Histology GI Pictures

Sources used:

1. Junqueira's Basic Histology TEXT AND ATLAS
2. Lippincott`s Pocket Histology
3. Atlas of Human Histology
   https://drive.google.com/file/d/1eV0N_S4SYE9xASRtS2m_JDx8TO5AaiK/view?usp=sharing
4. WebPath
   https://webpath.med.utah.edu/HISTHTML/NORMAL/NORMAL.htm
5. Histology Guide
   https://histologyguide.com
6. Doctor`s lab slides 2021
   https://drive.google.com/file/d/1skDHBIZMaJ2OkMgqcoM2vmxiuU0mOnuS/view?usp=sharing

Made by: Mais Mustafa

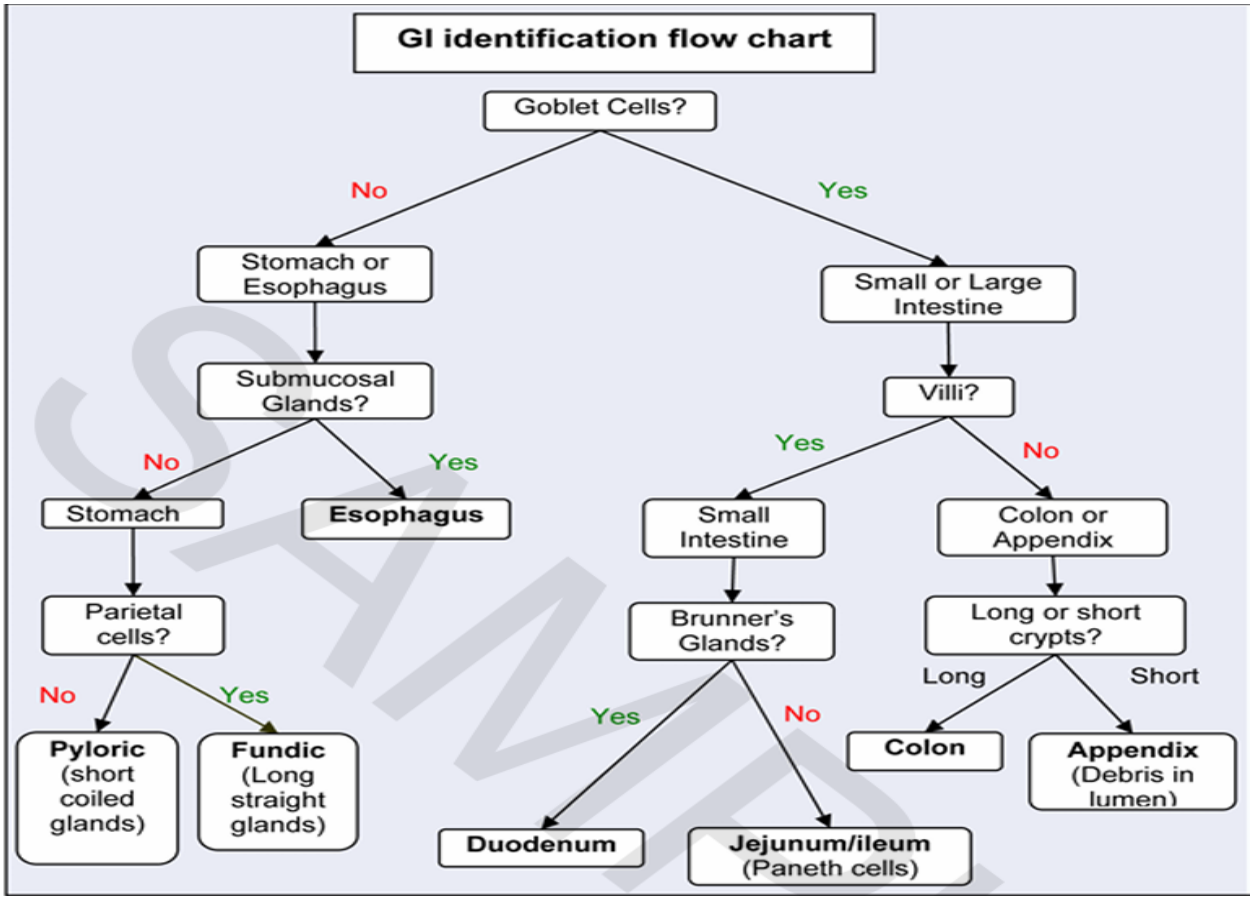


TABLE 15–2 Summary of distinguishing digestive tract features, by region and layers.

Region and Subdivisions	Mucosa (Epithelium, Lamina Propria, Muscularis Mucosae)	Submucosa (With Submucosal Plexuses)	Muscularis (Inner Circular and Outer Longitudinal Layers, With Myenteric Plexuses Between Them)	Adventitia/Serosa
Esophagus (upper, middle, lower)	Nonkeratinized **stratified squamous epithelium**; **cardiac glands** at lower end	Small **esophageal glands** (mainly mucous)	Both layers **striated muscle** in upper region; both layers **smooth muscle** in lower region; **smooth and striated muscle** fascicles mingled in middle region	Adventitia, except at lower end with serosa
Stomach (cardia, fundus, body, pylorus)	**Surface mucous cells** and **gastric pits** leading to **gastric glands** with **parietal and chief cells**, (in the fundus and body) or to mucous **cardiac glands** and **pyloric glands**	No distinguishing features	**Three indistinct layers** of smooth muscle (inner oblique, middle circular, and outer longitudinal)	Serosa
Small intestine (duodenum, jejunum, ileum)	**Plicae circulares**; **villi**, with **enterocytes** and **goblet cells**, and **crypts/glands** with **Paneth cells** and **stem cells**; **Peyer patches** in ileum	**Duodenal (Brunner) glands** (entirely mucous); possible extensions of Peyer patches in ileum	No distinguishing features	Mainly serosa

FIGURE **15–2** **Major layers and organization of the digestive tract.**

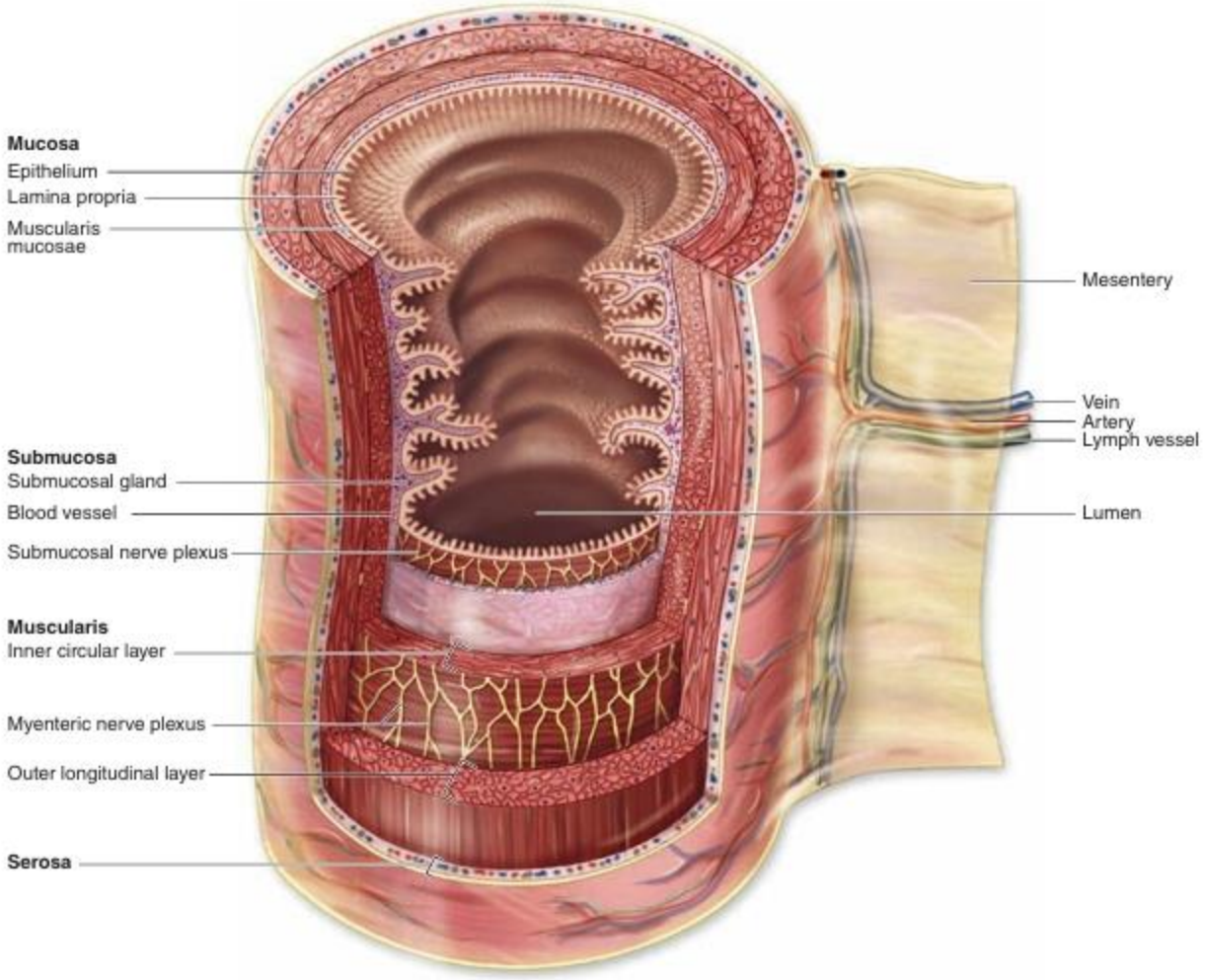


Diagram showing the structure of the small intestine portion of the digestive tract, with the four main layers and their major components listed on the left. The stomach, small intestine, and large intestine are suspended by mesenteries that are the sites of nerves, blood vessels and lymphatics from the stomach and intestines.

It is a hollow tube composed of a lumen whose diameter varies, surrounded by a wall made up of four principal layers: the mucosa, submucosa, muscularis, and serosa.

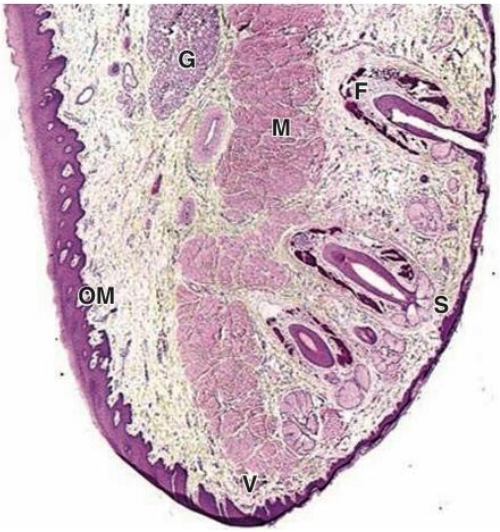
1. The mucosa (frequently called the mucous membrane) is made up of an epithelial lining, a lamina propria of loose connective tissue rich in blood and lymph vessels, and smooth muscle cells (muscularis mucosa), sometimes also containing glands and lymphoid tissue.

2. The submucosa is composed of dense connective tissue with many blood and lymph vessels and a submucosal (also called Meissner's) nerve plexus. It may contain glands and lymphoid tissue too.

3. The muscular layer, consisting of a thin inner circular layer & an outer longitudinal layer of smooth muscle cells separating the mucosa from the submucosa.

4. The outer layer, the serosa, is a thin layer of loose connective tissue, rich in blood and lymph vessels, and adipose tissue, and a simple squamous covering epithelium (mesothelium). In the abdominal cavity, the serosa is continuous with the mesenteries and with the peritoneum, and in places where the digestive organ is bound to other organs or structures, the serosa is replaced by a thick adventitia, consisting of connective tissue containing vessels and nerves, without the mesothelium.

FIGURE **15–3** Lip.



