



# NEET Biology

## Short Notes

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Digestive system and digestive glands is an important topic from the unit Human Physiology for NEET 2019. The article will help you in the preparation of AIIMS and NEET as well as other medical entrance examination. This article contains important concepts related to the digestive system and digestive glands from Human physiology.

### Digestive system and digestive glands

The process by which complex food substances are broken into simpler forms is called **digestion**, which is carried out by our digestive system through mechanical and biochemical methods.

**Various types of Nutrients in food-** Nutrients may be organic or inorganic and are of 2 types-

Macronutrients	Micronutrients
1. They include organic constituents such as carbohydrates, proteins, lipids, and vitamins.	1. They include inorganic constituents such as minerals, vitamins and water.
2. Also known as <b>proximate principles of food</b> because they are energy sources and used in the production of heat and different organic functions.	2. Also known as <b>protective principles of food</b> as they do not provide any energy but their deficiencies can lead to certain abnormalities and deficiencies in man.
	3. <b>Major macro-elements</b> are sodium, potassium, calcium, sulphur, phosphorus, magnesium and chloride required in large amounts.  <b>Trace micro-elements</b> are iron, iodine, zinc, manganese, cobalt, copper, molybdenum etc.

### Digestive system:

Consists of Alimentary canal and digestive glands.

**I. Alimentary Canal-** Begins with **the mouth** which is anteriorly located and associated with lip called **orbicularis oris** and opens through posteriorly located anus, which further leads to the Buccal or oral cavity containing teeth and muscular tongue

**1. Buccopharyngeal cavity-** Divided into two parts-

a) **Buccal Vestibule-** space b/w gums and cheeks where food stored temporarily.

b) **Main Oral Cavity-** inner and central part lined by stratified squamous epithelium and surrounded by upper and lower jaw.



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**2. Teeth** - teeth appears once in life are **monophyodont** e.g, **premolars and last molars of man.**

a) Human beings and a majority of mammals contain 2 sets of teeth one **temporary milk or deciduous teeth** replaced by **permanent** and this type of dentition is **diphyodont** appears twice in life. E.g, **incisors, canines, 1st and 2nd molars.** When the tooth is embedded in the socket of the jaw bone such dentition is **thecodont** e.g, **Incisors, Canines, 1st, and 2nd molars.**

b) Human has 32 permanent teeth differentiated into incisors (I), canine (C), premolars (PM), and Molars (M), such dentition is known as **heterodont.** In mammals including human except for premolar and last molar, all type teeth appear twice in life.

c) The hardest chewing surface of teeth in humans made up of enamel secreted by **ameloblast cell** involved in mastication of food.

d) The arrangement of teeth in the jaw is dentition. The human dental formula=  $2123/2123$  i.e  $I2/2C1/1PM2/2M3/3=8/8*2=16/16=32$ , similarly dental formula of the child is 20 and a 17-year-old is 28.

e) Human teeth are thecodont, heterodont, diphyodont and bunodont.

f) **Acrodont** when teeth attached to upper part of jaw e.g, **fishes, amphibians and reptiles.** **Pleurodont** when teeth fixed to the lateral surface of jaw ridge e.g, **fangs of snakes(reptiles).** **Bunodont** consists of small, blunt and rounded cusps e.g, **humans.**

**3.Tongue-** a voluntary, muscular and glandular structure present on the floor of the oral cavity connected through a flexible membrane called **frenulum linguae.** V shaped sulcus called **sulcus terminalis** divides the dorsal surface of the tongue into two unequal parts i.e **anterior** part which is free and **posterior** part connected to **hyoid bone.** Its function is the reception of taste and taste buds are the modifications of the epithelium. **Lingual frenulum** prevents the tongue from falling backwards.

**Papillae** - 3 functional papillae found in the posterior part in which taste receptors are present in form of taste buds, these are-

- a) **Filiform papillae-** have no taste buds, smallest and most abundant.
- b) **Fungiform papillae-** have taste buds, appears as red dots in the tongue.
- b) **Foliate papillae-** absent in man.
- c) **Circumvallate papillae-** have taste buds, largest and knob-like.

**4.Pharynx-** Oral cavity leads into pharynx, common passage for food and air.



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**5. Oesophagus-** Pharynx leads into the oesophagus. The opening of the oesophagus into the stomach is regulated by muscular (**gastro-oesophageal**) **sphincter**. The passing site of the oesophagus at Diaphragm called **hiatus**.

**6.Stomach-** The Widest part of the alimentary canal, J-shaped muscular structure covered by a layer called peritoneum. When fat and lymph tissues accumulated on peritoneum it is known as **Omentum**. Divided into 3 parts- **cardiac** portion into which oesophagus opens, **fundic** region and **the pyloric** region which opens into 1st part of small intestine.

