UNIT 9

DIGESTIVE SYSTEM

The system which consists of the structures associated with intake of food (ingestion), its digestion and absorption of digested food and finally removal of indigestible residue is known as digestive system.

Functions of Digestive System

The functions of digestive system include:

1. Ingestion or consumption of food substances and breakdown them into small particles.
2. Transport of small particles to different areas of digestive tract.
3. Secretion of several kinds of enzymes and other substances for digestion.
4. Digestion of food particles.
5. Absorption of digested products (nutrient materials).
6. Excretion of unwanted or harmful substances from the body.
7. Regulation of acid base balance.
8. Maintenance of water balance.

Organs/Parts of Digestive System

1. **Alimentary tract**
   - Mouth
   - Pharynx
   - Oesophagus
   - Stomach
   - Small intestine
   - Large intestine
   - Rectum
   - Anus
1. **Accessory organs**
   - Salivary Glands
   - Pancreas
   - Liver & Biliary tract
   - Gall bladder

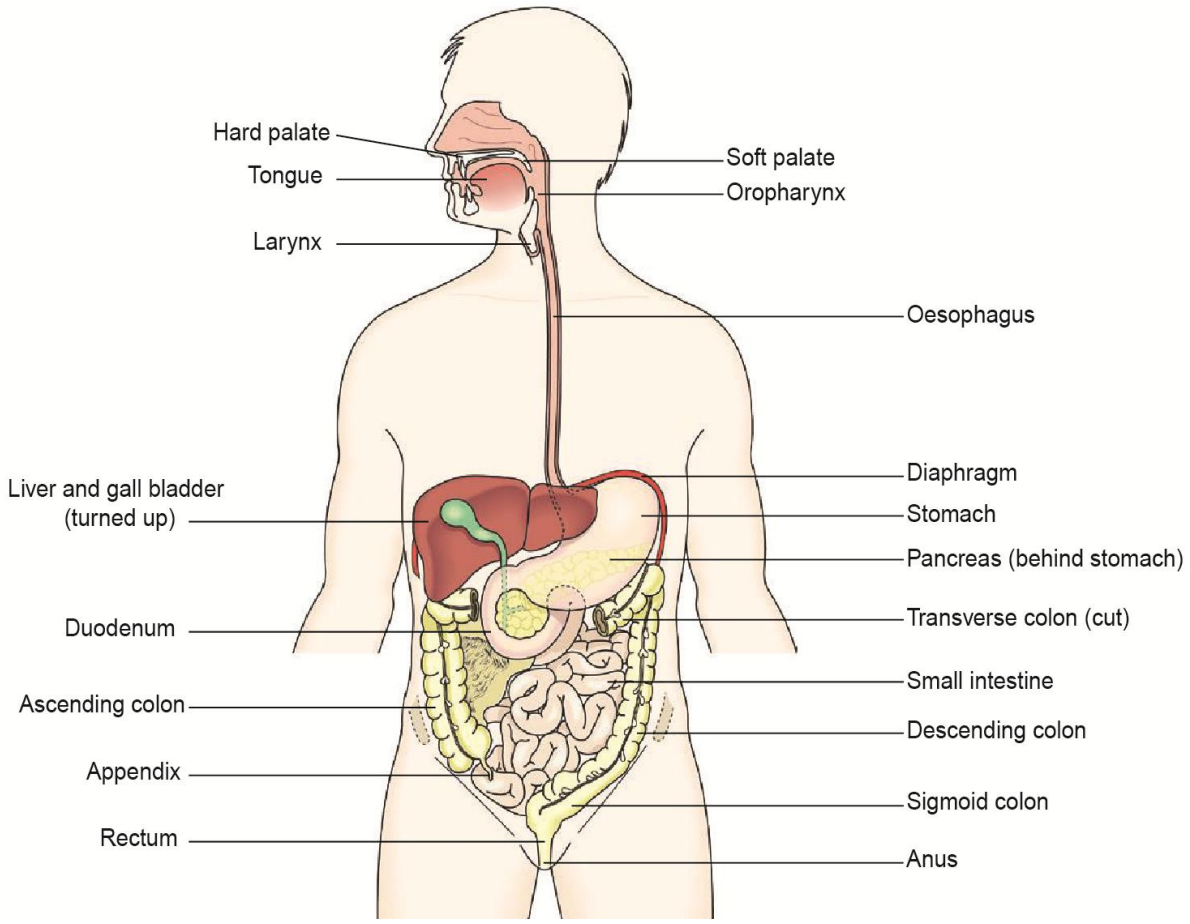


Fig. Organs of the digestive system

WALL OF GASTROINTESTINAL TRACT

In general, wall of the gastrointestinal tract is formed by four layers of tissue which are from inside out they are:

1. **Mucus layer**: Mucus layer is the innermost layer of the wall of gastrointestinal tract. It is also known as gastrointestinal mucosa or mucus membrane.
2. **Sub mucus layer (sub mucosa)**: Submucus layer is also present in all parts of GI tract, except the mouth and pharynx. It contains loose collagen fibers, elastic fibers, reticular fibers, few cells of connective tissue, blood vessels, lymphatic vessels and nerves.
3. **Muscular layer (muscle layer)**: Muscular layer in lips, cheeks and wall of pharynx contains skeletal muscle. The oesophagus has both skeletal and smooth muscles. The wall of the stomach and intestine is formed by smooth muscle.
4. **Serous or fibrous layer**: The outermost layer of the wall of alimentary canal is either serous or fibrous in nature.

