



DIGESTIVE SYSTEM (II)



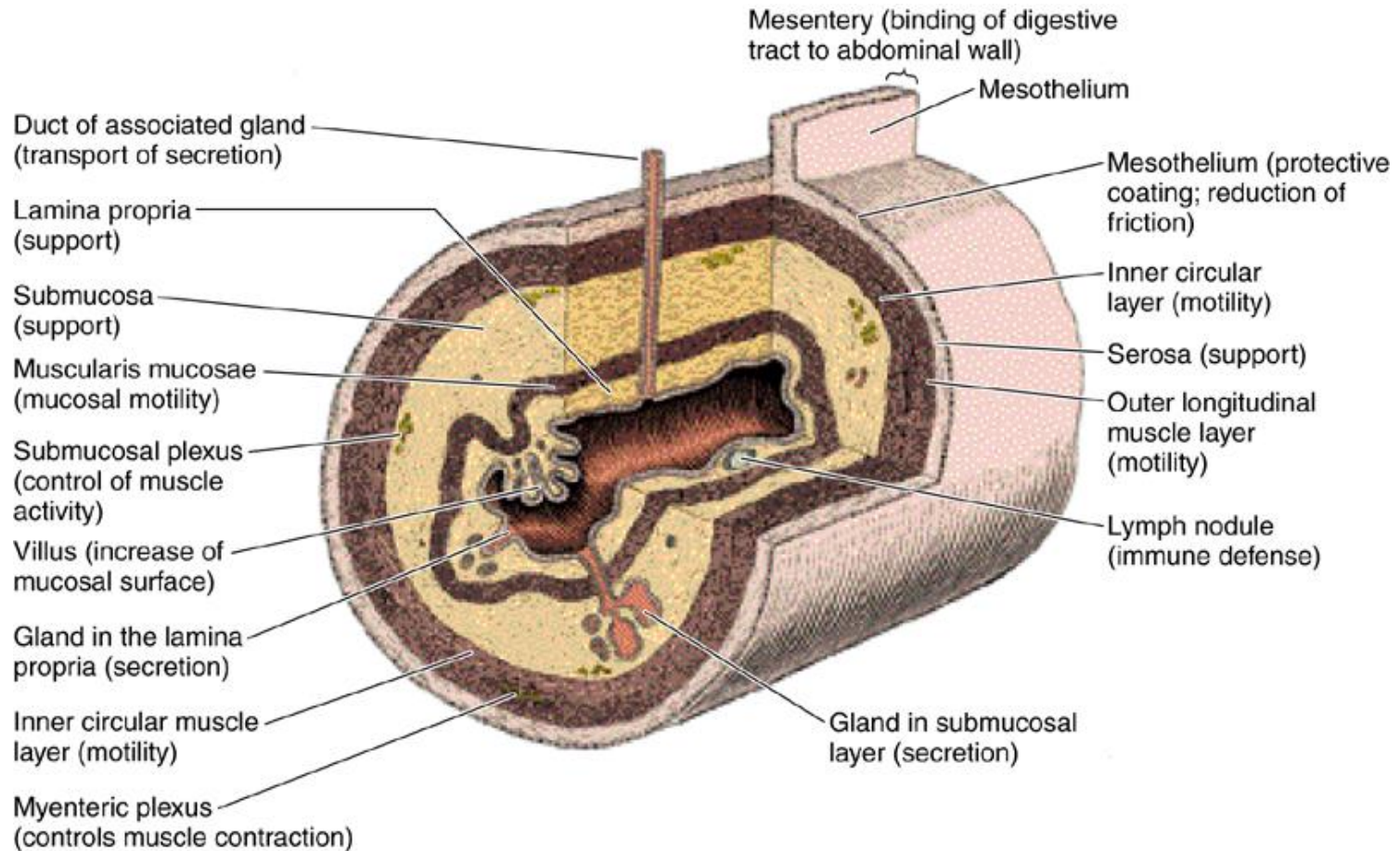
HISTOLOGY

Semester 2, Year 2 •

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General plan of GIT



General structure of gastrointestinal tract

Mucosa

Submucosa

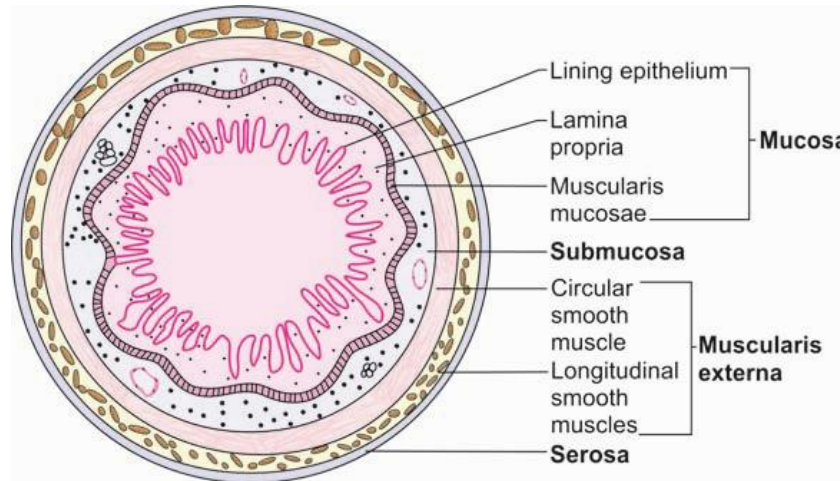
Musculosa

**Serosa or
Adventitia**

Epithelium

Corium

Muscularis mucosa



General Plan of GIT

(1) M: Mucosa:

Epithelium

Lamina Propria

Muscularis Mucosa

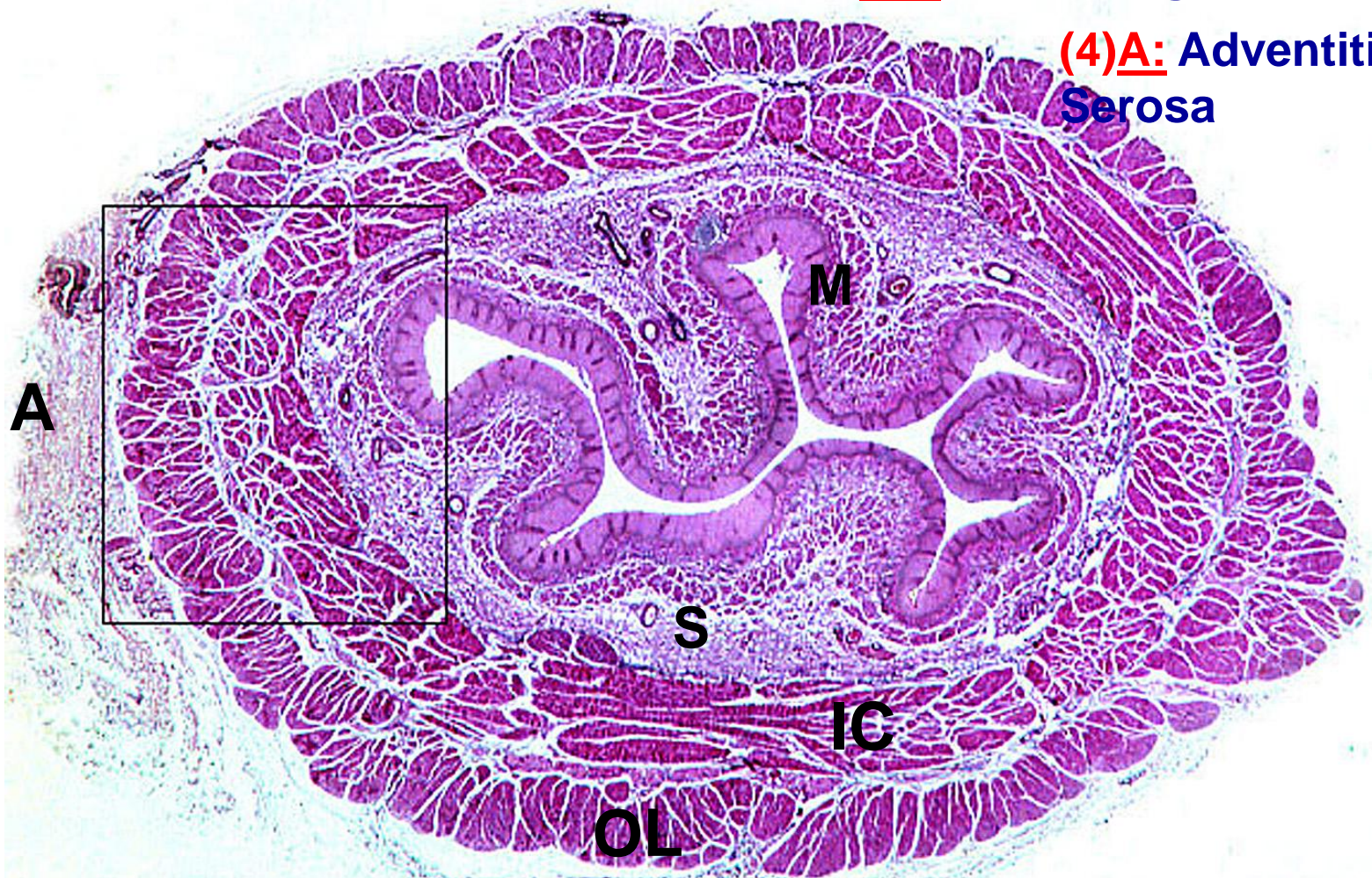
(2) S: Submucosa

(3) MUSCULOSA

IC: Inner circular

OL: Outer longitudinal

(4) A: Adventitia/
Serosa



(Mucosa) :

Epithelial lining :

- * Protective * Secretory * Absorptive
- Stratified epithelium in esophagous then simple in stomach and intestine

Lamina propria :

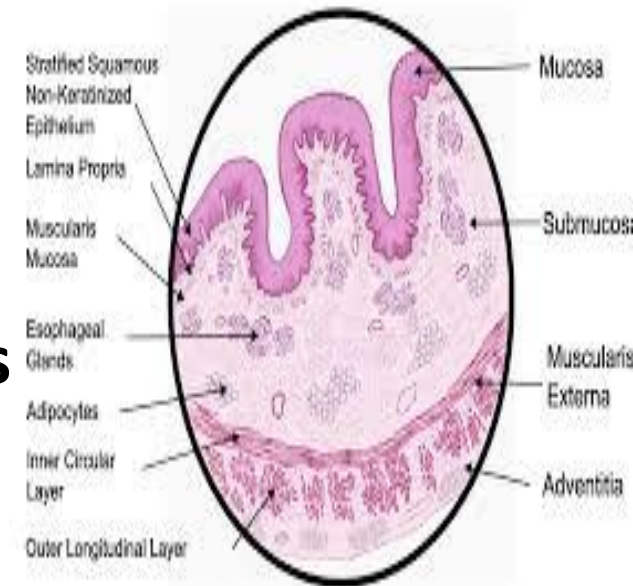
- * Gut associated lymphoid tissue
- *(GALT) * Fenestrated blood capillaries

