

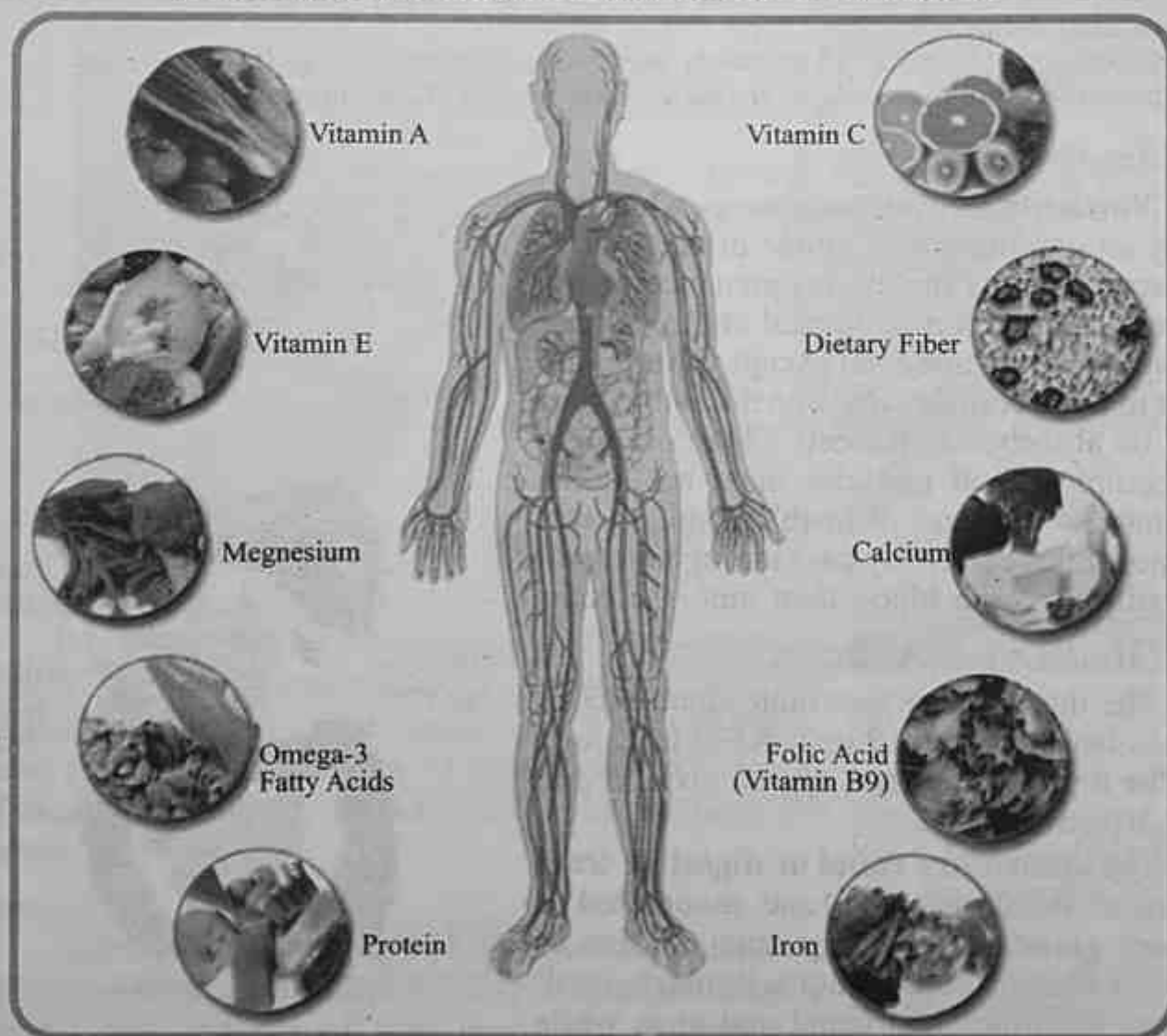
UNIT 11

DIGESTION

Major Concepts

- 11.1 Alimentary Canal; Structural and Functional Details
- 11.2 Role of Accessory Glands
- 11.3 Disorders of Digestive System.

SOME ESSENTIAL NUTRIENTS FOR YOUR BODY



Students Learning Outcomes

On completion of this unit students will be able to:

- Describe the mechanical and chemical digestion in oral cavity.
- Explain swallowing and peristalsis.
- Describe the structure of stomach and relate each component with the mechanical and chemical digestion in stomach.
- Explain the role of nervous system and gastrin hormone on the secretion of gastric juice.
- Describe the major actions carried out on food in the three regions of the small intestine.
- Explain the absorption of digested product from the small intestine lumen to the blood capillaries and lacteal of the villi.
- Describe the component part of large intestine with their respected roles.
- Correlate the involuntary reflex for egestion in infants and voluntary control to adults.
- Explain the storage and metabolic role of liver.
- Describe composition of bile and relate the constituents with respective role.
- Outline the structure of pancreas and explain its function as an exocrine gland.
- Relate the secretion of bile and pancreatic juice with the secretin hormone.
- Describe the causes, prevention, and treatment of the following disorders; ulcer, food poisoning, dyspepsia.
- Describe obesity in terms of its causes, preventions and related disorders.
- Explain the symptoms and treatments of bulimia nervosa and anorexia nervosa.

Introduction

Nutrients are food substances which are used by an organism as a source of energy and necessary elements for the maintenance of life and growth. The food is utilized at the cellular level, but most organic food except vitamins are present in large complex and non diffusible, thus cannot be absorbed in the cell. Therefore these large complex food particles must be broken down into simple and diffusible food, so that these molecules can easily pass through the wall of intestine into the blood then upto the cells.

