

2nd and 3rd Lectures

In

Anatomy and Physiology

For the

1st Class

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Digestive System (Part I)

Gastrointestinal tract (GIT)

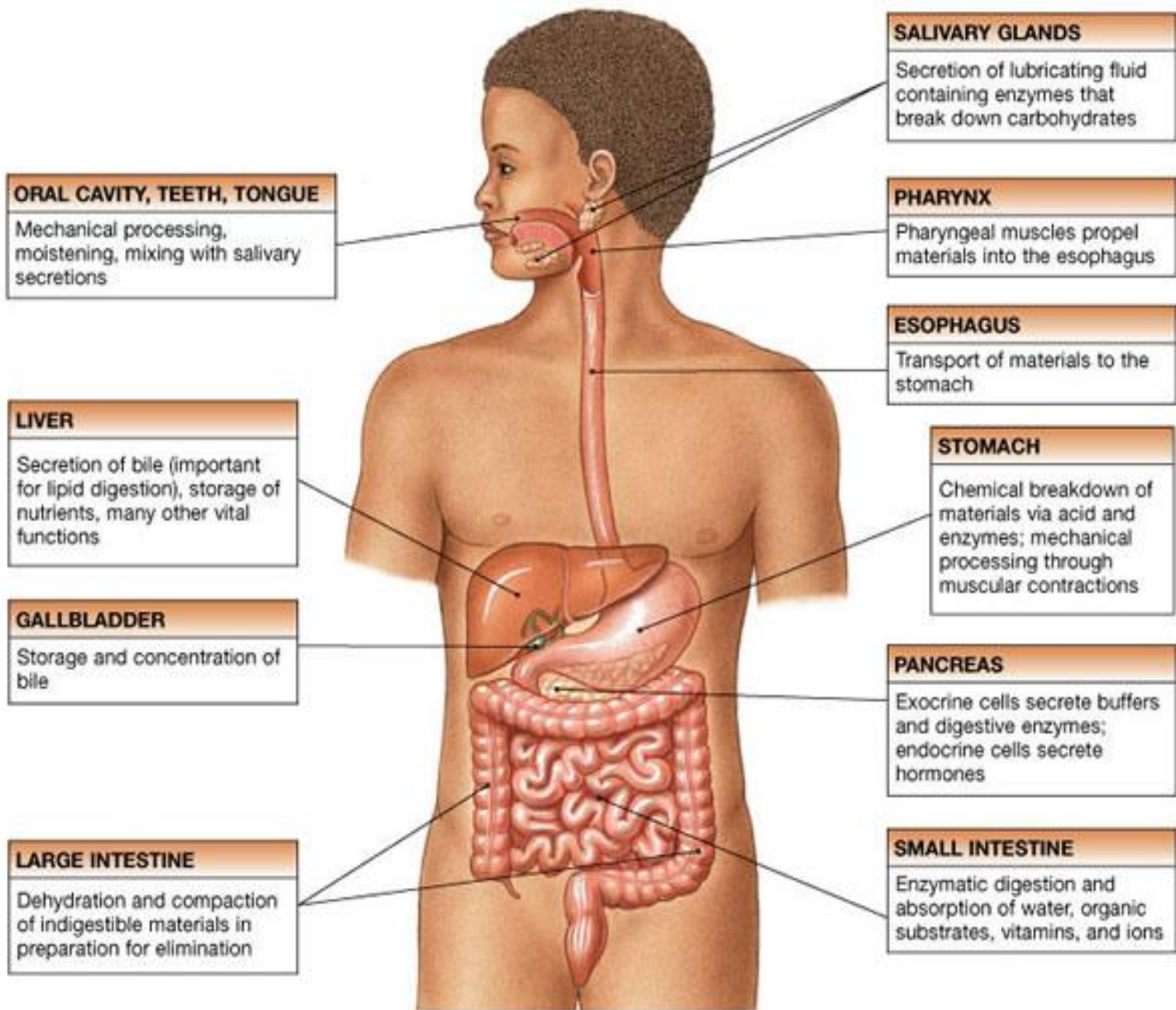
- Digestive system consists mainly of two parts:

1. Tube or tract consists:

- a). Oral cavity
- b). Pharynx
- c). Stomach
- d). Esophagus
- d). Small intestine
- e). Large intestine
- f). Anus

2. Accessory organs

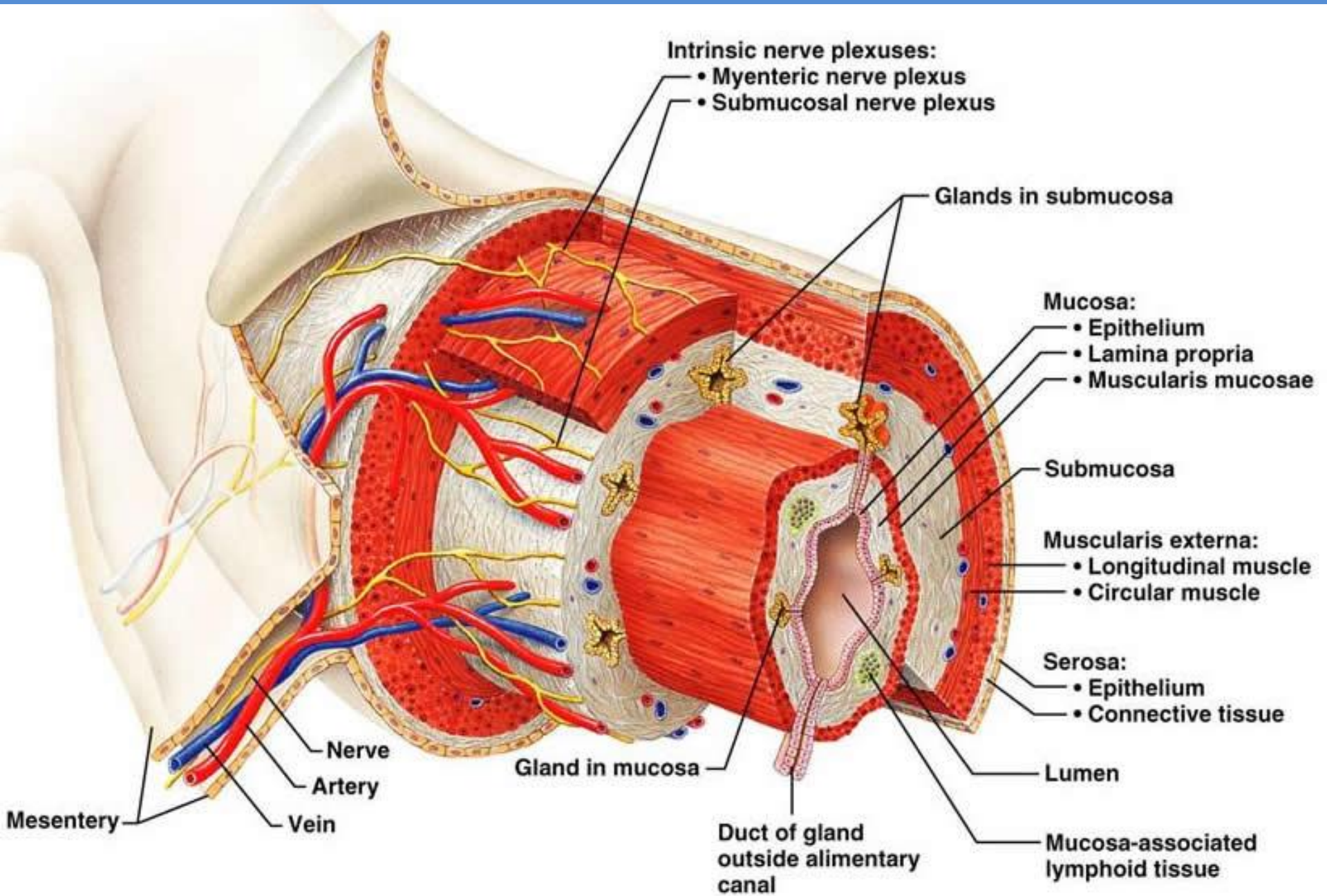
- a). Salivary glands
- b). Liver and gall bladder
- c). pancreas

