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Digestive system

- The assemblage of organs associated with
 - ingestion of food

-
- digestion
 - absorption
 - assimilation
 - egestion

Components of digestive system

Digestive system consists of

- alimentary canal
- associated digestive glands
- physiology of digestion.

Alimentary canal

- Alimentary is a long
- **Anatomy of alimentary canal:** Alimentary canal is complex coiled tube
- **Location of alimentary canal:** Alimentary canal extends from mouth to anus.
- **Length of alimentary canal:** The length of alimentary canal is
 - (8-10) meters.

Part of alimentary canal

Alimentary canal consists of following parts:

- Buccal cavity
- Pharynx
- Oesophagus
- Stomach
- Small intestine
- Large intestine

Mouth

- Mouth is a small and transverse aperture
- **Location of mouth:**
 - Mouth is present at face below the nose.

Contents of mouth

Mouth consists of

- vestibule
- buccal cavity.

Vestibule

- Vestibule is slit like space .
- Vestibule is externally bounded by lips
- Vestibule is laterally bounded by cheeks
- Vestibule is internally the teeth and the gums.

Lips

- There is the presence of two lips.
- The depression in the upper lip is called philtrum.

Buccal cavity

- The another term for buccal cavity is oral cavity.
- **Location of buccal cavity:**
 - Buccal cavity is present between upper jaw and lower jaw.

Histology of buccal cavity

- Buccal cavity is lined by mucus membrane.

Parts of buccal cavity

- Palate
- Tonsils
- Tongue
- Teeth

Palate

Types of palate

The type of palate are:

- anterior palate
- posterior palate

Character of anterior palate

- The anterior hard palate is bony
- The anterior hard palate is made up of bones of:
 - maxilla
 - palatine bone
- Anterior palate contains rugae.

Functions of anterior palate

- Anterior palate separates buccal chamber from nasal chamber.
- Rugae of anterior plate helps to hold food during mastication

Character of posterior palate

- Posterior palate is
 - soft
 - fleshy
 - smooth

Functions of posterior palate

- The soft palate forms uvula
- The other term for uvula is velum palatine.
- **Function of uvula:**
 - Uvula closes internal nostril during swallowing of food.

Tonsils

Histology of tonsils

- Tonsils are lymphoid tissue.

General location of tonsils

- Tonsils are located at
 - pharynx
 - oral cavity

Types of tonsils

The types of tonsils are:

- Nasopharyngeal tonsils
- Tubal tonsils

-
- Lingual tonsils
 - Palatine tonsils

Location of nasopharyngeal tonsils

- Nasopharyngeal tonsils are present in the nasopharynx.

Location of tubal tonsils

- Tubal tonsils located posterior to the opening of Eustachian tube

Location of lingual tonsils

- Lingual tonsils are situated on the posterior part of the tongue

Location of palatine tonsils

- Palatine are present in the oropharynx.

Tonsillitis

- Tonsillitis is the inflammation of palatine tonsils.

Tongue:

Structure of tongue

The tongue is described as a structure featuring characteristics of :

- large
- muscular
- highly mobile

Location of tongue

Tongue is present in the floor of buccal cavity.

Terms related to tongue

- **Frenulum Linguae :**
 - The tongue is attached to the floor of mouth cavity by a fold called frenulum linguae.
- **Ebners / Weber glands:**
 - Ebners glands are the glands present on the surface of tongue.
- **Sulcus terminalis:**
 - Structure dividing tongue into two parts as:
 - * pharyngeal
 - * papillary part.

Papillae in tongue

Location of papillae in tongue

- The dorsal surface of tongue has the presence of lingual papillae.

Types of papipplae

- The types of papillae are:
 - vallate papillae
 - filiform papillae
 - fungiform papillae

Vallate papillae

Location of vallate papillae

Vallate papillae is located at the base of the tongue.

Structure of vallate papillae

- Vallate papillae are the largest.
- They are arranged in an inverted V manner.

Number of vallate papillae

- Vallate papillae are 8-12 in number.

Fungiform papillae

Location of fungiform papillae

Fungiform papillae is situated at the + tip of the tongue + lateral edges of tongue

Structure of fungiform papillae

- Fungiform papillae are
 - mushroom shaped structures

Filiform papillae

- Filiform papillae are the smallest of all papillae.

Quantity of filiform papillae

- Filiform papillae are present on two third of tongue.