11.1 Digestive System of Man

The digestive or gastrointestinal tract of human consists of about 9 meters (30 feet) long tube. The digestive system, can be divided into two main parts:

The **alimentary canal or digestive tract** or gastrointestinal tract (GIT) and **associated or accessory glands**. Alimentary canal consists of oral cavity, pharynx, oesophagus, stomach, small and large intestine, anal canal and anus while accessory glands are salivary glands, gastric

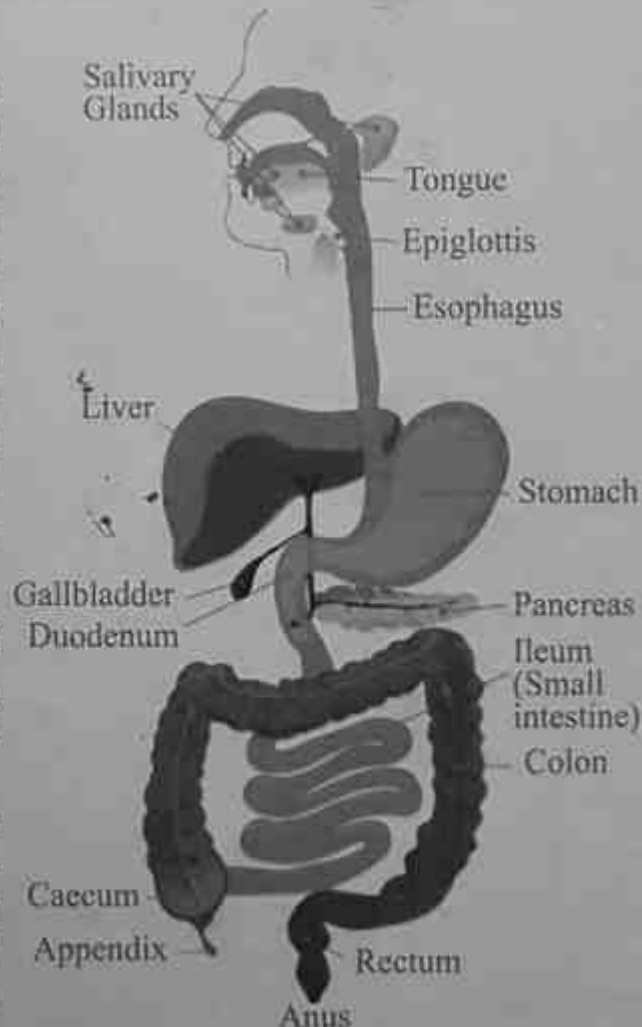


Fig. 11.1 Digestive system of man

glands, liver, pancreas and intestinal glands.

Entire alimentary canal consists of three main layers (tunics), an internal epithelium, mucosa and submucosa, muscular layers and external serosa.

Oral Cavity or Buccal Cavity:

The opening of oral cavity is mouth. The mouth is bounded by upper and lower lips. The oral cavity contains upper and lower jaws, palate, tongue and salivary glands. The salivary glands are present in three pairs, **sub lingual, sub mandibular and parotid glands**. These glands secrete saliva into the oral cavity. The tongue is muscular organ and is attached to the floor of oral cavity, it is freely movable and bears many taste buds. The roof of oral cavity is called **palate**, which is hard in anterior and soft at posterior.

Pharynx:

It is the posterior part of the oral cavity extended upto oesophagus and larynx, gives passage to air and food.

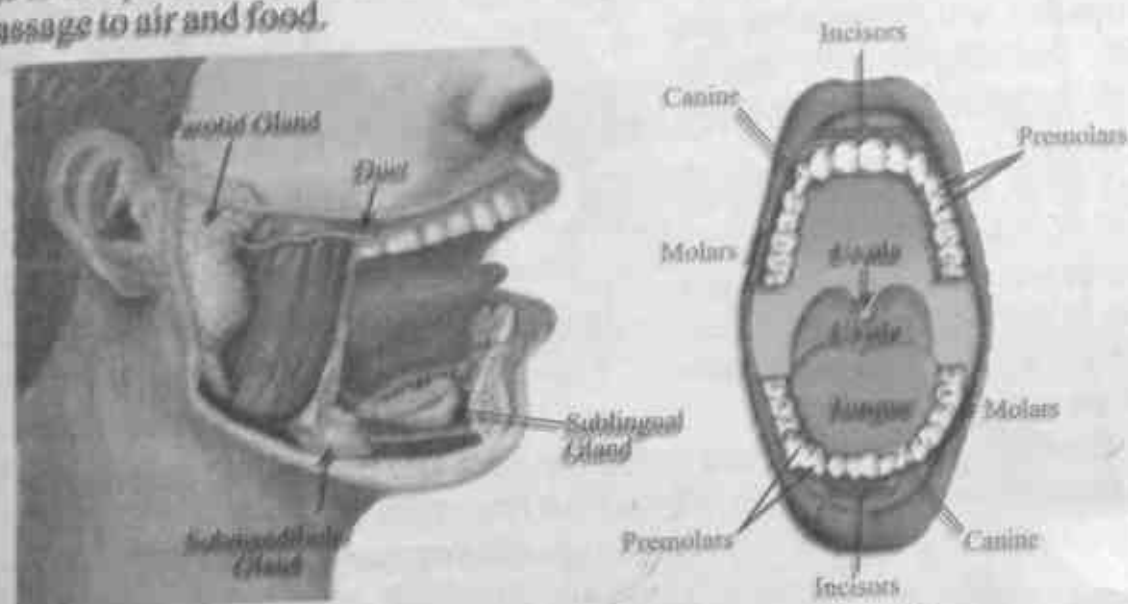


Fig. 11.2 Salivary glands and upper and lower jaws

Oesophagus: (means passage way).

It is a muscular tube which extends from pharynx to the neck, thorax and enters into the stomach through the oesophageal aperture of the diaphragm. The oesophagus shows characteristic waves of contraction known as peristalsis, which help to drive the food towards the stomach.

Stomach:

Stomach is widest part of digestive tract, located on left side of abdomen, below the diaphragm. It is roughly J-shaped and consists of four prominent regions i.e.,

Teeth:

Both jaws bear 32 permanent teeth (20 milk teeth), embedded in their sockets in the gums, teeth are of four types i.e., incisor 2/2, canine 1/1, premolar 2/2, and molar 3/3. Teeth help in grasping and grinding of food.

cardiac, fundus, body and pyloric regions. Cardiac sphincter (a ring type muscle) present at the cardiac end of stomach and oesophagus while pyloric sphincter at the opening of stomach into the duodenum both sphincter prevent backward flow of food.

Layers of stomach: The inner most layer of stomach is **epithelium** below it is **mucosa**, consists of connective tissues, rich in blood vessels, glands and nerves. Next to mucosa is **submucosa** having outer longitudinal muscles, inner circular and inner most oblique muscles. The contraction and relaxation of these muscles are responsible for grinding, churning and mixing of food with the help of enzymes in the stomach.

Serosa: It is the thin outermost layer which connects the stomach to the abdominal wall. The folds and wrinkles in the wall of the stomach are called **rugae**, which increases the surface area of the stomach.

