

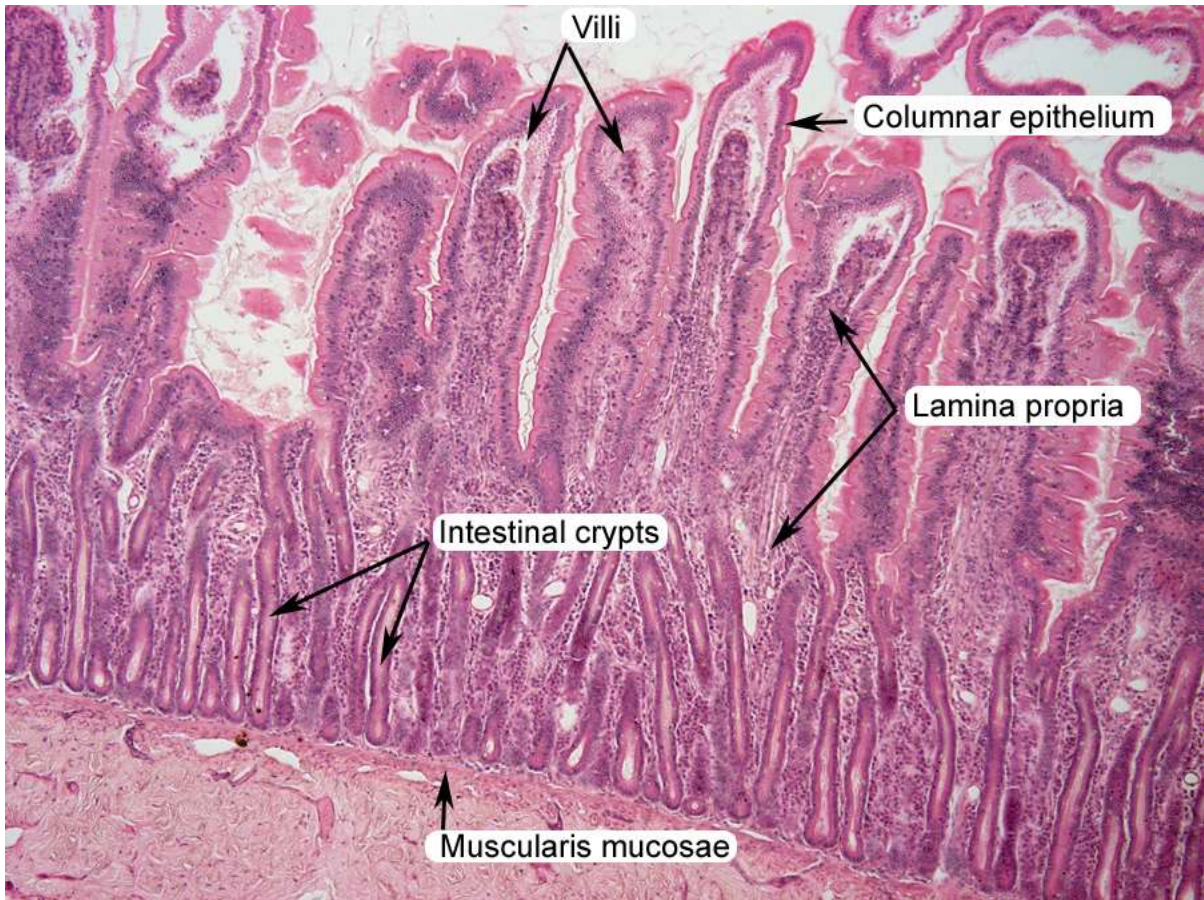
HISTOLOGY OF SMALL INTESTINE

By Shizra Nizamani

SMALL INTESTINE

- It is responsible for the absorption and digestion of nutrients.
- The digestive process is facilitated by the enzymes produced by the pancreas.
- It is the site for the absorption of amino acids, fats, glucose and some large molecules.
- To improve the efficiency of absorption, it is necessary to increase surface area.

- ⦿ The small intestine has several modifications to increase its surface area:
 1. Plicae circulares:- Large number of mucosal folds arranged circularly around the lumen.
 2. Villi:- The surface of the plicae is further arranged into the villi, that extend into the intestinal lumen.
 3. Microvilli:- The absorptive surface of the villi is further increased by the microvilli.
 4. Crypts of Liberkuhn:- These are the invaginations of intestinal mucosa between the bases of villi and form the intestinal glands.