Functions of tongue

- The functions of tongue are:
 - Tongue assists in mastication
 - Tongue assists in swallowing
 - Tongue assists in speech.
 - Tongue helps to find taste.

Teeth

Characteristics of human teeth

- The human teeth is characterized as:
 - Thecodont
 - * Thecodont is a term for teeth embedded in jaw socket.
 - Bunodont
 - * Bunodont are teeth having low cups.
 - Heterodont
 - * Heterodont are those having different types of teeth.
 - Diphyodont
 - * Diphyodont are those having two sets of teeth.

Shape of teeth of humans

- The teeth of human are:
 - incisors
 - * Incisors are characterized with with sharp, chisel-like cutting edges.
 - canine
 - * Canine are characterized with with pointed dagger-shaped structures.
 - premolar and molar
 - * Premolar and molar are structures with broad and grooved cusps.

Dental formula

Dental formula is the arrangement of teeth in respective jaw.

- The dental formula for human milk teeth is:
 - I 2/2
 - C 1/1
 - PM 0/0
 - M 2/2
- The dental formula for arrangement of human permanent teeth is:
 - I 2/2
 - C 1/1
 - PM 2/2
 - M 3/3

Structure of tooth

Tooth consists of following three parts - Crown - Neck - Root

Crown

- Crown is the exposed part of tooth.
- Crown is covered with hardest shining substance called enamel.
- A layer of dentine is present below enamel.

Neck

Neck is the part surrounded by gum.

Root

- Root is the part embedded in bony socket.
- Root is covered by a protective and supportive hard layer called cementum.
- There is the presence of pulp cavity
- Pulp cavity is filled with nerve fibres, blood vessels .
- Pulp cavity is lined by odontoblasts.
- Enamel is secreted by ameloblasts
- Ameloblasts are of ectodermal origin.
- Dentine is secreted by odontoblasts.
- Odontoblasts are of mesodermal origin.

Facts about teeth

- Third molar is called wisdom tooth.
- Third molar erupts between 17-25 years.

Function of teeth

- Teeth help in mastication
- Teeth help in speech production.

Pharynx

Dimension of pharynx

- Pharynx is about 12 cm long.
- **Location of pharynx** : Pharynx is a vertical canal beyond the soft palate.

Types of Pharynx

- Nasopharynx
- Oropharynx
- Laryngopharynx

Nasopharynx

- Nasopharynx is the upper part of pharynx.
- Nasopharynx has internal nares in the roof.
- Nasopharynx has a pair of Eustachian opening on lateral side.

Oropharynx

- Oropharynx is the lower part of the pharynx.
- The function of oropharynx is for the passage for food.

Laryngopharynx

- Laryngopharynx is the lowest part of the pharynx.
- Laryngopharynx has two apertures-anterior slit-like glottis.
- Laryngopharynx posterior gullet.
- Glottis bears epiglottis.
- Epiglottis is a leaf like cartilaginous flap.

Function of pharynx

- Pharynx passages the food from mouth cavity to the oesophagus.

Oesophagus:

Structure of Oesophagus

- Oesophagus is a
 - muscular
 - long
 - narrow
 - elastic tube

Dimensions of Oesophagus

The oesophagus is about 25cm in length.

Location of Oesophagus

- The oesophagus passes through the diaphragm .
- The oesophagus opens in the stomach in the abdomen.
- Oesophagus pierces the diaphragm at hiatus.

Histology of Oesophagus

- Oesophagus is lined with stratified squamous epithelium.
- Oesophagus contains goblets cells.
- Oesophagus does not contain digestive glands.

Anatomy of Oesophagus

- The upper end of oesophagus is closed by circo oesophageal sphincter.
- The lower end of oesophagus id closed by oesophageal sphincter.

Functions of Oesophagus

- Oesophagus passes food from the pharynx to the stomach.
- The passage of food from pharynx to stomach is done by peristalsis.

Stomach

Location of stomach

Stomach is situated on the left side of abdominal cavity.

Structure of stomach

- Stomach is the broadest part of alimentary canal.
- Stomach is J-shaped structure.
- Stomach has lesser and greater curvatures.