The mucosal surface forms numerous tube like pits, called **gastric pits**. The pits are the opening for gastric glands, which have four types of cells.

a) **Zymogen or principal cells**, secrete gastric enzymes (pepsinogen).

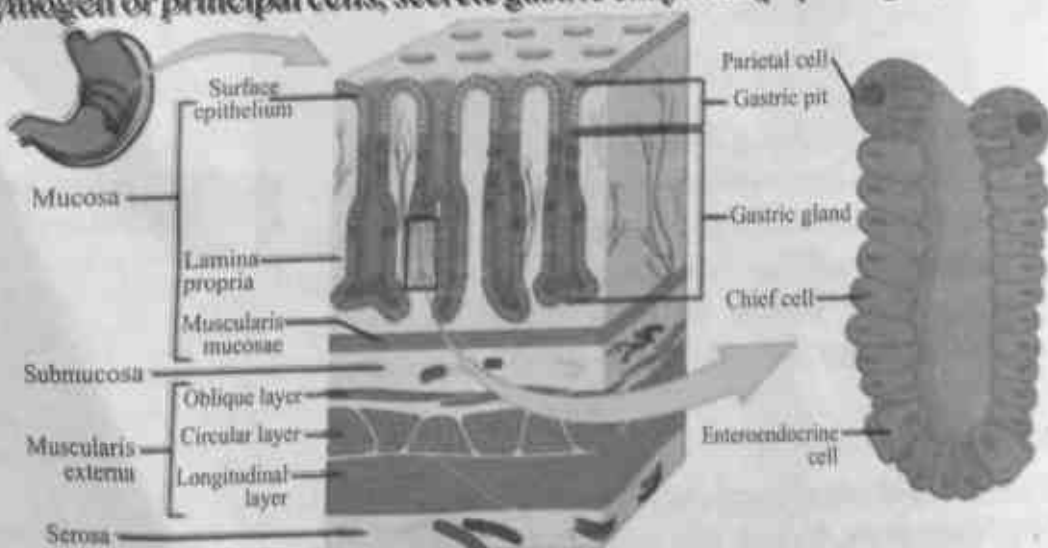


Fig. 11.4 Longitudinal section of stomach wall

Til bits

Tooth decay and Gum bleeding are very common human diseases. Make a list of their main causes and possible remedies of these diseases through the different sources available to you.

Oxyntic cell or parietal cells, secrete hydrochloric acid.
Goblet cells secrete protective mucus.
Endocrine cells secrete gastrin hormones.

Small intestine: Small intestine begins from end or pylorus of stomach, it is highly coiled tube about 6 to 7 meter long and about 2 to 4 cm in diameter. The small intestine consists of three parts, duodenum, jejunum and ileum.

Duodenum (Latin Twelve fingers breadth in length) is the first part of the small intestine, starts from pylorus of stomach and is "C" shaped, about 20 to 30 cm in length. It receives two alkaline fluids from liver and pancreas by a common duct called the **hepatopancreatic ampulla**.

Jejunum (Latin empty and hungry) is the second part of the small intestine, about 2.5 meter long.

Ileum (Latin twisted or coiled) is third part of small intestine, about four meter long. Ileum is highly convoluted and major part, where food is digested and absorbed. It contains **Brunner's gland** which produce intestinal juice. There is no clear cut demarcation between jejunum and ileum, except there is gradual decrease in the diameter of small intestine and thickness of its wall.

The internal lining of the small intestine is thrown into numerous finger like tiny projection called **villi** that increase the surface area for absorption of nutrients. Each villus contains blood capillaries, lacteal vessels covered with columnar epithelial cells and have mucus secreting goblet cells.

Tit bits

Appendicitis:

It is an inflammation of appendix, occur due to entrapping of undigested food, which on decomposition cause pain, thus must be removed through surgery before bursting.

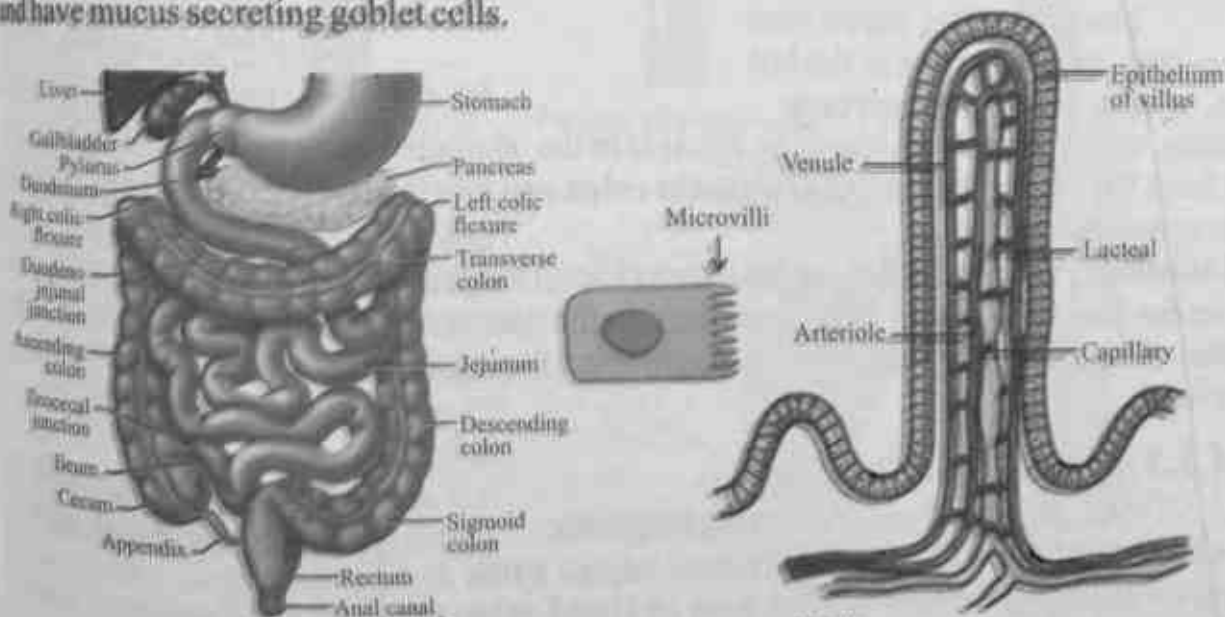


Fig. 11.5 Small, Large Intestine and Villus

There is **ileocecal sphincter** between ileum and caecum which prevent backward flow of undigested food from large intestine.

