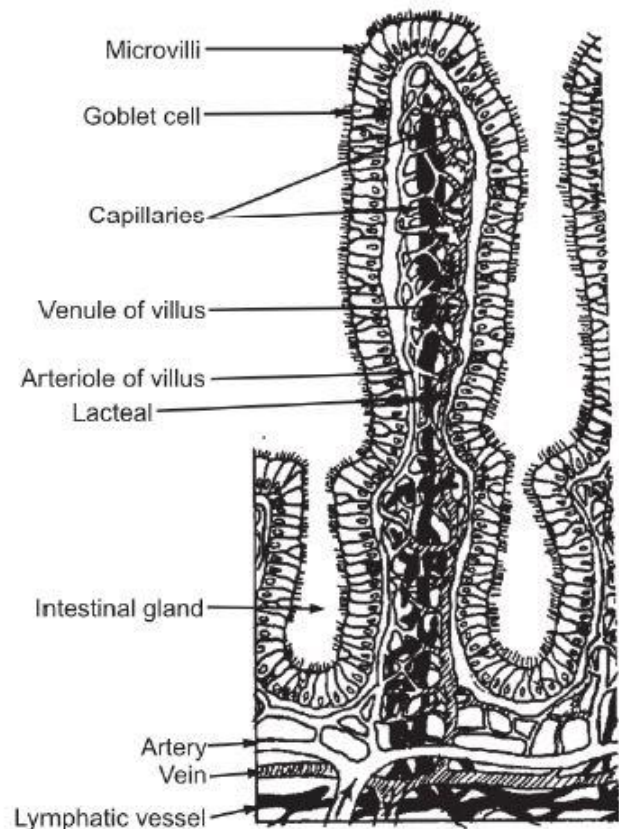


## SMALL INTESTINE

It is a long tube extending from the pyloric sphincter of the stomach up to the ileocecal valve. It is the most convoluted portion of the digestive tract. It is about 05 meters in length and lies in the abdominal cavity, surrounded by the large intestine. It has three regions that are continuous with each other. The three regions are the duodenum (25 cm) followed by the jejunum (02 meters) and ileum (03 meters). The duodenum is curved around the head of the pancreas and is tightly attached to the posterior abdominal wall. The common bile ducts from the liver and pancreatic duct from the pancreas join together and open into the duodenum at about its midpoint. The opening of these ducts is guarded by the sphincter of Oddi. The jejunum is the middle region and is suspended in the abdominal cavity by the mesentery. The ileum is the terminal 03 meters-long region and opens into the caecum of the large intestine.

Four layers of tissues as described in the general structural pattern of the alimentary canal are found in the small intestine. However, the modification in the wall of the small intestine is in the submucosa and mucous layers. These layers extend into the lumen forming shelf-like folds, increasing the surface area of the mucous membrane lining.

The surface area is further increased by the presence of a large number of finger-like projections of the mucous membrane. These projections are known as villi. Within each villus is a lymphatic capillary called a lacteal that is surrounded by a network of blood capillaries. The columnar epithelial cells that form the mucous membrane of the small intestine, at their free surface show many folds, forming smaller projections called microvilli. The mucous membrane also shows the presence of mucous-secreting goblet cells. Between the villi are found the intestinal glands (crypts of Lieberkühn) that empty their secretions between the villi.



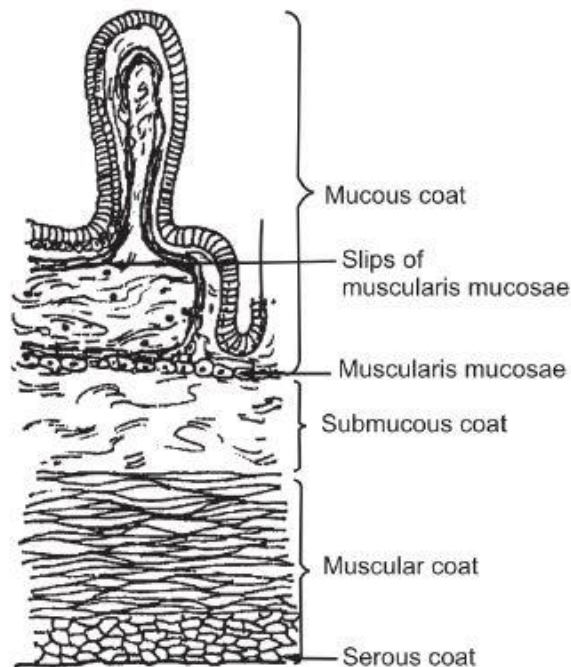
## FUNCTIONS OF SMALL INTESTINE

The Bruner's glands located in duodenum and the goblet cells of intestinal mucosa Secrete mucous. The secretion of mucous by Bruner's glands is stimulated by intestinalhormone secretin, the vagal impulses and the irritating stimulation of the mucosa. The entryof liquefied acidic food (chime) from stomach into the intestine stimulates goblet cells tosecrete mucous.