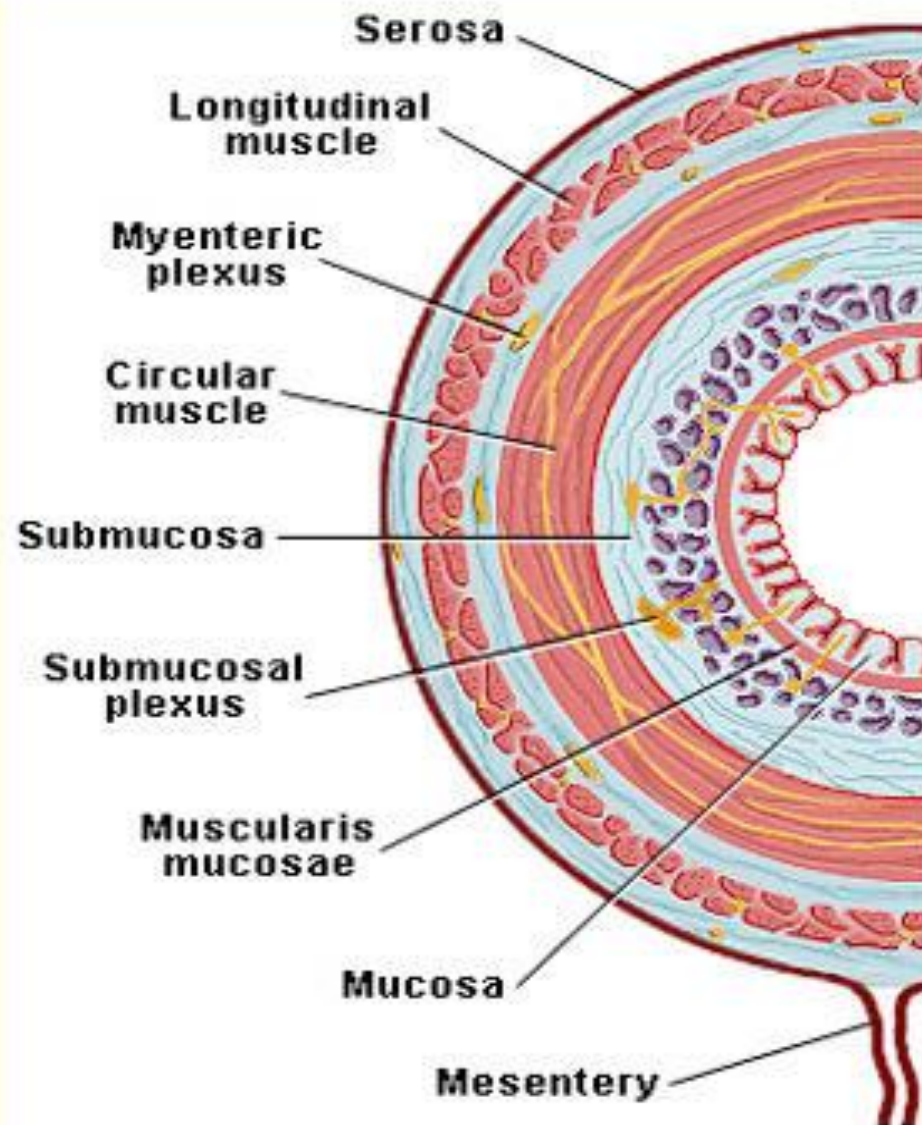


General Structure of the Digestive Tract

The wall of GIT is made up 4 principal layers:

1. Mucosa
2. Submucosa
3. Muscularis
4. Serosa or Adventitia





1. Mucosa (Mucous Membrane)

It consists of:

1. Epithelial lining
2. Lamina propria (loose connective tissue rich in blood and lymph vessels, and sometimes containing glands smooth muscles).
3. Muscularis mucosae thin muscular layers separate the mucosa from submucosa.

2. Submucosa

- It is composed of dense connective tissue with many **blood** and **lymph** vessels and also **nerve plexus** which called “**Meissner’s plexus**”.

3. Muscularis

- It is composed
- Inner circular smooth muscular layer
- **Myenteric nerve plexus** (*Auerbach's nerve plexus*).
- Outer longitudinal smooth muscular layer.

4. Serosa

It is composed

- A thin layer of loose connective, rich in blood and lymph vessels and adipose tissue
- Layer of simple squamous epithelium.

Anatomy of oral cavity

- Oral cavity is divided into two parts:

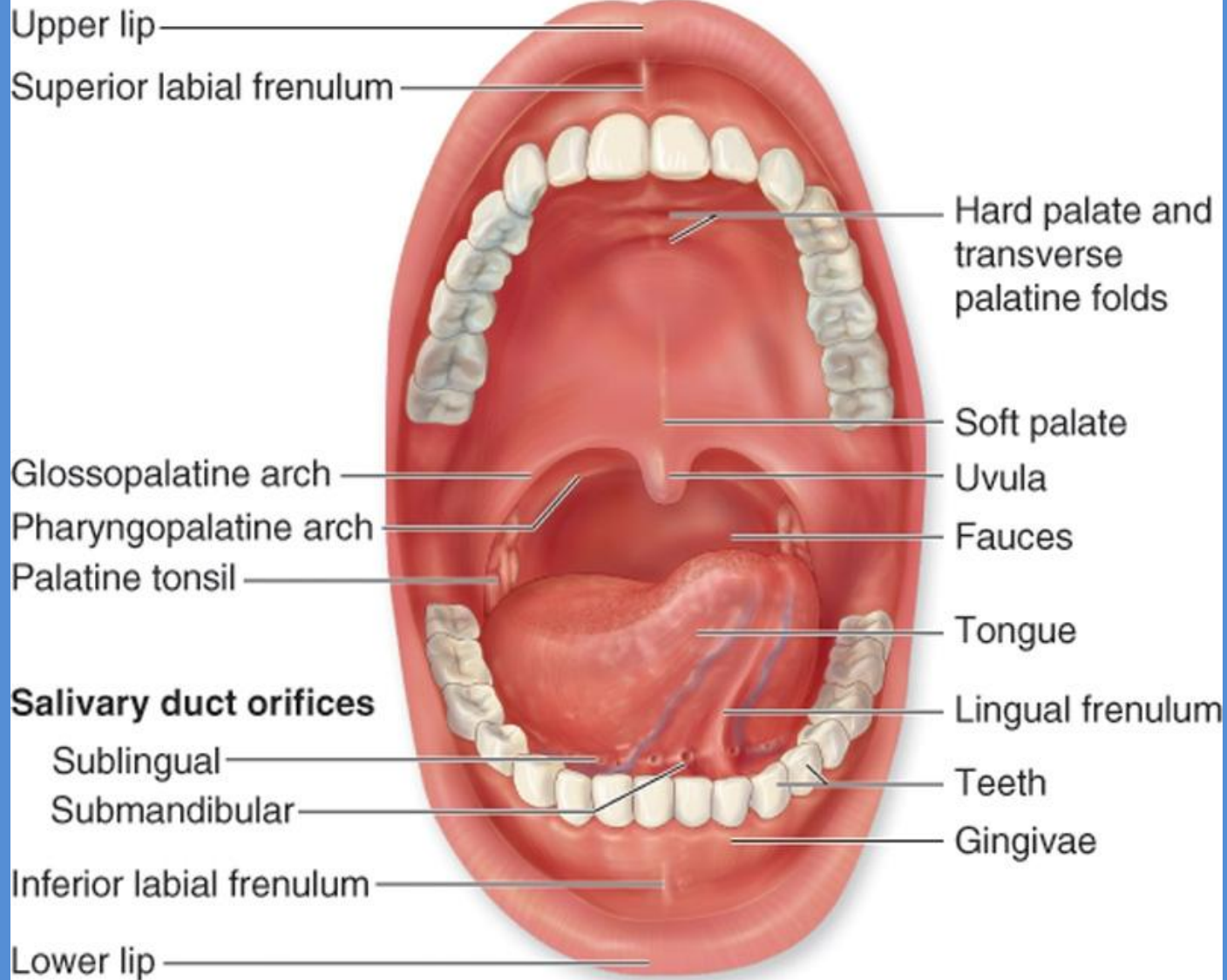
1. Vestibule

- a). Lateral: cheeks and lips
- b). Medial: upper and lower row of teeth.
- c). Posterior: reto-molar area.

2. Buccal cavity:

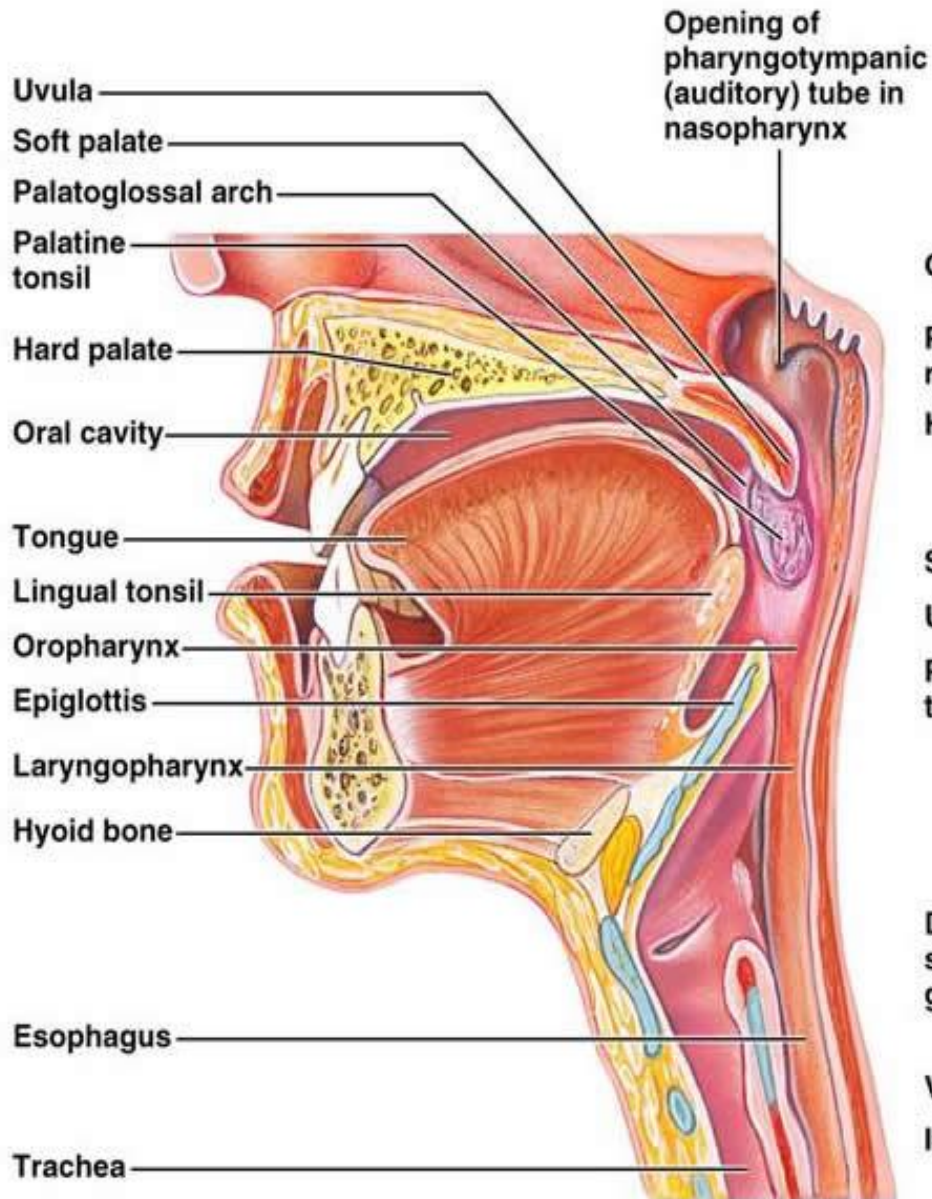
Roof: Hard palate (palatine) and Soft palate which ended with uvula.

