



# histology



## LEC. 3

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23/10/2013

wednesday .

It is a dilated portion of the digestive tract, its main function is to continue the digestion of CHO and to change it into semi liquid mass called "chyme", also initiate the digestion of protein and lipids, and it is a distensible organ end at the pyloric sphincter which prevents the reflux of its contents until it is converted into chyme.

*The stomach is divided into 4 regions: Cardia, fundus, body and pylorus.*

### Histological structure:

**Mucosa:** the gastric mucosa consists of

1. **Surface epithelium** that invaginate to form the "gastric pits" or crypts in which open the gastric glands.
2. **Lamina propria** composed of loose connective tissue containing lymphoid cells and blood vessels.
3. **Muscularis mucosa**- separating the mucosa from the submucosa composed of smooth muscle fibers send bundles of fibers run between the glands to reach the surface of the mucosa.

### Cardia :

It is a narrow band at the transition between the esophagus and the stomach and the **surface epithelium** composed of mucous-secreting cells with few parietal cells.



Lamina propria contains simple or branched tubular cardiac gland some of them are coiled lined by mucous cells.

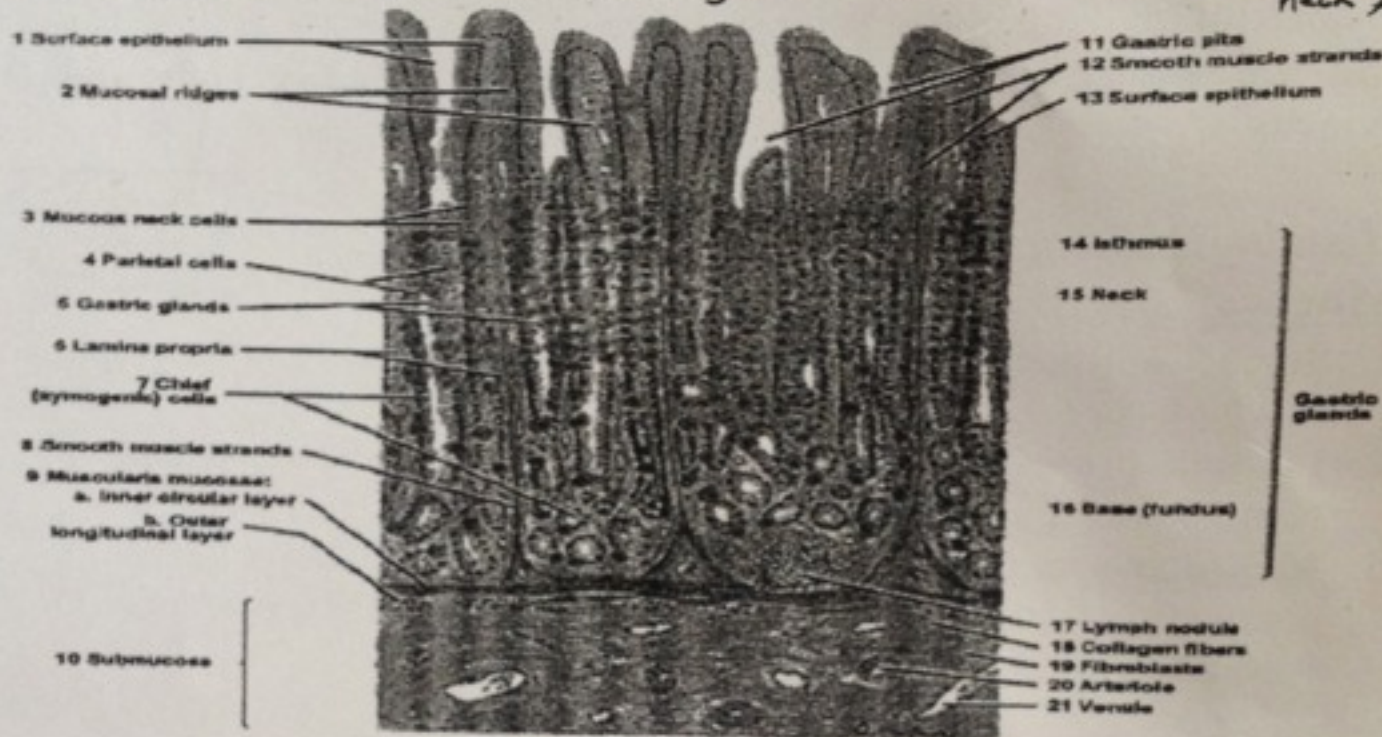


Muscularis mucosa is thick and irregular send bundles of fibers penetrate into the lamina propria toward the surface.

