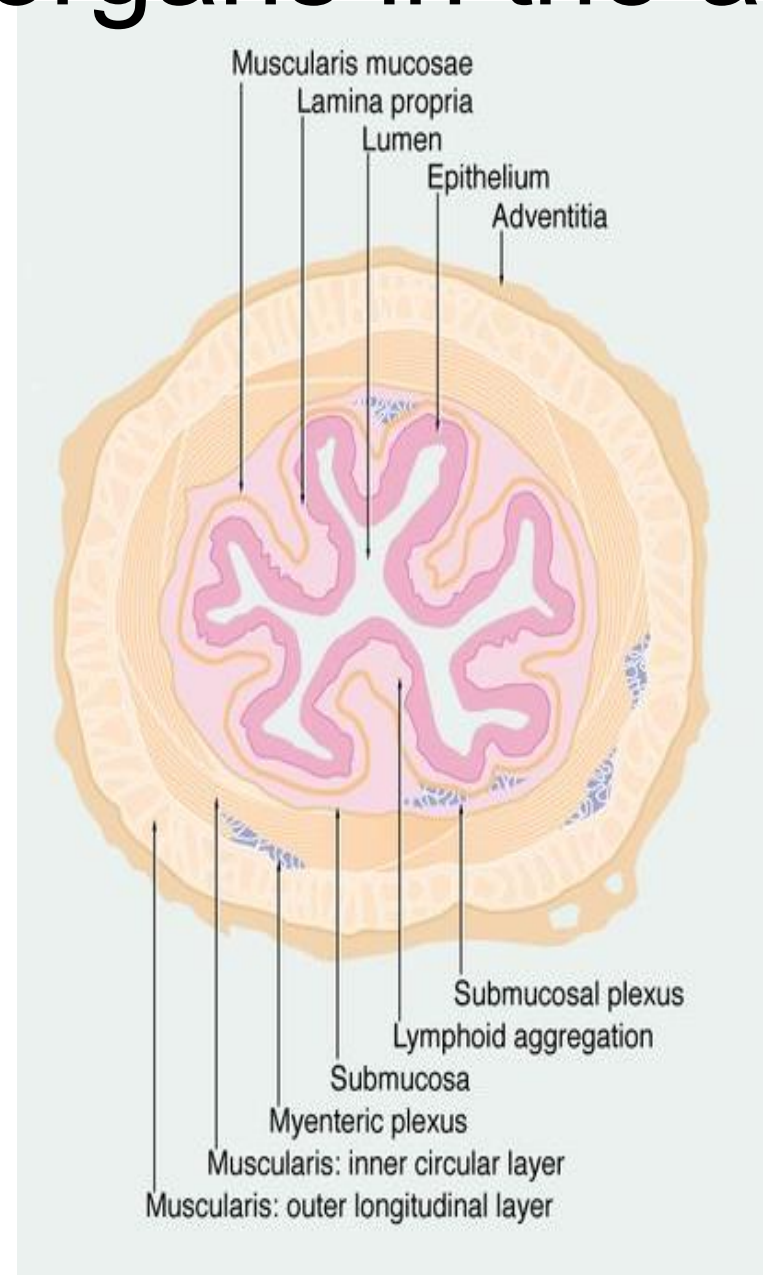
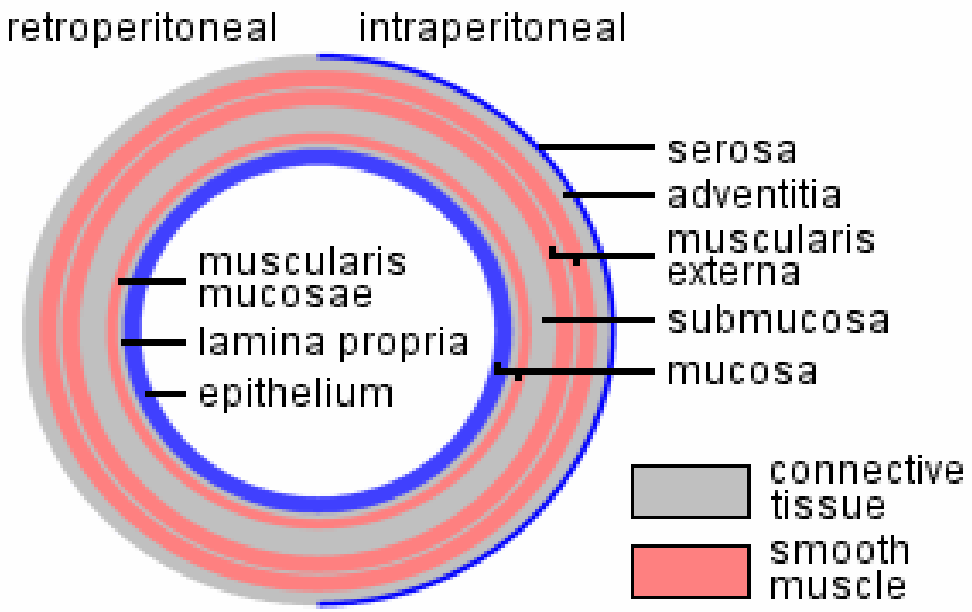
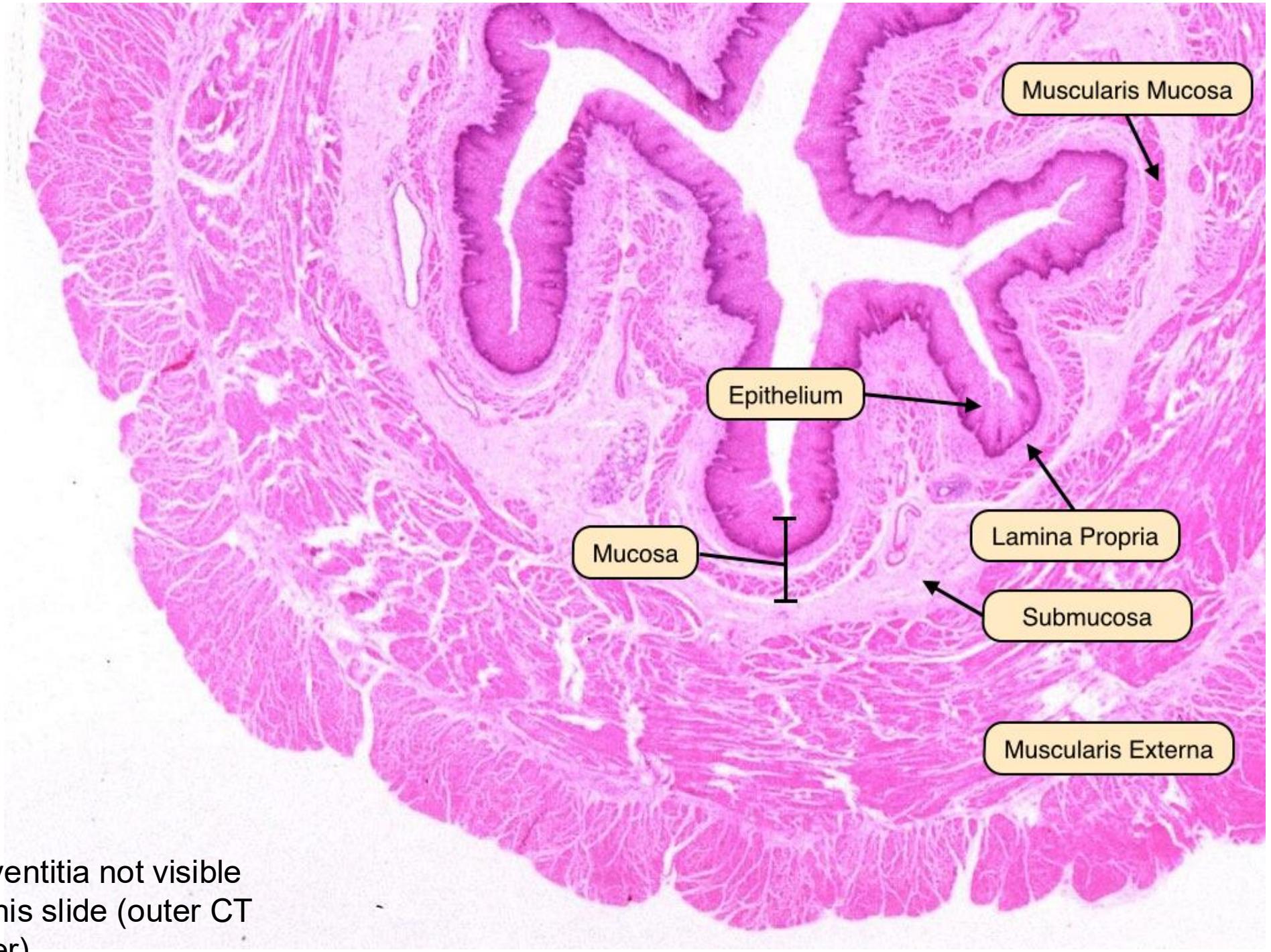
EEOB 3520
Lab 8 –Alimentary canal

General structure of the wall of organs in the alimentary canal







Adventitia not visible in this slide (outer CT layer)

Esophagus

Mucosa (1)

- non keratinized, stratified squamous epithelium with underlying lamina propria
- muscularis mucosae composed of scattered fascicles of smooth muscle in longitudinal orientation in the upper third, then more continuous
- mucous tubular glands in upper and lower thirds

Submucosa (2)

- dense connective tissue (collagen and elastic fibers)
- mucous tubular glands throughout the length (not a distinguishing feature, just something worth noting).

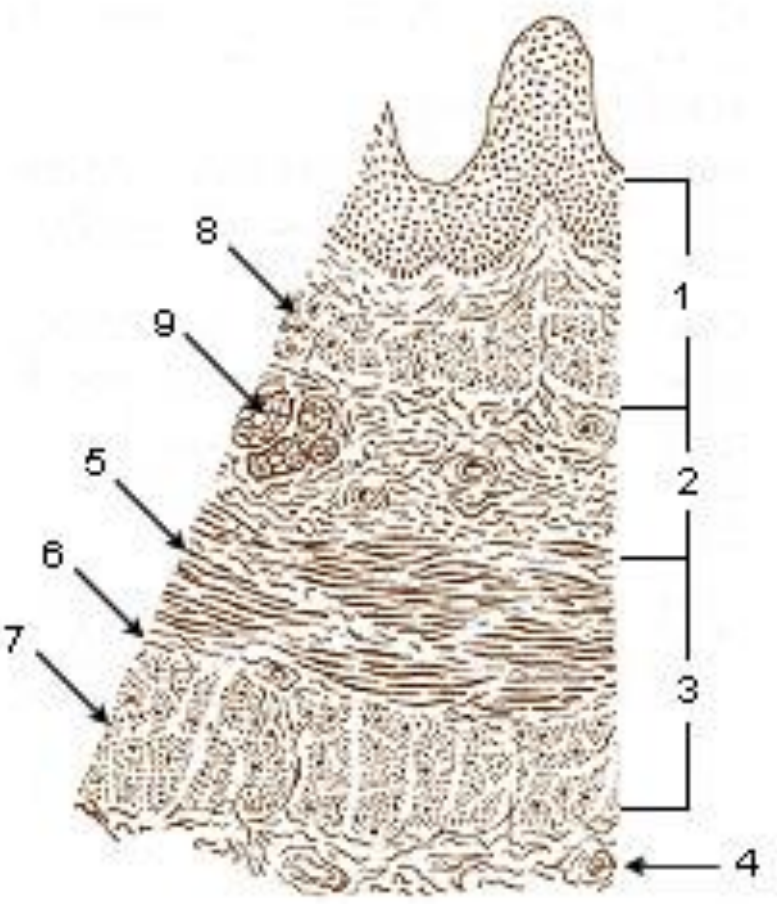
•Muscularis (3)

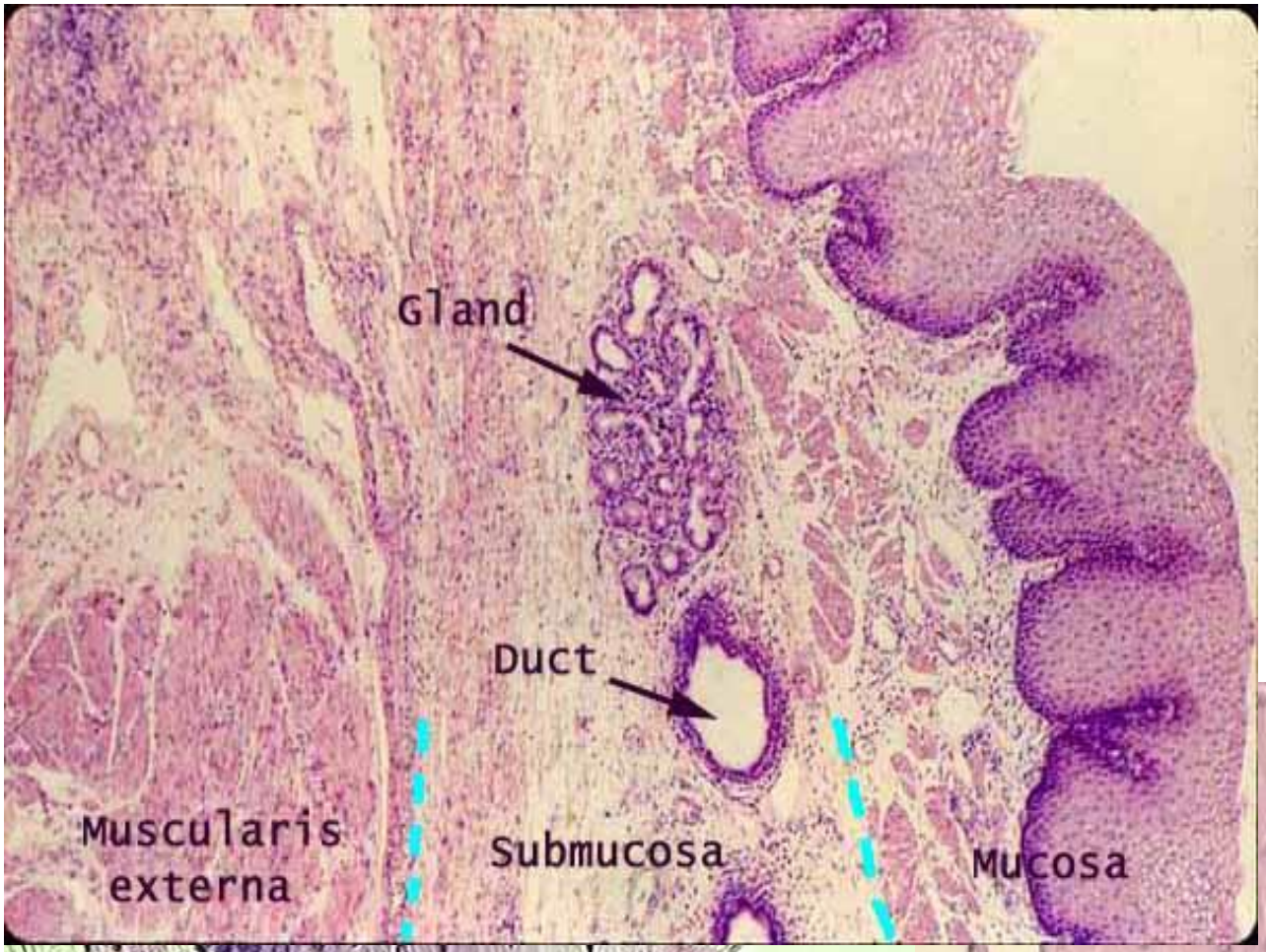
- upper third: skeletal muscle
- middle third: both skeletal and smooth
- lower third: smooth muscle

