

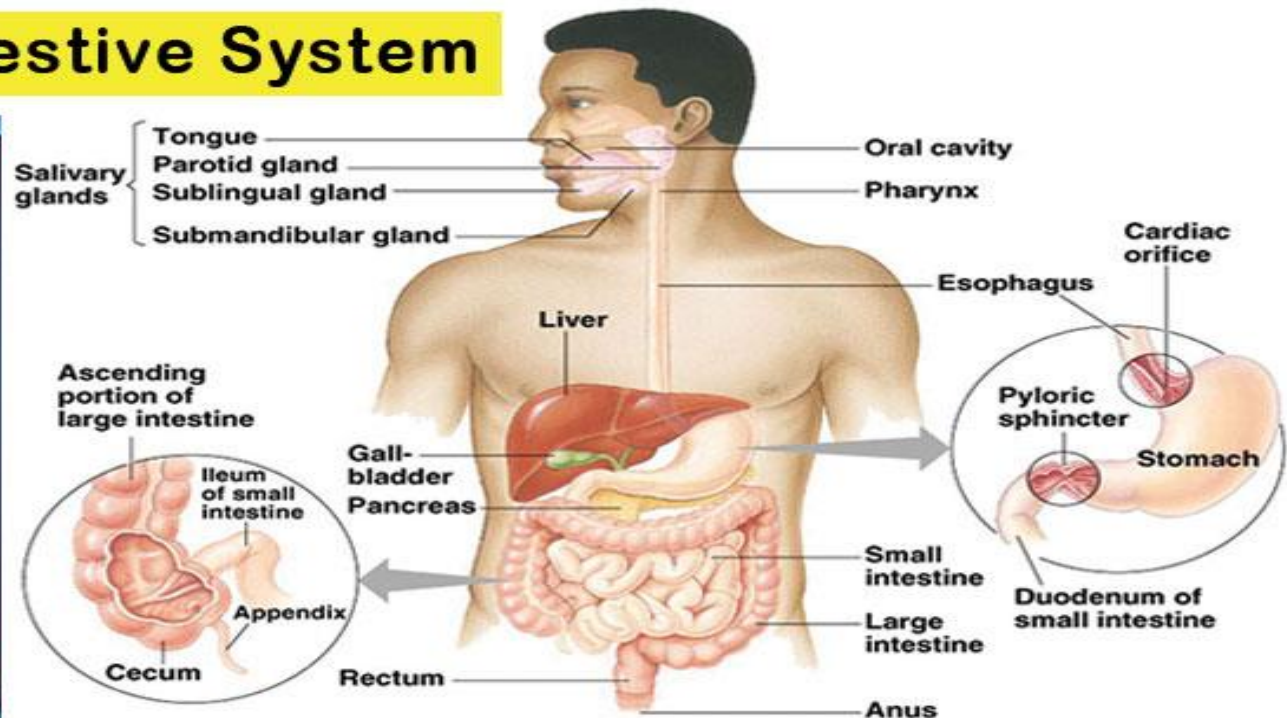
Physiology of the Gastrointestinal Tract Part /1

Second Stage/ University of Anbar-College of Dentistry
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Ph.D. Human Physiology/ Dep. Basic Science



The Human Digestive System



The Human Digestive System



The alimentary tract provides the body with a continual supply of water, electrolytes, vitamins, and nutrients.

