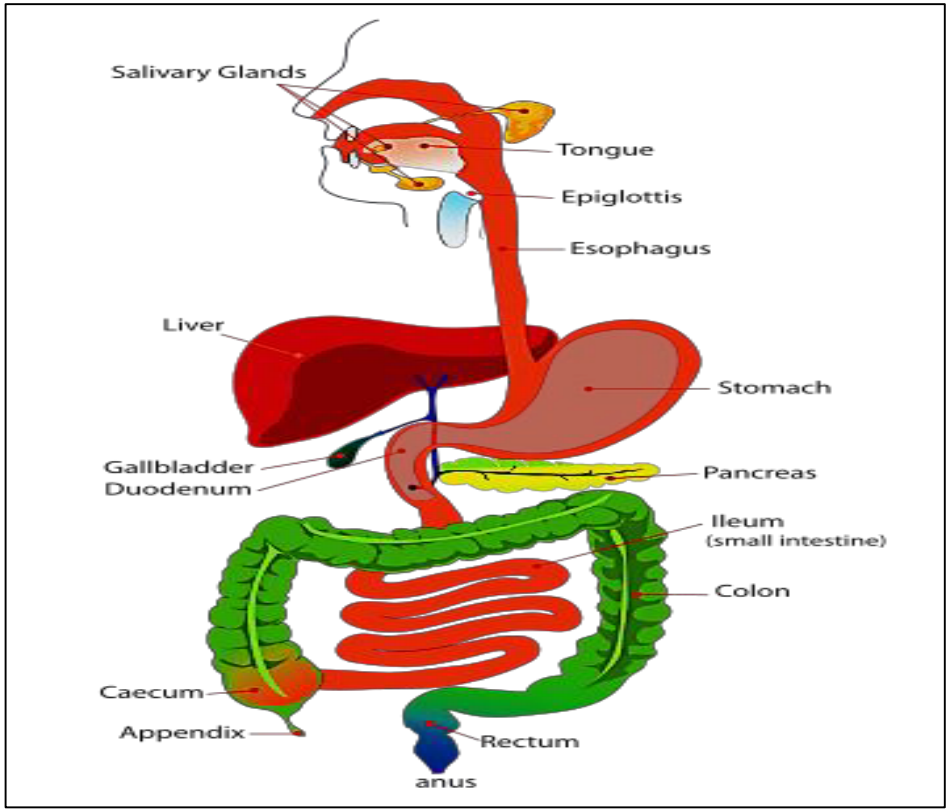
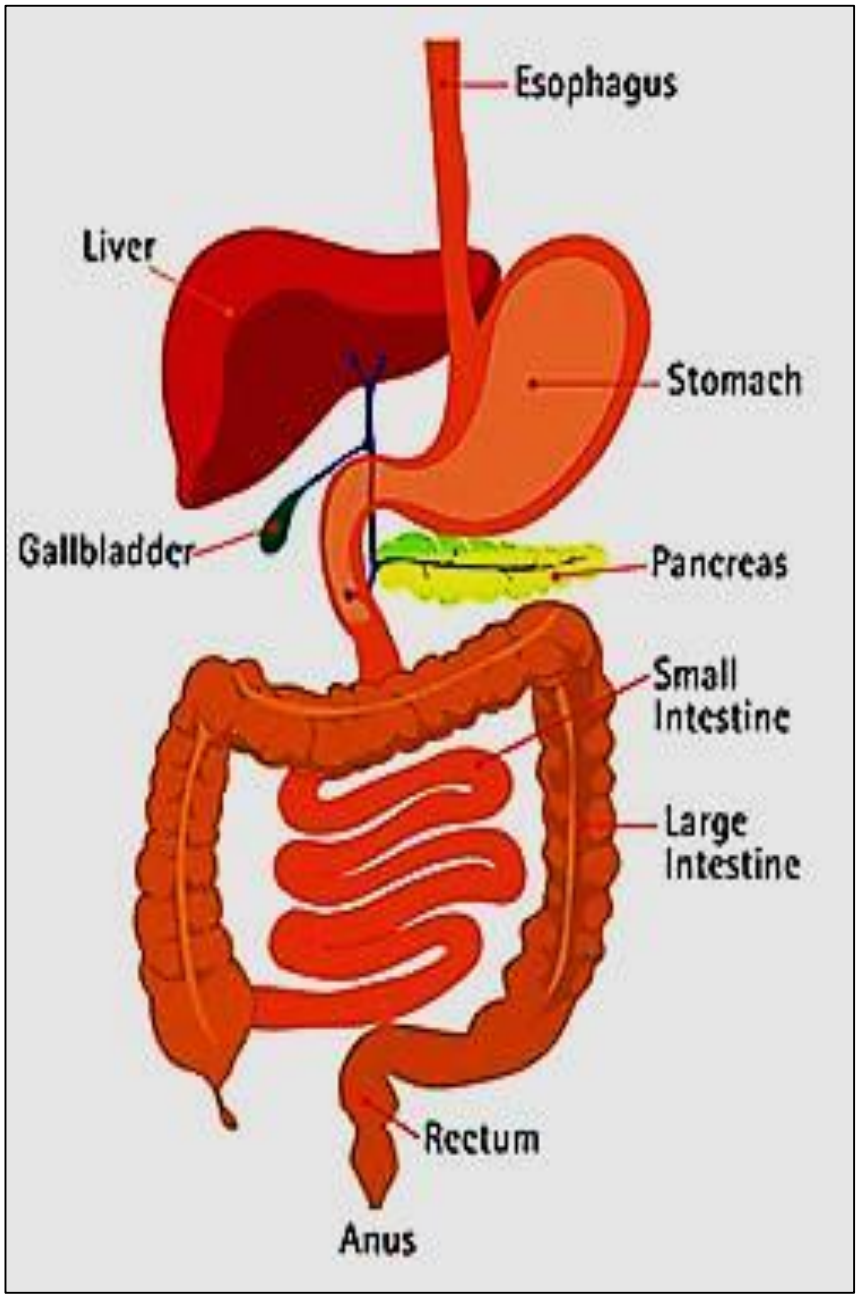
The Digestive system II



The gastro- intestinal tract:

Composed of:

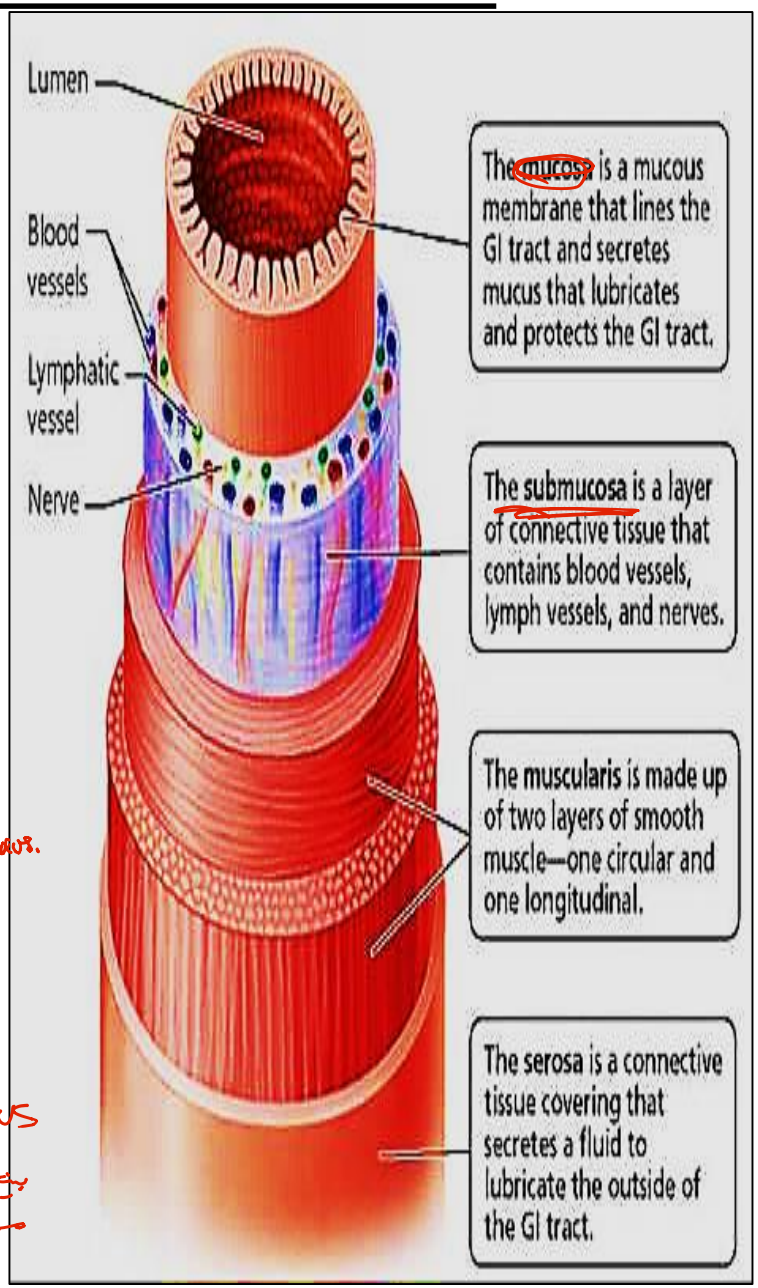
- Esophagus
- Stomach
- Small intestine
- Large intestine
- Anal canal



General features of the wall of the GIT

its wall is composed of **4 layers**:

- **Mucosa:**
  - Epithelium
  - CT (Lamina propria, corium)
  - Muscularis mucosa (s. ms.)
- **Submucosa:** C.T.
- **Musculosa** : 2 layers of smooth muscles (IC & OL)
- **Adventitia or serosa**



Adventitia vs. serosa

Serosa: **double layer epithelial membrane**

One layer is attached to the organ called **visceral layer** , the other layer will be close to the body cavity & called **partial layer**. In between these two epithelial layer is fluid called **serous for lubrication** (reduce friction)

Serosa will wrap organs that set in a body cavity i.e. abdominal cavity e.g. **GIT organs within the peritoneum** i.e **intraperitoneal organs** (liver, stomach, spleen, 1st part pf duodenum, ileum, jejunum, transverse & sigmoid colon)

Adventitia: is not epithelial, it is **CT** that wraps organs that set outside the peritoneal cavity i.e. retroperitoneal and attach them to the abdominal cavity

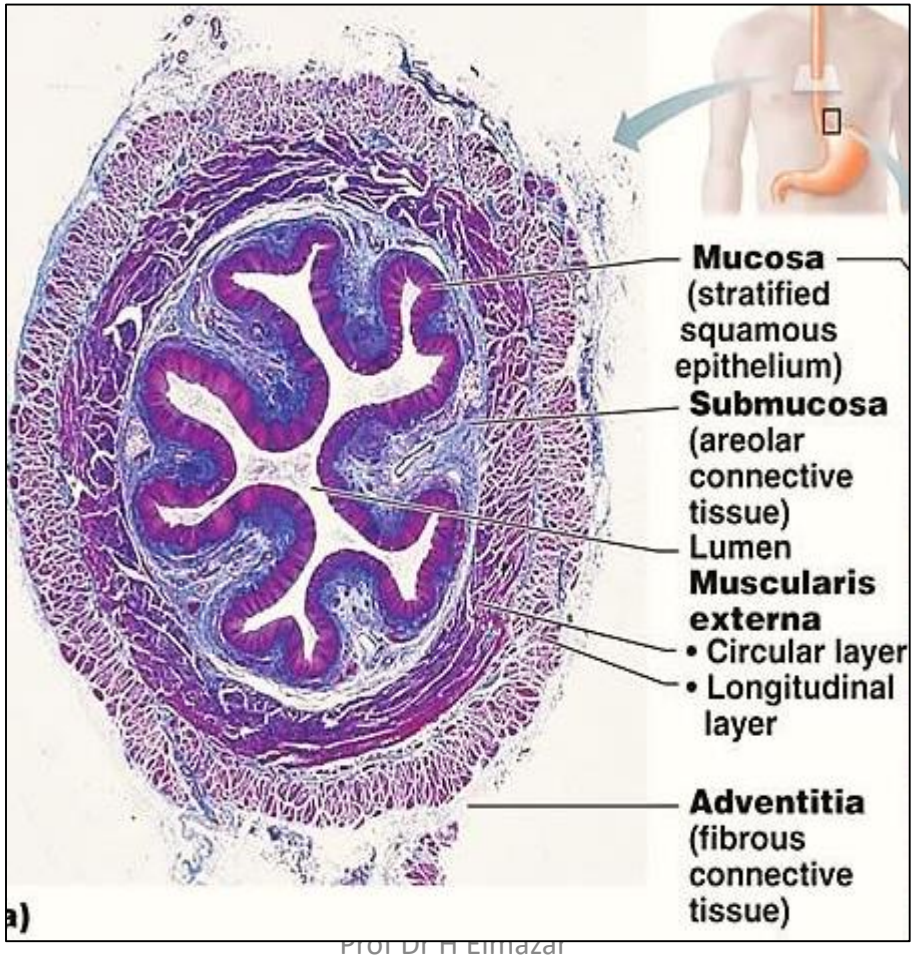
pancreas, rest of duodenum, cecum, ascending & descending Colcon