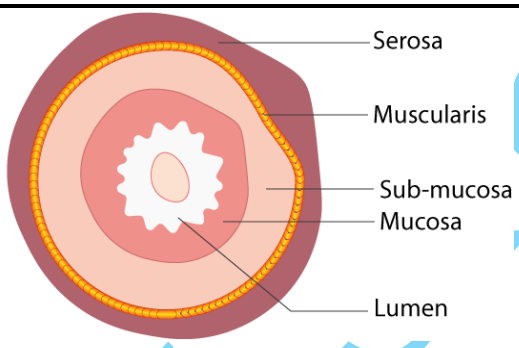


Fig. Structure of alimentary canal

PERITONEUM

Peritoneum is the serous membrane that lines the walls of the abdominal and pelvic cavities and clothes the abdominal and pelvic viscera. It is the largest serous membrane of the body.

Layers of Peritoneum

Peritoneum has two layers:

1. Parietal peritoneum: The parietal layer lines the anterior abdominal walls.
2. Visceral peritoneum: The visceral layer covers the organs (viscera) within the abdominal and pelvic cavities.

Peritoneal Cavity

The peritoneal cavity is a potential space between the parietal peritoneum and visceral peritoneum. It contains a small amount of serous fluid known as peritoneal fluid. The peritoneal fluid lubricates the visceral peritoneum and allows the mobile viscera to glide freely on the abdominal wall and each other within the limits dictated by their attachments.

MOUTH

Mouth is also known as buccal cavity or oral cavity. It extends from lips to the junction of oral cavity and oropharynx. The mouth is lined with mucous membrane consisting of stratified squamous containing small mucus secreting glands.

TONGUE

Tongue is a freely movable thick muscular (composed of voluntary muscle) organ covered by mucous membrane. It lies at the floor of mouth and base is attached to the hyoid bone. The superior surface of tongue consists of stratified squamous epithelium tissue with numerous papillae (little projections). These contain the taste buds that house the taste receptors (specialized sensory nerve ending).There are three different types of papillae present in the tongue.

- **Vallate papillae:** These are largest papillae usually 8 to10 in number. They are found on the base of the tongue.
- **Fungiform Papillae:** These are situated mainly at the tip and edge of the tongue.
- **Filiform papillae:** These are the smallest and most numerous than other papillae. They are situated at the side of the tongue.

Functions of Tongue

a. It helps in swallowing and chewing of food.
b. It plays a role in speech.
c. It helps to find the taste.
d. It acts as a brush to clean the teeth.

TEETH

The teeth develop in the sockets present in the alveolar processes of the mandible (forming lower jaw) and part of maxillary bone forming upper jaw.

Set of Teeth and Time of Eruption

There are two sets of teeth.

1. **Temporary (Deciduous or milk) teeth:** The temporary teeth comprise twenty (20) teeth (10 in each jaw). The eruption of milk teeth begins six (6) months after birth and is completed by the second year. They start shedding round about 6 to 7 years.
   Dental formula: In each half of a jaw, they are:
   - Incisor : 2
   - Canine : 1
   - Premolar : 0
   - Molar : 2

$$\frac{I_2C_1PM_0M_2}{I_2C_1PM_0M_2} \times 2 = 20$$

2. **Permanent teeth:** The permanent teeth begin to replace the deciduous teeth between the ages of 6 years. This dentition, consisting of 32 teeth, is usually completed by the age of 20 years.
   Dental formula: In each half of a jaw, they are:
   - Incisor : 2
   - Canine : 1
   - Premolar : 2
   - Molar :3

$$\frac{I_2C_1PM_2M_3}{I_2C_1PM_2M_3} \times 2 = 32$$

Parts of a Tooth

Each tooth has three parts:

- **Root:** The root consists of one to three fangs contained in the socket.
- **Crown:** crown is the part which projects beyond the level of gums.
- **Neck:** neck is the constricted portion between the root and crown.

Functions of Teeth

The functions of different teeth in chewing are:

1. Incisors provide strong cutting action.
2. Canines are responsible for tearing action.
3. Premolars and molars have grinding action.

SALIVARY GLANDS

The salivary glands are exocrine glands of the body. It is situated in the oral cavity. There are three pairs of salivary glands. These glands secrete saliva.

1. **Parotid glands:** Parotid glands are the largest salivary glands situated at the side of the face just below and in front of the ear.
2. **Submandibular glands:** Submandibular or submaxillary glands are located at the each side of the face under the angle of jaw.