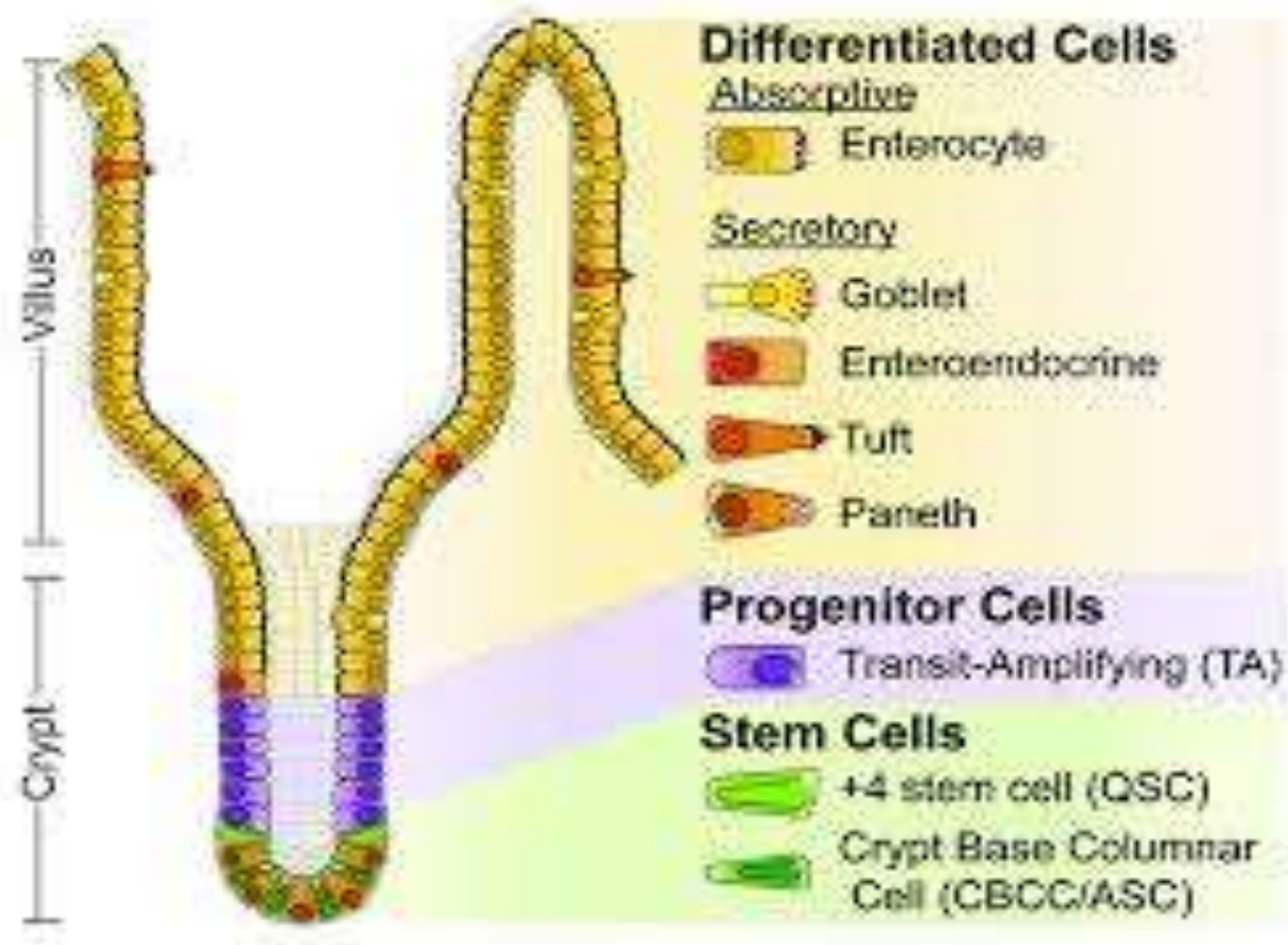
- The small intestine is subdivided into duodenum, Jejunum and ileum.