The Human Digestive System



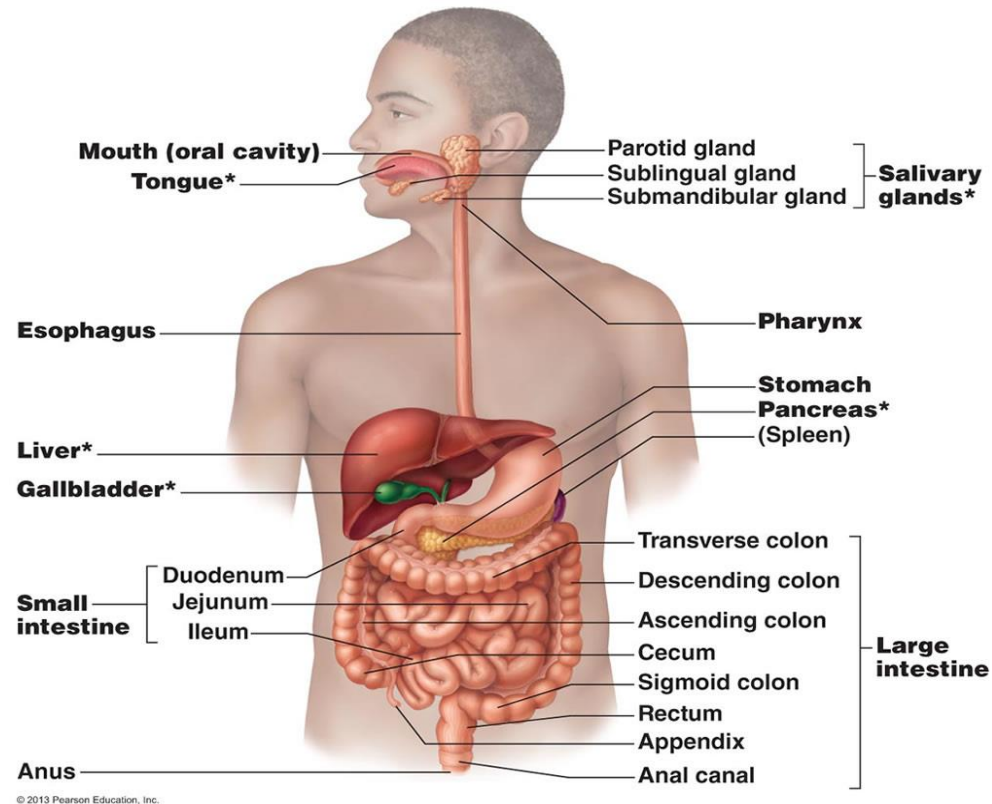
This requires :

- 1- movement of food through the alimentary tract.**
- 2- secretion of digestive juices and digestion of food.**
- 3- absorption of digestive products (water, electrolytes, and vitamins).**
- 4- circulation of blood to carry away absorbed Substances.**
- 5- nervous and hormonal control of all these functions**

The Human Digestive System

Main organs of the Digestive System:

- ✓ **Mouth**
- ✓ **Pharynx**
- ✓ **Esophagus**
- ✓ **Stomach**
- ✓ **Small intestine**
- ✓ **Large intestine.**



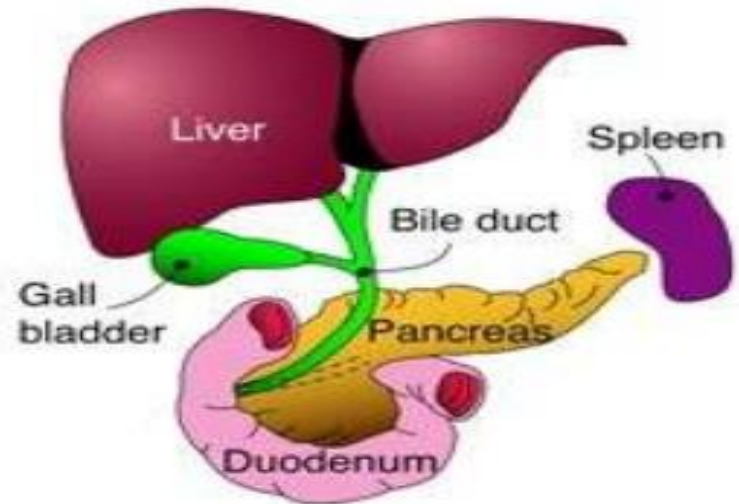
Together this makes a tube called the **Digestive tract**

