



Physiology of Digestive System

3rd Lecture

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Digestive System Function

- 1. Ingest Food**
- 2. Break down food into small molecules that can cross cell membranes**
- 3. Nutrient absorption**
- 4. Eliminate non-digestible wastes**

The stages of digestion are:

- 1. Mastication**
- 2. Digestion**
- 3. Absorption**

The three categories of nutrients

- 1. Protein (amino acids)**
- 2. Lipid or fat (fatty acid & glycerol)**
- 3. Carbohydrate (monosaccharaide)**

The Digestive System Consists of

a) Long hollow muscular tube or canal or tract called gastrointestinal tract or (GIT):

- it is about 5 meters long

b) Accessory glands: include:

- Salivary glands
- Liver and gall bladder
- Pancreas

Secretory glands

The secretory glands serve two primary functions throughout the alimentary tract: digestion (enzymes), lubrication and protection (mucus).

Several types of glands are found either in the wall of alimentary tract (goblet cells, tubular glands) or associated with alimentary tract (salivary glands, pancreas, and liver). These glands are stimulated by mechanical presence of food in a particular segment of the gastrointestinal tract.

A. Secretion of Mucus

Mucus is a thick secretion composed mainly of water, electrolytes, and a mixture of several glycoproteins (large polysaccharides bound with smaller quantities of protein).

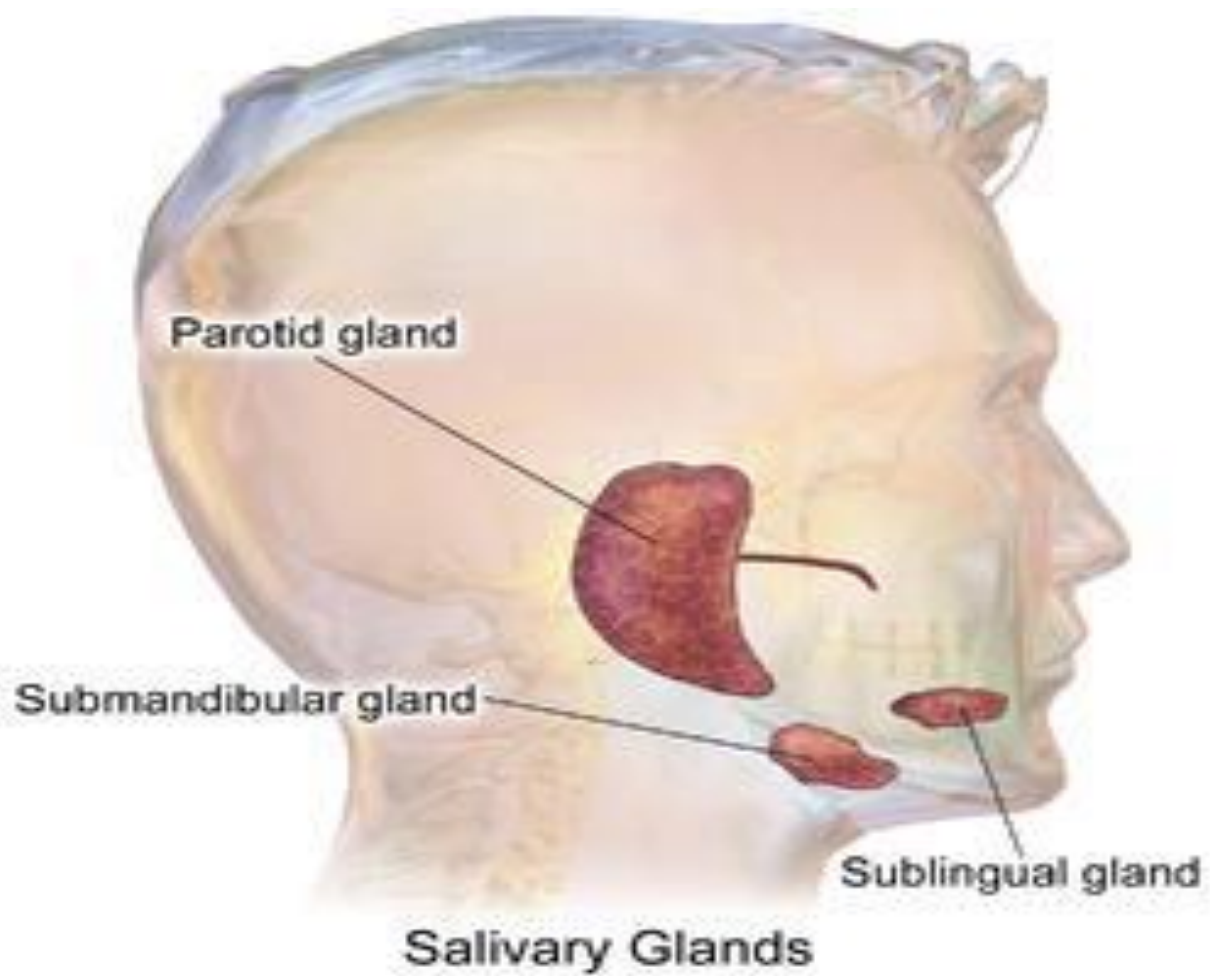
There are billions of Single-cell glands located on the surface of the epithelium in most parts of the gastrointestinal tract that extrude mucus directly onto the epithelial surface known as (goblet cells). Also mucus is secreted by other glands (e.g. salivary glands)

