

# Large Intestine

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### ■ **FUNCTIONAL ANATOMY OF LARGE INTESTINE**

Large intestine or colon extends from ileocecal valve up to anus (Fig. 36.1).

### ■ **PARTS OF LARGE INTESTINE**

Large intestine is made up of the following parts:

1. Cecum with appendix
2. Ascending colon
3. Transverse colon
4. Descending colon
5. Sigmoid colon or pelvic colon
6. Rectum
7. Anal canal.

### ■ **STRUCTURE OF WALL OF LARGE INTESTINE**

Wall of large intestine is formed by four layers of structures like any other part of the gut.

1. *Serous layer*: It is formed by peritoneum
2. *Muscular layer*: Smooth muscles of large intestine are distributed in two layers, namely the outer longitudinal layer and inner circular layer. The longitudinal muscle fibers of large intestine are arranged in the form of three long bands called **tenia coli**. The length of the tenia coli is less when compared to the length of large intestine. Because of this, the large intestine is made into series of pouches called **haustra**

3. *Submucosa layer*: It is not well developed in large intestine
4. *Mucus layer*: The crypts of Leiberkühn are present in mucosa of large intestine. But the villi, which are present in mucus membrane of small intestine, are absent in the large intestine. Only mucus-secreting glands are present in the mucosa of large intestine.

### ■ SECRETIONS OF LARGE INTESTINE

Large intestinal juice is a watery fluid with pH of 8.0.

### ■ COMPOSITION OF LARGE INTESTINAL JUICE

Large intestinal juice contains 99.5% of water and 0.5% of solids (Fig. 42.1). Digestive enzymes are absent and concentration of bicarbonate is high in large intestinal juice.

### ■ FUNCTIONS OF LARGE INTESTINAL JUICE

#### Neutralization of Acids

Strong acids formed by bacterial action in large intestine are neutralized by the alkaline nature of large intestinal juice. The alkalinity of this juice is mainly due to the presence of large quantity of bicarbonate.

#### Lubrication Activity

Mucin present in the secretion of large intestine lubricates the mucosa of large intestine and the bowel contents, so that, the movement of bowel is facilitated.

Mucin also protects the mucus membrane of large intestine by preventing the damage caused by mechanical injury or chemical substances.

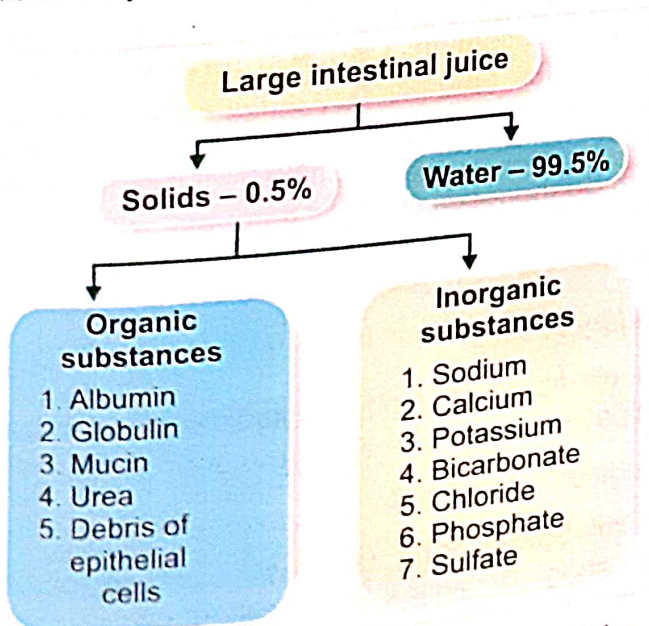


FIGURE 42.1: Composition of large intestinal juice

## ■ FUNCTIONS OF LARGE INTESTINE

### ■ 1. ABSORPTIVE FUNCTION

Large intestine plays an important role in the absorption of various substances such as:

- i. Water
- ii. Electrolytes
- iii. Organic substances like glucose
- iv. Alcohol
- v. Drugs like anesthetic agents, sedatives and steroids.