Large intestine: The large intestine is a wide tube which begins from the ileum of small intestine and ends to anus. It is about 2 meter long and divided into three parts i.e. caecum, colon and rectum.

Activity

How the large sized digestive tract is beneficial for human.

Humans are not carnivorous, still canines are present in their jaws can you guess why?

Tit bits

Antiperistalsis:

The reversal of peristalsis is called antiperistalsis which results in vomiting. The cause of this reversal is irritation in the oesophagus or stomach due to intake of toxic food.

Caecum: (Latin blind sac) It is a blind pouch, present between ileum and colon, extend about 6 cm behind the ileocecal junction, attached to the caecum a blind finger like projection known as vermiform appendix, which is non functional in man and about 10 cm long.

Colon: The colon is second part of large intestine, about 1.5 to 1.8 meter long and consists of four parts.

The ascending colon runs upwards and then runs to the left transversely is called **transverse colon**,

which goes down wards on left side of the abdomen known as **descending colon**. It form "S" shaped curve called **sigmoid colon** and join the last part of the large intestine known as rectum.

Rectum (L. rectus; straight) about 6 inch (15cm) long tube, runs straight downwards and join the anal canals (4cm long) and open to the external skin by a round opening called anus. The anus is guarded by two sphincter muscles (internal smooth and external striated).

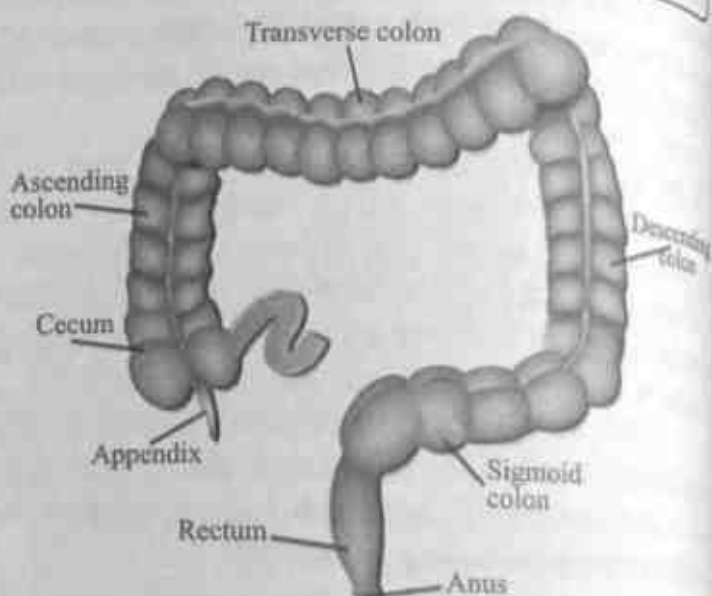


Fig. 11.6 Large intestine

11.1.2 Function of Oral Cavity

Oral cavity performs following functions:

Selection of food: First of all human beings smell and feel the food with the help of nose, eyes and hand, when the food enters the oral cavity it is tasted by tongue. The teeth and tongue help to find any hard object in the food e.g., piece of bone and stone.

Do you know?

A bolus (from Latin bolus = ball) is a ball like lump of food and saliva that forms in the mouth during the process of chewing.

Grinding of food: The food is chewed by ripping, crushing and grinding. These occur with the help of premolar and molar teeth, so can be easily passed through oesophagus and increase surface area for enzymatic action.

The salivary glands secrete mucus and saliva, mucus lubricates the food while sodium bicarbonate and other salts in the saliva are slightly antiseptic and kills the germs taken along with the food. It also maintains pH of food to alkaline level. The saliva also contain enzyme salivary amylase which digests the starch and glycogen, converts these into maltose.

Swallowing of food:

The semi digested and lubricated food arranged into small oval masses called bolus. The bolus are now pushed down into the pharynx and oesophagus by combined efforts of cheek muscles, floor of buccal cavity and tongue.

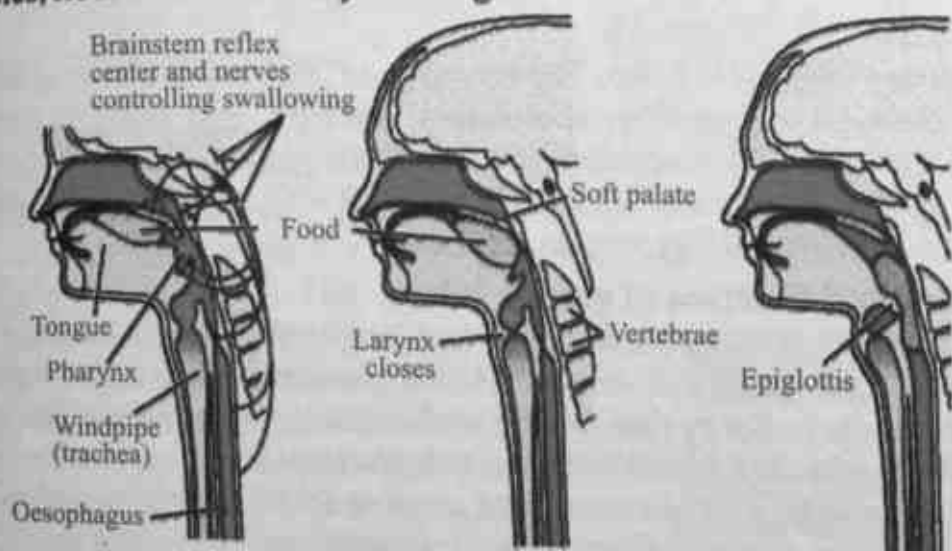


Fig. 11.7 Process of swallowing

Steps of swallowing:

- i) The tongue move upward and backward for forcing the bolus towards the pharynx.
- ii) The backward movement of the tongue pushes the soft palate up to close the nasal passage. At the same time the tongue forces the epiglottis into horizontal position to close the glottis.
- iii) Larynx move upwards under the back of tongue. The glottis is partly closed by the contraction of ring muscles.

