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### **MICROANATOMY OF THE SMALL INTESTINE**

The small intestine is the part of the gastrointestinal tract that follows the stomach, which is in turn followed by the large intestine. The small intestine is the site where almost all of the digestion and absorption of nutrients and minerals from food takes place.

The average length of the small intestine in an adult human male is 6.9 m (22 feet, 6 inches), and in the adult female 7.1 m (23 feet, 4 inches). It can vary greatly, from as short as 4.6 m (15 feet) to as long as 9.8 m (32 feet). The small intestine is approximately 2.5–3 cm in diameter, and is divided into three sections:

1.The duodenum is the first section of the small intestine and is the shortest part of the small intestine. It is where most chemical digestion using enzymes takes place.

2.The jejunum is the middle section of the small intestine. It has a lining which is designed to absorb carbohydrates and proteins. The inner surface of the jejunum, its mucous membrane, is covered in projections called villi, which increase the surface area of tissue available to absorb nutrients from the gut contents. The epithelial cells which line these villi possess even larger numbers of microvilli. The transport of nutrients across epithelial cells through the jejunum includes the passive transport of some carbohydrates and the active transport of amino acids, small peptides, vitamins, and most glucose. The villi in the jejunum are much longer than in the duodenum or ileum.

3.The ileum is the final section of the small intestine. The function of the ileum is mainly to absorb vitamin B12, bile salts, and any products of digestion that were not absorbed by the jejunum. The wall itself is made up of folds, each of which has many tiny finger-like projections known as villi on its surface. The ileum has an extremely large surface area both for the adsorption of enzyme molecules and for the absorption of products of digestion.

### **The Layers Of The Small Intestine**

The small intestine has four tissue layers:

1.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.

2.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.

3.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.

4.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.

### **Function**

The main functions of the small intestine are secretion and absorption. The epithelial cells of the small intestine secrete enzymes which digest chyme into the smallest particles, making them available for absorption. Concurrently the duodenum functions to mix food with bile and pancreatic enzymes to continue the digestion of carbohydrates, fats, and proteins.

Concerning absorption, carbohydrates and proteins are absorbed in the duodenum and jejunum respectively. The jejunum also functions to absorb most fats. The ileum function involves absorption of vitamin B12, bile salts and all digestion products which were not absorbed in duodenum and jejunum. All three small intestine segments absorb water and electrolytes.

### **MICROANATOMY OF LARGE INTESTINE**

The large intestine starts in the right iliac region of the pelvis, just at or below the right waist, where it is joined to the bottom end of the small intestine. It is about 4.9 feet (1.5 m) long, which is about one-fifth of the whole length of the intestinal canal.

The appendix is attached to its inferior surface of the cecum. It contains the least lymphoid tissue, and it is a part of mucosa-associated lymphoid tissue that gives it an important role in immunity.

On the surface of the large intestine, three bands of longitudinal muscle fibers called taeniae coli, each about 0.2 inches wide, can be identified. They start at the base of the appendix and extend from the cecum to the rectum.

- Appendix: An inner organ without any known use that can become inflamed.
- Cecum: A pouch, usually peritoneal, that is considered to be the beginning of the large intestine.
- Colon: The part of the large intestine that is the final segment of the digestive system, after (distal to) the ileum and before (proximal to) the anus.

### **LAYERS**

The intestinal wall is made up of multiple 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. There are 2 types of motility present in the colon, haustral contraction and mass movement. Haustra are saccules in the colon that give it its segmented appearance. Haustral contraction is activated by the presence of chyme and serves to move food slowly to the next haustra, along with mixing the chyme to help with water absorption. Mass movements are stronger and serve to move the chyme to the rectum quickly.

## **Function Of The Large Intestine**

The large intestine has 3 primary functions: absorbing water and electrolytes, producing and absorbing vitamins, and forming and propelling feces toward the rectum for elimination. By the time indigestible materials have reached the colon, most nutrients and up to 90% of the water has been absorbed by the small intestine. The role of the ascending colon is to absorb the remaining water and other key nutrients from the indigestible material, solidifying it to form stool. The descending colon stores feces that will eventually be emptied into the rectum. The sigmoid colon contracts to increase the pressure inside the colon, causing the stool to move into the rectum. The rectum holds the feces awaiting elimination by defecation.

## **Intestinal epithelium**

The intestinal epithelium is the single cell layer that form the luminal surface (lining) of both the small and large intestine (colon) of the gastrointestinal tract. Composed of simple columnar epithelial cells, it serves two main functions: absorbing useful substances into the body and restricting the entry of harmful substances. As part of its protective role, the intestinal epithelium forms an important component of the intestinal mucosal barrier. Certain diseases and conditions are caused by functional defects in the intestinal epithelium. On the other hand, various diseases and conditions can lead to its dysfunction which, in turn, can lead to further complications.