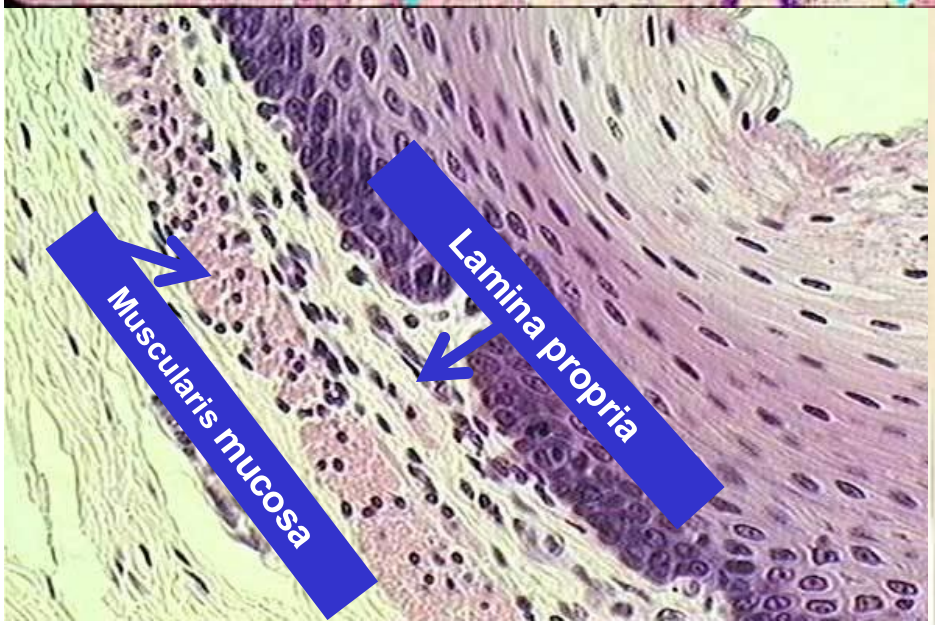
•Adventitia (esophagus) or serosa (stomach and below) (4)

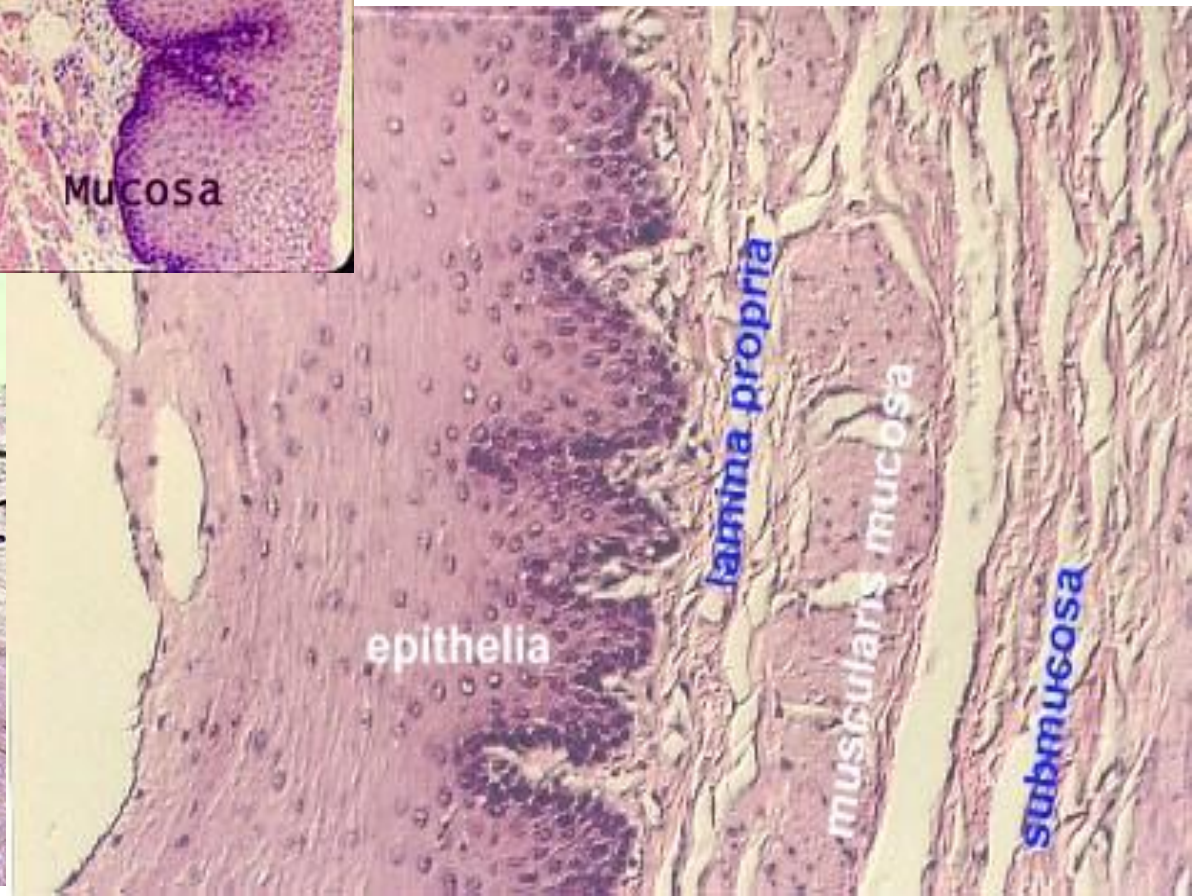
- depending on the whether above or below the diaphragm
- connective tissue

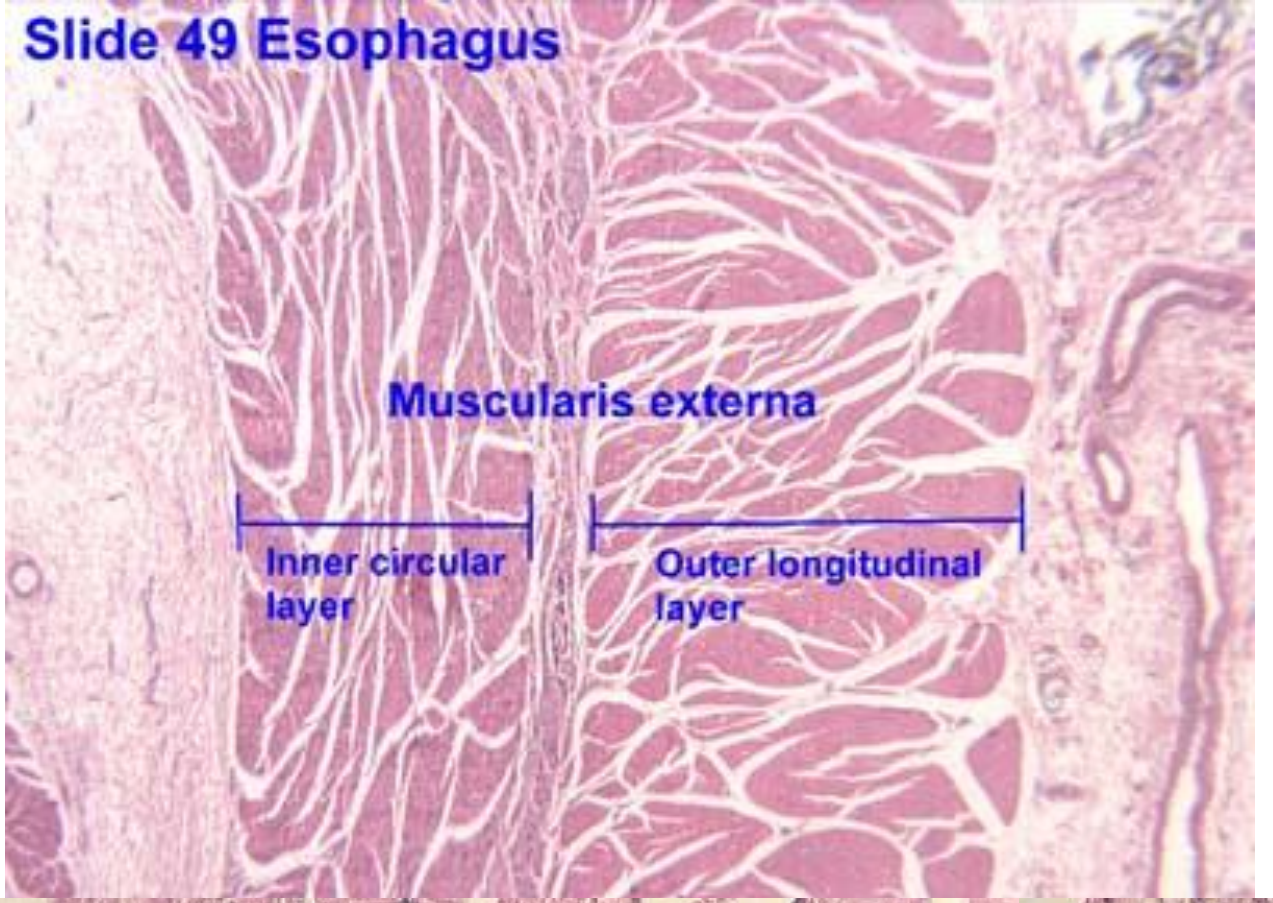
5. Striated muscle
6. Striated and smooth muscle
7. Smooth muscle
8. Lamina muscularis mucosae
9. Esophageal gland