DUODENUM:-

- The epithelium of the duodenal mucosa is regular simple columnar and microvilli of these cells form continuous brush border.
- The villi of this region are short and uniformly sized.
- Intestinal crypts extend downward to the deepest levels of tunica mucosa.
- They are the simple straight tubular glands lined by enterocytes, goblet cells, stem cells, paneth cells and enteroendocrine cells.

- ◉ Enterocytes:- these are the absorptive epithelial cells.
- ◉ Goblet cells:- glass shaped unicellular glands, which secrete mucus to protect the enterocytes.
- ◉ Enteroendocrine cells:- located in the deep regions of crypts and are less numerous.
- ◉ They are similar to those in stomach, but produce different hormones.
- ◉ They don't secrete into the lumen but into the blood flowing through the capillaries in the lamina propria.

- Paneth cells:- are found in the clusters at the bases of crypts in ruminants, and horse.
- These are pyramidal with basal spherical nuclei.
- They produce peptidase and lysozyme and release them into the gut.
- Stem cells:- are found in the lower third of the crypt.
- They divide to replace enterocytes and mucus cells of the villi.

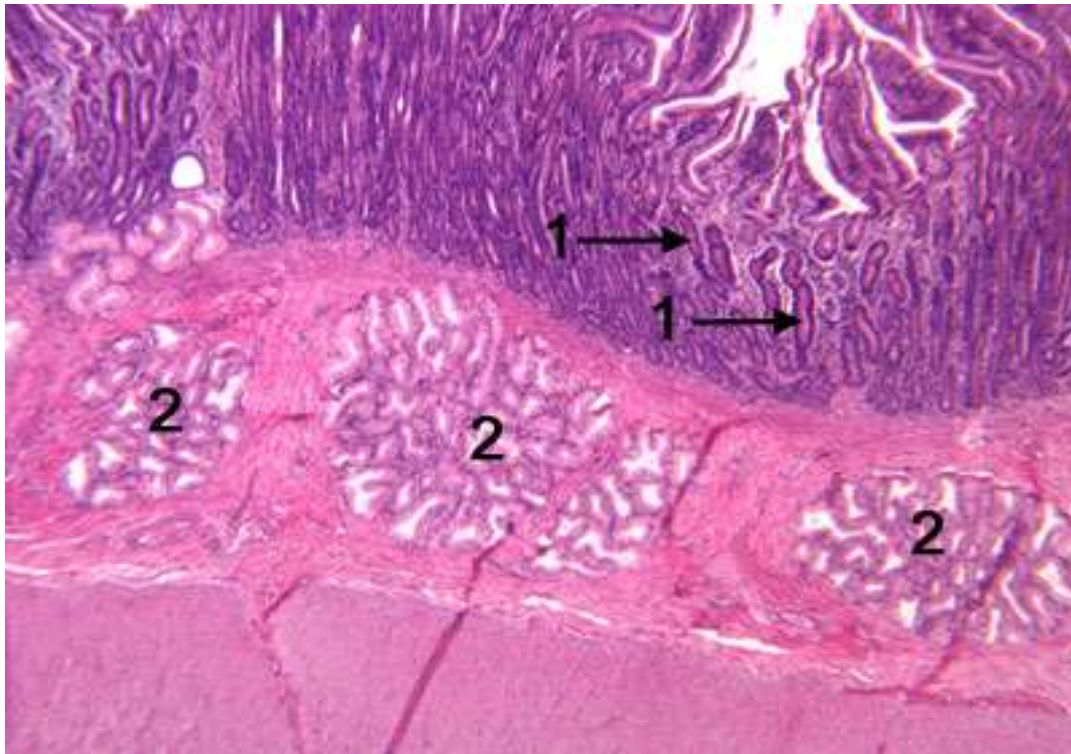


- ◉ The lamina propria:- loose and irregular connective tissue.
- ◉ It contains collagen fibers, plasma cells, blood capillaries and a central lacteal.
- ◉ Lacteal:- a single large lymphatic vessel.
- ◉ It also has small strands of smooth muscle, which come off the muscularis mucosae.
- ◉ Muscularis Mucosae:- A thin band of smooth muscle which runs all the way around the mucosal layer and sends strands up into the villi.
- ◉ These strands cause the villi to contract, expelling the contents of the crypts.

