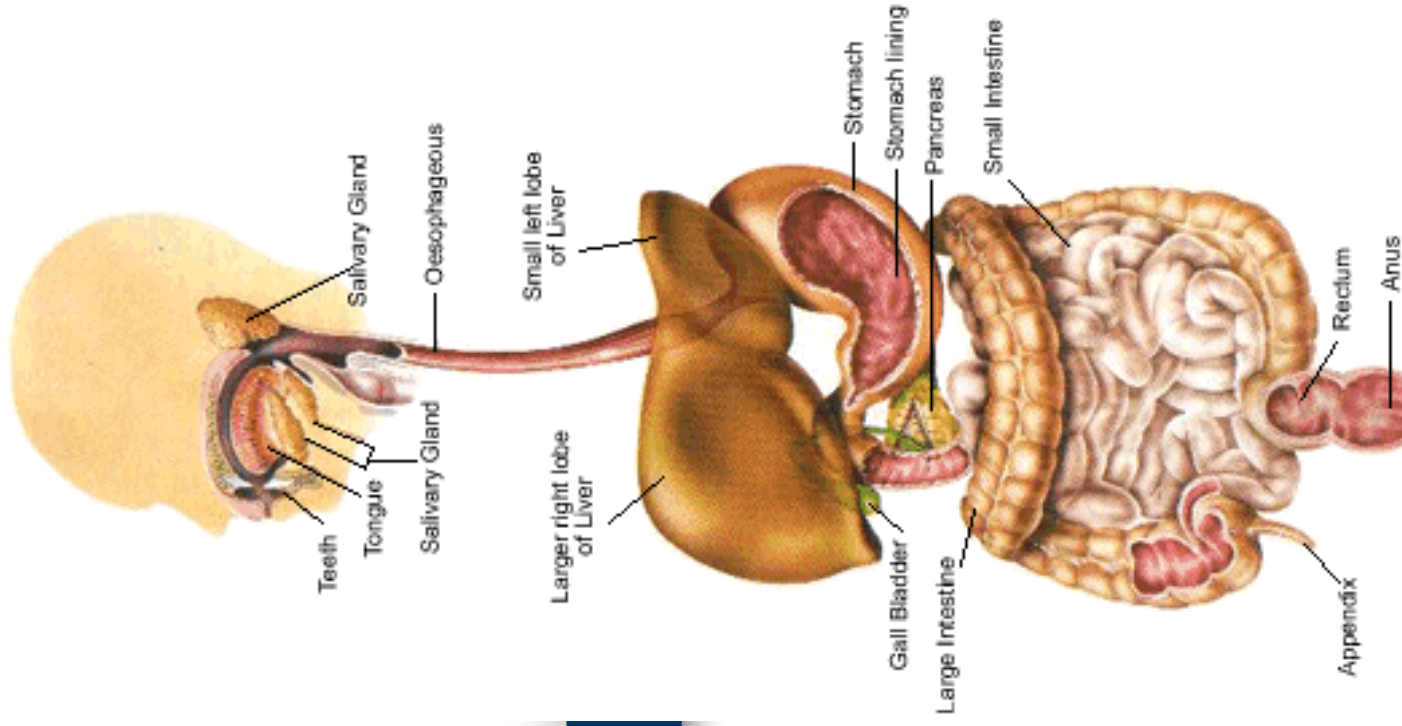


THE PROCESS OF DIGESTION

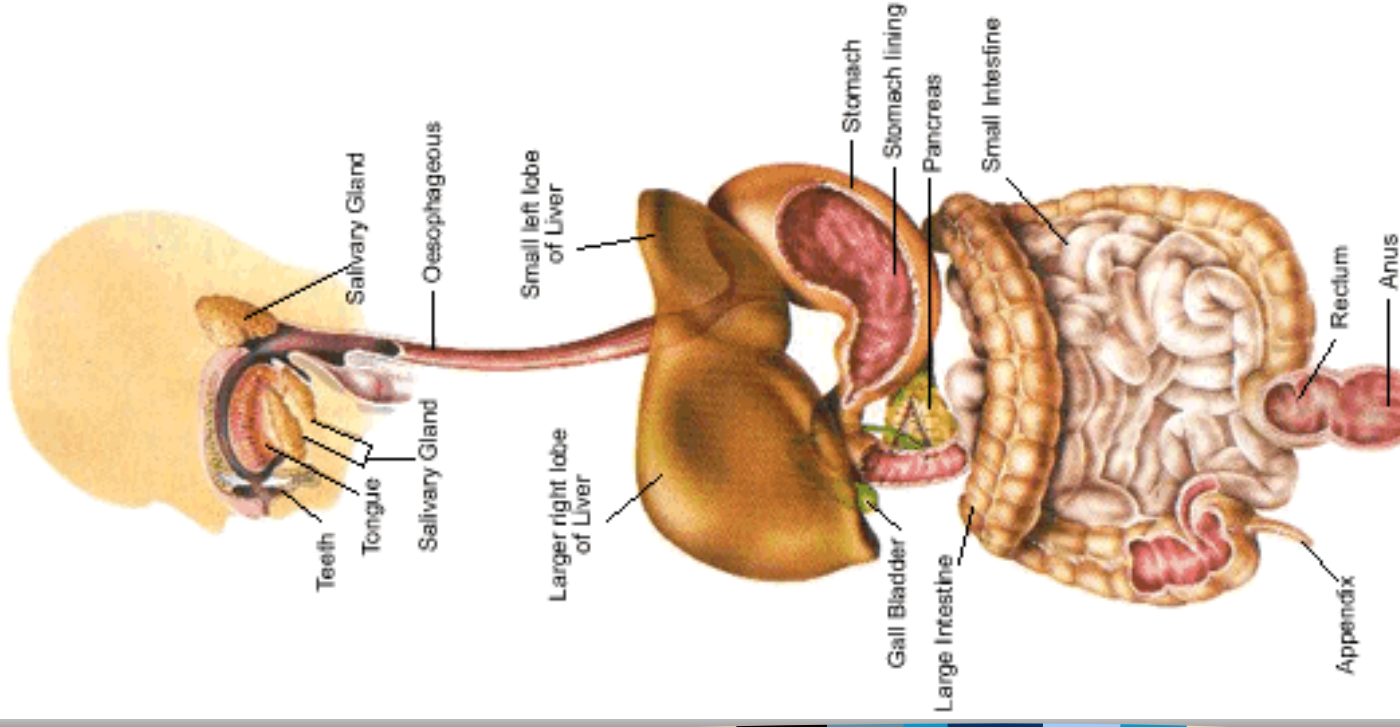
by
Geoffrey Axiak
CLINICAL NUTRITION NURSE



Why is digestion important?

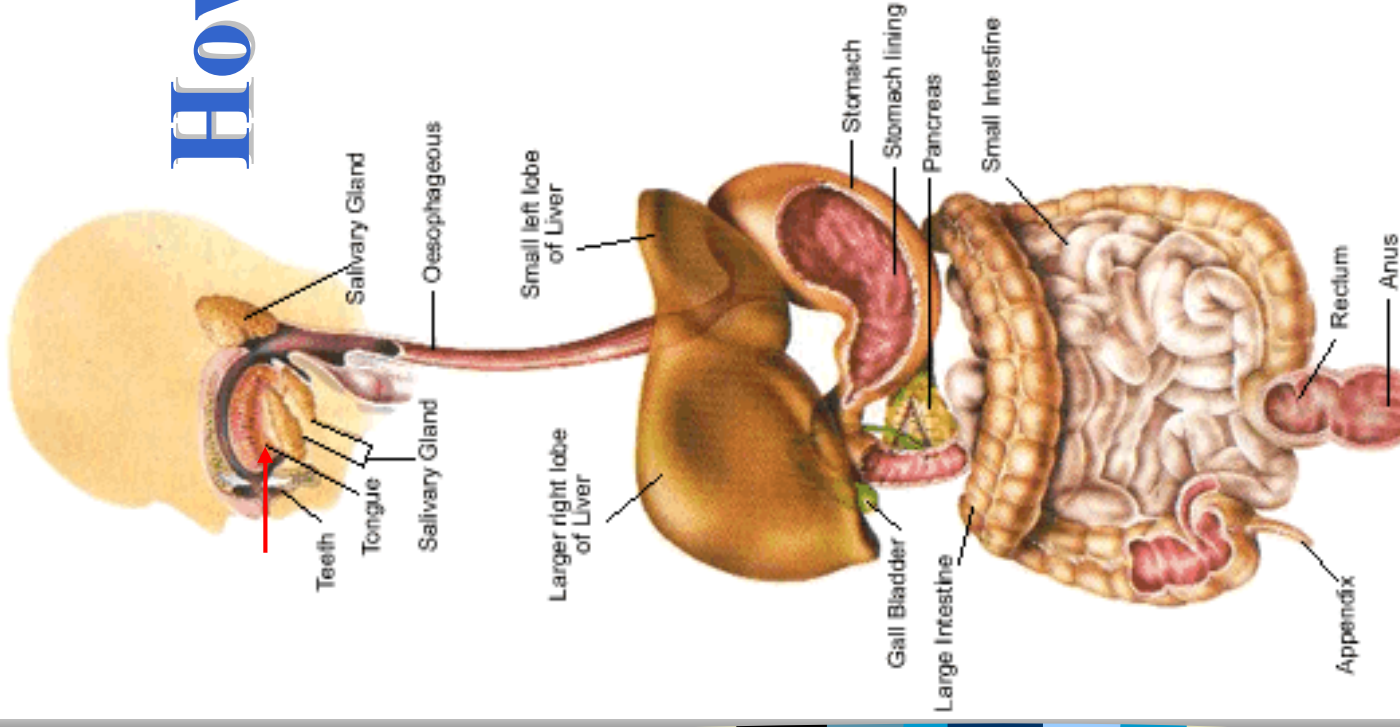
When we eat such things as bread, meat, and vegetables, they are not in a form that the body can use as nourishment. Our food and drink must be changed into smaller molecules of nutrients before they can be absorbed into the blood and carried to cells throughout the body.