The distension or irritation of intestinal mucosa and to some extent vagal impulses Stimulate intestinal gland to secrete the intestinal juice called the succus entericus. The composition of intestinal juice is as follows:

Water  
Mineral salts  
Enterokinase  
Amylase  
Peptidase  
Lipase  
Sucrase  
Maltase  
Lactase

- About 2-3 liters of intestinal juice is produced per day.
- The pH of this juice is 7 - 9.



Much of the food that enters the small intestine is undigested, though digestion of proteins and starches has commenced in prior parts of the alimentary canal. Major

digestion and absorption of food occur in the small intestine. The movements of the intestine and the chemical action of digestive juices contribute to the digestion process in the small intestine. The muscular movements of the small intestine apart from mixing food with digestive juices assist in absorption as absorbable materials are brought in contact with mucosa and improve the blood supply to the intestine which helps in secretion and faster removal of absorbed food. These movements include peristaltic, rhythmical, and pendulum movements.

The peristalsis is defined as a wave of relaxation caused by the contraction of longitudinal muscles followed by a wave of constriction (caused by the constriction of circular muscles). This helps in propelling the food contents onward.

The rhythmical movements consist of several periodic local constrictions forming segments of the small intestine. These movements help in mixing food with digestive juices and bringing the food intimately in contact with the mucosa. Pendulum movements consist of constrictions that move forward or backward for short distances moving the food over a short distance in the small intestine.

The chemical digestion of food in the small intestine is caused by the enzymes present in intestinal juice and pancreatic juice. The bile from the liver is poured into the small intestine and assists splitting of fats. The digestive secretions with their enzyme contents and their role in the digestion of food are described in the table at the end of this chapter.

The micro-organisms present in the small intestine act on carbohydrates and proteins and hydrolyze them. These micro-organisms synthesize certain vitamins that are absorbed from there. These organisms also inhibit the growth of many harmful organisms and prevent infection.

## LARGE INTESTINE (COLON)

It is about 1.5 meters long, starting from the caecum in the right iliac fossa and terminating into the rectum deep in the pelvis. Its lumen is larger than the small intestine. It surrounds the coiled-up small intestine and is divided into different parts, i.e. caecum, ascending colon, transverse colon, descending colon, and sigmoid colon.

Caecum is the first part of the colon and is a pouch-like dilated portion that is blunt inferiorly and continues upwards as ascending colon. The small intestine opens into it and the opening is guarded by the ileocaecal valve. A small narrow tube about 7 cm in length is attached to the end of the caecum. This is known as the appendix. Its functions are not known.

The ascending colon is that part of the colon that continues from the caecum, passes upwards on the right side, and on reaching the liver bends to the left (hepatic flexure); to become the transverse colon.

The transverse colon passes across the abdominal cavity from hepatic flexure on right side to the splenic flexure on left side. At splenic flexure (near spleen) it bends downwards to become the descending colon.

The descending colon passes down the left side of the abdominal cavity and on reaching the left iliac region, it bends towards the right to enter into true pelvis.

The descending colon on reaching the true pelvis, curves like the letter 'S' and hence named as sigmoid colon, which continues downwards as rectum.

