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**Assignment.**

**The Small Intestine**

The small intestine extends from the pyloric sphincter to the ileocecal valve, where it empties into the large intestine. The small intestine finishes the process of digestion, absorbs the nutrients, and passes the residue on to the large intestine. The liver, gallbladder, and pancreas are accessory organs of the digestive system that are closely associated with the small intestine.

The small intestine has three distinct regions – the duodenum, jejunum, and ileum. The duodenum, the shortest, is where preparation for absorption through small finger-like protrusions called 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. The small intestine follows the general structure of the digestive tract in that the wall has a mucosa with simple columnar epithelium, submucosa, smooth muscle with inner circular and outer longitudinal layers, and serosa. The absorptive surface area of the small intestine is increased by plicae circulares, villi, and microvilli.

Exocrine cells in the mucosa of the small intestine secrete mucus, peptidase, sucrase, maltase, lactase, lipase, and enterokinase. Endocrine cells secrete cholecystokinin and secretin.

The most important factor for regulating secretions in the small intestine is the presence of chyme. This is largely a local reflex action in response to chemical and mechanical irritation from the chyme and in response to distention of the intestinal wall. This is a direct reflex action, thus the greater the amount of chyme, the greater the secretion.

The small intestine is where most chemical digestion takes place. Many of the digestive enzymes that act in the small intestine are secreted by the pancreas and liver and enter the small intestine via the pancreatic duct. Pancreatic enzymes and bile from the gallbladder enter the intestine in response to the Hormone cholecystokinin, which is produced in the small intestine in response to the presence of nutrients. Secretin, another hormone produced in the small intestine, causes additional effects on the pancreas, where it promotes the release of bicarbonate into the duodenum in order to neutralize the potentially harmful acid coming from the stomach.

The three sections of the small intestine look similar to each other at a microscopic level, but there are some important differences. The parts of the intestine are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| **Layer** | **Duodenum** | **Jejunum** | **Ileum** |
| Serosa | 1st part serosa, 2nd–4th adventitia | Normal | Normal |
| Muscularis externa | Longitudinal and circular layers, with Auerbach's (myenteric) plexus in between | Same as duodenum | Same as duodenum |
| Submucosa | Brunner's glands and Meissner's (submucosal) plexus | No BG | No BG |
| Mucosa: muscularis mucosae | Normal | Normal | Normal |
| Mucosa: lamina propria | No PP | No PP | Peyer's patches |
| Mucosa: intestinal epithelium | Simple columnar. Contains goblet cells, Paneth cells | Similar to duodenum | ? |

**The Large Intestine**

The large intestine is the terminal part of the alimentary canal. The primary function of this organ is to finish absorption of nutrients and water, synthesize certain vitamins, form feces, and eliminate feces from the body. 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. 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. Three features are unique to the large intestine: teniae coli, haustra, and epiploic appendages. The teniae coli are three bands of smooth muscle that make up the longitudinal muscle layer of the muscularis of the large intestine, except at its terminal end. Tonic contractions of the teniae coli bunch up the colon into a succession of pouches called haustra (singular = hostrum), which are responsible for the wrinkled appearance of the colon. Attached to the teniae coli are small, fat-filled sacs of visceral peritoneum called epiploic appendages. The purpose of these is unknown. Although the rectum and anal canal have neither teniae coli nor haustra, they do have well-developed layers of muscularis that create the strong contractions needed for defecation. The stratified squamous epithelial mucosa of the anal canal connects to the skin on the outside of the anus. This mucosa varies considerably from that of the rest of the colon to accommodate the high level of abrasion as feces pass through. The anal canal’s mucous membrane is organized into longitudinal folds, each called an anal column, which house a grid of arteries and veins. Two superficial venous plexuses are found in the anal canal: one within the anal columns and one at the anus.

Depressions between the anal columns, each called an anal sinus, secrete mucus that facilitates defecation. The pectinate line (or dentate line) is a horizontal, jagged band that runs circumferentially just below the level of the anal sinuses, and represents the junction between the hindgut and external skin. The mucosa above this line is fairly insensitive, whereas the area below is very sensitive. The resulting difference in pain threshold is due to the fact that the upper region is innervated by visceral sensory fibers, and the lower region is innervated by somatic sensory fibers. The residue of chyme that enters the large intestine contains few nutrients except water, which is reabsorbed as the residue lingers in the large intestine, typically for 12 to 24 hours. Thus, it may not surprise you that the large intestine can be completely removed without significantly affecting digestive functioning. For example, in severe cases of inflammatory bowel disease, the large intestine can be removed by a procedure known as a colectomy. Often, a new fecal pouch can be crafted from the small intestine and sutured to the anus, but if not, an ileostomy can be created by bringing the distal ileum through the abdominal wall, allowing the watery chyme to be collected in a bag-like adhesive appliance. The small intestine absorbs about 90 percent of the water you ingest (either as liquid or within solid food). The large intestine absorbs most of the remaining water, a process that converts the liquid chyme residue into semisolid feces (“stool”). Feces is composed of undigested food residues, unabsorbed digested substances, millions of bacteria, old epithelial cells from the GI mucosa, inorganic salts, and enough water to let it pass smoothly out of the body. Of every 500 mL (17 ounces) of food residue that enters the cecum each day, about 150 mL (5 ounces) become feces.