Digestion is the process by which food and drink are broken down into their smallest parts so that the body can use them to build and nourish cells and to provide energy.



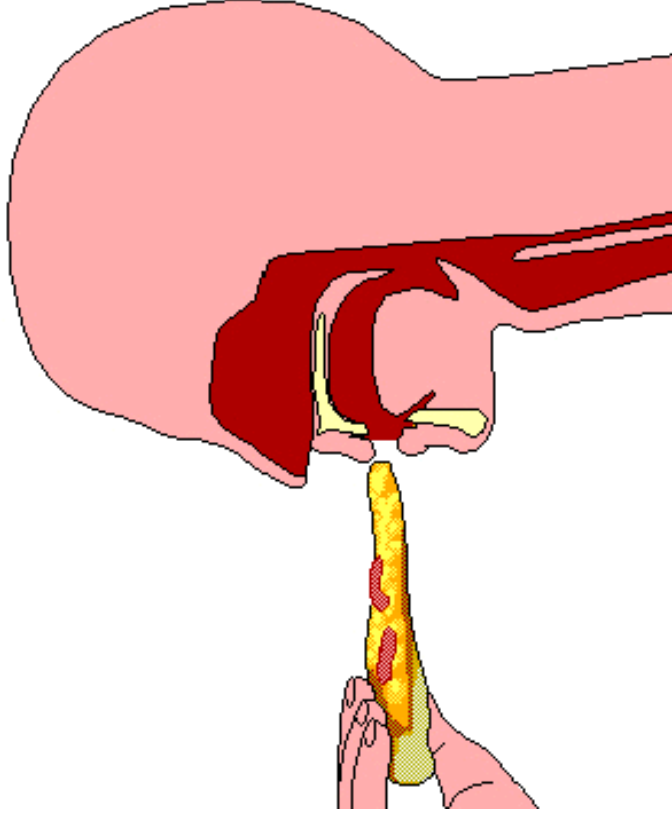
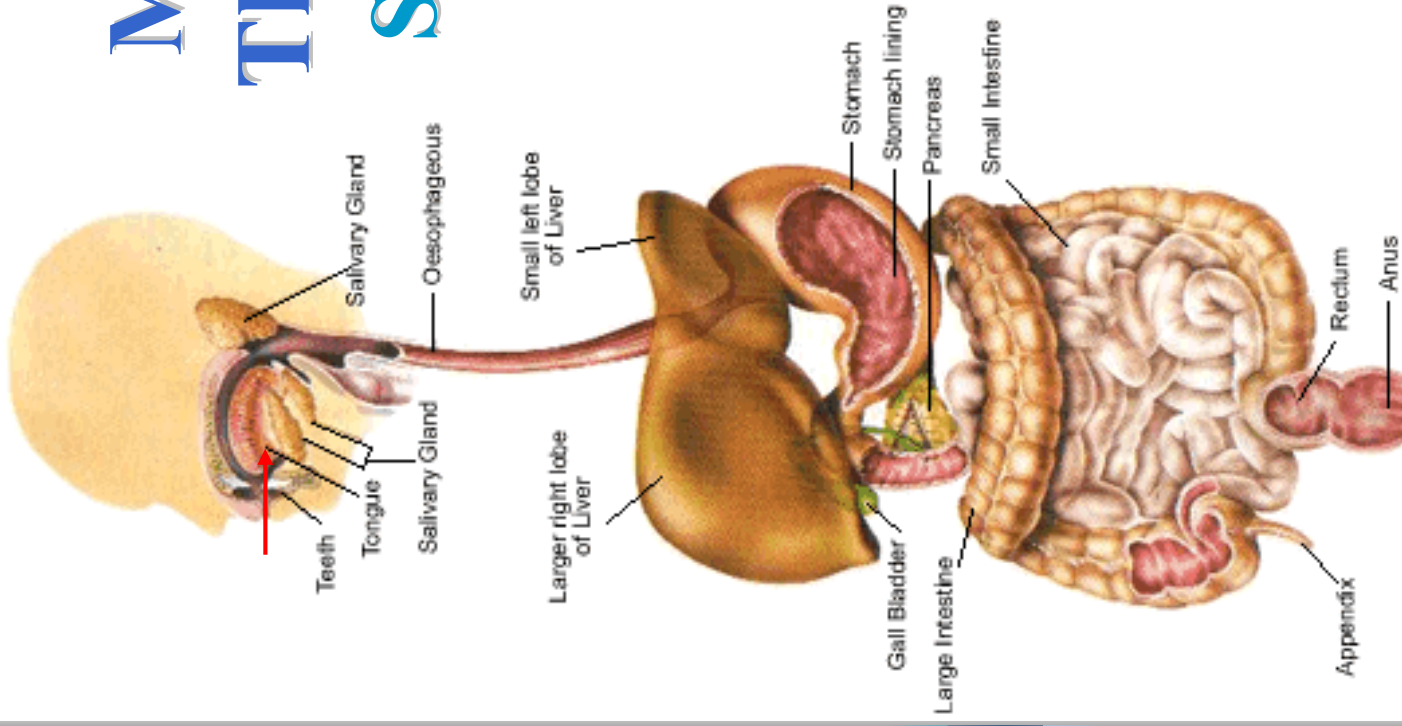
How is food digested?

Digestion involves the mixing of food, its movement through the digestive tract, and the chemical breakdown of the large molecules of food into smaller molecules. Digestion begins in the mouth, when we chew and swallow, and is completed in the small intestine. The chemical process varies somewhat for different kinds of food.



→ **Movement of food**

Movement of Food Through the System Swallowing Animation



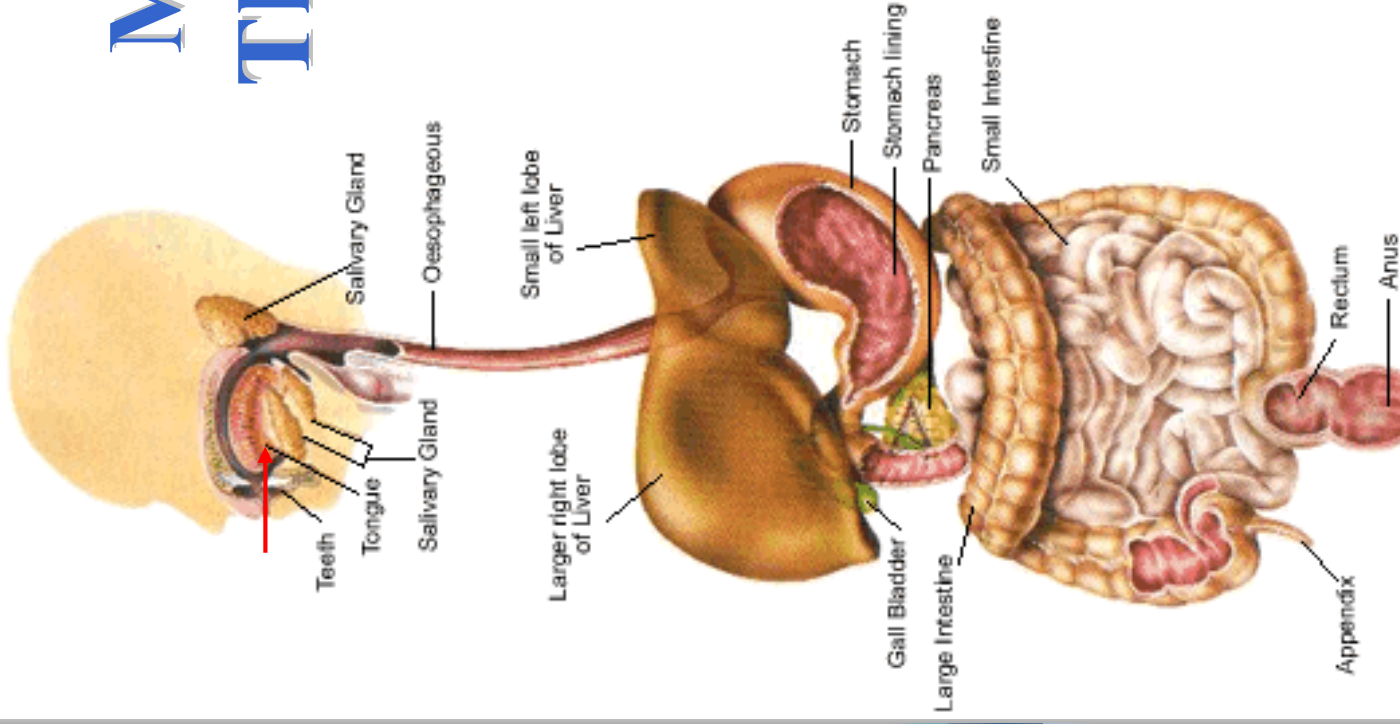
→ Movement of food

Movement of Food Through the System

The large, hollow organs of the digestive system contain muscle that enables their walls to move. The movement of organ walls can propel food and liquid and also can mix the contents within each organ.