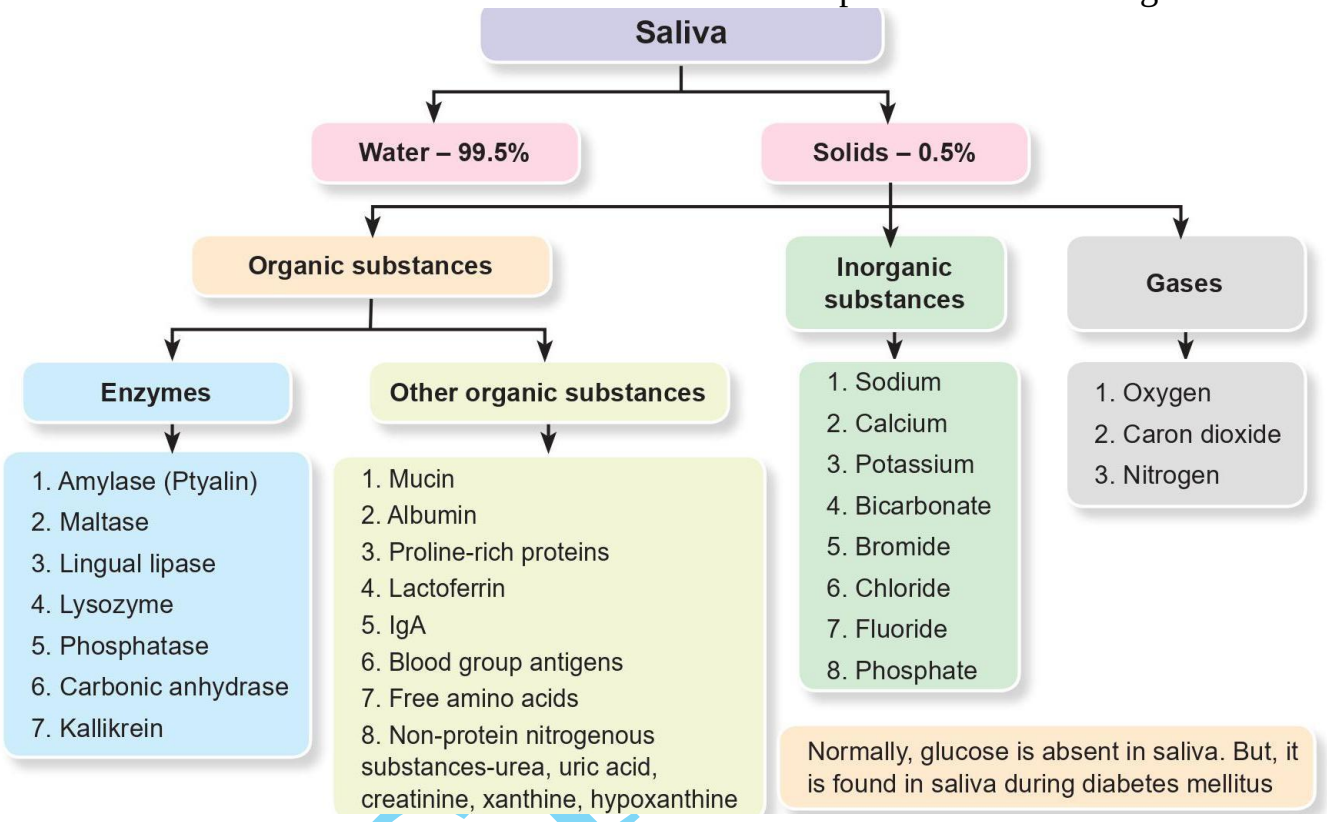
3. **Sublingual glands:** Sublingual glands are the smallest salivary glands situated in the mucosa at the floor of the mouth.

Saliva

Saliva is the viscous, colorless, cloudy fluids secreted by the salivary glands. 1 liter to 1.5 liter of saliva is produced daily and about 1ml /min.

Composition of Saliva

Mixed saliva contains 99.5 % water and 0.5 % solids. Composition of saliva is given below.



Functions of Saliva

1. **Digestive function:** Saliva contains many digestive enzymes such as salivary amylase, lingual lipase and maltase which help in digestion of carbohydrate and fats.
2. **Appreciation of taste:** Saliva acts as a solvent for many solid food particles, so it helps in distribution of food all over the tongue that helps in appreciation of taste.
3. **Preparation of food for swallowing:** When food is taken into the mouth, it is moistened and dissolved by saliva. The mucus membrane of mouth is also moistened by saliva.
4. **Excretory function:** Many organic and inorganic substances are excreted through the saliva such as mercury, lead and potassium iodide.
5. **Cleansing and protective functions:** Due to the constant secretion of saliva, the mouth and teeth are rinsed and kept free for food particles. Saliva contains some enzyme like lysozyme which helps in killing some bacteria.

PHARYNX

See the Unit: 8 (Respiratory System)

OESOPHAGUS

Oesophagus is a long, narrow, straight and fibro-muscular tube like structure. It is also known as food pipe or gullet. It is about 25(10 inch) long and 25 to 30 mm wide.

Position of Oesophagus

It lies in the median plane in the thorax in front of the vertebral column behind the trachea and the heart. It is continuous with the pharynx and just below the diaphragm it joins the stomach.

Structure of Oesophagus

The walls of oesophagus are composed of four layers which is interior to exterior are:

1. **Mucous layer (mucosa):** Mucous layer is formed by stratified squamous epithelium.
2. **Submucous layer (sub mucosa):** Submucous layer is formed by areolar tissue which serves to connect the mucus layer with the muscular layer and to carry the larger blood vessels and lymph vessels,
3. **Muscular layer (muscle layer):** The upper one -third of oesophagus is made up of skeletal muscle and lower tow-third of oesophagus is composed of smooth muscle.
4. **Fibrous layer (adventitia):** The fibrous layer of oesophagus is the outer layer of oesophagus, is made up of thin layer of fibrous tissue which is covers the muscular layer.

Functions of Oesophagus

1. It transports food from pharynx to stomach or acts as passage way.
2. It prevents the reflux of gastric contents.
3. It prevents the entry of air into stomach during respiration.