Mucus serves multiple functions in the alimentary tract:

- 1. Mucus act as a lubricant to allow easy slippage of food.**
- 2. Mucus has adherent qualities.**
- 3. Mucus is strongly resistant to digestion by the gastrointestinal enzymes, so it protects the epithelial surfaces of alimentary tract from digestion.**
- 4. The glycoproteins of mucus have amphoteric properties, which means that they are capable of buffering small amounts of either Acids or Alkalis.**

B. Secretion of Saliva

The principal glands of salivation are the parotid glands located between the ear and the jaw, submandibular glands located under the jaw, and sublingual glands located on the floor of mouth under the tongue; in addition, there are many very small buccal glands located in the mucous membrane lining the cheeks and mouth. Under basal awake conditions, about 0.5 milliliter of saliva, almost entirely of the mucous type, is secreted each minute; but during sleep, secretion becomes very little. Daily secretion of saliva normally ranges between 800 and 1500 milliliters.



Saliva contains two major types of protein secretion: (1) serous secretion that contains ptyalin (α -amylase), which is an enzyme for digesting starches, and (2) mucus secretion that contains mucin for lubricating and for surface protective purposes.

The parotid glands secrete almost entirely the serous type of secretion, while the submandibular and sublingual glands secrete both serous secretion and mucus, but buccal glands secrete only mucus.

In addition to protein secretion, saliva contains large quantities of potassium and bicarbonate ions, but the concentrations of both sodium and chloride ions are several times less in saliva than in plasma. Therefore, saliva has a pH between 6.0 and 7.0 which is a favorable range for the digestive action of ptyalin.

Saliva performs a number of important functions:

1. Oral Hygiene:

The mouth is loaded with pathogenic bacteria that can easily destroy tissues and cause dental caries, so saliva helps prevent the deteriorative processes.

2. Mastication & swallowing:

Saliva contains mucus that lubricates the food while the teeth chew it up and make it easier to swallow.

3. Digestion:

Saliva contains α -amylase (ptyalin) which starts to break down starch into simpler sugars before the food even leaves the mouth.

4. Buffering:

The buffers in saliva help maintain the oral pH around 7.0 which is suitable for the activity of digestive enzymes.