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### **Fundus and Body:**

Surface epithelium is thrown into short gastric pits; the lamina propria is filled with long branched tubular gastric glands some of them open at the bottom of the gastric pits. Each gland has 3 distinct regions: the isthmus, neck & base.

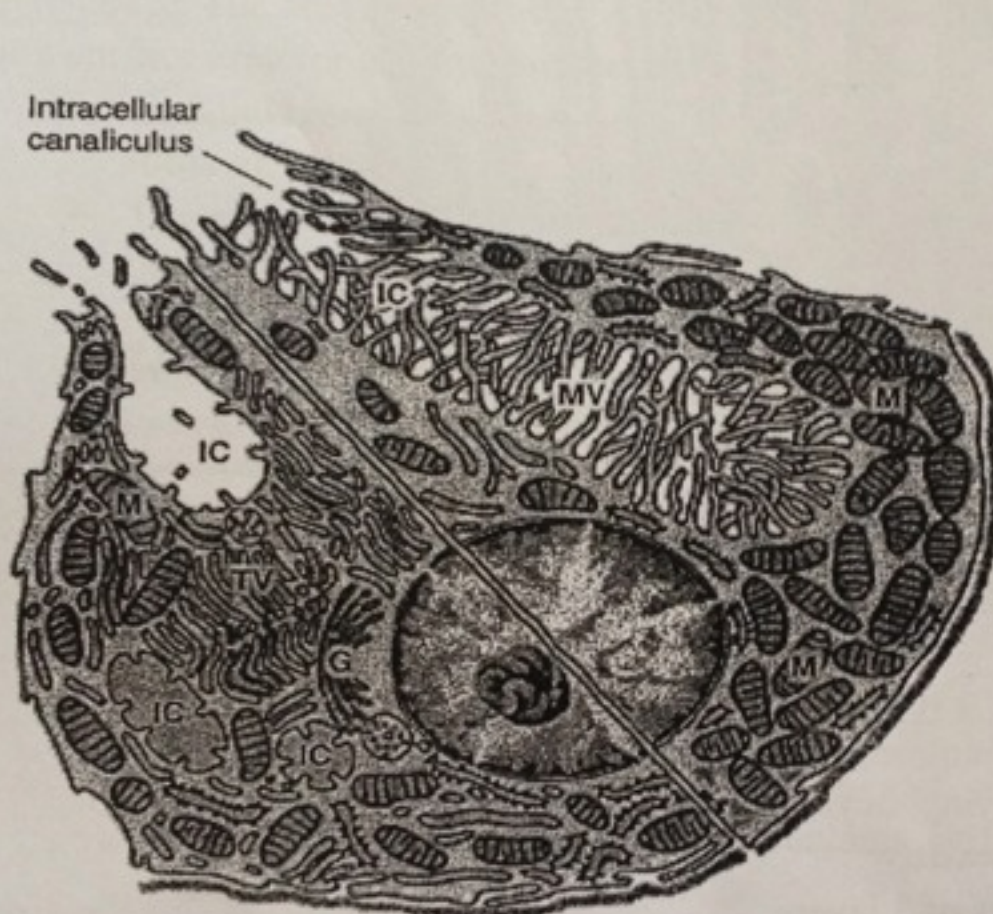


### Types of cells in the gastric mucosa:

1. **Stem cells:** - are columnar cells with basal nuclei, <sup>found in the isthmus & neck region</sup> having high rate of mitosis, they are able to replace all types of epithelial cells of gastric mucosa.
2. **Surface mucous cells:** - are tall columnar cells with basal nuclei and clear stained cytoplasm filled with mucin which is discharged in the lumen of the stomach.
3. **Mucous neck cells:** - lie in the neck of the gastric gland they are irregular in shape with basal nuclei and granular cytoplasm.
4. **Oxyntic (parietal) cells:** - present in the upper part of the gastric gland characterized by
  - Pyramidal shape with central spherical nuclei and eosinophilic cytoplasm.
  - The surface area of the cell increase as a result of deep circular invaginations of <sup>the apical</sup> plasma membrane forming intercellular canaliculus.