Muscularis mucosa

- * Inner circular
- * Outer longitudinal

Submucosa :

- * Loose C.T.
- * In oesophagus & duodenum → mucous secreting glands
- * Meissner's plexus of nerves



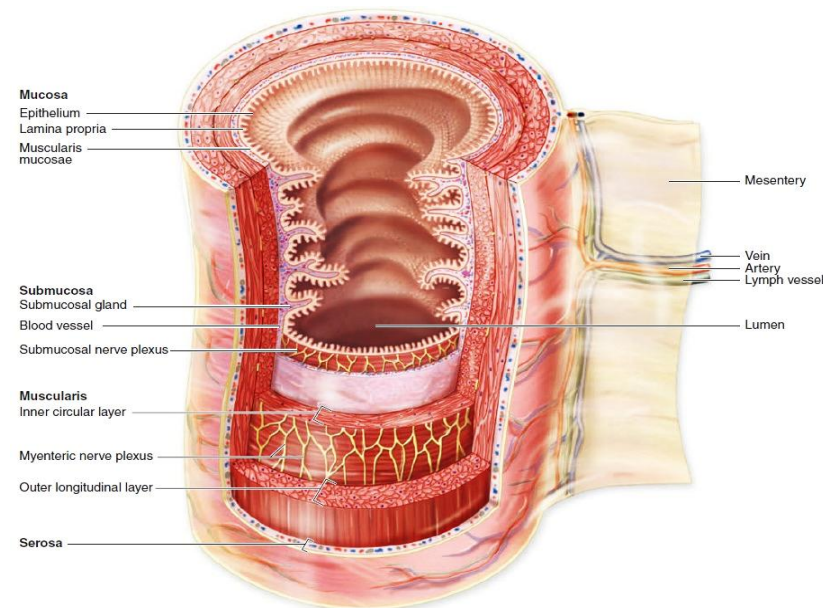
- **Musculosa :**

- 1- Inner circular

- 2- Outer longitudinal

- Auerbach's plexus (Myenteric) in between
(Longitudinal) (Circular)

- **Serosa or (adventitia)**



Adventitia vs. serosa

Serosa: simple squamous epithelium

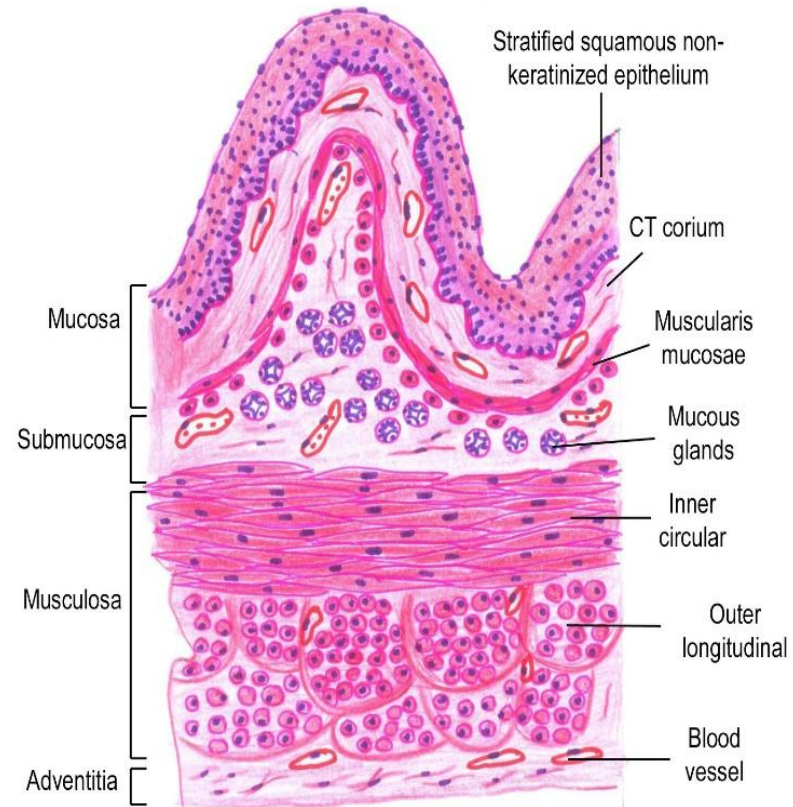
Serosa will wrap organs that set in a body cavity i.e abdominal cavity like GIT organs within the peritoneum i.e intraperitoneal organs (liver, stomach, spleen, 1st part pf duodenum, ileum, jejunum, transverse & sigmoid colon)

Adventitia: is not epithelial is loose 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

• Oesophagus

DIGESTIVE SYSTEM



Esophagus (dog)

The esophagus

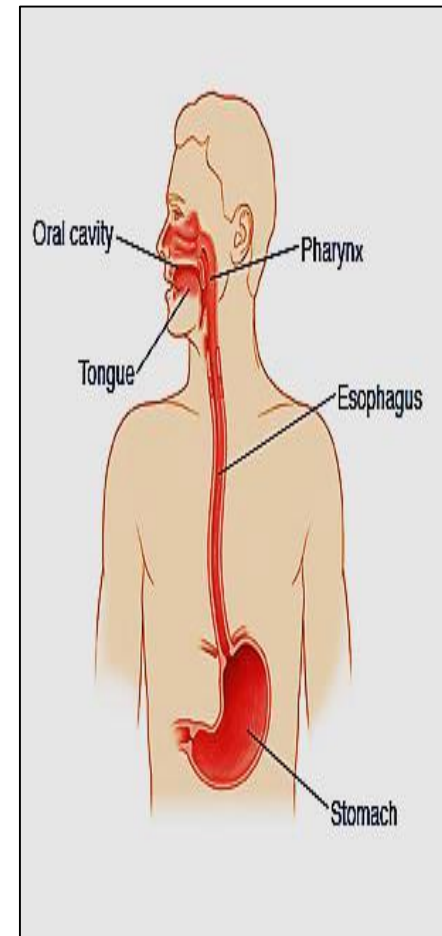
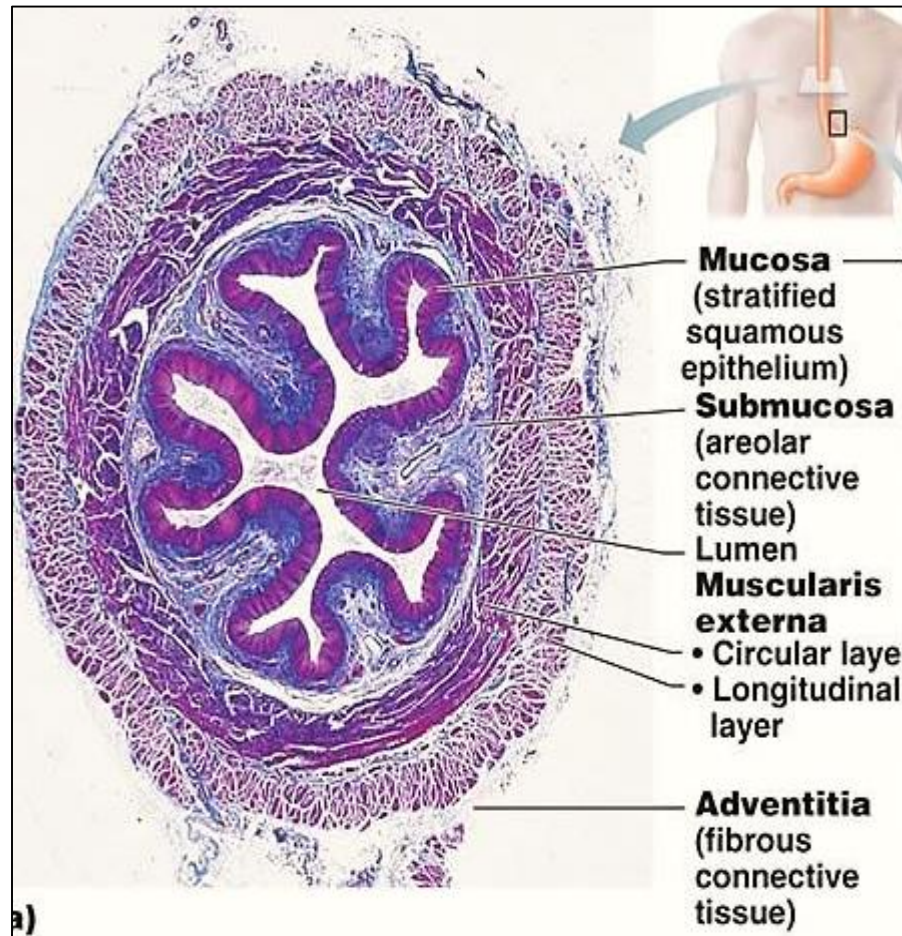
- Muscular tube connects the pharynx with stomach, transport food
- Its wall consists of 4 layers:

- **Mucosa**

- **Submucosa:**

- **Musculosa**

- **Adventitia**



■ Mucosa

- Epithelium: Non-keratinized stratified squamous epith.
- Lamina propria: B.V., nerves, mucous gland (lower third)
- Muscularis mucosa: smooth ms.