Low-magnification micrograph of a lip section showing one side covered by typical oral mucosa (**OM**), the opposite side covered by skin (**S**) containing hair follicles (**F**) and associated glands. Between the oral portion of the lips and normal skin is the vermilion zone (**V**), where epidermis is very thin, lightly keratinized, and transparent to blood in the rich microvasculature of the underlying connective tissue. Because this region lacks the glands for oil and sweat, it is prone to excessive dryness and chapping in cold, dry weather. Internally, the lips contain much striated muscle (**M**) and many minor salivary glands (**G**). (X10; H&E)

The well-developed core of striated muscle in the lips, or labia, makes these structures highly mobile for ingestion, speech, and other forms of communication. Both lips have three differently covered surfaces: 1) The internal mucous surface has lining mucosa with a thick, nonkeratinized epithelium and many minor labial salivary glands. 2) The red vermilion zone of each lip is covered by very thin keratinized stratified squamous epithelium and is transitional between the oral mucosa and skin. This region lacks salivary or sweat glands and is kept moist with saliva from the tongue. The underlying connective tissue is very rich in both sensory innervation and capillaries, which impart the pink color to this region. 3)The outer surface has thin skin, consisting of epidermal and dermal layers, sweat glands, and many hair follicles with sebaceous glands.

At low power, the normal tongue has an overlying **squamous epithelium** beneath which is a lamina propria. The bulk of the tongue is composed of skeletal muscle. Scattered throughout the tongue, but more prominent toward the back of the tongue, are minor salivary glands.

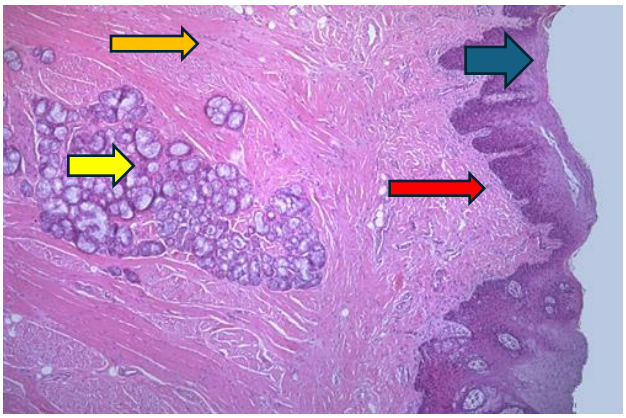
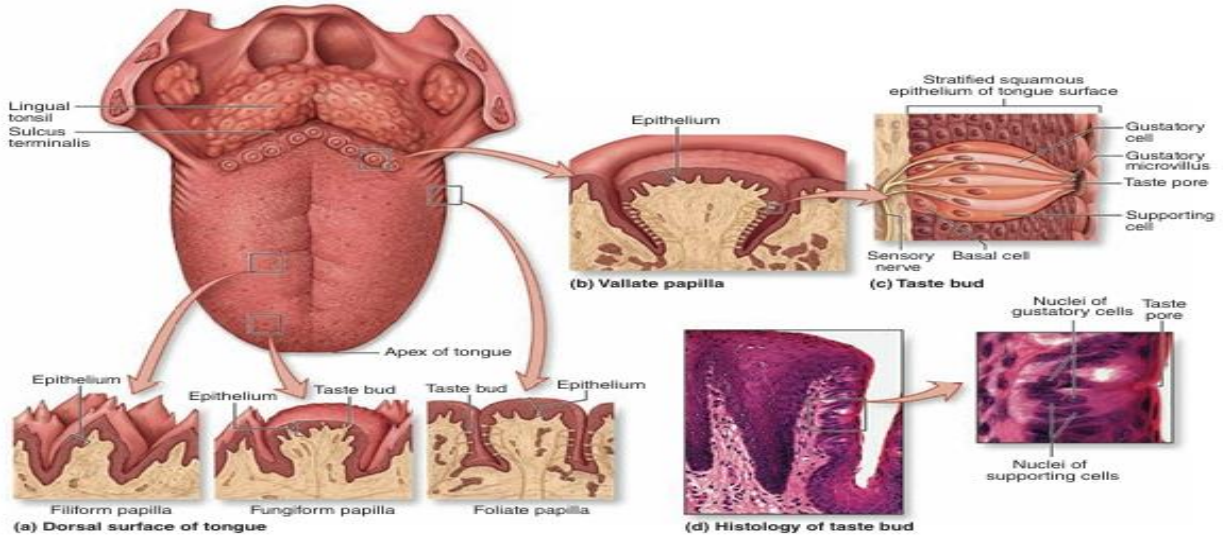


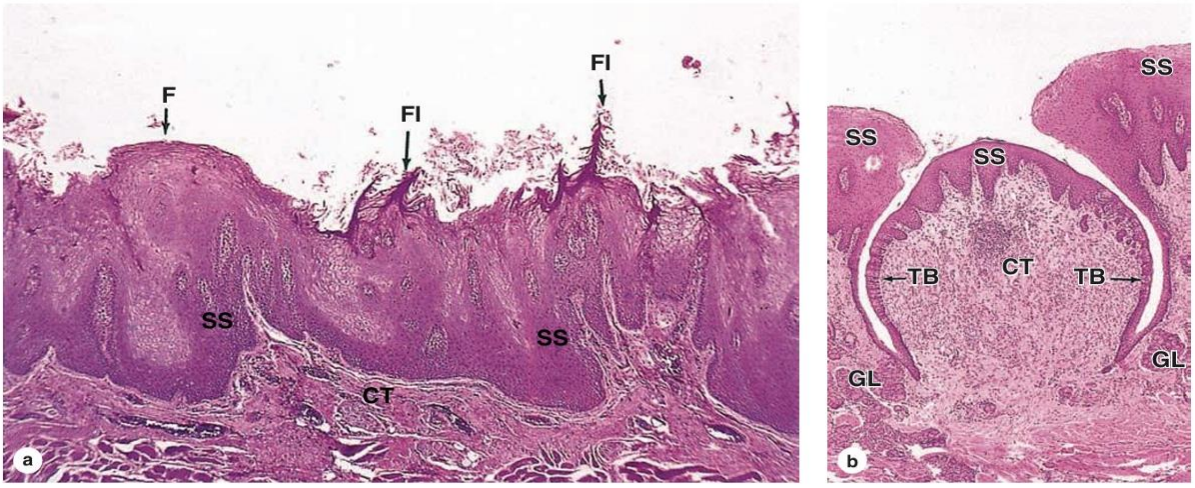
FIGURE 15–4 Tongue, lingual papillae, and taste buds.



On its dorsal surface **(a)**, the posterior third of the tongue has the **lingual tonsils** and the anterior portion has numerous **lingual papillae** of four types. Pointed **filiform papillae** provide friction to help move food during chewing. Ridge-like **foliate papillae** on the sides of the tongue are best developed in young children. **Fungiform papillae** are scattered across the dorsal surface, and 8–12 large **vallate papillae (b)** are present in a V-shaped line near the terminal sulcus. **Taste buds** are present on fungiform and foliate papillae but are much more abundant on vallate papillae.

(c) Diagram of a single taste bud shows the **gustatory (taste) cells**, the **supporting cells** whose function is not well understood, and the basal **stem cells**. Microvilli at the ends of the gustatory cells project through an opening in the epithelium, the **taste pore**. Afferent sensory axons enter the basal end of taste buds and synapse with the gustatory cells. In the stratified squamous epithelium of the tongue surface, taste buds form as distinct clusters of cells that are recognizable histologically even at low magnification **(d)**. At higher power the taste pore may be visible, as well as the elongated nuclei of gustatory and supporting cells. (140X and 500X; H&E)

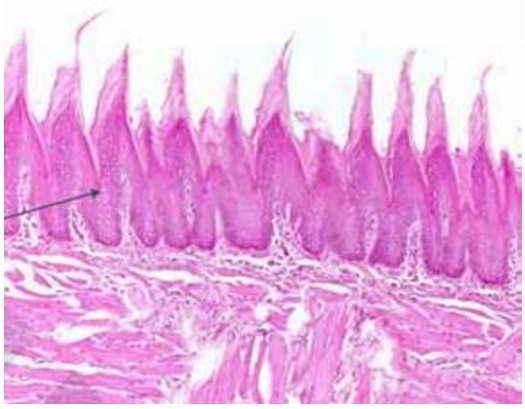
FIGURE 15–5 Lingual papillae.

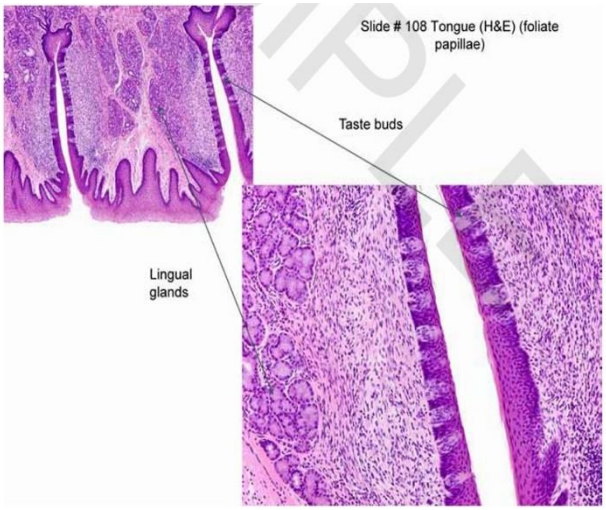


(a) Section of the dorsal surface of tongue showing both filiform (**FI**) and fungiform papillae (**F**). Both types are elevations of the connective tissue (**CT**) covered by stratified squamous epithelium (**SS**), but the filiform type is pointed and heavily keratinized while the fungiform type is mushroom-shaped, lightly keratinized, and has a few taste buds.

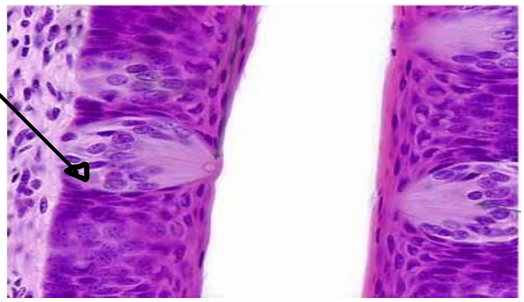
(b) Micrograph shows a single very large vallate papilla with two distinctive features: many taste buds (**TB**) around the sides and several small salivary glands (**GL**) emptying into the cleft or moat formed by the elevated mucosa surrounding the papilla. These glands continuously flush the cleft, renewing the fluid in contact with the taste buds. (Both X20; H&E)