Parts of stomach

- Stomach is divided into two parts.
- The parts of stomach are:
 - cardiac
 - pyloric

Cardiac

Parts of cardiac portion

- The larger cardiac part is further subdivided into two parts.
- The two parts of the cardiac portion are:
 - fundus
 - body

Fundus

- Fundus is the upper convex dome- shaped part.
- Fundus is situated above the level of cardiac orifice.

Body

Body lies between fundus and pyloric antrum.

Pyloric

- Pyloric part is divided into two parts.
- The parts of the pyloric portion of the stomach are:
 - pyloric antrum
 - pyloric canal

Pyloric canal

- Pyloric canal is a narrow and tubular structure.
- The right end of the pyloric canal ends at the pylorus.

Pyloric antrum

Pyloric antrum is the right narrow lower portion of the stomach.

Anatomy of stomach

Stomach has two openings The openings of the stomach are : The cardiac orifice The cardiac orifice is guarded by cardiac sphincter

and pyloric orifice guarded by pyloric sphincter. **Gastric Rugae:** + Gastric rugae is the folds of the muscosa. + Gastric rugae is seen only in empty stomach.

Histology of Stomach

- The mucosal lining of the stomach has gastric glands.

Functions of stomach

- Stomach acts as storage of food.
- Stomach processes mechanical churning of food.
- Stomach conducts partial digestion.
- Stomach conducts the limited absorption of water, alcohol etc.

Intestine

Location of intestine

- Intestine is the longest and coiled part of alimentary canal.
- Intestine is located behind the stomach.

Parts of intestine

- Intestine is divided into two parts .
- The two parts of intestine are :
 - small intestine
 - large intestine.

Small intestine:

Structure of small intestine

Small intestine is the longest and coiled part of intestine

Parts of small intestine

- The small intestine is divisible into three parts
- The three parts of the small intestine are:
 - duodenum
 - jejunum
 - ileum

Structure of Duodenum

Duodenum is C shaped curved tube.

Anatomy of Duodenum

- Duodenum receives bile from gall bladder
- Duodenum receives pancreatic juice from pancreas
- The bile and pancreatic juice are received through a common hepatopancreatic duct.
- The opening of hepatopancreatic ampulla is guarded by sphincter of Oddi.
- The wall of duodenum contains crypts of Lieberkuhn
- The wall of duodenum contains branched Brunner's glands.

Structure of Jejunum

- Jejunum is the middle part of small intestine.
- Jejunum is narrower than duodenum.

Anatomy of Jejunum

- The jejunum has larger but thick walled villi.
- The villi of jejunum does not absorb digested food.

Structure of Ileum

- The ileum is the longest part of the small intestine.
- The ileum is the highly coiled part of small intestine

Anatomy of Ileum

- The wall of ileum is thinner and less vascular
- The inner surface is provided with numerous villi.
- Villi greatly increase the surface area for absorption.
- Lamina propria of ileum contains granular masses of lymph nodules
- The granular masses of lymph nodules in the lamina propria of ileum called Peyer's patches.

Functions of small intestine

Functions: Small intestine serves two main functions; i) - Small intestine completes the digestion of food. - Small intestine absorbs the digested food.

Large intestine

Dimensional properties of large intestine

- Large intestine is thicker than small intestine.
- Large intestine is wider than small intestine.

Location of large intestine

- Large intestine surrounds the small intestine.
- Large intestine is present in the lower abdominal cavity.

Shape of large intestine

- Large intestine has general shape of an inverted U.

Parts of large intestine

- Large intestine has three parts .
- The parts of large intestine are:
 - caecum
 - colon
 - rectum

Caecum:

Structure of caecum

- Caecum is a dilated sac like structure.

Ileo Caecal valve

- The junction of ileum with caecum is called ileo-caecal junction.
- The ileo caecal junction is guarded by ileo-caecal valve.

Vermiform appendix

- Vermiform appendix is a short, slender worm -like projection.
- Vermiform appendix is present in the caecum.

Colon:

Structure of colon

- Colon is long and ucoiled tube.

Shape of colon

- The shape of colon is inverted U shaped tube.

Parts of colon

- Colon is divided into 4 parts.
- The parts of colon are:
 - ascending colon
 - transverse colon
 - descending colon
 - sigmoid colon.

Histology of colon

- The wall of colon has three longitudinal bands
- The bands of wall of colon are called taeniae coli.

Rectum

Composition of rectum

- Rectum is made up of muscles.

Functions of rectum

- Rectum stores undigested food.
- The time of storage of food is for short period.

