

## **The Digestive System**

Is a tubular system extends from the oral cavity to the rectum, it is responsible for ingestion the food materials, mastication of it in the mouth cavity, deglutition it through the pharynx and esophagus, digestion of it in the stomach, absorption of its extracts in the small intestine and elimination of the indigestible materials through the large intestine outside the body via anal canal.

The digestive system is consisting of:

- .1 Mouth cavity**
- .2 Pharynx**
- .3 Esophagus**
- .4 Stomach**
- .5 Duodenum**
- .6 Jejunum**
- .7 Ileum**
- .8 Cecum**
- .9 Colon**
- .10 Rectum**
- .11 Anal canal**

The digestive system have accessory structures and glands assist in the mastication of food and others secretion of enzymes , others for metabolism the food materials

- .1 Teeth**
- .2 Tongue**
- .3 Salivary glands**
- .4 Liver and gall bladder**

## **.5 Pancreas**

### **.1 The Mouth Cavity:**

Is the first part which the food intake inside it, it is bounded superiorly by the hard palate, inferiorly by the tongue, laterally by the cheeks and teeth, posteriorly by the oropharynx, anteriorly by lips and teeth.

**The Tongue:** Is muscular structure of skeletal muscle, covered by mucus membrane with papillae. The inferior surface of tongue is smooth.

**The papillae are two types:**

- A. Mechanical papillae, for capturing of food intake.**
- B. Chemical papillae, for giving the taste of food, acid, bitter, salty or sweet, by presence of taste buds in these papillae.**
  - **The mechanical papillae are called Filiform papillae.**
  - **The chemical papillae are called Fungiform, Foliate and Circumvallate papillae.**
    - **Fungiform are mushroom like with taste buds.**
    - **Foliate are leave-like with taste buds.**
    - **Circumvallate are cup-like with taste buds.**

**The Taste Buds:** is formed by long-sensory cells with hair and axons, and supporting cells around with basal cells (germinal cells) in the base of bud to replace the upper both types of cells.

**The tongue is formed by skeletal muscle fibers extend in three directions:**

- A. Longitudinal**
- B. Horizontal**
- C. Vertical**

**And in between, there is minor salivary glands.**

The salivary glands secrete watery materials to lubricate the surface of tongue and remove the food particles from the surface of the tongue after tasting it by taste buds of the chemical papillae.

The teeth in the mouth: are responsible of capture of food and cut of it. The teeth are two sets:

- A. Mandibular (lower teeth) of jaw
- B. Maxillary (upper teeth) of jaw

The teeth are:

Incisors , Canines, Premolar and Molar

And in the first stage of life, the teeth are deciduous and after that transform into permanent.

The salivary glands in the head: are three major types:

- A. Parotid salivary gland
- B. Submandibular salivary glands
- C. Sublingual salivary glands

The other glands are minor include:

- A. Labial salivary glands
- B. Lingual salivary glands
- C. Buccal salivary glands

The major salivary glands are consisting of mucus and serous acini with pyramidal cells in these acini , these are surrounding by capsule.

The salivary glands have many ducts to convey the secretion to the oral cavity, these are :

- A. Intralobular ducts

**B. Interlobular ducts**

**C. Intercalated ducts**

**D. Interlobular ducts**

**E. Striated ducts**

**F. Main salivary duct**

These ducts are collecting the saliva and drain it in one main duct to the oral cavity.

The minor salivary glands are not surrounded by capsule and have no main duct and acini of the gland are few and the secretion is little in compare with major salivary glands. These glands are located in between other tissues like tongue, lips.

**.2 The Esophagus:**

The structure is tubular formed by four layers:

**A. Mucosa**

**B. Sub mucosa**

**C. Muscular layer**

**D. Tunica adventitia**

**Mucosa:** is formed by stratified squamous epithelium resting on basement membrane, and lamina propria engorged with mucosal esophageal glands, and muscularis mucosa of smooth muscle fibers located between the lamina properia and submucosa.