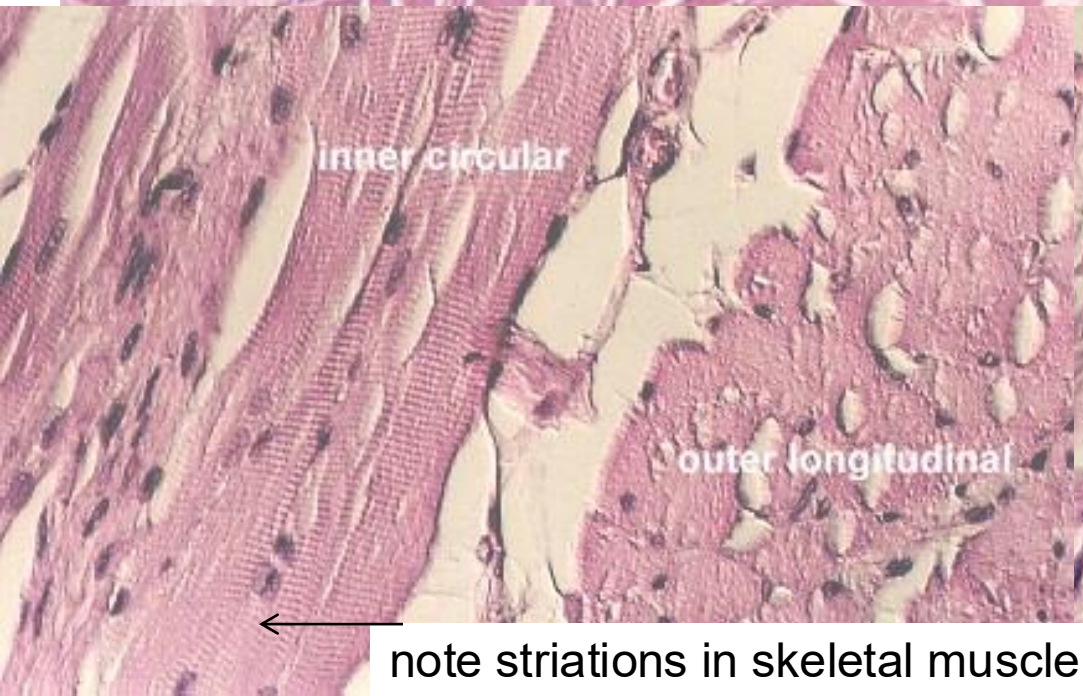

Gland
Duct
Muscularis externa
Submucosa
Mucosa


Muscularis mucosa
Lamina propria


epithelia
lamina propria
muscularis mucosa
submucosa



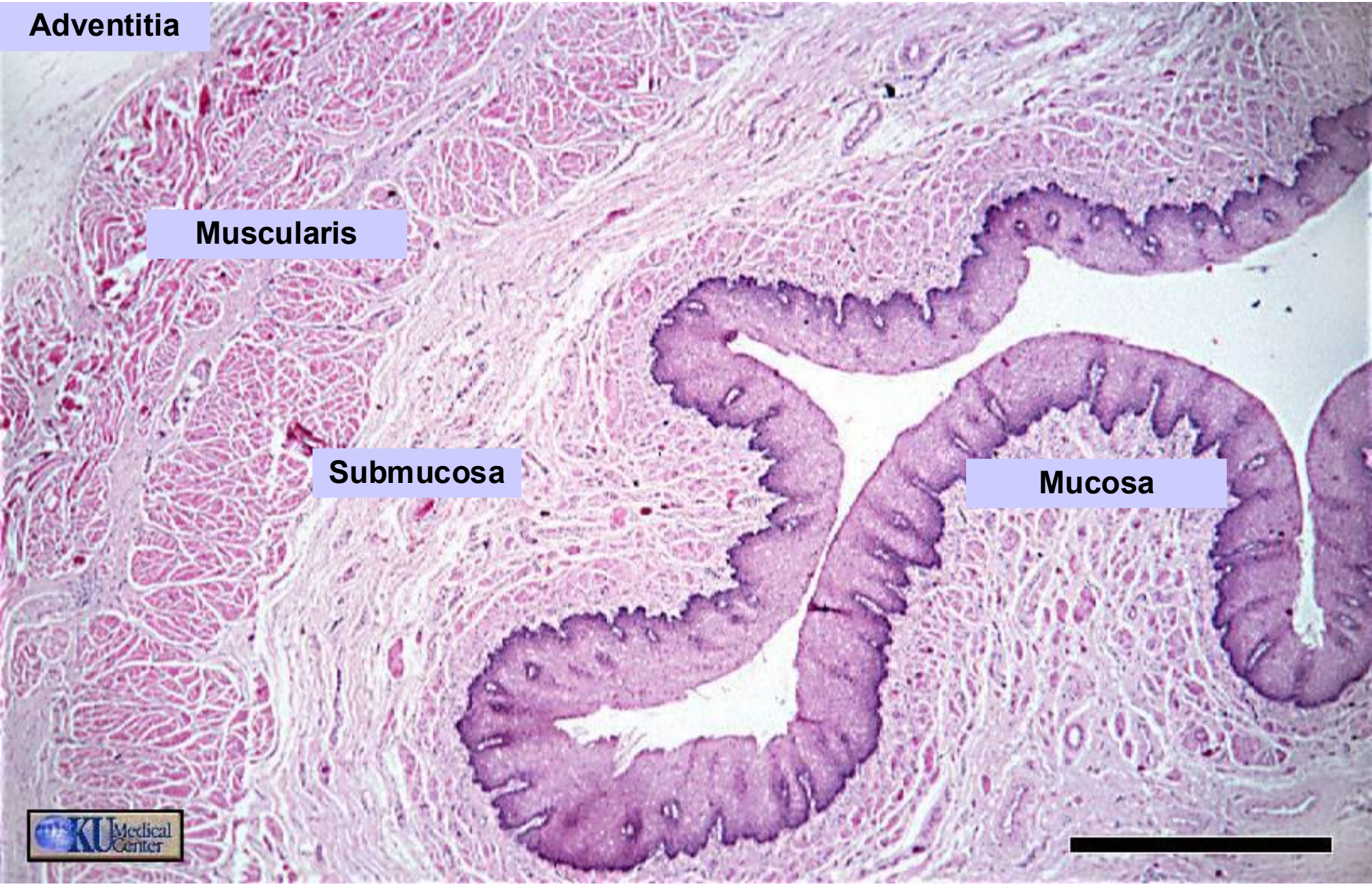
Upper 3rd, skeletal, middle 3rd mix, bottom 3rd smooth muscle



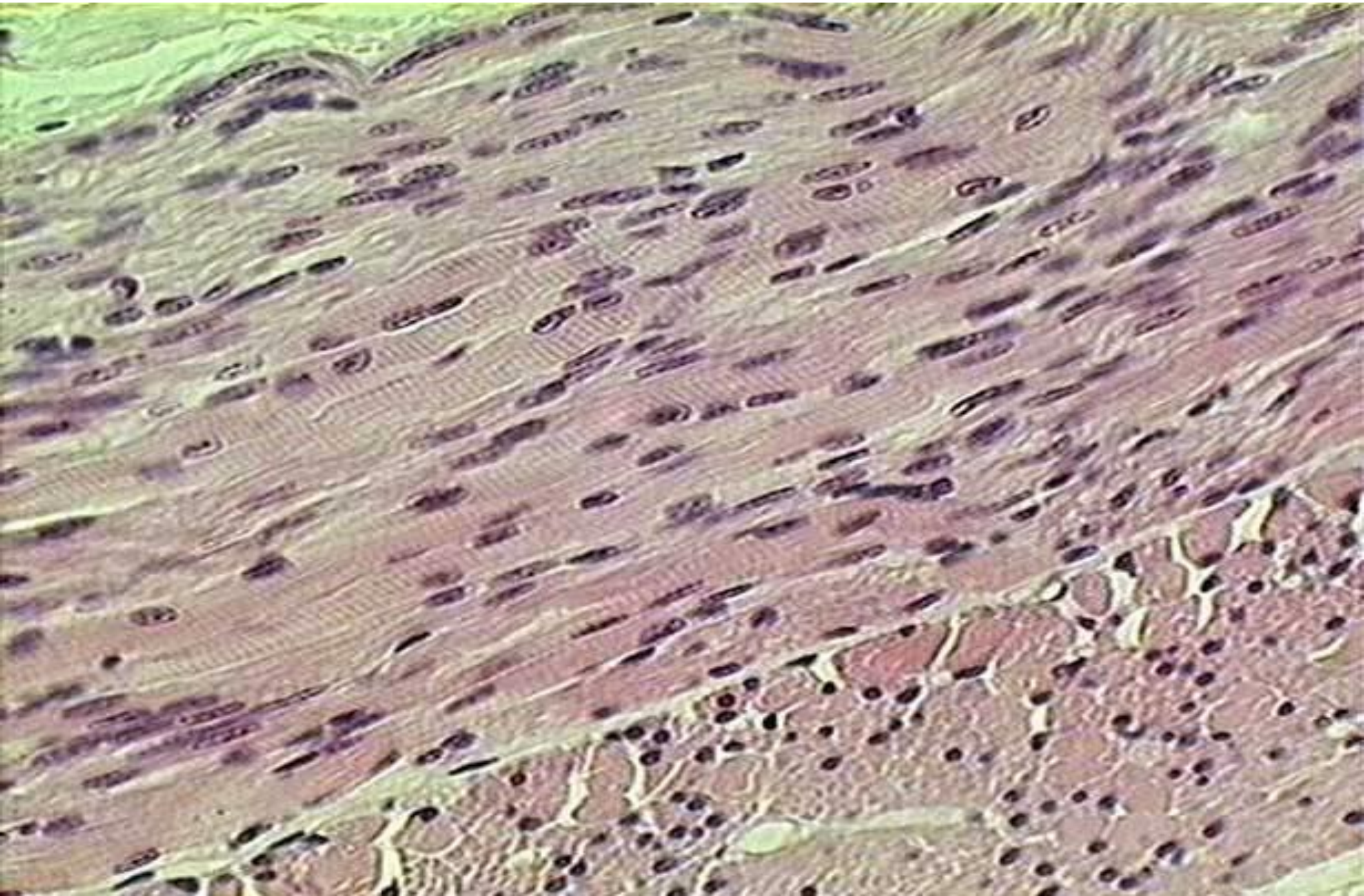


note striations in skeletal muscle

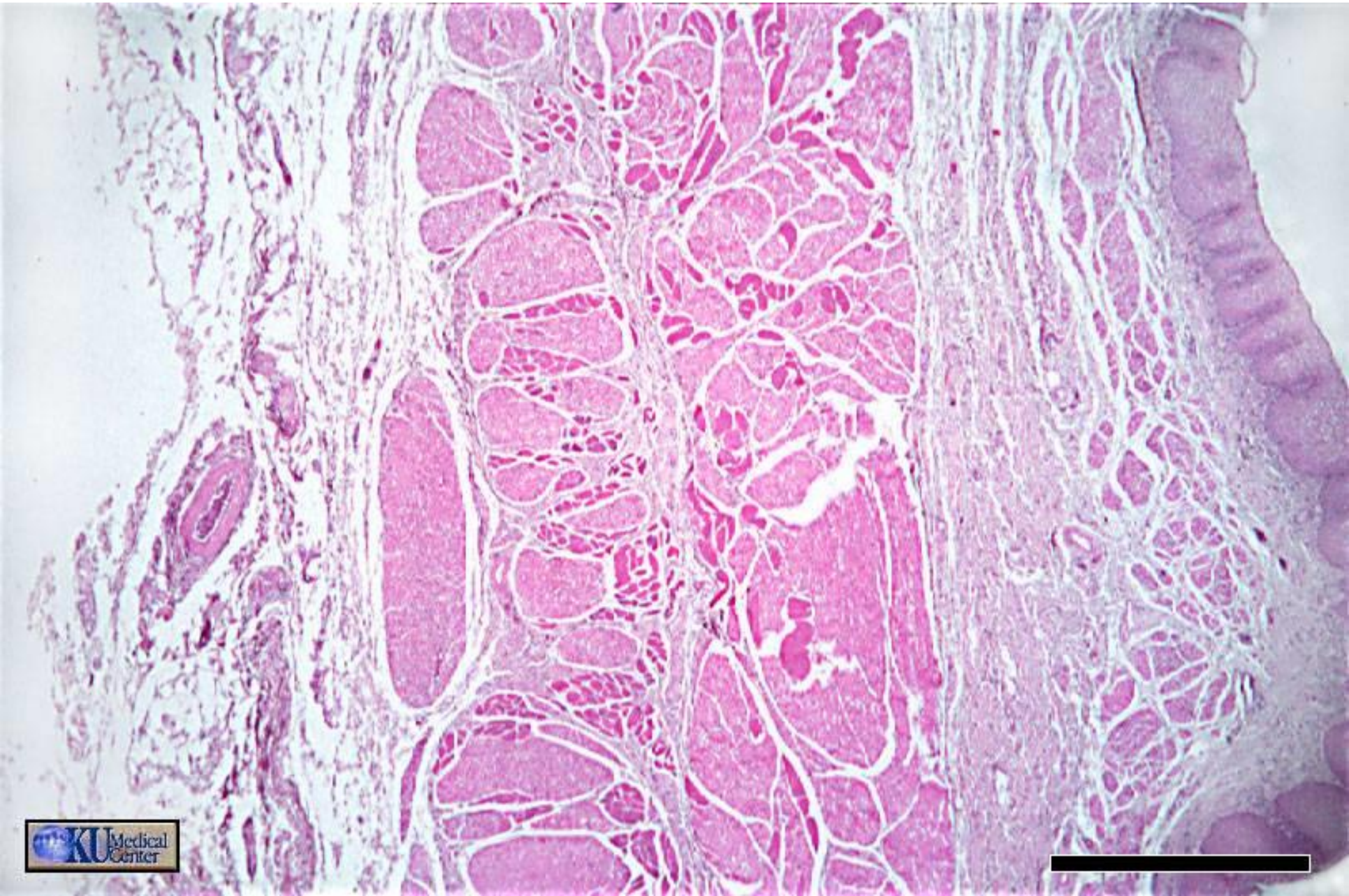
Esophagus, upper third, characterized by skeletal muscle



Esophagus, muscularis externa upper third, skeletal muscle



Esophagus, middle third, mixture of skeletal and smooth muscle



Esophagus, lower third, only smooth muscle

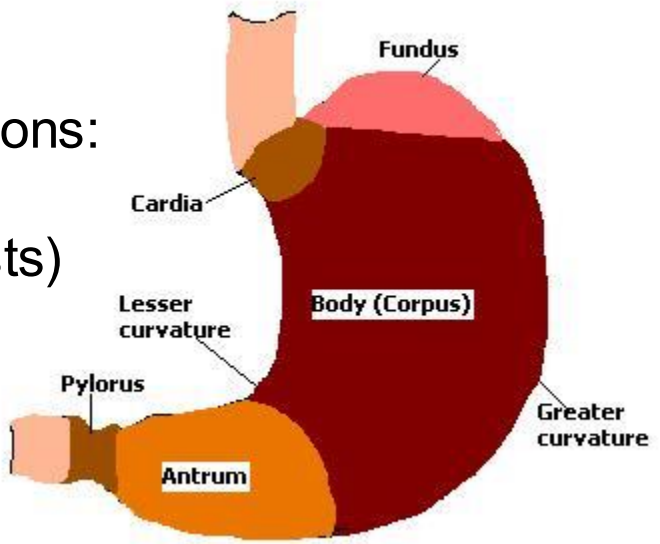


Stomach

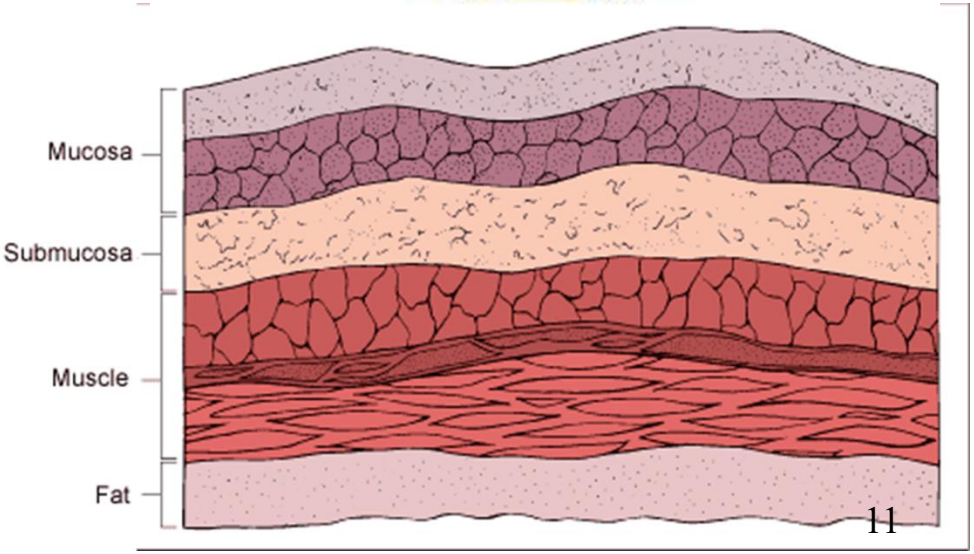
Rugae are evident in an empty stomach. Rugae are branching longitudinal folds of the mucosa (and underlying submucosa); they which are not evident when the stomach becomes full and distended.