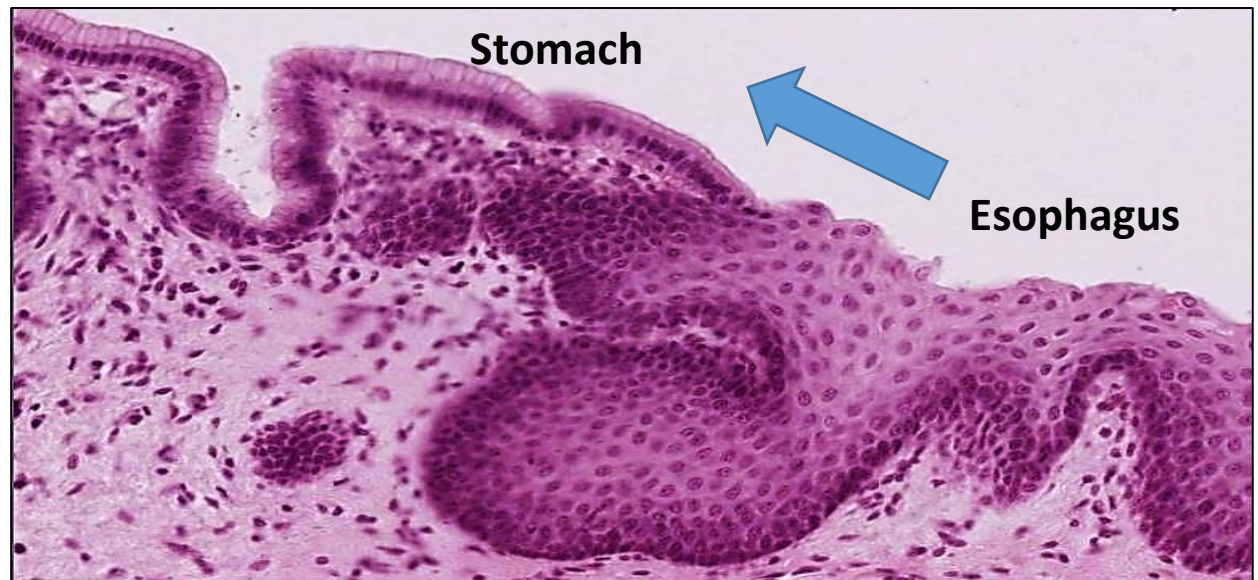
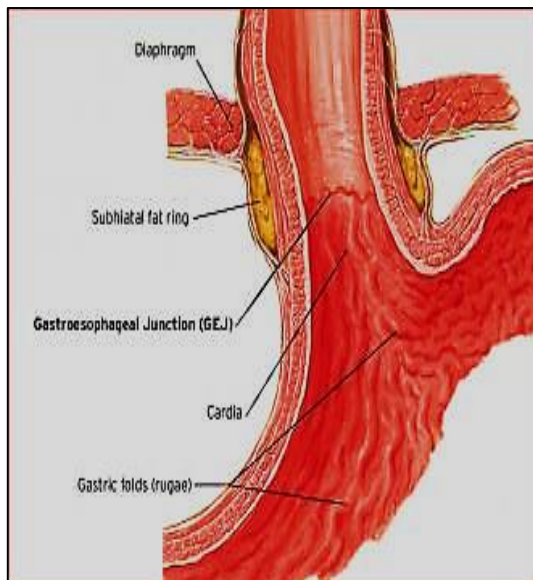
■ **Submucosa:** loose C.T. contains BV, lymphatics, Meissner's plexus of nerves & esophageal mucous glands

■ **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

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



The stomach

• It is formed of:-

1. **Cardiac region**: which surrounds the cardiac orifice at the gastro-oesophageal junction.

2. **Fundic region**: it is the upper convex part above the level of the lower end of the oesophagus.

3. **Body of the stomach**: It is the main part, forming the middle 2/3 of the stomach.

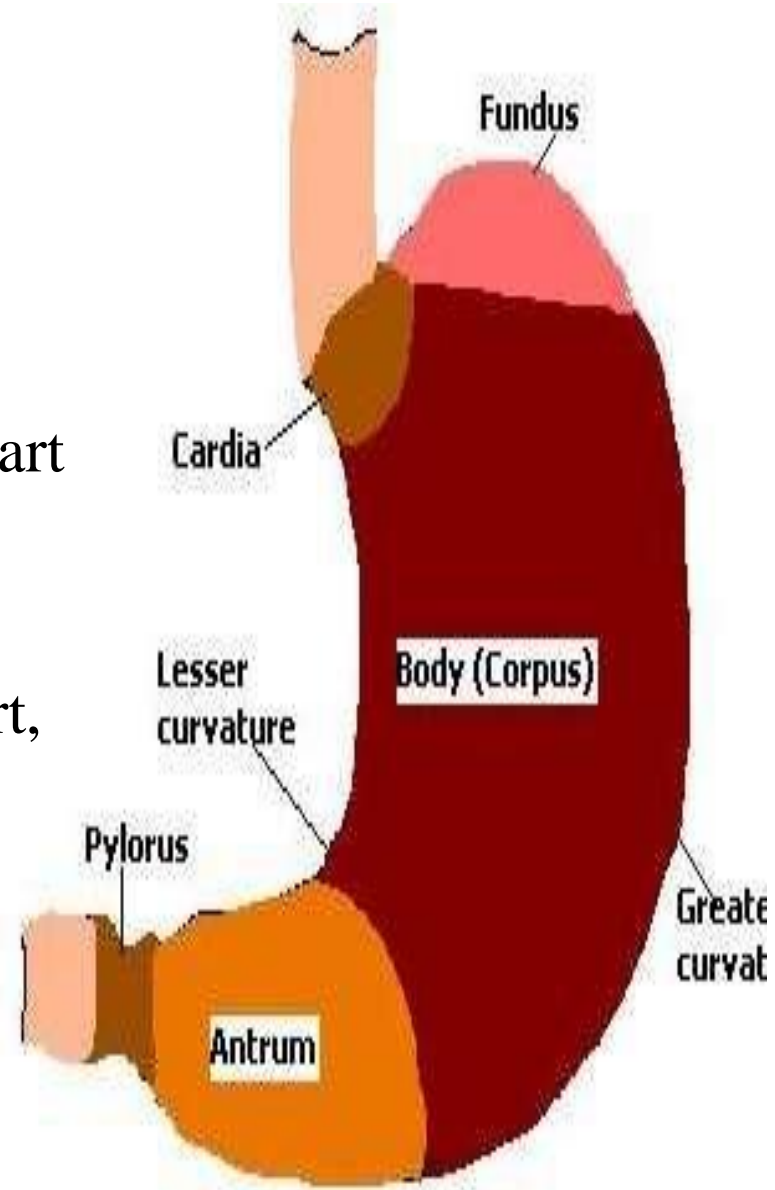
The fundus and the body have the same structure while the pylorus differs

4. **Pyloric region**: It is formed of

A. Pyloric antrum,

B. pyloric canal

C. pyloric sphincter.



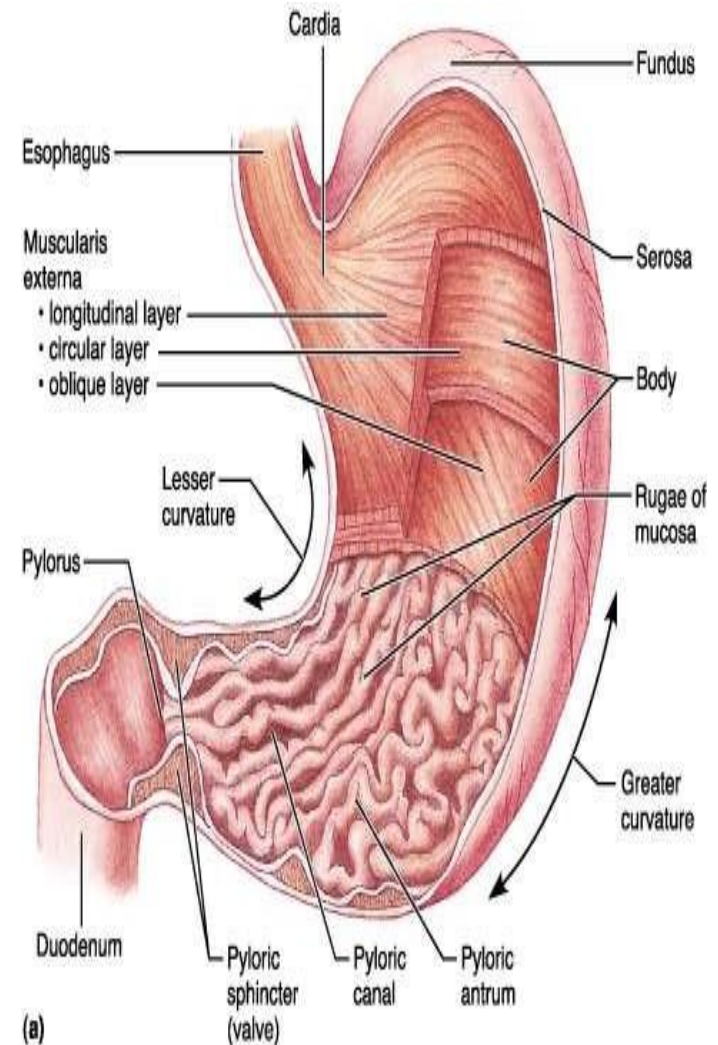
Histology of the Fundus of stomach

- It is formed of 4 layers, which are:

(A) Mucosa:

By N/E:

- (1) **Greyish pink** colour.
- (2) **Smooth surface** (has no villi).
- (3) Many folds called **gastric rugae** which increase its volume.
- (4) The surface is interrupted by holes (**gastric pits**).