Functions of large intestine

- The functions of large intestine are:
 - absorption of water
 - defaecation
 - synthesis of vitamin K
 - synthesis of vitamin B complex.

Anus:

- Anal sphincter guard the anus.
- Anal sphincter are two in number.

Types of anal sphincter

- The types of anal sphincter are:
 - Internal anal sphincter
 - External anal sphincter
- Internal anal sphincter is made up of smooth muscles.
- External anal sphincter is made up of striated muscles.

Digestive Glands

- Based in the nature of action of digestive glands they are divisible into :
 - associated digestive glands
 - * Associated digestive glands interact with digestion by producing ducts
 - glands at the alimentary canal.

Associated digestive glands

- The types of associated digestive glands are:
 - salivary glands
 - liver
 - pancreas

Glands at the alimentary canal

- The glands at the alimentary canal are:

-
- intestinal glands
 - gastric glands

Role of digestive glands

- Digestive glands secrete digestive juices.
- Digestive juices contain enzymes.
- Digestive enzymes are necessary for the chemical digestion of the food.

Salivary Glands

Location of salivary glands

- Salivary glands are located at the mouth cavity.

Types of salivary glands

- The types of salivary glands are:
 - parotid glands
 - submaxillary glands
 - sublingual glands

Parotid glands

- Parotid glands are the largest salivary glands.
- The secretion of parotid glands is called Stensen's duct.
- Stensen's duct opens in the mouth cavity.
- Stensen's duct opens in the upper second molar tooth.

Location of parotid glands

- Parotid glands are present on each side of the face.
- Parotid glands are present just below and in front of the ears.

Submaxillary glands

- The secretion of submaxillary glands is Wharton's duct.
- Wharton's duct is poured at the side of frenulum of the tongue.

Location of submaxillary glands

- Submaxillary glands are located at the angles of the lower jaw.

Sublingual glands

- Sublingual glands are the smallest salivary glands.
- Sublingual glands secrete ducts.
- The duct of sublingual glands is called duct of Rivinus.

Location of sublingual glands

- Sublingual glands are located beneath the tongue.

Saliva

- Saliva is a fluid.
- Saliva is viscous.
- Saliva is colourless.
- Saliva is cloudy.

Contents of saliva

The contents of saliva are:

- salivary amylase
- lysozyme
- lingual lipase

Functions of saliva

The functions of saliva are:

- Saliva moistens dry food.
- Saliva facilitates swallowing action by lubrication of food.
- Saliva keeps the mouth clean.
- Saliva keeps the teeth clean.
- Saliva dissolves sugar.
- Saliva dissolves salts.

Gastric glands

Location of gastric glands

- The gastric glands are present at the wall of stomach.

Types of gastric glands

The types of gastric glands present at the wall of stomach are: - simple branched - simple tubular

Types of cells present in gastric glands

The types of cells present in gastric glands are:

- parietal cells
- chief cells
- mucous cells

Functions of parietal cells

- Parietal cells secrete Castle's intrinsic factor.
- Parietal cells secrete

Role of castle's intrinsic factor

- castle's intrinsic factor absorbs Vitamin

Functions of chief cells.

- Chief cells secrete proenzymes.
- The proenzymes secreted by chief cells are:
 - pro renin
 - gastric lipase

Functions of mucous cells

- Mucous cells secrete mucus.

Gastric Juice

- All the secretion of gastric glands is called gastric juice.
- There is the presence of Argentaffin cells.
- Argentaffin cells are also called entero-endocrine cells.

Argentaffin cells

- Argentaffin cells consists of
 - D - cells
 - G Cells

Contents of D-cells secretion

- D-cells are composed of following secreted constituents:
 - somatostatin
 - enterocrinin

-
- Somatostatin and enterocrinin cell secrete enzymes.
 - The enzymes / ducts secreted by somatostatin and enterocrinin are:
 - serotonin
 - histamine

Contents of secretion of G-cells

- G-cells secrete hormones.
- The hormones secreted by G-cells is :
 - gastrin

Liver

- Liver is the largest gland.