The stomach can be divided into three histological regions:

- cardia (around the esophageal orifice)
- fundic region (fundus and corpus/body of anatomists)
- pyloric (near intestine)



The muscularis externa is unusual in that it includes an inner layer of oblique smooth muscle in addition to a middle circular and outer longitudinal layer



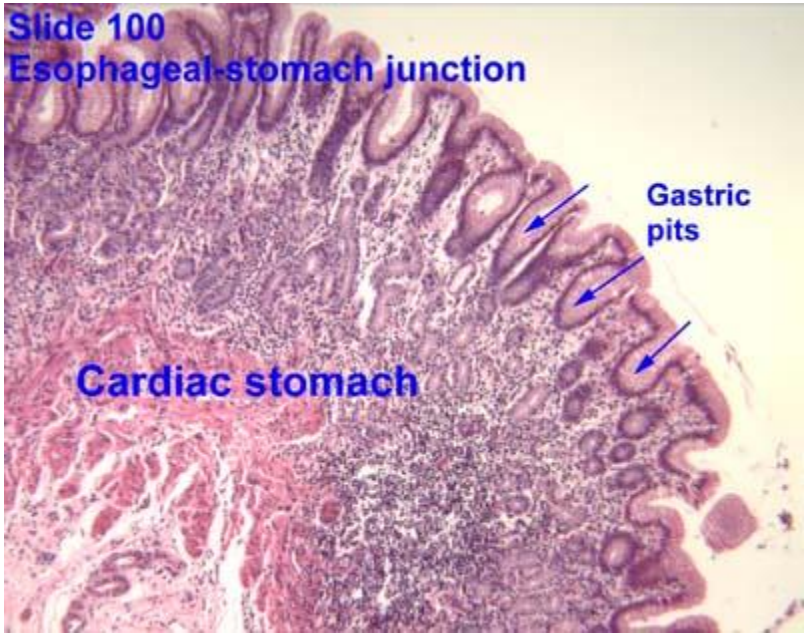
Stomach

The mucosa includes **gastric pits or foveolae**; at the bottom of each pit, gastric glands extend downwards

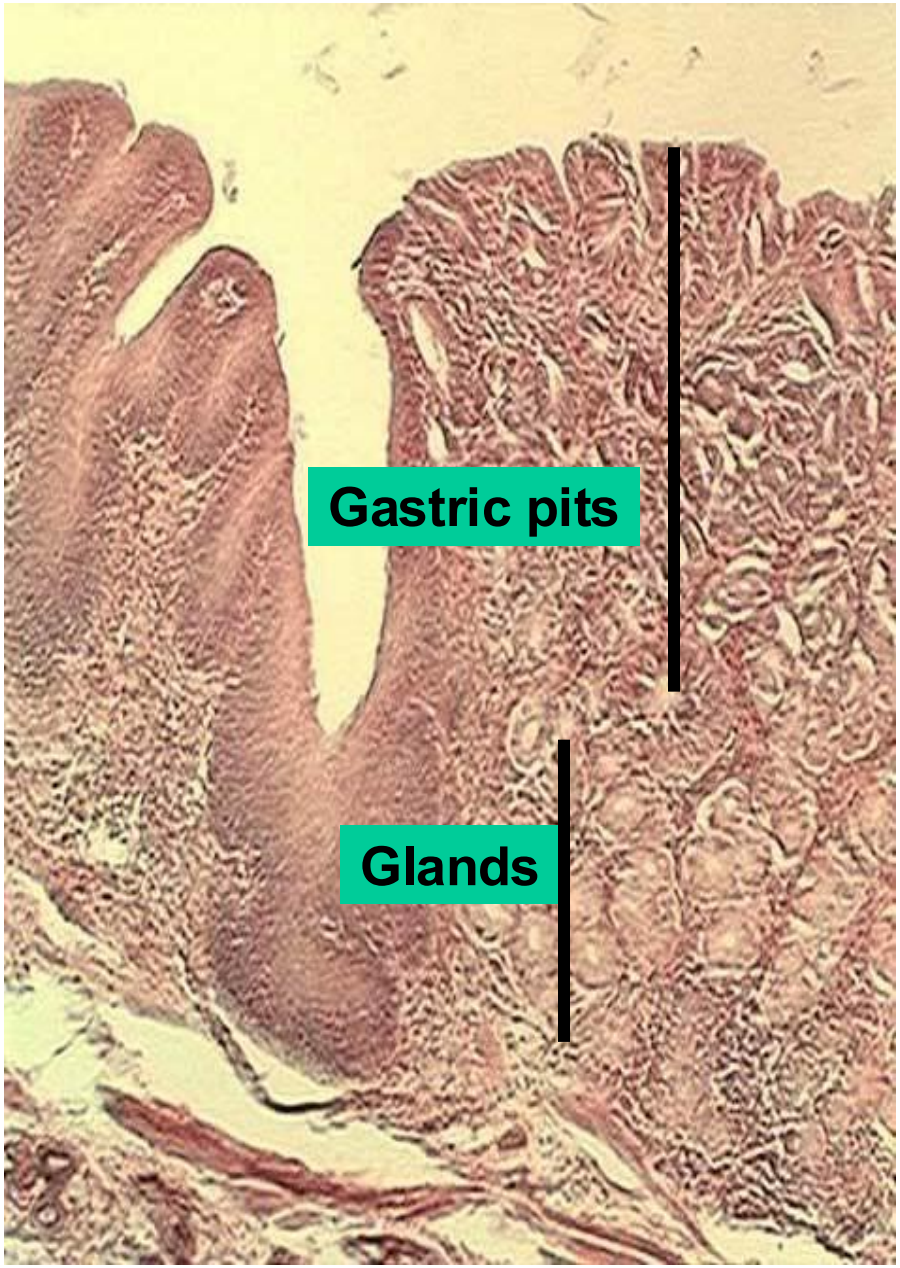
- in the fundic region: foveolae occupy one-third and glands two-thirds of the thickness of mucosa
- in the cardia and pyloric region: two-thirds foveolae and one-third glands

Spaces between glands occupied by loose connective tissue (lamina propria) connective tissue cells, and slender vertical strands of smooth muscle, which extend from the muscularis mucosae

surface and lining of foveolae with tall, columnar, mucus-secreting epithelium



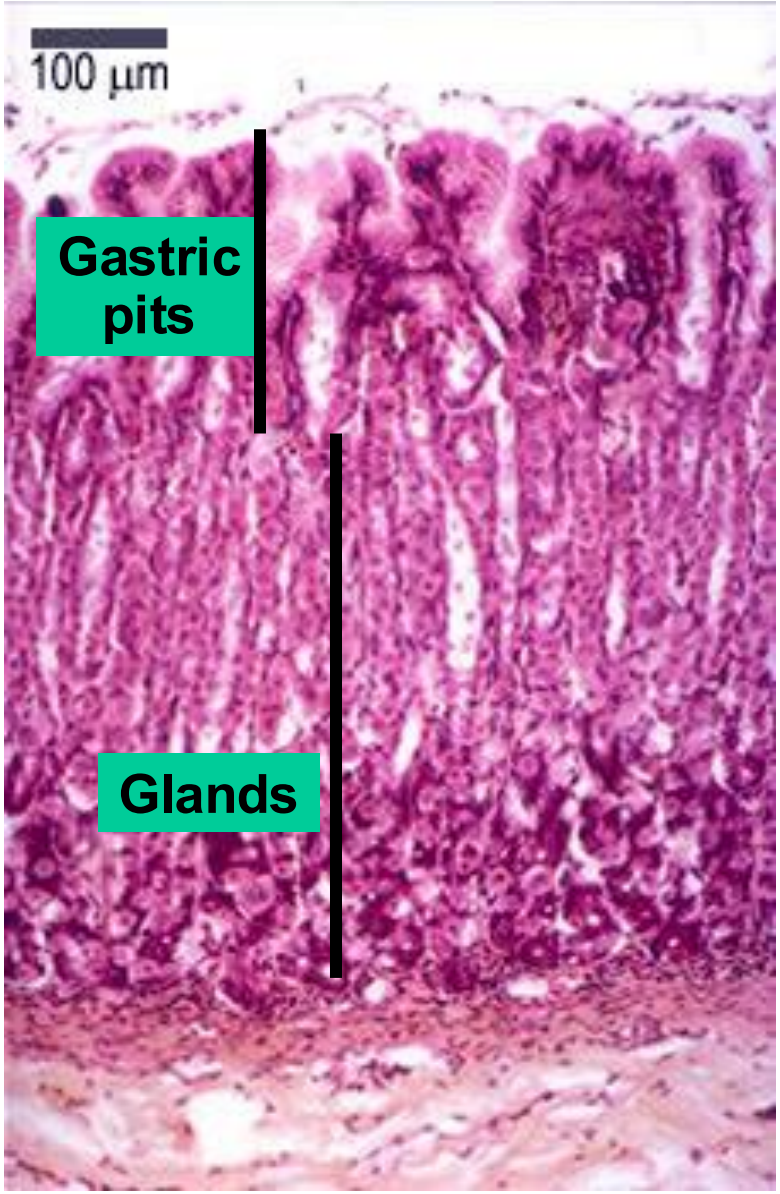
Stomach - cardiac region; mucosa is 2/3 gastric pits and 1/3 glands

