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**MATRIC: 19/MHS03/015**

**DEPARMENT: HUMAN ANATOMY**

**SMALL INTESTINE**

It is made of 3 segments;

Duodenum- The epithelium of the duodenal mucosa is regular simple columnar, and microvilli of these cells form continuous brush border.

-Lamina propria- loose and irregular connective tissue. It contains collagen fibres, plasma cells, blood capillaries and a central lacteal (a single large lymphatic vessel). It has small strands of smooth muscle, which come off the muscularis mucosae

-Muscularis Mucosae- A thin band of smooth muscles 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 crypts.

-Tunica Submucosa- It has number of blood vessels, lymphatics and neurons. It has glandular elements, called Brunner’s glands.

-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.

-Serosa- loose connective tissue layer with an outer mesothelial covering

Jejunum

Jejunal villi are longer and more irregular. The muscularis mucosae is sparse or even absent.

There are folds, plicae circulares which include mucosa as well as submucosa. These are permanent structures help to increase surface area. There are no glands in the submucosa in this region.

Ileum

It has aggregations of lymphatic tissue in the submucosa. There are payer’s patches. Other features are similar with that of duodenum and jejunum.

Adventitia (Outermost layer) – Comprised of loosely arranged fibroblasts and collagen, with the vessels and nerves passing through it. Most of the small intestine adventitia is covered by mesothelium and is commonly called the serosa.

The small intestine is the major absorptive site in the gastrointestinal tract, and therefore has several modifications to aid its function. The mucosa and submucosa form large numbers of folds (or plicae) arranged in a circular fashion in the lumen (therefore called plicae circulares). Additionally, the plicae contain microvilli to further increase the surface area, which increases absorption.

There are several unique features in the small intestine:

Circular folds (Plicae circulares)- Circular folds (valves of Kerckring, plicae circulares) are the transverse folds of mucosa found predominantly in the distal duodenum and proximal jejunum

Intestinal villi are finger like extensions of intestinal mucosa which project into the lumen of the small intestine. Between the villi are intestinal glands (crypts of Lieberkuhn) which secrete intestinal juice rich in digestive enzymes.

Microvilli are projections found on the apical surface of each intestinal cell (enterocyte)

Cells found in the small intestine:

Enteroendocrine cells which, as part of the enteric endocrine system sense the lumenal environment and secrete hormones such as cholecystokinin and gastrin into blood.

Goblet cells, which secrete a lubricating mucus into the intestinal lumen.

Paneth cells, which provide an important anti-bacterial defence for the small intestine.

Stem cells, which allow rapid and constant turnover of small intestinal epithelial cells

The epithelium of the small intestine lines the luminal surface. There are several components to the epithelium:

Enterocytes – Tall columnar cells, which have an absorptive function. They contain brush border enzymes on the surface which have an important digestive function.

Goblet cells – Exocrine glands which secrete mucin.

The Crypts of Lieberkuhn -are glands found in the epithelial lining. They contain numerous cells such as stem cells to produce new cells to replenish the cells lost due to abrasion, as well as enteroendocrine cells to synthesise and secrete hormones.

To protect from pathogens, there are Paneth cells which secrete protective agents (such as defensins and lysozymes) and Peyer’s patches which are only found in the ilium. Peyer’s patches contain mucosal-associated lymphatic tissue (MALT) which house white blood cells and lymphocytes. These cells can produce antibodies to further protect the small intestine from infection.

Peyer's patches are part of gastrointestinal associated lymphoid tissue (GALT). They are found in ileum.

Brunner glands are found in the submucosa of the duodenum. They produce mucus rich in alkaline which protects the duodenum from the corrosive effects of gastric acid.

The small intestines are equipped with an inner circular and an outer longitudinal layer of smooth muscle, collectively classified as the muscularis externa. Located between these muscle layers is the parasympathetic plexus of Auerbach. The outermost parts of the intestines (serosa) are covered by a single-layered squamous epithelium that provide protection for the organ.

**LARGE INTESTINE**

The large intestine is that part of the digestive tube between the terminal ileum and anus. Depending on the species, ingesta from the small intestine enters the large intestine through either the ileocecal or ileocolic valve. Within the large intestine, three major segments are recognized:

-the cecum is a blind-ended pouch that in humans carries a worm-like extension called the vermiform appendix.

-the colon constitutes most of the length of the large intestine and is subclassified into ascending, transverse and descending segments.

-the rectum is the short, terminal segment of the digestive tube, continuous with the anal canal.

The muscularis externa has its longitudinal and circular layers present. However, the longitudinal layers concentrate into three muscular bands that course along the length of the colon called the taeniae coli muscles.

Contraction of these taeniae coli in the un-distended colon give rise to the sacculation’s (haustra) observed grossly. Myenteric plexus is present between the layers of the muscularis externa.

The vermiform appendix has a similar histological appearance to the colon with the following exceptions:

The taeniae coli are absent in the appendix;

The lamina propria and submucosa contain joining lymphatic nodules along its length;

The muscularis externa is continuous circumferentially and longitudinally;

The thick mucosa has deep crypts, but there are no villi. The epithelium is formed of columnar absorptive cells with a striated border, many goblet cells, endocrine cells and basal stem cells, but no Paneth cells. The surface epithelial cells are sloughed into the lumen and must be replaced around every 6 days. The lamina propria and submucosa are like the small intestine.

The longitudinal smooth muscle in the muscularis externa is arranged in three longitudinal bands called taenia coli.

lymphoid cells are also found in the lamina propria layers as well as tubular glands, that secrete mucus. Some of these cells are absorptive cells. Stem cells are also present.