- ◉ **Tunica submucosa:**- it has number of blood vessels, lymphatics and neurons.
- ◉ These elements are called the submucosal plexus.
- ◉ This plexus along with plexus of tunica muscularis helps to coordinate the movements of the intestine and facilitate the passage of food through lumen.
- ◉ It also has true glandular elements, called Brunner's glands.
- ◉ These submucosal glands specifically are a feature of duodenum, and found in the first portion of it.
- ◉ These glands produce alkaline secretions which neutralize the very acidic material (pH= 2-3) entering the duodenum from the stomach.

- ◉ **Tunica muscularis:**- is thick and has two layers of muscles, inner circular and outer longitudinal.
- ◉ Between these two layers is a second nervous plexus, Myenteric plexus (plexus of Auerbach).
- ◉ It is present at the regular intervals between the inner and outer muscle coats.
- ◉ **Serosa:**- a loose connective tissue layer with an outer mesothelial covering.

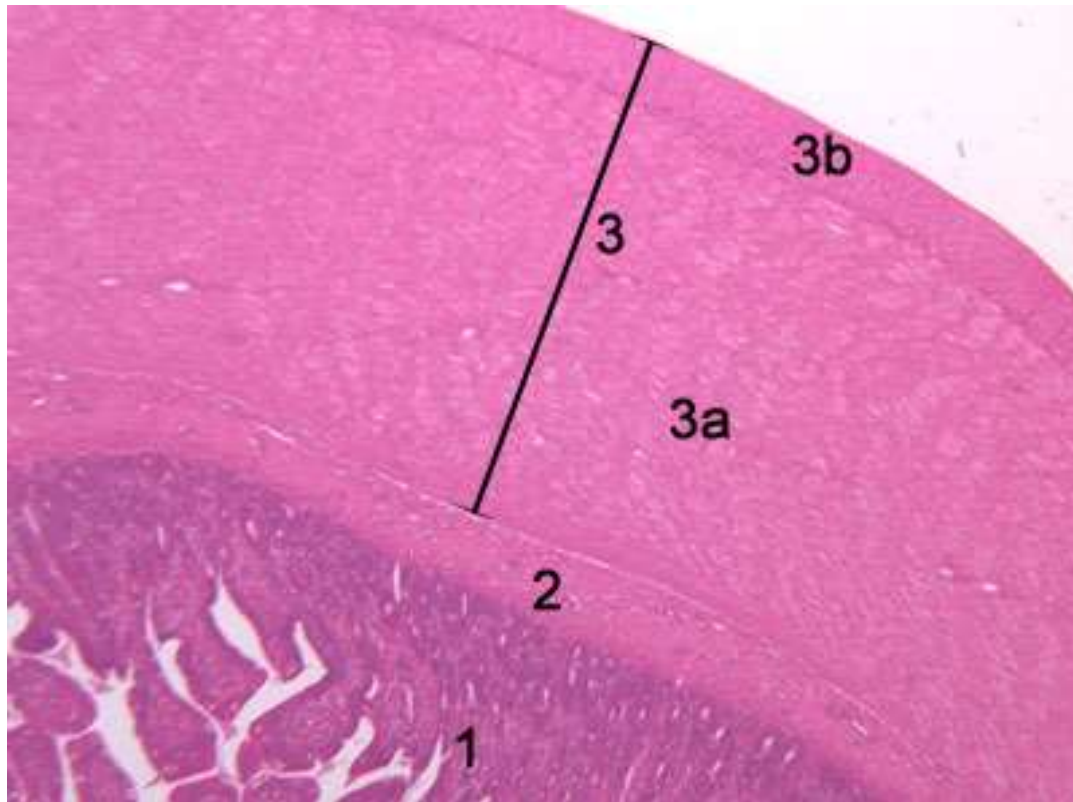
DUODENUM



- 1) Crypts of lieberkuhn
- 2) Brunner's glands.