Typical movement of the oesophagus, stomach, and intestine is called peristalsis. The action of peristalsis looks like an ocean wave moving through the muscle. The muscle of the organ produces a narrowing and then propels the narrowed portion slowly down the length of the organ. These waves of narrowing push the food and fluid in front of them through each hollow organ.

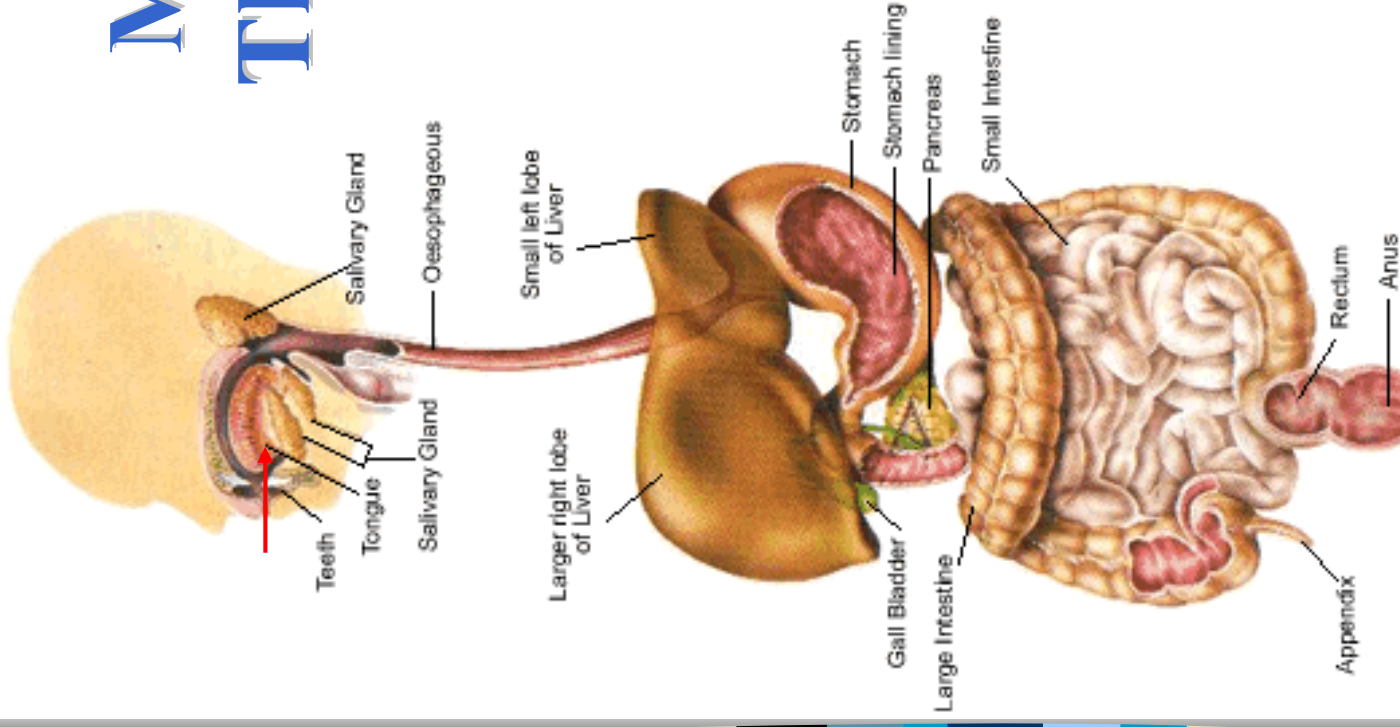
→ **Movement of food**



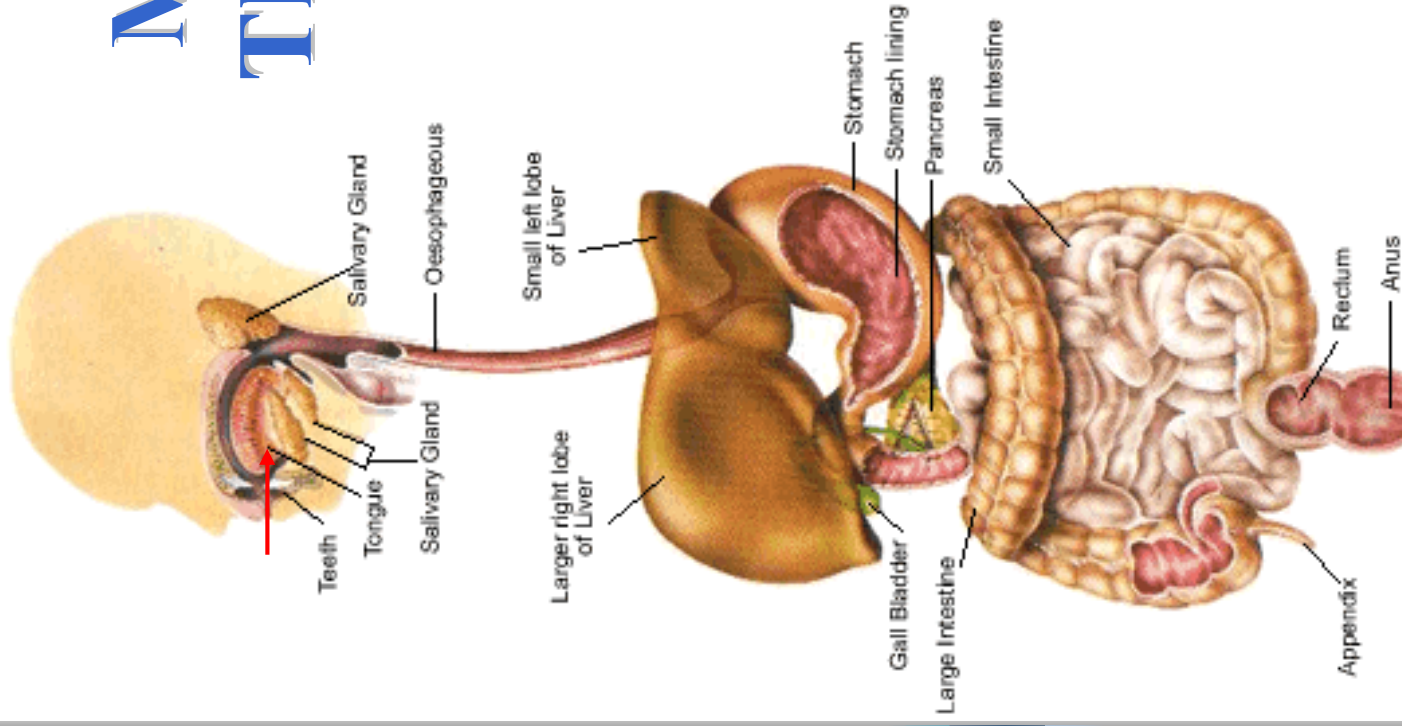
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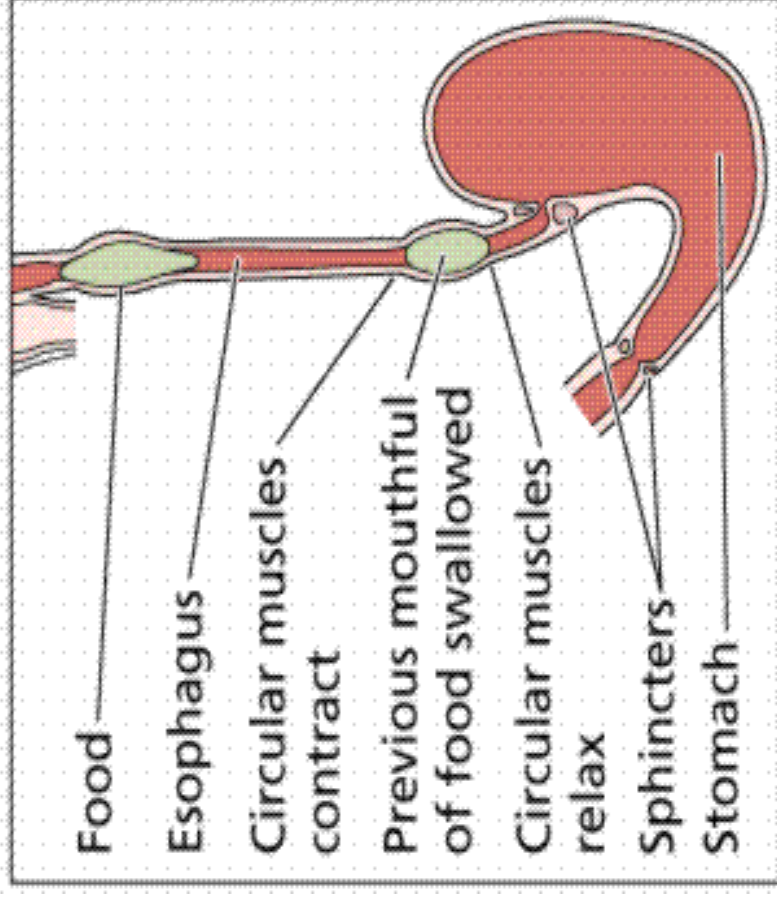
→ **Movement of food**