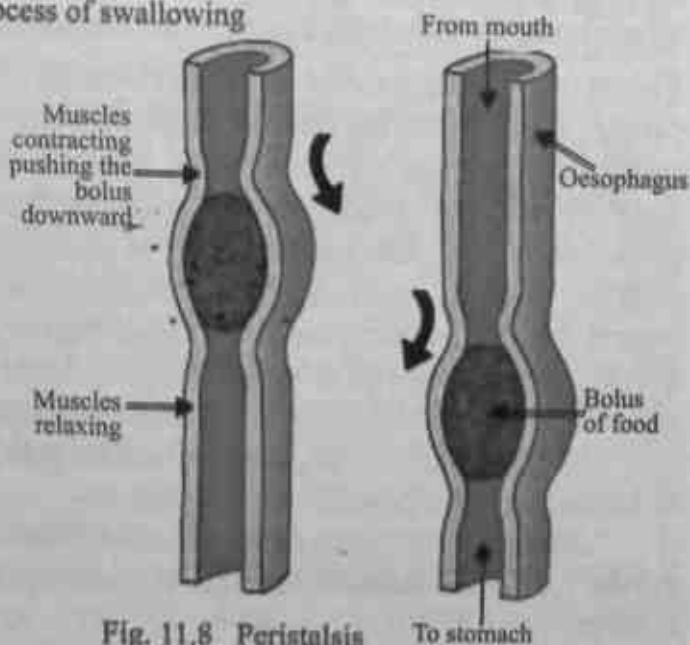


Fig. 11.8 Peristalsis

iv) The main muscles of pharynx contract and initiate peristalsis.

11.1.3 Function of Oesophagus

Oesophagus pushes the food from pharynx to stomach through the process of peristalsis, the salivary enzymes keep its action continue.

Peristalsis: (Gk. Peristaliskis; to wrap around)

It is the movement of the gut to move the food to lower side. It consists of waves of contraction of circular and longitudinal muscles, preceded by waves of relaxation in circular muscle behind the bolus contract and a mechanical pressure propels the food, the circular muscle is relaxed in front of the bolus, thus the bolus move forward. Then the next one contract while the first one relax and so on.

11.1.4 Function of Stomach

Secretion of gastric juice. The secretion of gastric juice from gastric gland is caused by chemical and nervous stimulation, the sight and smell of food is also a stimulus. In the oral cavity food stimulates the gastric gland by impulse, more juices are secreted by gastric gland when the food touches the wall of the stomach. Adult human produces about three liters of gastric juice per day.

Composition and function of gastric juice:

It consists of mucin, pepsin, HCl and renin. The **mucin** forms a protective covering around the inner wall of stomach and prevent it from acidic and enzymatic action. It also acts as buffer by reducing the acidic effects of gastric juice for some time, if this protecting mechanism fails, it causes ulcer in the stomach.

The enzyme **pepsin** is secreted as inactive form known as pepsinogen from zymogen cells of gastric gland. It is activated into pepsin when exposed to acidic medium of stomach. Pepsin breaks protein into polypeptides and dipeptides.

Gastrin: The endocrine cells of stomach secrete gastrin. If our food contains more protein than endocrine cells of stomach secrete gastrin, which diffuses in the blood and return back to the stomach again. Gastrin stimulates gastric glands to secrete large quantity of gastric juice. The **oxyntic cells** secrete **HCl** in high concentration form with pH of about 1.3, but the final pH of gastric juice of stomach becomes 2 to 3 due to dilution. Acidic environment of stomach stops the reaction of ptyalin, kill micro organisms in food, activate pepsinogen into pepsin, also control the opening and closing of **pyloric aperture** of stomach. Gastric Juice also contains **prorenin** (more in infants) which become active to renin by HCl, it coagulate the caseinogen, the soluble protein of milk into insoluble calcium salts of casein in the presence of calcium chloride ions which is then digested by pepsin.

The semi digested food of stomach becomes soupy mixture known as chyme. It passes to the duodenum through pyloric opening, when reaches a certain degree of acidity.

11.1.5 Function of Small Intestine

Most of digestion and absorption of nutrients occurs in small intestine. When food enters from stomach into duodenum, the acidity of food stimulates the pancreas and liver to secrete bile and pancreatic juices that are poured into the duodenum. The intestinal mucosa also secretes mucus and enzymes that remain associated with the intestinal epithelial surface. The mucus protects the intestinal wall from acidic chyme and digestive enzymes.

Pancreatic juice:

It is slightly alkaline with a pH-8 and neutralize the acidic chyme of, provides suitable medium for the action of digestive enzymes. The pancreatic juice contains, many enzymes such as pancreatic amylase which converts starch into maltose and glucose. **Trypsin** is also secreted as inactive **trypsinogen**, which is activated by enterokinase, secreted by the lining of duodenum. It breaks proteins into peptone and polypeptides. Sodium bicarbonate partly neutralizes the acidic chyme coming from the stomach. The digestion of lipids is initiated in small intestine, firstly **bile**, secretion of

liver emulsifies the fats then **lipase** secreted by pancreas digests lipid molecules. The primary products of this digestive process are free forms of fatty acids and glycerol. Phospholipids and cholesterol are also present in digested products. When lipid is digested in the intestine bile salts aggregate around the small droplets to form **micelles** (small morsel). The micelles passes by means of simple diffusion through epithelial lining of small intestine. In the intestinal epithelial cell, triacylglycerol is formed which become **chylomicrons** (lipoprotein) when mixed with proteins. The chylomicron leaves the epithelial cell and enters the lacteals of the lymphatic system within villi of intestine. From lymphatic system, it is poured in blood stream and before entering lipid storing tissues i.e., adipose tissues, triglyceride is broken down into fatty acids and glycerol. In adipose tissue these are again converted into triglycerol.