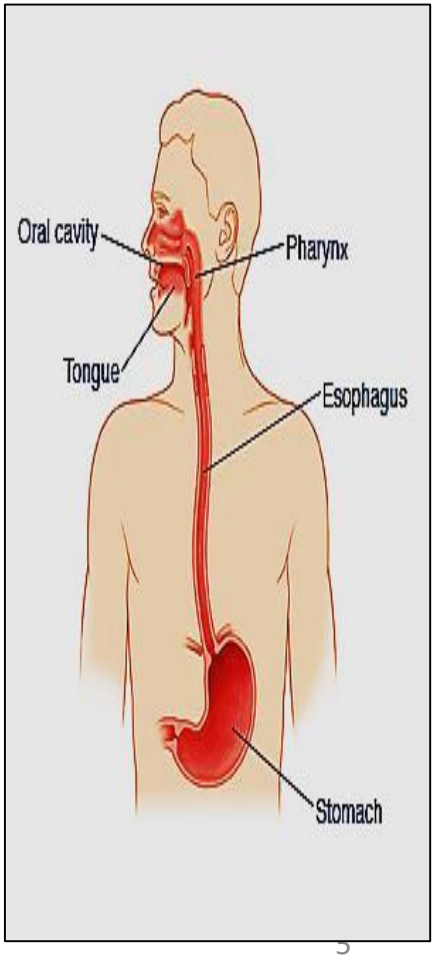
The esophagus

No role except transport.

- Muscular tube connects the pharynx with stomach, transport food
- Its wall consists of 4 layers:

- Mucosa
- Submucosa:
- Musculosa
- Adventitia





- **Mucosa**

  Epithelium: Non-keratinized stratified squamous epith.

  Lamina propria: B.V., nerves, lymphatics (!Cardiac orifice)

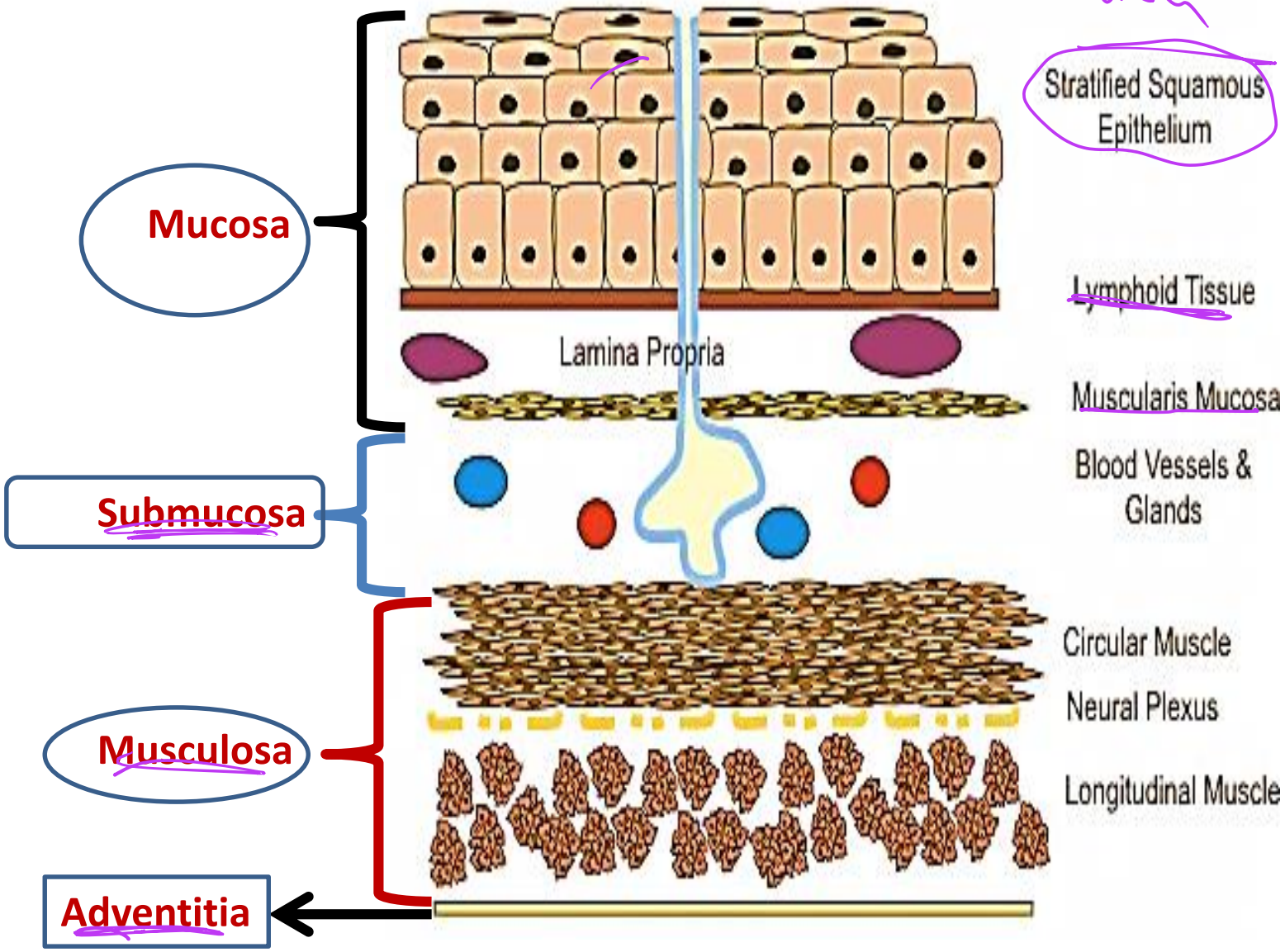
  Muscularis mucosa: smooth ms.

- **Submucosa**: loose C.T. contains BV, lymphatics, Meissner's plexus of nerves & esophageal mucous glands

- **Musculosa**: IC &OL (**OL**: upper 1/3 Striated *, middle 1/3 mixed & lower 1/3 smooth ms.) NB: swallowing start with controllable motion but finishes with involuntary peristalsis

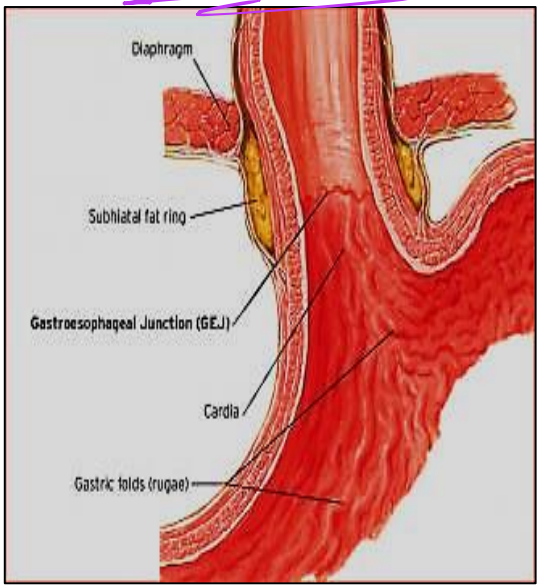
- **Adventitia**: covers most of the esophagus except the most distal portion which is located in the abdominal cavity is covered by serosa

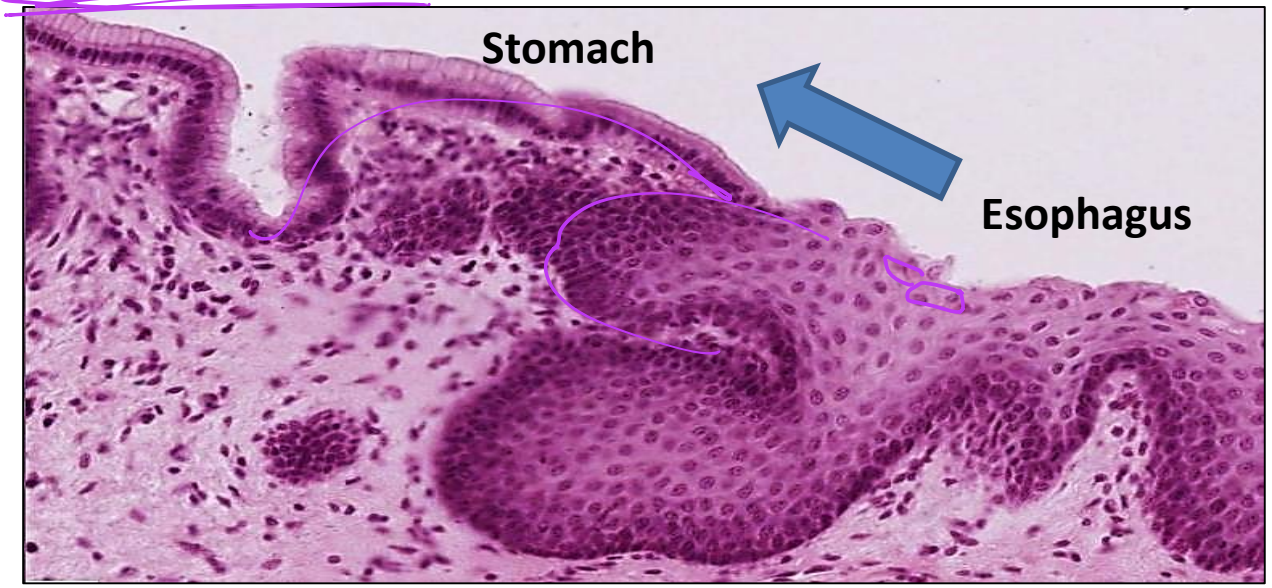
Layers of the wall of the esophagus



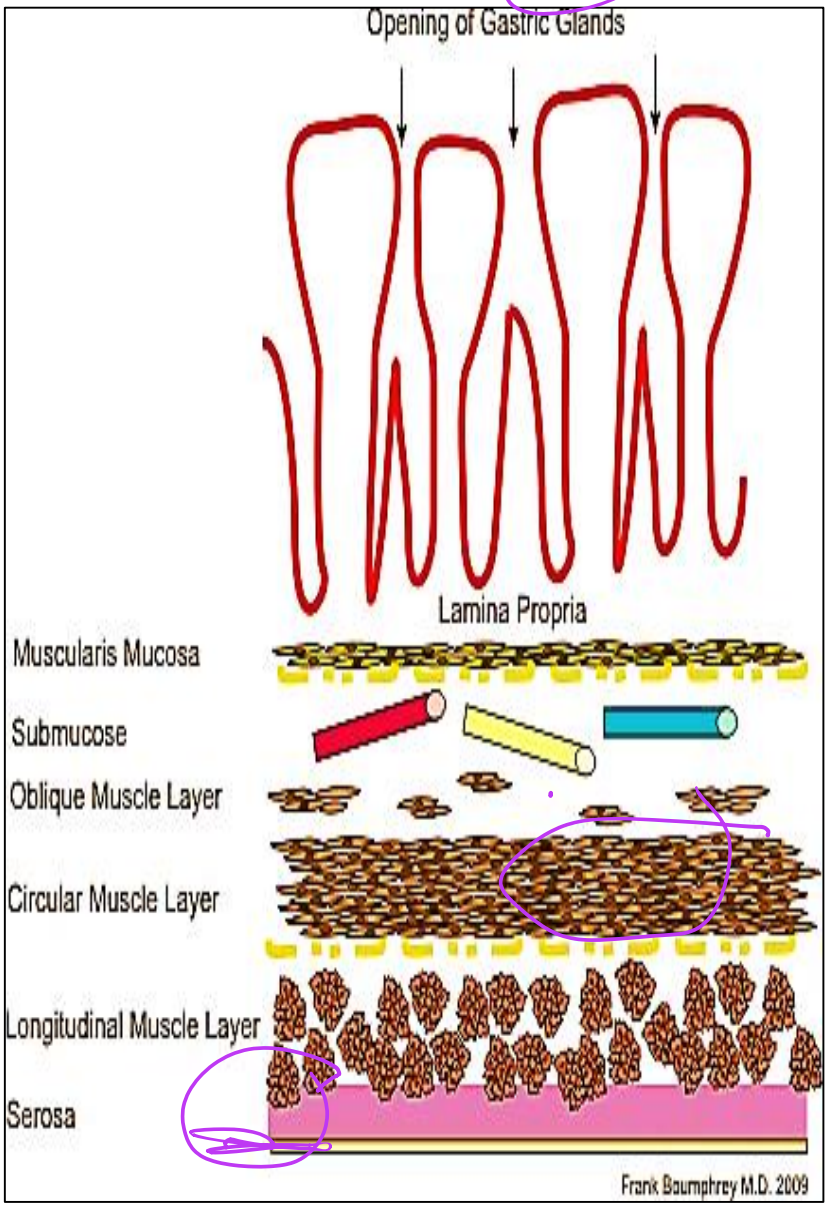
Changes at gastro- esophageal junction

1. The stratified Squamous → simple columnar epithelium
2. The lamina propria of stomach is wide & contains gastric glands (branched tubular)
3. The esophageal glands in the submucosa of esophagus stops in that of stomach
4. The musculosa becomes more thick in stomach due to the appearance of inner oblique layer