**Sub mucosa:** is formed by C-T with blood vessels and nerves.

**Muscular layer:** is formed by muscle fibers.

- **The first third of esophagus (upper third) is formed by skeletal muscle fibers arranged inner longitudinal and outer circular.**

- The middle third is formed by mixed smooth muscle fibers and skeletal fibers.
- The lower or posterior third is formed only by smooth muscle fibers which is connected with stomach.
- The outer layer of esophagus is covered by delicate C-T formed by elastic fibers and collagen bundles with the presence of the blood vessels and nerves (sympathetic and parasympathetic.)

The connection of the esophagus with stomach is by cardiac region through cardiac sphincter.

### The Stomach:

The wall of the stomach is formed by four layers:

- .1 Tunica mucosa
- .2 Tunica sub mucosa
- .3 Tunica muscularis
- .4 Tunica serosa

Tunica mucosa: is formed by:

- A. Epithelial cells
- B. Lamina propria
- C. Muscularis mucosa

The epithelial cells are many types for protection and secretion.

- Simple columnar epithelium for protection
- Mucus neck cells for secretion of mucus
- Parietal cells for secretion of HCL.
- Chief or main cells for secretion of pepsinogen

The lamina propria is formed by C-T with blood vessels and nerves and embedded with gastric glands which mentioned below.

The muscularis mucosa are small bundles of smooth muscle cells.

Sub mucosa: is C-T containing blood vessels, lymph and nerves.

Tunica muscularis: is formed by three coats of smooth muscle fibers:

- A. Inner oblique
- B. Middle circular
- C. Outer longitudinal

In between C-T and B-V

Tunica serosa: is formed by loose C-T covered with simple squamous cells, and the C-T containing blood vessels and nerves.

The Small Intestine:

Is formed by four layers like stomach and have the mucosa have intestinal villi for absorption of food materials and water.

The small intestine is formed by:

- A. Duodenum
- B. Jejunum
- C. Ileum

- The mucosa arranged in form of villi have simple columnar epithelium covered with microvilli.
- The lamina propria have intestinal glands (mucus glands) Crypt of Luberkuhen.
- The sub mucosa of duodenum have Brunner's glands of mucus secretion.

- The muscular coat is formed by:
  - o Inner circular
  - o Outer longitudinal
- Serosa have C-T with B-V and nerves.
- The jejunum have tall villi like fingers and have no Brunner's glands.
- The ileum have lymphatic nodules in the lamina propria called Peyer's patches which are not present in the jejunum and duodenum.
- Other features are present in whole segments of small intestine.

**The Large Intestine (cecum and colon):**

Have four tunics or coats like small intestine, but here there is no villi, and the epithelium have numerous goblet cells (mucus cells) and the lamina propria is engorged with intestinal mucus gland. (Goblet cells are numerous in between simple columnar epithelium more than in the small intestine)

**Liver:**

Is formed by liver cells in the form of cords to be forming hepatic lobule, in the center of each lobule, there is central vein, in the periphery of each lobule, there is portal area, formed by:

- .1 Branch of portal vein.
- .2 Branch of hepatic artery.
- .3 Branch of bile duct.

In between liver cells, there is sinusoids for passing the blood of hepatic artery which containing the oxygenated blood and blood from portal vein which have nutrition from small intestine, then collect in the central vein to pass outside the liver through hepatic vein to the heart via vena cava.

The sinusoids also have Kupffer cells which are macrophages.

**Pancreas:**

**Is formed by two portions:**

- .1 Exocrine portion**
- .2 Endocrine portion**

The exocrine portion is formed by Acini for secretion of enzymes pass through ducts to the duodenum, these ducts are:

- A. Intercalated duct**
- B. Intra lobular duct**
- C. Inter lobular duct**
- D. Main duct (straightened duct)**

The endocrine portion is formed by langerhan's islets for secretion of insulin from B-cells, glucose through alpha-cells and somatostatin through C-cells.