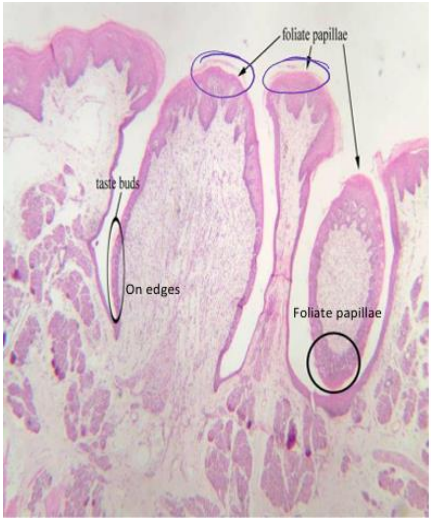
Filiform papillae

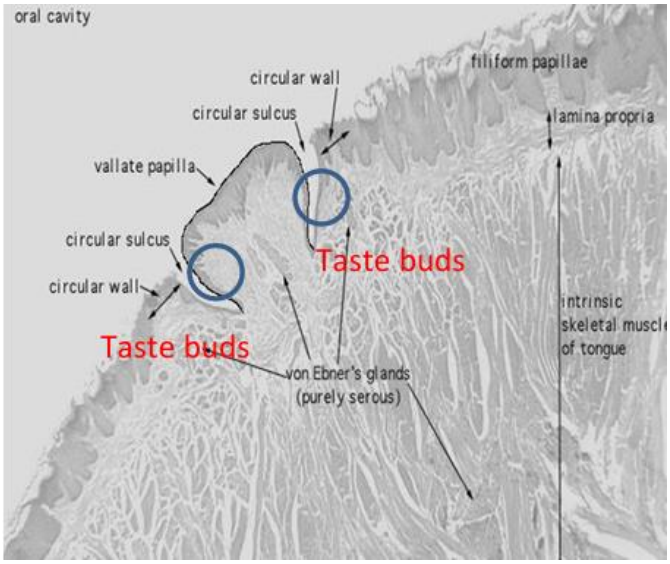




Taste buds

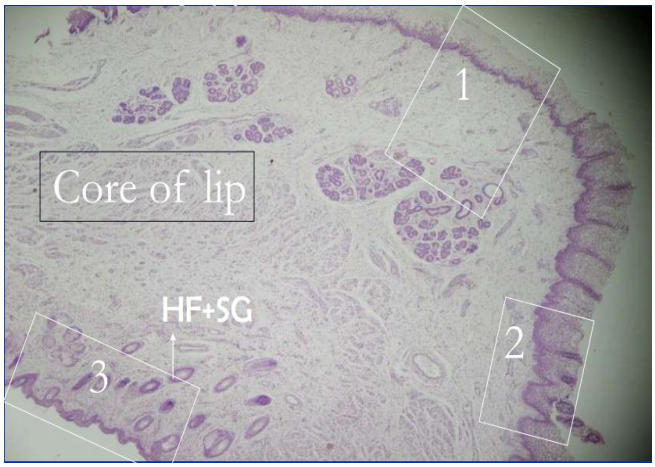


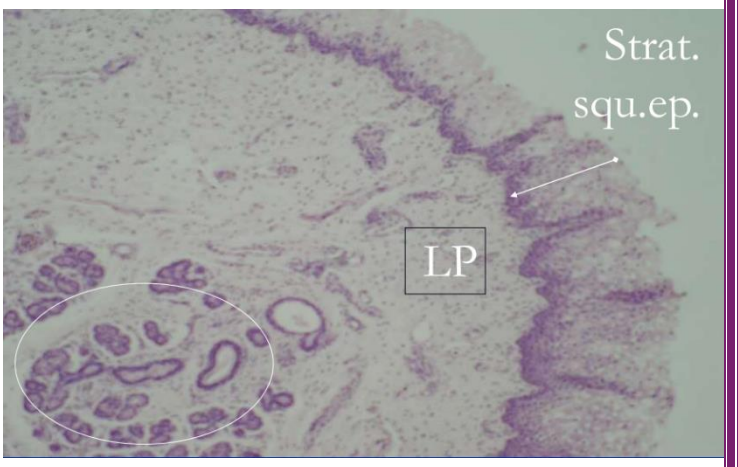


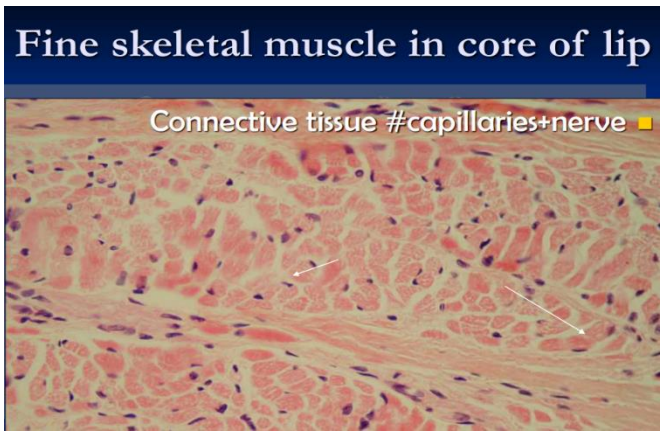


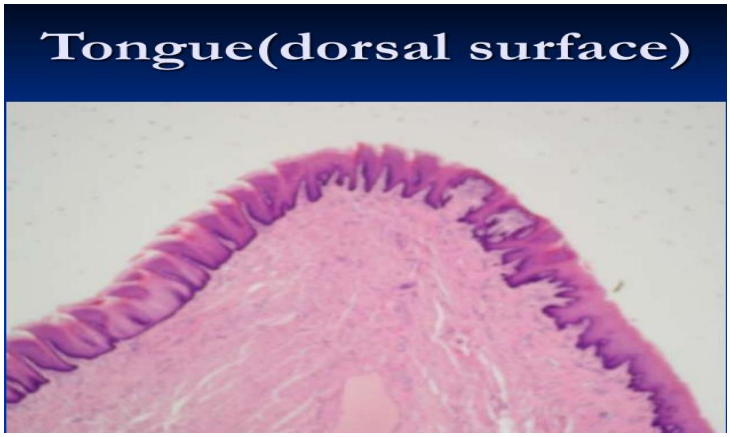
Doctor`s slides:

1. Oral mucosa 2. Red margin 3. Hair follicles and sebaceous glands
   LP: lamina propria

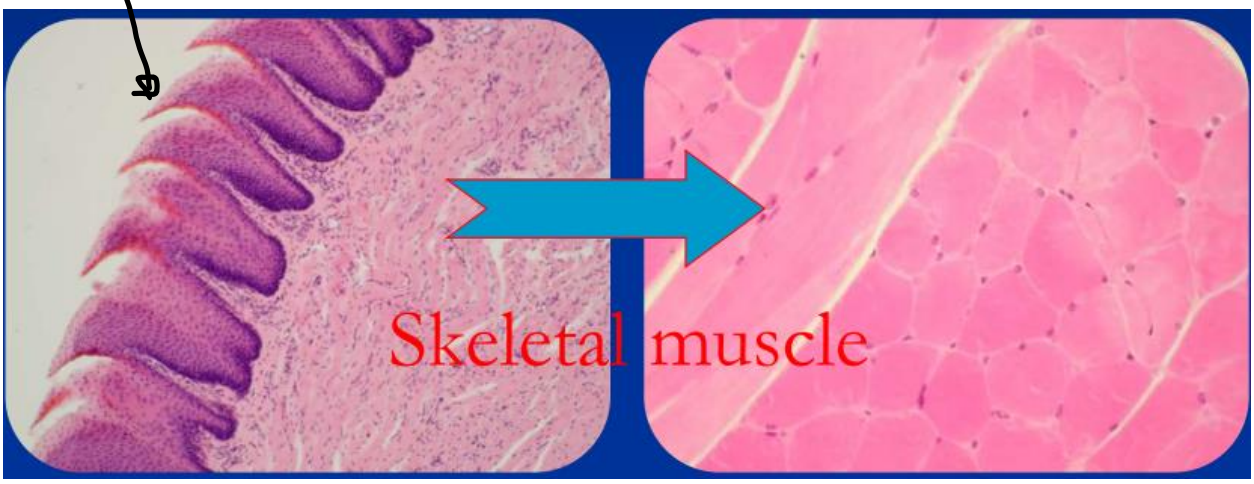


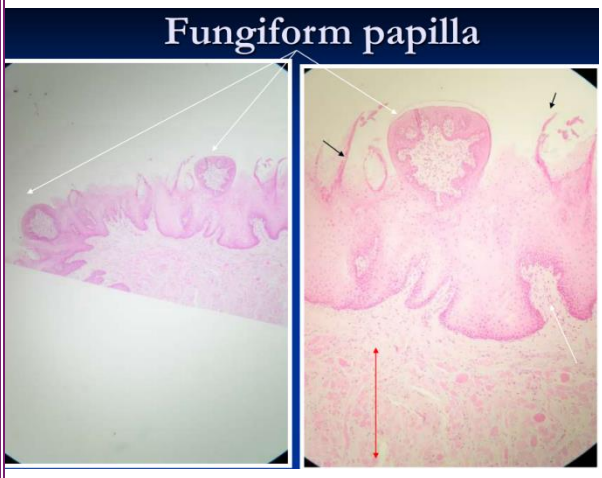




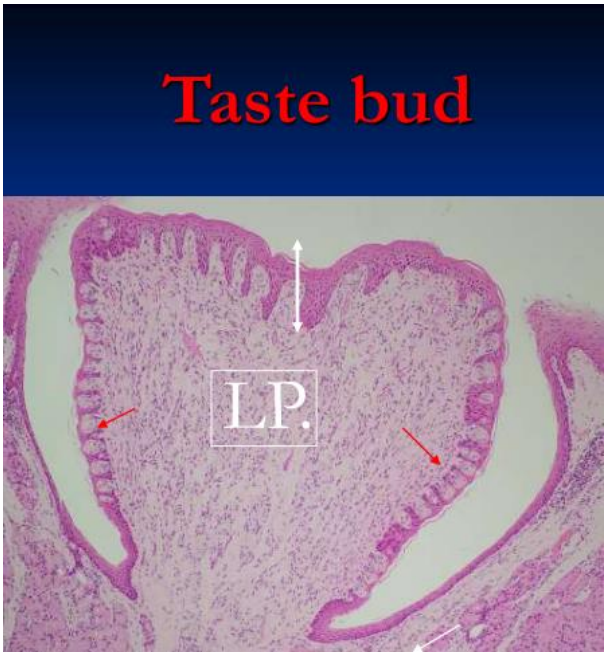


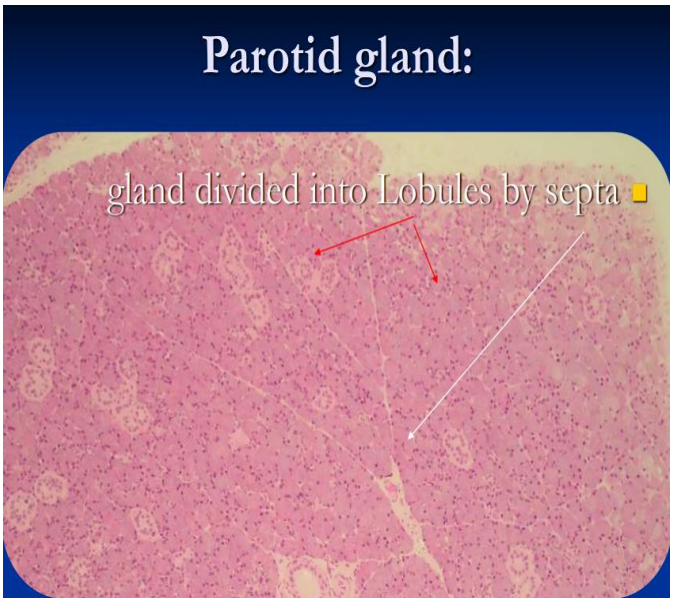
Filiform papillae

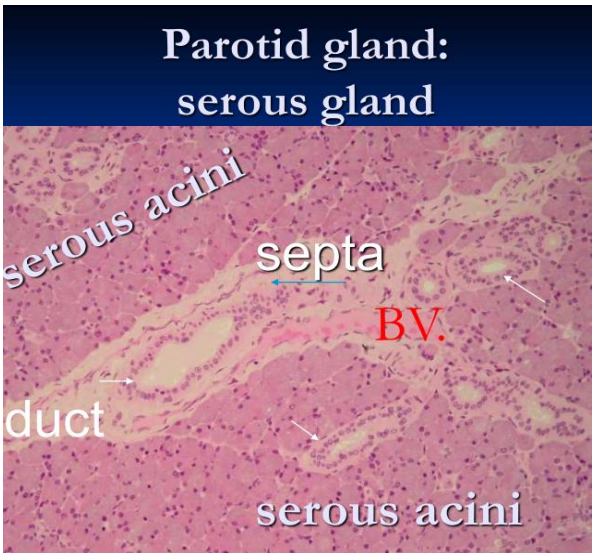


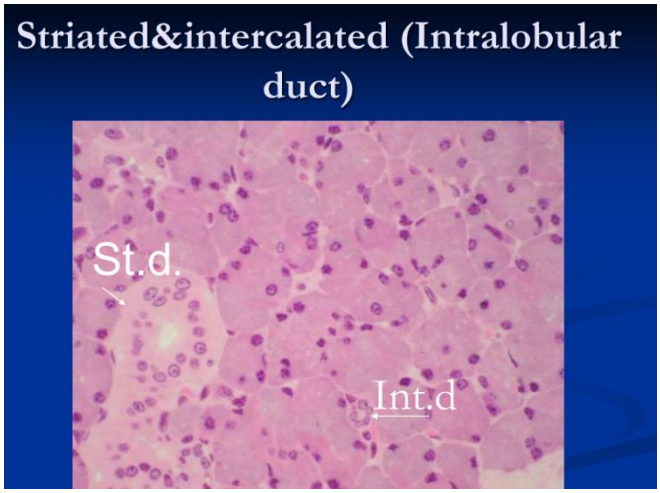

Fungiform papilla

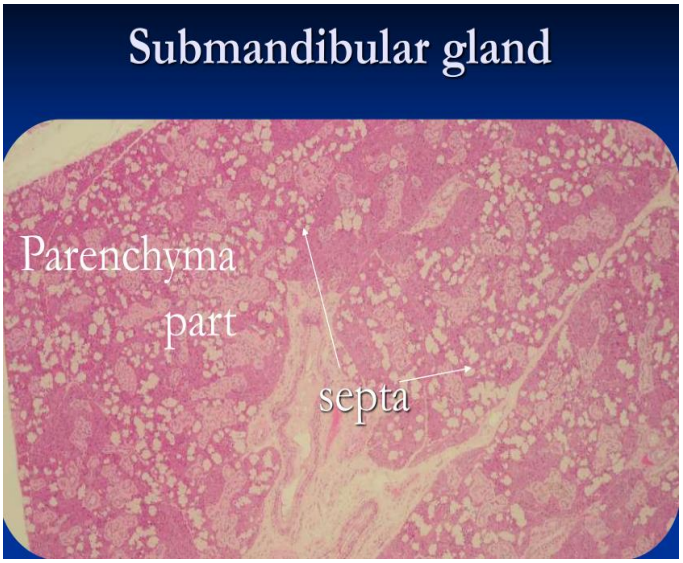

Circumvallate Papilla
sulcus=groove
VonIbner's gland
Sk.musc.