STOMACH

Stomach is the widest organ of the alimentary canal. It is hollow, bag like and J shaped structure. It is situated in the left side of abdominal cavity. It is about 25 cm in long.

Parts of Stomach

The stomach has four parts:

1. Cardiac region 2. Fundus 3. Body or corpus 4. Pyloric region

Curvatures of Stomach

The stomach has two curvatures:

1. Lesser curvature 2. Greater curvature

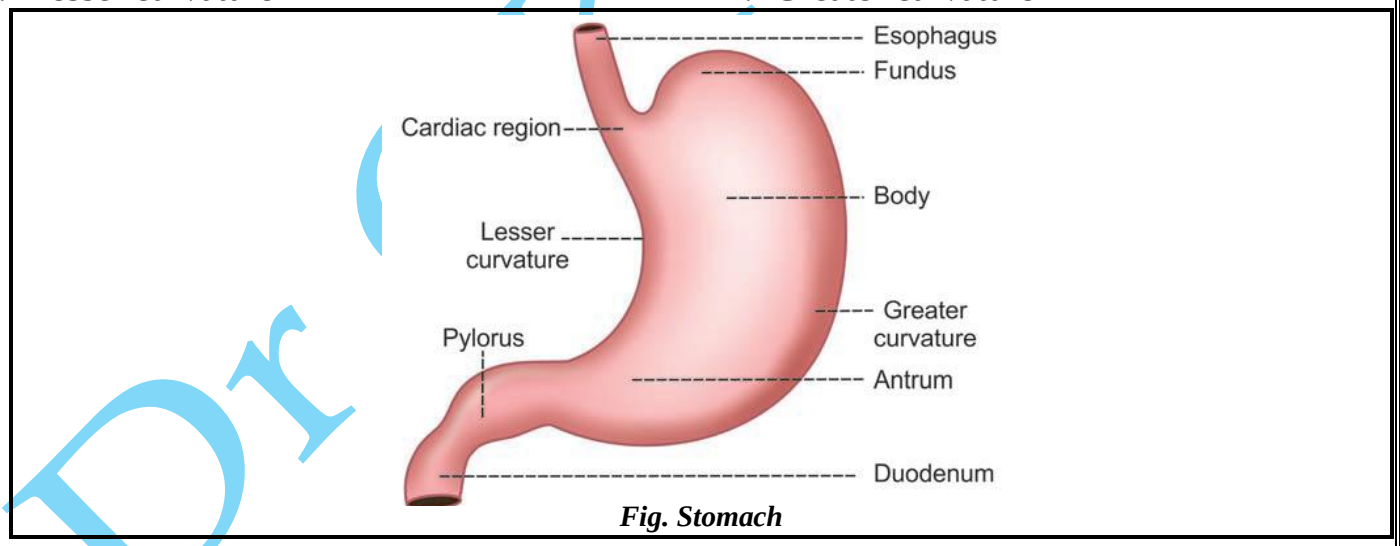


Fig. Stomach

Wall of Stomach

The stomach wall is formed by four layers of structures:

1. **Mucus layer (mucosa):** The mucus layer is inner layer of stomach wall. The mucus layer is formed by mucus-secreting columnar epithelial cells.
2. **Submucus layer (sub mucosa):** The submucus layer of stomach wall is formed by areolar tissue, blood vessels, lymph vessels and nerve fibers.
3. **Muscular layer (muscle layer):** The muscular layer of stomach wall is formed by three layers of smooth muscle fibers, namely outer longitudinal, middle circular and inner oblique layers.
4. **Serous layer (serosa):** The serous layer is outer layer of stomach wall. The serous layer is formed by peritoneum.