The Human Digestive System

Accessory organs of the Digestive System:

- 1) **Teeth**
- 2) **Tongue**
- 3) **Liver**
- 4) **Pancreas**
- 5) **Gall Bladder**
- 6) **Salivary Gland**

- The accessory organs of the digestive system are not a part of the alimentary canal (food does not pass through them), but they assist the alimentary organs in the process of digestion



The Human Digestive System

Functions of Digestive System:-

- 1-Ingestion.
- 2-Secretion.
- 3-Mixing & Propulsion.
- 4-Digestion

A-Mechanical :-Food is broken down mechanically, with movement.

B-Chemical:- Food is broken down with a chemical or enzyme

5-Absorption.

6-Defecation.

The Human Digestive System

The Gastrointestinal Tract Has Its Own Nervous System Called the:

(Enteric Nervous System) in the wall of the gut beginning in the esophagus and extending all the way to the anus. The enteric system is composed mainly of two plexuses:

1-The Myenteric plexus, or Auerbach's plexus outer plexus located between the muscle layers, Stimulation cause :

The Human Digestive System

1-The Myenteric plexus, or Auerbach's plexus

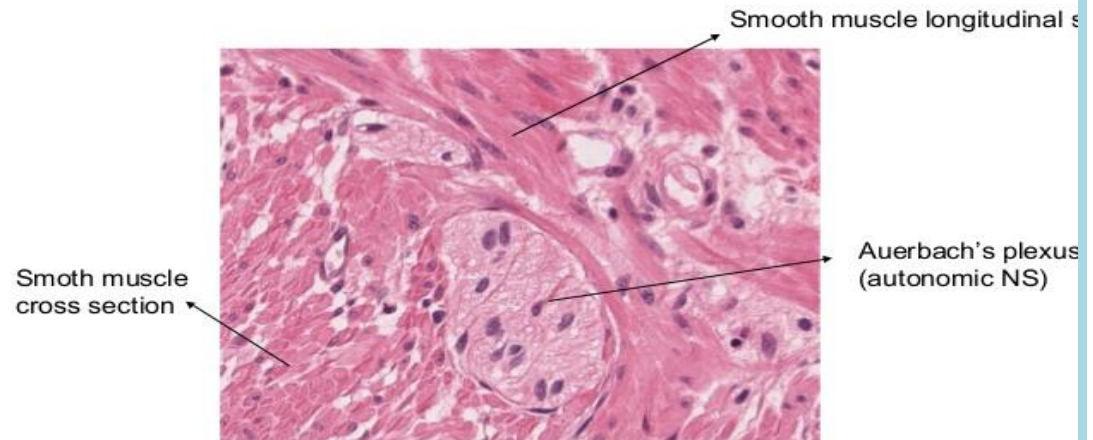
Stimulation cause :

- 1- Increased intensity of rhythmical contraction.**
- 2- Increased rate of contraction.**
- 3- Increased velocity of conduction.**
- 4- The myenteric plexus is also useful for inhibiting the pyloric sphincter which controls emptying of the stomach.**

The Myenteric plexus, or Auerbach's plexus

The Myenteric Plexus

Auerbach's plexus (myenteric plexus)



Slide 49 Esophagus

Myenteric
(Auerbach's)
plexus

This image shows a histological section of the esophagus. It displays the characteristic layers of the esophageal wall, including the muscularis externa. The myenteric plexus is visible as a cluster of cells located between the two layers of smooth muscle. Blue arrows point from the text label to the myenteric plexus in the image.