Floor: tongue.

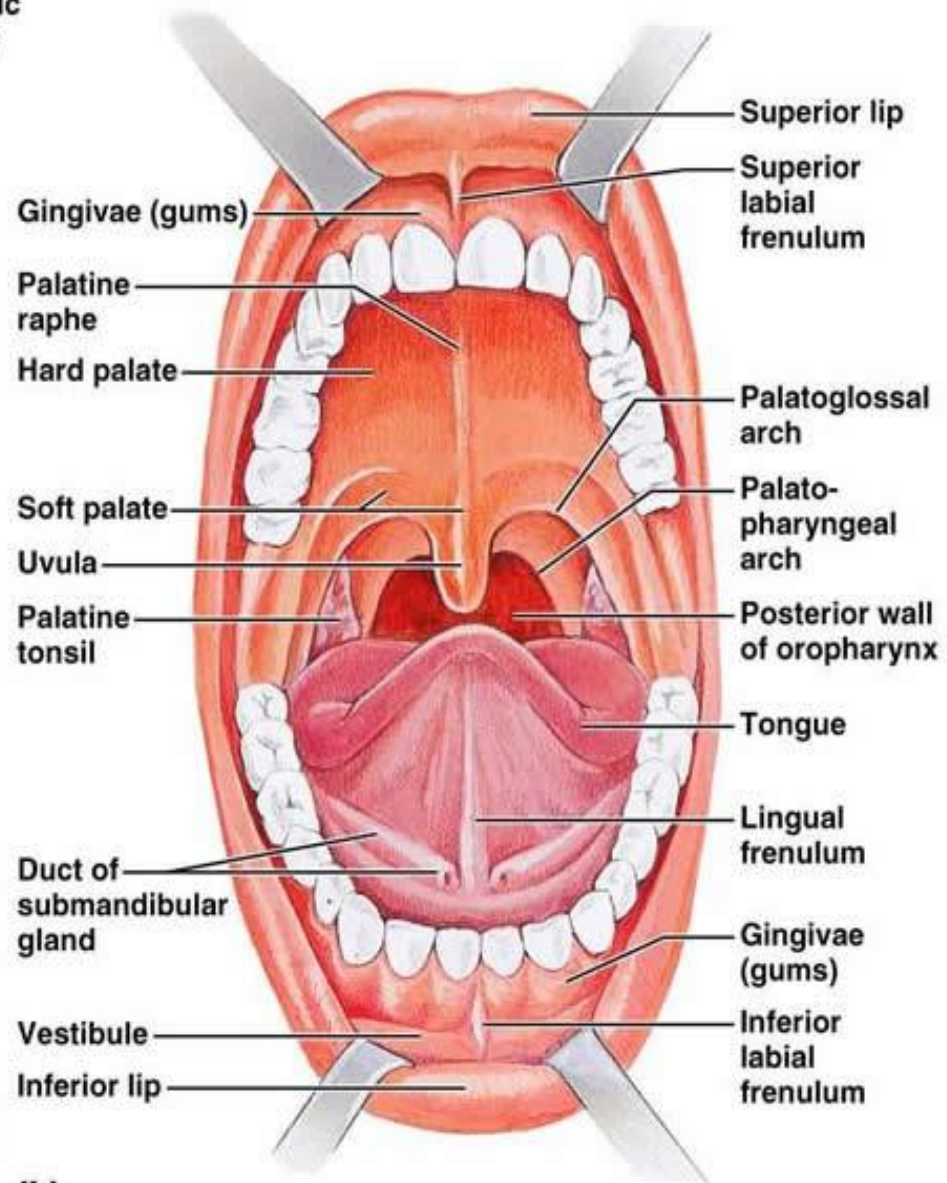


(a)

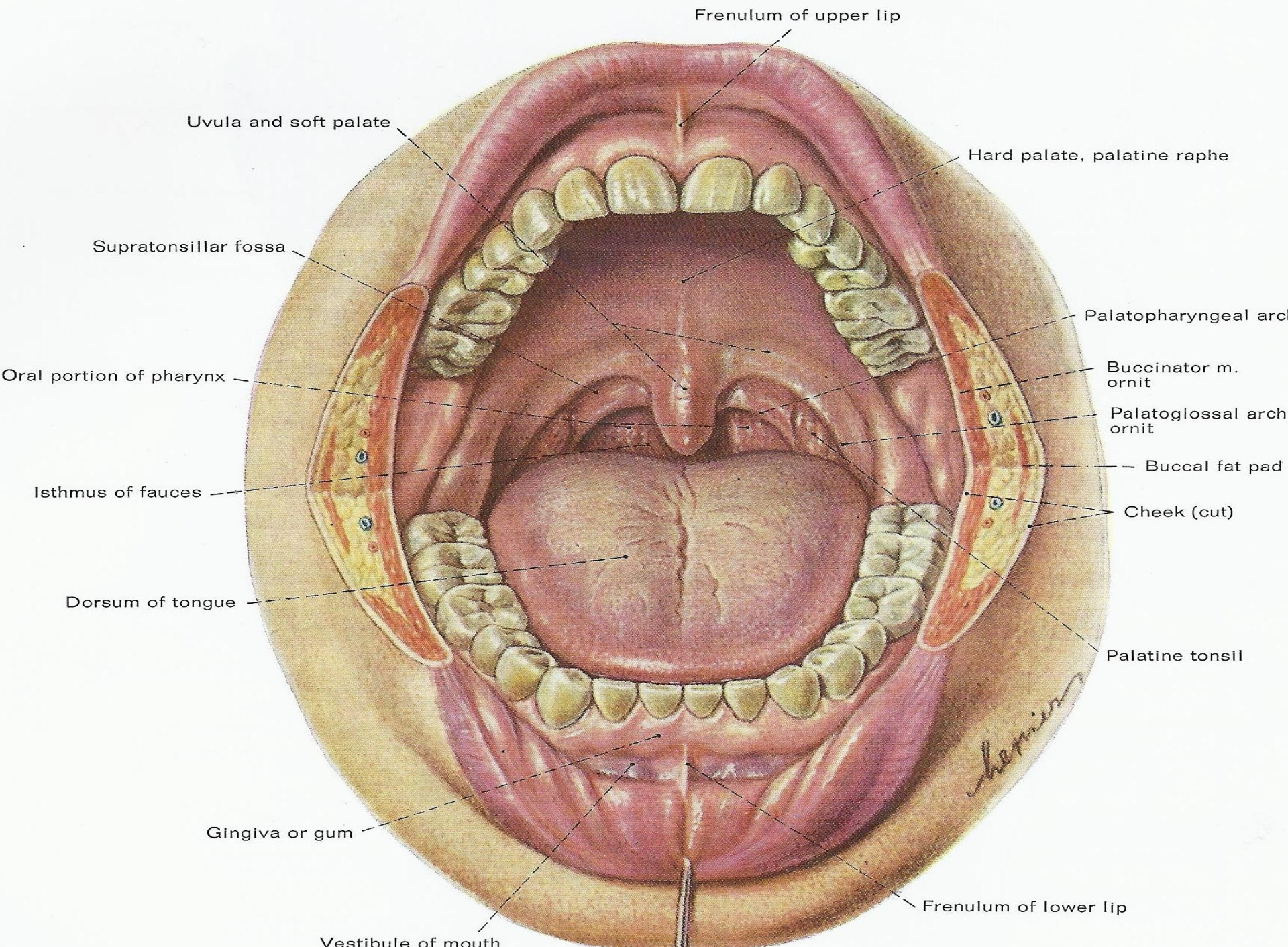
Oral cavity



(a)



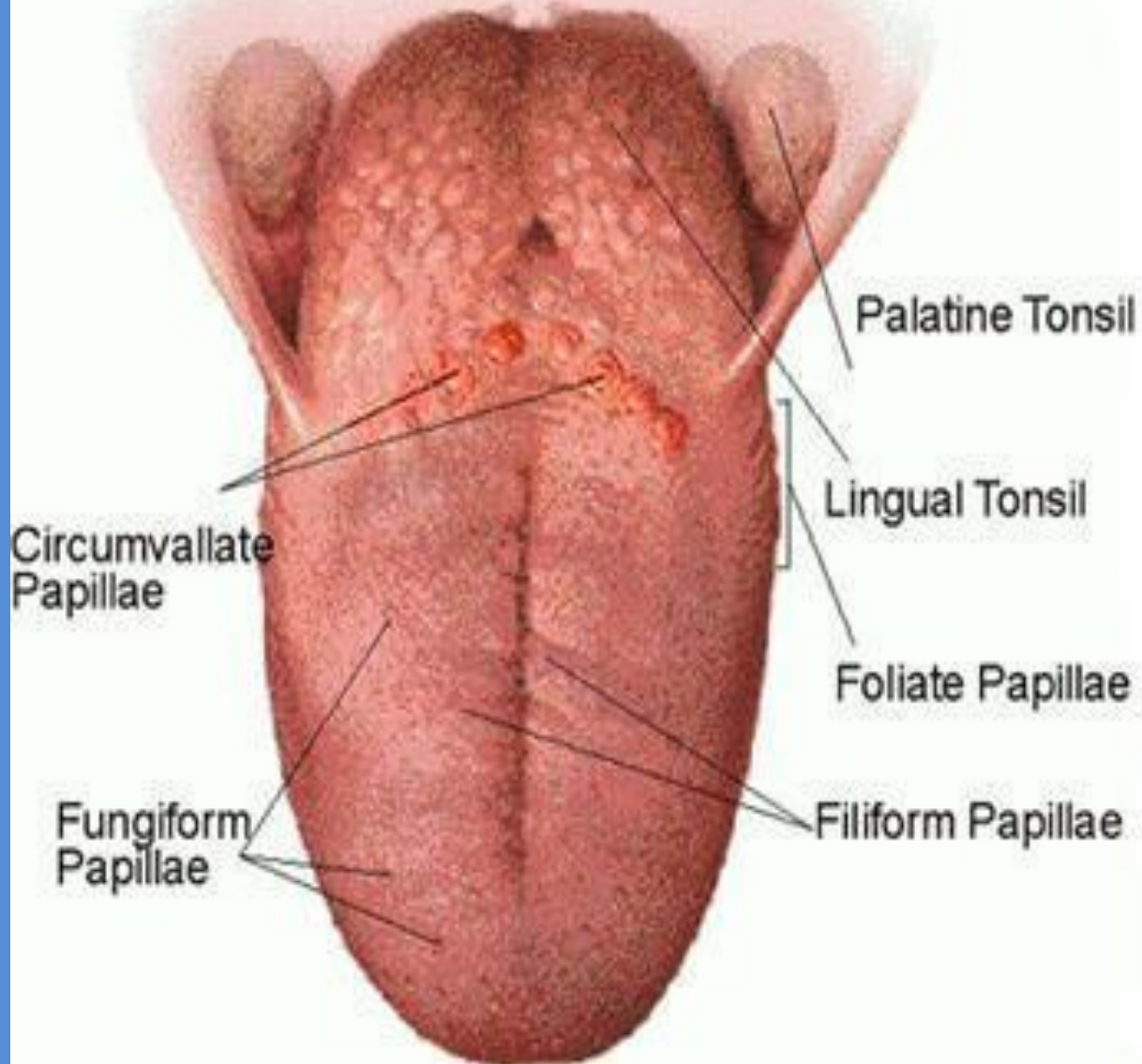
(b)