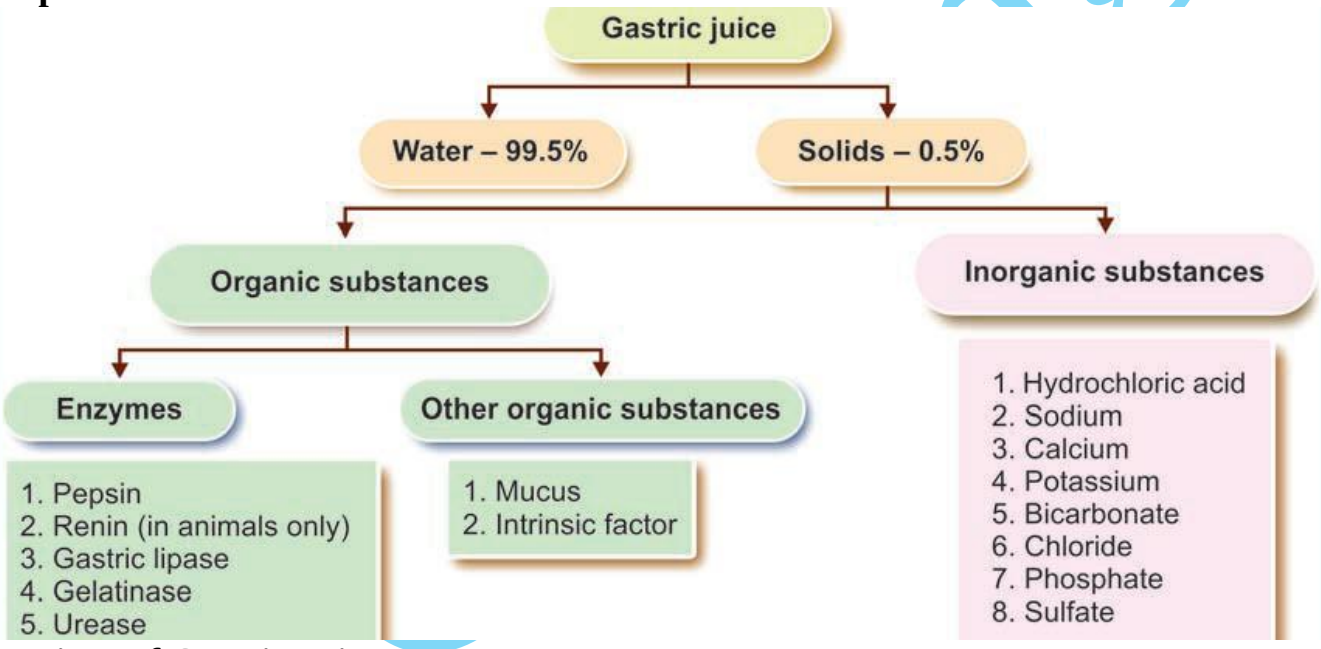
Functions of Stomach

1. **Storage Function:** Food is stored in the stomach for a long period, i.e. for 3 to 4 hours.
2. **Formation of chyme:** Stomach mixes the bolus with gastric juice and converts it into the semisolid material known as chyme.
3. **Digestive function:** Stomach contains many digestive enzymes which help in digestion of carbohydrate, proteins and fat.
4. **Protective function:** Mucus is secreted by gastric glands which protects the wall of stomach from acidic environment of hydrochloric acid (HCL).
5. **Haemopoietic functions**: Stomach secrets substances required for blood formation, which help in the process of blood cell formation.
6. **Excretory function:** Many substances like toxins, alkaloids and metals are excreted through gastric juice.

Gastric Juice

The secretion of gastric gland is known as gastric juice. It is the clear, watery, strongly acidic fluid.

Composition of Gastric Juice



Functions of Gastric Juice

1. **Digestive functions**:
   a. Pepsin is secreted as inactive pepsinogen. Pepsinogen is converted into pepsin by hydrochloric acid.
   b. Gastric amylase degrades starch (but its action is insignificant).
   c. Gastric lipase digests the butter fat.
2. **Haemopoietic function:** Intrinsic factor of Castle, secreted by parietal cells of gastric glands plays an important role in erythropoiesis.
3. **Protective function (functions of mucus):** Mucus protects the stomach wall from irritation or mechanical injury, by virtue of its high viscosity.
4. **Functions of hydrochloric acid(HCL)**
   a. HCL activates pepsinogen into pepsin.
   b. HCL kills some of the bacteria entering the stomach along with food substances.
   c. HCL provides acid medium, which is necessary for the action of hormones.

SMALL INTESTINE

Small intestine is a long, coiled, tube like organ. It is situated between the pyloric sphincter to stomach and ileocecal valve, which opens into large intestine. It is about 6m long.

Parts of Small Intestine

Small Intestine is divided into three parts:

1. **Duodenum:** It is small C- shaped and first part of small intestine, which joins the stomach.
2. **Jejunum:** It is the second part of small intestine, which lies between the duodenum and ileum. It is about 8 feet long.
3. **Ileum:** It is the last and longest part of small intestine. It is highly coiled part.

Structure of Small Intestine

Histologically, the wall of small intestine is made up of four layers which form within an outwards consists of:

1. **Mucous layer (mucosa):** Mucous layer is inner layer of small intestine covered by serous membrane known as mesentery.
2. **Sub mucous layer (sub mucosa):** Sub mucous layer is composed of areolar connective tissue, blood vessels, lymph vessels and nerves.
3. **Muscular layer (muscle layer):** Muscular layer is composed of longitudinal and circular smooth muscle fibers.
4. **Serous layer (serosa):** Serous layer is outer layer of small intestine composed of columnar epithelium tissue.

Functions of Small Intestine

1. **Mechanical function:** Small intestine help in the mixing of chyme with the digestive juices like succus entericus, pancreatic juice and bile.
2. **Secretory function:** Small intestine secretes succus entericus, enterokinase and the GI hormones.
3. **Hormonal function:** Small intestine secretes many GI hormones such as secretin, cholecystokinin, etc.
4. **Digestive function:** Small intestine completes the digestion of carbohydrate, protein and fat.
5. **Absorptive functions:** Small intestine absorbs nutrients.

LARGE INTESTINE

The large intestine is a "U" shaped and tube like organ. It is also known as colon. It extends from ileocecal valve up to anus. It is about 1.5 meter long.

Parts of Large Intestine

The large intestine consists of seven parts.

- Cecum with appendix Colon
- Ascending colon
- Transverse colon
- Descending colon
- Sigmoid colon or pelvic colon
- Rectum
- Anus

Structure of Large Intestine

Histologically, the wall of large intestine is made up of four layers which form within an outwards consists of:

1. **Mucous layer (mucosa):** Crypts of Lieberkuhn present in mucous layer of large intestine. Only mucus secreting glands are present in the mucosa of large intestine.
2. **Sub mucous layer (sub mucosa):** Sub mucous layer of large intestine is not well developed.
3. **Muscular layer (muscle layer):** Muscle layer consists of two layers of smooth muscles. The longitudinal muscles & circular muscles fibers. The longitudinal muscles fibers are collected into three bonds called taenia coil.