The peptone and polypeptide chains are broken down into **dipeptide**, amino acids by peptidase bound to the **microvilli** of small intestine, then enters the intestinal

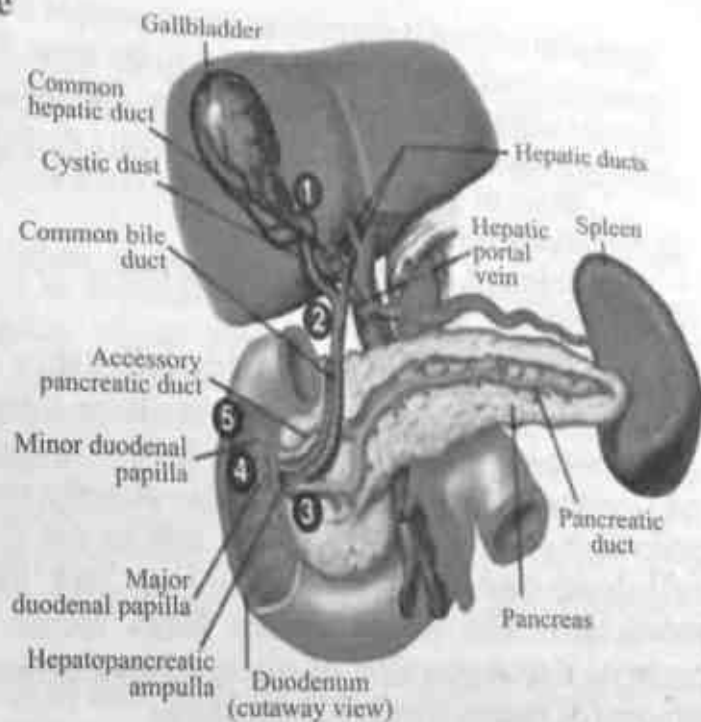


Fig. 11.9 Associated Glands of Digestive System

Do you know?

Chyle from Greek word *chylos* juice, means a milky body fluid consisting of lymph and emulsified fats formed in small intestine during digestion.

epithelial cells. All dipeptides are converted into amino acids before entering the hepatic portal system, which carries them to the liver. The amino acids are either modified in the liver or released in the blood stream and distributed to entire body cells where amino acids are used as building blocks to form new proteins or used for energy.

Most of the water is absorbed in the small intestine and about 6 to 7% is absorbed in the large intestine.

Calcium, potassium, magnesium, sodium and phosphorous ions are also actively transported.

11.1.6 Function of the Large Intestine

The material that reaches the large intestine contains water and dissolved salts along with waste and undigested food. Absorption of water and salts from the chyme takes place by large intestine. It also absorbs vitamin K and B. The remaining chyme is yellowish or brownish in colour due to the presence of bile pigments. It consists of cellulose bacteria, mucin, water and undigested substances. The odour of the feces comes from the bacterial decomposition of nitrogenous compounds. The removal of faeces is called defecation.

Movement in the large intestine takes place:

The peristaltic waves push the chyme into the ascending colon. Distention of the rectal wall due to deposition of feces acts as a stimulus that initiates the defecation reflex.

The external anal sphincter (composed of striated muscles) is consciously controlled, prevents the movement of feces out of the rectum and through the anal opening. If this sphincter is relaxed voluntarily, feces is expelled.

In infants, the defecation reflex is involuntary, (unconsciously controlled).

11.2 Function of Accessory Glands

Liver: Liver is the largest internal organ and gland of the body, dark red in color, situated on the right side of the abdomen below the diaphragm. It is bilobed, the right lobe is larger than the left lobe. Liver is formed of hepatic cells. A pear shaped, sac like structure called **gall bladder** lies along the right side of liver, where the secretion of liver called bile is stored temporarily. The hepatic ducts transport bile out of the liver. The right and left hepatic ducts unite to form a single common hepatic duct. The common hepatic duct is joined by the cystic duct to the gall bladder to form the common bile duct, which empties into the duodenum at the major **duodenal papilla** in union with the pancreatic duct.

Function of liver: The liver have many roles in the body such as digestive and excretory function. It stores and processes nutrients, synthesizes new molecules and detoxifies harmful substances.

Tit bits

Constipation:

Slow passage of wastes in large intestine results in hardening of faeces. This cause constipation.

Activity

Why it is advised not to drink water right after meal? give medical/scientific reason.

11.2.1 Composition of Bile

The secretion of liver is known as bile. It does not contain digestive enzymes, rather consists of water, bile salts, (sodium glycolate and sodium taurocholate) **bile pigment** (Bilirubin and biliverdin) **lecithin** (*Phospholipid*), cholesterol, mucus cells and cell debris.

Role of Bile:

It emulsify the fats into droplets to increase surface area for lipid digestive enzymes (**lipase**). It contains **bilirubin** which results from the breakdown of haemoglobin. In the intestine, bacteria convert bilirubin into urobilinogen which give brownish color to feces and yellowish color to urine when absorb again in blood stream. Bile salts help in the absorption of fatty acid from intestinal tract to circulatory system.

Role of secretin hormone to regulate secretion of bile:

The duodenal endocrine cells secrete an hormone known as **secretin**, poured in the circulatory system and carry to the liver and stimulates the secretion of bile juices. Its secretion depends on fats and acidity.

Storage Role of liver: The hepatocytes of liver with the help of insulin remove sugar from the blood and store in the form of glycogen. It also stores fats, Vitamins (A, B12, D, E and K), copper and iron. The stored substances are reused whenever needed thus storage function is usually short term.

Metabolic role of liver: Liver is involved in metabolism of glucose. It converts surplus glucose in the form of glycogen (**glycogenesis**), whenever glucose is needed it changes glycogen into glucose (**glucogenesis**). the amino acids, fatty acids, glycerol and lactic acid are also changed into glucose (**gluconeogenesis**).

- Liver cells denature the fatty acids and phosphorylate fats.
- Liver helps in the deamination of amino acids synthesize vitamin "A" from carotenoid and synthesis of albumin from amino acids.
- The formation of clotting proteins (prothrombin and fibrinogen) also occurs in it.
- It breaks RBCs after completion of 120 days life span. In embryo liver helps in formation of RBCs. (i.e., fetal RBCs).
- The bile pigments bilirubin and biliverdin are formed from break down of haemoglobin.
- Liver is the center of heat production (i.e., **geyser of body**).
- **Detoxification** of poisonous substances and formation of heparin which prevent clotting of blood inside blood vessels.

11.2.2 Pancreas (Sweet bread)

It is a soft gland, grayish pink in color, situated transversely beneath the stomach. It acts as both endocrine and exocrine gland. From the exocrine cells, a duct arises called pancreatic duct, which joins the common bile duct then together opens into the duodenum. The secretion of this gland is known as pancreatic juice.

- The endocrine part of the pancreas consists of pancreatic islets. (islets of

Langerhans) which mostly secrete insulin and glucagon hormone.

The secretion of pancreatic juice is related to secretin hormone:

The hormone secretin controls the exocrine secretions of pancreas, which maintain pH of chyme in the intestine, by secreting watery solution that contains a large amount of bicarbonate ions.

11.3 Some Common Diseases Related to Digestive System and Food Habits

Some common disorders of digestive tract are as under.