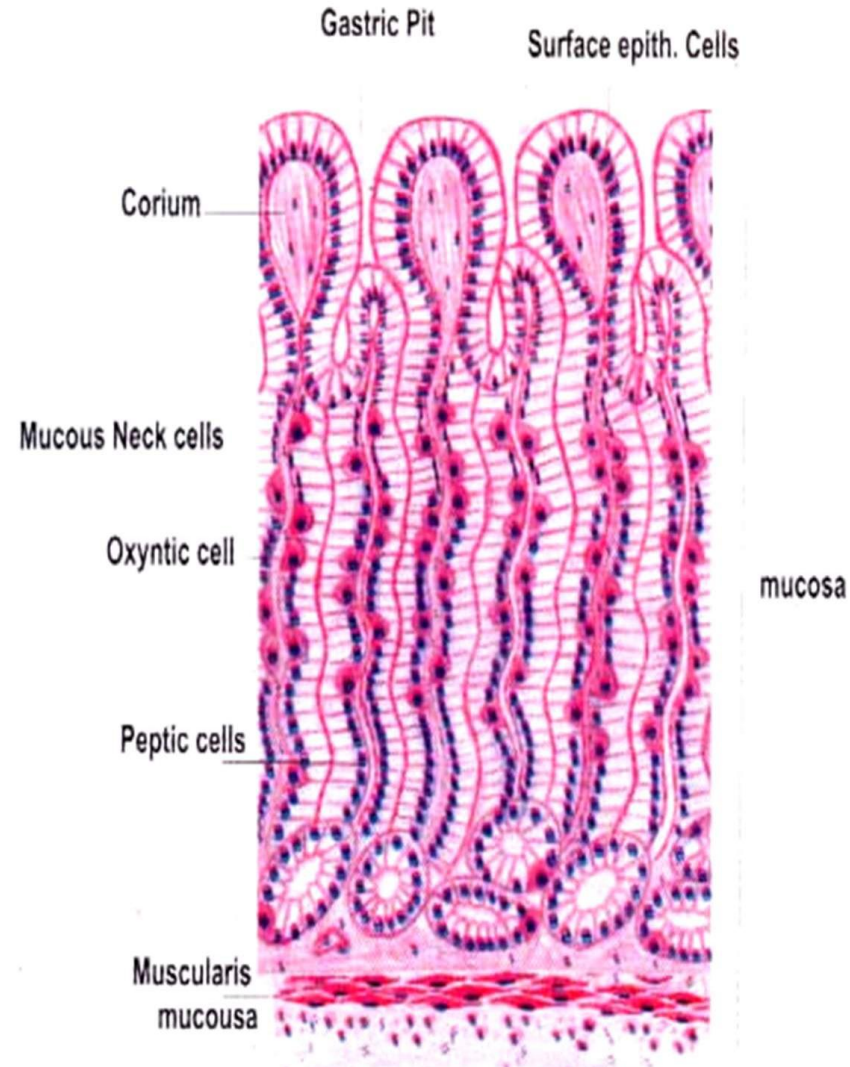


Histology of the Fundus of stomach

- By L/M:

The Mucosa is formed of:

- 1- Epithelium:
- It is simple columnar secretory epithelium
- It secretes mucous which form thick coat of viscid secretion.
- It is interrupted by the gastric pits.
- (2) Corium:
- It is a loose connective tissue containing blood vessels, nerves, and lymphatics.
- It contains immune cells (**lymphocytes**, **plasma cell**)
- It also contains the fundic glands.
- (3) Muscularis mucosa:
- It is formed of
 - 1 inner circular layer of smooth muscle
 - 2 outer longitudinal layer of smooth muscle



Histology of the Fundus of stomach

(B) Submucosa:

It is a loose connective tissue containing blood vessels, nerves and lymphatics

It contains the **Meissner's plexus of nerves**.

It contains cells of allergy (**mast cells**, **eosinophils**)

(C) Muscularis:

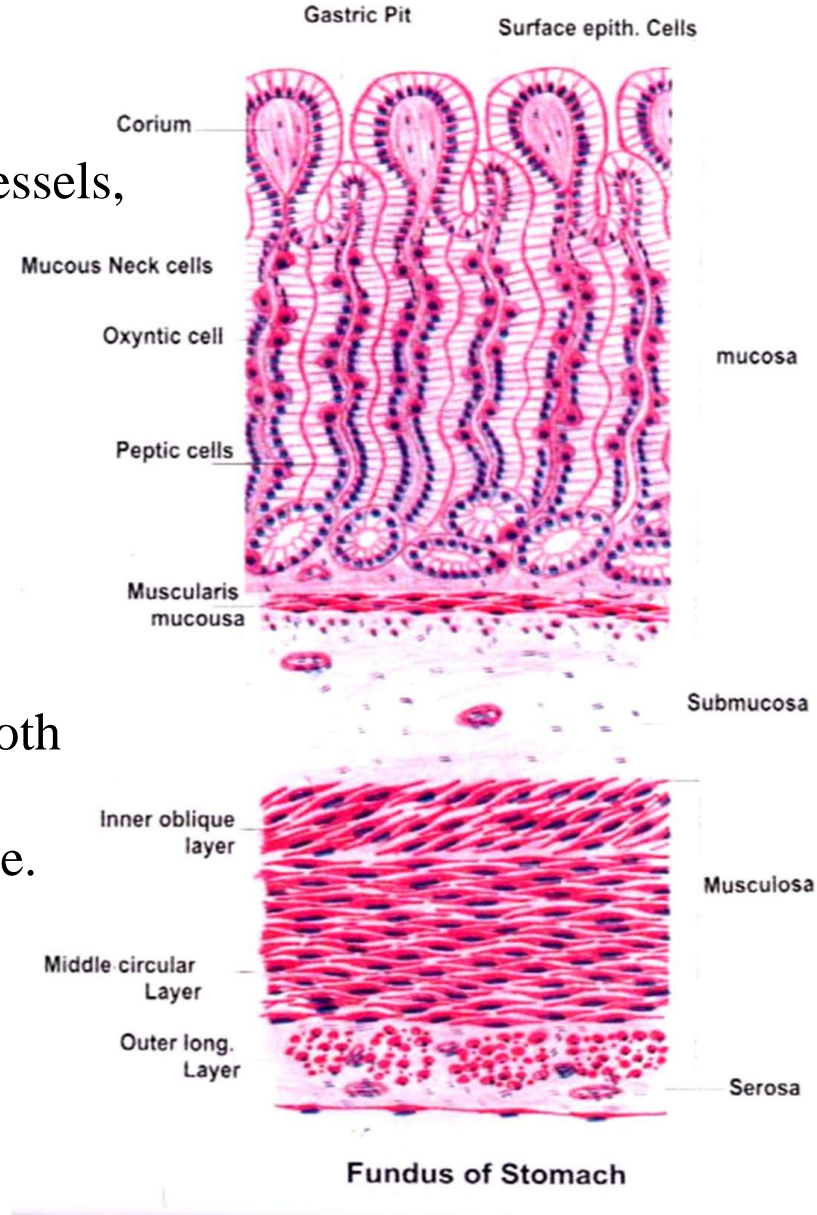
It is formed of 1- inner oblique,

2 middle circular and

3 outer longitudinal layers of smooth muscle fibers.

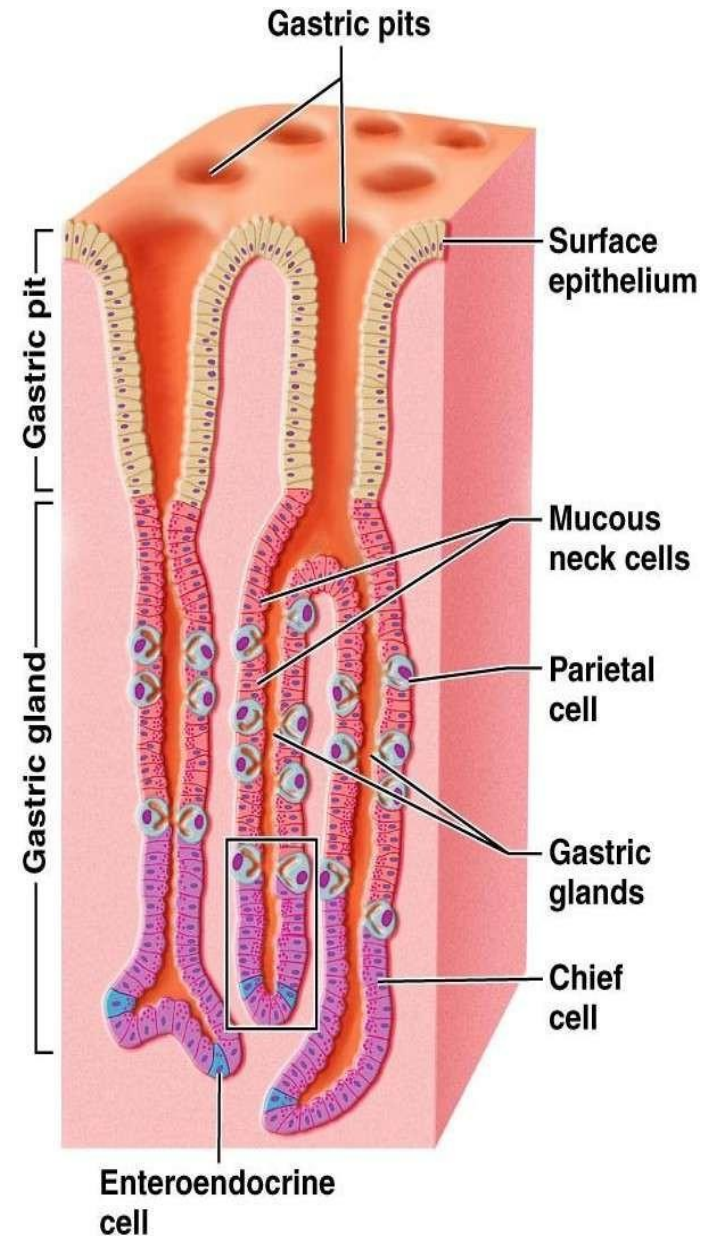
Auerbach's plexus is found between these muscle.

(D) Serosa



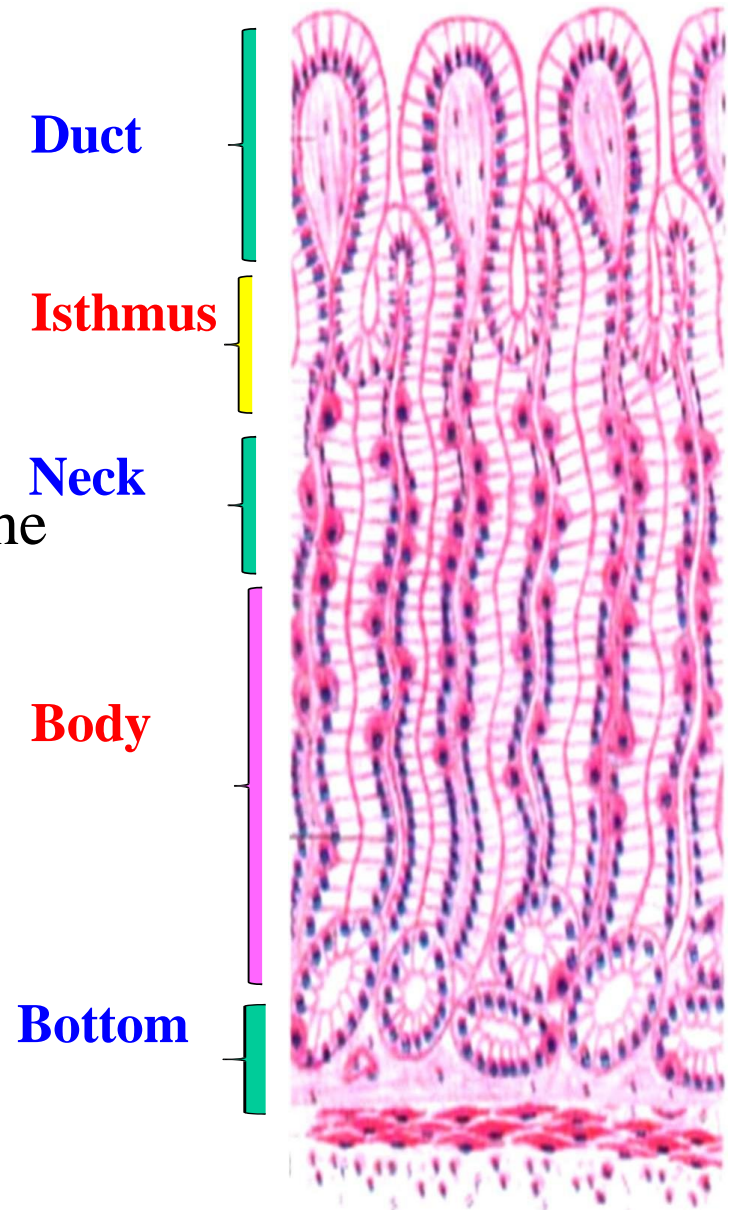
Fundic glands

- **Characters:**
- **Type:** they are simple branched tubular glands.
- **Site:** they are numerous and occupy most of the corium and very close to each other.
- **Shape:** they are narrow and long (extend from the surface to the muscularis mucosa).
- **Arrangement:** they are narrow, straight, parallel to each other and perpendicular to the surface.