4. **Serous layer (serosa):** Serous layer is outer layer of large intestine formed by peritoneum.

Functions of Large Intestine

1. **Absorptive function:** Large intestine plays an important role in the absorption of various substances such as:
   - Water
   - Electrolytes
   - Organic substances like glucose
   - Alcohol
   - 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 B_{12} and vitamin K. By this function, large intestine contributes in erythropoietic activity and blood clotting mechanism.

PANCREAS

The pancreas is both, an exocrine and endocrine gland (mixed gland or heterocrine gland) of the body. It is pale, yellowish, grey gland or glandular organ in the digestive system. It is situated in the epigastric and left hypochondriac region of the abdominal cavity. It is about 60 to 90gm weight and about 12 to 15 cm long.

Structure of Pancreas

Histologically, the pancreas consists of two parts such as exocrine part and endocrine part.

1. **Exocrine part**: The exocrine part of pancreas consists of large number of pancreatic cells or acini, connective tissue, blood vessels. The pancreatic cell secretes pancreatic juice. The normal human secretes 500 to 800ml of pancreatic juice per day. The pancreatic juice consists of proteolytic enzyme, lipolytic enzyme, amylolitic enzyme.
2. **Endocrine part**: The endocrine part of the pancreas takes the form of many small clusters of cells known as islet of langerhans. The pancreas has about one million islets of langerhans. Each islet of langerhans consists of four types of cells such as:
   a. **Alpha cells (α cell):** It secretes glucagon hormone which increases the sugar level in blood.
   b. **Beta cells (β cells):** It secretes insulin hormone which converts excess glucose into glycogen in the liver and muscles. Deficiency of insulin causes diabetes mellitus.
   c. **Delta cells (δ cells):** It secretes somatostatin (ss) hormone which decreases the rate of nutrient absorption into the blood from GI tract. It also inhibits the secretion of growth hormone from the anterior lobe of pituitary gland.
   d. **Pancreatic polypeptide cells (PP-Cells or PF cells):** It secretes pancreatic polypeptide (PP) hormone which inhibits the release of pancreatic juice.

LIVER

Liver is the largest digestive gland of the body. It is situated in the upper right part of the abdominal cavity below the diaphragm and under the curve of lower ribs. It is reddish brown in colour .It generally weighs 1.3 to 1.8 kg (male) and 1.2 to 1.4 kg (female) which is about 2% of the body weight.

Lobes of Liver

Liver is divided into right and left lobe by the attachment of falciform ligament anteriorly and superiorly by the fissure for the ligamentum teres inferiorly and by the fissure for the ligamentum venosum posteriorly.

1. **Right lobe:** The right lobe is much larger than the left lobe and form 5/6 part of the liver. It contains caudate lobe in its posterior surface and quadrate lobe in its inferior surface.
2. **Left lobe:** The left lobe of the liver is much smaller than the right lobe form only 1/6 of the liver.

Surface of Liver

The liver has four surfaces:

1. Superior surface
2. Inferior surface
3. Anterior surface
4. Posterior surface

Structure of Liver

The liver consists of a large number of liver cells known as lobules. Each lobule has a central vein or intra lobular vein. The connective tissue lying in between the lobules contains the branches of:

- Portal vein
- Hepatic artery
- Bile duct

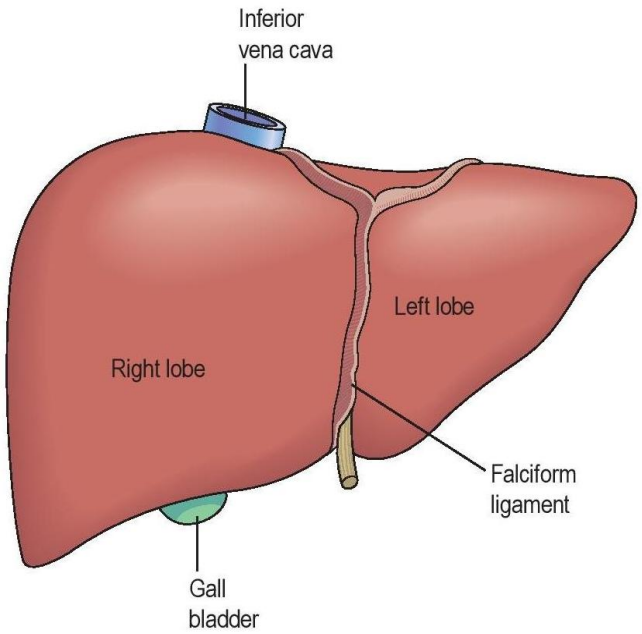


Fig: Anterior view of live

Functions of Liver

Liver is the largest gland and one of the vital organs of the body. It performs many vital metabolic and homeostatic functions, which are summarized below.

1. **Metabolic function:** Liver is the largest metabolic organ of the where the metabolism of carbohydrates, proteins and lipids takes place.
2. **Storage function:** Liver is the site for storage of glycogen, amino acids, iron, folic acid and vitamins A, D, E, K and B_{12} are stored in liver.
3. **Synthesis functions:** Liver produces glucose by gluconeogenesis (reverse process to form glucose). Liver also produces plasma proteins, some blood coagulation factors, enzymes such as alkaline phosphatase, serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), serum isocitrate dehydrogenase.
4. **Secretory function:** Liver secretes bile which helps in digestion of fat.
5. **Excretory function:** Liver excretes cholesterol, bile salts, heavy metals (like lead, arsenic and bismuth), toxins, bacteria and virus (like that of yellow fever) through bile.