11.3.1 Dyspepsia

Incomplete digestion is called dyspepsia.

Symptoms: Abdominal discomfort due to over production of gas in the stomach is called **Flatulence** i.e., distension of stomach by gases formed during digestion. Other symptoms are **heart burn**, **nausea** (feeling of vomit) and vomiting.

Causes or reasons (Aetiology)

- Gastritis inflammation of lining of stomach.
- Excessive acidity in stomach.
- Alcohol and smoking.
- Insufficient quality and quantity of bile secretions.

Prevention and Treatment:

Avoid smoking, reduce body weight, use of light and easily digestible food, avoid alcohol, tea, fatty food, avoid over eating.

Antacid for heart burning, antibiotic can be used. Histamine blocking agents, which check acid production, stop non-steroid anti inflammatory drugs (NSAID) e.g., Aspirin while the stomach is empty.

11.3.2 Food poisoning

An acute illness caused by eating food containing toxic substances (contaminated food), occurs within 12-24 hours after eating.

Symptoms: vomiting, diarrhea (it is persistent loosening of bowels). It also causes abdominal pain, dizziness, fatigue, double vision, nausea, headache and dehydration.

Aetiology (Reasons):

This disease is due to intake of contaminated food which contains toxin, produced by certain bacteria, such as *Salmonella* and *Campylobacter*.

Human may develop food poisoning by taking the liquid from defrosting (remove ice) frozen meat contains *Salmonella* bacteria. It also contaminates the unpasteurized milk, egg and meat which are not cooked properly.

Prevention and treatment:

Use only freshly prepared hot food or thoroughly rewarmed food.

Do you know?

The persons with blood group "O" are more prone to peptic ulcer. It is also hereditary.

Physicians may treat water and salt deficiency which results from vomiting and diarrhea through oral rehydration solution (ORS).
Loperamide antibiotic therapy against any infection can also be advised.
The dishes and utensils should be washed before using.
Unwashed fruits, precooked food should be washed before handling.
Unsterilized water should not be used.

11.3.3 Obesity

When a person has over weight due to abnormal and excess body fat is called

obesity.

Symptoms: An obese person mostly suffers from:

- Hypertension (high blood pressure).
- Heart disease (coronary heart disease).
- Diabetes mellitus.
- Bone pain in knees, hips and joints due to over weight.
- Stomach disorders.
- Gall bladder diseases.

Aetiology or Cause: When people eat more than their need, then excess calories are stored in their bodies as fats, so they become obese. The fats are mostly stored in adipose tissues in the abdomen. Genetic tendency is also a factor. Disorder of the thyroid, pituitary and adrenal glands, emotional disturbances also cause obesity.

Adipose tissue: Surplus food is stored in the form of fat droplets in cytoplasm. The droplets join and form large globule of fat in the middle of cell pushing the nucleus one side. Groups of fat cells form adipose tissues around the kidney and under the skin.

Prevention and Treatment: Gradual reduction in the food, regular exercise also increase metabolic rate.

Related Disorders: Obesity is also the cause of diabetes mellitus, cardiovascular disease and stroke, angina, heart failure, arthritis and anemia, obesity shortens life span.

13.3.4 Anorexia Nervosa

(Gk. An; with out: orexic: longing; intense desire; Nervosa: nervous)

It is the loss of natural strong desire towards food due to the fear of becoming obese. Such a feeling is common in female between the ages of 12 to 21 years.

Symptoms: Loss of appetite, anorexic girl over estimate the size of her own body. They do not mature psychologically and are unable to face the challenges of puberty and emerging sexuality. The patient is mostly emotionally disturbed in making new friends or maturing sexual relation. The patient may be seen engaged in prolonged exercises.



Fig. 11.10 Anorexia Girl

They lose feminine (women) characteristics and the girls retreat (retire) into childlike state in which she feels safe.

Treatment: Psychiatric therapy is usually required to treat anorexia girls. They are fed through other route than alimentary canal i.e., intramuscularly or intravenously. The recovery of anorexia is very slow. It may take 2 to 4 years or more. Group and family therapy is applied to reduce depression.

11.3.5 Bulimia Nervosa: (Gk. Bulimia; bous, ox, limous, hunger) (Nervosa; nervous)

It is a neurotic disorder in older girls.

Symptoms and cause: Bouts (a spell) of excessive eating of fattening food of high calories followed by self-induced vomiting, fasting or purgatives i.e., making stomach empty with a laxative. This frequent vomiting and purging (purify) may cause physical effects including serum electrolytes imbalance and frequent recurring infections.

They develop ulcer due to regular use of laxatives.

Damage tooth enamel from acids in digestive fluids of vomits.

Treatment: the initial treatment of bulimics is to overcome the effects of weight loss and malnutrition, family therapy: antidepressant drugs can also be used. The patient should be admitted in hospital and treated under strict supervision.

11.3.6 Piles (Hemorrhoids)

Symptoms: painful masses of dilated, tortuous (full of twist and turns) and swollen vein in the anorectal (anus + rectum) mucosa. It causes itching and may bleed during bowel movement.

Causes:

- It may include prolonged constipation.
- During pregnancy.
- Liver disorder and gas of stomach and intestine.
- Fatty diet which cause gas.

Treatment:

- Improvement of the hygienic conditions.
- Use of food softeners such as roughage in food or laxative to prevent from constipation.
- The patients should not sit on hard seats.
- Hemorrhoids are also removed by surgery.

For your information

Giardiasis is a disease of small intestine caused by giardia. It is most common pathogenic parasite of human gastro-intestinal tract.

Can you guess?

What is peptic ulcer and what are its causes?

Activity

Stomach ulcer, food poisoning and dyspepsia are common digestive system disorders of our society. Make a list of main causes of these disorders and their preventions through your personal observations and by searching different reliable sources.

11.3.7 Ulcer

The sore (pain) in the stomach and duodenum is called ulcer or peptic ulcer. It is more in man than women.