Fundic glands

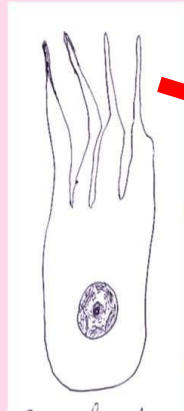
- Parts:
- The gland is formed of:
 - (1) **Duct (pit)**: occupy 1/4 of the corium.
 - (2) **Isthmus**: the part between the duct and the neck.
 - (3) **Neck**: the upper part of the gland.
 - (4) **Body**: the main part of the gland.
 - (5) **Bottom**: the lower part of the gland.



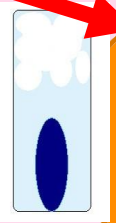
Fundic Gland

Lining cells of Fundic gland

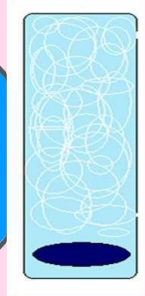
Caveolated cells



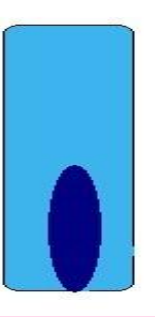
Surface columnar cells



Mucous neck cells



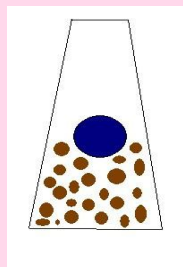
Undifferentiated columnar cells



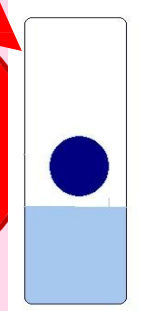
Parietal Cells (Oxyntic)

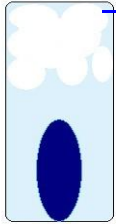
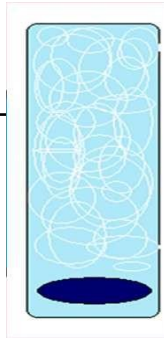
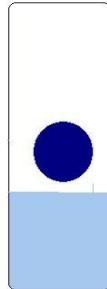



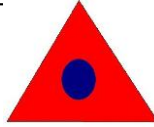
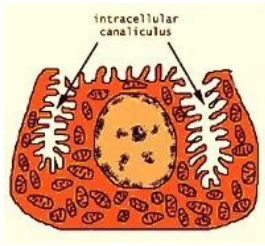
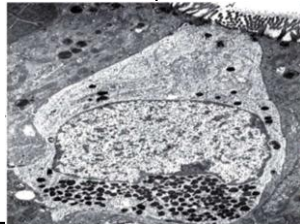
Entero- endocrine cells.



Peptic cells (chief – zymogen – central)



	1) <u>Surface columnar cells</u>	2) <u>Mucous neck cells</u>	3) <u>Peptic cells (chief)</u>
SITE	<ul style="list-style-type: none"> Cover the surface and line the duct 	<ul style="list-style-type: none"> At the neck of the gland 	<ul style="list-style-type: none"> At the body & bottom of the gland
LM Shape: Nucleus: Cytoplasm: stain:	<ul style="list-style-type: none"> ♥ Columnar ☺ Basal & oval • By H&E »» clear apical due to dissolved mucin Granules 🏆 Alcian blue 	<ul style="list-style-type: none"> ♥ Columnar ☺ Basal, flat or triangle • Foamy due to more dissolved mucin granules 	<ul style="list-style-type: none"> ♥ Columnar ☺ Rounded, near the base • Basal & basophilic due to ↑ rER • Pale apical part due to unstained zymogen granules 
EM			<ul style="list-style-type: none"> ☺ Numerous rER & Golgi Apparatus ☺ Apical electron dense granules ☺ Luminal rich with microvilli
FUN.	<ul style="list-style-type: none"> ♣ Secrete mucous to protect stomach from it is enzymes & HCL 	<ul style="list-style-type: none"> ♣ Secrete acidic mucous 	<ul style="list-style-type: none"> ♣ Secrete pepsinogen & renin enzymes 

	4) Parietal (oxyntic) cells	5) Entero-endocrine cell
SITE	<ul style="list-style-type: none"> mainly in neck and body 	<ul style="list-style-type: none"> it have one type (entero chromaffin or EC cells)
LM Shape : Nucleus : Cytoplasm : stain :	<ul style="list-style-type: none"> triangular central, rounded , deep stain deep acidophilic 	<ul style="list-style-type: none"> pyramid or Columnar 'e narrow apex Rounded ,near the base Pale basophilic Silver (argentaffin granules)
EM 	<ul style="list-style-type: none"> Numerous mitochondria Numerous sER Show long microvilli Few rER & Golg Apparatus have 2 types of canaliculi 1) <u>Intracellular canaliculi</u> 2) <u>extracellular canaliculi</u> 	<ul style="list-style-type: none"> numerous rER & prominent Golgi apparatus Contain basal dense granules 
FUN.	<ul style="list-style-type: none"> Secretate HCL Secretate intrinsic factor , which help absorption of Vit . B12 	<ul style="list-style-type: none"> These hormones are selective Secretate serotonin (V.C) Secretate endorphin (morphine like substance) Pass from capillaries of corium to blood stream

EM of Parietal (oxyntic) cells

1 Intra-cellular canaliculi

These canaliculi contain many microvilli.

They contain **carbonic anhydrase** enzyme which releases H^+ ions from carbonic acid.

H^+ ions unit with $Cl^- \rightarrow HCl$.

The pH of the canaliculi is highly acidic (**0.8**).

These canaliculi protect the cytoplasm against the HCl and deliver it to the lumen of the gland.

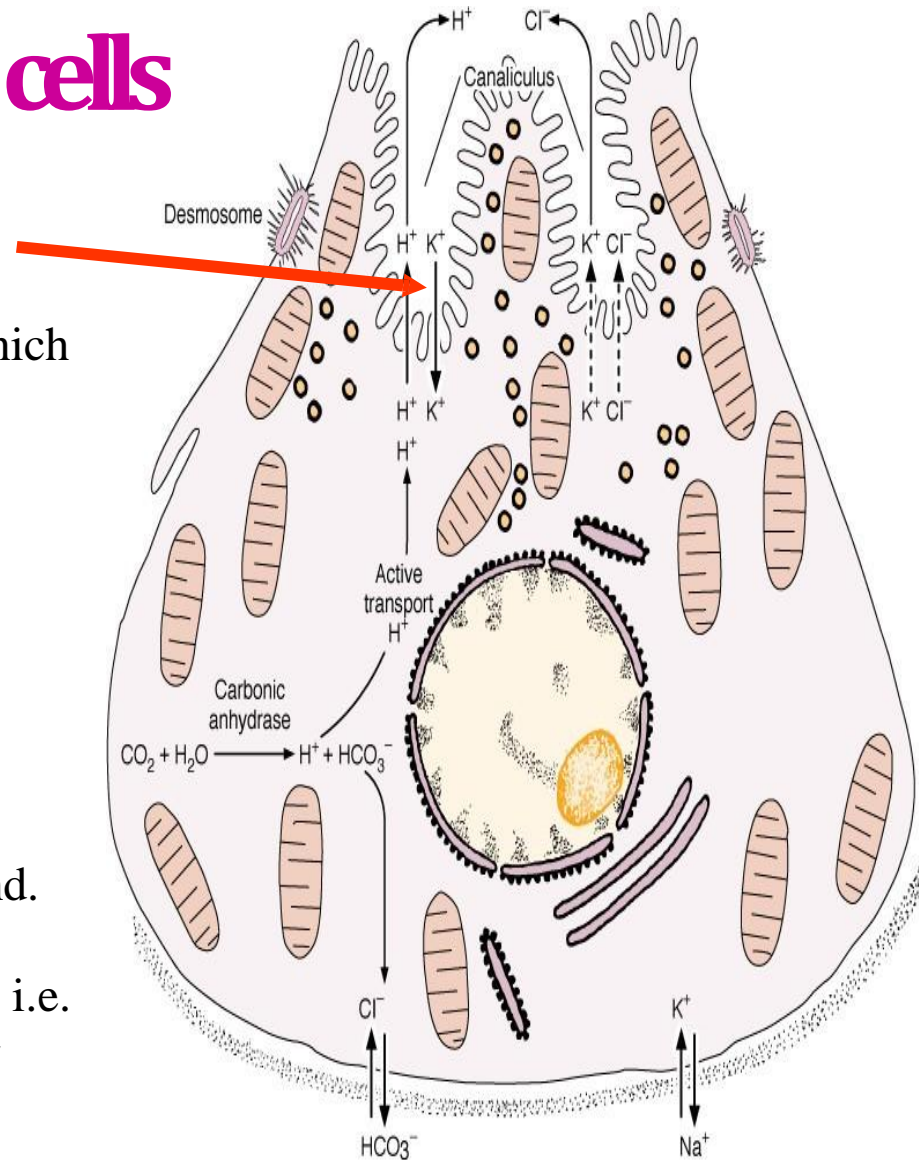
2 Extra-cellular canaliculi

They are present **between** the parietal cells.