Movement of Food Through the System



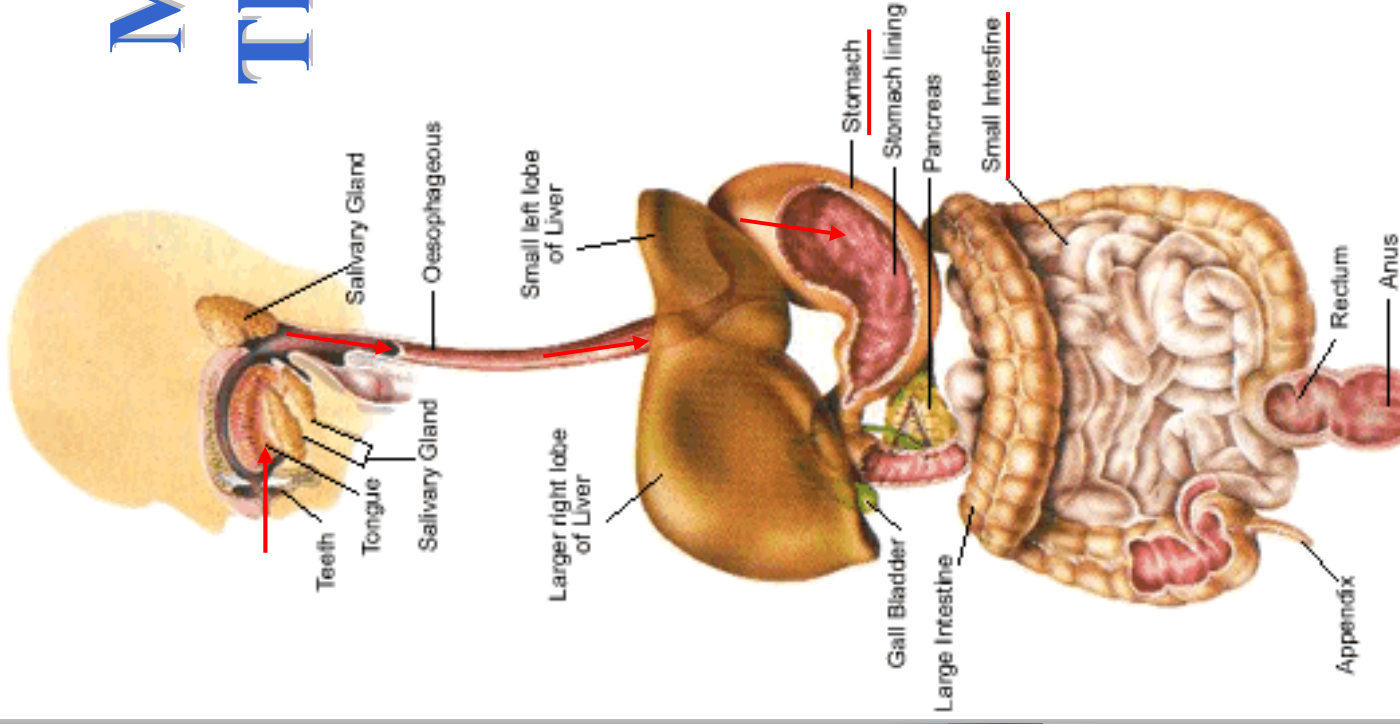
Peristalsis



Movement of Food Through the System

The food then enters the stomach, which has three mechanical tasks to do. First, the stomach must store the swallowed food and liquid. This requires the muscle of the upper part of the stomach to relax and accept large volumes of swallowed material. The second job is to mix up the food, liquid, and digestive juice produced by the stomach. The lower part of the stomach mixes these materials by its muscle action. The third task of the stomach is to empty its contents slowly into the small intestine.

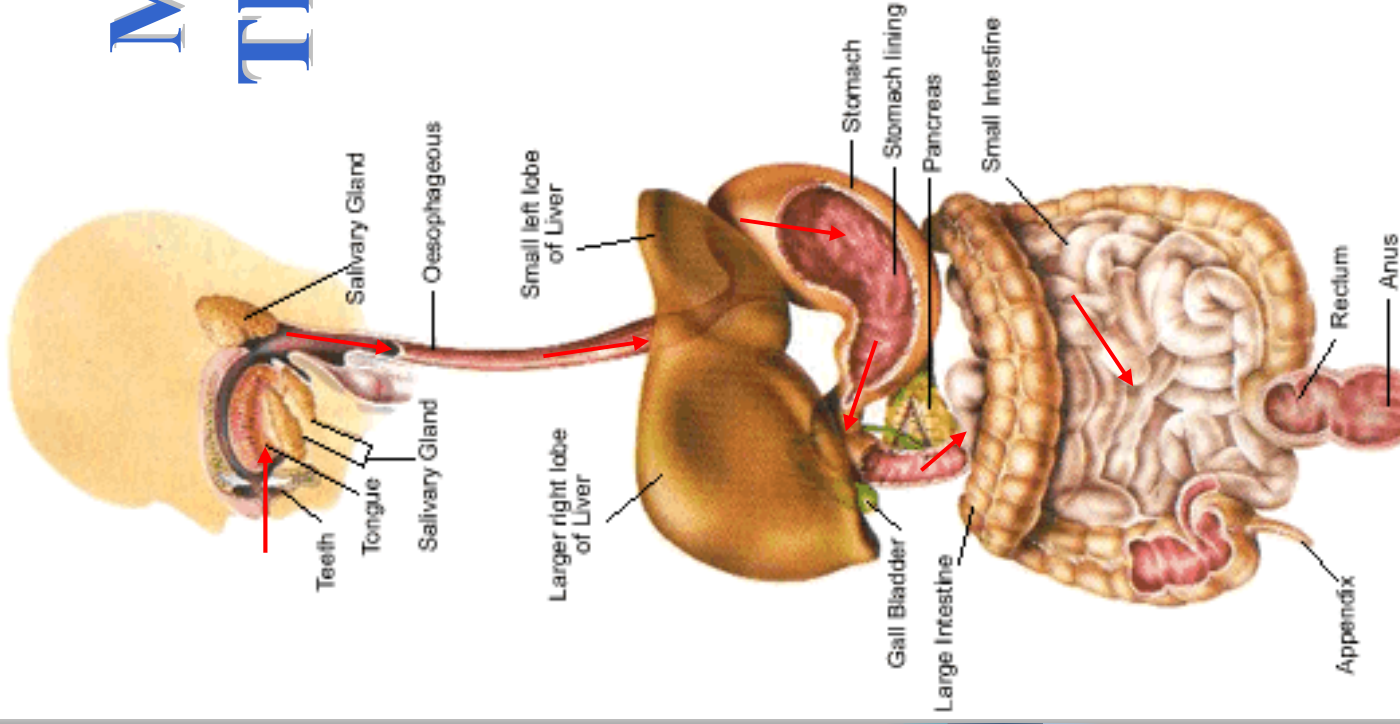
→ **Movement of food**



Movement of Food Through the System

Several factors affect emptying of the stomach, including the nature of the food (mainly its fat and protein content) and the degree of muscle action of the emptying stomach and the next organ to receive the contents (the small intestine).