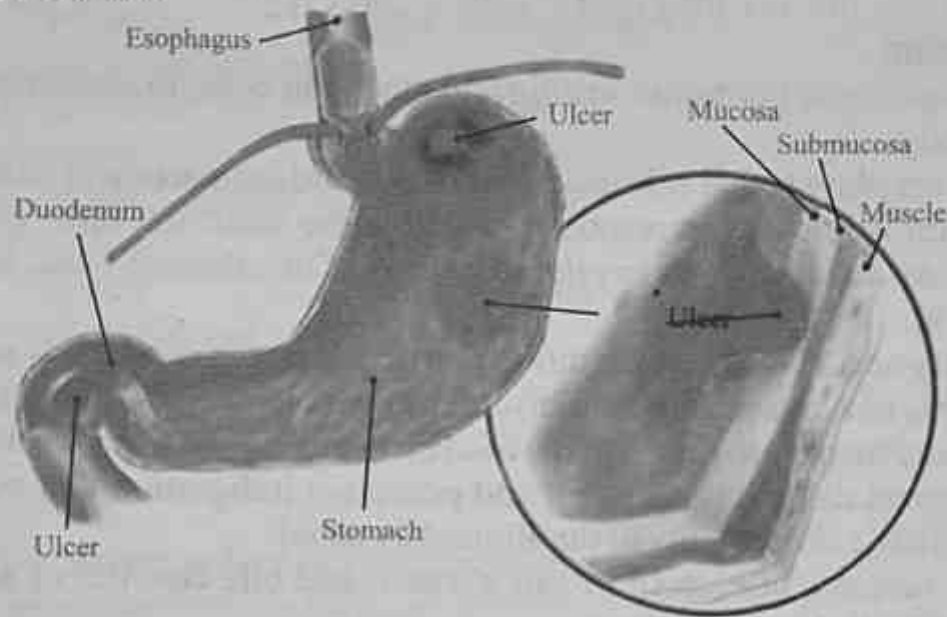


Fig. 11.10 Peptic Ulcer

Causes (Aetiology):

Break down of inner mucous layer of gastrointestinal tract by combine action of pepsin and HCl in the stomach cause peptic ulcer. Excessive alcohols. Stress, aspirin and anxiety (mentally troubled).

Helicobacter pylori bacterium is the most important factor in peptic ulcer.

Prevention and Treatment:

The patient should avoid spicy food and use simple food. Avoid excessive intake of tea and coffee.

The patient should also avoid from alcohol and smoking. Missing of meal are to be avoided. Antacids like milk and other drugs such as **cimetidine** reduce gastric secretions and help in healing ulcer. Sedative drugs help to reduce stress and tension. Vomiting relieves pain in gastric ulcer.

SUMMARY

- Digestion is the process by which polymers, large and complex food is broken down into monomers, small and simple food so the body can use them to build, nourish cells and to provide energy.

- Peristalsis occurs throughout the length of the digestive tract. It is responsible for keeping things moving, begins from esophagus.
- Stomach consists of four regions which are: the cardiac region, fundus, body and pylorus.
- Gastrin hormone controls the secretion of gastric juice. Protein containing food stimulates the endocrine cells of the stomach to secrete gastrin.
- The large intestine consists of three regions: the caecum, colon and rectum.
- Small intestine is a long tube consist of three regions i.e., the duodenum, jejunum and ileum.
- The pancreatic hormones insulin and glucagon helps to maintain glucose level in our body.
- The liver plays a vital role in detoxification and destruction of harmful substances.
- Secretin is released in response to acid in the small intestine, and stimulates the pancreas and bile ducts to release a flood of bicarbonate base, which neutralizes the acid.
- Obesity occurs when we eat more food or calories than our body uses up.
- Bulimia nervosa is an eating disorder in which a person may eat a lot of food at once and then try to get rid of the food by vomiting and using laxatives.
- Dyspepsia describes recurrent and persistent indigestion that occurs without an identifiable abnormality of the alimentary canal.
- Liver secretes bile, store in gall bladder, and bile consists of salts, cholesterol, bilirubin etc. but no enzymes.
- Liver is store house of vitamins like A, B12, D, E, K.
- There are three pairs of salivary glands in our oral cavity, which secrete mucus and saliva.
- Chief cell of stomach secretes non functional pepsinogen which is later converted into active protein digesting enzyme called pepsin.
- Gluconeogenesis is the process of converting fats, proteins and lactic acid into glucose.

EXERCISE

Section - I: Objective Questions.

Multiple Choice Questions

A. Select the best option.

1. The teeth adapted for tearing are called .
 (a) Incisor (b) Canine
 (c) Molar (d) Premolar
2. The opening from the oesophagus into stomach is called.
 (a) Cardiac opening (b) Pyloric opening
 (c) Stomach opening (d) Oesophagus opening

3. Which of the following enzyme is secreted by gastric gland?
 (a) Amylase (b) Lipase
 (c) Pepsin (d) Trypsin
4. Excess intake of carbohydrate causes.
 (a) Obesity (b) Piles
 (c) Dyspepsia (d) Bulimia nervosa
5. Fatty acid and glycerol are first absorbed by.
 (a) Lymph vessel (b) Villi
 (c) Capillaries (d) None of these
6. *Helicobacter pylori* causes
 (a) Peptic ulcer (b) Piles
 (c) Bulimia (d) Anorexia
7. Bile is the secretion of
 (a) Pancreas (b) Liver
 (c) Stomach (d) Intestine
8. Stomach consists of _____ parts
 (a) 5 (b) 4
 (c) 3 (d) 2

B. Fill in the blanks.

1. The premolars and molars are specialized for _____.
2. The enzyme present in saliva is called _____.
3. The oesophagus is about _____ long.
4. The outer most opening of stomach is called _____.
5. Lipase is a _____ digesting enzyme.
6. Chyme is turned into a watery emulsion called _____.
7. Secretin is hormone produced by _____.
8. The bilirubin is produced by the breakdown of _____ in liver.
9. *Salmonella* is a bacterium cause disease _____.
10. The enzyme trypsinogen is changed into trypsin by _____.

Section-II Short Questions.

1. Describe steps of swallowing.
2. Write the name of different layers of stomach.
3. List the enzymes of digestive system.
4. What are the hormones of digestive tract and their brief role?
5. What are the functions of bile?
6. Why some digestive enzymes are secreted in inactive form?
7. What are the symptoms and treatment of bulimia nervosa?
8. Write the aetiology of food poisoning, dyspepsia and obesity?

Section-III Extensive Questions.

1. What is the role of oral cavity in digestion of food?
2. Describe the structure of stomach?
3. Describe the structure of small intestine?
4. Explain the function of stomach?
5. Describe the structure and function of large intestine?
6. Explain the role of liver and pancreas in digestion?
7. Describe the importance of duodenum in digestive tract?