They conduct the HCl to the lumen of the gland.

N.B:

The pH of the oxyntic cell is normal (**neutral**) i.e. not acidic because HCl is formed in the intra cytoplasmic canaliculi.



*6)Undifferentiated
columnar cells*

SITE

- in the isthmus . Neck & base of the gland

LM

Shape :
Nucleus :
Cytoplasm :

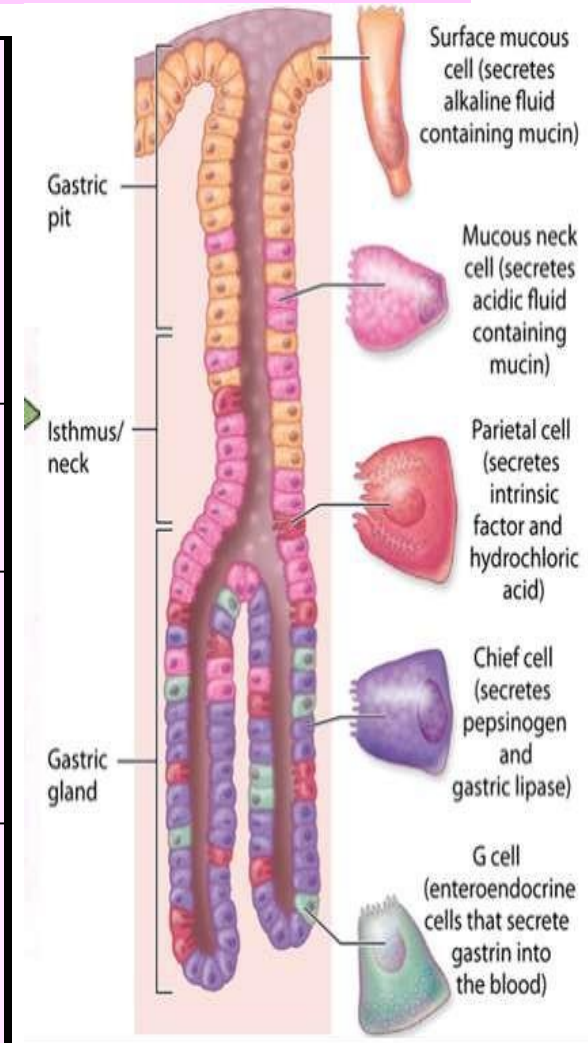
- short columnar
- basal , oval
- deep **basophilic** due to
↑ **ribosomes**

FUN.

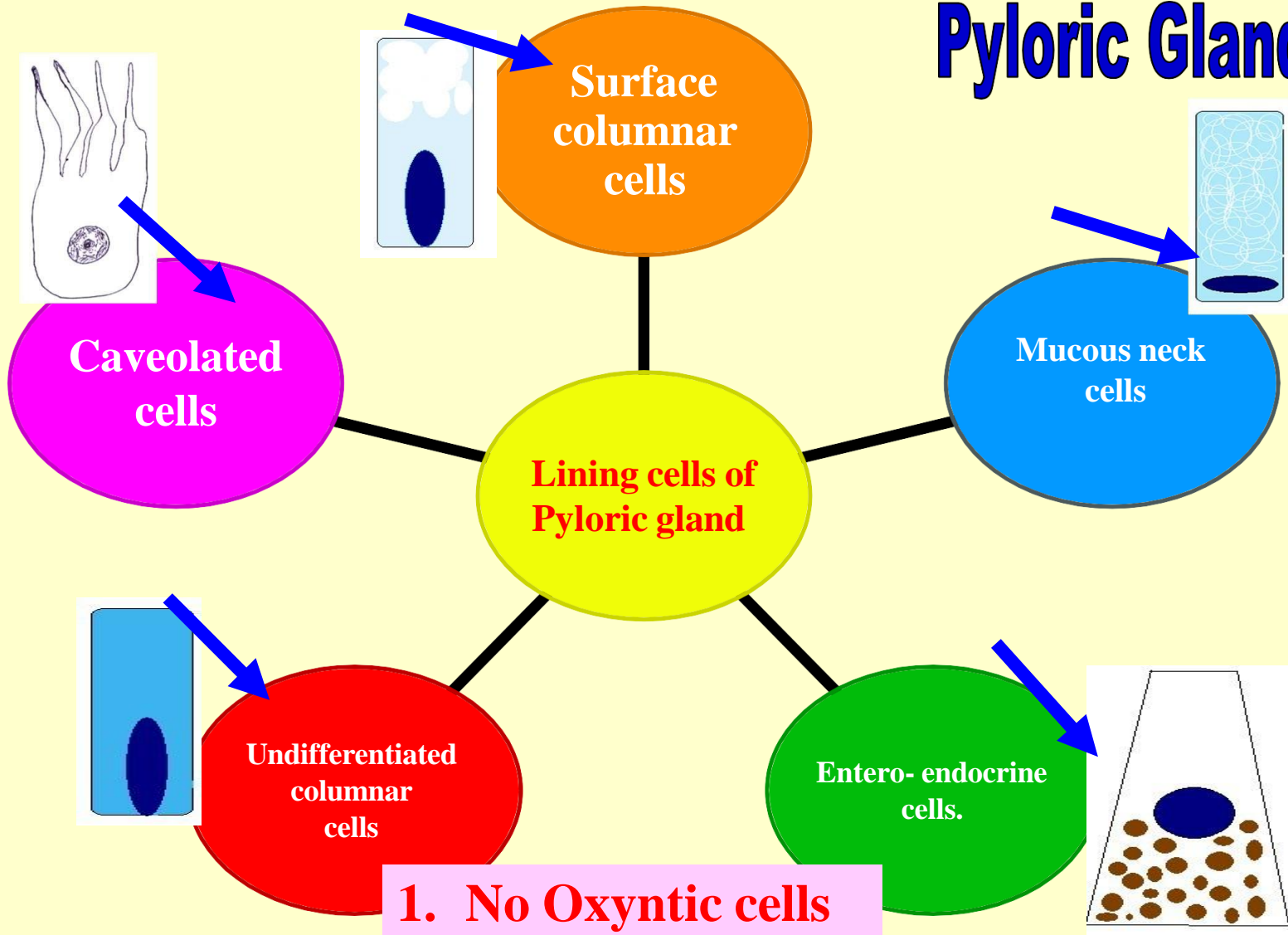
- ♣stem cells for renew of the cells of the fundic gland

Distribution of cells in the fundic Glands

The isthmus Cells	The neck Cells	Cells in body & bottom
1- Surface epithelium cells	1- Mucous neck cell	1- Peptic cells
2-Undifferentiated columnar cells	2-Undifferentiated columnar cells	2-Enteroendocrine cells.
3- Few oxyntic cells	3- Some oxyntic cells	3- Many Oxyntic cells in the body -rare in bottom



Pyloric Gland



1. No Oxyntic cells
2. No Peptic cells

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

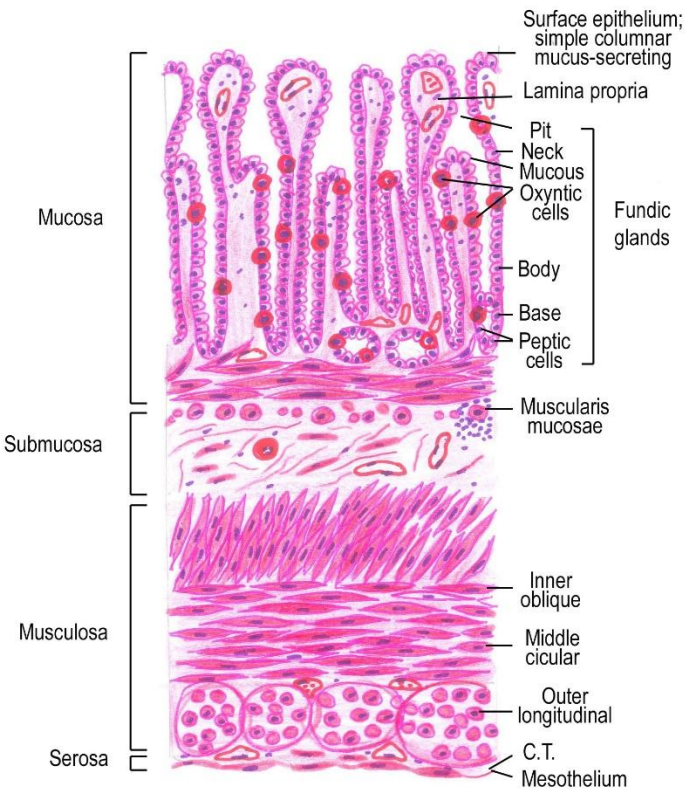
- **Musculosa**: thinner formed of 3 layers of ms. (IO, MC, OL)

Pylorus

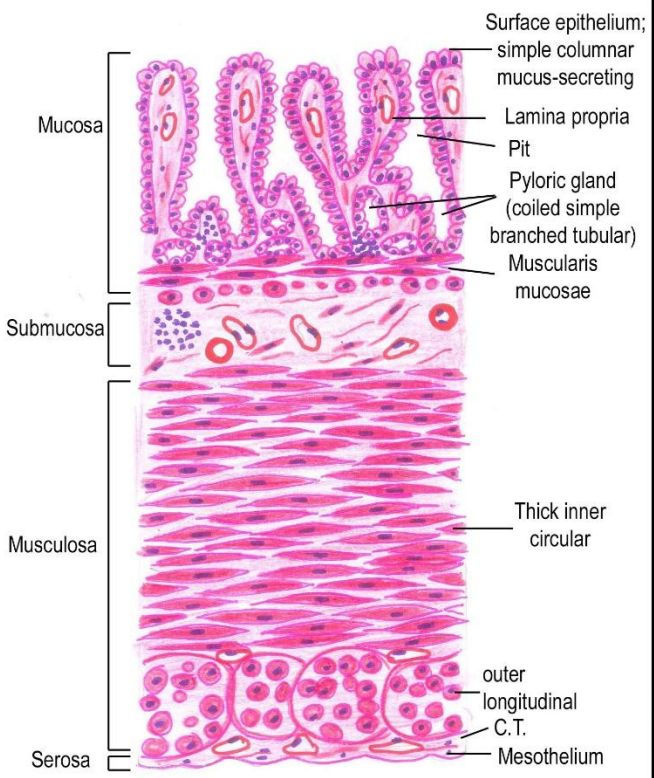
- Thin mucosa
- **Pits** are wide & long
- P. Glands are **coiled branched tubular & short**
- Occupy ½ of mucosal thickness
- Lined e mucous secreting cells
No oxyntic, No peptic cells
- Lymphocytic infiltration & lymph nodules