The four layers of tissues described in general plan are present in the large intestine. However, the longitudinal muscles in the muscle layer show typical arrangement. These muscles instead of forming a continuous layer, are arranged in three bands (0.5–0.6 mm

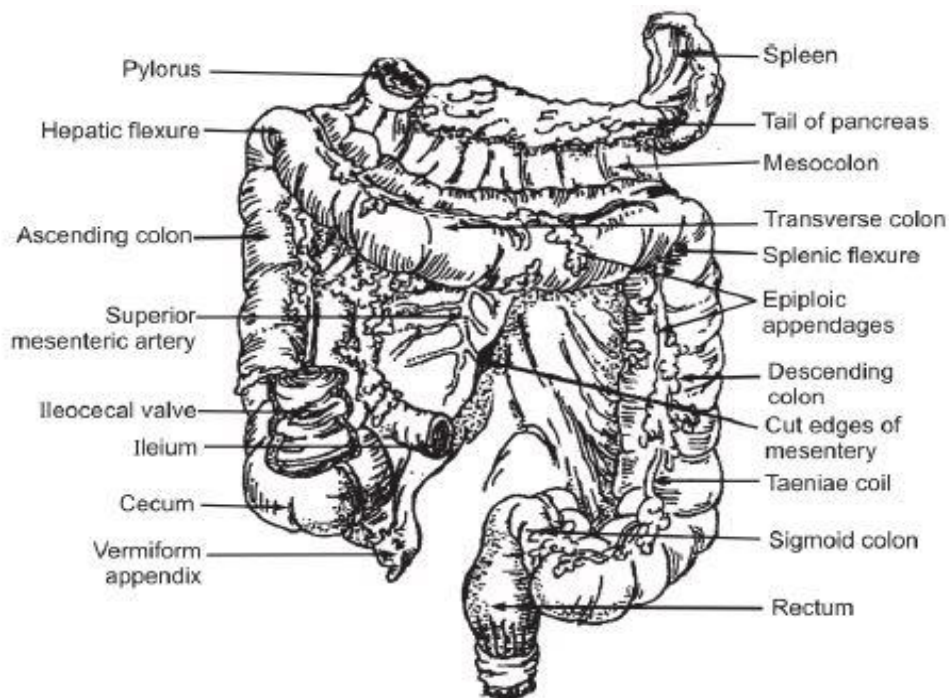
thick), called as taeniae coli. These are located at regular intervals around the colon and are about one sixth shorter in length than the rest of the colon. This gives a puckered appearance to the colon. Another modification is found in mucous layer where the circular folds and villi are absent. It contains large number of goblet cells that secrete mucous and solitary lymph nodules.

## FUNCTIONS OF LARGE INTESTINE

**Absorption of water:** The contents entering the large intestine at caecum are fluid inconsistency. Whereas the faeces are semi-solid which indicates that large amount of water is absorbed from large intestine. In addition, mineral salts and some drugs are also absorbed from large intestine.

**Microbial activity:** Large numbers of micro-organisms are found in the large intestine.

They include *E. coli*, *E. aerogenes*, *S. faecalis*, *C. welchii* etc. They synthesize Vitamin K and Folic acid.



Defecation: When food enters into the stomach, initiates a strong gastrocolic reflex.

In response to this reflex, a strong peristaltic movement starts in transverse colon forcing its contents into descending and pelvic colon and into the rectum. Entry of contents in rectum stimulates stretch receptors in its wall, initiating the nerve impulses. These impulses are conveyed to consciousness and urge to defecate. As external anal sphincter is under conscious control, defecation can be inhibited until such time as it is convenient to defecate.

Defecation involves strong peristaltic wave over the colon pushing the contents into the rectum, contraction of muscles of rectum, relaxation of internal anal sphincter and voluntary relaxation of external anal sphincter. Contraction of abdominal muscles and lowering of diaphragm increases the intra-abdominal pressure that helps the process of defecation.

<b>Small intestine</b>	<b>Large intestine</b>
1. It is longer and has small width.	1. It is shorter and has broad width.
2. It is in between the stomach and large intestine.	2. It is the last part of the digestive system.
3. It helps in digestion and absorption.	3. It helps in reabsorption of food and elimination of wastes.
4. It absorbs carbohydrates, proteins, fats, minerals and vitamins.	4. It absorbs water, nutrients and salts.
5. It has three parts - duodenum, jejunum and ileum.	5. It has four parts - caecum, colon, rectum and anal canal.

## RECTUM AND ANUS

Rectum is a small dilated tube continuous with the sigmoid colon above and to the anal canal below. It shows four layers of tissues as described in the general plan of the alimentary canal. The mucous membrane shows a large number of goblet cells which secrete mucus. The anal canal is about 03.8 cm long, and leads from the rectum to the exterior. There are two sphincters that control the opening of anus, the internal anal sphincter consisting of involuntary muscles and the external anal sphincter of voluntary muscles.