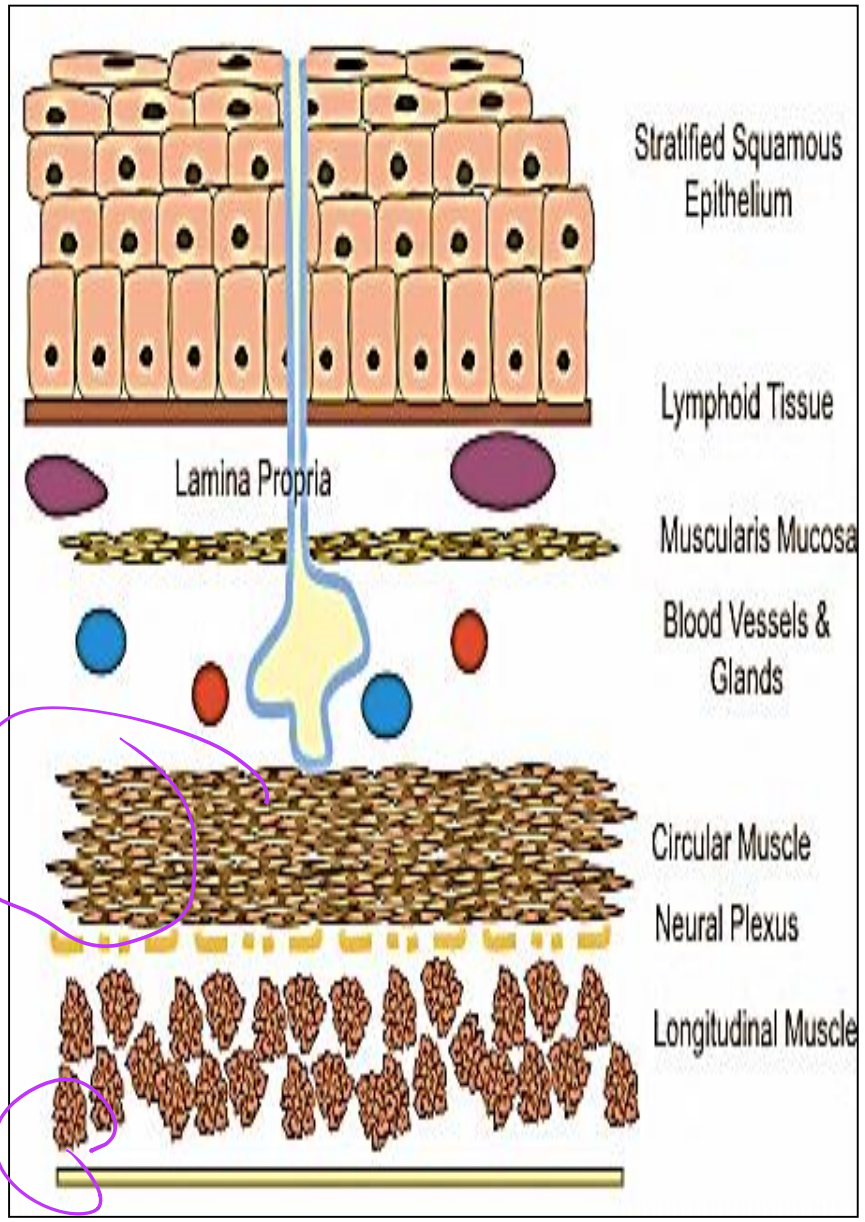




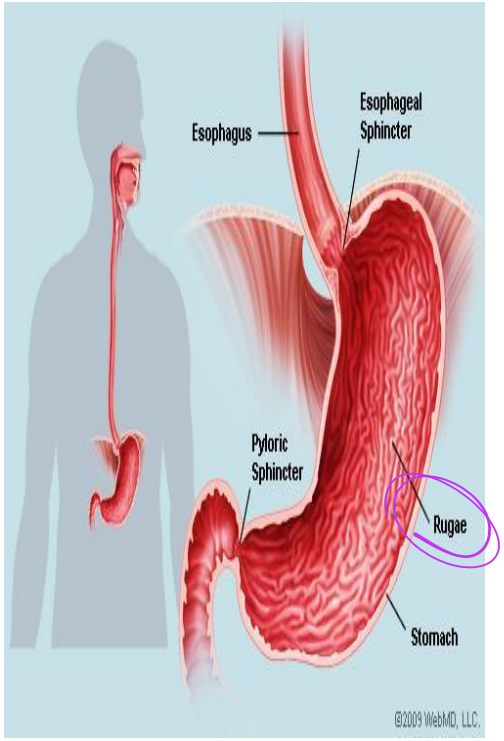
Layers of wall of stomach



Layers of wall of esophagus



The stomach

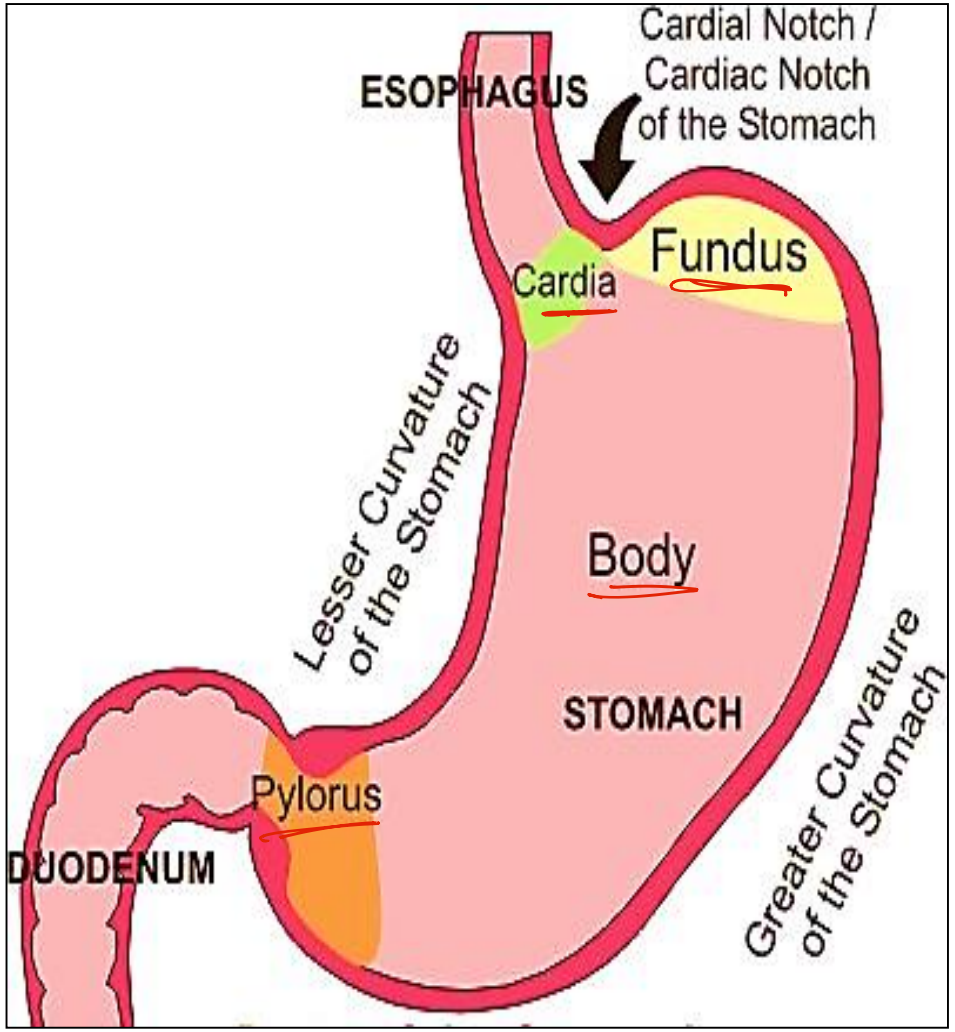


- The most dilated part of the GIT
- The mucosa in empty stomach forms longitudinal folds called gastric rugae
- It acidifies & converts the food → **chyme**
- The mucosa of stomach contains **gastric glands** (cardiac, fundic , pyloric)
- These glands secrete gastric juice which contains:
  - Acid: HCl
  - Mucus
  - enzymes: pepsinogen, lipase

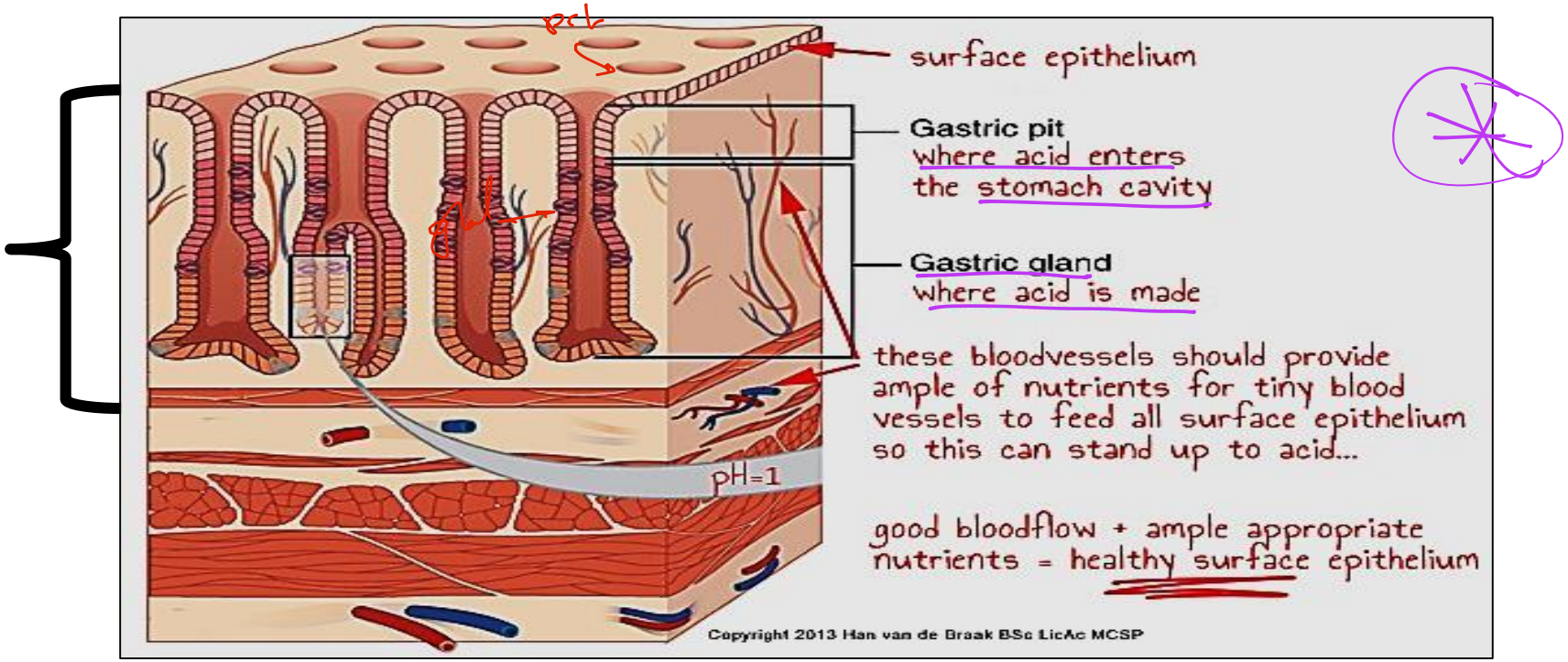
The stomach

The stomach is subdivided into 4 regions:

1. The cardiac region
2. The fundus
3. The body
4. The pyloric region



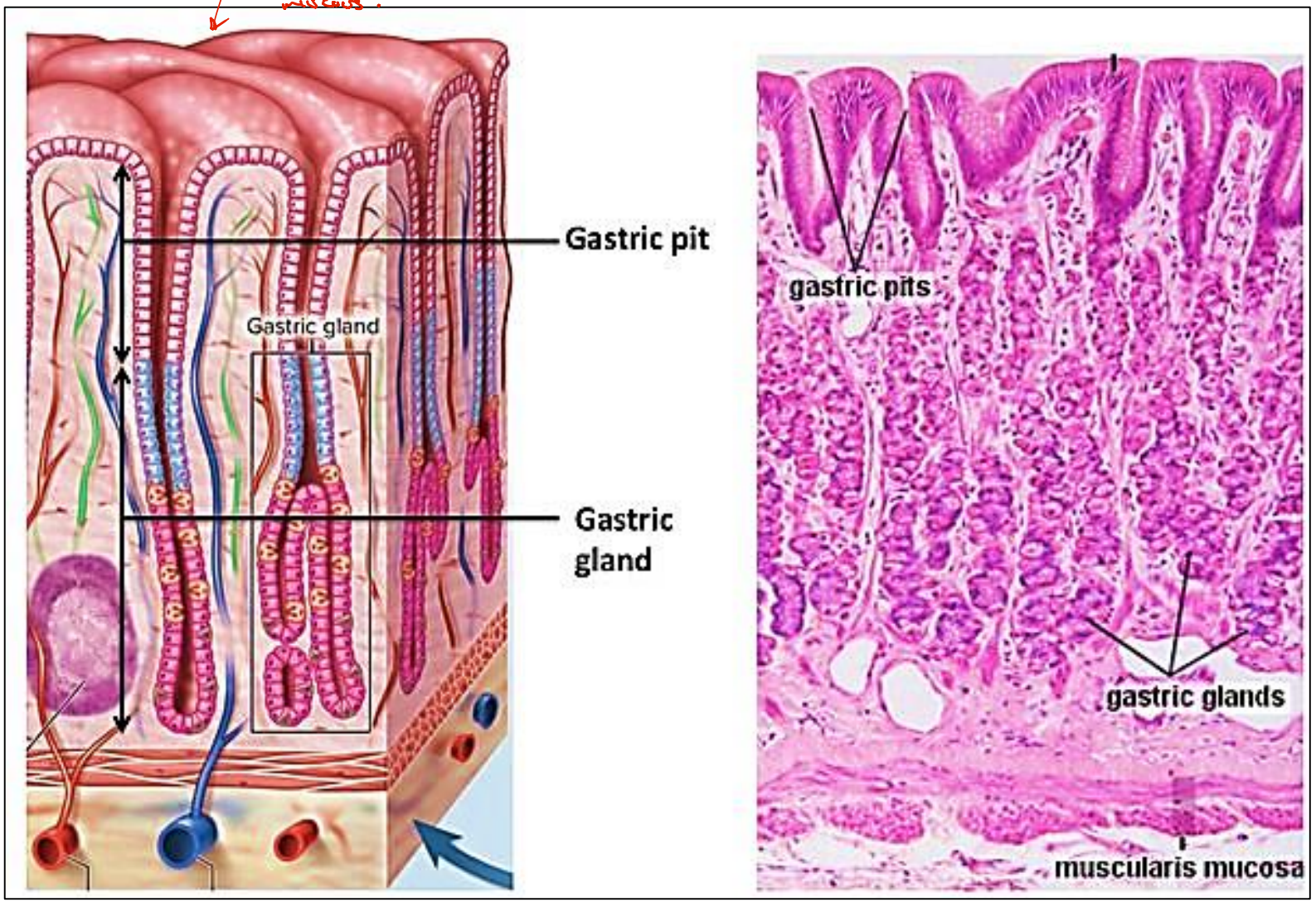
The fundus & body of the stomach



1- The mucosa:

- **epithelium**: ***simple columnar cells***, these cells secrete **neutral mucus** for lubrication & protection*
- **lamina propria**: contains ***gastric glands*** & C.T. fills the spaces between the glands . It also contains B.V., lymphatics, nerves

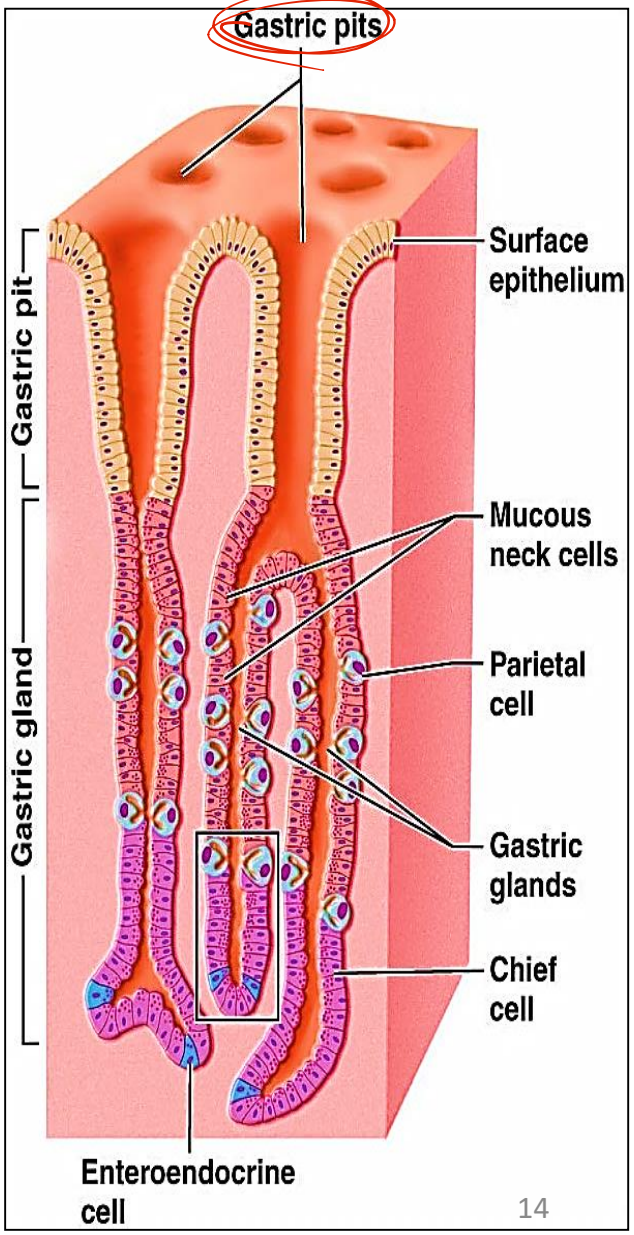
The gastric (fundic) glands



- **Muscularis mucosa**: layers of smooth muscles arranged as (IC & OL) inner circular & outer longitudinal

Gastric glands (fundus)

- simple branched tubular.
- occupy the entire thickness of the mucosa .
- They open onto the surface epithelium through gastric pits.
- through the pits the mucus, HCl & gastric enzymes reach the lumen of the stomach

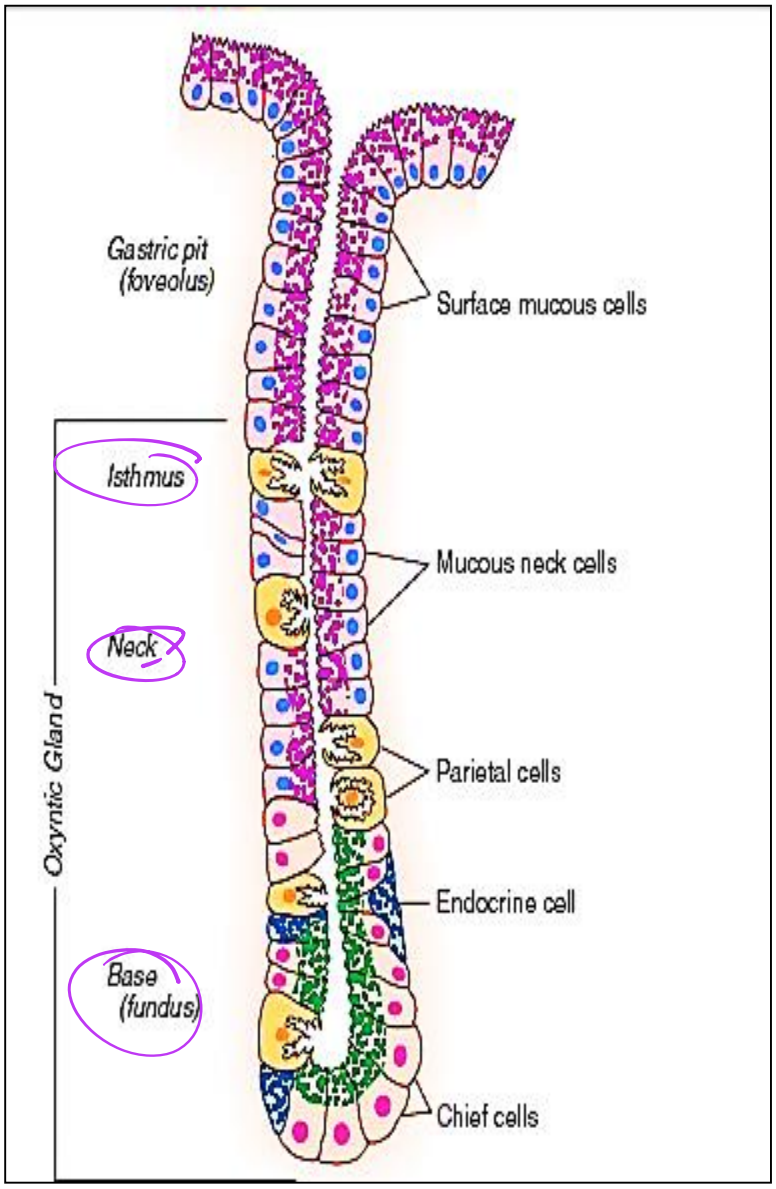


- **Each gland** is formed of 3 parts: **isthmus, neck & base**

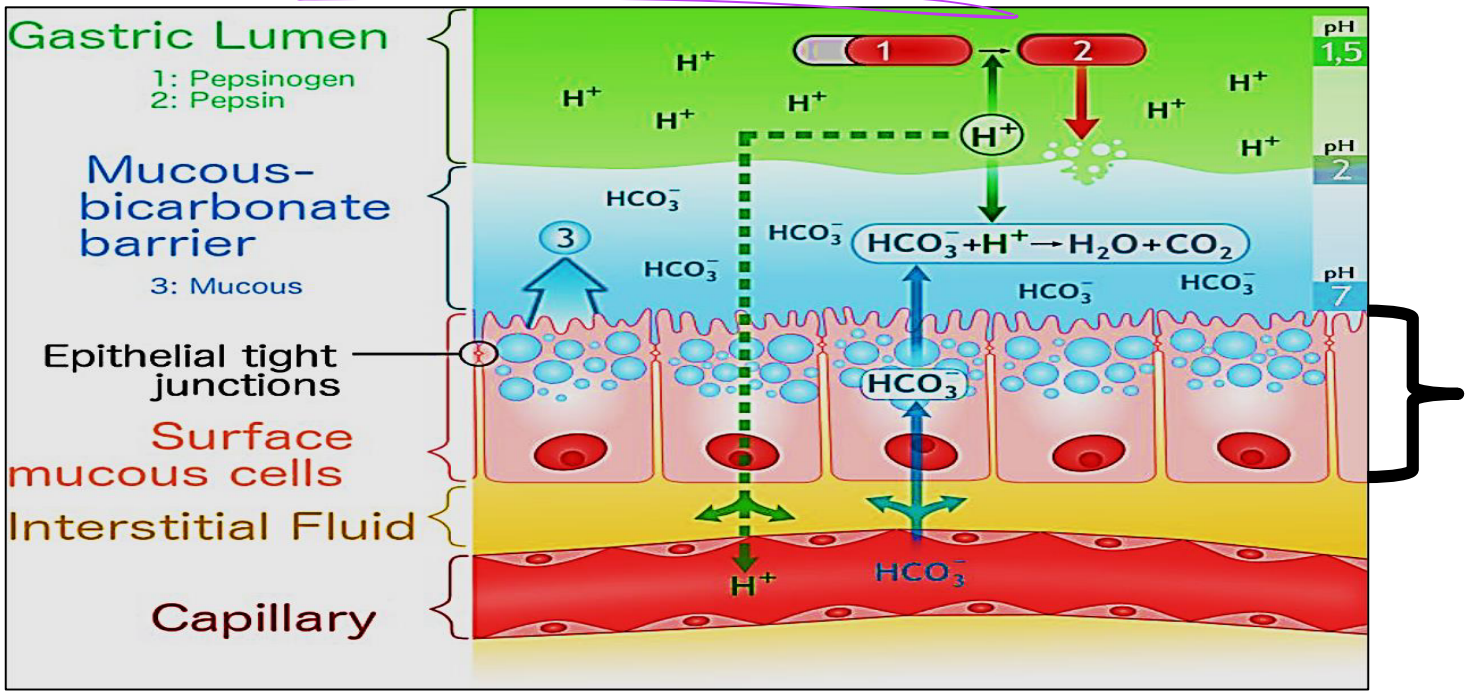
- **6 types of cells** line the fundic glands:

1- Surface mucous cells (Foveolar cells):
cover the surface & line the gastric pits & isthmus. Their apical cytoplasm contains mucin granules.
They sec. ***neutral mucus*** for protection (Gastric mucosal barrier)

2- Mucous neck cell: present in neck of gastric glands,
low columnar cells e foamy cytoplasm.
They secrete ***acidic mucus***



Gastric mucosal barrier



1- Tight junctions between the lining epithelial cells

2- A thick insoluble mucus covering secreted by surface epithelial cells, forms a physical barrier that coats the entire surface of the gastric mucosa.

