intestine. The muscle of the upper part of the stomach relaxes to accept large volumes of swallowed material from the esophagus. The muscle of the lower part of the stomach mixes the food and liquid with digestive juice.

Small intestine. The muscles of the small intestine mix food with digestive juices from the pancreas, liver, and intestine and push the mixture forward to help with further digestion. The walls of the small intestine absorb the digested nutrients into the bloodstream. The blood delivers the nutrients to the rest of the body.

Large intestine. The waste products of the digestive process include undigested parts of food and older cells from the GI tract lining. Muscles push these waste products into the large intestine. The large intestine absorbs water and any remaining nutrients and changes the waste from liquid into stool. The rectum stores stool until it pushes stool out of the body during a bowel movement.

How do digestive juices in each organ of the GI tract break down food?

Digestive juices contain enzymes—substances that speed up chemical reactions in the body—that break food down into different nutrients.

Salivary glands. Saliva produced by the salivary glands moistens food so it moves more easily through the esophagus into the stomach. Saliva also contains an enzyme (amylase) that begins to break down the starches from food.

Glands in the stomach lining. The glands in the stomach lining produce stomach acid and an enzyme that digests protein.

Pancreas. The pancreas produces a juice containing several enzymes that break down carbohydrates, fats, and proteins in food. The pancreas delivers digestive juice to the small intestine through small tubes called ducts.

Liver. The liver produces a digestive juice called bile. The gallbladder stores bile between meals. When a person eats, the gallbladder squeezes bile through the bile ducts, which connect the gallbladder and liver to the small intestine. The bile mixes with the fat in food. The bile acids dissolve fat into the watery contents of the intestine, much like how detergents dissolve grease from a frying pan, so the intestinal and pancreatic enzymes can digest the fat molecules.

Small intestine. Digestive juice produced by the small intestine combines with pancreatic juice and bile to complete digestion. The body completes the breakdown of proteins, and the final breakdown of starches produces glucose molecules that absorb into the blood. Bacteria in the small intestine produce some of the enzymes needed to digest carbohydrates.

What happens to the digested food molecules?

The small intestine absorbs most digested food molecules, as well as water and minerals, and passes them on to other parts of the body for storage or further chemical change. Specialized cells help absorbed materials cross the intestinal lining into the bloodstream. The bloodstream carries simple sugars, amino acids, glycerol, and some vitamins and salts to the liver. The lymphatic system, a network of vessels that carry white blood cells and a fluid called lymph throughout the body, absorbs fatty acids and vitamins.

How is the digestive process controlled?

Hormone and nerve regulators control the digestive process. The cells in the lining of the stomach and small intestine produce and release hormones that control the functions of the digestive system. These hormones stimulate production of digestive juices and regulate appetite.

Two types of nerves help control the action of the digestive system: extrinsic and intrinsic nerves. Extrinsic, or outside, nerves connect the digestive organs to the brain and spinal cord. These nerves release chemicals that cause the muscle layer of the GI tract to either contract or relax, depending on whether food needs digesting. The intrinsic, or inside, nerves within the GI tract are triggered when food stretches the walls of the hollow organs. The nerves release many different substances that speed up or delay the movement of food and the production of digestive juices.

Why is digestion important?

Digestion is important for breaking down food into nutrients, which the body uses for energy, growth, and cell repair. Food and drink must be changed into smaller molecules of nutrients before the blood absorbs them and carries them to cells throughout the body. The body breaks down nutrients from food and drink into carbohydrates, protein, fats, and vitamins.

Carbohydrates. Carbohydrates are the sugars, starches, and fiber found in many foods. Carbohydrates are called simple or complex, depending on their chemical structure. Simple carbohydrates include sugars found naturally in foods such as fruits, vegetables, milk, and milk products, as well as sugars added during food processing. Complex carbohydrates are starches and fiber found in whole-grain breads and cereals, starchy vegetables, and legumes. The Dietary

Guidelines for Americans, 2010, recommends that 45 to 65 percent of total daily calories come from carbohydrates.

Protein. Foods such as meat, eggs, and beans consist of large molecules of protein that the body digests into smaller molecules called amino acids. The body absorbs amino acids through the small intestine into the blood, which then carries them throughout the body. *The Dietary Guidelines for Americans, 2010*, recommends that 10 to 35 percent of total daily calories come from protein.

Fats. Fat molecules are a rich source of energy for the body and help the body absorb vitamins. Oils, such as corn, canola, olive, safflower, soybean, and sunflower, are examples of healthy fats. Butter, shortening, and snack foods are examples of less healthy fats. During digestion, the body breaks down fat molecules into fatty acids and glycerol. The Dietary Guidelines for Americans, 2010, recommends that 20 to 35 percent of total daily calories come from fat.

Vitamins. Scientists classify vitamins by the fluid in which they dissolve. Water-soluble vitamins include all the B vitamins and vitamin C. Fat-soluble vitamins include vitamins A, D, E, and K. Each vitamin has a different role in the body's growth and health. The body stores fat-soluble vitamins in the liver and fatty tissues, whereas the body does not easily store water-soluble vitamins and flushes out the extra in the urine