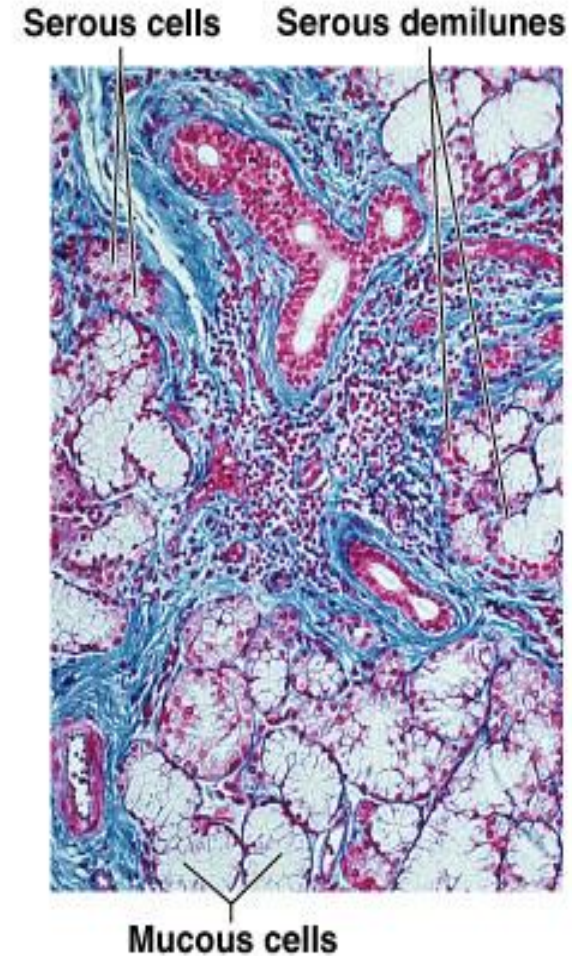
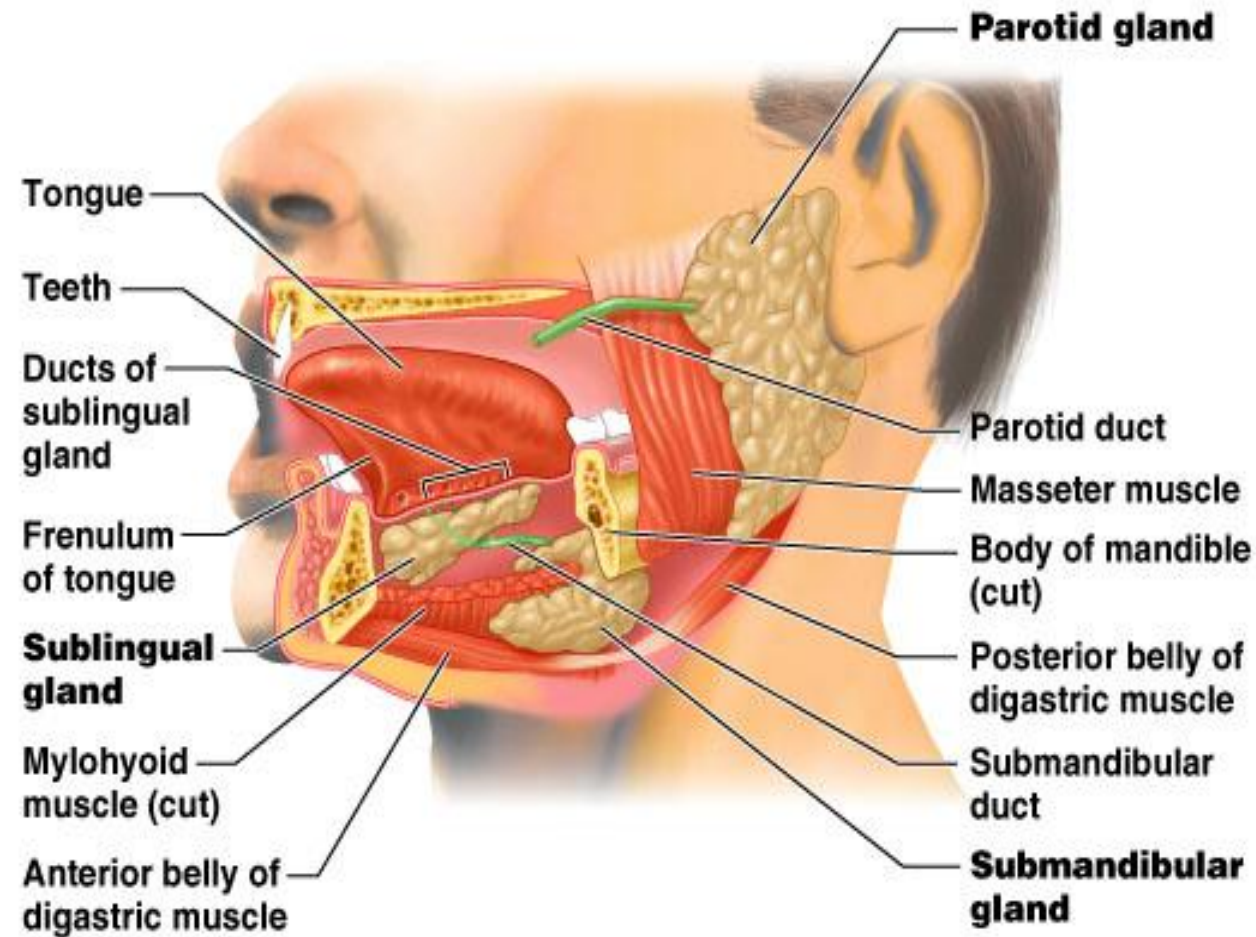
Structures of the oral cavity

1. Tongue: Muscular organ has different types of papillae. These papillae are important for taste.
2. Gum and teeth
3. Salivary glands consist three major glands a). Parotid glands (pairs), b). Sub-mandibular glands (pair) and c). Sublingual gland.
4. Lymphoid tissues: Tonsils (lingual tonsils, Palatine tonsils).