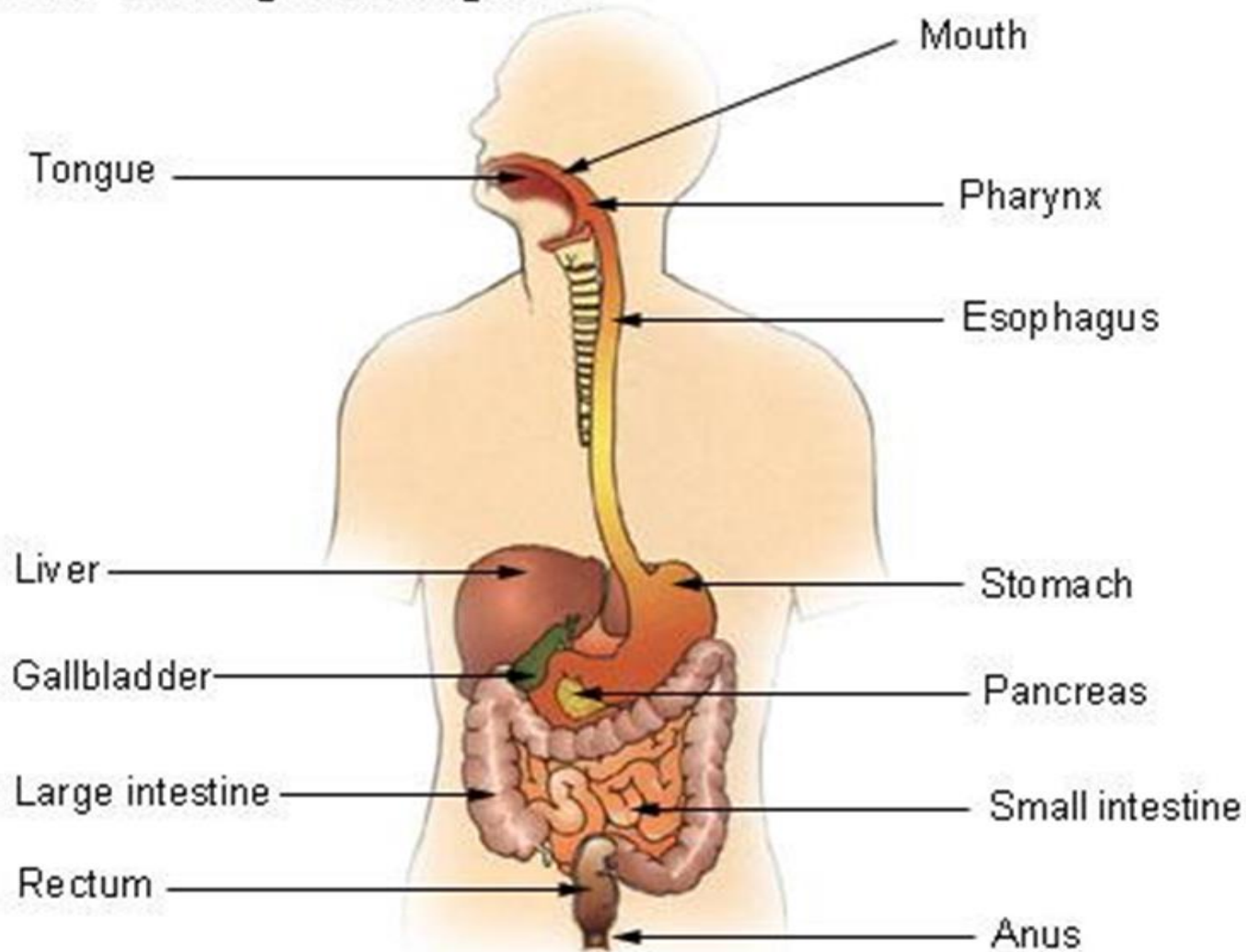
5. Taste & Speech:

Saliva keeps the mouth moist, serves as a solvent for the molecules that stimulate the taste buds, and aids speech by facilitating movements of the lips and tongue.

Gastrointestinal tract or (GIT) Structures included:

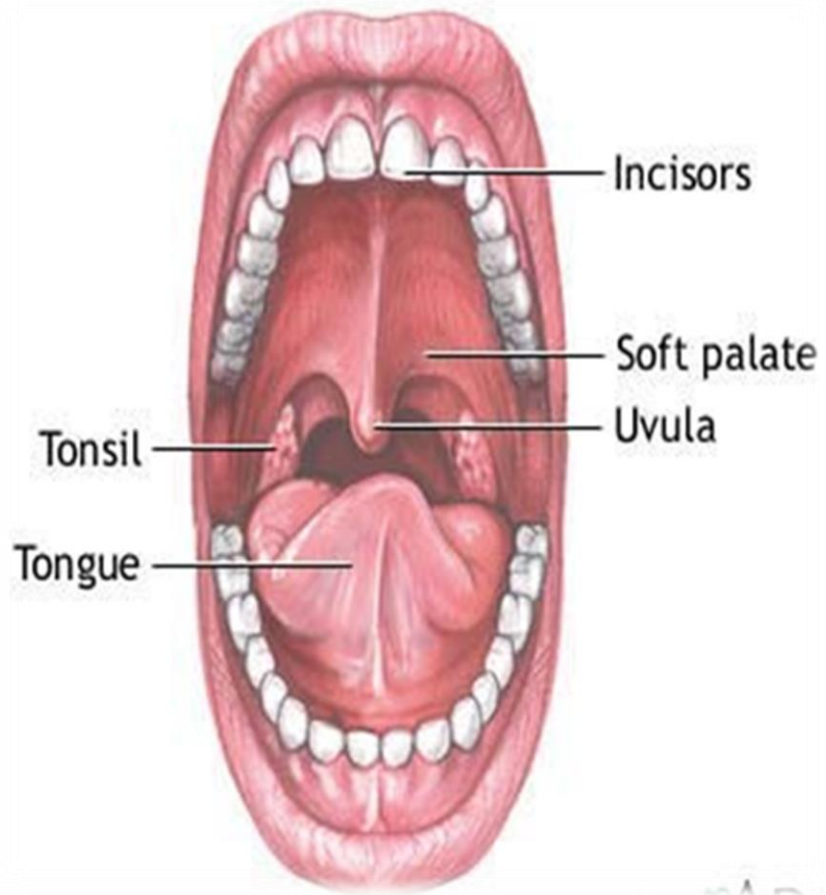
- 1. Mouth**
- 2. Pharynx**
- 3. Esophagus**
- 4. Stomach**
- 5. Small intestine**
- 6. Large Intestine**
- 7. Rectum**

Organs of the Digestive System



Mouth

- **Mechanical digestion - Teeth bite off and chew food into a soft pulp that is easy to swallow. The tongue is used for moving food around in the mouth**
- **Chemical digestion – saliva by Salivary glands produce saliva which contains the digestive enzyme amylase.**



Pharynx

The pharynx is a part of the gastrointestinal system and also the respiratory system. The pharynx receives air from the nares or the mouth and it also receives food from the mouth.

Epiglottis is a flap-like structure at the back of the throat that closes over the trachea preventing food from entering it. It is located in the Pharynx.

Esophagus

The esophagus is a muscular tube. It takes food from the throat and pushes it down through the neck, and into the stomach.

It moves food by waves of muscle contraction called peristalsis.

- 1. What is the digestive system?**
 - a. The body's breathing system.**
 - b. The body's system of nerves.**
 - c. The body's food-processing system.**
 - d. The body's blood-transporting**

Answer: C

- 2. Digestion begins in the mouth. Which of the following statement is INCORRECT?**
 - a. The tongue aids in the digestion of the food.**
 - b. The saliva changes some of the starches in the food to sugar.**
 - c. The tongue keeps the food in place in the mouth while the food is being chewed.**
 - d. The digestive juices can react more easily with the food when chewed.**

Answer: a

3. Where does food pass through between the mouth and the stomach?

- a. The gullet.**
- b. The rectum.**
- c. The small intestine.**
- d. The large intestine.**

Answer: a

4. What prevents food from entering the windpipe?

- a. The uvula.**
- b. The tongue.**
- c. The trachea.**
- d. The epiglottis.**

Answer: d

5. What happens when food reaches the stomach?

- a. Nothing. No digestion occurs in the stomach.**
- b. The food moves quickly into the small intestine.**
- c. Juices mix with the food and stomach muscles squeeze it.**
- d. The food is completely digested and is absorbed by tiny blood vessels.**

Answer: c

6. Where does the partly-digested food go after it leaves the stomach?

- a. The gullet.**
- b. The appendix.**
- c. The small intestine.**
- d. The large intestine.**

Answer: c