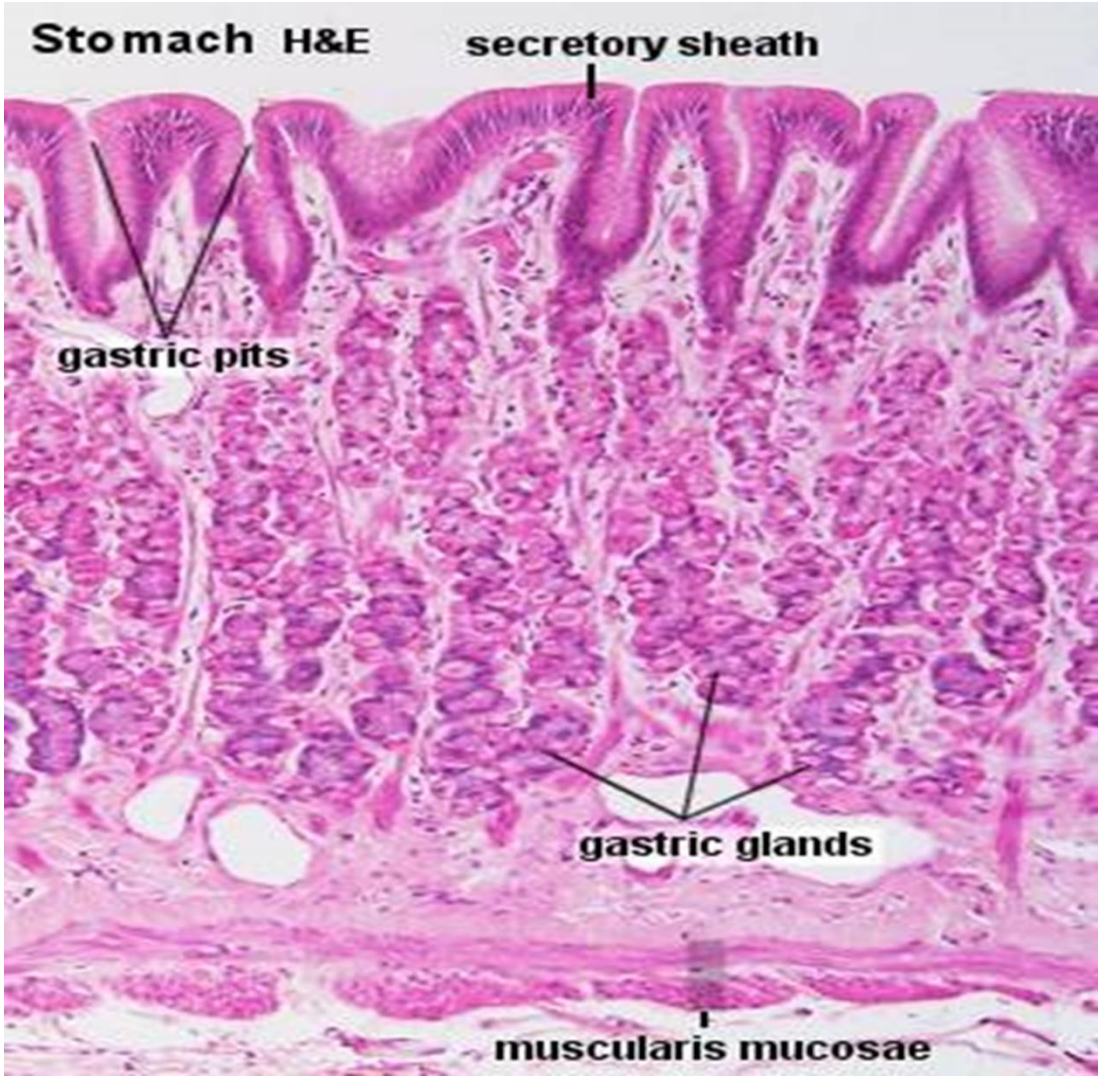




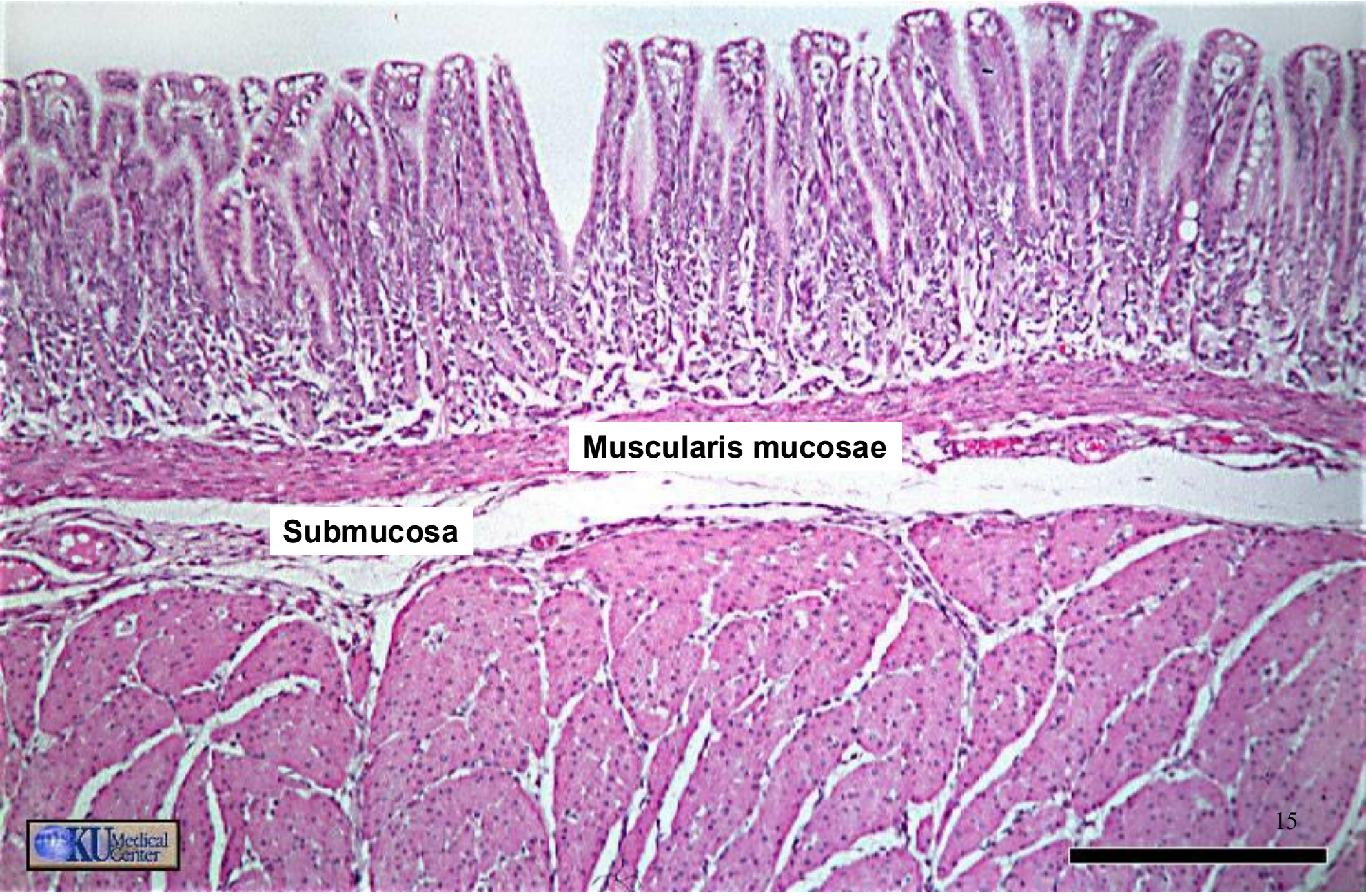
Note: sometimes it looks closere to 50/50.
Also notice that the glands are coiled so they don't look as "organized" as other sections

Stomach – fundic region; mucosa is 1/3 gastric pits and 2/3 glands (see Figure 17.8, page 575)





Stomach – pyloric region; mucosa is 2/3 gastric pits, 1/3 glands
(see Figure 17.15, page 583)



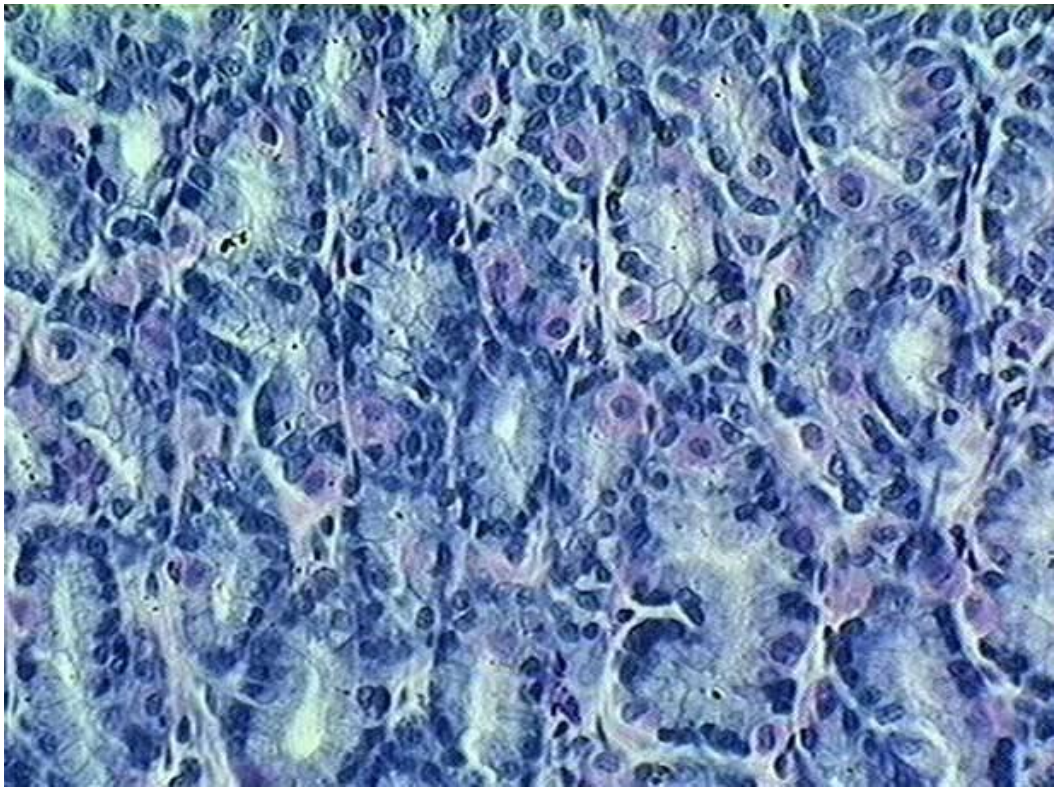
Gastric glands of the stomach

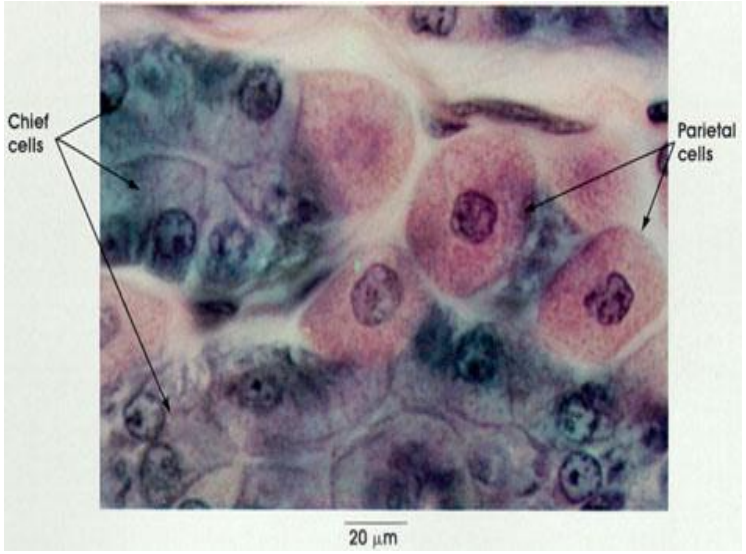
In **cardia**, glands are branched and coiled; lined by mucus-secreting cells; also include enteroendocrine cells (secrete gastrin)

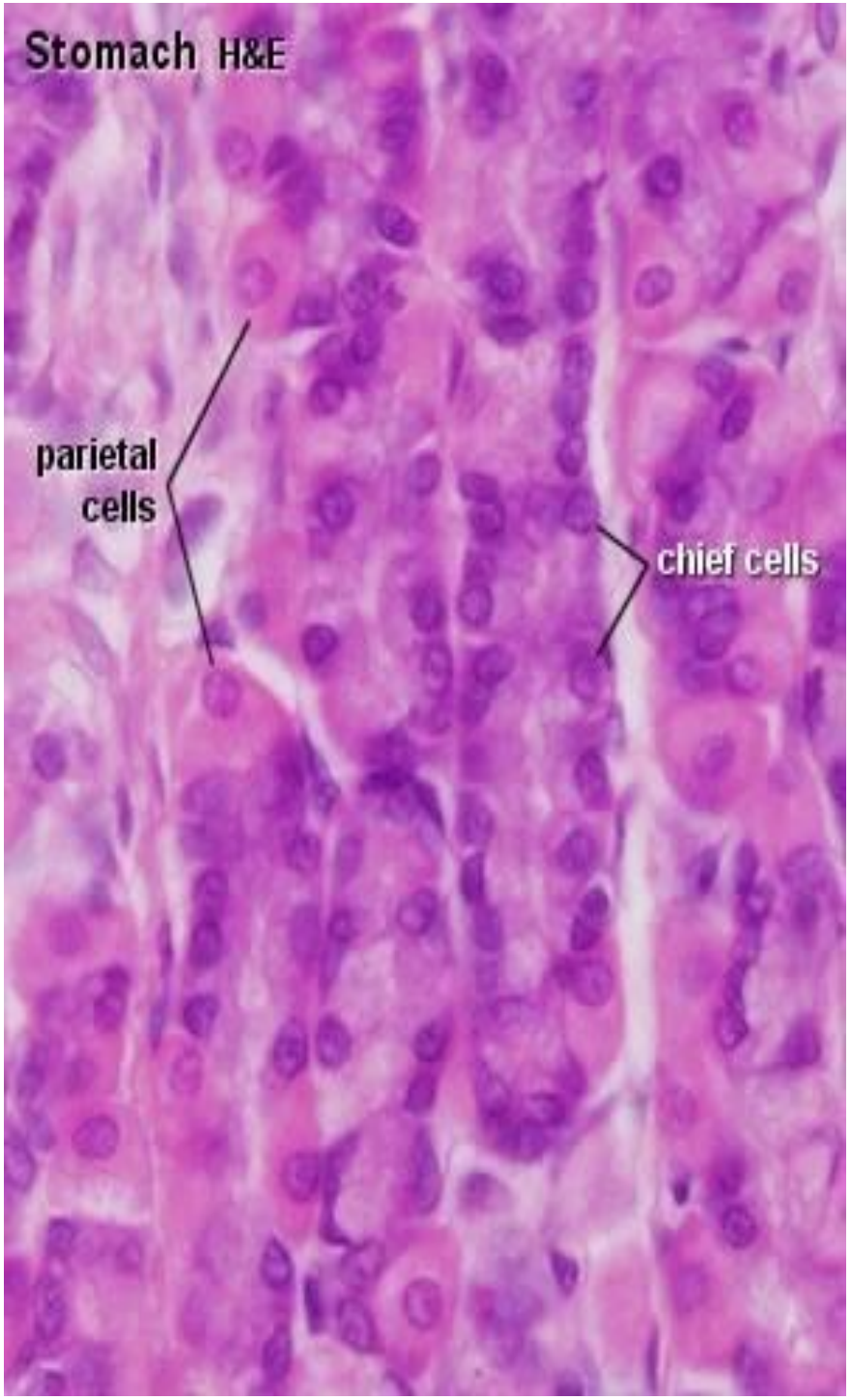
In **fundic region**: short foveolae and long, straight glands; five types of cells can be distinguished

- **stem cells**: small and undifferentiated
- **mucous neck cells**: irregular shape; nucleus at base and granules at apical portion; more acidic than those mucus-secreting from surface
- **parietal cells**: secrete HCl, large, rounded cells with central nucleus and intensely eosinophilic cytoplasm (stain very pink)
- **chief cells**: predominant on the lower-third of the gland; strongly basophilic cytoplasm and conspicuous apical secretory granules containing pepsinogen; smaller than parietal cells
- **enteroendocrine cells** (argentaffin cells in text figure legends: small, ovoid or pyramidal with basal granules; all will stain with a silver stain but 15 different types can be distinguished using immunocytochemistry techniques

In **pyloric region**: deep foveolae; short, branched, highly tortuous glands with larger lumen; mucus-secreting cells predominate, which also secrete lysozyme (bacteriolytic); few parietal cells, but abundant enteroendocrine cells




Chief cells
Parietal cells
20 μm


Stomach H&E
parietal cells
chief cells

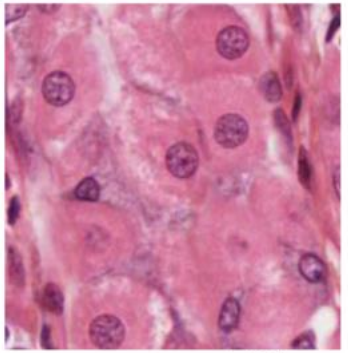
Fundic glands

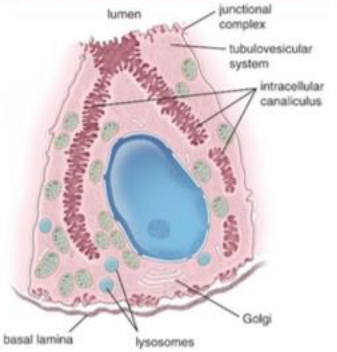
Mucous cells (surface & neck)