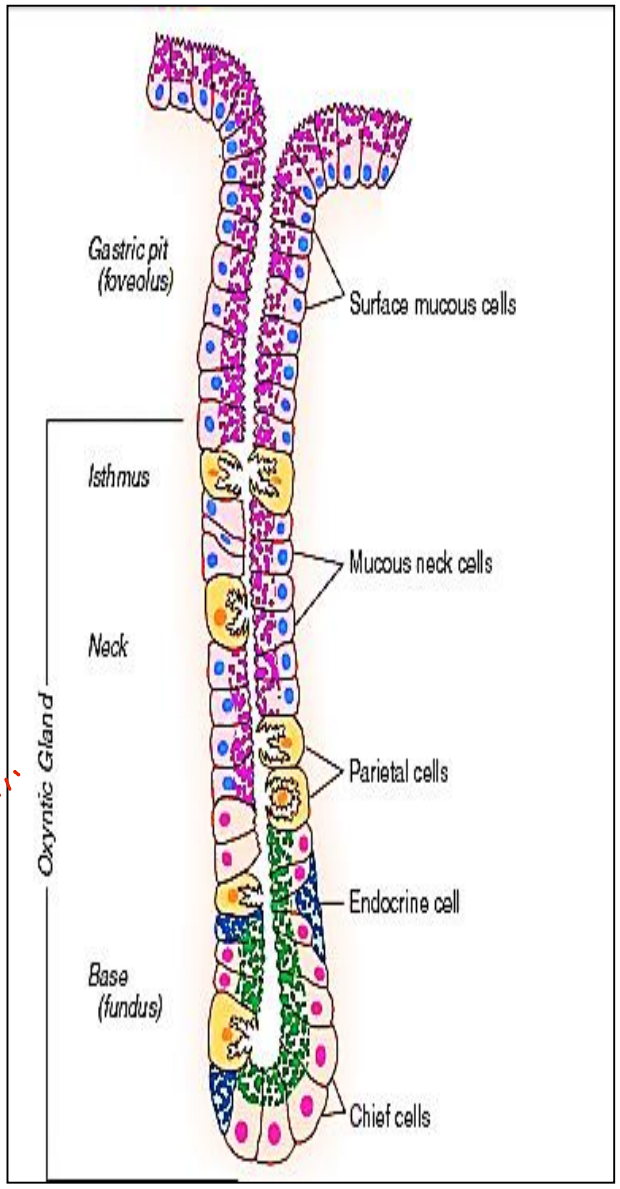
3- Bicarbonate ions, secreted by the surface epithelial cells. The bicarbonate ions act to neutralize harsh acids that find access to cells

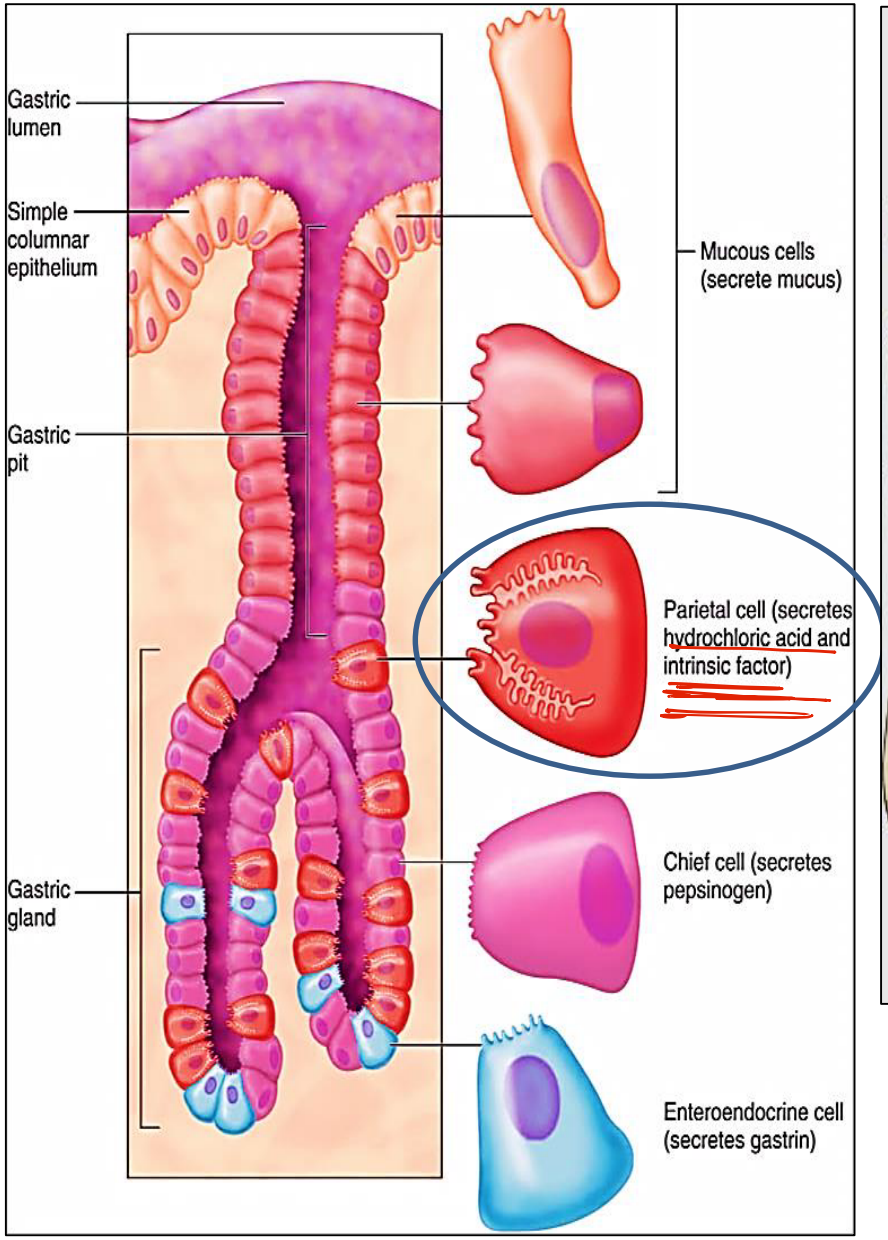
3- stem cells: present in neck region, low columnar. They differentiate to other gastric cells

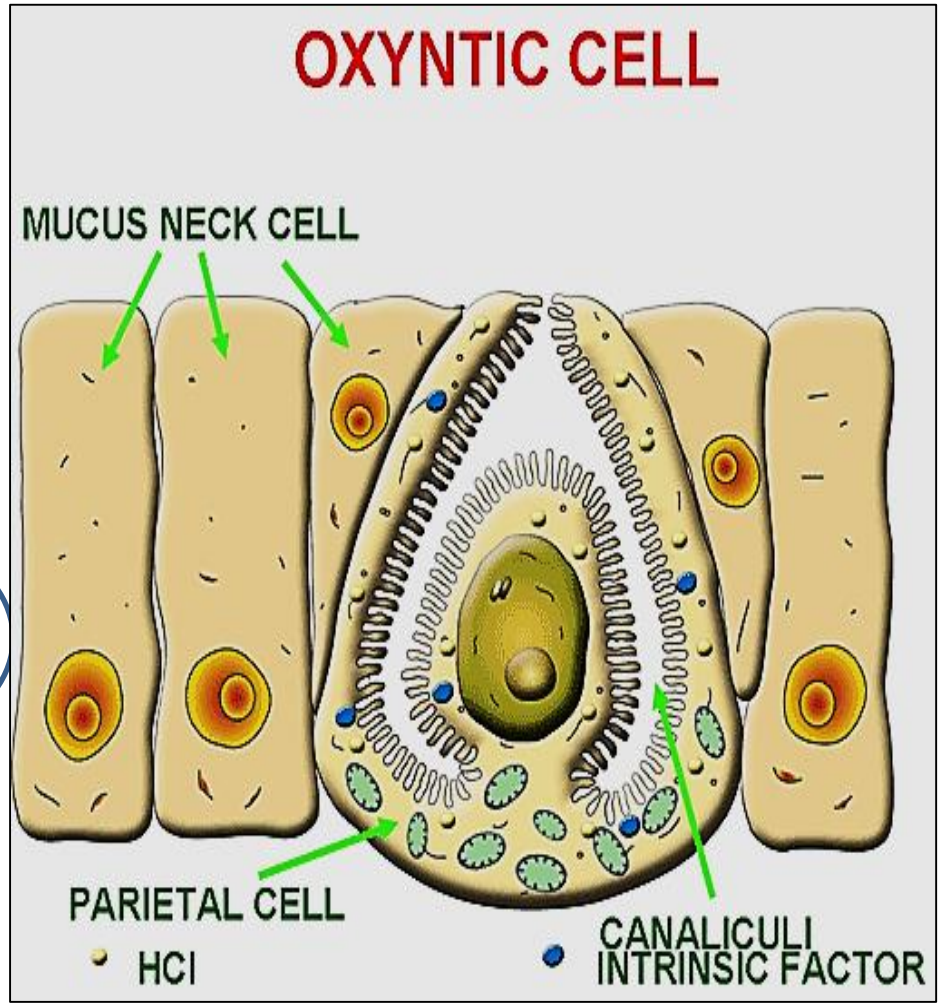
4- Parietal (oxyntic) cells :

- ***triangular* in shape e *acidophilic cytoplasm* & *rounded central nucleus*.**
  present mainly in the upper half of the glands. Few at the base of glands

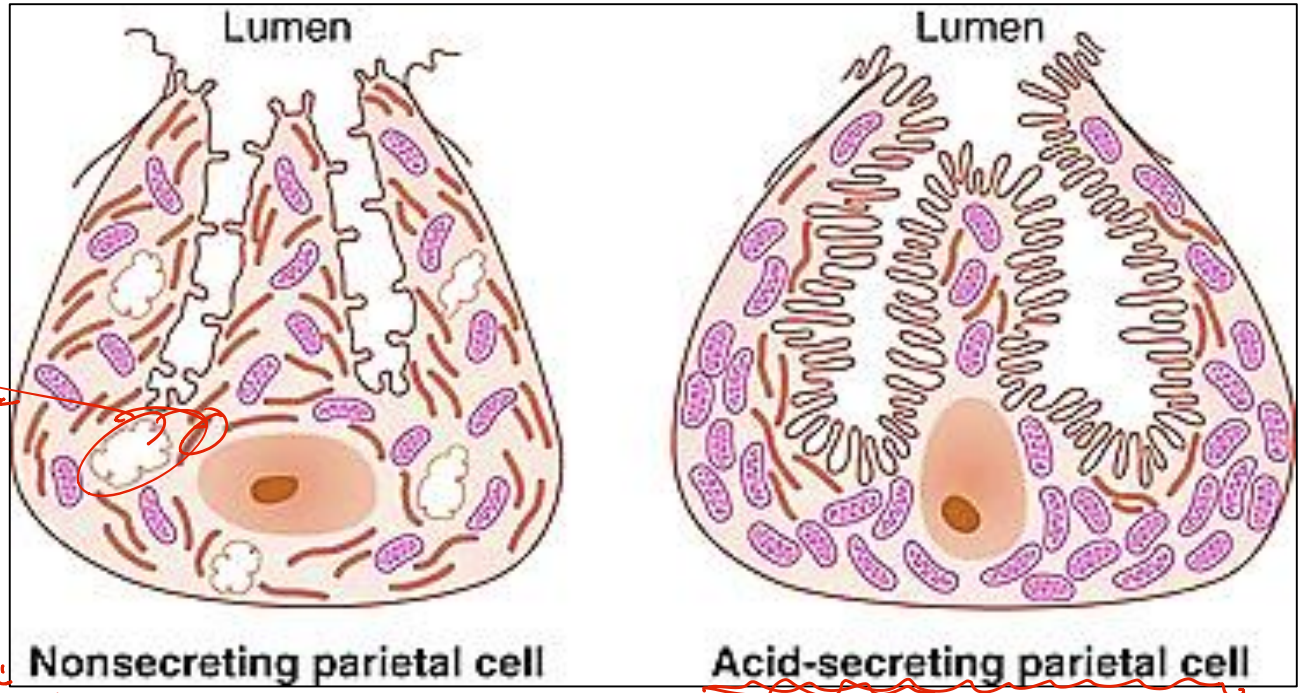
- **E/M : their apical surfaces show branching Intracellular canaliculi that open at the apex.**
- **↑ mitochondria, ↑SER, NO sec. granules**
- **They secret HCl & intrinsic factor(glycoprotein) needed for vit. B12 absorption**