Location of liver

- Liver is located behind the right side of abdominal cavity
- Liver is located behind the diaphragm
- Colour of liver is reddish brown

Lobes of liver

- Liver has two lobes:
- Caudate lobe is a lobe of the liver
- Quadrate lobe is a lobe of the liver

Gall bladder

- Gall bladder is a pear shaped structure.
- Gall bladder is located under the surface of right lob

Functions of gall bladder

- Gall bladder acts as reservoir.
- Gall bladder stores bile secreted by liver.
- Gall bladder produces cystic duct
- Cystic duct of gall bladder joins with bile ducts.
- This combination of the ducts is a common hepatic duct.
- The common hepatic duct opens in the duodenum

Histological structure of liver

- Liver lobes are formed by hexagonal lobules.
- Hexagonal lobules are surrounded by sheath of connective tissue.
- The sheath of connective tissue that surrounds the hexagonal lobules are called Glisson's capsule.

Histological structure of lobules of liver

- Each lobule of liver is formed by hepatocytes
- Hepatocytes are hepatic cells.
- The shape of hepatocytes is polyhedral.

Anatomical structure of liver

- There is the presence of portal triad at the periphery of each lobule.
- Portal triad consists of:
 - portal vein
 - hepatic artery
 - bile duct
- Bile canaliculi are the spaces between hepatic cells.
- Bile canaliculi unite to form bile duct.
- Bile duct of lobules unite to form common hepatic duct.

Functions of liver

Secretion of bile

- The chemical property of bile is alkaline .
- The colour of bile' is dark green.
- The physical state of bile is a fluid.

Contents of bile

- Bile contains bile salts
- Bile contains bile pigments.
- Bile contains some waste substances.
- The contents of bile salts are:
 - sodium bicarbonate c sodium glycolate
 - sodium tauro chlorate

Contents of bile pigment

- The contents of bile pigments are:
 - bilivirdin
 - bilirubin

Functions of bile

- Bile acts as antiseptic.
- Bile stimulates peristalsis.
- Bile neutralizes chyme.

Carbohydrate metabolism.

- Liver regulates sugar level.
- Liver regulates sugar level by glycogenesis .and glycolygenesis.

Glycogenesis

- Glycogenesis is the conversion of excess glucose into glycogen.
- Glycogenesis is done by liver cells.
- Glycogenesis is done in the presence of insulin.

Glycoly genesis

- Glycoly genesis the conversion of glycogen into glucose.
- Glycogenesis is done by liver cells.
- Glycoly genesis is done in the presence of glucagon.

Protein metabolism.

- Liver decomposes amino acids into ammonia.
- Ammonia is converted into urea.
- The process of conversion of ammonia in to urea is deamination

Lipid metabolism

- Liver controls lipogenesis.
- Lipogenesis is the conversion of excess glucose and amino acids into fats.

Production of plasma proteins

- Liver produces fibrinogen liver produces prothrombin

Immunity

- Liver does phagocytosis
- Phagocytosis is done by Kupffer cells.
- Kupffer cells eat dead cells and bacteria.

Storage

- Liver stores minerals.
- Liver stores vitamins .
- The minerals stored by liver are. copper and iron.
- The vitamins stored by liver are *A, D E, K*, and

Production

- Liver produces anticouglatory chemical
- The anticoagulatory chemical is heparin.
- Liver acts as erythropoetic organ in foetus.
- Liver produces RBC in foetus.

Pancreas

- Pancreas is the second largest organ .
- Structure of pancreas is a long and lobe like.
- The colour of pancreas is yellow.
- The mass of pancreas is (60gm).
- **Location of pnacreas:** Pancreas is located at the loop of duodenum. Pancreas extends upto the spleen behind the stomach
- **Parts of Pancreas:** Pancreas contains head , body and tail.
- **Type of Gland:** Pancreas is a heterocrine gland.

Exocrine part of pancreas

- The exocrine part of pancreas is formed by pancreatic lobules.
- The pancreatic lobules contain aciner glandular cells.
- The aciner glandular cells are triangular.
- **Functions of exocrine cells:**

-
- Exocrine cells of pancreas secrete pancreatic juice.
 - Pancreatic juice is poured in the duodenum.
 - The pouring of pancreatic juice is done through hepatopancreatic ampulla.

Endocrine part of pancreas

- The endocrine part of pancreas contains a group of cells.
- The group of cells on the endocrine part of pancreas are called islets of Langerhans.

Islets of langerhans

- The islets of langerhans contain four types of cells.
 - () cells.
 - () cells.
 - () cells.
 - (F) cells.