**7.Small intestine-** categories into three parts-

- a) **Duodenum-** retroperitoneal and initial part of small intestine, C-shaped, and 25 cm long.
- b) **Jejunum-** long and coiled middle portion.
- c) **Ileum** - longest portion and highly coiled.
  - The opening of the stomach into the duodenum is regulated by **Pyloric sphincter**.
  - **Brunner's glands** in the duodenum located in sub-mucosa secrete mucus.

**8. Large intestine-** differentiated into 3 parts-

- a) **Caecum-** small blind sac, **Vermiform appendix** arises from the caecum is vestigial in a human being and well developed in the rabbit. Further opens into the colon.
- b) **Colon-** divided into 3 parts- **ascending, transverse and descending** part. Descending part opens into rectum while ascending part is the smallest and lacks **mysentry**. **Mass action contraction** only occurs in the colon. Small fat filled projections called **epiploic appendages** are present. Colon wall has 3 bands of longitudinal muscle called **taeniae coli**.
- c) **Rectum-** largest part and repository of fecal matter. Opens through the anus.

## Histology of Alimentary Canal

Wall of alimentary canal possesses 4 layers- serosa, muscularis, sub-mucosa and mucosa.

**1. Serosa** - outermost layer made up of thin mesothelium with some connective tissues. Absent in upper part of the oesophagus.

**2. Muscularis layer-** made up of the circular inner layer and the longitudinal outer layer of smooth muscles. **Maximum peristalsis** thickest layer found in the stomach and **minimum peristalsis** thinnest layer found in the rectum. Additional oblique muscle found inner to circular muscle in the stomach.



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**3. Sub-mucosa** - composed of areolar connective tissue layer containing blood vessels, lymph vessels and nerves.

**4. Mucosa**- innermost layer forms irregular folds called **rugae** in the stomach and finger-like projections in small intestine also contain absorptive and secretory cells. It is further divided into 3 parts-

a) **Mucosa muscularis**- formed of smooth muscles, exposed surface area for absorption and supporting the folds of the mucosa.

b) **Lamina propria**- made up of areolar connective tissue contains mucosa-associated lymphoid tissue provides immunity e.g, Peyer's patches.

c) **Epithelial mucosa**- this layer in oesophagus made up of non- keratinised stratified squamous epithelium. Except for oesophagus, it is made up of columnar mucous epithelium and single layer thick.

Gastric glands and crypts in between the bases of villi called **crypts of Lieberkuhn** in the intestine. are formed by mucosa in the stomach. All 4 layers show some modifications in the alimentary canal.

- **Myenteric plexus/ plexus of Auerbach**- present b/w longitudinal and circular muscle fibres of muscle coat and contain fibres from both autonomic divisions mostly controls peristaltic movements in the alimentary canal.
- **Meissner plexus/ Submucosal plexus**- present b/w mucosa and muscle coat, controls different digestive glands secretion.

## Digestive glands

Accessory digestive glands are Salivary glands, Liver and Pancreas.

**1. Salivary gland**- Consists of 3 glands.a)**Parotids**- These are largest glands opens through **Stenson's Duct**, found near cheek.b)**Sub-maxillary/Sub-mandibular**- opens through **the Whartons duct**, present at lower jaw.c)**Sub-lingual**- opens through **Rivinius duct**, smallest salivary glands and found near the tongue.

These glands secrete salivary juice into buccal cavity and located outside the buccal cavity.

**Saliva**- daily secretion-1.5 litres, ph- 6.7, salivary amylase- ptyalin and lysozyme, secreted by-parasympathetic innervation, activation of salivary amylase by- chlorine atoms, viral infection-mumps.

**2. Liver**- largest gland, developed from endoderm, located in the abdominal cavity below the diaphragm has right and left lobes which are separated from each other through the falciform ligament.



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- Structural and functional unit of the liver is hepatic lobules containing hepatic cells arranged in forms of cords. Thin connective tissue sheath called **Glisson's Capsule** covers each capsule (characteristic of the mammalian liver).
- **Kupper cells** are phagocytic cells (kill RBCs, WBCs and bacteria) present in the mammalian liver.
- Bile is secreted by hepatic cells which are transported to the gallbladder (where bile is stored and concentrated) through hepatic ducts.
- **Cystic ducts** (ducts of the gallbladder) along with hepatic duct forms bile duct.
- **Hepatopancreatic duct** (bile duct + pancreatic duct) guarded by **the sphincter of Oddi** to open into the duodenum.

**3. Pancreas-** both exocrine and endocrine, exocrine part secretes alkaline pancreatic juice containing enzymes while the endocrine part secretes hormones, insulin and glucagon. It has 2 ducts, 1st is **duct of Santorini** (non-functional) and 2nd is **duct of wirsung** (functional).

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