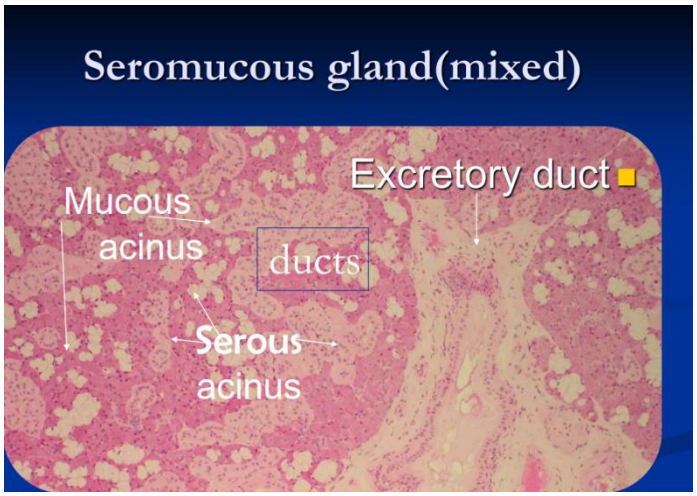

Taste bud
LP.

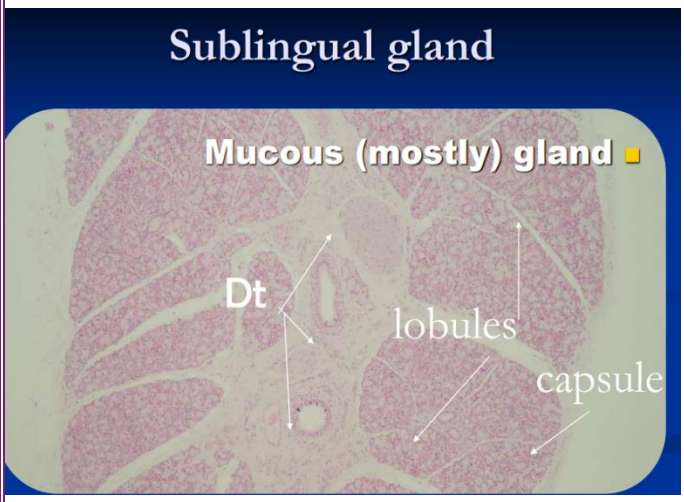

Parotid gland:
gland divided into Lobules by septa


Parotid gland:
serous gland
serous acini
septa
BV.
duct
serous acini


Striated&intercalated (Intralobular duct)
St.d.
Int.d


Submandibular gland
Parenchyma part
septa


Seromucous gland(mixed)
Excretory duct
Mucous acinus
ducts
Serous acinus


Sublingual gland
Mucous (mostly) gland
Dt
lobules
capsule

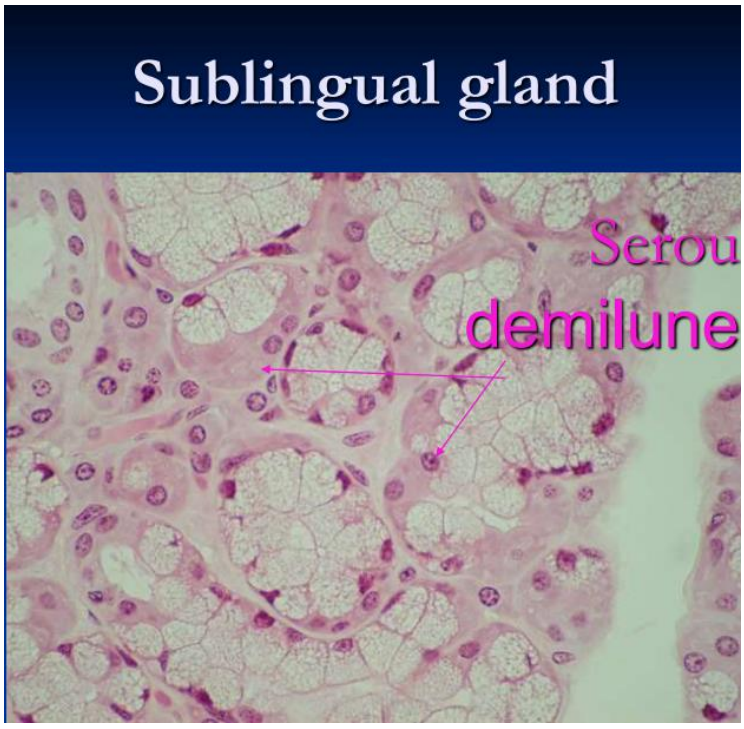
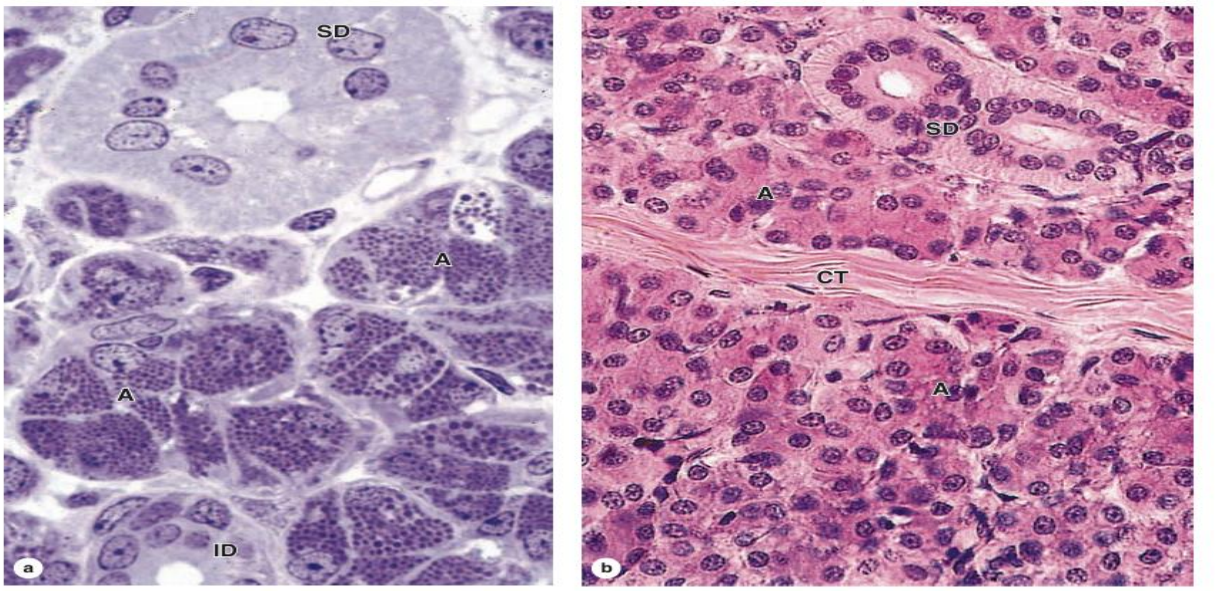
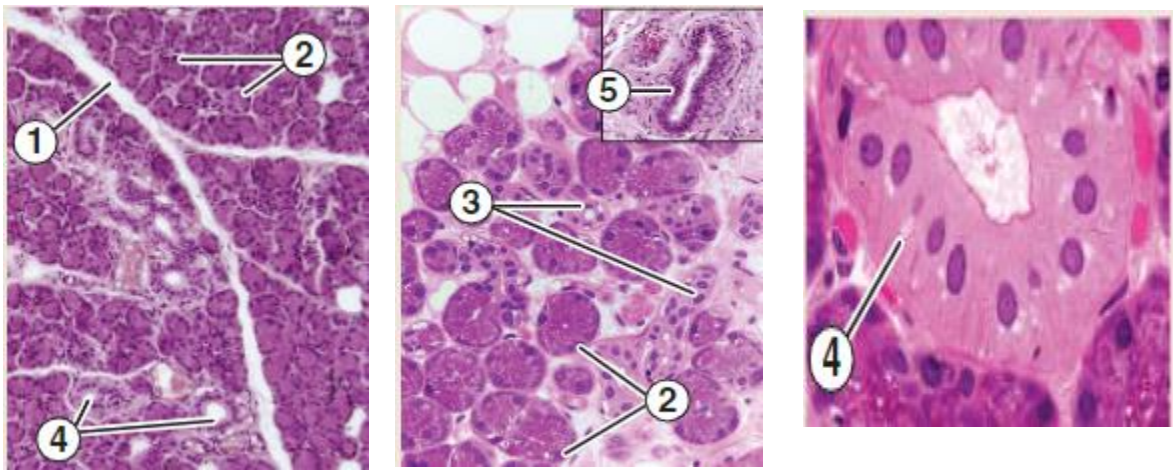

Sublingual gland
Serou
demilune

FIGURE **16–3** Parotid gland.



The large parotid gland consists entirely of serous acini with cells producing amylase and other proteins for storage in secretory granules.
(a) Micrograph of a parotid gland shows densely packed serous acini (**A**) with ducts. Secretory granules of serous cells are clearly shown in this plastic section, as well as an intercalated duct (**ID**) and striated duct (**SD**), both cut transversely. (X400; PT)
(b) Striations of a duct (**SD**) are better seen here, along with a septum (**CT**) and numerous serous acini (**A**). The connective tissue often includes adipocytes. (X200; H&E)

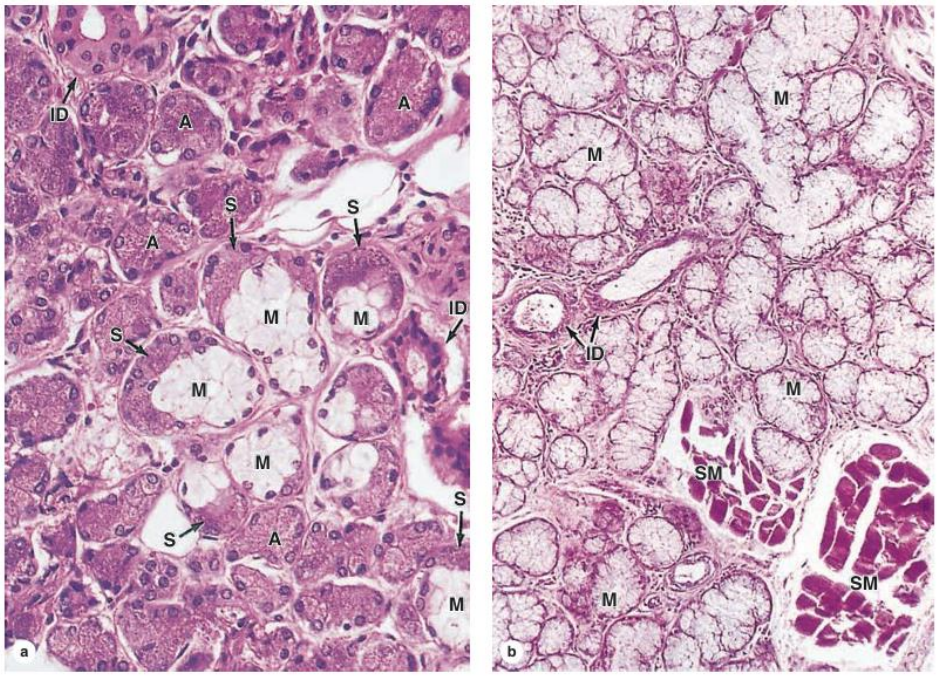


Parotid gland

1. Capsule and connective tissue septa: Dense irregular connective tissue, surrounding and protecting salivary gland and dividing it into lobes and lobules.
2. Secretory acini: Spherical secretory units, serous-secreting pyramidal to cuboidal cells, producing and secreting watery fluid containing amylase.
3. Intercalated ducts: Simple cuboidal epithelium, draining each secretory acinus.
4. Striated ducts: Simple columnar epithelium, subnuclear striations, draining intercalated ducts.