### ■ 2. FORMATION OF FECES

After the absorption of nutrients, water and other substances, the unwanted substances in the large intestine form feces. This is excreted out.

### ■ 3. EXCRETORY FUNCTION

Large intestine excretes heavy metals like mercury, lead, bismuth and arsenic through feces.

### ■ 4. SECRETORY FUNCTION

Large intestine secretes mucin and inorganic substances like chlorides and bicarbonates.

### ■ 5. SYNTHETIC FUNCTION

Bacterial flora of large intestine synthesizes folic acid, vitamin B12 and vitamin K. By this function, large intestine contributes in **erythropoietic activity** and blood clotting mechanism.

## ■ DIETARY FIBER

Dietary fiber or roughage is a group of food particles which pass through stomach and small intestine without being digested and reach the large intestine unchanged. Other nutritive substances of food are digested and absorbed before reaching large intestine.

Characteristic feature of dietary fiber is that it is not hydrolyzed by digestive enzymes. So, it escapes digestion in small intestine and passes to large intestine. It provides substrate for **microflora** of large intestine and increases the bacterial mass. The anaerobic bacteria, in turn, degrade the **fermentable components** of the fiber. Thus, in large intestine, some of the components of fiber are broken down and absorbed and remaining components are excreted through feces.



### Components of Dietary Fiber

Major components of dietary fiber are cellulose, hemicelluloses, D-glucans, pectin, lignin and gums. Cellulose, hemicelluloses and pectin are partially degradable, while other components are indigestible. Dietary fiber also contains minerals, antioxidants and other chemicals that are useful for health.

### Sources of Dietary Fiber

Sources of dietary fiber are fruits, vegetables, cereals, bread and wheat grain (particularly its outer layer).

### Significance of Dietary Fiber

Diet with high dietary fiber has health benefits since dietary fiber:

1. Delays emptying of stomach
2. Increases formation of bulk and soft feces and eases defecation
3. Contains substances such as antioxidants and other useful substances.

When high dietary fiber food is taken, other foods, which may cause some diseases may be decreased in quantity or completely excluded from diet. Diet with high fiber content tends to be low in energy and it may be useful in reducing the body weight. Some components of dietary fiber also reduce blood cholesterol level and thereby decrease the risk for **coronary heart disease** and **gallstones**.

Dietary fiber is suggested for treating or to prevent **constipation** and **bowel syndrome**. It is also useful in treatment of some disorders such as diabetics, cancer, ulcer, etc.

## ■ APPLIED PHYSIOLOGY

### ■ DIARRHEA

Diarrhea is the frequent and profuse discharge of intestinal contents in loose and fluid form. It occurs due to the increased movement of intestine. It may be acute or chronic.

#### Causes

Normally, when digested food passes through colon, large portion of fluid is absorbed and only a semisolid stool remains. In diarrhea, the fluid is not absorbed sufficiently, resulting in watery bowel discharge. Acute diarrhea may be caused by temporary problems like infection and chronic diarrhea may be due to disorders of intestinal mucosa. Thus, the general causes of diarrhea are:

1. **Dietary abuse:** Diarrhea is caused by intake of contaminated water or food, artificial sweeteners found in food, spicy food, etc.
2. **Food intolerance:** Acute diarrhea is caused mainly by indigestion of food substances, particularly lactose, a sugar present in milk and milk products may not be digested easily
3. **Infections by:**
  - i. Bacteria such as *Escherichia coli*, *Salmonella*, *Shigella*, etc.
  - ii. Viruses like rotavirus, hepatitis virus, etc.
  - iii. Parasites like *Entamoeba histolytica*, *Giardia lamblia*, etc.
4. **Reaction to medicines such as:**
  - i. Antibiotics
  - ii. Antihypertensive drugs
  - iii. Antacids containing magnesium
  - iv. Laxatives
5. **Intestinal diseases:** Chronic diarrhea occurs during inflammation of intestine, irritable bowel syndrome and abnormal motility of the intestine.