Tongue



Position of the salivary glands

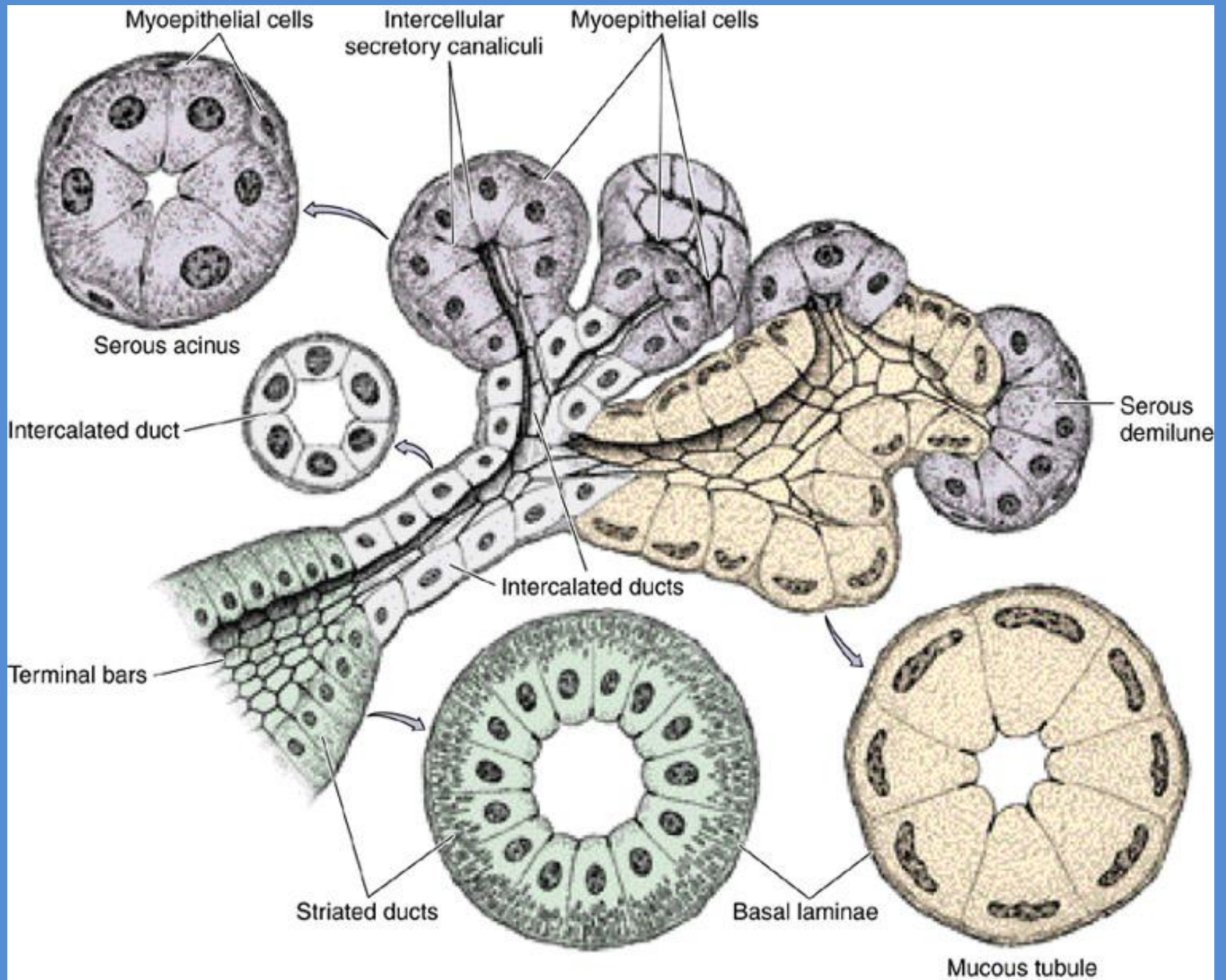


(b)

(a)

Salivary Glands

- **Glands** are organized arrangement of secretory cells.
- **Exocrine glands** are organized as acini or tubule, exocrine gland has ducts therefore its **secretion reaches by ducts to the affected part.**
- **All salivary glands are exocrine glands.**
- Secretion of salivary glands may be serous, or mucous or mixed.
- Saliva in the mouth has digestive , lubricating, protective functions.
- Each salivary gland receives **parasympathatic** and **sympathatic** innervation.
- ***Parasympathatic increases the secretion of saliva by all salivary glands.***
- ***Sympathatic innervation remains uncertain.***



Tubular secretory structure

Alveolar secretory structure

Simple duct structure
(duct does not branch)



(a) Simple tubular
Example: intestinal glands

(b) Simple branched tubular
Example: stomach (gastric) glands

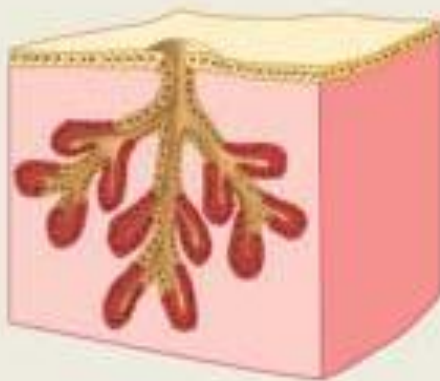


(c) Simple alveolar
Example: No important example in humans



(d) Simple branched alveolar
Example: sebaceous (oil) glands

Compound duct structure
(duct branches)



(e) Compound tubular
Example: duodenal glands of small intestine



(f) Compound alveolar
Example: mammary glands




(g) Compound tubuloalveolar
Example: salivary glands

Key: = Surface epithelium = Duct = Secretory epithelium

Saliva

- About 1.5 liters is produced every day.
- Saliva consists of **water** (98%), **minerals, salts, mucous, enzymes** [like amylase enzyme (by parotid gland) and probably lipase enzyme (by sublingual gland)] and also contains, **lysozyme, immunoglobulin, and clotting factors** that act against bacteria.
- **Amylase enzyme** digests carbohydrates. Action of this enzyme continuous till food enters the stomach.

Table 26.3		Oral Cavity Structures	
Structure	Description	Function	
Gingivae	Dense connective tissue and nonkeratinized stratified squamous epithelium	Surrounds necks of teeth and covers alveolar processes	
Hard palate	Anterior roof of mouth; bony shelf covered by dense connective tissue and nonkeratinized stratified squamous epithelium	Forms anterior 2/3 of roof of mouth; separates oral cavity from nasal cavity	
Lips	Form part of anterior walls of oral cavity; covered with keratinized stratified squamous epithelium	Close oral cavity during chewing	
Salivary glands	Three  large multicellular glands: parotid glands, sublingual glands, and submandibular glands	Produce saliva	
Soft palate	Posterior roof of mouth formed from skeletal muscle and covered with nonkeratinized stratified squamous epithelium; the uvula hangs from it	Forms posterior 1/3 of roof of mouth; helps close off opening to nasopharynx when swallowing	
Teeth	Hard structures projecting from the maxillae and mandible: incisors, canines, premolars, and molars	Mastication (chewing food)	
Tongue	Composed primarily of skeletal muscle and covered by stratified squamous epithelium; surface covered by papillae	Pushes food against palate to turn it into a bolus; detects tastes (via taste buds)	
Tonsils	Aggregates of partially encapsulated lymphatic tissue	Detect antigens in swallowed food and drink and initiate immune response if necessary	
Vestibule	Space between cheek and gums	Space where ingested materials are mixed with saliva and mechanically digested	
Uvula	Small, conical, muscular projection extending from the soft palate	Assists soft palate in closing off entryway to nasopharynx when swallowing	

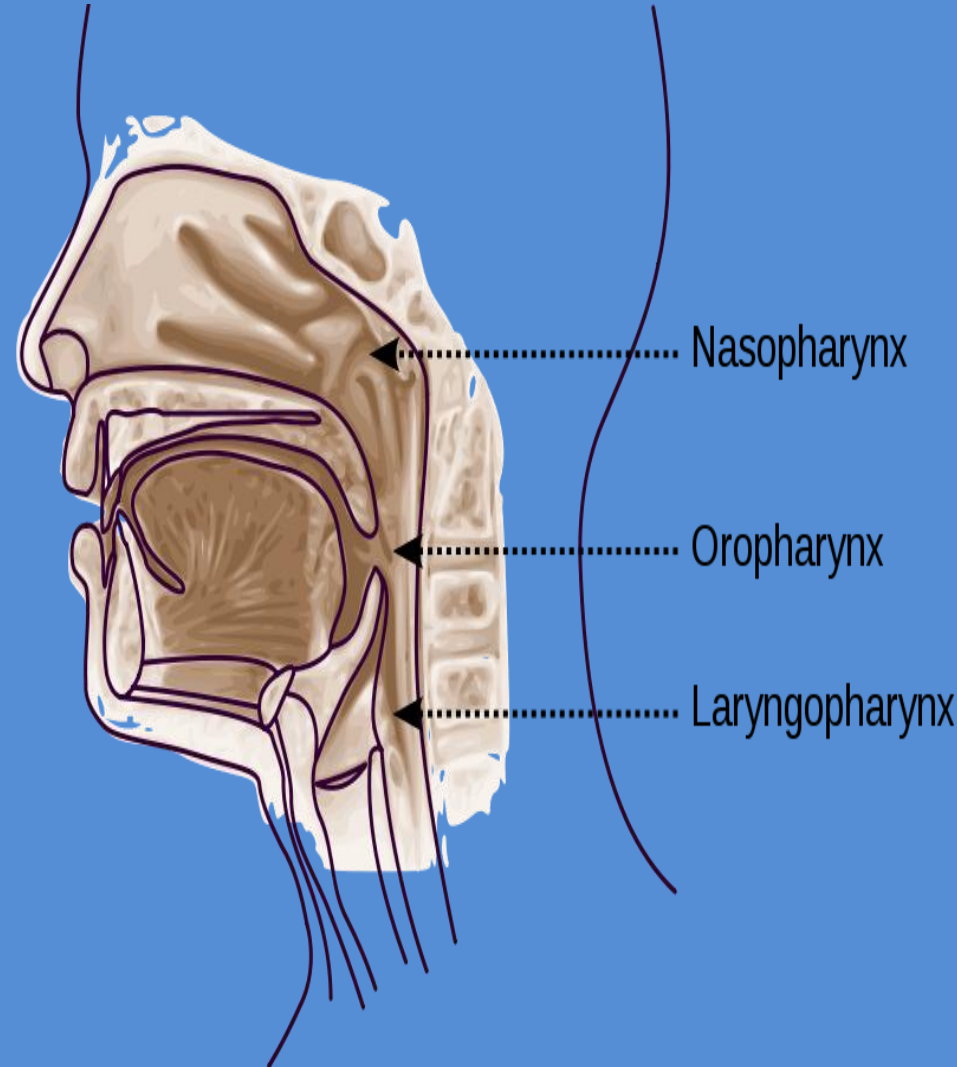
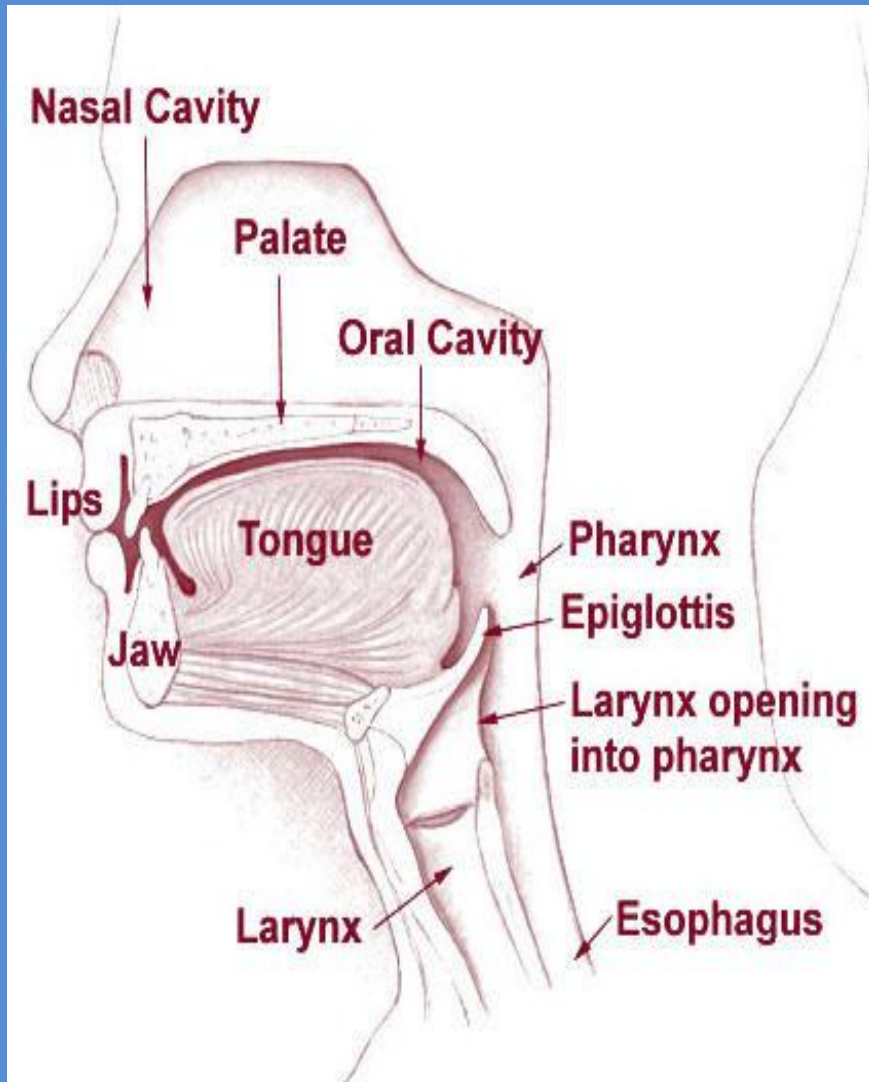
Pharynx and esophagus