Apical mucinogen granules

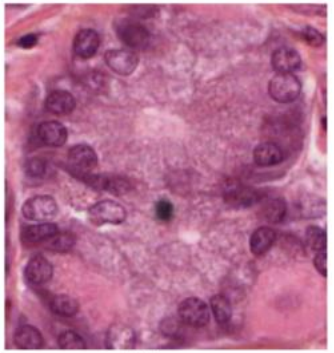
Parietal cells

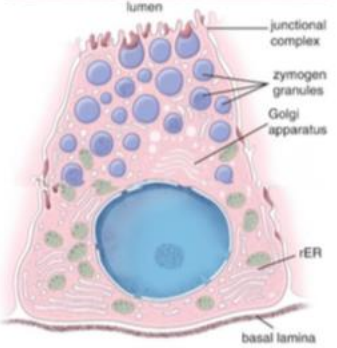




acidophilic, proton pumps, mitochondria, canaliculi, tubulovesicular system

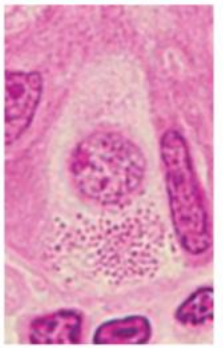
Chief cells

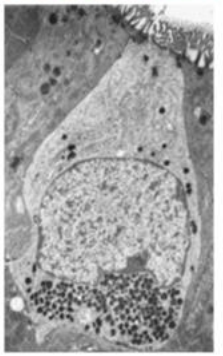




basophilic, RER, apical SGs

Enteroendocrine cells

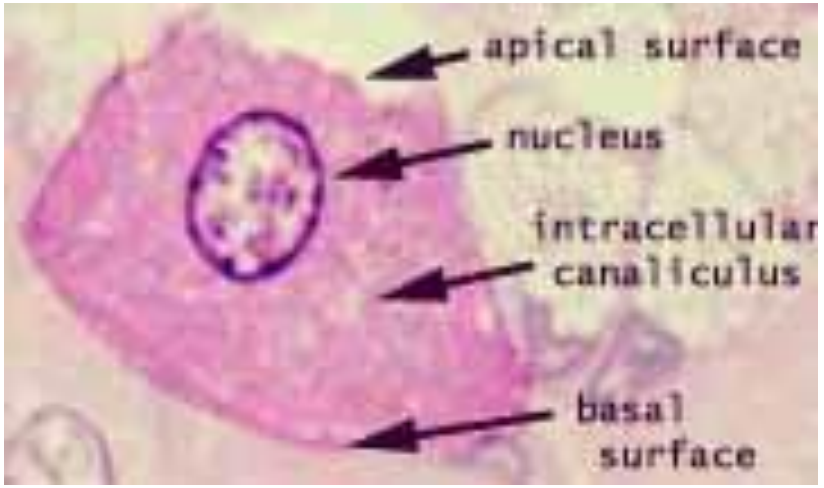




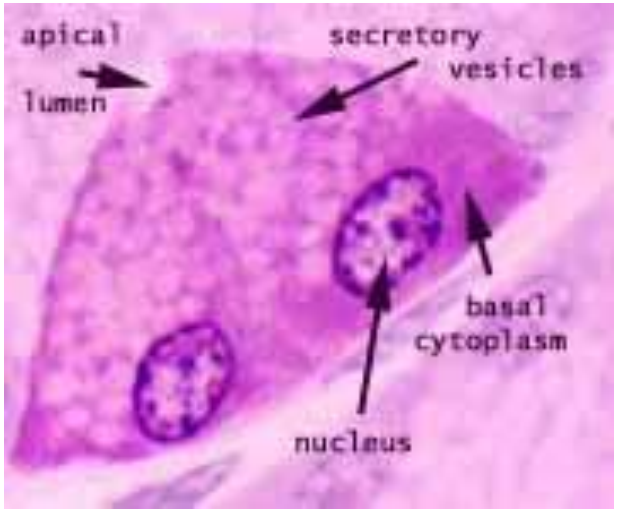
basal SGs

https://www.memorangapp.com/flashcards/68940/GS+HE+31+%26+32+GI+Histology+I+and+II/

PARIETAL CELL

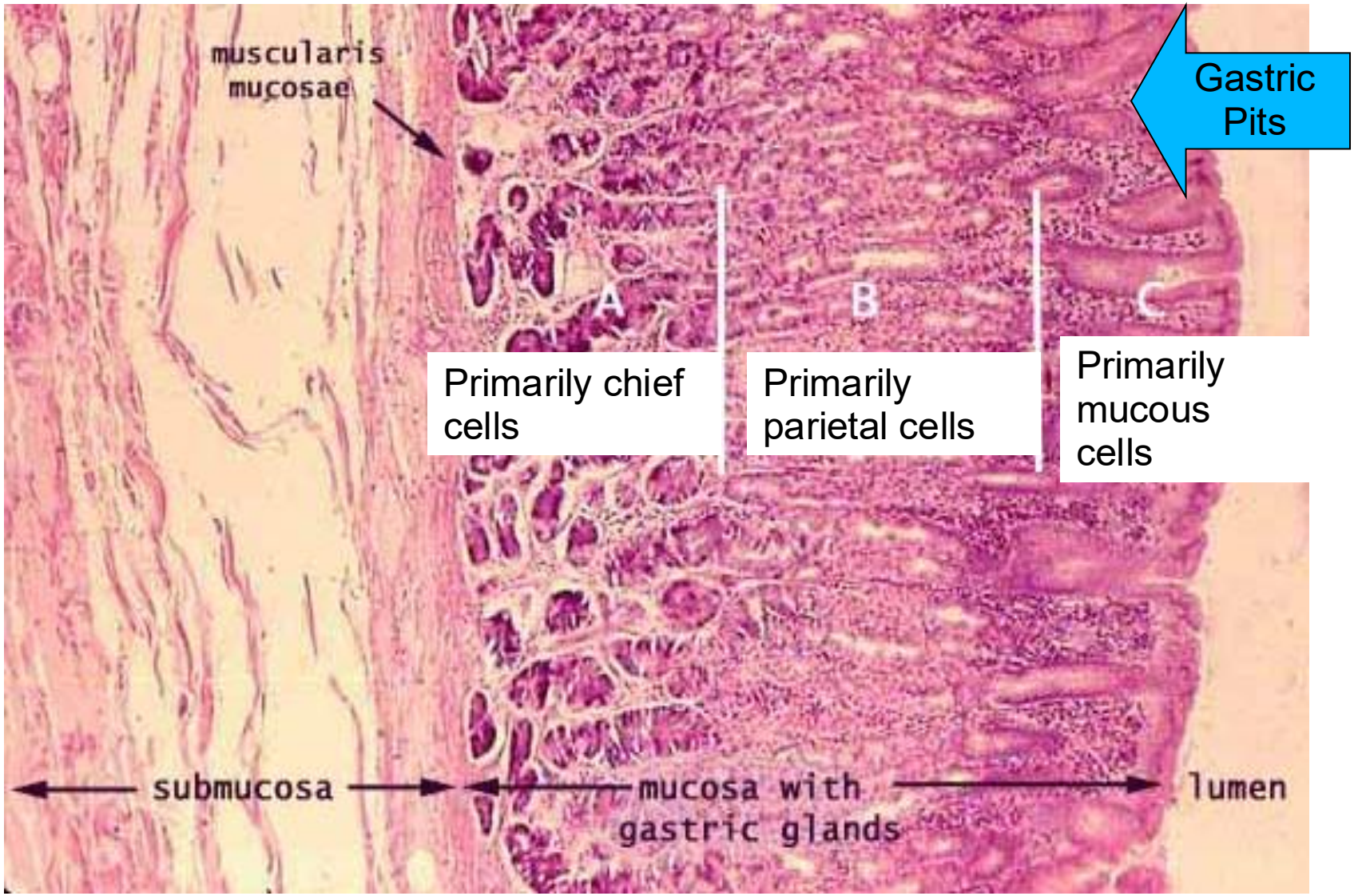


CHIEF CELL



Stomach

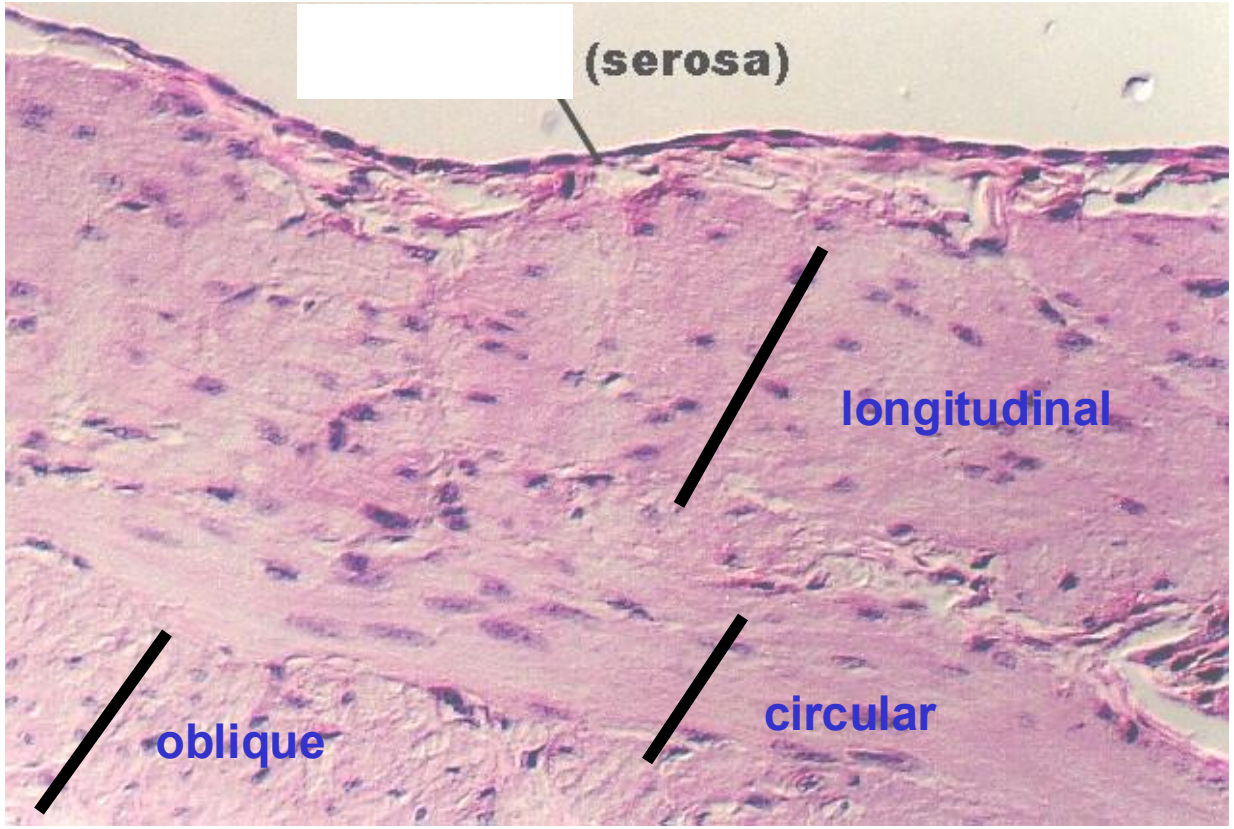
The **submucosa** is a dense layer of connective tissue, with bundles of collagen fibers. Also includes a network of lymphatic vessels and numerous blood vessels

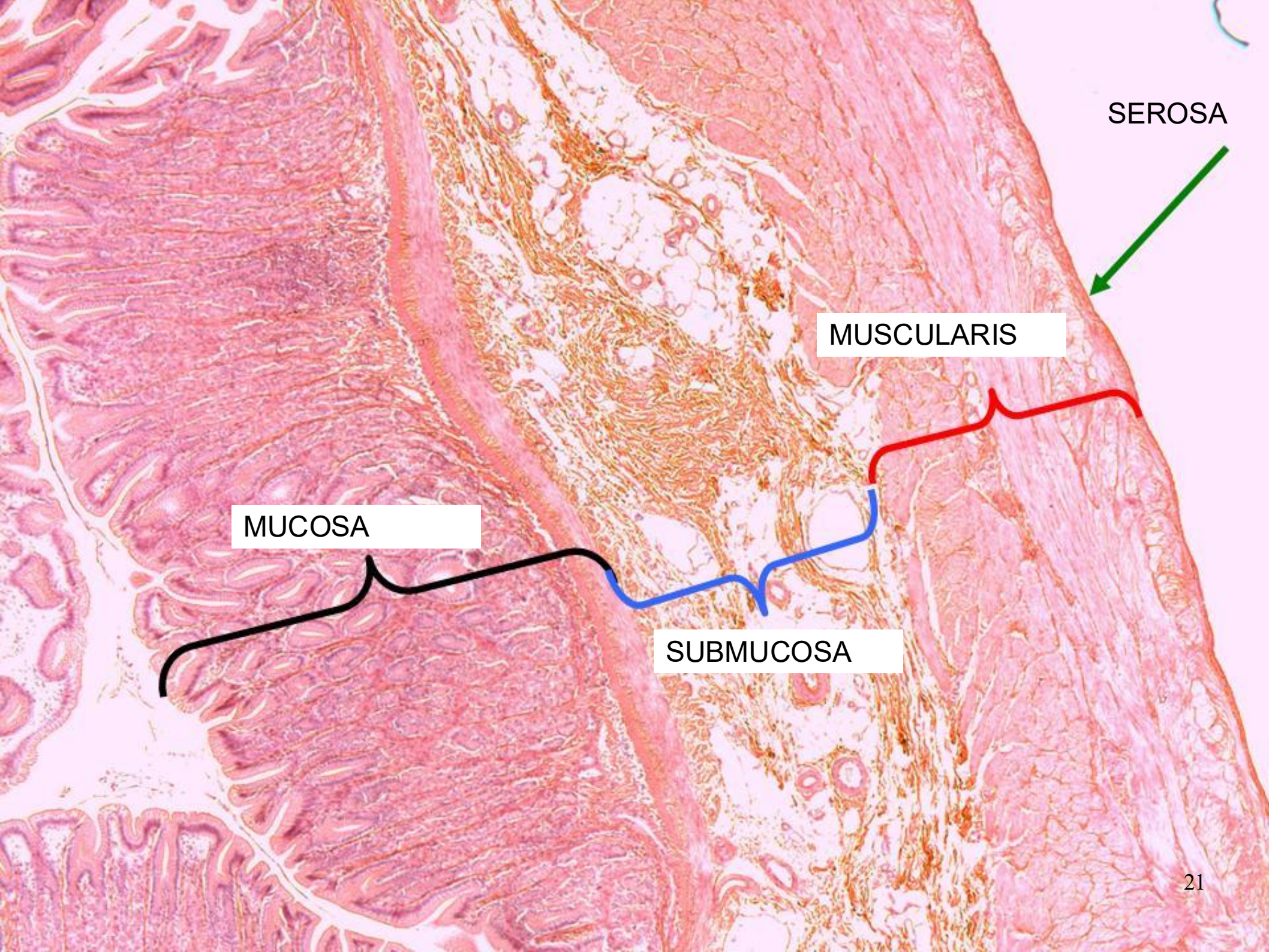


Stomach

Muscularis external

- three layers of smooth muscle
  - outermost layer: longitudinal and incomplete
  - middle layer: circular
  - inner layer: oblique

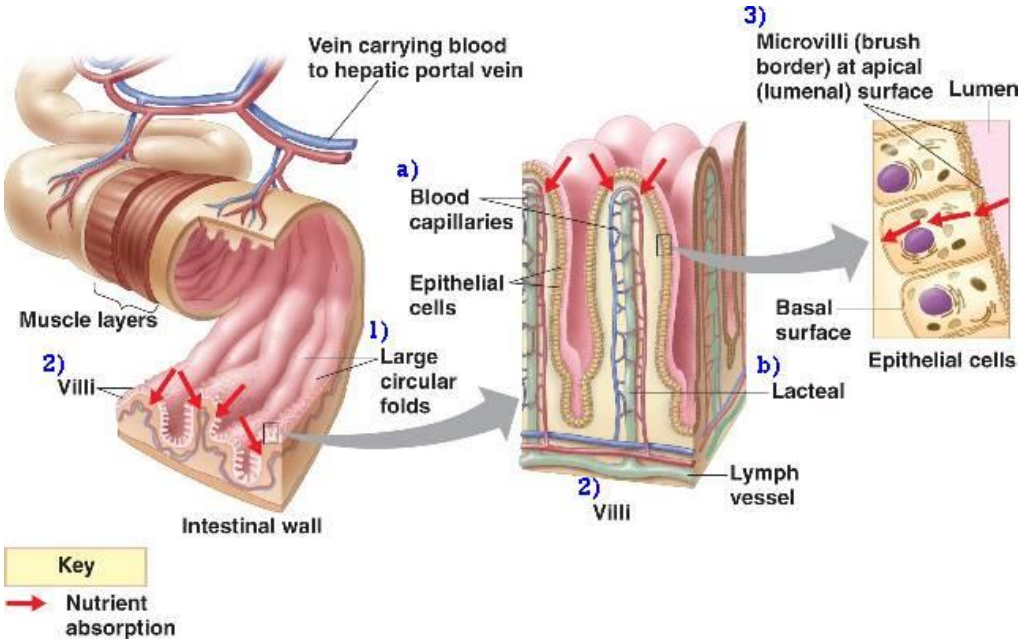



SEROSA
MUSCULARIS
MUCOSA
SUBMUCOSA

Small Intestine

Organ is divided into 3 segments:

- duodenum
- jejunum
- ileum



Total Surface Area ≈ 200 m^2

Modifications for increasing Surface Area:

- **Plicae circulares (Circular Folds)**: circular folds in mucosa & submucosa with a submucosa core, projected into lumen
- more conspicuous in jejunum, then diminish in number and height until the middle of the ileum.