- The cytoplasm closed to the canaliculi contains clusters of vesicles while the rest of the cytoplasm contains a lot of mitochondria which is responsible for eosinophilic cytoplasm; also there is RER and Golgi apparatus.
- Parietal cells produce **intrinsic factor** which binds with vitamin B12 to make it absorbable by the digestive tract; also they secrete a diluted solution of hydrochloric acid (HCl), this metabolic activity requires energy provided by abundant mitochondria.



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#### 5- Chief (peptic) cells or (enzyme- producing cells):-

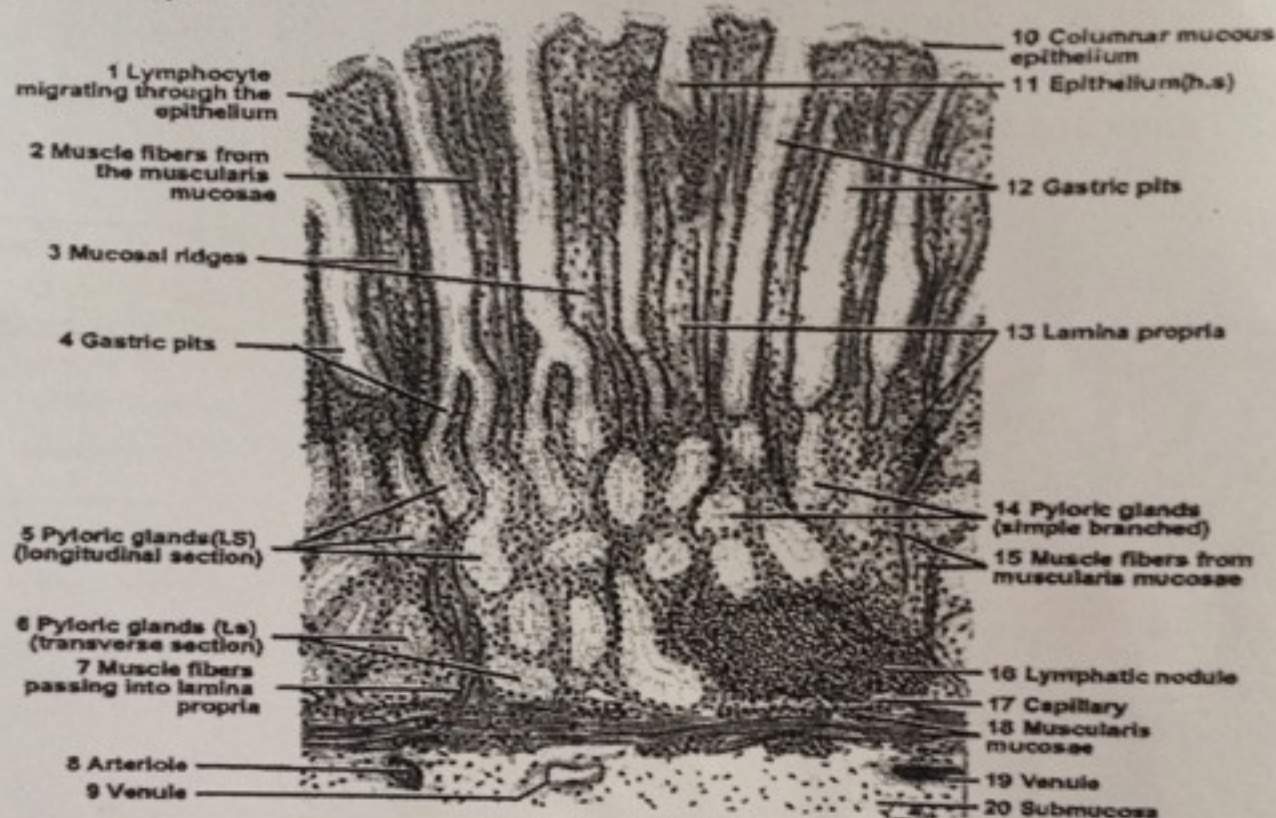
- Present in the lower part of the gastric gland.
- They have large basal nuclei and RER, the cytoplasm is filled with **zymogene granules** which contains the inactive enzyme pepsinogen which is discharged into the gastric lumen where it is converted by the gastric acid into the active enzyme pepsin.