Oxyntic cell secretes HCl & intrinsic factor showing tubulovesicular system

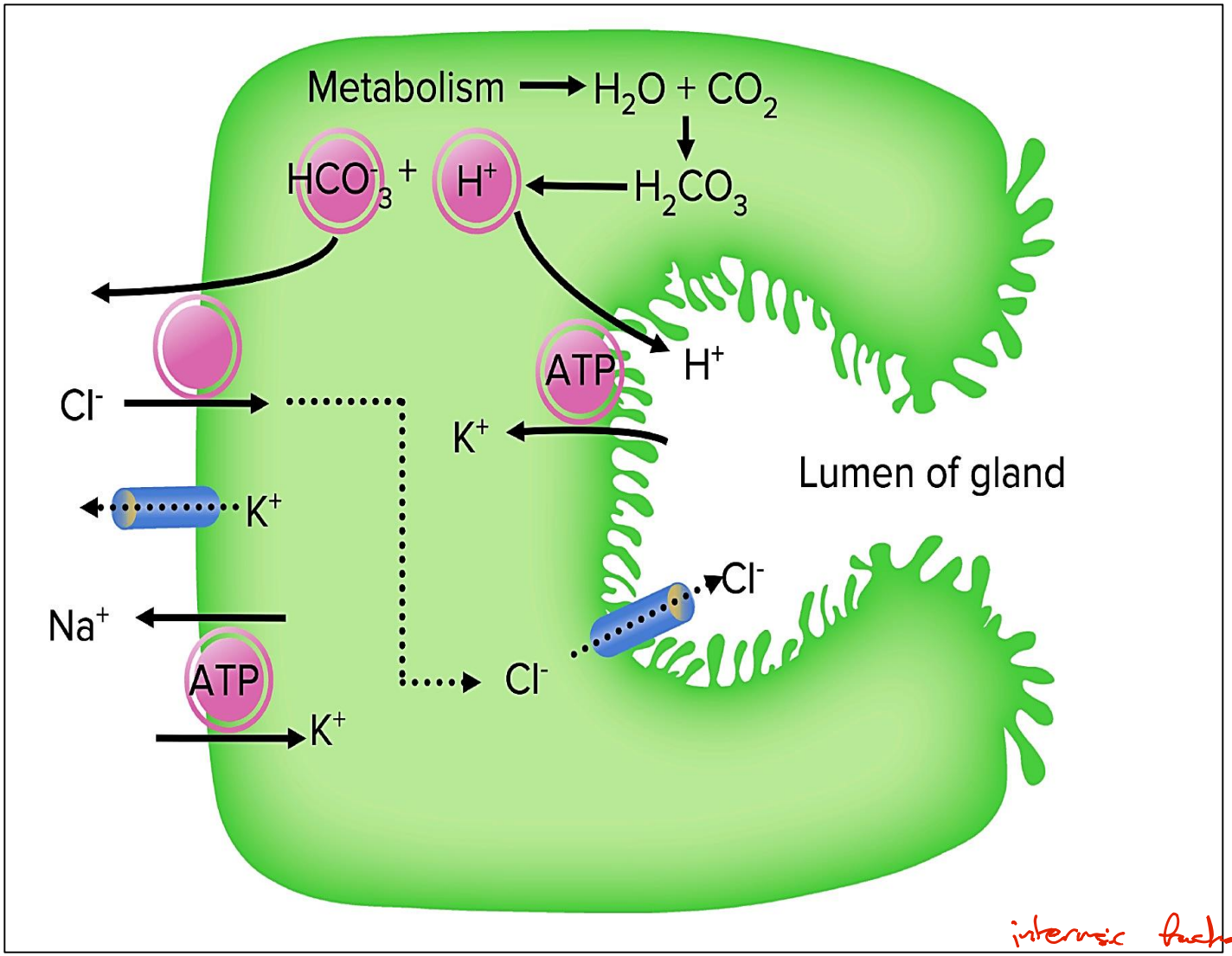


Showing tubulovesicular system in active vs resting parietal cell

The system refers to a network of membrane bounded vesicles remodel adjusting the need for acid production

It plays role in proton pumps. It increase the surface area for proton pump when acid secretion is needed

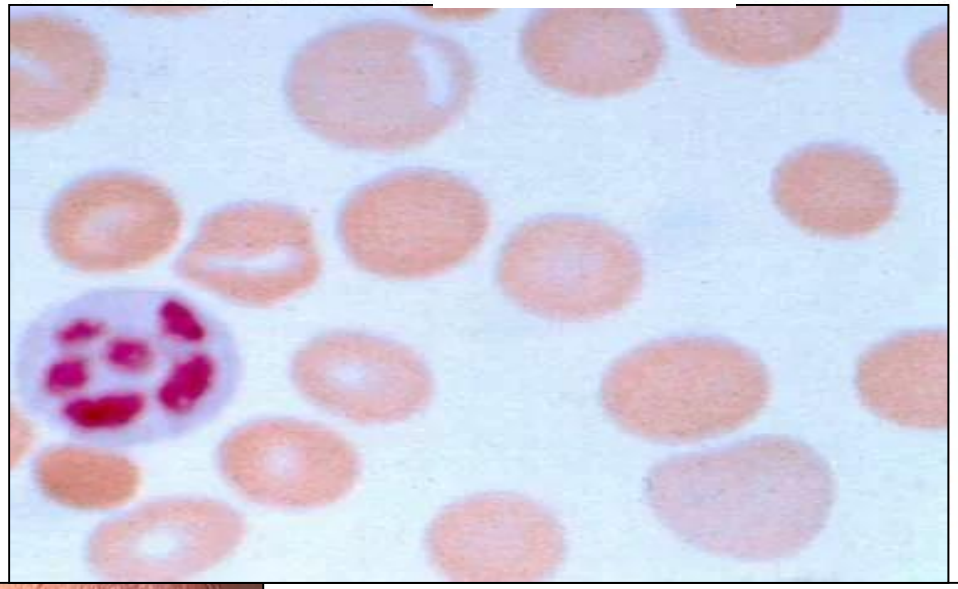
Formation of HCL



intrinsic factor

Pernicious Anemia

- Pernicious anemia is caused by a lack of intrinsic factor
- Intrinsic factor is a protein made in the stomach. It helps your body absorb vitamin B12, necessary for normal RBC production; RBCs are larger

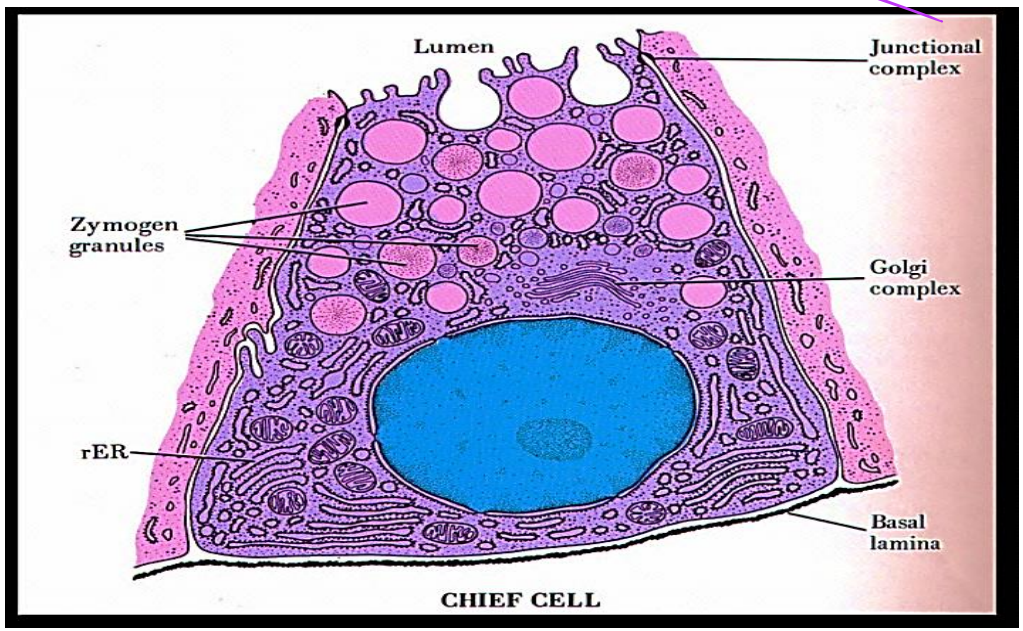


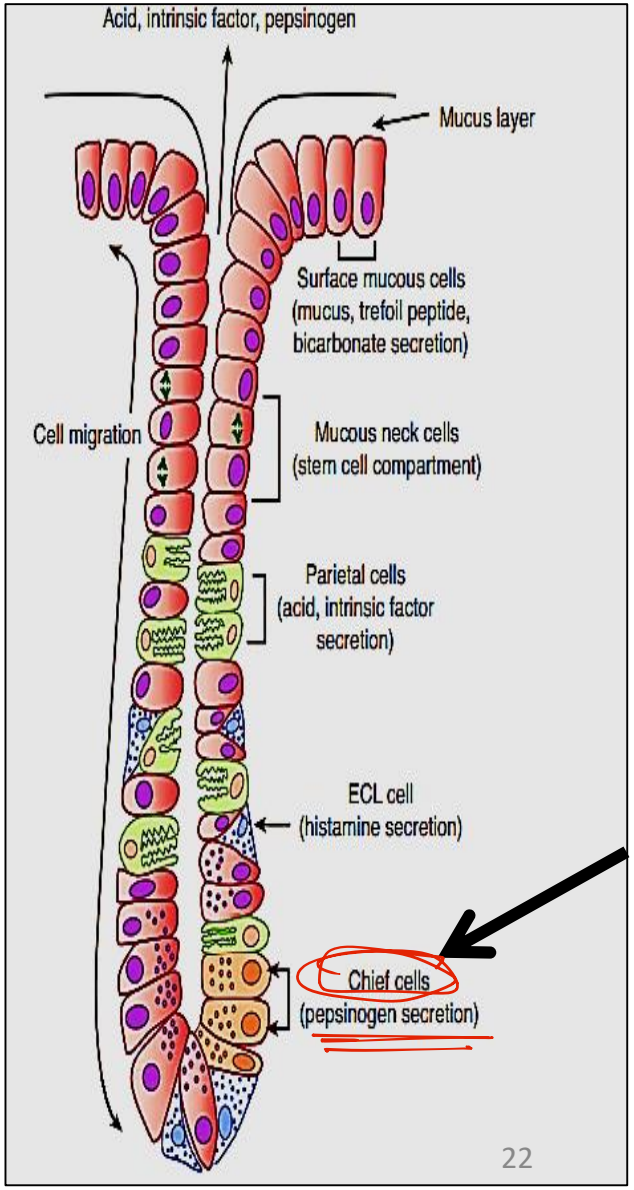
One of the signs of pernicious anemia is red tongue with smooth surface (Beefy tongue)

5-Peptic (Chief, Zymogenic) cells: mainly at the base of gastric glands. columnar cells e basal rounded nuclei.

- **The basal cytoplasm is basophilic due to ↑rER, while the apical part contains ↑↑ zymogen granules**

- **E/M : protein secreting cells**
- **These cells secrete pepsinogen & G. lipase**





6- Entero-endocrine cells :

- present in the base of the glands.
- Hormone secreting cells
- (diffuse neuroendocrine system)

- Their secretions accumulates in the basal part to be released to the B.V.