Secretion of cells in islets of langerhans

- Alpha cells secrete glucagon.
- Beta cells secrete insulin.
- Delta cells secrete somatostatin.
- F cells secrete pancreatic polypeptide.

Functions of secretion of cells of islets of langerhans

- Insulin helps in carbohydrate metabolism.
- Glucagon helps in carbohydrate metabolism.
- Somatostatin inhibit the secretion of insulin and glucagon.
- Pancreatic polypeptide inhibit the secretion of pancreatic juice.

Intestinal glands

Location of intestinal glands

- Intestinal glands are located at the mucosa of small intestine.
- The intestinal glands are of two types.
- The types of intestinal glands are:
 - crypts of lieberkhun
 - brunner's gland

Crypts of lieberkhun

- Crypts of lieberkhun are located at the villi of small intestine.
- Crypts of lieberkhun are simple tubular glands.

Function of crypts of lieberkhun

- Crypts of lieberkhun collectively secrete succus entericus.
- The enzymes present at the succus entericus are:
 - amino peptidase
 - dipeptidase
 - intestinal lipase
 - enterokinase
 - maltase
 - iso maltase
 - dextrinase
 - lactase
 - sucrase
 - nucleotidase
 - nucleosidase

Brunners gland

- Brunners gland are branched tubular glands.
- Brunners gland are present at the submucosa of duodenum.

Functions of brunners glands

- Brunners glands secrete thick mucus.
- The thick mucus secreted by brunners gland protects the duodenal mucosa from acidic chyme.

Parts of digestion {#sec:Parts of digestion}

The parts of digestion are:

- Ingestion
- Digestion
- Absorption
- Assimilation
- Egestion

Ingestion

- Ingestion is the process of taking food into oral cavity.

Digestion

- Digestion is:
 - The hydrolysis of complex food substances to simplest compounds.
 - The simplest compounds can be absorbed in the alimentary canal.
 - The simplest compounds are absorbed for their utilization.

The location of digestion are:

- Buccal cavity
- Stomach
- Intestine

Buccal digestion {#sub:Buccal digestion}

- **Mastication:**
 - The breaking down of ingested food into smaller pieces is mastication.
 - **Location of mastication:** Mastication is done in the buccal cavity.
- **Role of tongue:**
 - Tongue mixes the small food particles with the saliva.

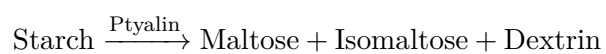
Contents of Saliva

The saliva consists of the following components:

- salivary amylase
- lingual lipase

Functions of Saliva {#sub:Functions of Saliva}

- **Salivary amylase**
 - Salivary amylase converts starch
 - It converts starch into:
 - * maltose
 - * isomaltose
 - * dextrin



- **Lingual lipase**

- Lingual lipase converts lipids
- It converts lipids into:
 - * lipase Fatty acids
 - * glycerol



Post buccal digestion {#sub:Post buccal digestion}

- **Bolus:**

- Bolus is the food passed from buccal cavity to pharynx.

- **Peristalsis:**

- Peristalsis is a wave like motion.
- **Cause of peristalsis:** Peristalsis occurs by the alternating contraction and relaxation.
 - * Longitudinal muscles relax and contract.
 - * Circular muscles relax and contract.

Gastric digestion {#sec:Gastric digestion}

- **Site for gastric digestion:**

- Gastric digestion occurs in the stomach.

- **Component of gastric digestion:**

- Gastric digestion contains gastric juice.

- * **Contents of gastric juice:**

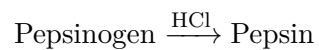
- Gastric juice contains enzymes.

The components of gastric enzymes are:

-
- pepsin
 - renin
 - gastric lipase

Pepsin

- **Secretion:** Pepsin is secreted as pepsinogen.
- **Conversion:**
 - Pepsinogen is converted into pepsin.
 - Pepsinogen is converted into pepsin by



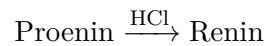
Function of pepsin {#sub:Function of pepsin}

- **Pepsin:**
 - Pepsin hydrolyses protein.
 - Pepsin hydrolyses protein into:
 - * proteoses
 - * peptones



Renin

- **Secretion:**
 - Renin is secreted as prorenin.
- **Conversion:**
 - Prorenin is converted into renin.
 - Prorenin is converted into renin by .