**6- Enteroendocrine cells:** - are small rounded cells located on the epithelial basement membrane, they have central dark nucleus with a rim of clear cytoplasm.



**Pylorus:**

This region shows deep gastric pits into which open tubular mucous glands extending down to the muscularis mucosa. Compared to the cardiac glands. These glands are lined by mucous cells and scattered parietal cells particularly close to the pyloric sphincter, the glands secrete mucin and lysozyme enzyme.

**Submucosa of the stomach:**

Composed of dense connective tissue, blood vessels and lymphatic vessels with scattered lymphocytes, macrophages and mast cells in addition to **Meissner's plexus**.

**Muscular coat:** consists of 3 layers:

Internal oblique, middle circular and outer longitudinal, it differ from other parts of digestive tract by the presence of inner oblique muscle and this help the stomach to mix the foods with the secretions of gastric mucosa. At the pylorus the middle circular muscle is greatly thickened to form the **pyloric sphincter**. Located between the circular and longitudinal smooth muscle layers is a **myentric ( Auerbach 's ) nerve plexus** of parasympathetic ganglia and nerve fibers.

**Serosa:** Thin and covered by mesothelium containing blood vessels and adipose cells.



Small intestine

It is the site of terminal food digestion and nutrient absorption, the small intestine is the main site for the absorption of amino acids, sugars and fats and also it is the site for the secretion of enzymes to complete the digestive process, it is about 6 meters in length and divided into 3 segments: **duodenum, jejunum and ileum.**

Histological structure:

**Mucosa:** The small intestine shows structural modifications to increase its surface area for absorption, these modifications are:

- The lining mucosa and submucosa are thrown into numbers of **folds or plicae** <sup>circularis</sup> which are most prominent in the jejunum.
- The surface of plicae arranged into intestinal villi which are long outgrowths of the mucosa consists of epithelium and lamina propria projecting into the lumen of the small intestine.
- Tubular glands or intestinal glands called glands of Lieberkühn extends down from the base of the villi to the muscularis mucosa.

The surface epithelium of the villi is continuous with that of intestinal glands and consists of 5 types of cells:-

1-Enterocytes (absorptive cells):-

Tall columnar cells with ~~an oval~~ basal nuclei, the apex of the cells shows brush border consists of about 3000 microvilli which act to increase the surface area of absorption and secretion of some digestive enzymes, the cytoplasm contains mitochondria, Golgi apparatus, Lysosomes and ribosomes.

2-Goblet cells: -

Lie between the absorptive cells and increase in number in the jejunum and ileum and most numerous in the terminal ileum. The cytoplasm is fully expanded with mucin granules, its mucous secretion is important to protect and lubricate lining epithelium of the intestine.

3-Paneth's cells:-

Have basal nuclei and prominent large eosinophilic granules in their apical cytoplasm, these granules secrete lysozyme which protects against infection. *These cells lie in the basal portion of the intestinal glands*



**4-Enteroendocrine cells:**

Mainly lie in the lower third of the crypts, triangular in shape with broad base which in contact with the basement membrane and spherical nuclei with pale staining cytoplasm.

**5-Stem cells:**

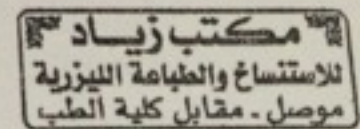
They multiply to replace other type of cells, they are located in the lower half of the intestinal glands.