5. Interlobular ducts: Simple to stratified columnar epithelium, draining each lobe and transferring saliva to the oral cavity.

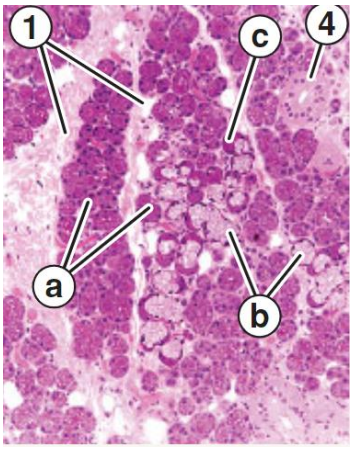
FIGURE **16–5** Submandibular gland and sublingual gland.

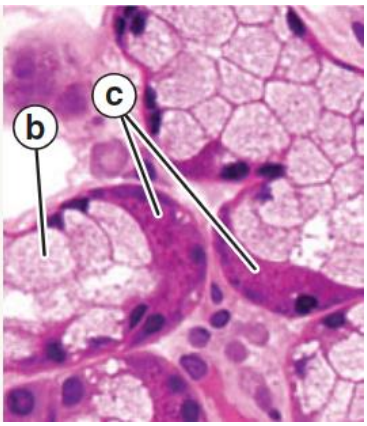


(a) The submandibular gland is a mixed serous and mucous gland (serous cells predominate), and shows well-stained serous acini (**A**) and "serous demilunes" (**S**) and pale-staining mucous cells (**M**) grouped as tubules in this tubuloacinar gland. (The crescent-shaped "serous demilunes" arise at least in part artifactually due to disproportionate swelling of the adjacent mucous cells during slide preparation.) Small intralobular ducts (**ID**) drain each lobule. (X340; H&E)

(b) The sublingual gland is a mixed but largely mucous gland with a tubuloacinar arrangement of poorly stained mucous cells (**M**). Small intralobular ducts (**ID**) are seen in connective tissue, as well as small fascicles of lingual striated muscle (**SM**). (X140; H&E)

Submandibular gland



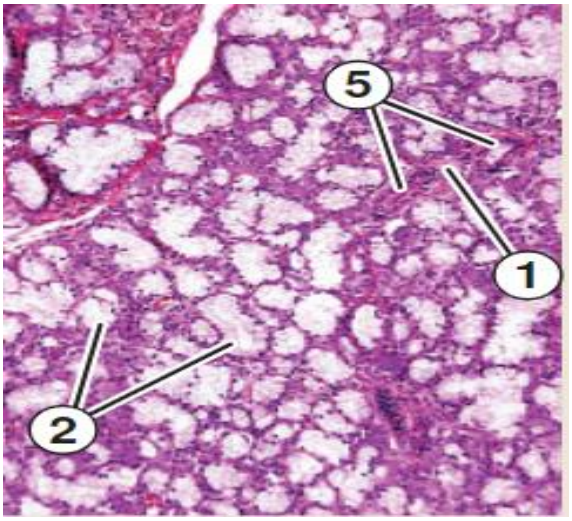


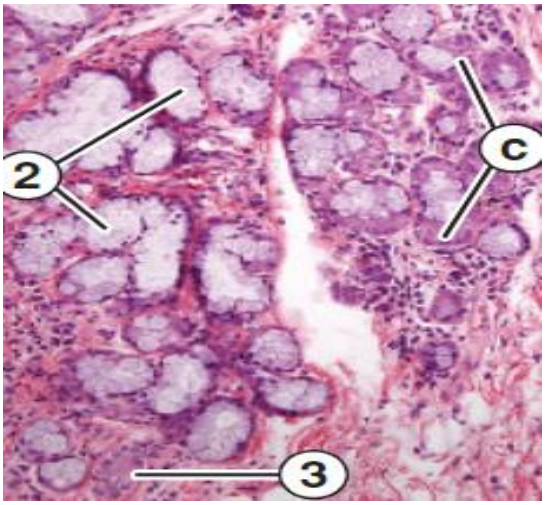
1. Capsule and septa
2. a) Serous acini
   b) Mucous tubules
   c) Serous demilunes:

Mucous tubules capped by serous-secreting acinar-forming hemi-spheres.

Sublingual gland

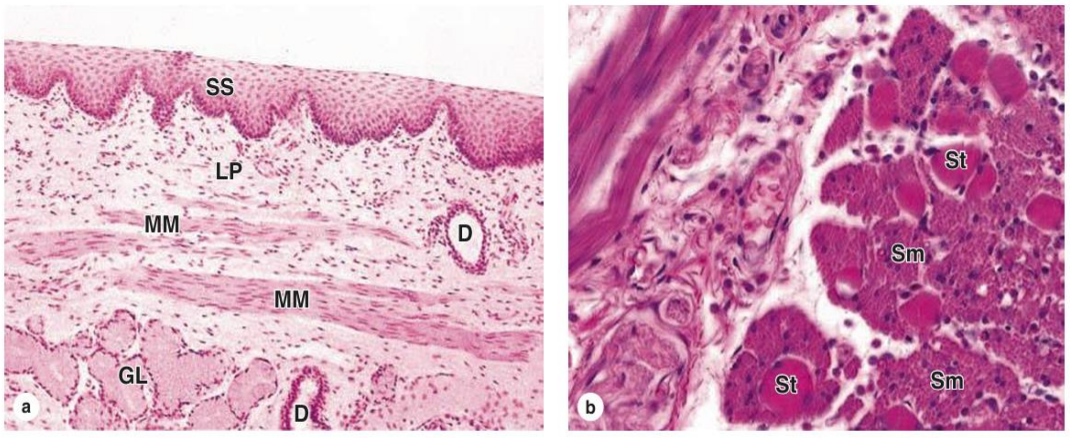
1. Capsule and septa
2. Mostly mucous tubules with some serous demilunes
3. Intercalated ducts: Simple cuboidal epithelium
4. Striated ducts: Simple cuboidal to columnar epithelium, subnuclear striations
5. Interlobular ducts: Simple to stratified columnar epithelium





Esophagus:

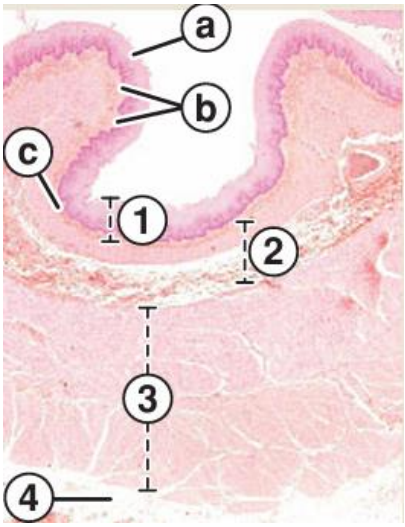
FIGURE **15–13** **Esophagus.**



(a) Longitudinal section of esophagus shows mucosa consisting of nonkeratinized stratified squamous epithelium (**SS**), lamina propria (**LP**), and smooth muscles of the muscularis mucosae (**MM**). Beneath the mucosa is the submucosa containing esophageal mucous glands (**GL**) that empty via ducts (**D**) onto the luminal surface. (X40; H&E)

(b) Transverse section showing the muscularis halfway along the esophagus reveals a combination of large skeletal or striated muscle fibers (**St**) and smooth muscle fibers (**Sm**) in the outer layer, which is cut transversely here. This transition from muscles under voluntary control to the type controlled autonomically is important in the swallowing mechanism. (X200; H&E)

1. Mucosa: Thrown into longitudinal folds with collapsed lumen, protecting, distending and collapsing the lumen as bolus passes.



a. Epithelium: Nonkeratinized stratified squamous epithelium, protecting, withstanding friction during swallowing.

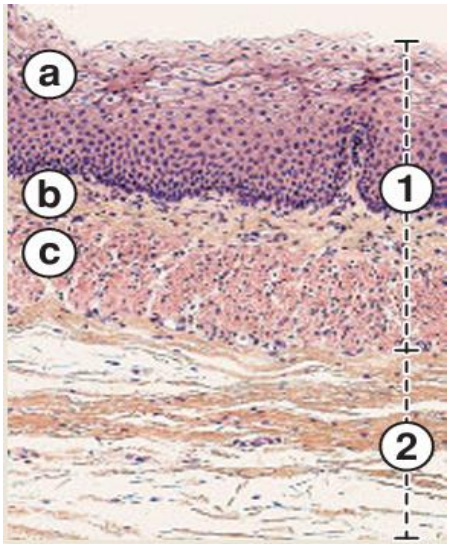
b. Lamina propria: Loose connective tissue, nutritional, immunologic support for epithelium.

c. Muscularis mucosa: Smooth muscle tissue, contributing to mucosal folding.

2. Submucosa: Dense irregular connective tissue, structural support, delivery of neurovasculature to the esophageal wall.

d. Esophageal glands: Compound tubuloacinar exocrine glands, secreting mucus, lubricating the lumen, scattered throughout sub mucosa, increase in number closer to stomach.

3.Muscularis propria, peristaltic contraction during swallowing

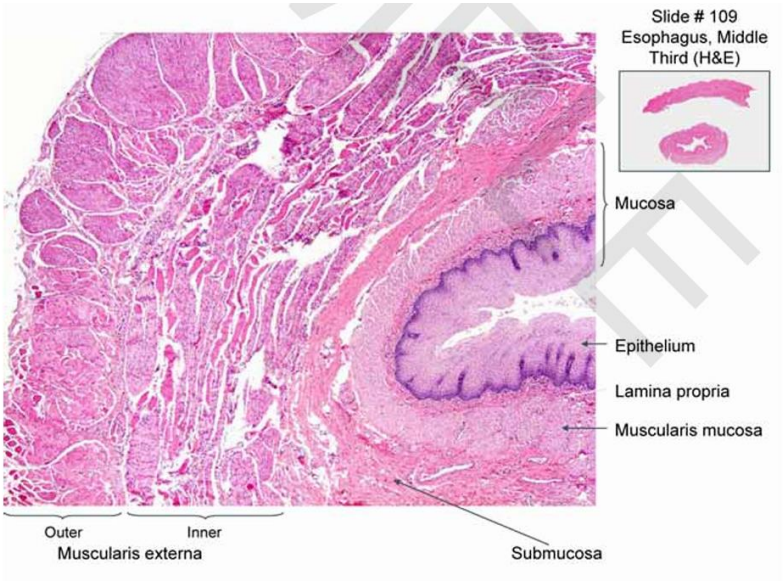


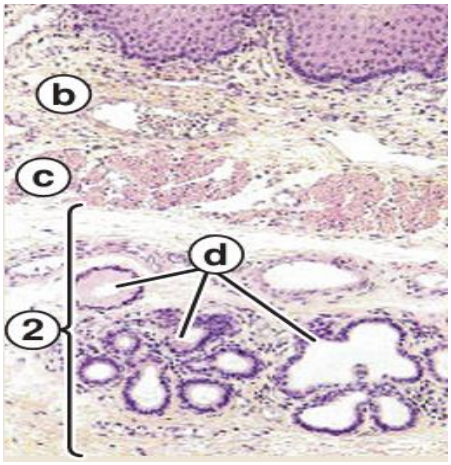
e. Skeletal muscles, upper one third of esophagus

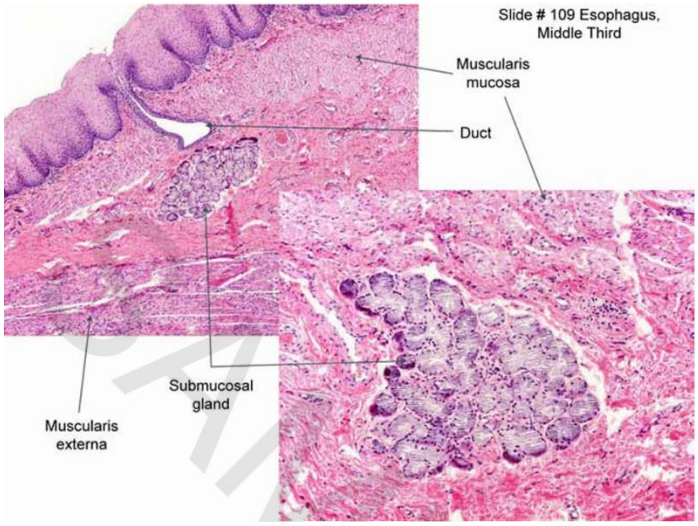
f. Skeletal and smooth muscles, middle one-third of esophagus