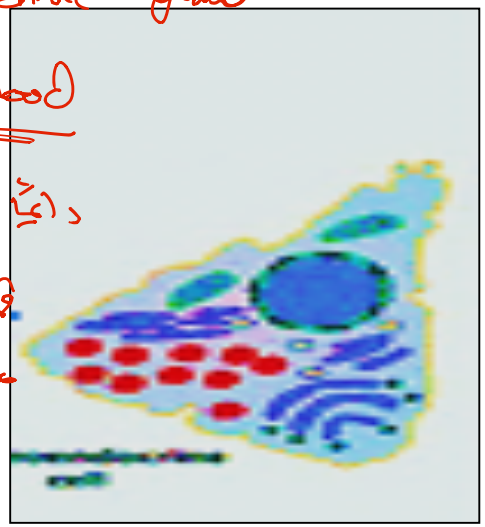
- They secrete:

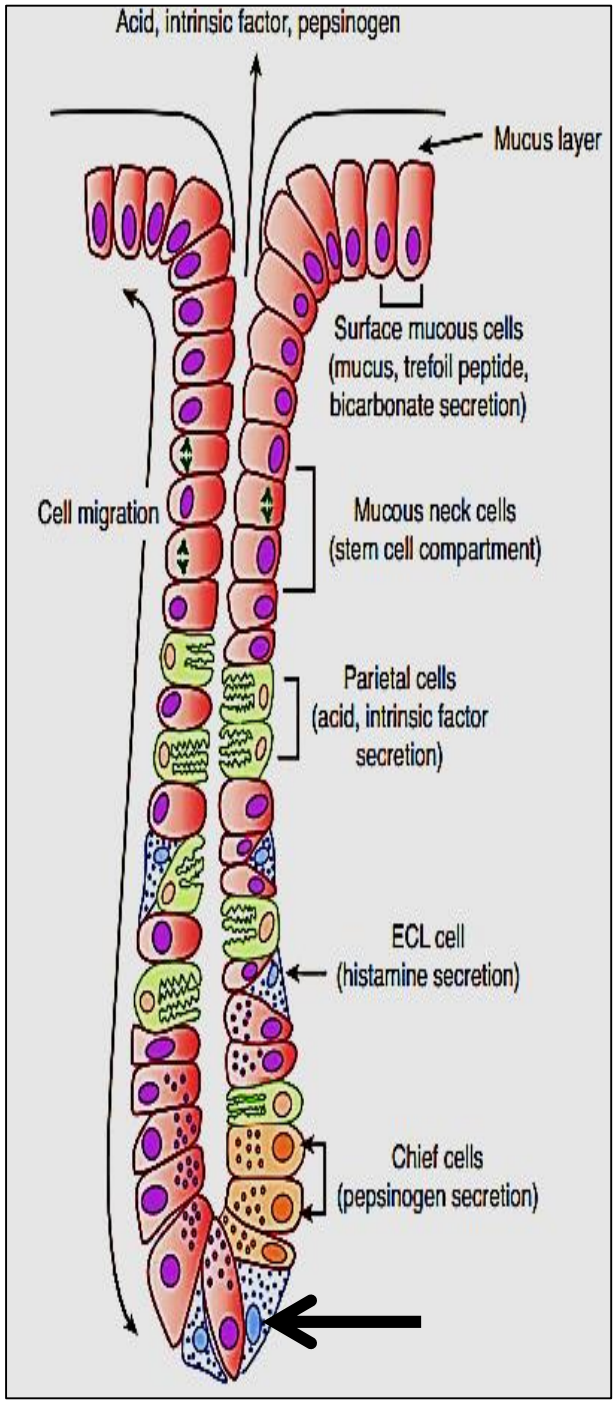
✓ Gastrin

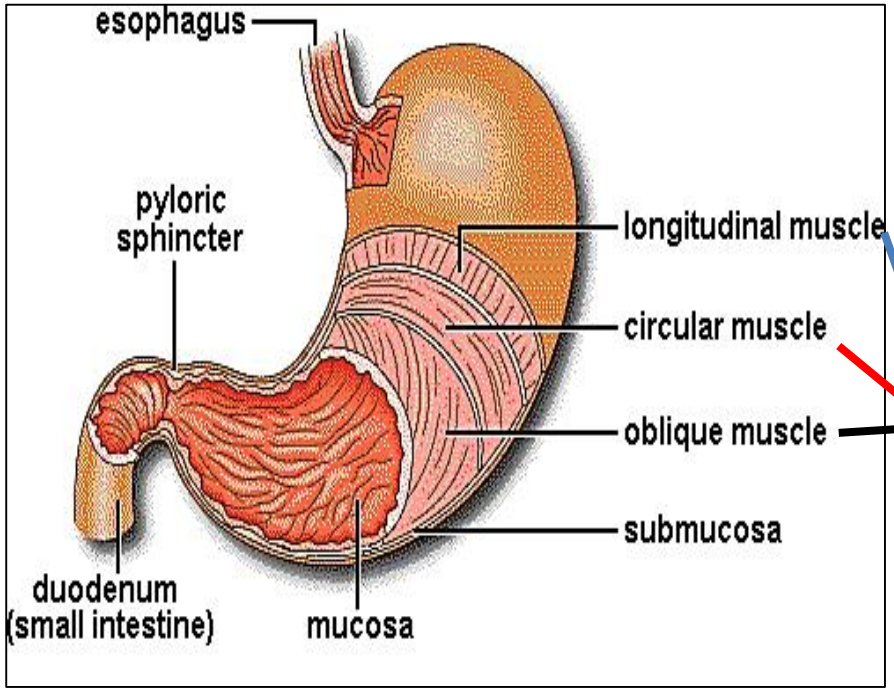
✓ Enteroglucagon

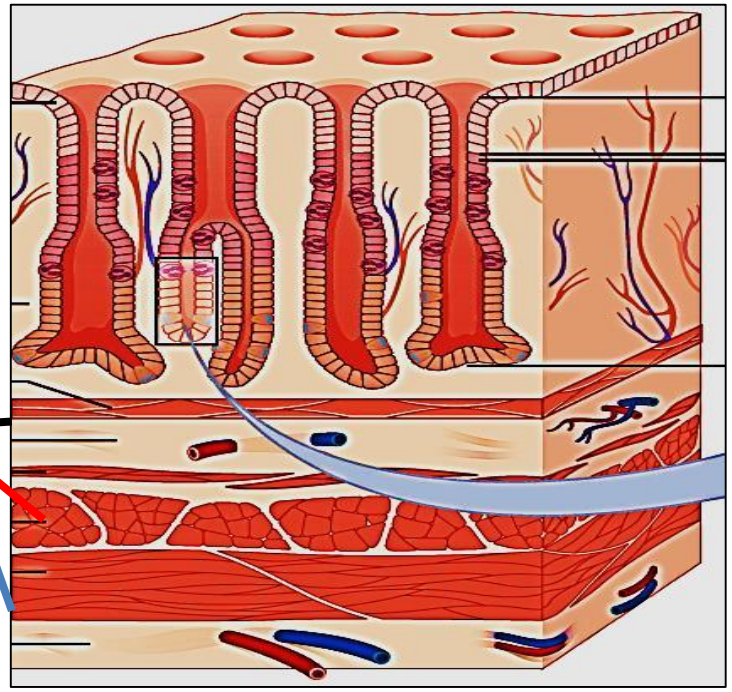
✓ Serotonine

✓ Somatostatin(D cells)









2- The submucosa: loose C.T. with B.V., lymphatics, meissner's plexus of nerves

3- The musculosa: formed of 3 layers of smooth ms.

Inner oblique - middle circular - outer longitudinal.

Auerbach's plexus is present between middle & outer layers

4- The Serosa: is the peritoneal covering, is formed simple squamous mesothelium & loose C.T. It contains B.V., lymphatics, & nerves

The difference between fundus & pylorus

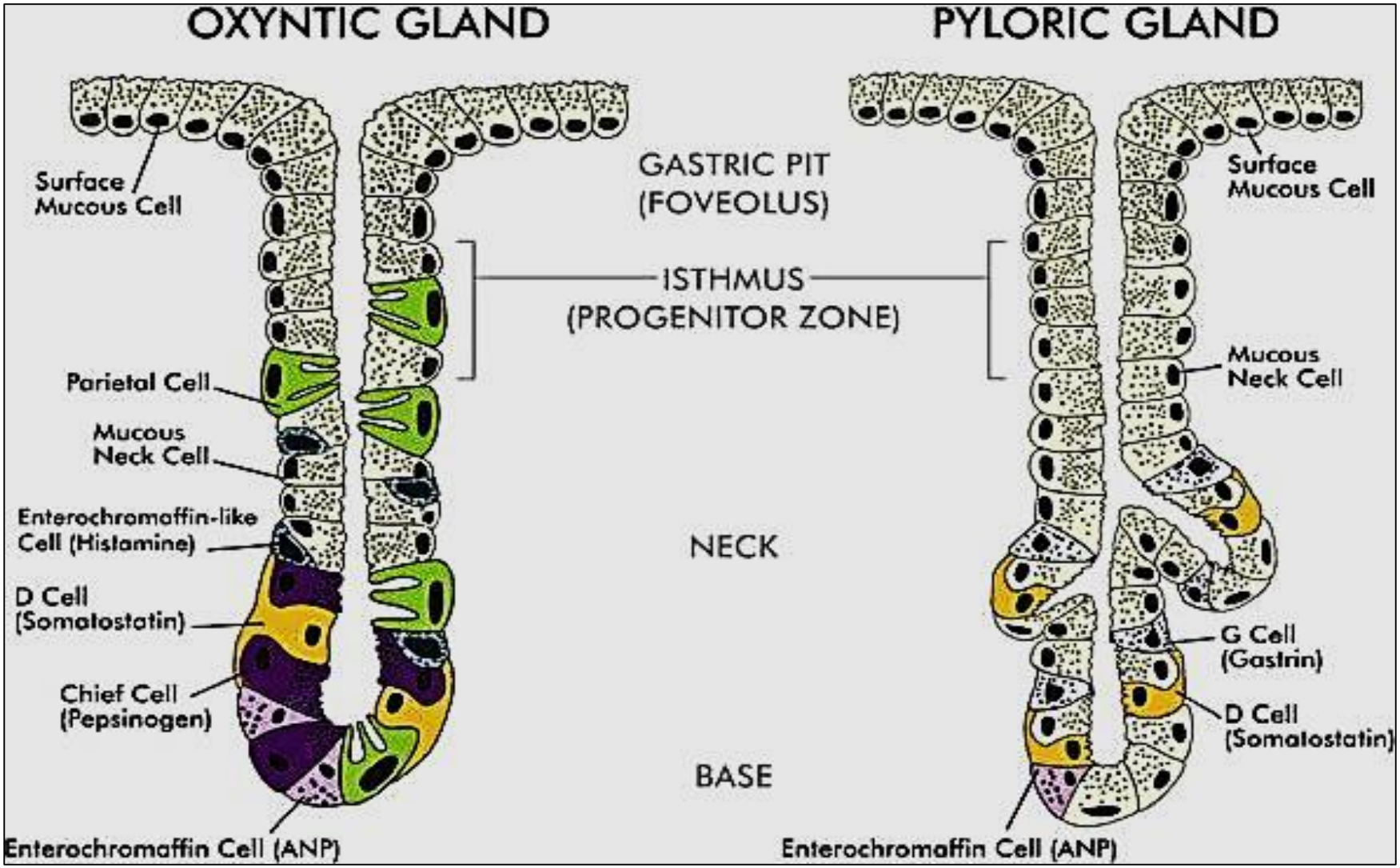
Fundus

- Thick mucosa
- Pits are narrow & short
- F. Glands are simple branched tubular & long
- occupy most of mucosal thickness
- Lined e 6 types of cells
- Corium: lymphocytic infiltration
- Musculosa: thinner formed of 3 layers of ms. (IO, MC,OL)

Pylorus

- Thin mucosa
- Pits are wide & long
- P. Glands are coiled branched tubular & short
- Occupy ½ of mucosal thickness
- Lined e mucous secreting cells
  No oxyntic, No peptic cells
- Lymphocytic infiltration & lymph nodules
- Thicker , formed of 2 layers of muscles. Thick IC to form the p. sphincter & OL