- The pharynx is divided into three parts:
 1. Nasopharynx
 2. Oropharynx
 3. Laryngopharynx

Swallowing (deglutition)

1. After food has been chewed and moistened by saliva, the mouth closes and the tongue pushes the bolus into the pharynx.
2. Food entering the oropharynx is carried downwards by contraction of constrictor muscles present in the wall of the pharynx.
3. Soft palate closes the opening between nasopharynx and oropharynx.
4. Then contraction of pharyngeal muscles push food into the esophagus.

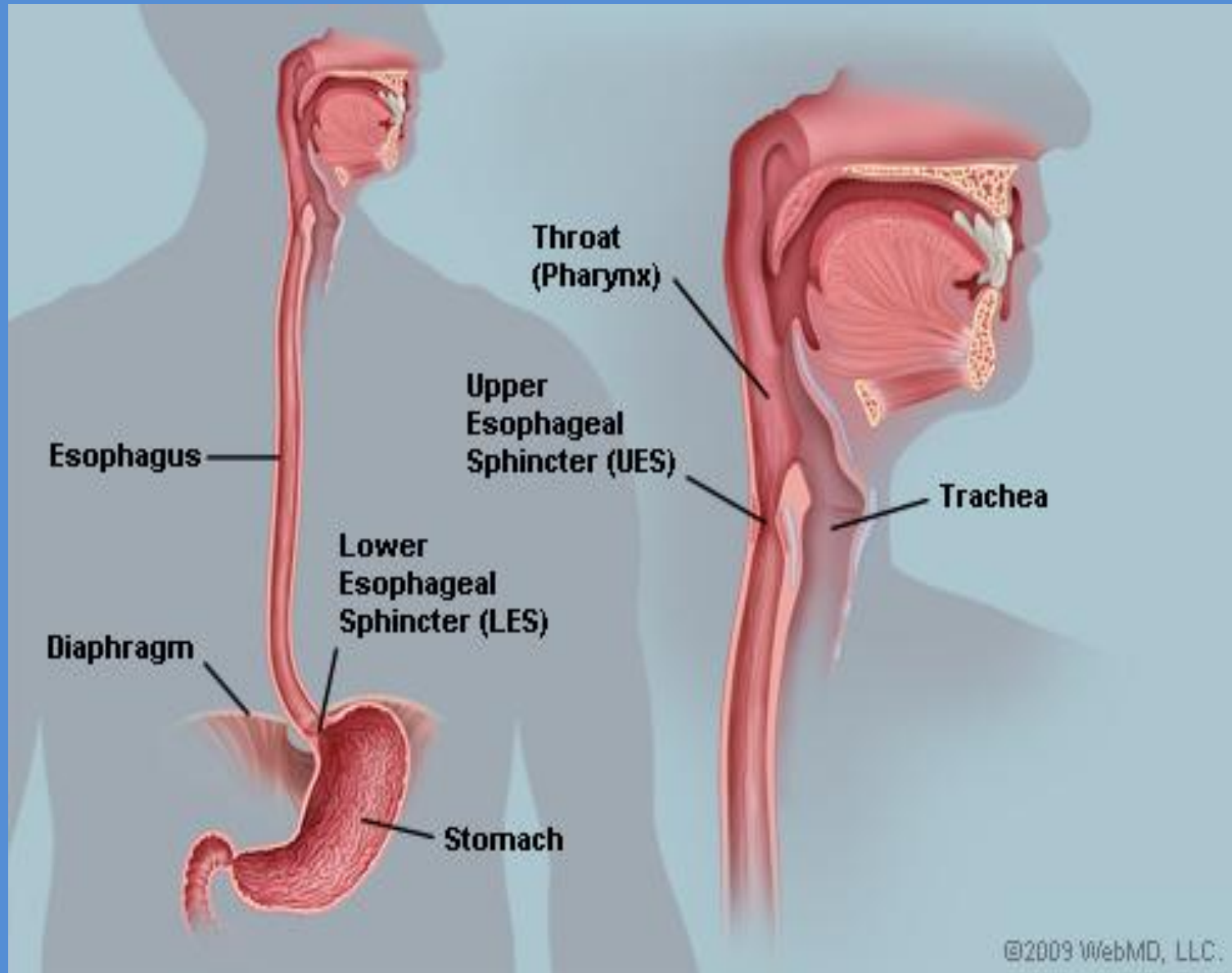
Parts of pharynx



Esophagus

- It is a muscular tube whose function is to transport foodstuff from the mouth to the stomach.
- It descends toward the thoracic cavity, posterior to the trachea, and enters the abdominal cavity through the oesophageal hiatus (an opening in the diaphragm) to empty into the stomach.

The esophagus and its sphincters



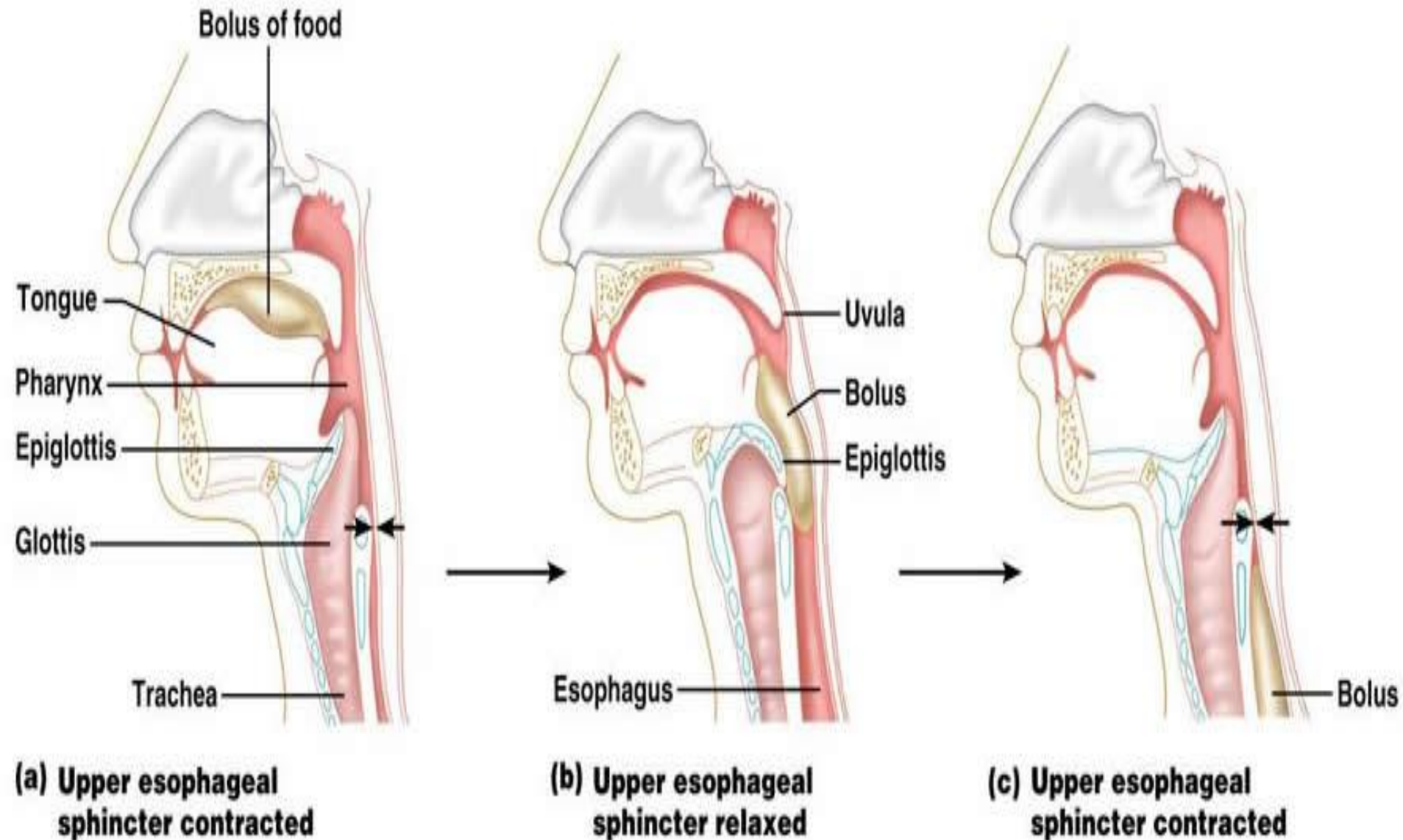
Characteristic Histology of Esophagus

- Mucosa and submucosa project into large folds
- Submucosa contains small mucous secreting glands (**esophageal glands**) their secretion facilitates the transport the foodstuff and protects mucosa).
- Superior third of esophagus muscular layers contains skeletal muscle fiber.
- Middle third of esophagus muscular layers compose from mixture of both skeletal and smooth muscle fiber
- Inferior third of esophageal muscular layers composes only from smooth muscle fibers.
- Serosa covers only the end part of oesophageal wall