**Lamina propria:** - Consist of loose connective tissues, blood vessels and lymphatic vessels with some smooth muscle fibers which are responsible for the movement of villi during absorption, the lamina propria penetrates the core of the villi taking the blood vessels and lymphatic which are prominent in the villi, **central lymphatic (lacteal)** running vertically in the center of the core of the villus, lamina propria also contains lymphocytes, plasma cells, eosinophils and macrophages.

**Submucosa:** loose connective tissue containing blood vessels, lymphatic and nerve plexus, in the duodenum it contains clusters of mucous secreting glands called **Brunner's glands** with short ducts open into the bases of the intestinal crypts, their function they act to protect the duodenum mucous membrane against the effect of gastric acid, also bring it's PH to the level at which pancreatic enzymes are most effective.

**Muscular coat of the small intestine:** consist of inner circular and outer longitudinal . parasympathetic ganglion cells of the **myentric plexus** are present in the connective tissue between the inner circular and outer longitudinal smooth muscle.

**Serosa:** (adventitia and mesothelium) contains blood vessels and adipose tissue.

**Regional specialization of small intestine:-**

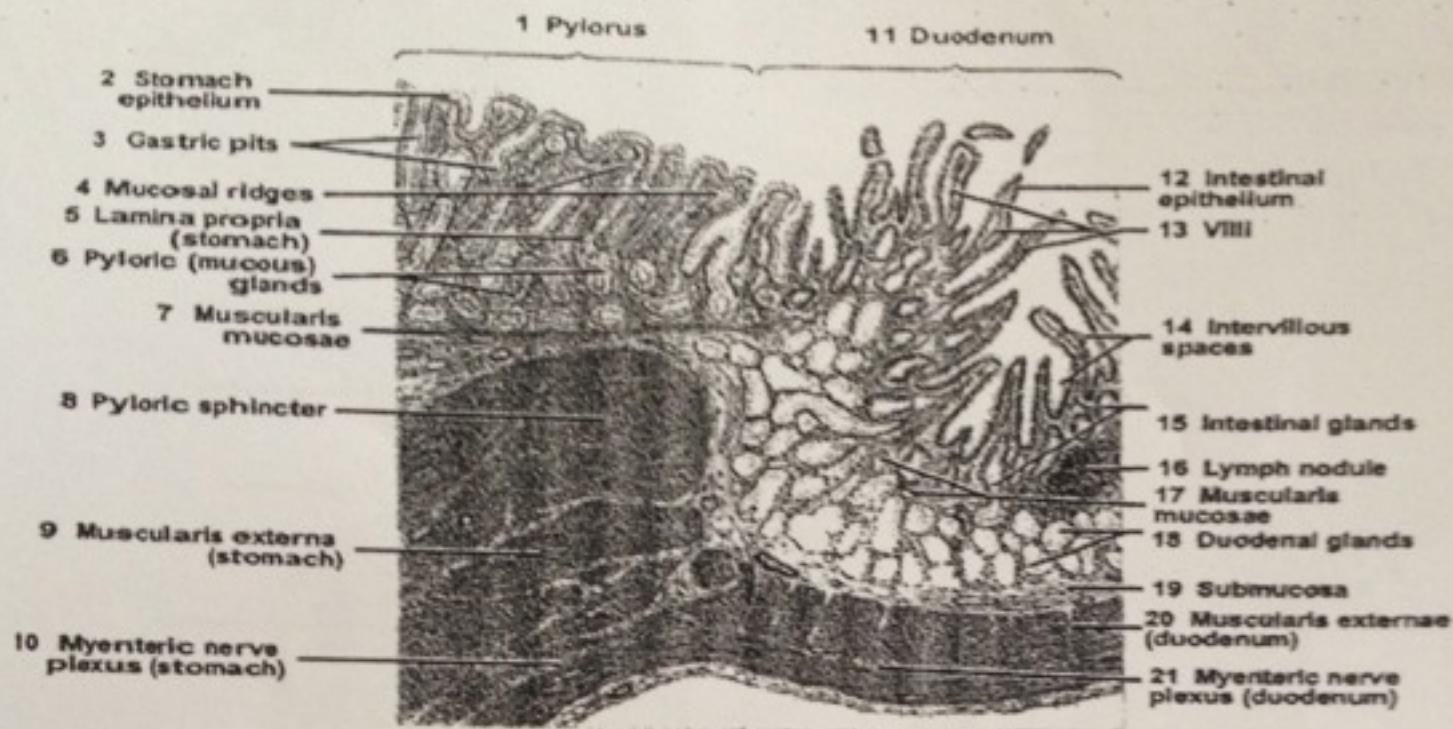
**Duodenum:** entirely retroperitoneal, leaf shaped villi, Brunner's gland in the submucosa; receive secretion from the liver and pancreas.