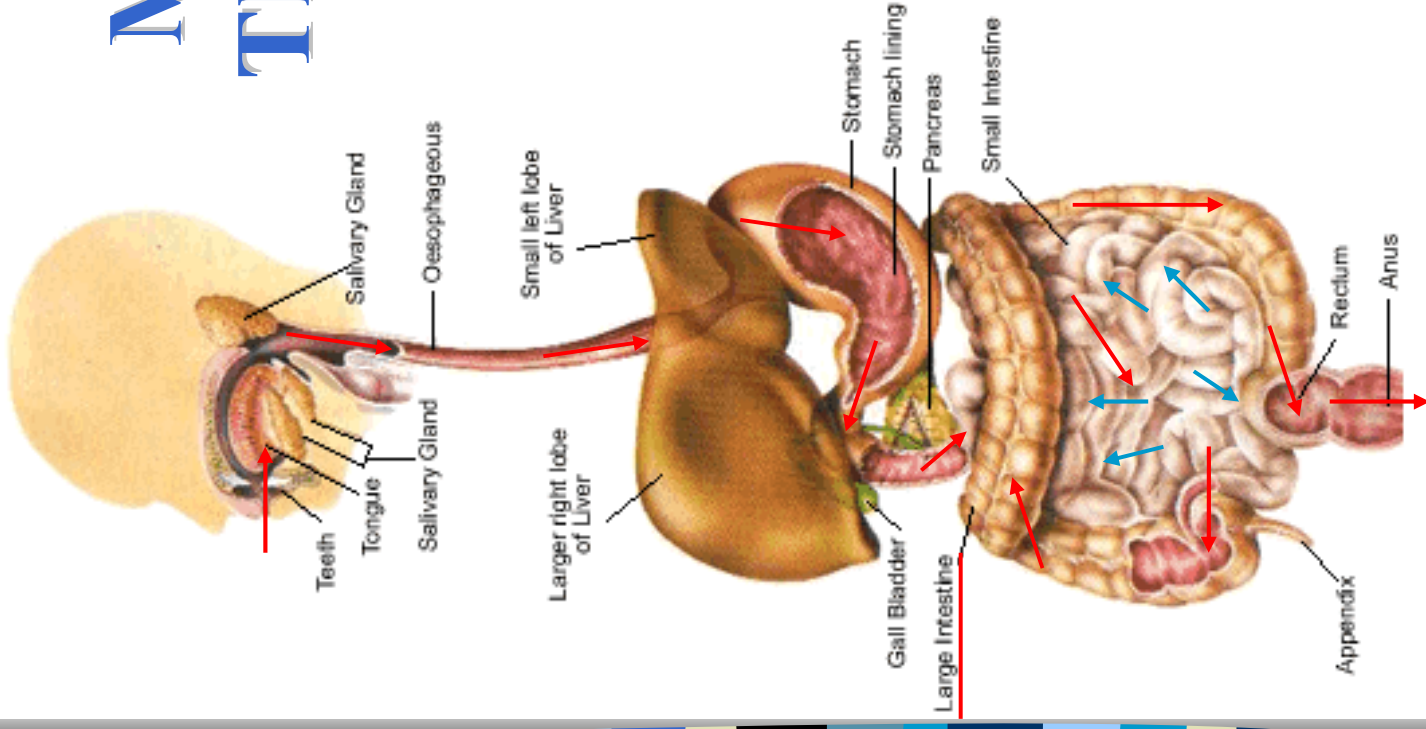
As the food is digested in the small intestine and dissolved into the juices from the pancreas, liver, and intestine, the contents of the intestine are mixed and pushed forward to allow further digestion.



→ **Movement of food**

Movement of Food Through the System

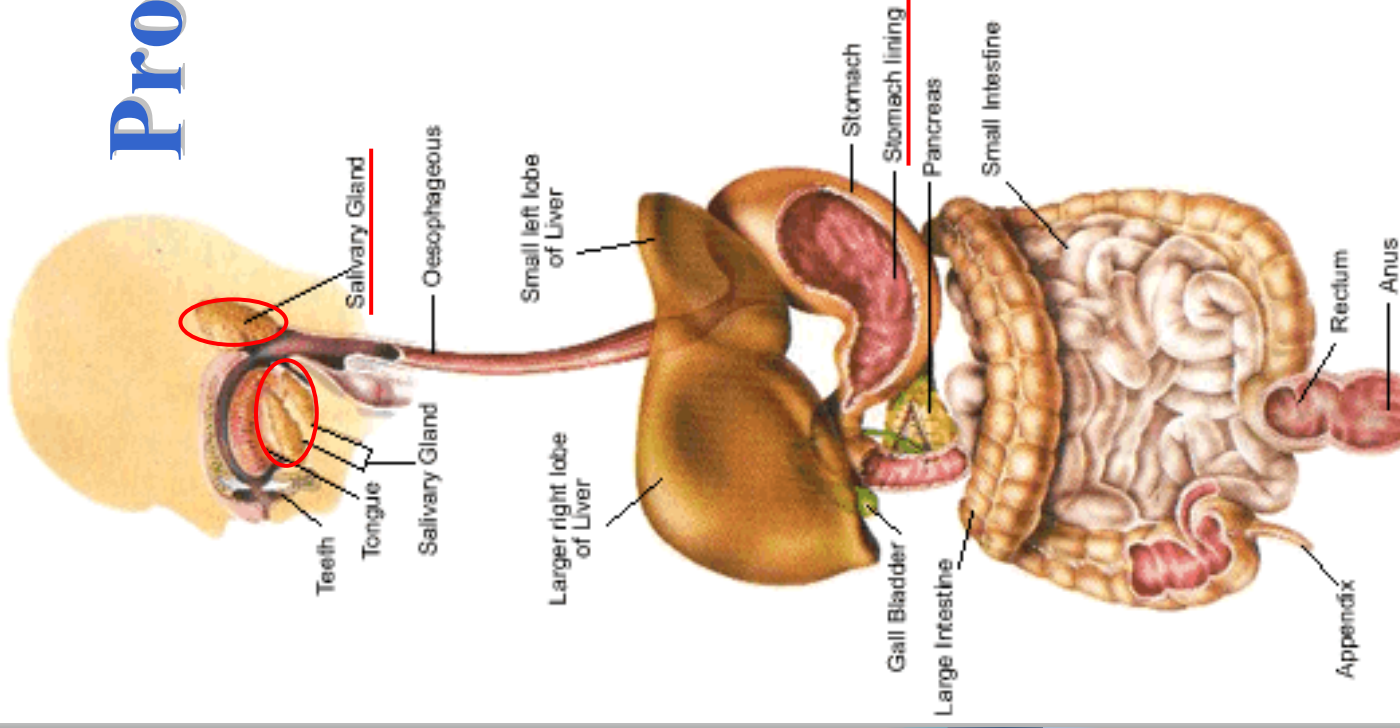
Finally, all of the digested nutrients are absorbed through the intestinal walls. The waste products of this process include undigested parts of the food, known as fiber, and older cells that have been shed from the mucosa. These materials are propelled into the colon, where they remain, usually for a day or two, until the feces are expelled by a bowel movement.



Production of Digestive Juices

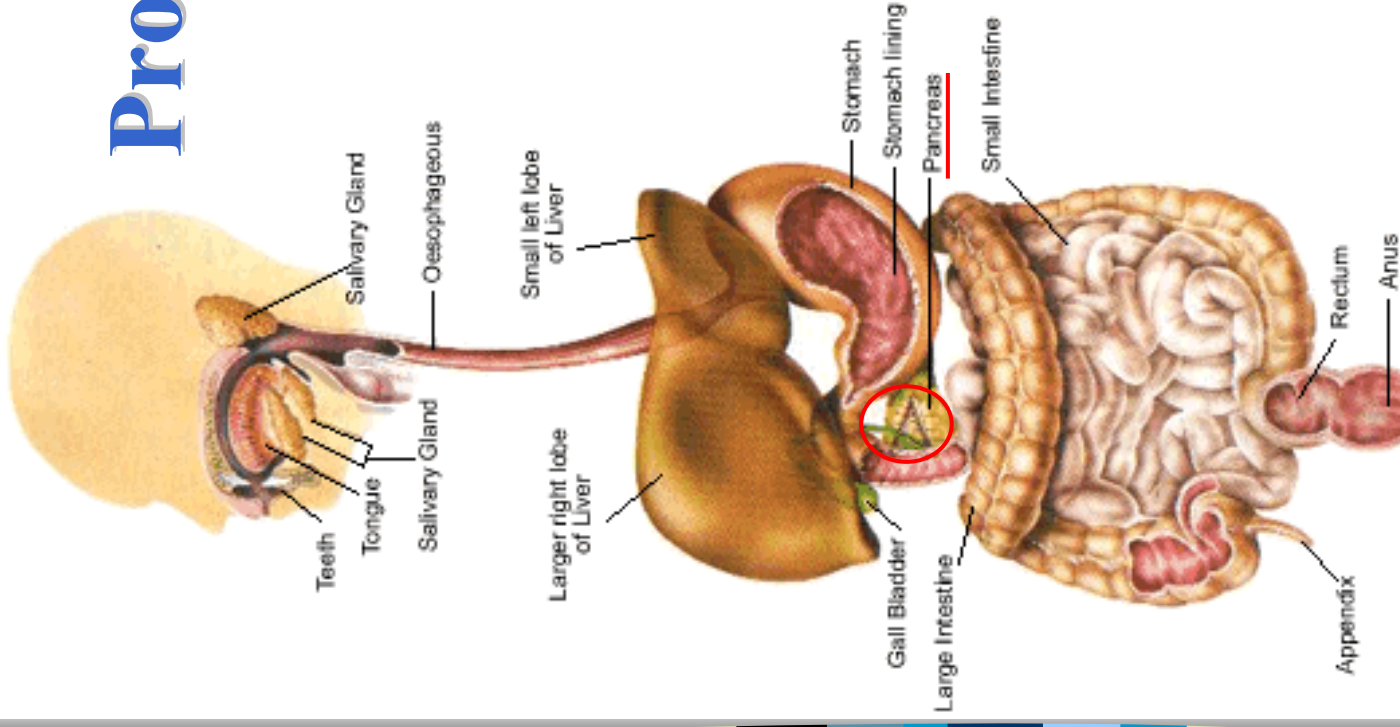
The glands that act first are in the mouth—the salivary glands. Saliva produced by these glands contains an enzyme that begins to digest the starch from food into smaller molecules.