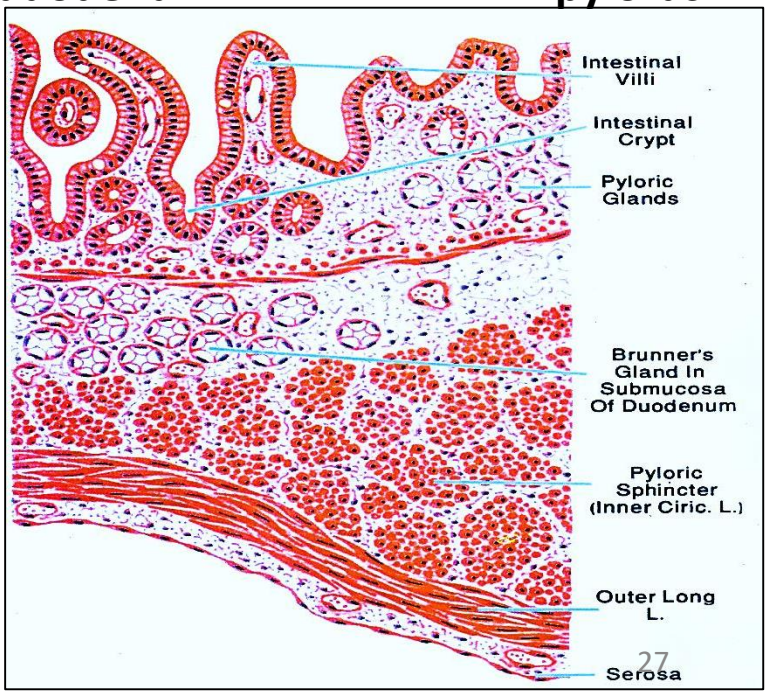
Difference between fundic & pyloric glands

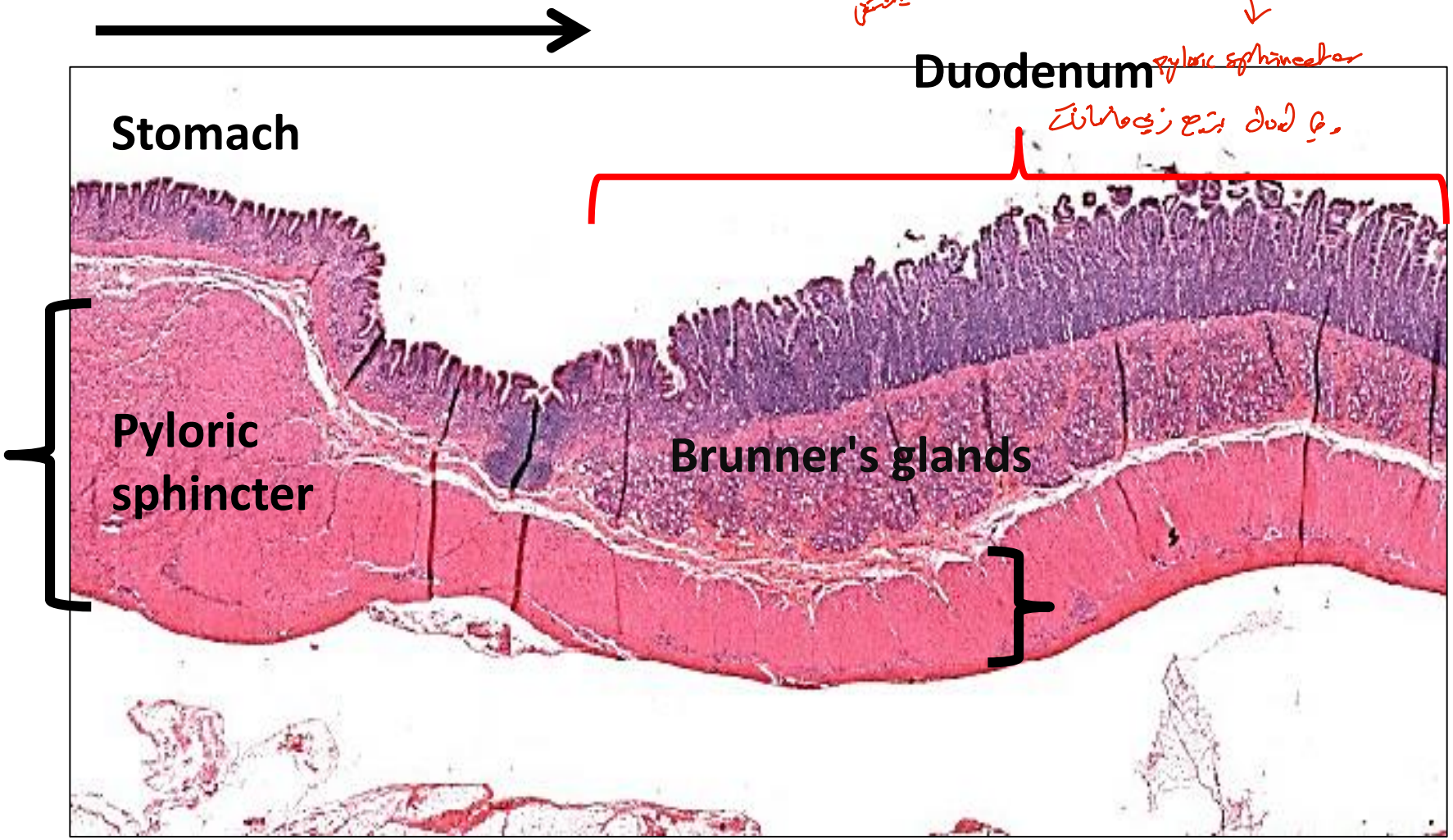


Changes at gastro duodenal junction

- intestinal villi start to project from mucosa
- Intestinal crypts replace pyloric glands in the corium of duodenum
- Surface columnar cells with brush border. Goblet cells appear between cells
- Muscularis mucosa: pass unchanged
- Brunner's glands appear in duodenal submucosa
- Musculosa is thinner in the duodenum
- Serosa pass unchanged

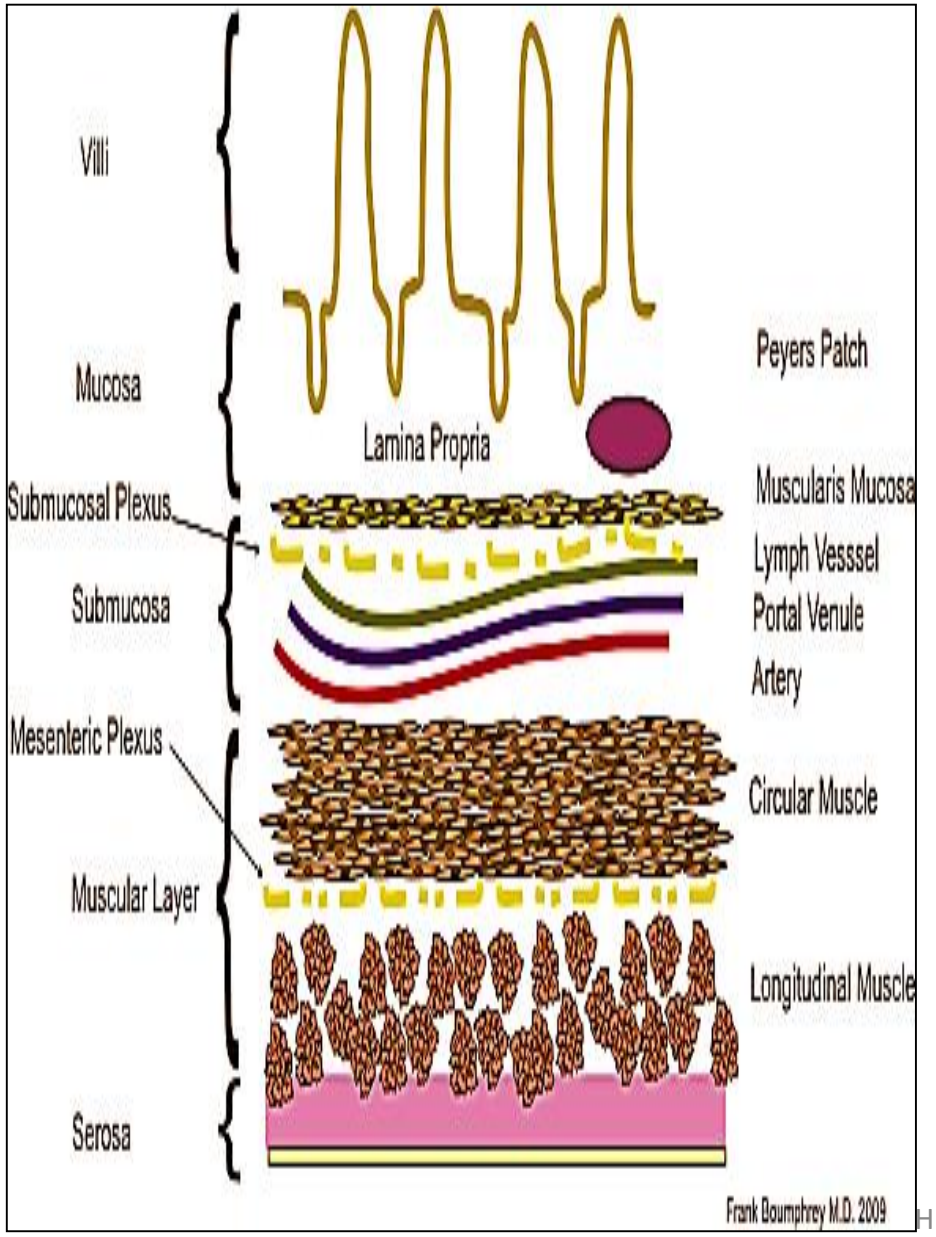
duodenum ← pylorus



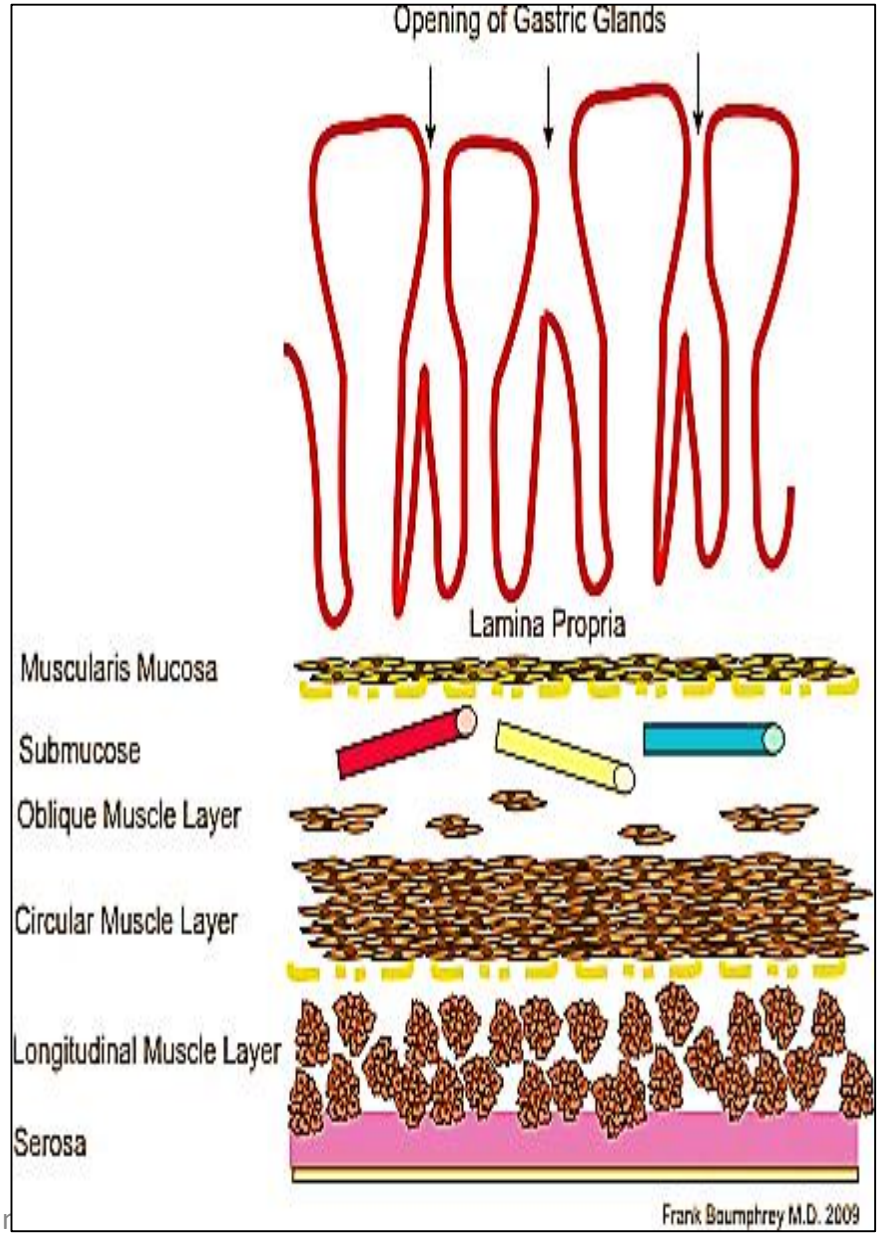


Gastro duodenal junction

Wall of intestine



Wall of stomach



Thank you