### Features

Severe diarrhea results in loss of excess water and electrolytes. This leads to **dehydration** and electrolyte imbalance. Chronic diarrhea results in **hypokalemia** and **metabolic acidosis**. Other features of diarrhea are abdominal pain, nausea and **bloating** (a condition in which the subject feels the abdomen full and tight due to excess intestinal gas).

### ■ CONSTIPATION

Failure of voiding of feces, which produces discomfort is known as constipation. It is due to the lack of movements necessary for defecation (Chapter 43). Due to the absence of mass movement in colon, feces remain in the large intestine for a long time, resulting in absorption of fluid. So the feces become hard and dry.

#### Causes

##### 1. Dietary causes

Lack of fiber or lack of liquids in diet causes constipation.

##### 2. Irregular bowel habit

Irregular bowel habit is most common cause for constipation. It causes constipation by inhibiting the normal defecation reflexes.

### 3. Spasm of sigmoid colon

Spasm in the sigmoid colon (**spastic colon**) prevents its motility, resulting in constipation.

### 4. Diseases

Constipation is common in many types of diseases.

### 5. Dysfunction of myenteric plexus in large intestine – megacolon

Megacolon is the condition characterized by distension and hypertrophy of colon, associated with constipation. It is caused by the absence or damage of ganglionic cells in myenteric plexus, which causes dysfunction of myenteric plexus. It leads to accumulation of large quantity of feces in colon. The colon is distended to a diameter of 4 to 5 inch. It also results in hypertrophy of colon. Congenital development of megacolon is called Hirschsprung disease.

### 6. Drugs

The drugs like diuretics, pain relievers (narcotics), antihypertensive drugs (calcium channel blockers), antiparkinson drugs, antidepressants and the anticonvulsants cause constipation.

## ■ APPENDICITIS

Inflammation of appendix is known as appendicitis. Appendix is a small, worm-like appendage, projecting from cecum of ascending colon. It is situated on the lower right side of the abdomen.

Appendix does not have any function in human beings. But, it can create major problems when diseased. Appendicitis can develop at any age. However, it is very common between 10 and 30 years of age.

### Causes

The cause for appendicitis is not known. It may occur by bacterial or viral infection. It also occurs during blockage of connection between appendix and large intestine by feces, foreign body or tumor.

### Features

1. Main symptom of appendicitis is the pain, which starts around the umbilicus and then spreads to the

lower right side of the abdomen. It becomes severe within 6 to 12 hours

2. Nausea
3. Vomiting
4. Constipation or diarrhea
5. Difficulty in passing gas
6. Low fever
7. Abdominal swelling
8. Loss of appetite.

If not treated immediately, the appendix may rupture and the inflammation will spread to the whole body, leading to severe complications, sometimes even death. Therefore, the treatment of appendicitis is considered as an emergency.

Usual standard treatment for appendicitis is **appendectomy** (surgical removal of appendix).

## ■ ULCERATIVE COLITIS

Ulcerative colitis is an inflammatory bowel disease (IBD), characterized by the inflammation and ulcerative aberrations in the wall of the large intestine. It is also known as **colitis** or **proctitis**. Rectum and lower part of the colon are commonly affected. Sometimes, the entire colon is affected.

Ulcerative colitis can occur at any age. More commonly, it affects people in the age group of 15 to 30 years. Rarely it affects 50 to 70 years old people.

### Cause

Exact cause for ulcerative colitis is not known. However, it is believed that the interaction between the immune system and viral or bacterial infection causes this disease.

### Features

1. Abdominal pain
2. Diarrhea with blood in the stools
3. Early fatigue
4. Loss of appetite and weight
5. Arthritis and osteoporosis
6. Eye inflammation
7. Liver diseases like hepatitis, cirrhosis, etc.
8. Skin rashes
9. Anemia.