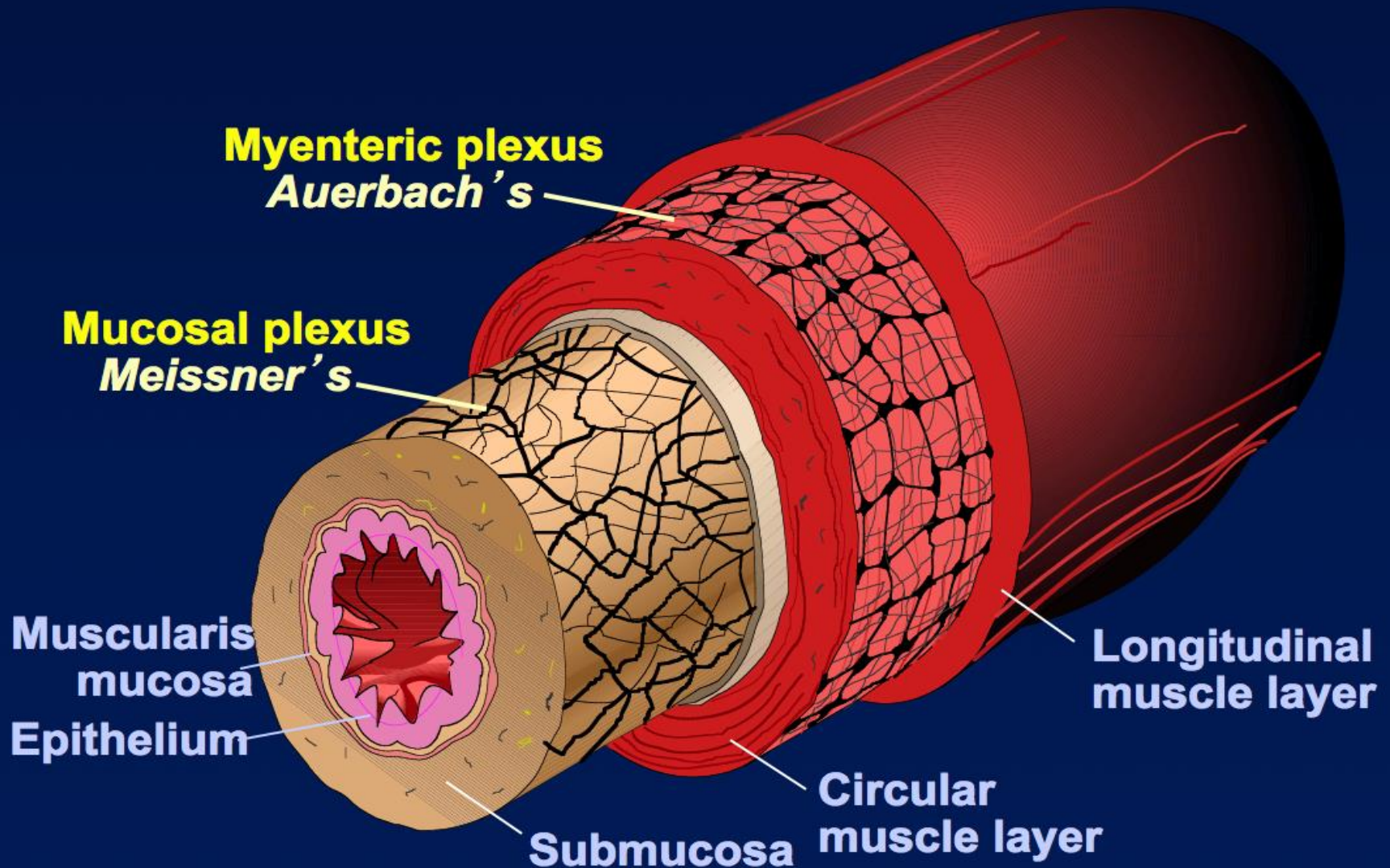
2-The Submucosal plexus, or Meissner's plexus:

is an inner plexus that lies in the submucosa.

1- Controls function within small segments of the Gastrointestinal wall.

2- Helps control local intestinal secretions, absorption, blood flow and local contraction of the muscularis mucosa.