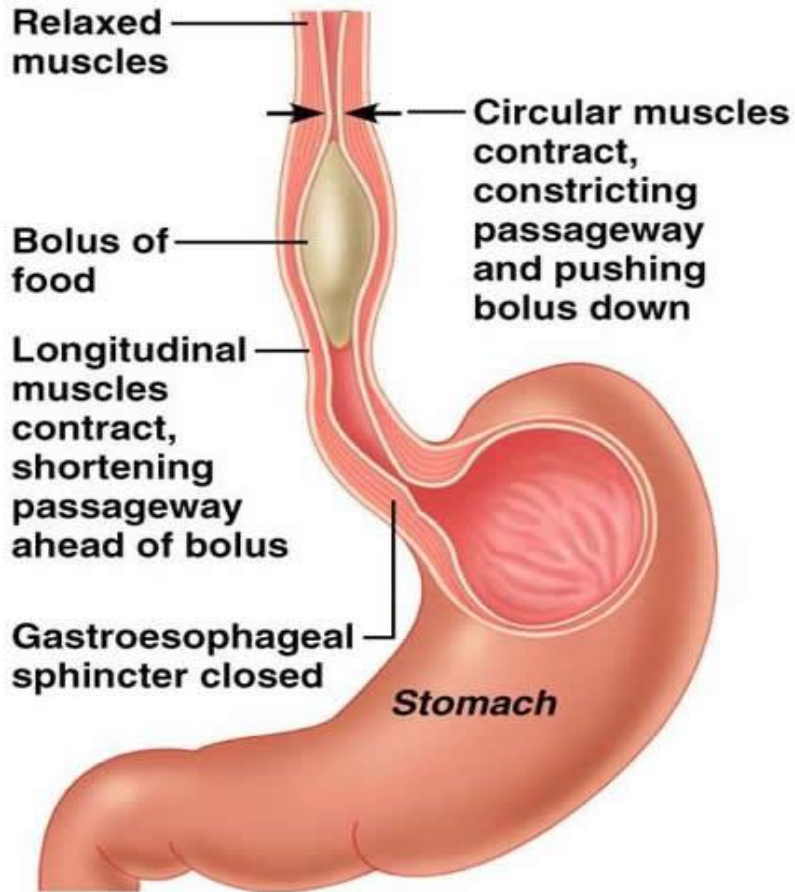
Sphincters of esophagus

- 1. Upper esophageal sphincter** composed from skeletal muscle and located in the upper part of esophagus just below pharynx. Prevent air to enter esophagus.
- 2. Lower esophageal sphincter** (cardiac sphincter) composed of smooth muscle, which normally remain in state of active contraction to prevent backflow of materials from the stomach into esophagus.

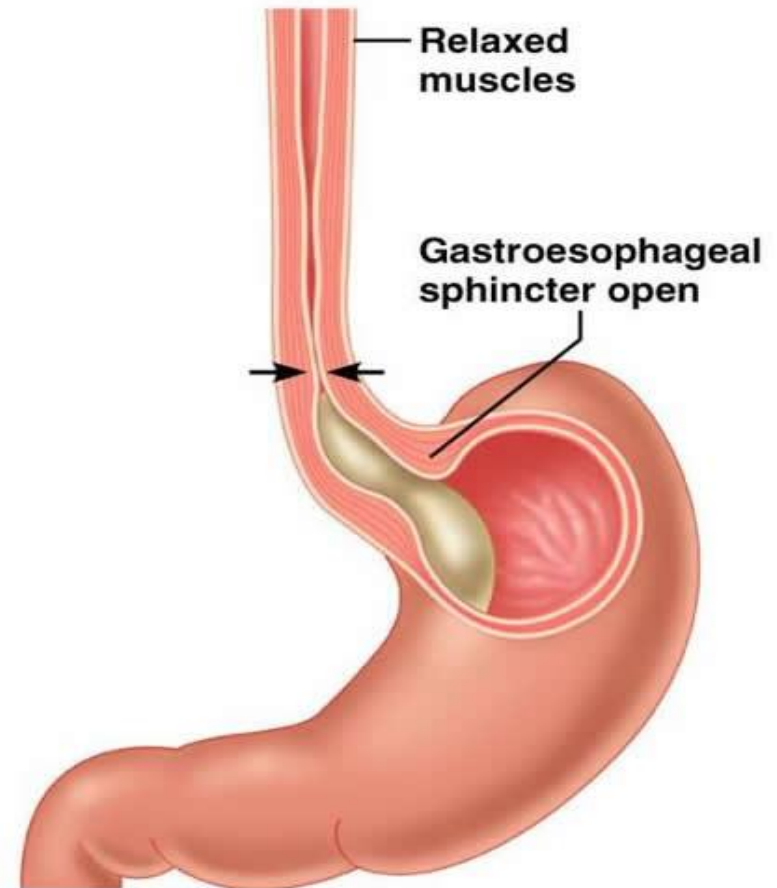
Function of the upper esophagus sphincter