- **Intestinal villi**: finger-like projections from mucosa into lumen; longest in duodenum & proximal jejunum; core of loose CT containing blood capillaries & a blind-ending lymphatic vessel (**lacteal**) for transport of absorbed lipids into blood vascular system

- **Microvilli**: folded apical plasma membrane of individual epithelial cells

4 layers throughout small intestine: mucosa, submucosa, muscularis, serosa

Mucosa

1) Epithelium:

- absorptive cells – columnar, with microvilli
- goblet cells
- stem cells
- enteroendocrine cells

2) Lamina propria: tissue that surrounds intestinal glands and forms core of villi

Peyer's patches: aggregated lymphoid nodules in ileum that extend into submucosa (lymphoid nodules are solitary in other regions of small intestine)

3) Muscularis mucosae:

between lamina propria and submucosa

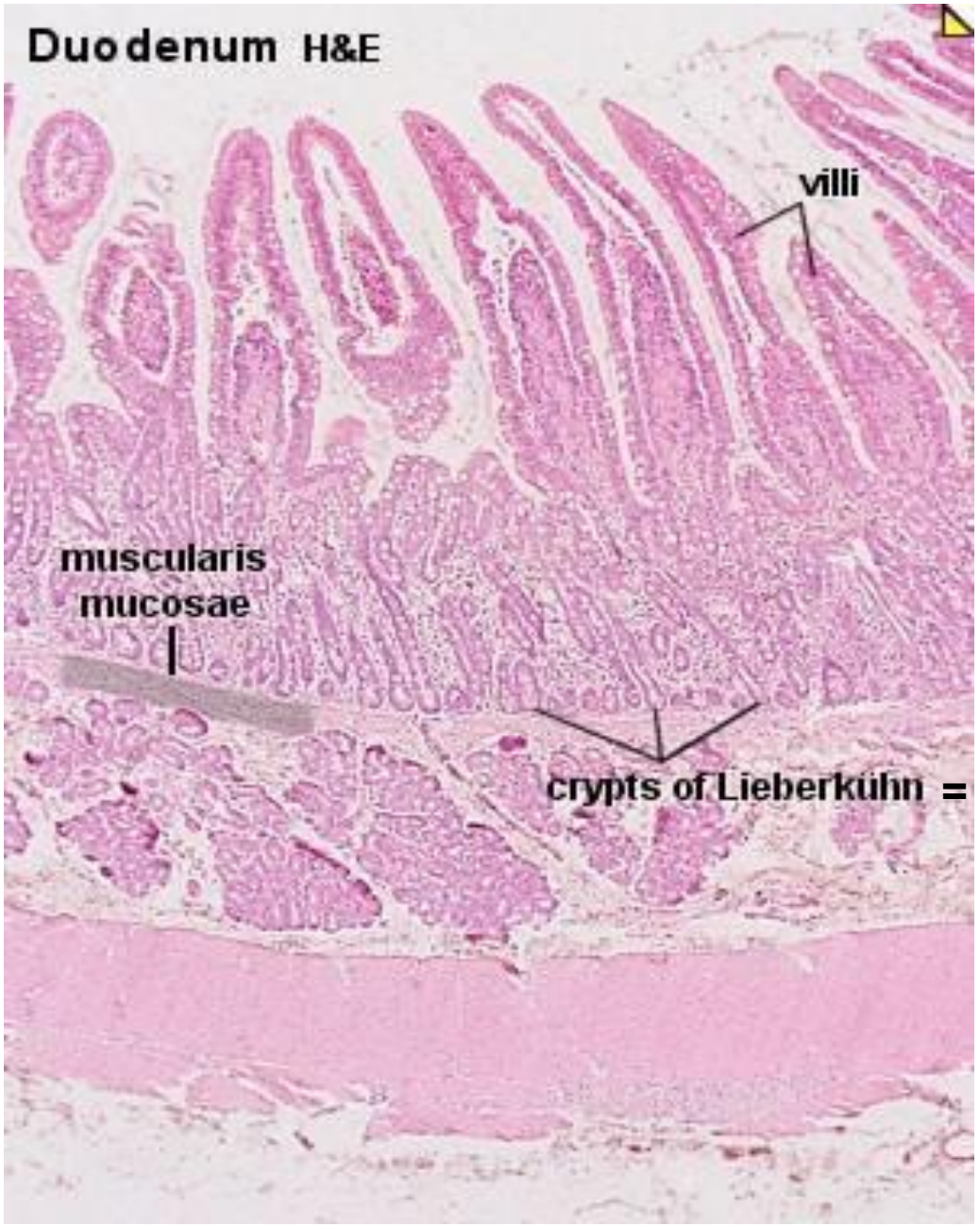
thin layer of circumferentially-oriented smooth muscle;

some strands project into villi, contributing to movement



Brunner's glands

Muscularis externa

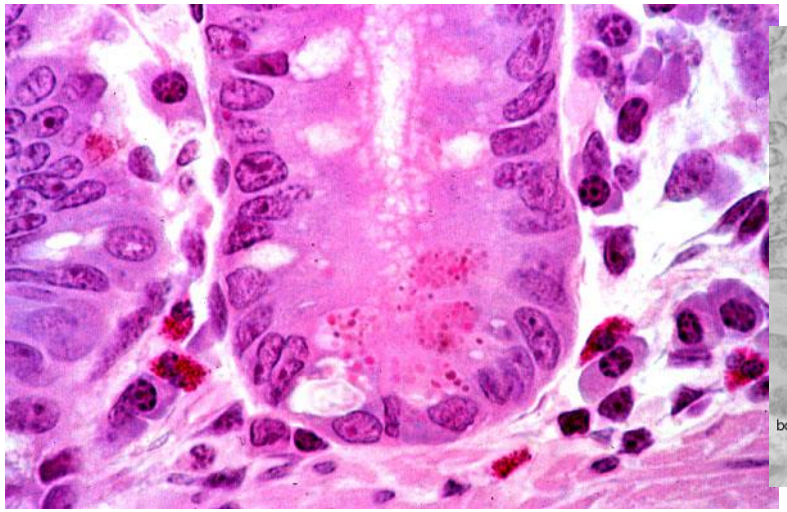


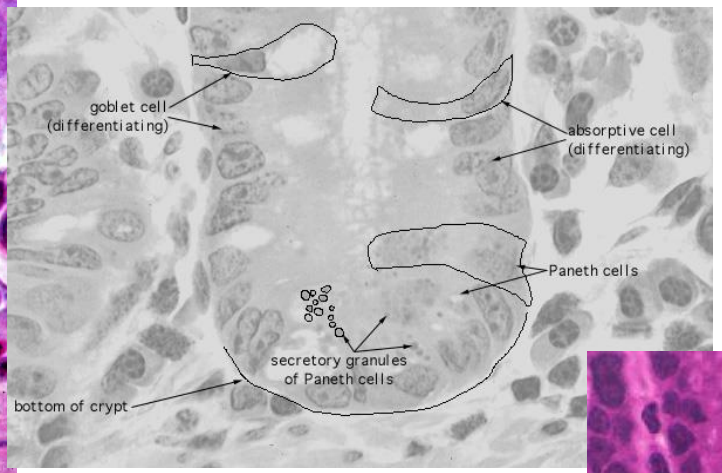
= Intestinal glands

Found near the muscular mucosae; extend through the lamina propria and open onto the luminal surface of the intestine.

crypts of Lieberkuhn:

short intestinal glands between villi, formed by invagination of epithelium, have **Paneth cells** in their walls (pyramidal, contain large eosinophilic secretory granules; defend against bacterial infections)





http://www.bu.edu/histology/p/11606loa.htm

enteroendocrine cells – will have acidophilic granules on basal side of cell



Submucosa

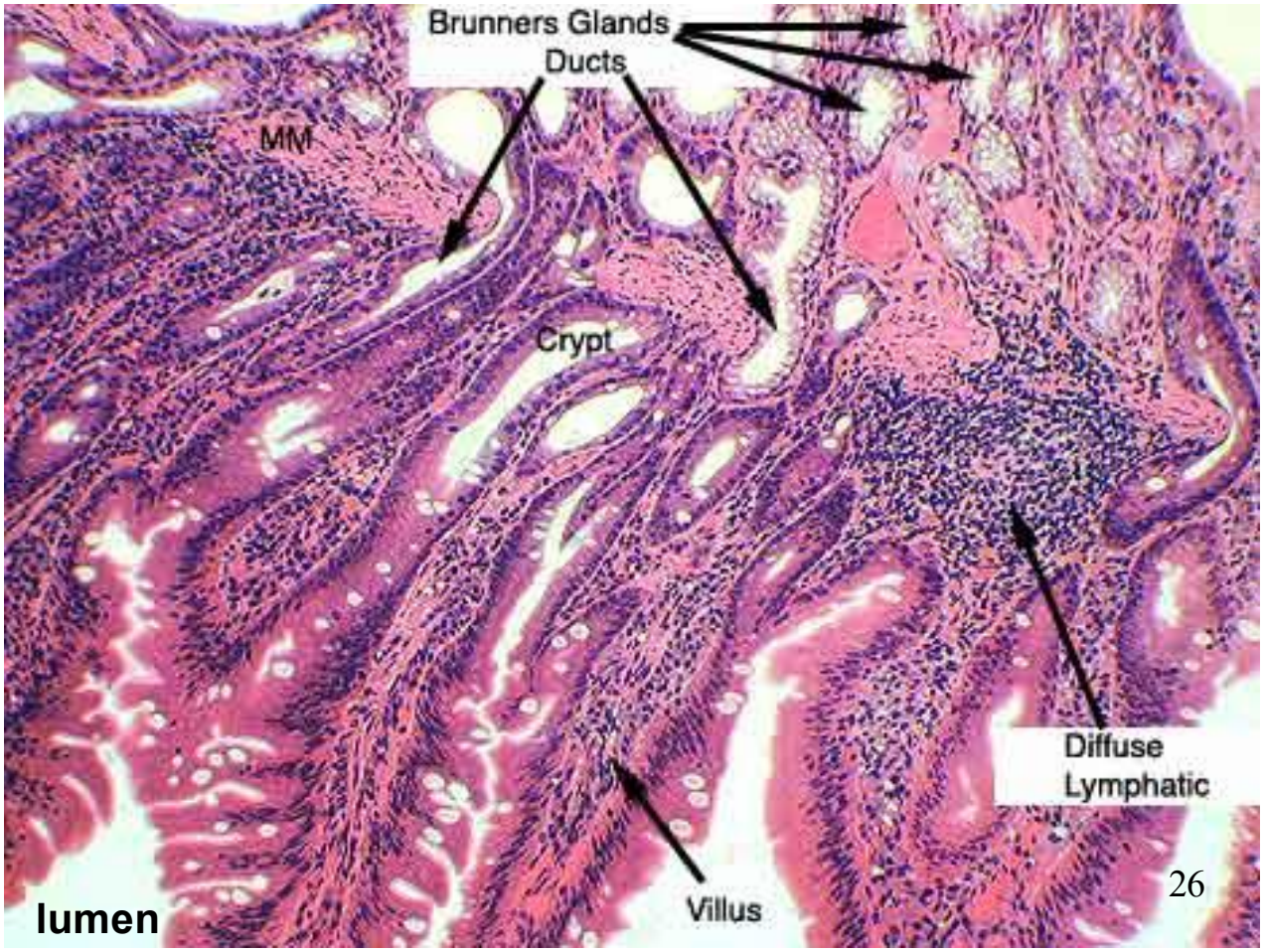
- dense CT
- collagen & elastic fibers
- adipose cells

Glands of Brunner (in duodenum): tubuloacinar, mucous glands in submucosa that open into gut lumen between villi; ***regulate pH with bicarbonate*** for activity of pancreatic enzymes