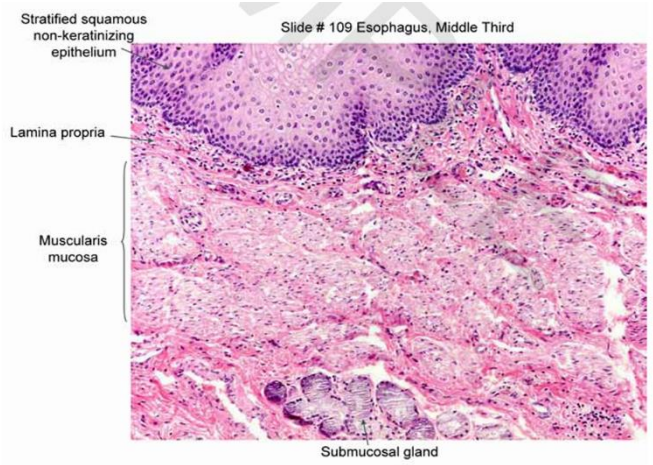
g. Smooth muscles, lower one-third of esophagus

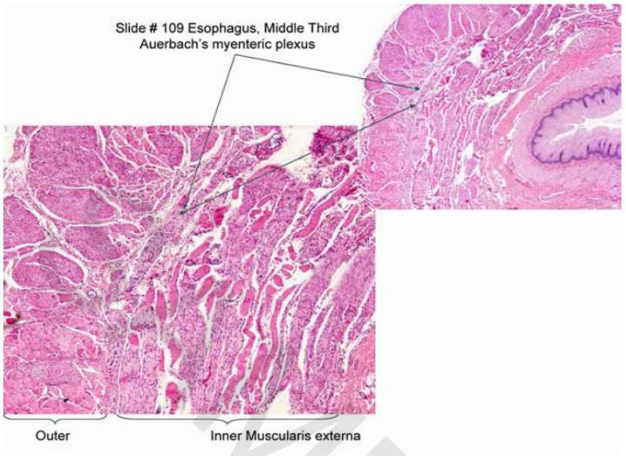
4. Adventitia or serosa: Connective tissue, anchoring, stabilizing, supporting esophagus.

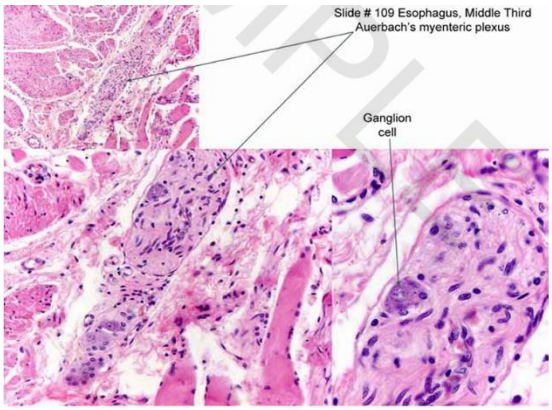






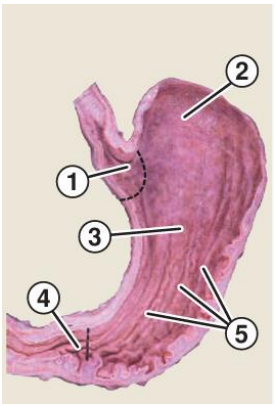






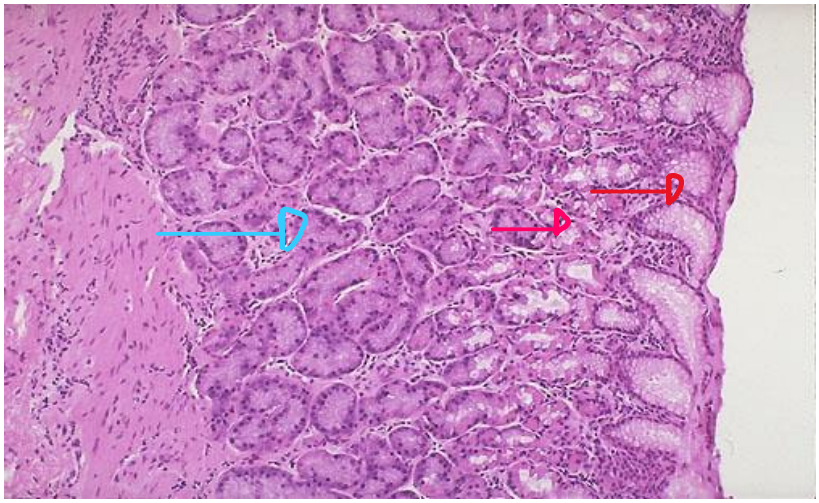
Stomach:

Dilated portion of the GI tract, temporary storage of ingested food, mixing it with stomach juice; disinfecting; initiating digestion, four major regions make up the stomach: the cardia, fundus, body, and pylorus.



1. Cardia: Ring like region surrounding gastroesophageal junction, receiving bolus from esophagus, limited prevention of reflux.
2. Fundus: Dome-shaped superior out pocketing, accommodating large volume of food and drinks.
3. Body: Majority of the stomach, temporary storage, churning, mixing of food with stomach secretions
4. Pylorus: Funnel-like distal end of the stomach, controlled release of chyme into duodenum, preventing reflux.

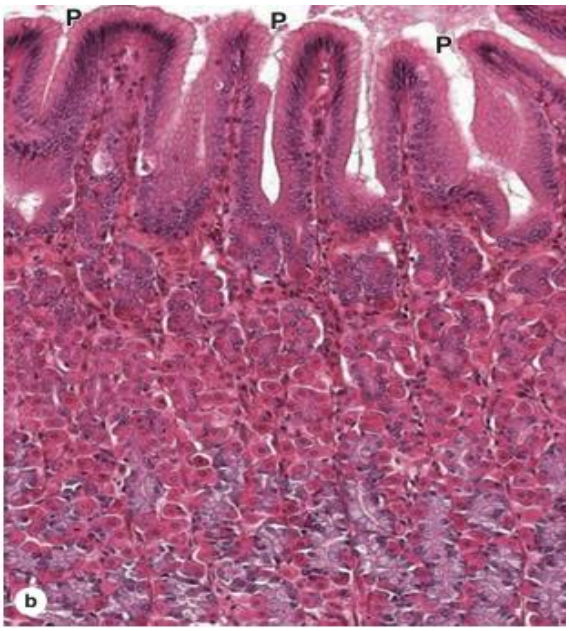
5. Rugae: Longitudinal mucosal folds, allowing stomach to expand



This is the normal fundus (body) of the stomach at medium power. The mucosa has short gastric pits, beneath which are long glands with pink parietal cells and mucus secreting cells. The parietal cells produce hydrochloric acid.

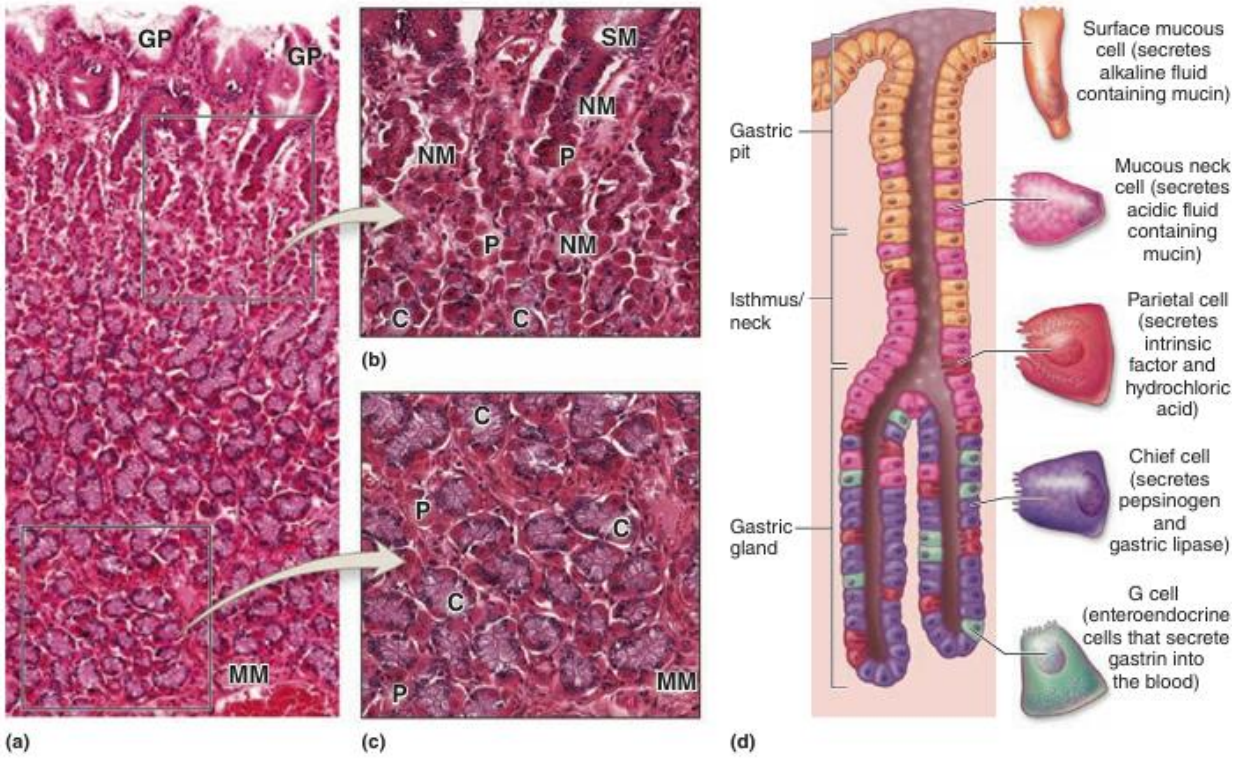
FIGURE **15–15** Wall of the stomach with rugae.

A low-magnification micrograph of the stomach wall at the fundus shows the relative thickness of the four major layers: the mucosa (**M**), the submucosa (**SM**), the muscularis externa (**ME**), and the serosa (**S**). Two rugae (folds) cut transversely and consisting of mucosa and submucosa are included. The mucosa is packed with branched tubular glands penetrating the full thickness of the lamina propria so that this sublayer cannot be distinguished at this magnification. The **muscularis mucosae** (arrows), immediately beneath the basal ends of the gastric glands, is shown. The submucosa is largely loose connective tissue, with blood vessels (**V**) and lymphatics. (X12; H&E)



A section of the stomach lining shows that these surface mucous cells are part of a simple columnar epithelium continuous with the lining of the pits (P). Each pit extends into the lamina propria and then branches into several tubular glands. These glands coil and fill most of the mucosa. Around the various cells of the closely packed gastric glands are cells, capillaries, and small lymphatics of the connective tissue lamina propria.

FIGURE 15–17 Gastric glands.



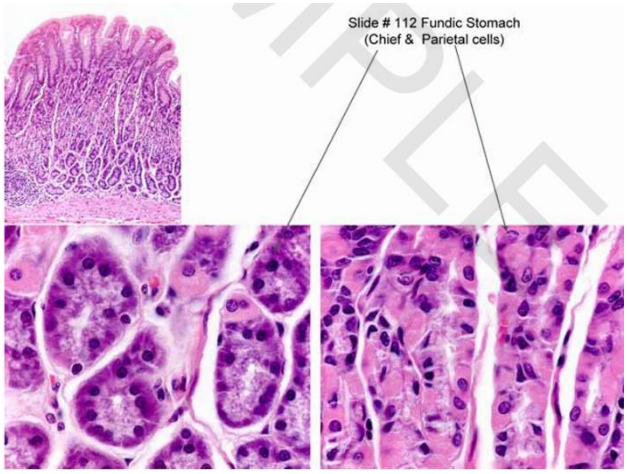
Throughout the **fundus** and **body** regions of the stomach, the gastric pits lead to gastric glands with various cell types.