Esophageal movement



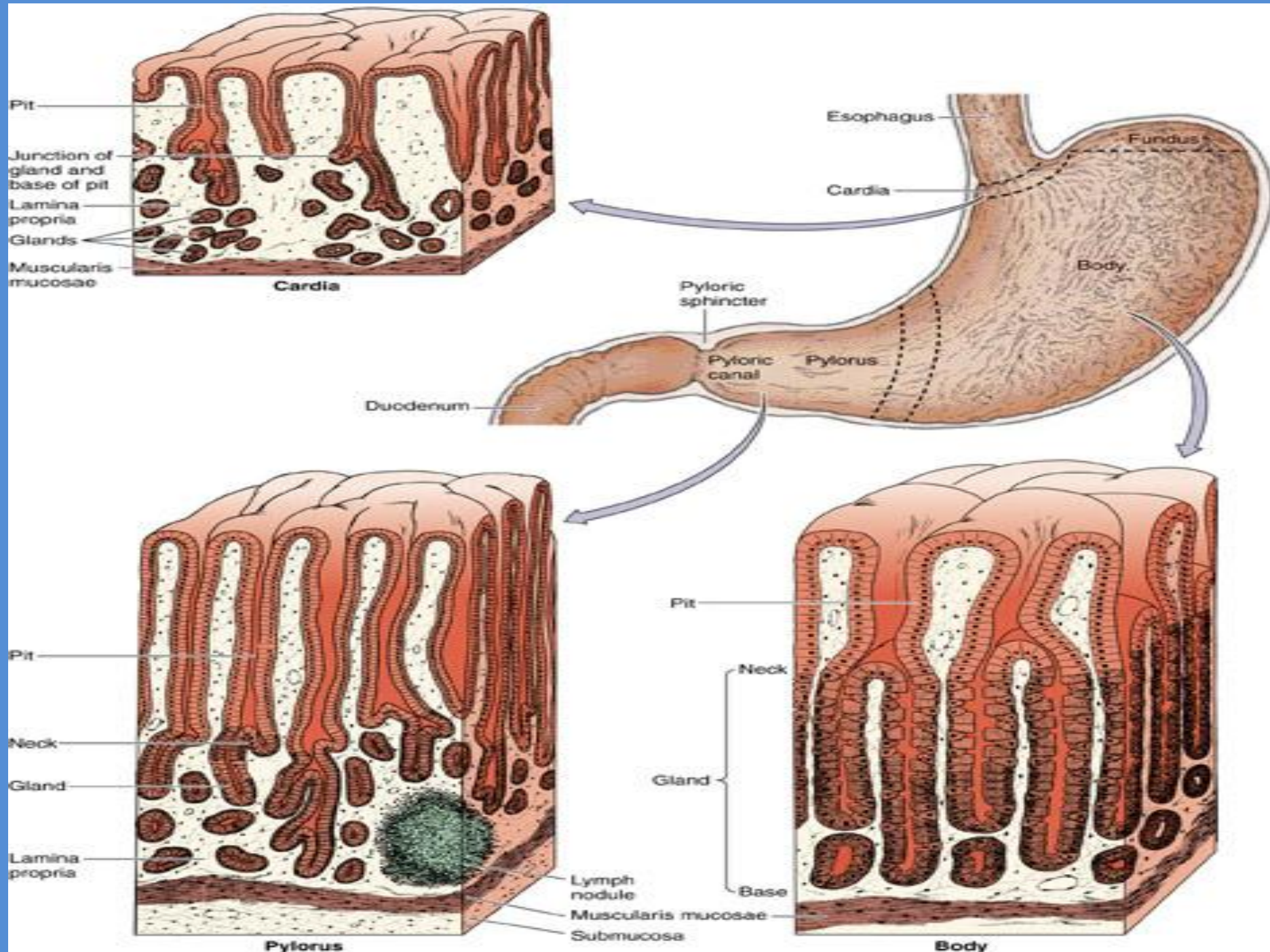
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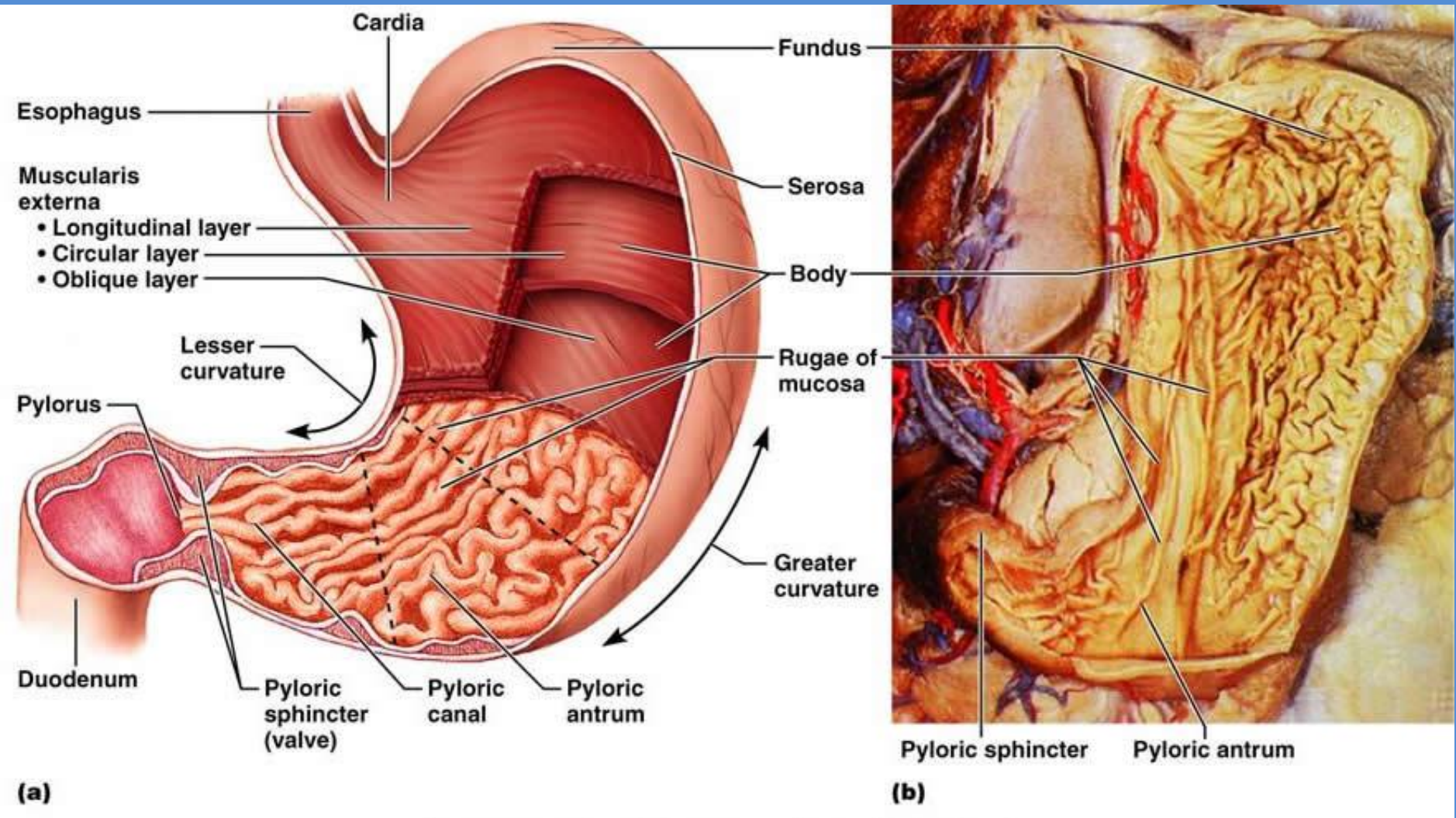
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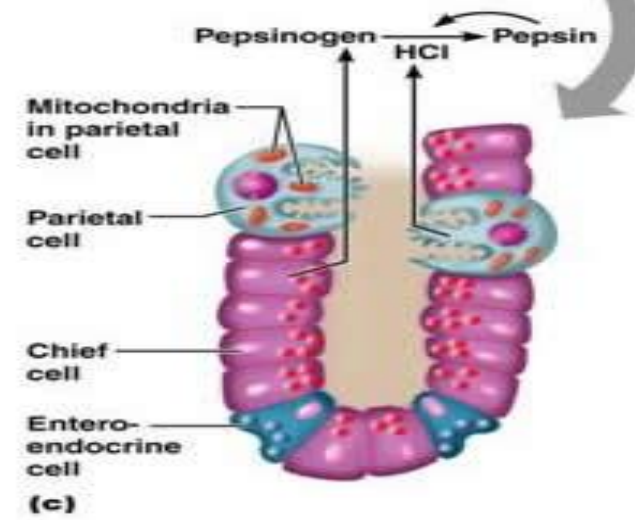
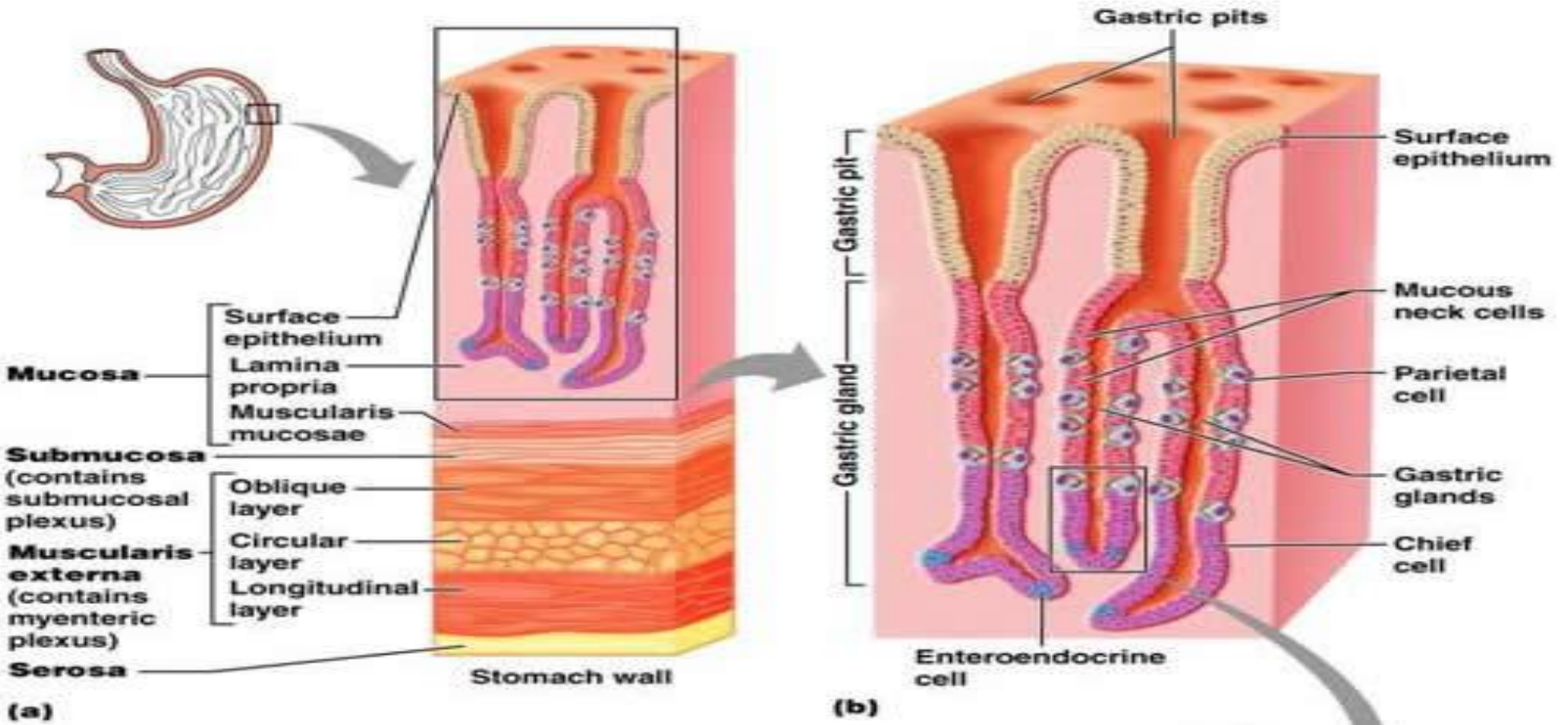
Stomach

- It is a muscular organ has ability to digest foods and convert them to chyme.
- The major regions of the stomach include: **cardia, fundus, body, and pylorus regions.**
- There are two curvature in the stomach: greater curvature (lateral surface) and lesser curvature (medial surface).
- Extending from curvatures are the lesser omentum and greater omentum which help to tie the stomach to other digestive organs.



Anatomy of the Stomach





Cells of
the
stomach

- The mucosa and submucosa of empty stomach make longitudinal folds known as (**rugae**).
- Invagination of epithelial lining formed gastric pits.
- Lining epithelia and gastric pit cells secrete an alkaline mucus to protect them from stomach acidity.
- The muscular layer contains an extra layer in addition to the circular and longitudinal layers.

- Stomach has exocrine and endocrine secretions.
- The main secretory cells in the stomach are:
 1. **parietal cells** (oxyntic): secret
 - **HCL** (actually H^+ and CL^-)
 - potassium chloride**
 - traces of electrolytes**
 - intrinsic factor** is essential for absorption of vitamin B12
 2. **Chief cells** (zymogenic cells) secret Pepsinogen (inactive form of pepsin enzyme). **Pepsin** is an enzyme digests proteins.
 3. Mucous cells secret mucus
 4. **Enteroendocrine cells** like
 - G- cells secret **gastrin**.(enhance of acid by parietal cells)
 - D- cells secret **somatostatin** (acts by inhibit release other hormones like gastrin).