

QUESTION: Describe the microanatomy of the small and large intestine. State the functions, segment, layers, general features and epithelium of each part of the small and large intestine.

ANSWERS:

1. **SMALL INTESTINE:** The small intestine is divided into three parts, namely: the duodenum, jejunum, and ileum. It also possesses the standard 4 layers present in most parts of the gastrointestinal tract. These are the: the mucosa, submucosa, muscularis propria and serosa.

The mucosa includes a columnar epithelium with glands called Crypts of Lieberkuhn, other components of the mucosa include: mucus-secreting goblet cells, Paneth cells which secrete lysozymes, enteroendocrine cells which secrete hormones, fingerlike projections called villi which increase its absorptive surface area, lamina propria and muscularis mucosa. The mucosa is arranged in spiral folds called plicae circulares.

The submucosa contains the blood vessels and the Meissner nerve plexus. The muscularis propria contains inner circular and outer longitudinal muscles, and also the myenteric (Auerbach) nerve plexus. The serosa covers the organs of the peritoneal cavity and is called the visceral peritoneum.

Below is a table comprising the histology of the small intestine:

STRUCTURE	FUNCTION	LOCATION
DUODENUM: first short segment of the small intestine. Its components are:	Neutralizing acidic chime, mixing it with pancreatic secretions	Retroperitoneal position behind the liver
1. Plicae circulares: moderate amount	Limited compartmentalization of duodenum	Throughout duodenum
2. Villi: leaf-like, middle length mucosal projections	Increasing surface area	Throughout duodenal mucosa
3. Epithelium: simple columnar epithelium	Protection and limited amount of absorption	Innermost mucosal layer in contact with duodenal content.
4. Brunner glands: branched tubuloacinar glands	Secretion of alkaline glycoproteins, bicarbonate ions, mucus and zymogens	Duodenal submucosa
JEJUNUM: middle, longest portion of small intestine. Its components are:	Majority of absorption	Within peritoneum

<p>1. Plicae circulares: prominent and numerous</p> <p>2. Villi: long, finger-like mucosal projections</p> <p>3. Epithelium: simple columnar with mostly enterocytes</p> <p>4. Intestinal glands: simple to branched tubular, relatively uniform in size and shape</p>	<p>Limited compartmentalization of jejunum</p> <p>Increasing surface area</p> <p>Absorption of nutrients</p> <p>Production of seromucous secretions</p>	<p>Throughout jejunum</p> <p>Throughout jejunal mucosa</p> <p>Innermost mucosal layer in contact with jejunal content</p> <p>Lamina propria</p>
<p>ILEUM: last segment of small intestine. Its components are:</p> <p>1. Plicae circulares: decrease in number and height towards distal portion</p> <p>2. Villi: long, finger-like mucosal projections</p> <p>3. Epithelium: simple columnar with increasing goblet cells</p> <p>4. Intestinal glands: simple to branched tubular, relatively uniform size and shape</p> <p>5. Peyer patches: large lymphoid follicles with or without germinal centers</p>	<p>Absorbing vitamin B₁₂, bile salts and other nutrients remaining in chime</p> <p>Limited compartmentalization of ileum</p> <p>Increasing surface area</p> <p>Absorption of nutrients, mucous secretion</p> <p>Seromocous secretions</p> <p>Immune surveillance and response to encountered antigens</p>	<p>Lower portion of the peritoneum</p> <p>Throughout ileum</p> <p>Throughout ileal mucosa</p> <p>Innermost mucosal layer in contact with ileal content</p> <p>Lamina propria, may extend into submucosa</p> <p>In lining of epithelium</p>

2. LARGE INTESTINE: The large intestine or bowel has the following regions, the short cecum, with the ileocecal valve and the appendix; the ascending, transverse, descending, and sigmoid colon; and the rectum where feces is stored prior to evacuation. The large intestine has 4 layers as follows:

- Mucosa: includes a columnar epithelium with large number of mucus-secreting goblet cells (villi: present in small intestine and absent in colon), lamina propria, and muscularis mucosa. The appendix is rich in mucosa associated lymphoid tissue (MALT).

- Submucosa: contains the blood vessels and Meissner nerve plexus
- Muscularis propria: contains continuous inner circular and outer longitudinal muscles arranged in bands and myenteric (Auerbach) nerve plexus. Taenia coli are formed by bands of outer longitudinal muscles.
- Serosa: Visceral peritoneum

Below is a table comprising the histology of the large intestine (colon):

STRUCTURE	FUNCTION	LOCATION
1. Mucosa: relatively thin	Absorption, protection, lubrication	Inner layer of colonic wall
a. Epithelium: simple columnar	Lining the lumen, absorption of water	Innermost mucosal layer in contact with lumen
b. Lamina propria: diffuse lymphoid tissue and lymphoid follicles	Immunological surveillance and response to antigens	Deep to epithelium
c. Glands: simple tubular glands	Production of mucus	Within lamina propria
d. Muscularis mucosa: thin strip of smooth muscle layer	Isolated movements of mucosa	Outermost mucosal layer
2. Submucosa: Dense irregular connective tissue	Structural support and delivery of neurovasculature	Between muscularis mucosa and propria
3. Muscularis propria	Peristaltic movements	Between submucosa and serosa
a. Circular layer: smooth muscle tissue	Constriction of compartments	
b. Longitudinal layer: smooth muscle tissue, thickened bands (taenia coli)	Longitudinal contraction and maintaining haustra	
4. Serosa or adventitia: connective tissue with or without mesothelium	Protection, insulation and delivery of neurovasculature	Outermost layer
APPENDIX: Similar histology as the rest of the large intestine except for:	Largely immunologic surveillance and immune response	Extending out from inferior portion of cecum, position with the peritoneum varies
1. Uniform, longitudinal layer instead of teniae coli	Unclear	Outer layer of muscularis propria
2. Large number of lymphoid nodules with or without germinal center	Phagocytosis, antibody production, lymphocyte proliferation and differentiation	Lamina propria and submucosa

<p>ANORECTAL JUNCTION: Site of mucosal transition. Its features are:</p> <ol style="list-style-type: none"> 1. Simple columnar, colonic epithelium 2. Non-keratinized stratified squamous epithelium, eventually transitioning to keratinized stratified squamous of the perianal skin 	<p>Lining and protecting the mucosa at the site of transition</p> <p>Lining and lubricating lumen</p> <p>Protecting from abrasion and friction</p>	<p>Junction between terminal segment of rectum and anal column</p>
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