The next set of digestive glands is in the stomach lining. They produce stomach acid and an enzyme that digests protein. One of the unsolved puzzles of the digestive system is why the acid juice of the stomach does not dissolve the tissue of the stomach itself. In most people, the stomach mucosa is able to resist the juice, although food and other tissues of the body cannot.



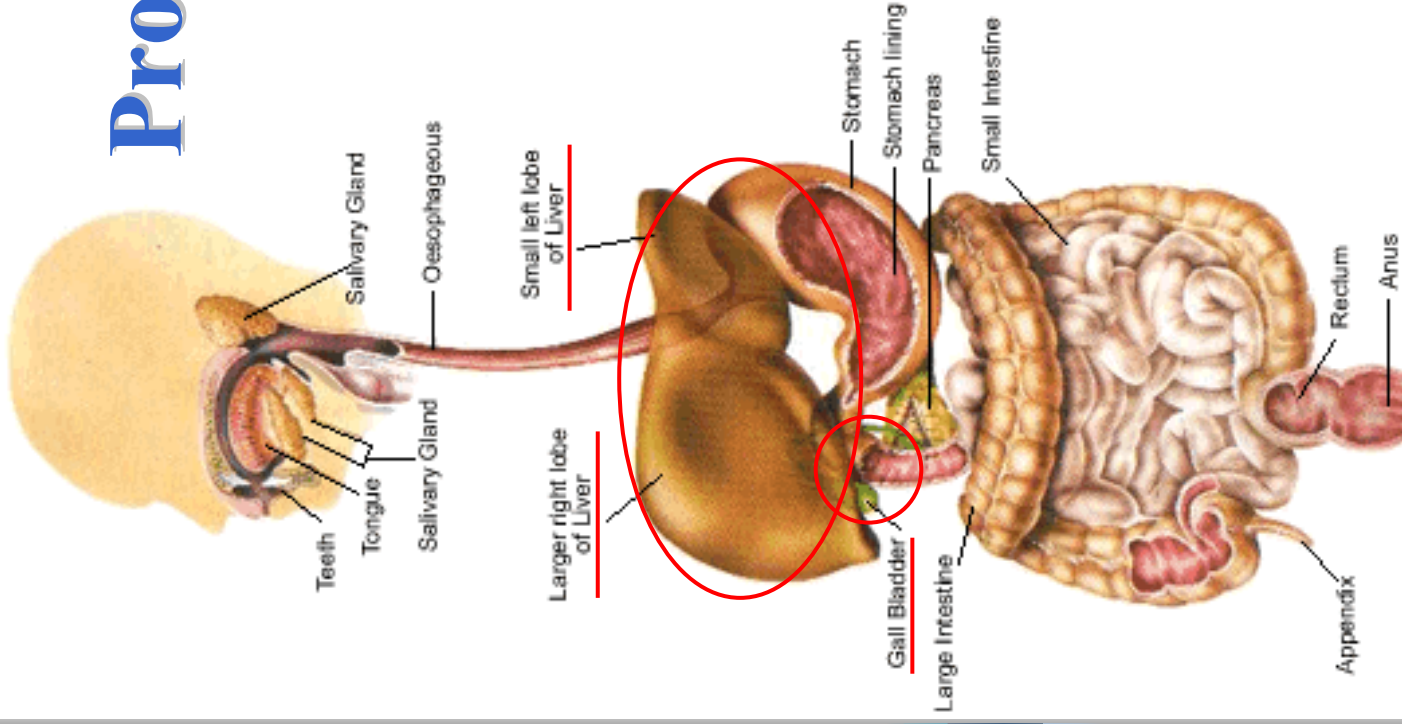
Production of Digestive Juices

After the stomach empties the food and juice mixture into the small intestine, the juices of two other digestive organs mix with the food to continue the process of digestion. One of these organs is the pancreas. It produces a juice that contains a wide array of enzymes to break down the carbohydrate, fat, and protein in food. Other enzymes that are active in the process come from glands in the wall of the intestine or even a part of that wall.



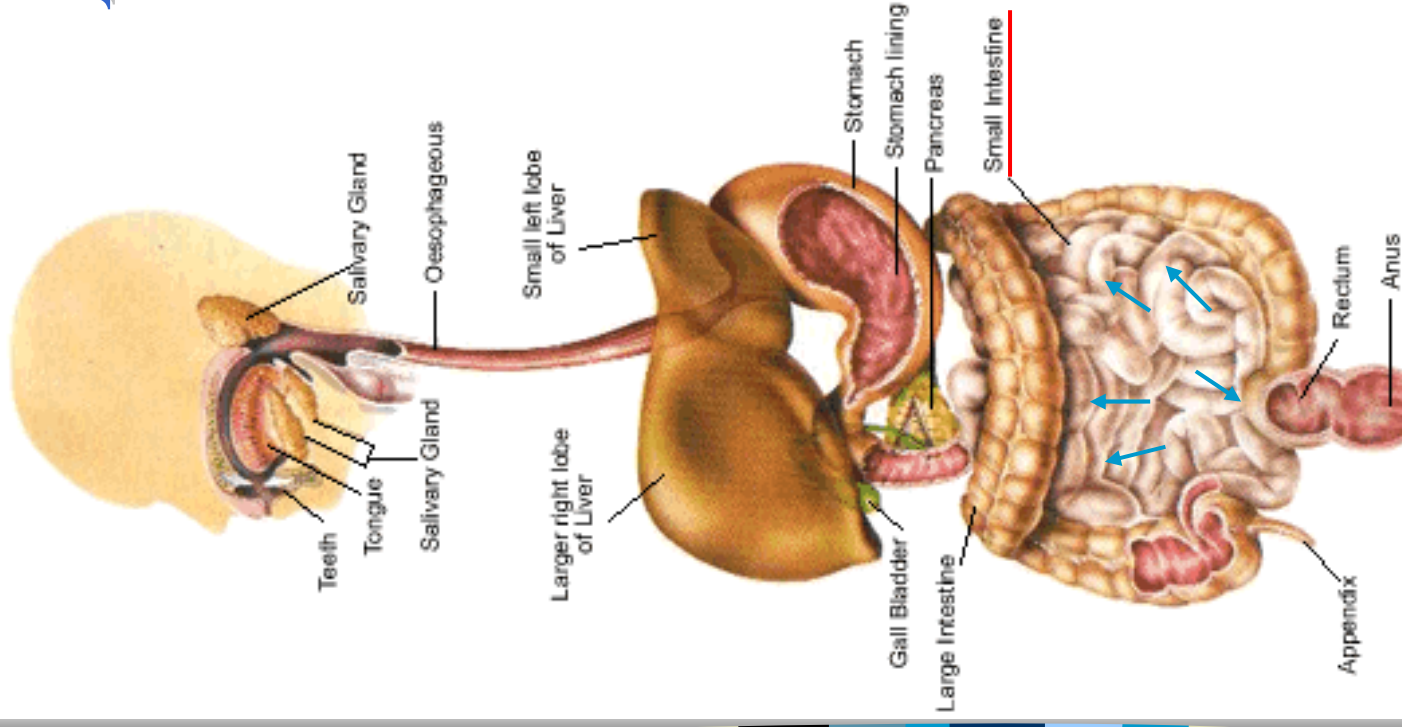
Production of Digestive Juices

The liver produces yet another digestive juice—bile. The bile is stored between meals in the gallbladder. At mealtime, it is squeezed out of the gallbladder into the bile ducts to reach the intestine and mix with the fat in our food. The bile acids dissolve the fat into the watery contents of the intestine, much like detergents that dissolve grease from a frying pan. After the fat is dissolved, it is digested by enzymes from the pancreas and the lining of the intestine.



Absorption and Transport of Nutrients

Digested molecules of food, as well as water and minerals from the diet, are absorbed from the cavity of the upper small intestine. Most absorbed materials cross the mucosa into the blood and are carried off in the bloodstream to other parts of the body for storage or further chemical change. As already noted, this part of the process varies with different types of nutrients.