◎ JEJUNUM:-

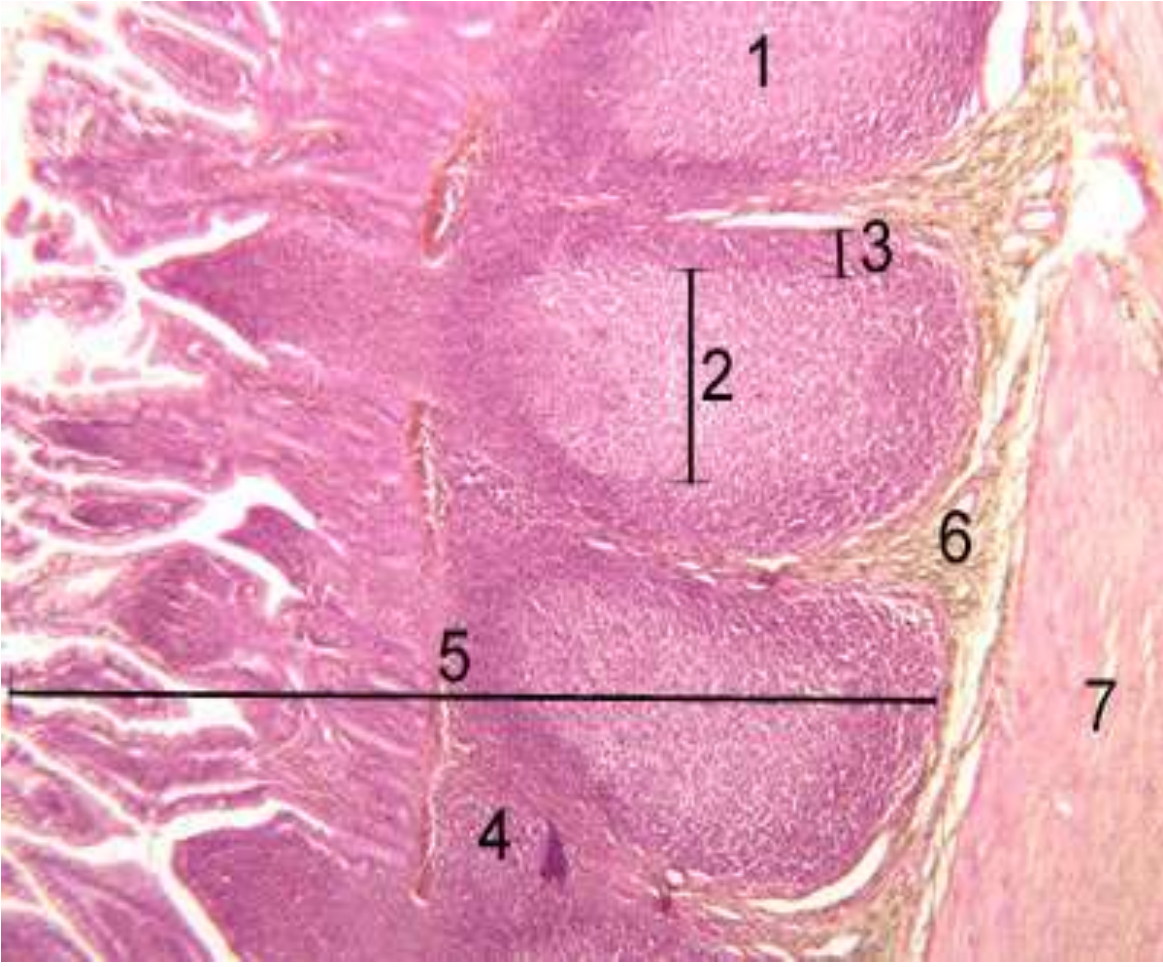
- ◎ Jejunal villi are longer and more irregular. (characteristic feature)
- ◎ The muscularis mucosae is sparse or even absent.
- ◎ There are the folds, *plicae circulares* which include mucosa as well as submucosa.
- ◎ These are the permanent structures help to increase surface area.
- ◎ There are no glands in the submucosa in this region.
- ◎ Other structures are same as in the duodenum.



- 1) Mucosa
- 2) Submucosa
- 3) Muscularis externa
 - 3a) Inner circular layer
 - 3b) Outer longitudinal layer.

○ ILEUM:-

- It has the large aggregations of lymphatic tissue in the submucosa, (characteristic feature).
- These are the lymphatic nodules or (Peyer's patches).
- They contain the germinal centers and are an important part of lymphatic system.
- They are the site for the development of B-lymphocytes.
- The villi are more leaf like.
- Other features are similar with that of duodenum and jejunum.



- 1) Lymphatic nodule
- 2) Germinal center
- 3) Marginal zone
- 4) Diffuse lymphatic tissue
- 5) Mucosa and peyer's patches
- 6) Ileal submucosa
- 7) Muscularis externa



THANK YOU!