6. **Heat production:** Enormous amount of heat is produced in the liver because of metabolic reactions. Liver is the organ where maximum heat is produced.
7. **Haemopoietic function:** In fetus (hepatic stage), liver produces the blood cells.
8. **Hemolytic function:** The senile red blood cells after a lifespan of 120 days are destroyed by kupffer cells of liver.
9. **Inactivation drugs:** Fat soluble drugs are converted into water soluble substances, which are excreted through bile or urine.
10. **Inactivation of hormones:** Liver catabolizes the hormones such as growth hormone, parathormone, cortisol, insulin, glucagon and estrogen.
11. **Detoxification and protective functions:** Liver helps in detoxification of substances by either complete degradation of toxic substance or by converting them into less toxic substance.
12. **Defensive function:** Liver contains kupffer cells which plays an important role in defense mechanism of the body by either phagocytosis or by producing the substance which activates the immune system.

GALL BLADDER

The gall bladder is a pear shaped sac like organ. It is attached to the posterior surface of the liver by connective tissue. The bile secreted from liver is stored in gall bladder. It is about 7 to 10cm long, 3cm wide & capacity of bladder is about 30 to 60ml.

Functions of Gall Bladder

1. It stores bile.
2. It absorbs water so that is 10 to 15 times more concentrated than liver bile.
3. It secretes mucin.
4. It maintains the pressure in biliary system

BILIARY SYSTEM/ BILIARY APPARATUS

Biliary system is also known as extrahepatic biliary apparatus. The biliary system is formed by gall bladder and extrahepatic bile ducts (bile ducts outside the liver). The right and left hepatic bile duct which comes out of liver join to form common hepatic duct. It unites with the cystic duct from gall bladder to form common bile duct.

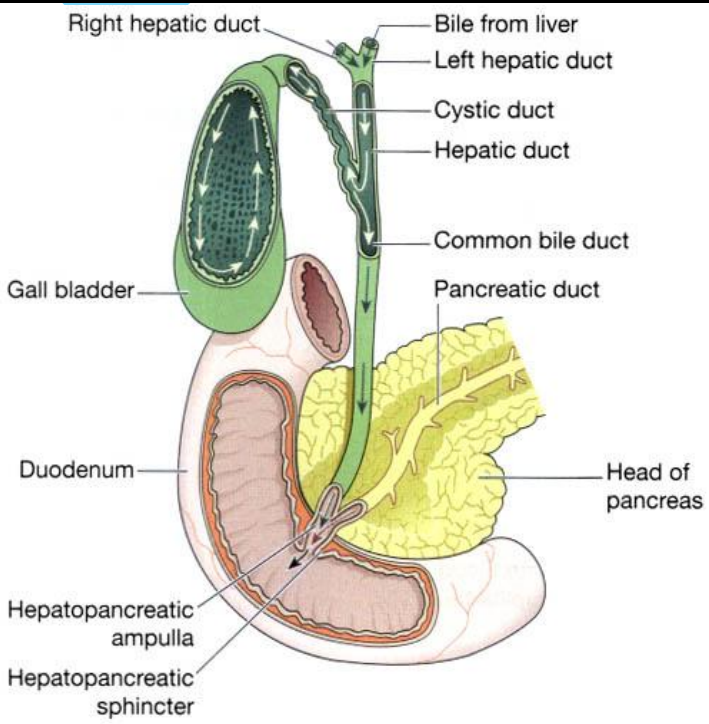


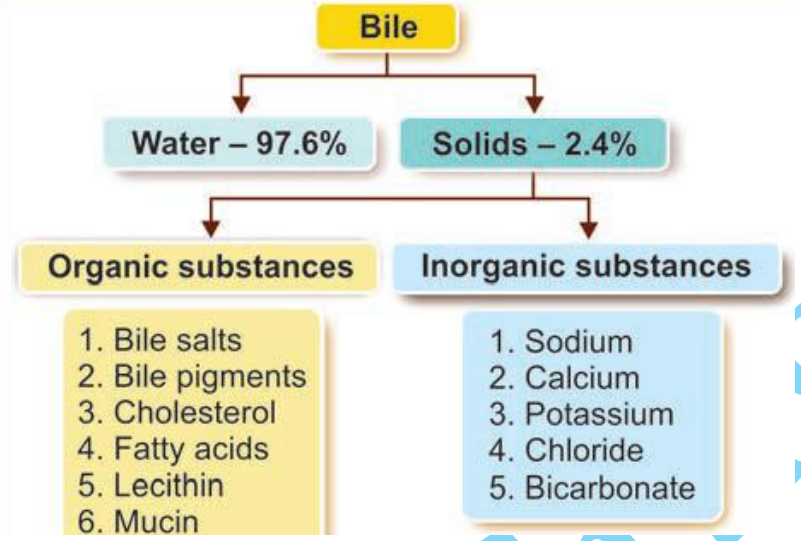
Fig. Biliary tract

BILE

The bile or gall is a bitter-tasting, dark green to yellowish brown fluid, produced by the liver.

Composition of bile

Bile contains 97.6 % of water and 2.4 % of solids. Solids are organic and inorganic substances. Composition of bile is given below.