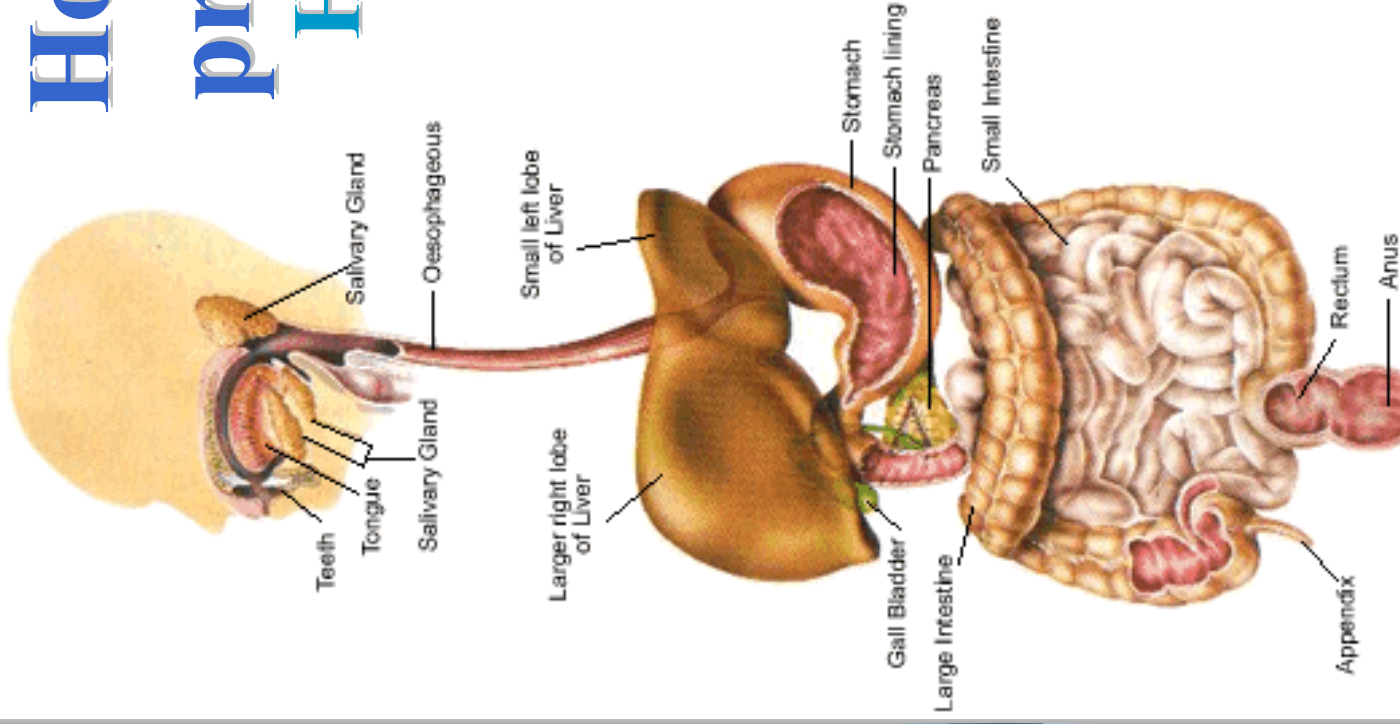


→ Absorption of food

How is the digestive process controlled?

Hormone Regulators

A fascinating feature of the digestive system is that it contains its own regulators. The major hormones that control the functions of the digestive system are produced and released by cells in the mucosa of the stomach and small intestine. These hormones are released into the blood of the digestive tract, travel back to the heart and through the arteries, and return to the digestive system, where they stimulate digestive juices and cause organ movement



How is the digestive process controlled?

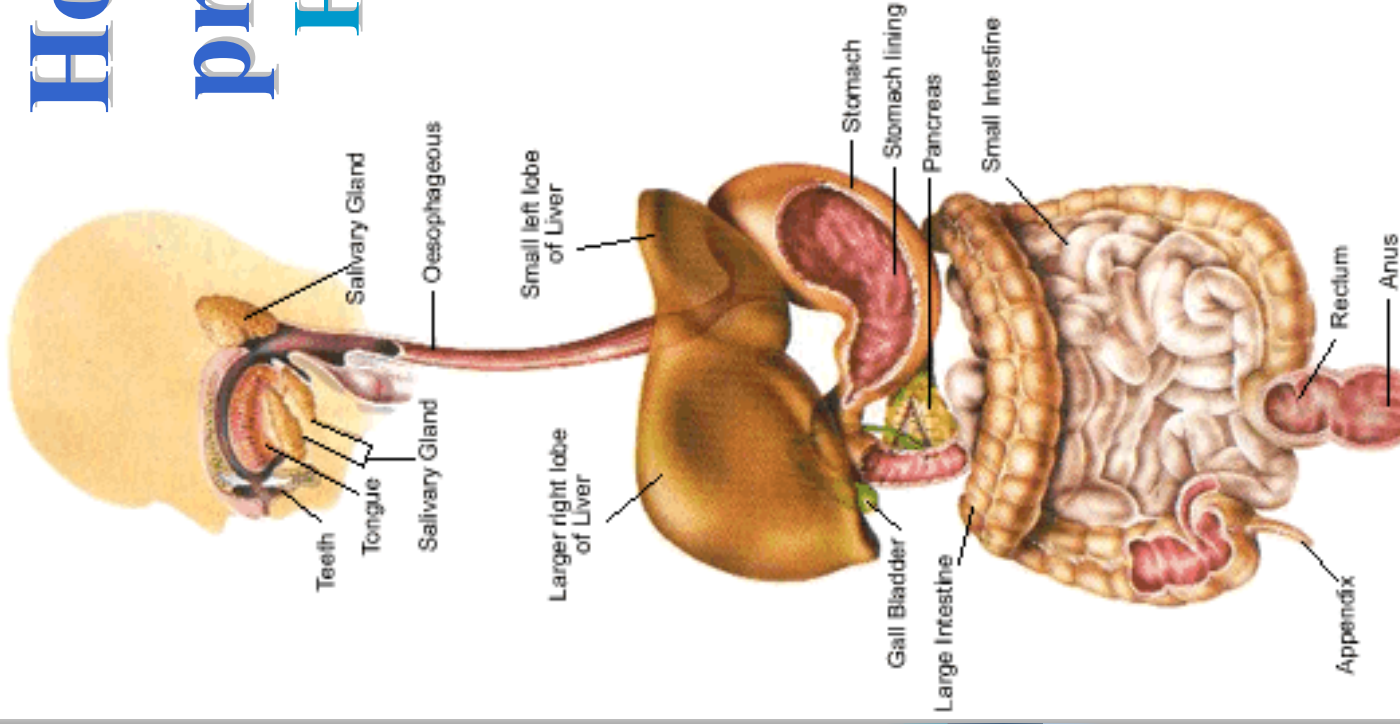
Hormone Regulators

The hormones that control digestion are gastrin, secretin, and cholecystokinin (CCK):

Gastrin causes the stomach to produce an acid for dissolving and digesting some foods. It is also necessary for the normal growth of the lining of the stomach, small intestine, and colon.

Secretin causes the pancreas to send out a digestive juice that is rich in bicarbonate. It stimulates the stomach to produce pepsin, an enzyme that digests protein, and it also stimulates the liver to produce bile.

CCK causes the pancreas to grow and to produce the enzymes of pancreatic juice, and it causes the gallbladder to empty.



How is the digestive process controlled?