**Jejunum:** is the main absorptive site, finger like villi, plicae (most prominent).

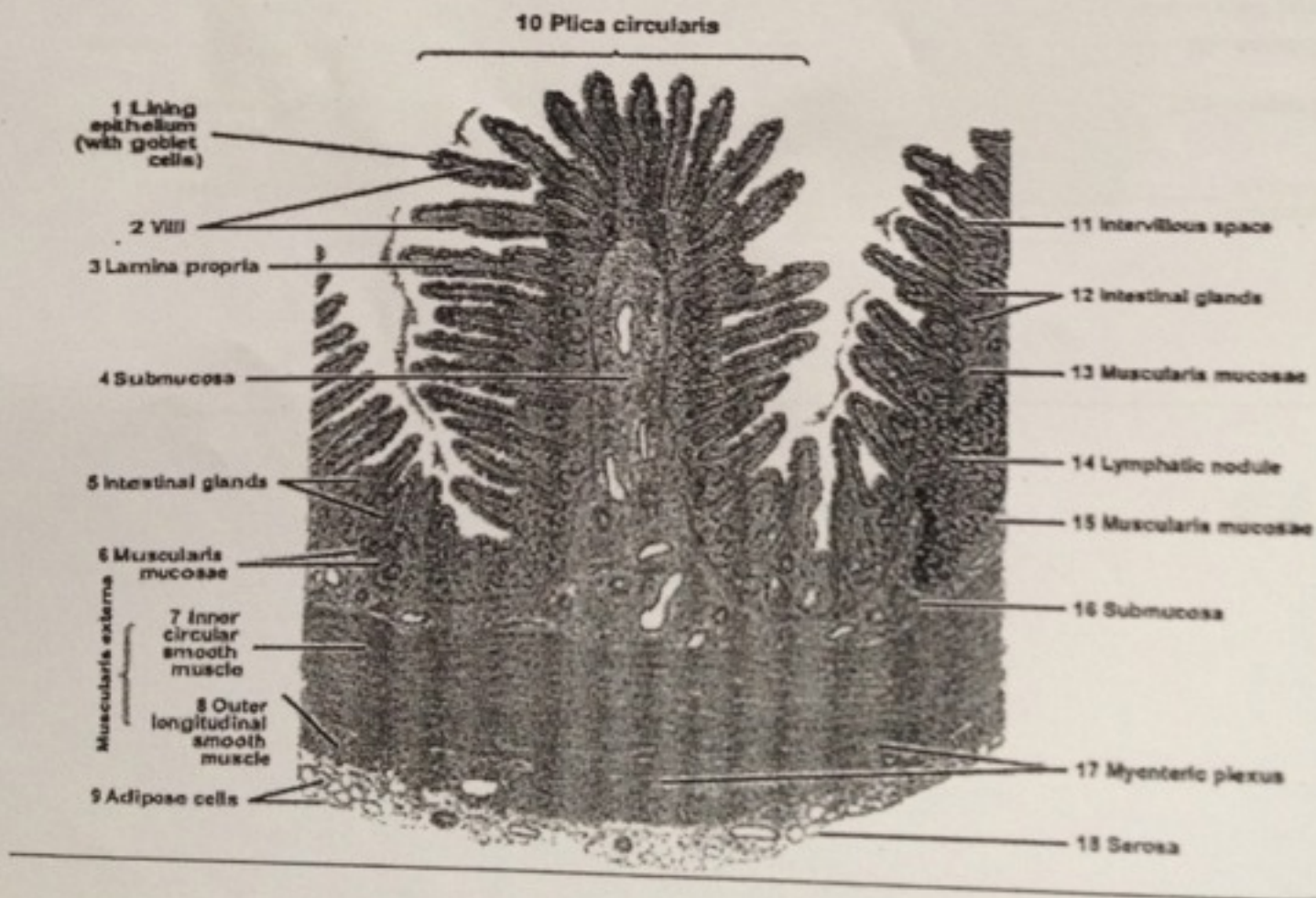
**Ileum:** aggregation of lymphoid tissue to form large nodules called (**Peyer's patches**) which may expands in the lamina propria, splits the muscularis mucosa and extend into the submucosa