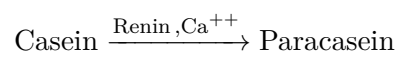


Function of renin {#sub:Function of renin}

- **Renin:**

- Renin converts caesin of milk.
- Renin converts casein of milk only in the presence of calcium.
- Renin converts casein of milk into:

- * Paracaesin



- * **Post paracasein digestion:**

- Pepsin hydrolyses paracasein.
 - * Pepsin hydrolyses paracasein into:
 - proteoses
 - peptones



Function of Gastric lipase {#sub:Gastric lipase}

- **Gastric lipase:**

- Gastric lipase converts little of fats.
 - * This limitation is imposed by the lack of emulsifying chemicals.
- Gastric lipase converts fats into :
 - * fatty acids
 - * glycerol



Post Gastric Digestion: {#sec:Post Gastric Digestion:}

- **Chyme:**

- Chyme is the partially digested food of the stomach.

- **Peristalsis:**

- Peristalsis passes food from stomach to pyloric sphincter.
 - Pyloric sphincter is present in the duodenum.

Internal digestion {#sec:Internal digestion}

Pre Internal Digestion {#sub:Pre Internal Digestion}

- Bile is pored into the duodenum.
 - Bile is pored by the contraction of gall bladder.

The components of internal digestion are:

- bile
- pancreatic juice
- intestinal juice

Function of Bile

- **Bile:**

- Bile salts emulsify fats.
 - * The emulsification of fats make an environment for action of pancreatic lipase.

Pancreatic Enzymes {#sec:Pancreatic Enzymes}

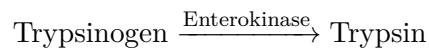
The pancreatic enzymes are:

- trypsin

-
- chymotrypsin
 - carboxypeptidase
 - pancreatic amylase
 - pancreatic lipase
 - ribonuclease
 - deoxyribonuclease

Trypsin

- **Secretion:** Trypsin is secreted as inactive trypsinogen.
- **Conversion:**
 - The inactive trypsinogen is converted into trypsin.
 - The inactive trypsinogen is converted into trypsin by enterokinase.
 - * Enterokinase is a component of succus entericus.



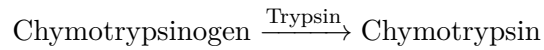
Function of trypsin {#sub:Function of trypsin}

- **Trypsin:**
 - Trypsin acts on protein.
 - Trypsin hydrolyses protein into:
 - * proteoses
 - * peptones

Chymotrypsin

- **Secretion:** Chymotrypsin is secreted as inactive chymotrypsinogen.
- **Conversion:**
 - Chymotrypsinogen is converted into chymotrypsin.

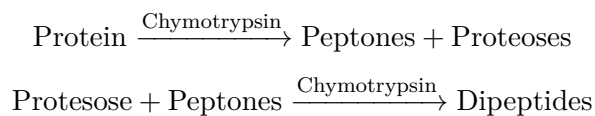
-
- Chymotrypsinogen is converted into chymotrypsin by the action of trypsin.



Function of chymotrypsin {#sub:Function of chymotrypsin}

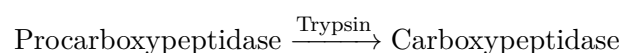
- **Chymotrypsin**

- Chymotrypsin acts on protein.
- Chymotrypsin hydrolyses proteins into:
 - * peptides



Carboxypeptidase

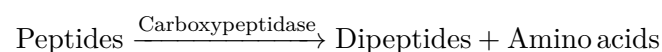
- **Secretion:** Carboxypeptidase is secreted as procarboxypeptidase.
 - Procarboxypeptidase is converted into carboxypeptidase
 - Procarboxypeptidase is converted into carboxypeptidase by the action of trypsin.



Function of carboxypeptidase {#sub:Function of carboxypeptidase }

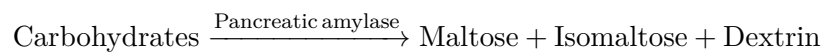
- **Carboxypeptidase:**

- Carboxypeptidase acts on peptides.
- Carboxypeptidase reduces peptides into:
 - * dipeptides
 - * amino acids



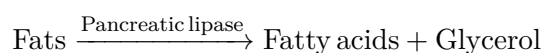
Function of Pancreatic amylase {#sub:Function of Pancreatic amylase}