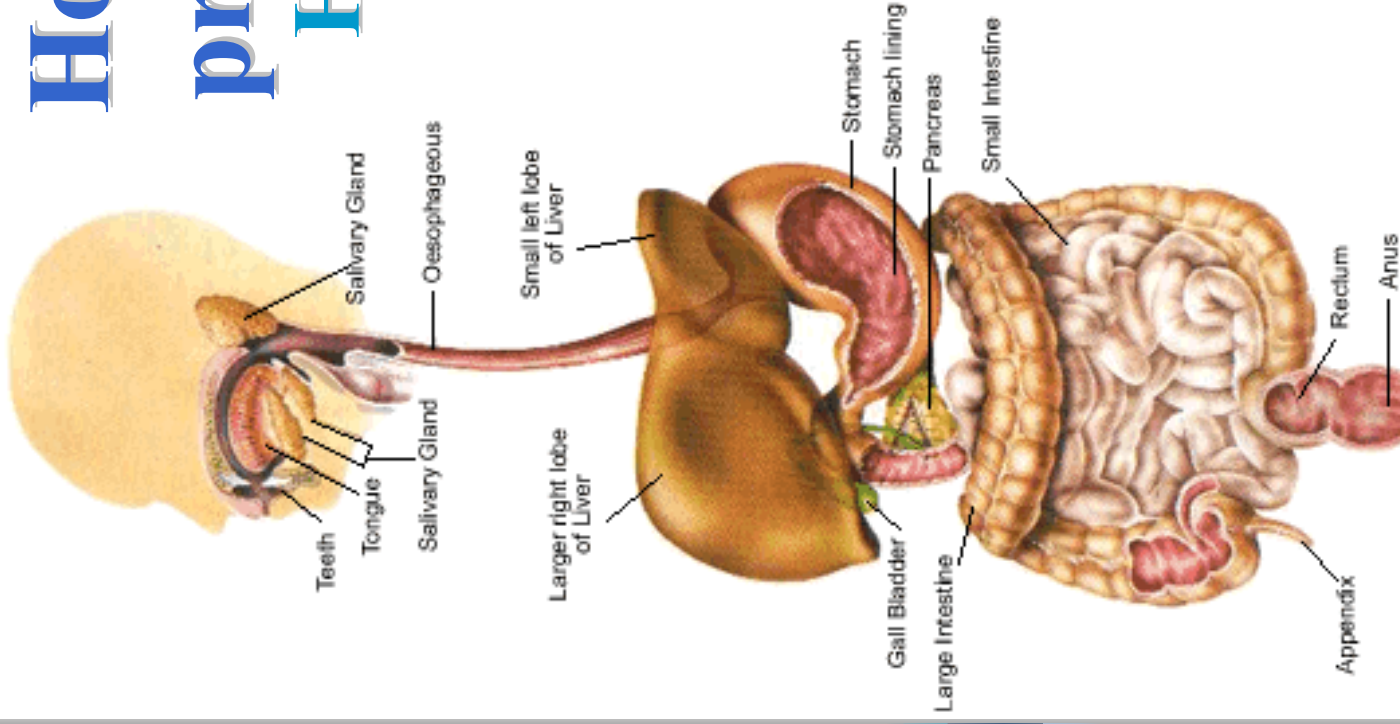
Hormone Regulators

Additional hormones in the digestive system regulate appetite:

Ghrelin is produced in the stomach and upper intestine in the absence of food in the digestive system and stimulates appetite.

Peptide YY is produced in the GI tract in response to a meal in the system and inhibits appetite.

Both of these hormones work on the brain to help regulate the intake of food for energy.

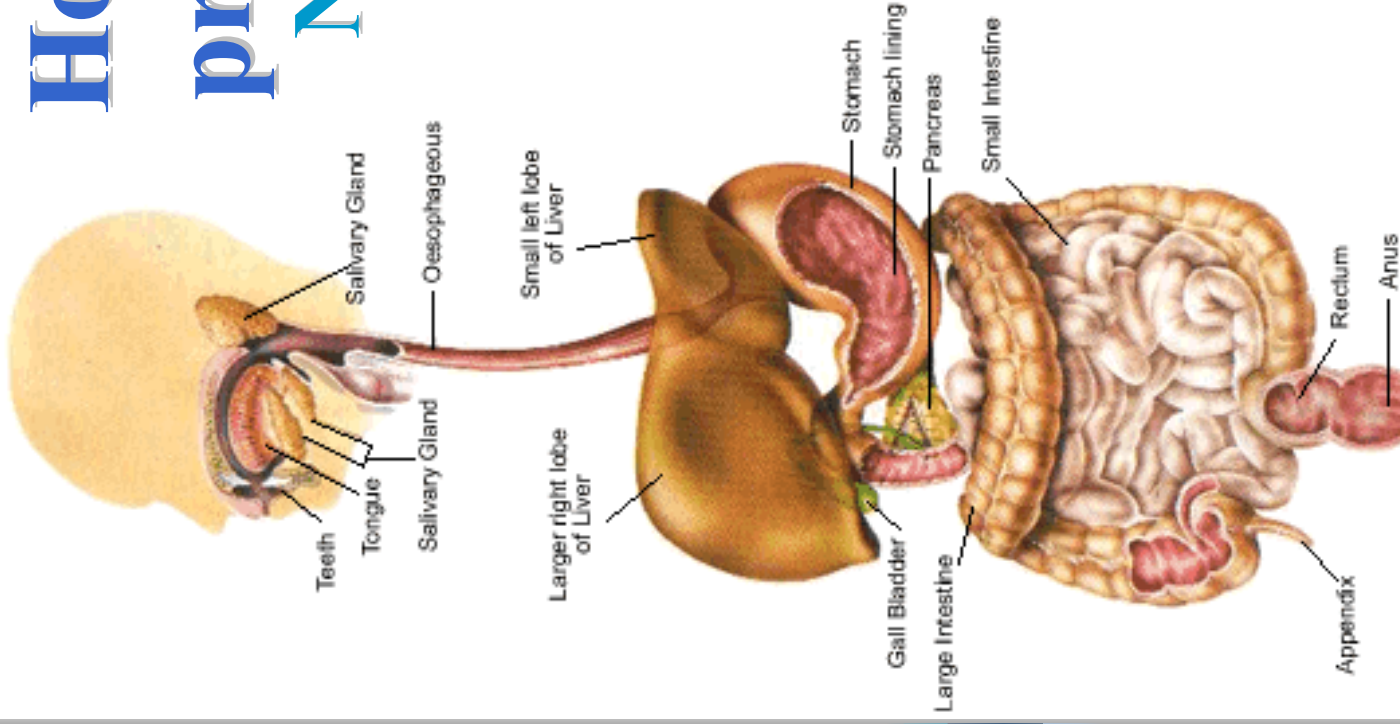


How is the digestive process controlled?

Nerve Regulators

Two types of nerves help to control the action of the digestive system. Extrinsic (outside) nerves come to the digestive organs from the unconscious part of the brain or from the spinal cord. They release a chemical called acetylcholine and another called adrenaline. Acetylcholine causes the muscle of the digestive organs to squeeze with more force and increase the "push" of food and juice through the digestive tract.

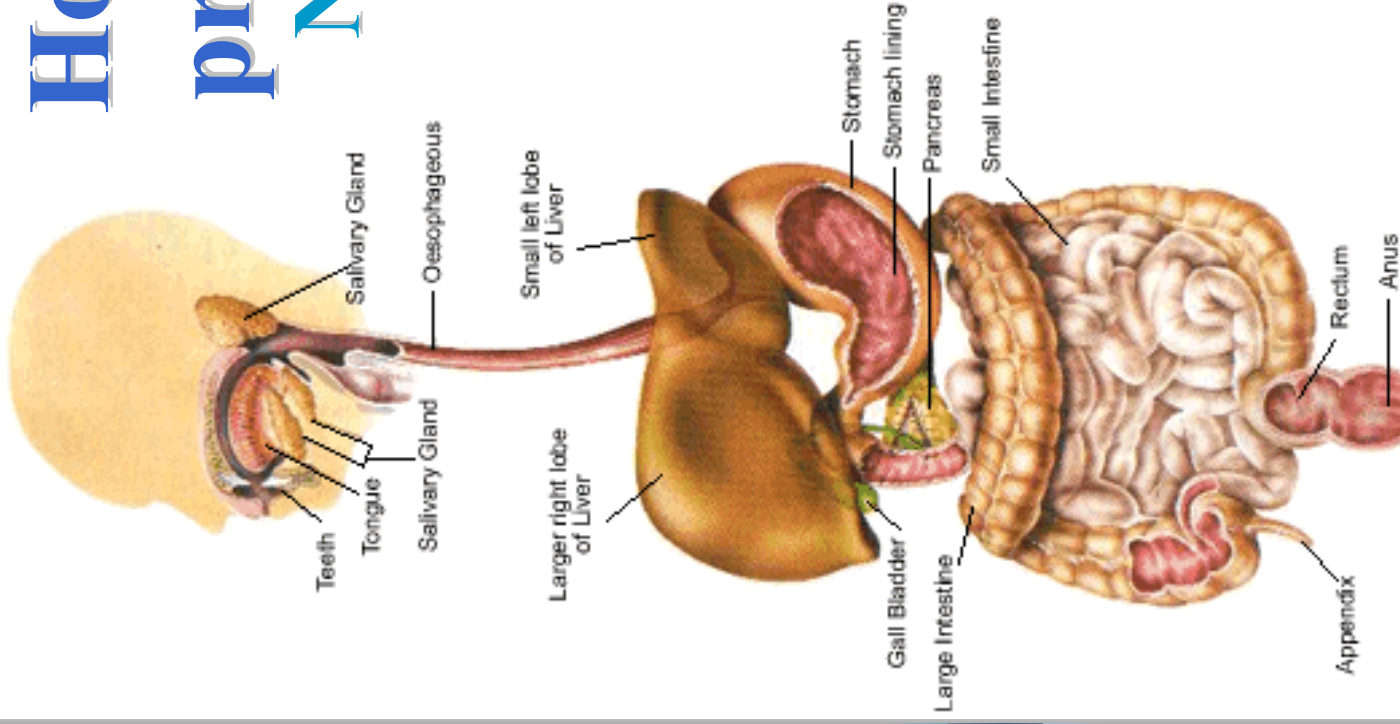
Acetylcholine also causes the stomach and pancreas to produce more digestive juice. Adrenaline relaxes the muscle of the stomach and intestine and decreases the flow of blood to these organs.



How is the digestive process controlled?

Nerve Regulators

Even more important, though, are the intrinsic (inside) nerves, which make up a very dense network embedded in the walls of the esophagus, stomach, small intestine, and colon. The intrinsic nerves are triggered to act when the walls of the hollow organs are stretched by food. They release many different substances that speed up or delay the movement of food and the production of juices by the digestive organs.



Finally!
Thanks!