Functions of bile

1. Bile helps in the absorption of digested fats from intestine into blood.
2. Bile excretes bile pigments, heavy metals like copper and iron, some bacteria like typhoid bacteria, some toxins, cholesterol, lecithin, alkaline phosphatase etc.
3. Bile acts as a laxative action by stimulating of peristalsis movements of the intestine.
4. Bile acts an antiseptic action by inhibits the growth of certain bacteria in the lumen of intestine.
5. Bile neutralizes the acid chyme, which enters the intestine from stomach. Thus an optimum pH is maintained for the action of digestive enzyme.
6. Bile prevents the formation of gall stone by keeping the cholesterol and lecithin in solution.
7. Bile acts a lubricant for the chyme in intestine.

DIGESTION

Digestion is the chemical complex process which changes complex food into simpler forms by the action of different chemical enzymes within the alimentary canal.

Types of Digestion

The digestion is of two types:

1. **Physical or mechanical digestion**: The large pieces of food that are ingested have to be broken into smaller particles in the mouth by the grinding action of teeth (chewing or mastication) are known as mechanical digestion.
2. **Chemical digestion**: The breakdown of food with the help of various digestive enzymes that take place in the mouth, stomach and small intestine is known as chemical digestion.

DIGESTION AND ABSORPTION OF CARBOHYDRATE

The digestion of carbohydrates begins in mouth, continues in stomach but occurs mainly (almost all) in the small intestine.

In mouth

Initial starch digestion start in the mouth by the salivary enzyme amylase (ptyalin) present in the saliva which is digests cooked starch to maltose.

$$\text{Starch (polysaccharide)} \xrightarrow{\text{Salivary amylase}} \text{Maltose (disaccharide)}$$

In stomach

Gastric juice contains a weak amylase which plays a minor role in digestion of carbohydrates.

In small intestine

In the small intestine the carbohydrates are digested by:

a. Pancreatic amylase

- The pancreatic amylase converts starch (polysaccharides) into dextrin and maltose

$$\text{Starch (polysaccharide)} \xrightarrow{\text{Pancreatic amylase}} \text{dextrin and maltose (disaccharides)}$$

b. Succus entericus

- The amylolytic enzymes present in the succus entericus are maltase, sucrase, lactase and dextrinase.
- Maltase, sucrase and lactase convert the disaccharides (maltose, sucrose and lactose) into two molecules of monosaccharides.

$$\text{Maltose} \xrightarrow{\text{Maltase}} \text{Glucose + Glucose}$$

$$\text{Sucrose} \xrightarrow{\text{Sucrase}} \text{Glucose + Fructose}$$

$$\text{Lactose} \xrightarrow{\text{Lactase}} \text{Glucose + Galactose}$$

End products of carbohydrates digestion

- The end products of carbohydrates are monosaccharides such as glucose, fructose and galactose.
- Glucose represents 80 % of the final product of carbohydrate digestion. Galactose and fructose represent the remaining 20 %.

Absorption of carbohydrates

Carbohydrates are absorbed from the small intestine in the form of monosaccharides (glucose, lactose and fructose).

DIGESTION AND ABSORPTION OF PROTEINS

Enzymes responsible for the digestion of proteins are known as proteolytic enzymes.

In mouth

Digestion of proteins does not occur in the mouth as there are no proteolytic enzymes in the saliva. Digestion of proteins begins in the stomach and completed in the small intestine.

In stomach

HCl converts pepsinogen into pepsin. Pepsin then converts proteins into polypeptides.

$$\text{Pepsinogen} \xrightarrow{\text{HCL}} \text{Pepsin}$$

$$\text{Protein} \xrightarrow{\text{Pepsin}} \text{proteoses peptones and polypeptides}$$

In small intestine

- Enterokinase converts chymotripsinogen and trypsinogen into chymotrypsin and trypsin.
- Chymotrypsin, trypsin and peptidase then convert polypeptides into tripeptides, dipeptides and amino acid.

$$\text{Polypeptides} \xrightarrow[\text{Pancreatic juice}]{\text{Trypsin/Chymotrypsin}} \text{Peptides}$$

$$\text{Peptidases} \xrightarrow{\text{Pipties}} \text{Amino acids (Absorbable)}$$

Ends products of proteins digestion

The protein digestion which starts in the stomach is completed in the enterocytes of small intestine. The end products of protein digestion are amino acids.

Absorption of proteins

Most proteins are absorbed as amino acids via active transport processes that occur mainly in the duodenum and jejunum.

DIGESTION AND ABSORPTION OF FATS

Fats are digested by lipolytic enzymes.

In mouth

No digestion

In stomach

No digestion

In intestine

- Bile from liver emulsifies fats. Pancreatic lipase converts fat into fatty acid and glycerol.
- In the enterocytes, lipase converts fat into fatty acid and glycerol.

$$\text{Fat} \xrightarrow[\text{(Bile salt)}]{\text{Bile}} \text{Emulsified fats}$$

$$\text{Emulsified Fat} \xrightarrow{\text{Lipase}} \text{Fatty acids + Glycerol (Absorbable)}$$

End products of fat digestion

Fatty acids, cholesterol and monoglycerides are the final products of lipid digestion.

Absorption of Fats

Monoglycerides, cholesterol and fatty acids from the micelles enter the cells of intestinal mucosa by simple diffusion.

DIGESTIVE SYSTEM
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