Submucosal plexus, or Meissner's plexus



The Human Digestive System

Autonomic Control of the Gastrointestinal Tract:

1-The Parasympathetic Nerves

Increase the Activity of the Enteric Nervous System.

The parasympathetic supply to the gut is made up of **cranial** and **sacral** divisions:

The cranial parasympathetics innervate, by way of the vagus nerves, the esophagus, stomach, small intestine, pancreas, and first half of the large intestine.

The sacral parasympathetics innervate, by way of the pelvic nerves, the distal half of the large intestine

The Human Digestive System

2- The Sympathetic Nervous System

Usually Inhibits Activity in the Gastrointestinal Tract, Causing Many Effects Opposite to Those of the Parasympathetic System

The Human Digestive System

Ingestion of food: followed by Mastication (**Chewing**) and Swallowing (**Deglutition**).

Mastication (Chewing): The teeth are designed for chewing, the anterior teeth (**incisors**) providing a strong cutting action and the posterior teeth (**molars**), a grinding action

The Human Digestive System

Part: 1

Mouth

- ✓ Digestion actually begins in the mouth.
 - ✓ Food enters in the mouth or oral cavity.
 - ✓ Tasting, Mechanical breakdown of food.
- , and the tongue moves the pieces around so that saliva can be mixed with them, this begins the digestion.

The Human Digestive System

Part: 1

Structures in the mouth that helps digestion:

- **Teeth-cut, tear, crush and grind food.**
- **Salivary glands- produce and secrete saliva into oral cavity.**
- **Parotid (beneath the cheeks).**
- **Submaxillary (below the jaw bone).**
- **Sublingual(below the tongue).**

The Mouth

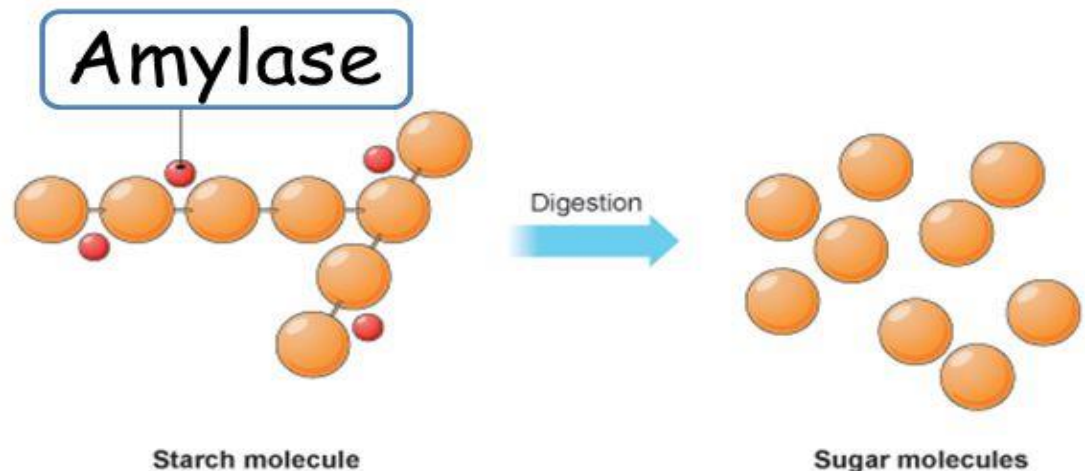
The mouth performs two functions:

1. Mechanical digestion

involves chewing - teeth chop and grind food into small pieces.

2. Mixing food with saliva

saliva starts the break down of carbohydrates (starch) **using an enzyme** called **amylase**.