- Thicker , formed of 2 layers of muscles. Thick IC to form the p. sphincter & OL

The difference between fundus & pylorus



Fundus



Pylorus

DIGESTIVE SYSTEM

- **Function of the stomach:**

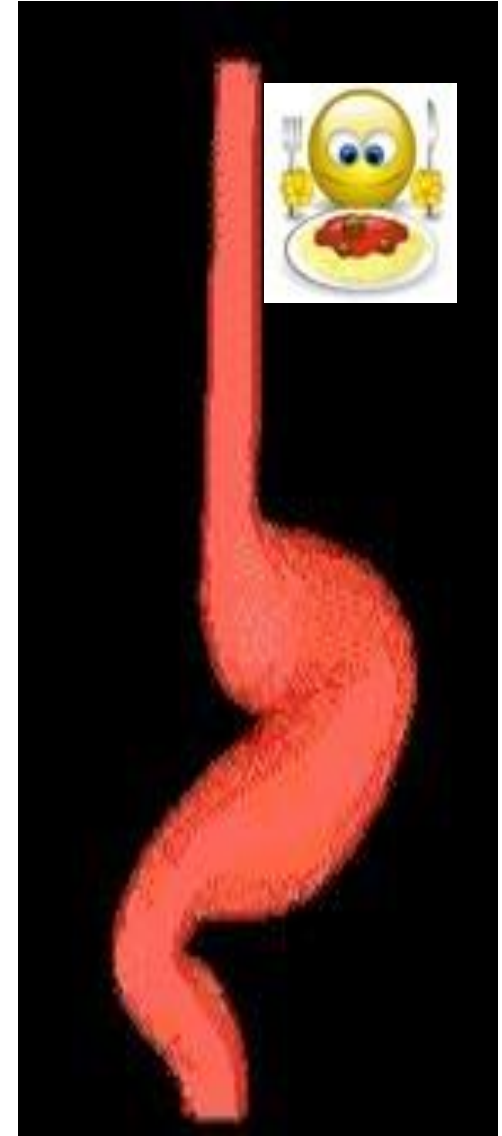
- (1) **Digestion** through pepsin, renin enzymes.
- (2) **HCl secretion** : antibacterial - help fat digestion.
- (3) **Secretion of intrinsic factor**
- (4) **Secretion of mucous** to form gastric barrier
- (5) **Secretion of some hormones**

_____ **Entero-endocrine cells in fundus**

EC cells: (secrete serotonin and endorphine).

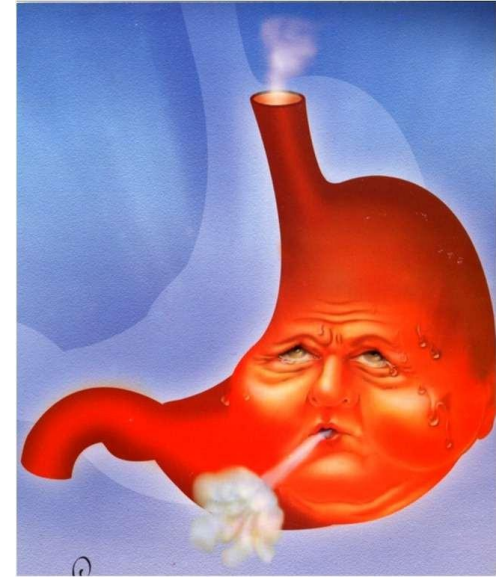
Entero-endocrine cells in pylorus:

- **EC cells**: (secrete **serotonin** and **endorphin**).
 - **G cells** (secrete **gastrin** hormone, which stimulates oxyntic cells to secrete HCl).
 - **D cells**: secrete **somatostatin** hormone, (which inhibit insulin, gastrin , glucagon and growth hormones).
- (6) **Limited absorptive function** for water, drugs, alcohol, and salts



Stomach

- Mucous Gastric Barrier:
- It is a thick film of mucous which protects the stomach against its enzymes and HCl.
- This mucous is secreted by
 - 1 the **surface epithelium** and
 - 2 the **mucous neck** cells.

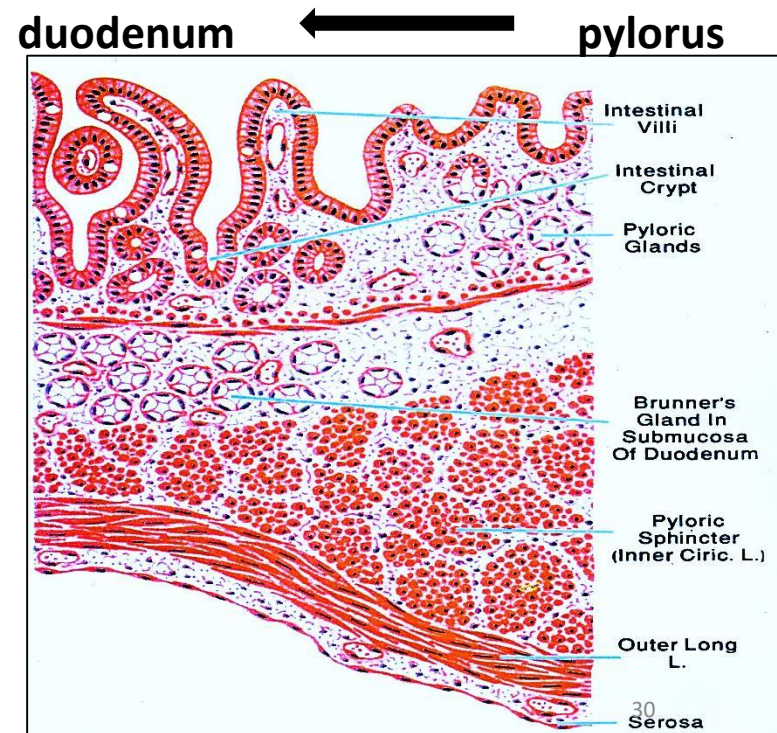


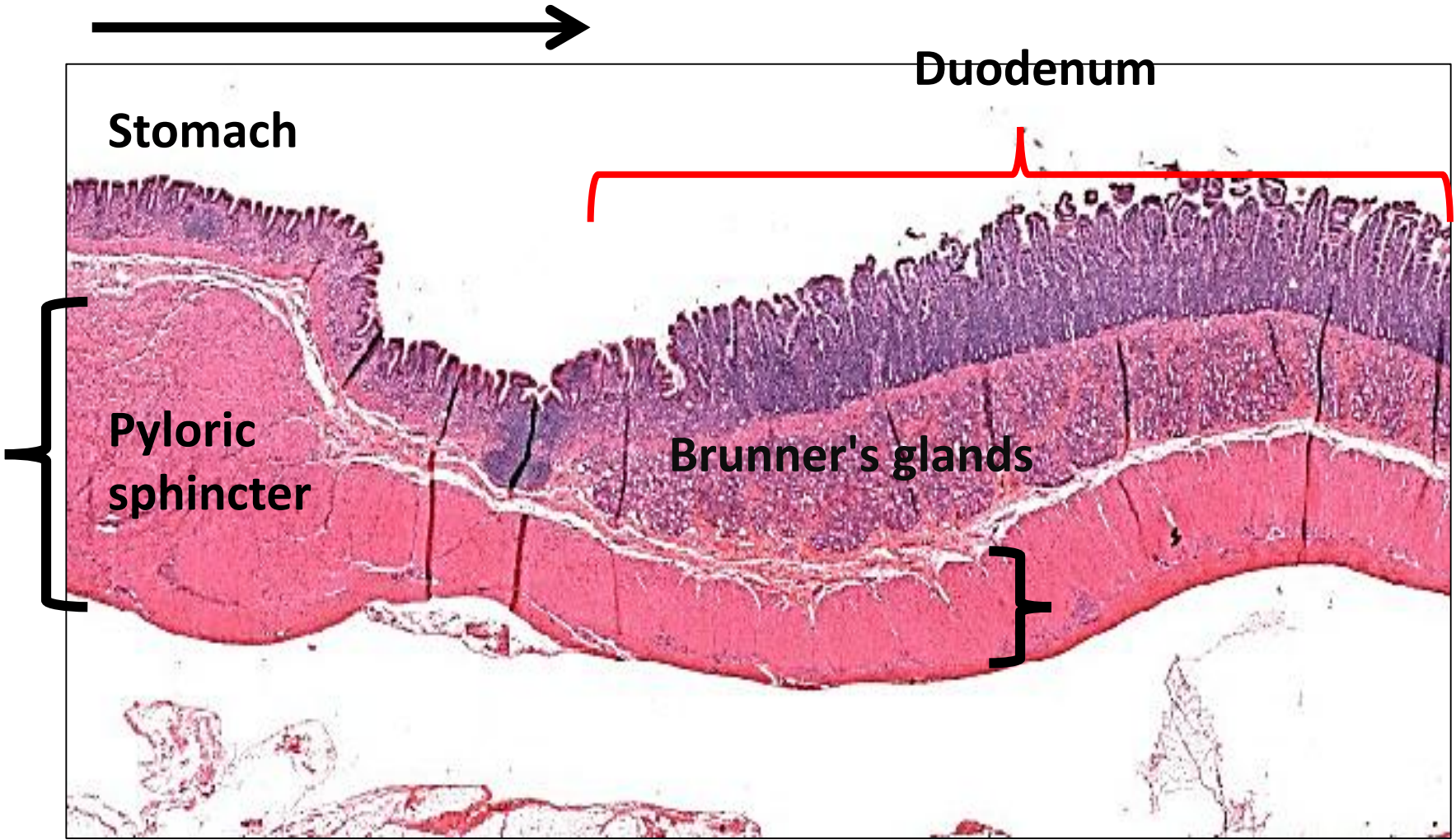
N.B

The Epithelium undergoes renew every 2-6 days by proliferation of Undifferentiated columnar cells