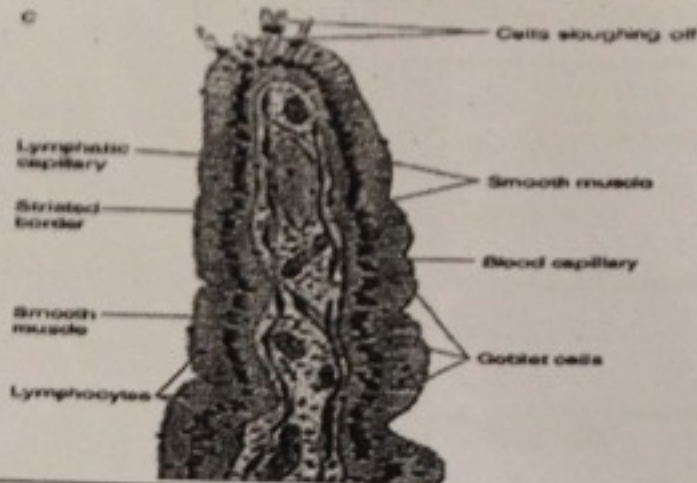
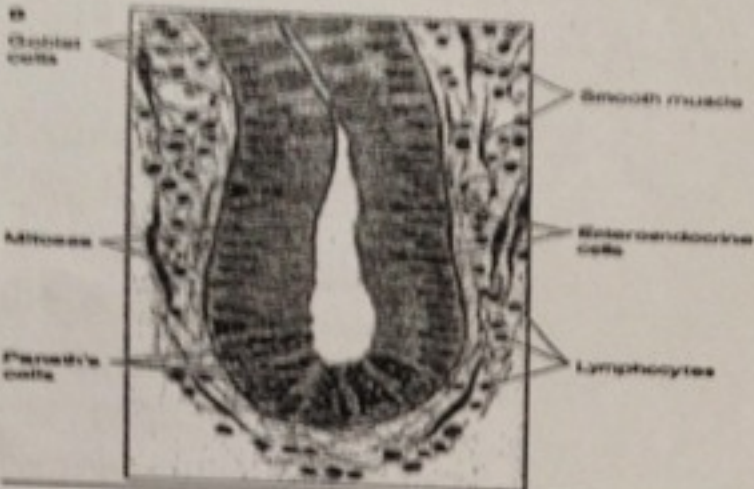
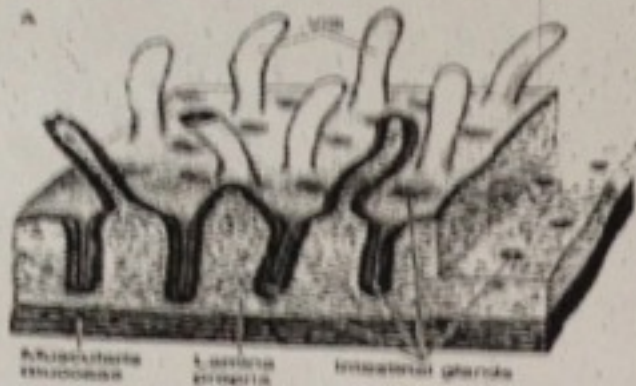
## ■ Duodenum:



## ■ Jejunum and Ileum:



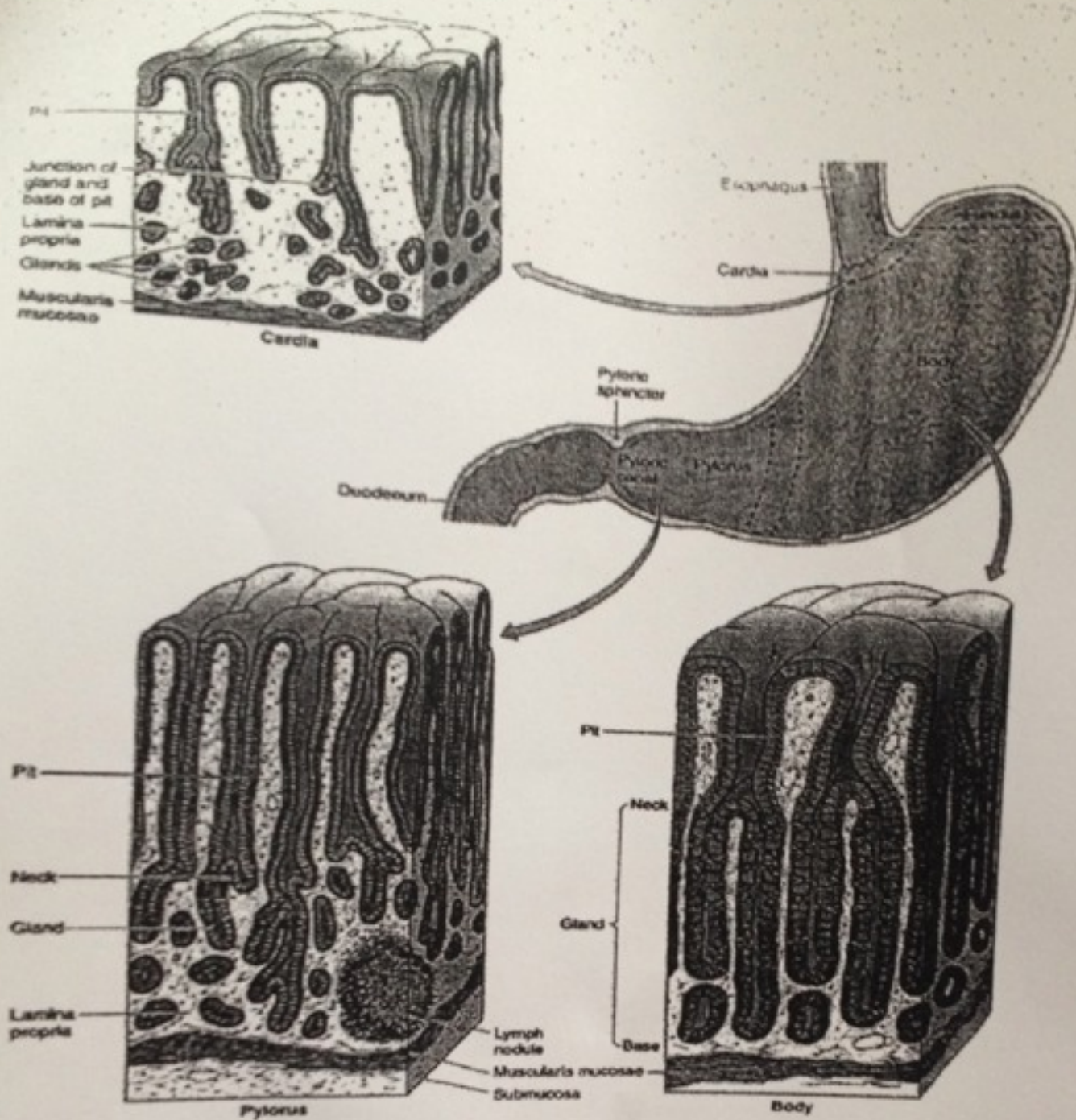




Paneth cells

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