The Human Digestive System

Part: 1

Functional Movements in the Gastrointestinal Tract

Two types of movement occur in the gastrointestinal tract:-

- 1-Propulsive (Peristalsis) movements**
- 2- Mixing movements**

Peristalsis is the basic propulsive movement of the gastrointestinal tract

Longitudinal muscle

Circular muscle

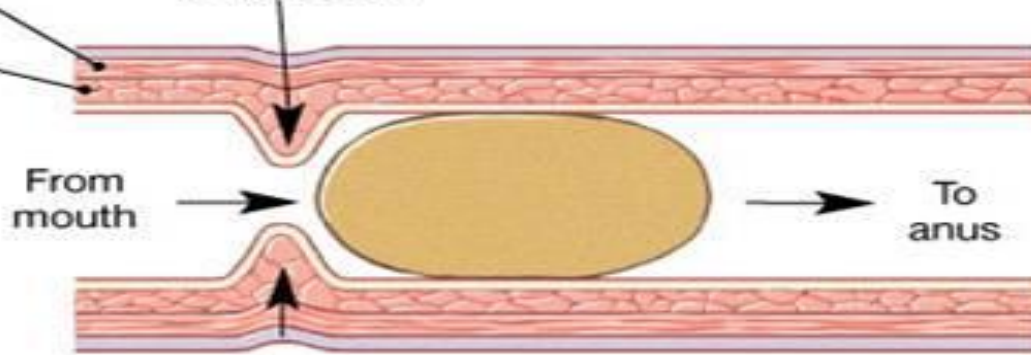
Contraction

From mouth

To anus

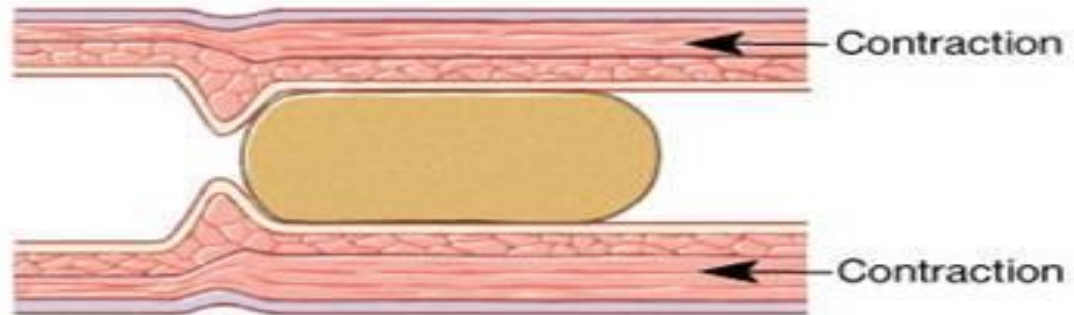
STEP 1:

Contraction of circular muscles behind food mass



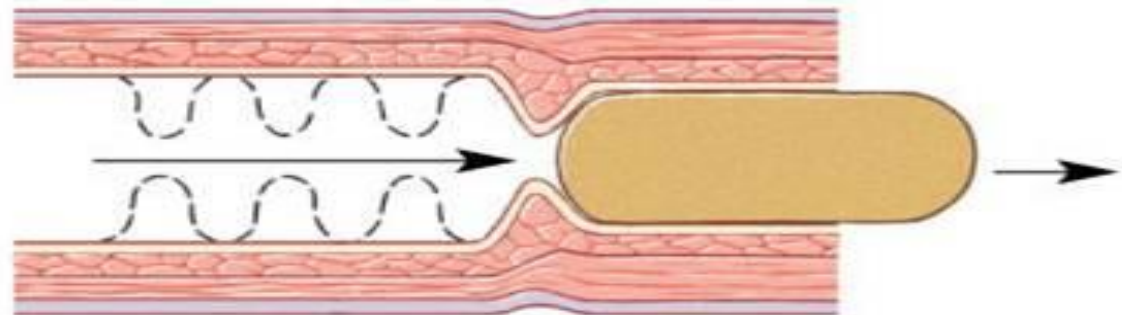
STEP 2:

Contraction of longitudinal muscles ahead of food mass



STEP 3:

Contraction of circular muscle layer forces food mass forward



Chewing is important for:

1-Digestion of all foods, but especially important for most fruits and raw vegetables because these have indigestible cellulose membranes around their nutrient portions that must be broken before the food can be digested.