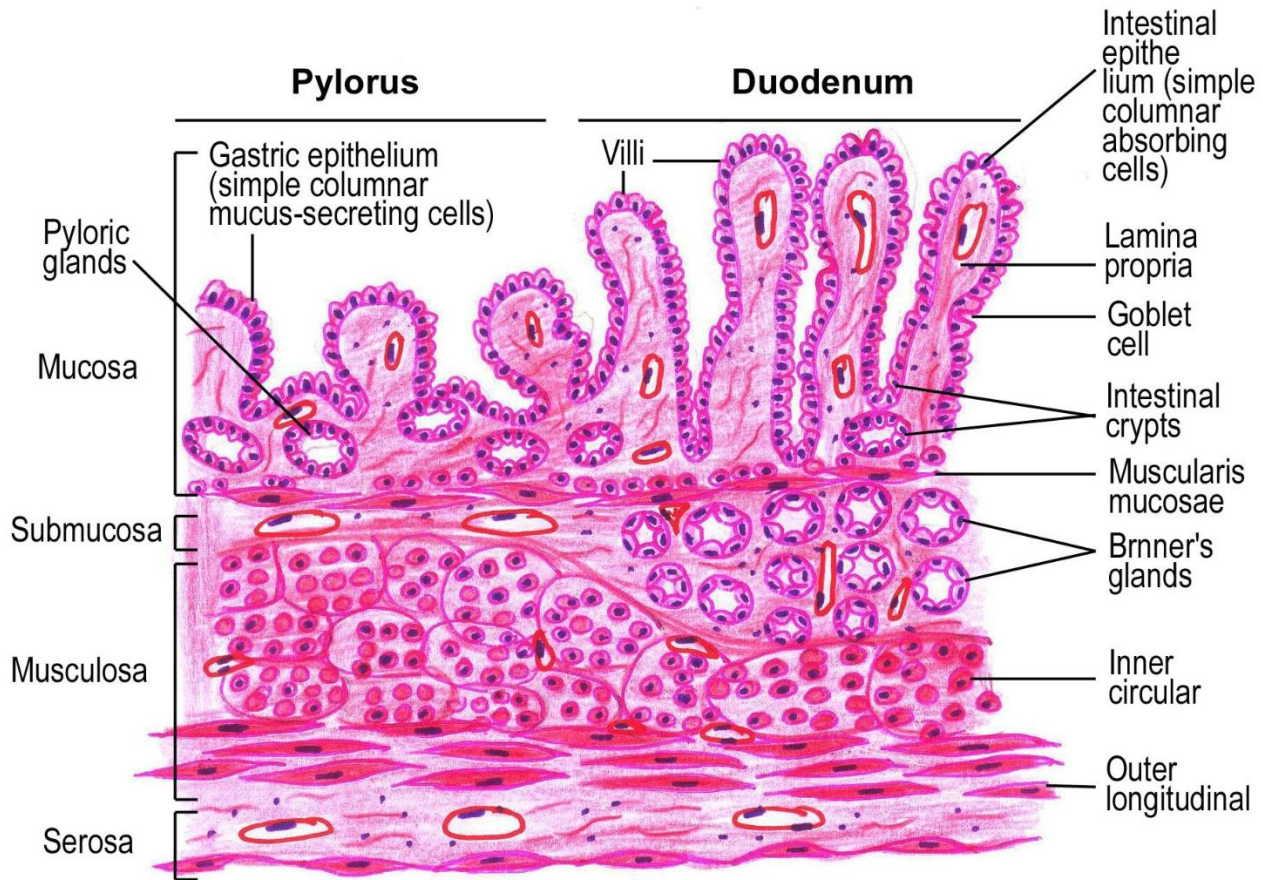
Changes at gastro duodenal junction

- **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**



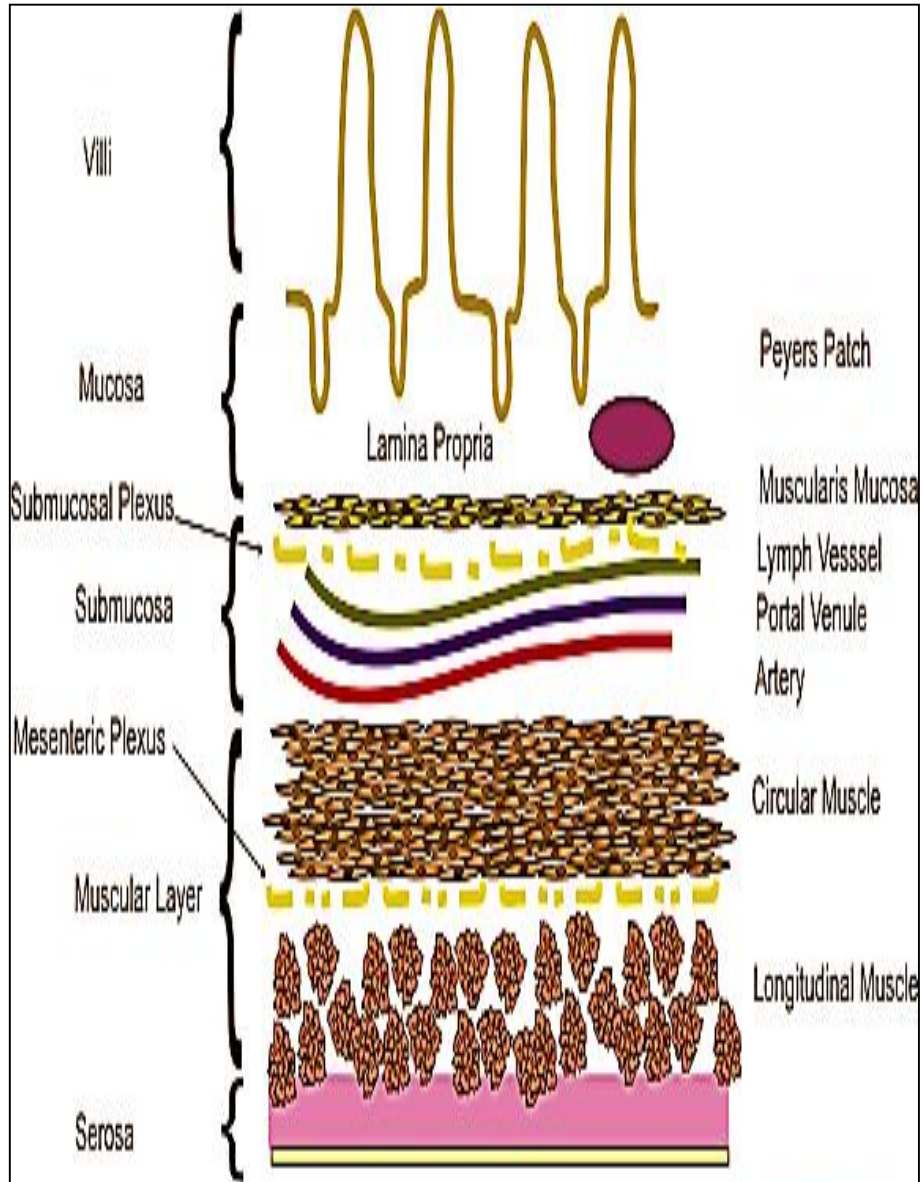


Gastro duodenal junction

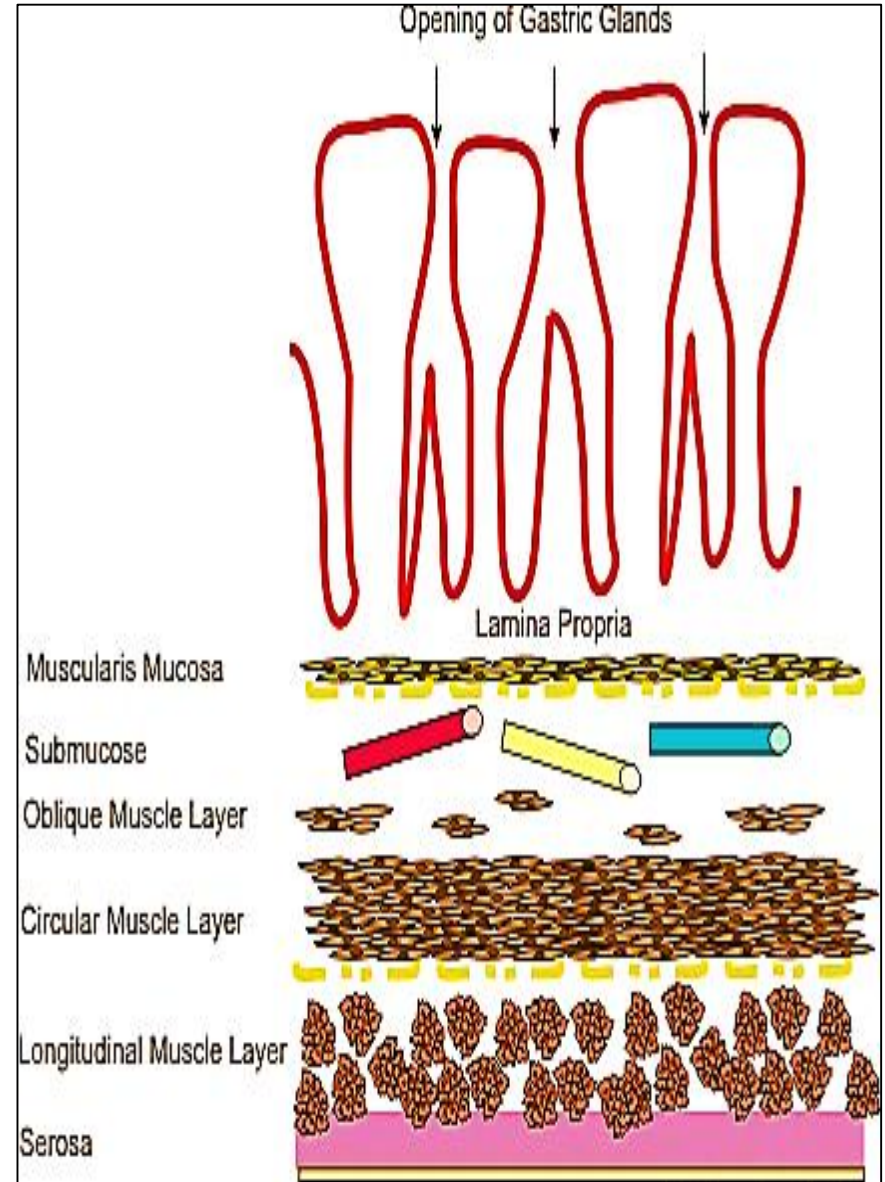


Pyloro-duodenal junction (LS)

Wall of intestine



Wall of stomach



سبحان الله وبحمده
سبحان الله العظيم

السلام عليكم ورحمة الله