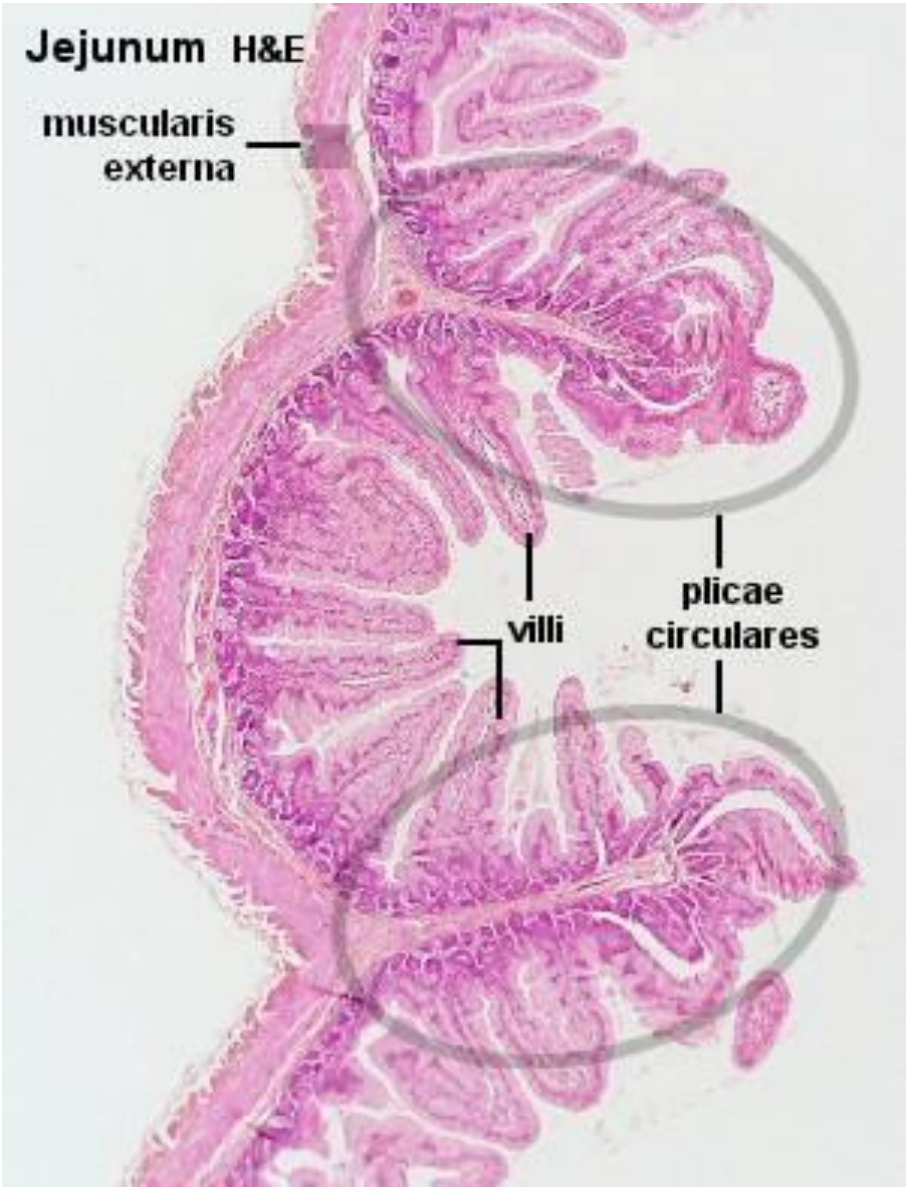
Muscularis

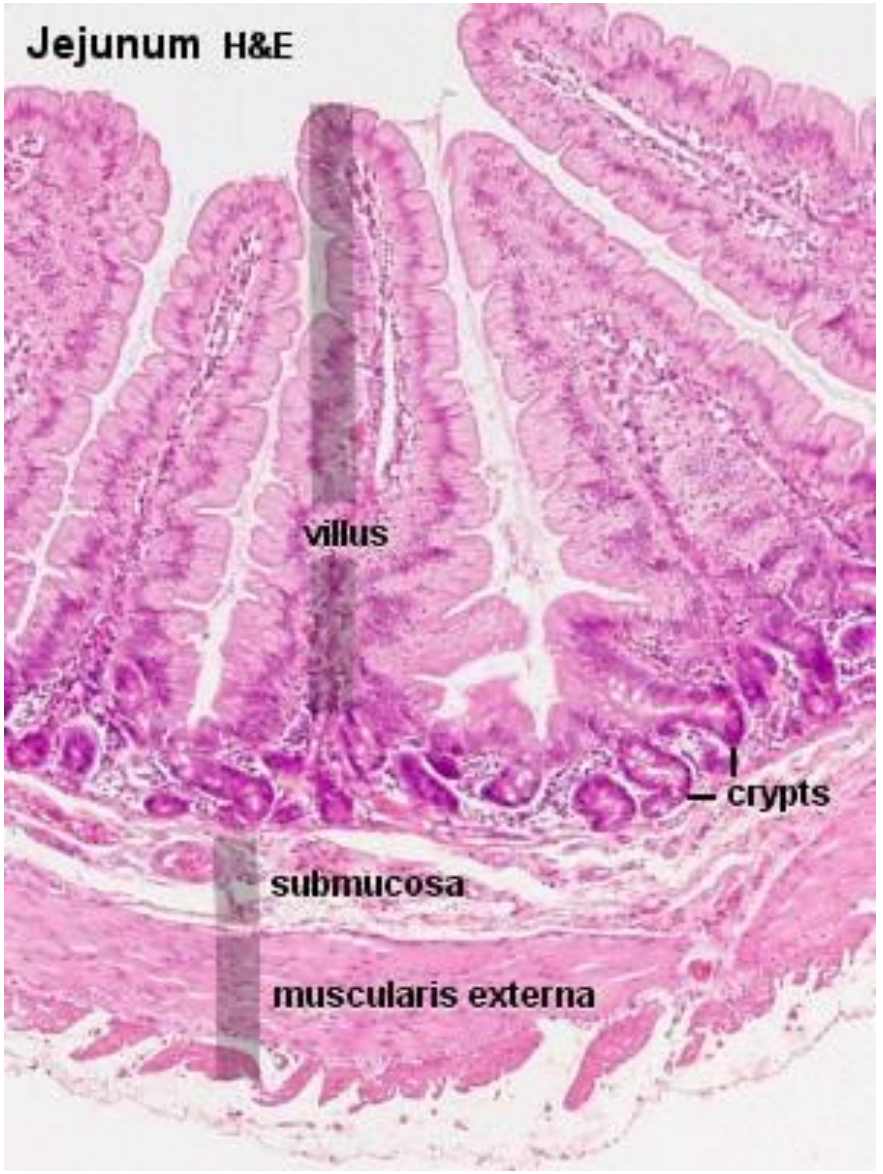
- inner layer circular
- outer layer longitudinal

peristaltic contraction:
intermittent, wave-like muscular contractions



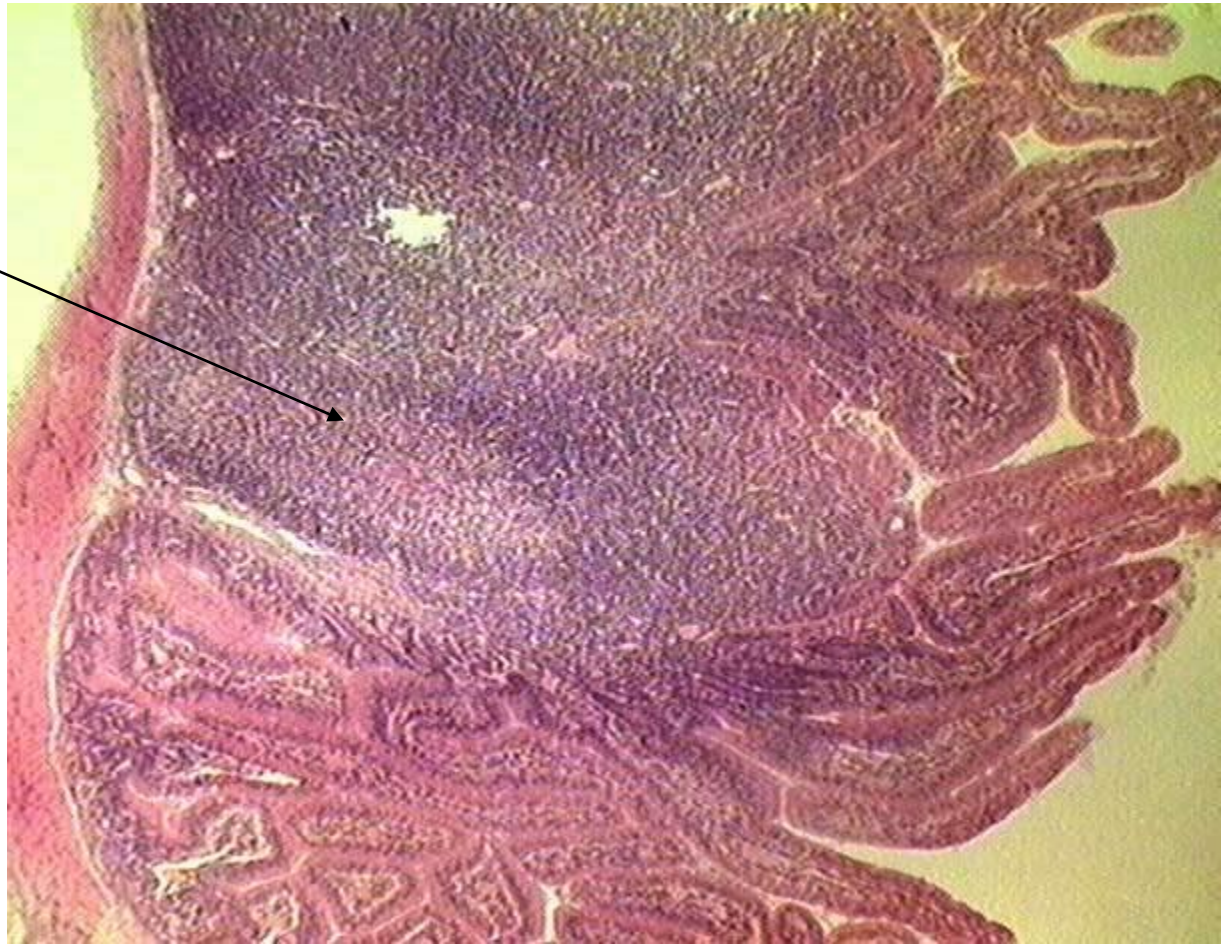
Jejunum


Jejunum H&E
muscularis externa
villi
plicae circulares


Jejunum H&E
villus
crypts
submucosa
muscularis externa

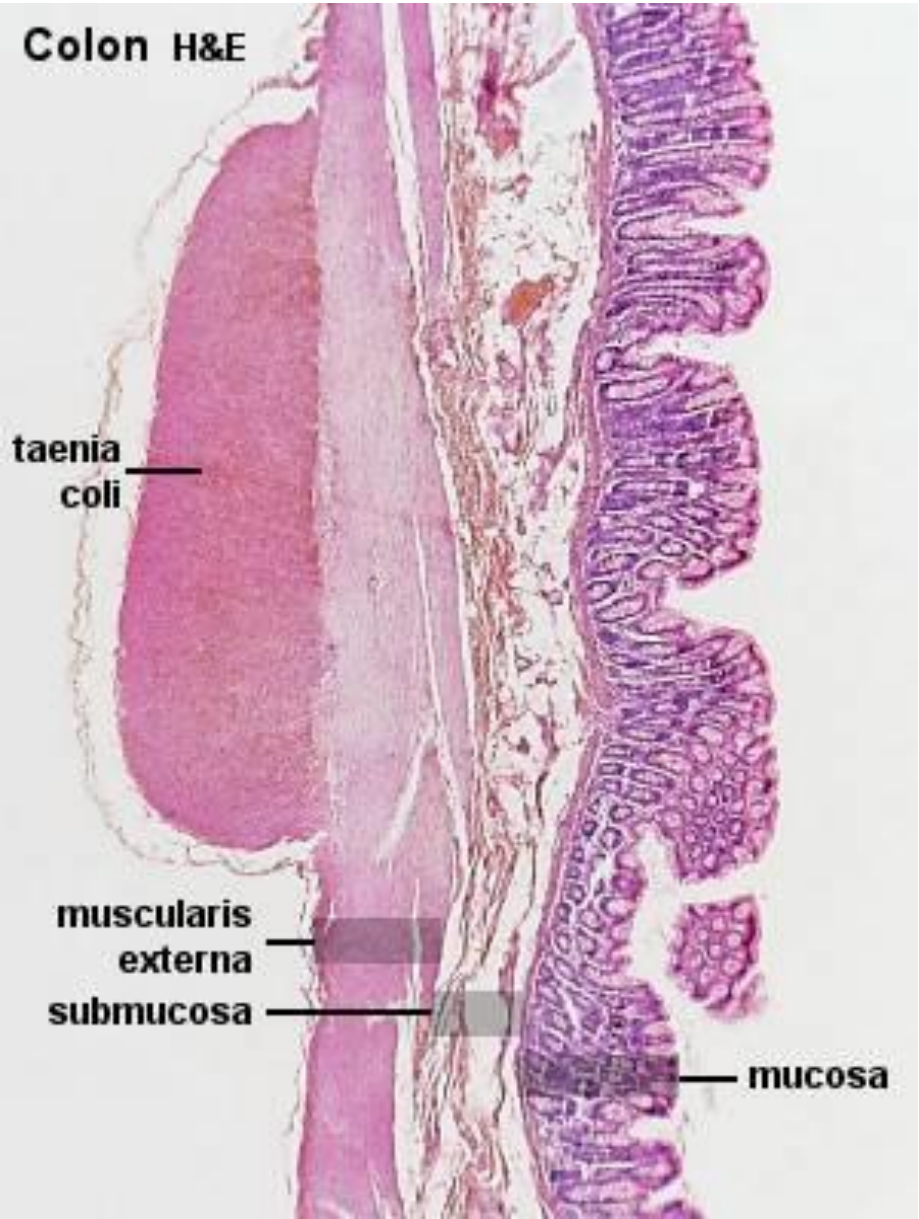
Ileum

Aggregated lymphoid nodules
(Peyer's patches)
AKA GALT or MALT



Large Intestine - Colon

Shorter, less convoluted than small intestine
Concentrates indigestible residues by absorbing some water and electrolytes



tenia coli – outer longitudinal layers of muscularis externa reduced into three bands

Mucosa of colon

- no folds or villi
- many straight glands

1) **Epithelium:**
   - columnar absorptive cells
   - goblet cells – secrete mucus
   - solitary enteroendocrine cells

2) Lamina Propria

many lymphocytes and macrophages
lymphoid nodules (GALT) are common,
extend into submucosa

distal third of colon:
stable longitudinal folds, with shorter glands



Submucosa

numerous lymphoid follicles

Muscularis

outer longitudinal layer is incomplete: **taenia coli:** three longitudinal bands of smooth muscle; between bands, outer layer of longitudinal smooth muscle is very thin or lacking



colon