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Question: Describe the micro anatomy of the small and large intestine.

The Small Intestine

Functions: The small intestine is the part of the intestines where 90% of the digestion and absorption of food occurs, the other 10% taking place in the stomach and large intestine. The main function of the small intestine is absorption of nutrients and minerals from food. It absorbs the product of digestion and it also secretes hormones through enteroendocrine cells.

Segments: The small intestine has three segments; the duodenum, jejunum, and ileum. The duodenum, the shortest, is where preparation for absorption through the villi begins. The jejunum is specialized for the absorption through its lining by enterocytes, small nutrient particles which have been previously digested by enzymes in the duodenum. The main function of the ileum is to absorb vitamin B12, bile salts, and whatever products of digestion were not absorbed by the jejunum.

Layers: The small intestine has four tissue layers; the serosa is the outermost layer of the intestine. The serosa is a smooth membrane consisting of a thin layer of cells that secrete serous fluid, and a thin layer of connective tissue. Serous fluid is a

lubricating fluid that reduces friction from the movement of the muscularis. The muscularis is a region of muscle adjacent to the submucosa membrane. It is responsible for gut movement, or peristalsis. It usually has two distinct layers of smooth muscle: circular and longitudinal. The submucosa is the layer of dense, irregular connective tissue or loose connective tissue that supports the mucosa, as well as joins the mucosa to the bulk of underlying smooth muscle. The mucosa is the innermost tissue layer of the small intestines, and is a mucous membrane that secretes digestive enzymes and hormones. The intestinal villi are part of the mucosa.

General Features: Small intestine is a long, narrow, folded or coiled tube extending from the stomach to the large intestine; it is the region where most digestion and absorption of food takes place. It is about 6.7 to 7.6 metres (22 to 25 feet) long, highly convoluted, and contained in the central and lower abdominal cavity. A thin membranous material supports and somewhat suspends the intestines which contains areas of fat that help retain heat in the organs, as well as an extensive web of blood vessels.

Epithelium: The mucosa of the small intestine is lined by a simple columnar epithelium which consists primarily of absorptive cells (enterocytes), with scattered goblet cells and occasional enteroendocrine cells. In crypts, the epithelium also includes Paneth cells and stem cells. Absorptive cells (enterocytes) are responsible for absorbing nutrients from the intestinal lumen and transporting across the epithelium to the lamina propria, whence they diffuse into capillaries. Goblet cells secrete mucus to promote movement and effective diffusion of gut contents. Enteroendocrine cells secrete hormones to regulate secretion into the GI tract. Tuft cells orchestrate immunity against parasites. Paneth cells, located at the bottoms of the crypts, secrete lysosomal enzymes and other factors into the crypt

lumen. These agents presumably help protect the crypt epithelium with its vital stem cells. Stem cells line the walls of the crypts and continually replenish the intestinal epithelium, completely replacing all the absorptive and goblet cells approximately once every four days. Lamina propria of each villus is richly supplied with capillaries and also includes a single lacteal, for transporting absorbed nutrients. Lamina propria also includes thin strands of smooth muscle (presumably allowing some motility for individual villi, to encourage thorough fluid mixing at the absorptive surface) and numerous white blood cells. The muscularis mucosa of the small intestine forms a thin layer (only a few muscle fibers in thickness) beneath the deep ends of the crypts. The submucosa of the small intestine is relatively unspecialized, except in the duodenum where it is packed with the mucous-secreting Brunner's glands. Muscularis externa of the small intestine has the standard layers of inner circular and outer longitudinal smooth muscle, with ganglia of Auerbach's plexus scattered in between. Over most of the small intestine, the outer layer is a serosa attached to mesentery. The exception is the duodenum, which is retroperitoneal.

The Large Intestine

Functions: The 4 major functions of the large intestine are; reabsorption of water and mineral ions such as sodium and chloride, formation and temporary storage of faeces, maintaining a resident population of over 500 species of bacteria and bacterial fermentation of indigestible materials.

Segments: The large intestine is subdivided into four main regions: the cecum, the colon, the rectum, and the anus. The ileocecal valve, located at the opening between the ileum and the large intestine, controls the flow of chyme from the

small intestine to the large intestine. The first part of the large intestine is the cecum, a sac-like structure that is suspended inferior to the ileocecal valve. It is about 6 cm (2.4 in) long, receives the contents of the ileum, and continues the absorption of water and salts. The cecum blends seamlessly with the colon. Upon entering the colon, the food residue first travels up the ascending colon on the right side of the abdomen. Food residue leaving the sigmoid colon enters the rectum in the pelvis, the rectum extends anterior to the sacrum and coccyx. This structure follows the curved contour of the sacrum and has three lateral bends that create a trio of internal transverse folds called the rectal valves. These valves help separate the faeces from gas to prevent the simultaneous passage of faeces and gas. Finally, food residue reaches the last part of the large intestine, the anal canal, which is located in the perineum, completely outside of the abdominopelvic cavity.

Layers: The 4 layers of the large intestine from the lumen outward are the mucosa, submucosa, muscular layer, and serosa. The muscular layer is made up of 2 layers of smooth muscle, the inner, circular layer, and the outer, longitudinal layer. These layers contribute to the motility of the large intestine.

General Features: The large intestine runs from the appendix to the anus. It frames the small intestine on three sides. Despite its being about one-half as long as the small intestine, it is called large because it is more than twice the diameter of the small intestine, about 3 inches.

Epithelium: The mucosa of the colon is lined by a simple columnar epithelium with a thin brush border and numerous goblet cells. The crypts of Lieberkühn are straight and unbranched and lined largely with goblet cells. In many regions the mucus is partially preserved. At the base of the crypts, undifferentiated cells and endocrine cells are present; however, Paneth cells are not usually present. The appearance of the lamina propria is essentially the same as in the small intestine:

Leukocytes are abundant and the isolated lymphoid nodules present in this tissue extend into the submucosal layer. The muscularis mucosae is a bit more prominent compared to the small intestine, and consists of distinct inner circular and outer longitudinal layers. The submucosa has a mixture of irregular connective and adipose tissue, numerous blood vessels, and several ganglion cells and nerves of the submucosal plexus. The muscularis externa of the large intestine is different from that of the small intestine in that the outer longitudinal layer of smooth muscle varies in thickness and forms three thick longitudinal bands.

Differences Between Large and Small Intestine

Small Intestine	Large Intestine
The small intestine is a part of the digestive system that runs between the stomach and large intestine	The large intestine is the terminal part of the intestine that is wider and shorter than the small intestine
The small intestine is longer than large intestine	It is shorter than the small intestine
It is narrower than the large intestine	It is wider than the small intestine

<p>The three components of the small intestine are duodenum, jejunum and ileum</p>	<p>Colon, cecum, rectum and anal canal are the components of the large intestine</p>
<p>It exhibits small movements in the abdominal cavity</p>	<p>The large intestine is fixed or shows very less mobility</p>
<p>It is responsible for the absorption of nutrients from the digested food</p>	<p>It takes part in the absorption of electrolytes and water and in the production of vitamins.</p>
<p>The longitudinal muscles are arranged in circular layers</p>	<p>The longitudinal muscles are arranged in three bands known as Teniae Colie</p>
<p>Composed of Villi in the internal surface</p>	<p>Lacks Villi</p>
<p>Involved in digestion</p>	<p>Not involved in digestion</p>