2- Chewing the digestion of food for simple reason: Digestive enzymes (in saliva) act only on the surfaces of food particles; therefore the rate of digestion is absolutely dependent on the total surface area exposed to the digestive secretions

Saliva & Salivary glands:

The principal glands of salivation are the **parotid**, **submandibular** and **sublingual glands**.

Saliva contains two major types of protein secretion:

1- The serous secretion (watery saliva) contains ptyalin (α -amylase), which is an enzyme for digesting starches.

2-The mucous secretion contains mucin for **lubrication** and for **surface protection**.

Saliva Contains low **Concentrations of potassium and Bicarbonate Ions** and high **Concentrations of sodium and chloride Ions**.

Swallowing (Deglutition)

Swallowing is a complicated mechanism, principally because the pharynx subserves respiration as well as swallowing. In general, swallowing can be divided into:

- 1- A voluntary stage in oral cavity** which initiates the swallowing process; When the food is ready for swallowing, it is voluntarily pushed into the pharynx by the tongue.
- 2- A pharyngeal stage**, which is involuntary and constitutes passage of food through the pharynx into the esophagus.
- 3- An esophageal stage**, involuntary phase that transports food from the pharynx to the stomach

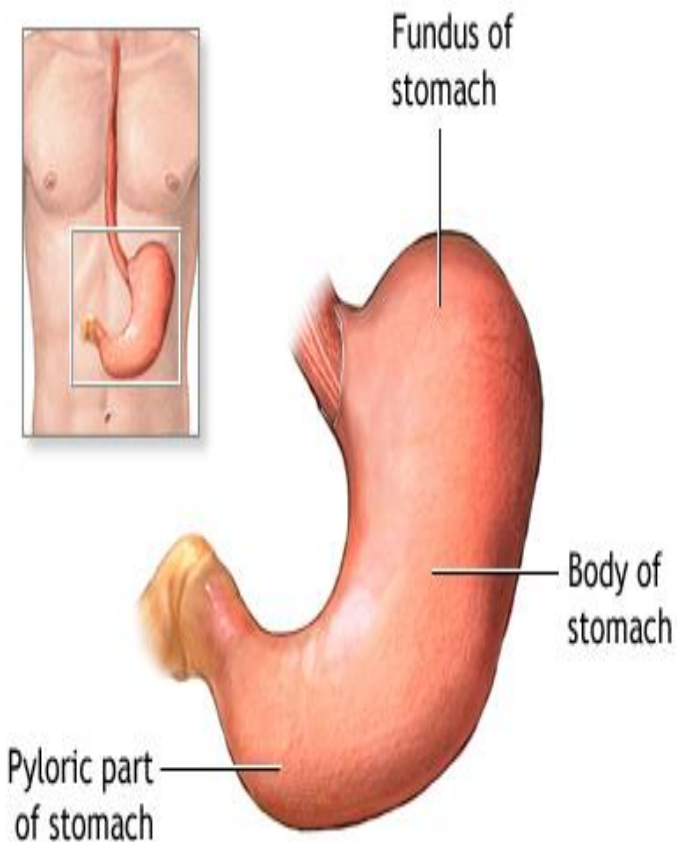
Stomach

There Are Three Functions of the Stomach:-

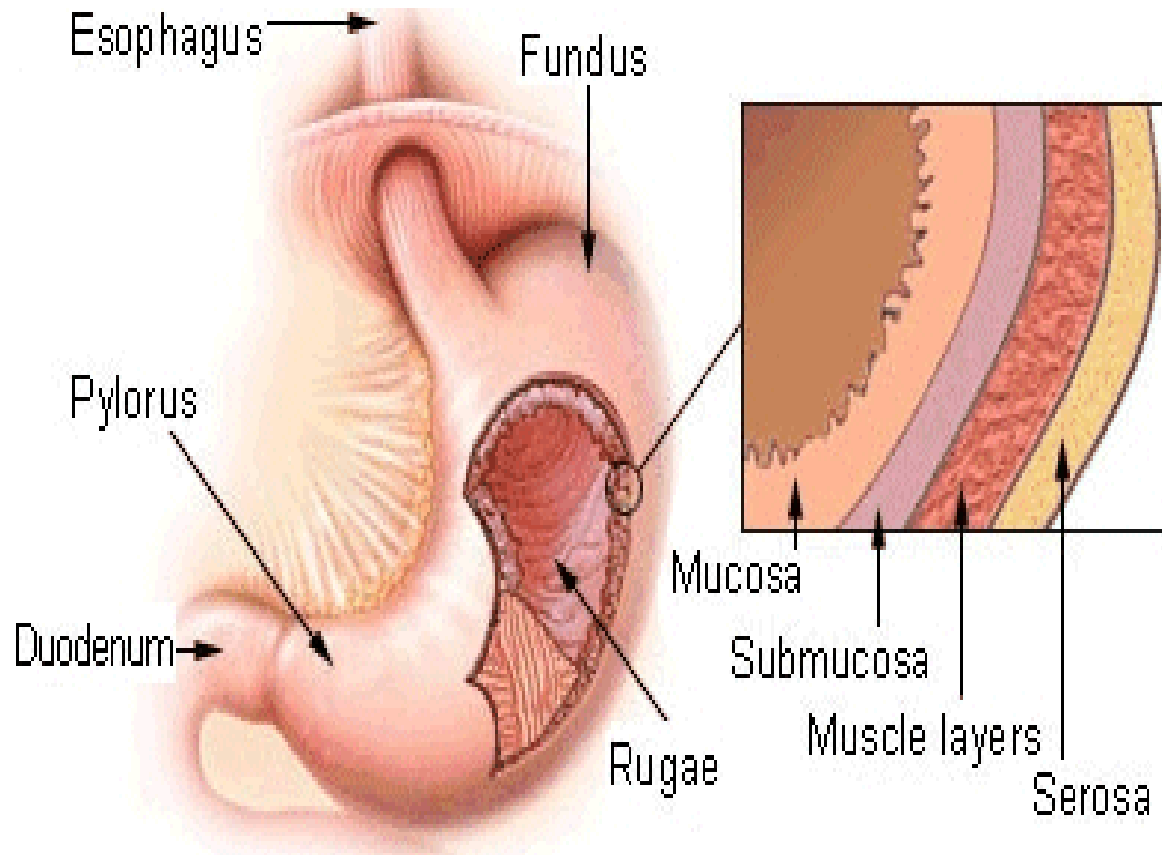
1- Storage of food until the food can be processed in the duodenum

2- Mixing of food with gastric secretions until it forms a semifluid mixture called chyme

3- Emptying of food into the intestine at a rate suitable for proper digestion and absorpti



Stomach



The Human Digestive System

Part: 1

Tongue

- ❖ **Mixes and rolls food into tiny mashed up bits (Bolus).**
- ❖ **Pushes the bolus toward the pharynx and into the esophagus when swallowing.**



References

1-Essentials of Physiology for Dental Students. K Sembulingam and Prema Sembulingam ,2016, four Edition , Jaypee Brothers Medical Publishers.

2- Human Physiology. Stuart Ira Fox., TWELFTH EDITION,2017. Published by McGraw-Hill

A close-up photograph of a person's hands holding a white rectangular card. The card has the words "Thank You" written in a vibrant purple, elegant cursive font. The person holding the card is wearing a light-colored, possibly white, button-down shirt. The background is softly blurred, showing what appears to be a brown, textured surface, possibly a chair or a wall. The overall lighting is warm and natural.

*Thank
You*