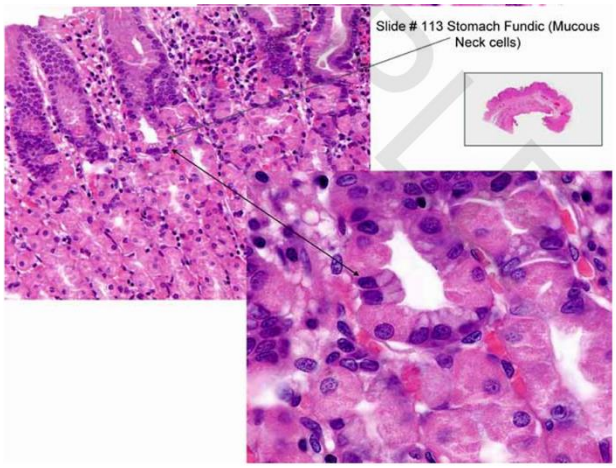
(a) The long, coiled gastric glands penetrate the complete thickness of the mucosa, from the gastric pits (**GP**) to the muscularis mucosae (**MM**).

(b) In the neck of a gastric gland, below the surface mucous cells (**SM**) lining the gastric pit, are small mucous neck cells (**MN**), scattered individually or clustered among parietal cells (**P**) and stem cells that give rise to all epithelial cells of the glands. The numerous parietal cells (**P**) are large distinctive cells often bulging from the tubules, with central nuclei surrounded by intensely eosinophilic cytoplasm with unusual ultrastructure. These cells produce HCl, and the numerous mitochondria required for this process cause the eosinophilia. Chief cells (**C**) begin to appear in the neck region. Around these tubular glands are various cells and microvasculature in connective tissue.

(c) Near the muscularis mucosae (**MM**), the bases of these glands contain fewer parietal cells (**P**) but many more zymogenic chief cells (**C**). Chief cells are found in clusters, with basal nuclei and basophilic cytoplasm. From their apical ends chief cells secrete pepsinogen, the zymogen precursor for the major protease pepsin. Zymogen granules are often removed or stain poorly in routine preparations. (Both X200; H&E)

(**d**) Diagram showing general morphology and functions of major gastric gland cells.

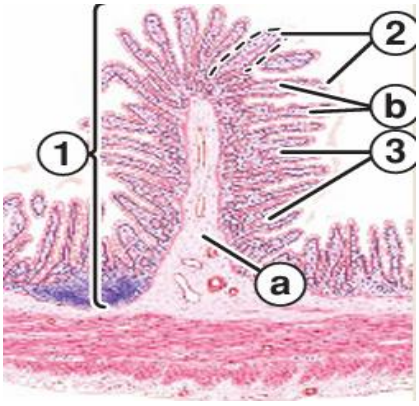


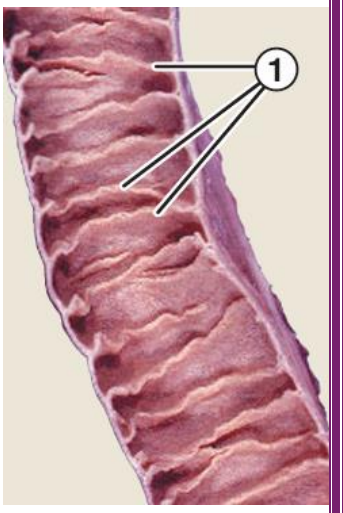


Small Intestine:

The small intestine is the site where the digestive processes are completed and where the nutrients (products of digestion) are absorbed by cells of the epithelial lining. The small intestine is relatively long—approximately 6 m—and consists of three segments: the duodenum, jejunum, and ileum. These segments have most histologic features in common and are discussed together.

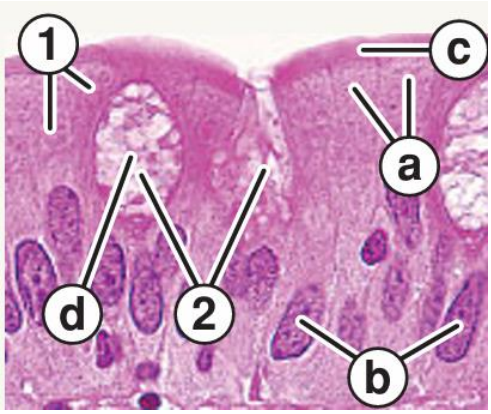
1. Plicae circulares: Large, horizontal projections, loosely compartmentalizing small intestine, increasing surface area
    a. Submucosal core
2. Villi: Numerous long, finger like mucosal projections into the lumen that give the mucosa a velvety appearance, increasing surface area for absorption and secretion.
    b. Lamina propria core
3. Crypts of Lieberkühn: Deep depressions in between villi that are ductal openings of intestinal glands, releasing intestinal gland secretions into the lumen.





Cells of the small intestine:

1. Enterocytes: Columnar cells, absorption
    a. Eosinophilic cytoplasm
    b. Basal nuclei
    c. Microvilli



2. Goblet cells: Pale-staining columnar cells, mucous secretion

    d. Apical mucous filled vesicles

3. Paneth cells: Columnar cells, antibacterial function, phagocytosis of bacteria, regulating normal flora

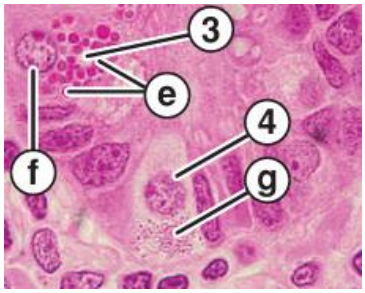
    e. Abundant supranuclear eosinophilic granules in cytoplasm

    f. Basal nuclei

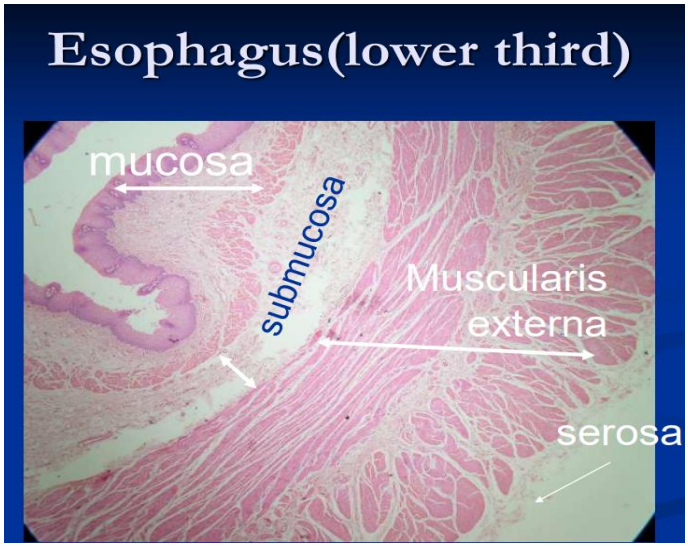
4. Enteroendocrine cells: Columnar cells, releasing hormones to regulate digestion

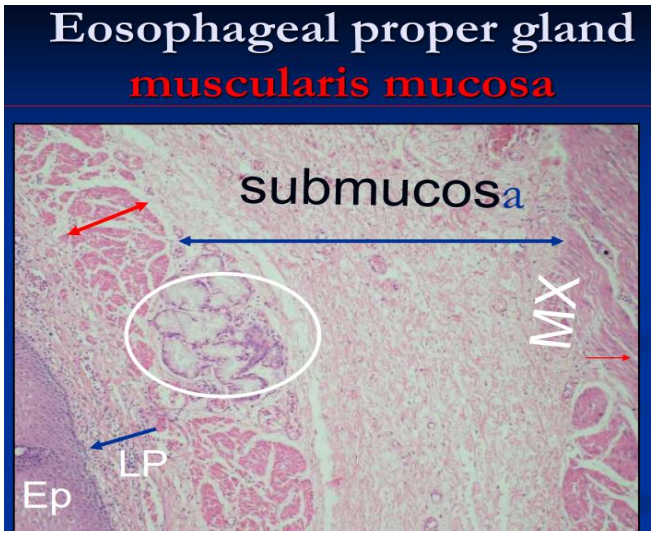
    g. Infranuclear eosinophilic granules

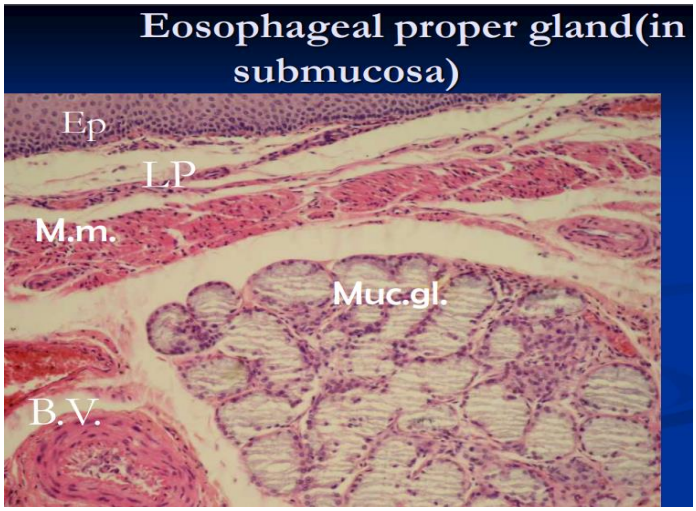
5. M cells: Columnar cells, no microvilli, Antigen transport, engulfing microorganisms, immune function.

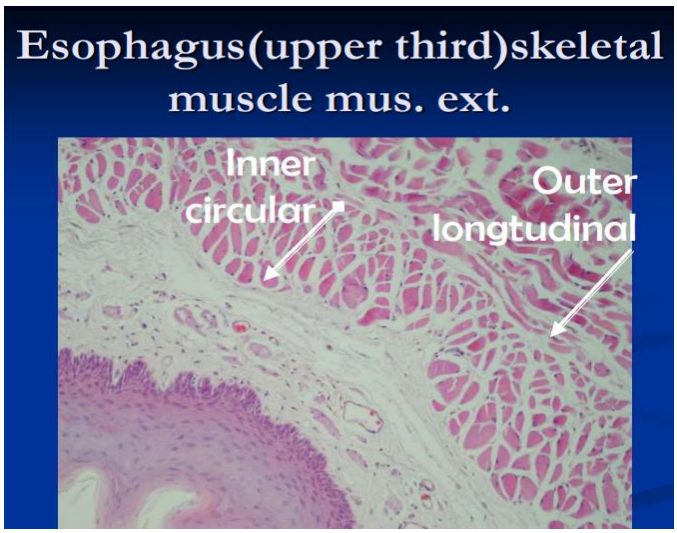


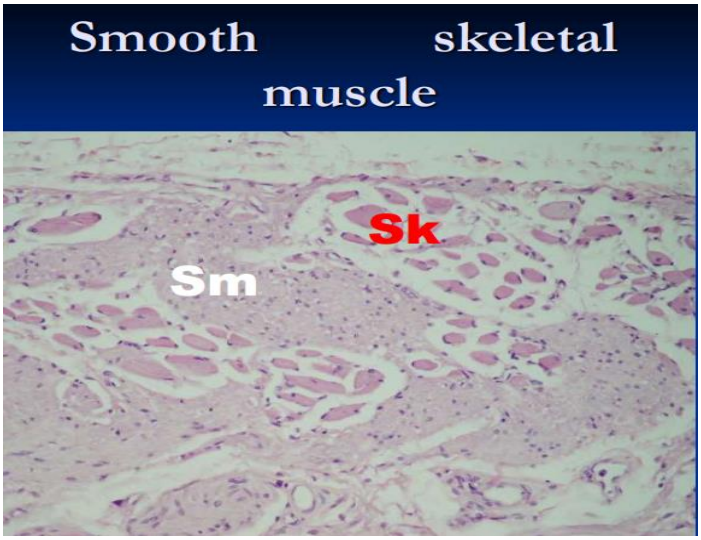
Doctor`s slides:

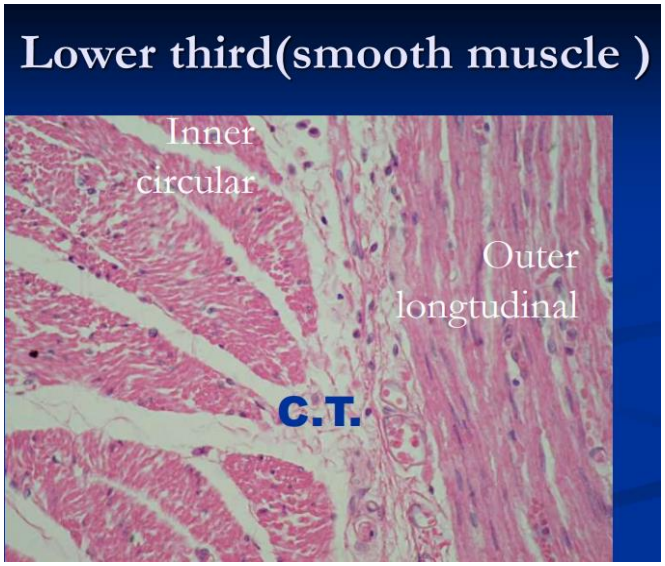


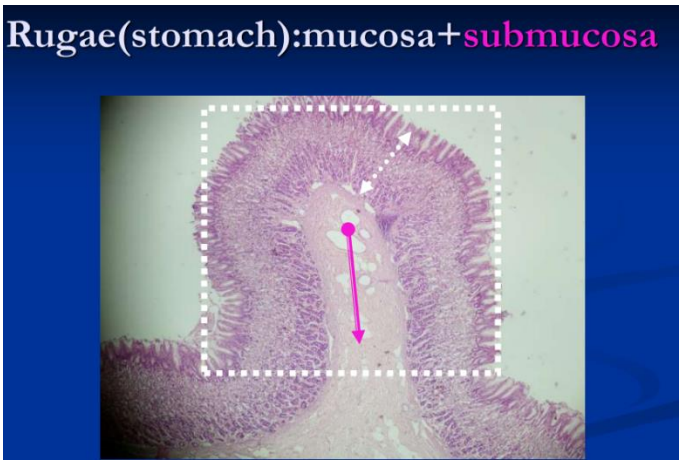


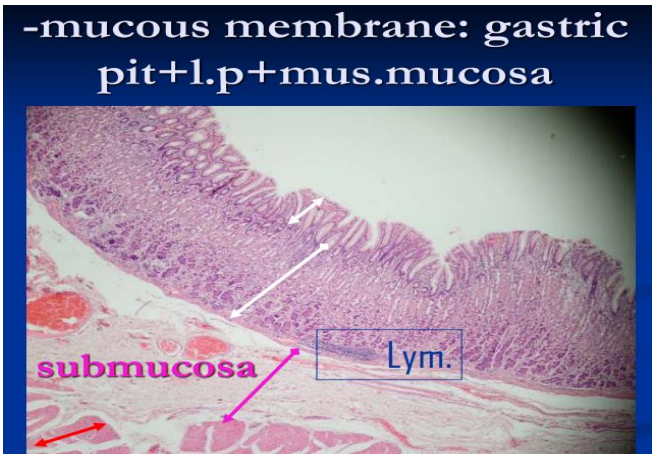


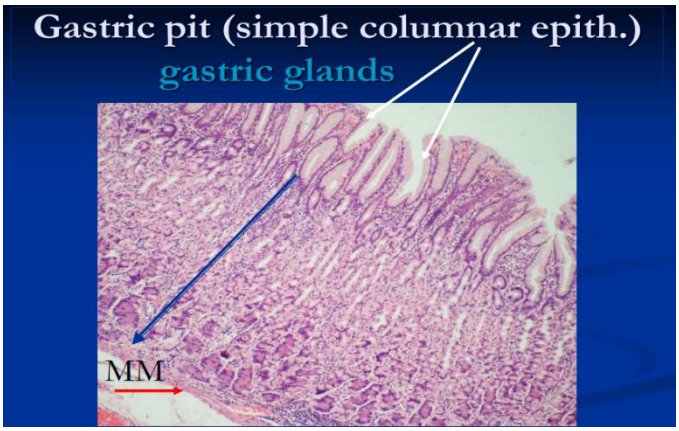




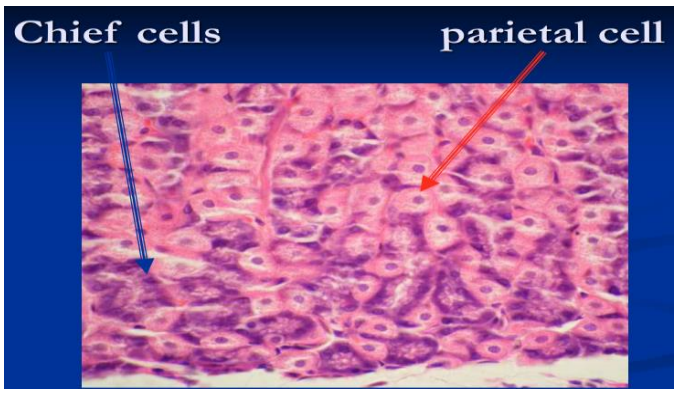


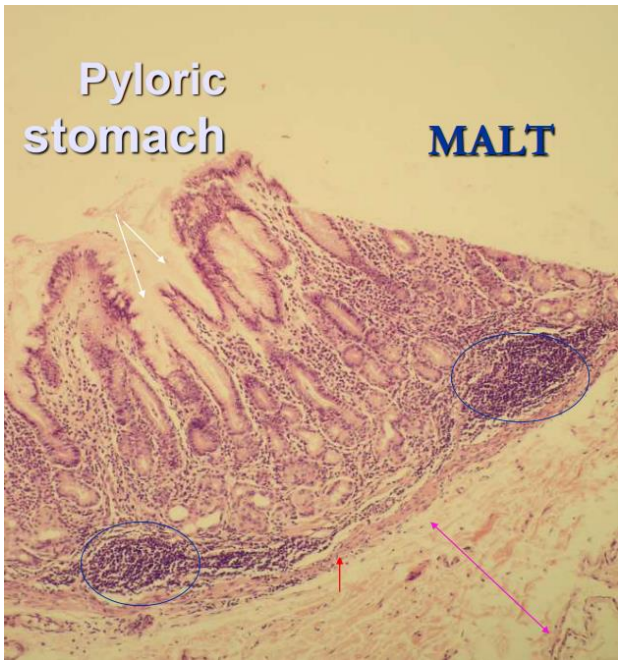

Rugae(stomach):mucosa+submucosa

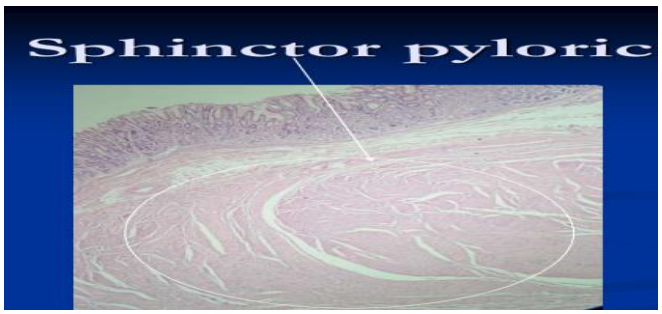

-mucous membrane: gastric pit+l.p+mus.mucosa
submucosa
Lym.


Gastric pit (simple columnar epith.)
gastric glands
MM

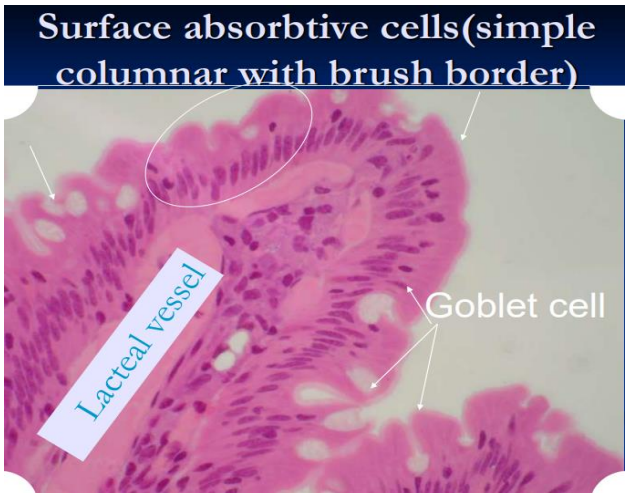

Mucous_secreting surface cells


Chief cells
parietal cell

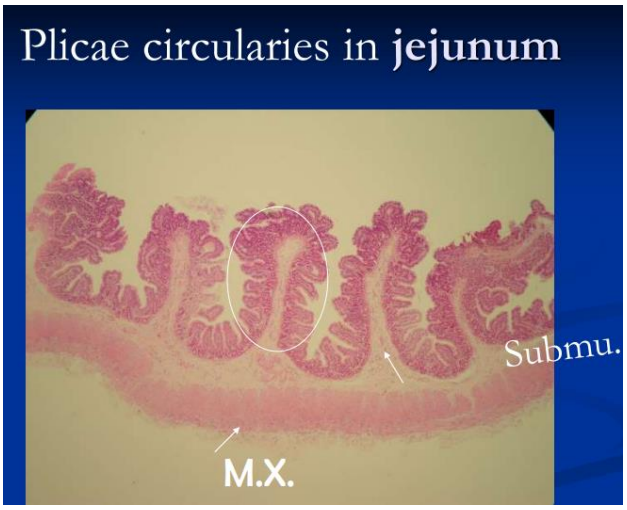

Pyloric stomach
MALT

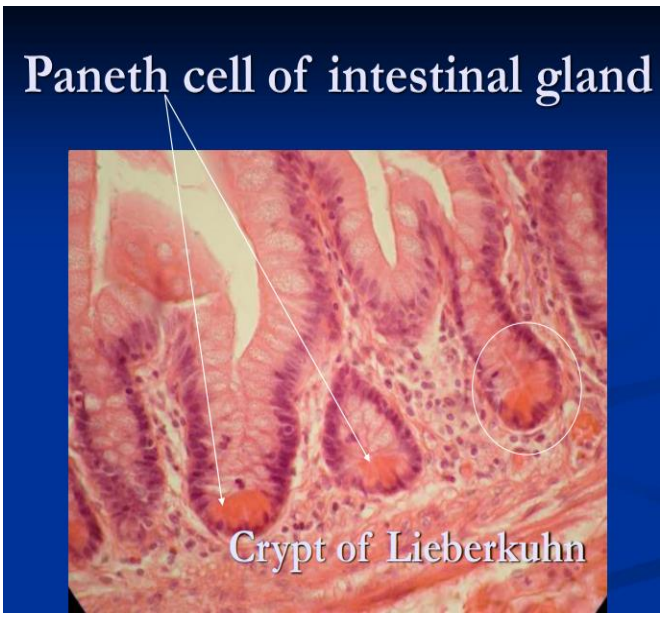

Sphinctor pyloric

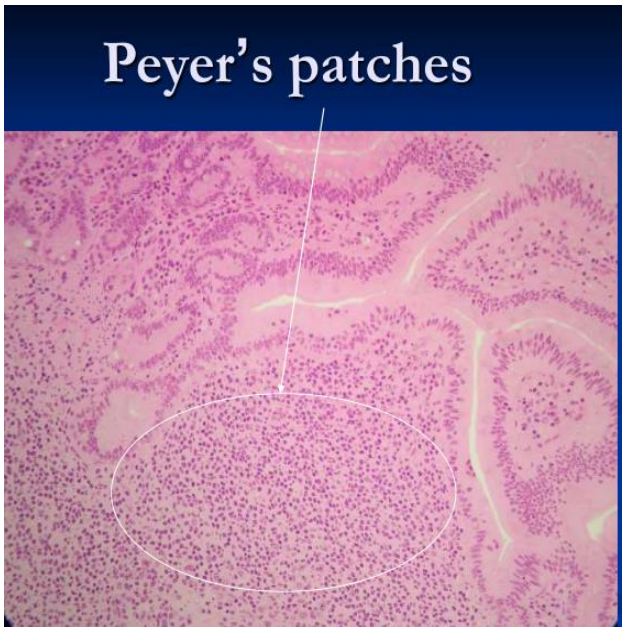

Crypt of Lieberkuhn
villus


Surface absorbtive cells(simple columnar with brush border)
Lacteal vessel
Goblet cell


Lym.
MM
Brunner's glands


Plicae circularies in jejunum
Submu.
M.X.


Paneth cell of intestinal gland
Crypt of Lieberkuhn


Peyer's patches