- Pancreatic amylase acts on:
 - starch
 - glycogen
- Pancreatic amylase converts carbohydrate into :
 - maltose
 - isomaltose
 - limit dextrin



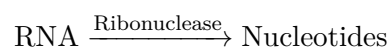
Function of Pancreatic lipase {#sub:Function of Pancreatic lipase}

- **Pancreatic lipase**
 - Pancreatic lipase acts on dietary fats.
 - Pancreatic lipase converts dietary fats into :
 - * fatty acids
 - * glycerol



Function of Ribonuclease

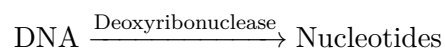
- **Ribonuclease:**
 - Ribonuclease acts on *RNA*.
 - Ribonuclease converts *RNA* into
 - * Nucleotides



Function of deoxyribonuclease {#sub:Function of deoxyribonuclease}

- **Deoxyribonuclease:**

- Deoxyribonuclease acts on *DNA* .
- Deoxyribonuclease converts *DNA* into:
 - * Nucleotides



Intestinal Juice {#sec:Intestinal Juice}

- **Secretion:**

- Intestinal juice is also termed as succus entericus.

The enzymes present in the intestinal juice are:

- enterokinase
- aminopeptidase
- dipeptidase
- intestinal lipase
- maltase
- isomaltase
- dextrinase
- sucrase
- lactase
- nucleotidase
- nucleosidase

Enterokinase

- Enterokinase is a non digestive enzyme.

Function of Enterokinase {#sub:Function of Enterokinase}

- **Enterokinase**

- Enterokinase acts on trypsinogen.
- Enterokinase converts on inactive trypsinogen into trypsin.

Function of aminopeptidase {#sub:Function of aminopeptidase}

- **Aminopeptidase:**

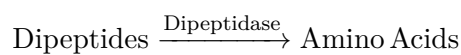
- Aminopeptidase acts on peptides.
- Aminopeptidase acts on amino group of peptides.
- Aminopeptidase peptides into :
 - * dipeptides
 - * amino acids



Function of dipeptidase {#sub:Function of dipeptidase}

- **Dipeptidase**

- Dipeptidase acts on dipeptides.
- Dipeptidase converts dipeptides into :
 - * Amino acids

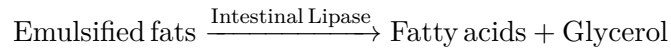


Function of intestinal lipase {#sub:Function of intestinal lipase}

- **Intestinal Lipase**

- Intestinal Lipase acts on emulsified fats.
- Intestinal Lipase hydrolyses emulsified fats into:

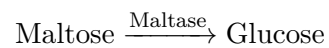
-
- * fatty acids
 - * glycerol



Function of Maltase {#sub:Function of Maltase}

- **Maltase**

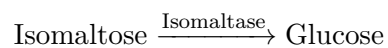
- Maltase acts on maltose.
- Maltase splits maltose into:
 - * glucose molecules



Function of Isomaltase {#sub:Function of Isomaltase}

- **Isomaltase**

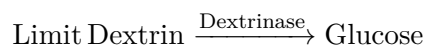
- Isomaltase acts on isomaltose.
- Isomaltase converts isomaltose into:
 - * glucose



Function of Dextrinase {#sub:Function of Dextrinase}

- **Dextrinase:**

- Dextrinase acts on dextrins.
- Dextrinase hydrolyses dextrins into:
 - * glucose



Function of sucrase {#sub:Function of sucrase}

- **Sucrase**
- Sucrase acts on Sucrose.
- Sucrase converts sucrose into:
 - glucose
 - fructose



Function of Lactase {#sub:Function of Lactase}

- **Lactase:**
 - Lactase acts on lactose.
 - Lactase converts lactose into:
 - * Glucose
 - * Galactose



Function of nucleotidase {#sub:Function of nucleotidase}

- **Nucleotidase:**
 - Nucleotidase acts on nucleotides.
 - Nucleotidase hydrolyses nucleotides into:
 - * nucleosides
 - * inorganic phosphates



Function of nucleosidase {#sub:Function of nucleosidase}

- **Nucleosidase**

- Nucleosidase acts on nucleosides.
- Nucleosidase hydrolyses nucleosides into:
 - * nitrogen base
 - * pentose sugar



Post Intestinal Digestion {#sub:Post Intestinal Digestion}

- **Chyle:** Chyle is the fully digested alkaline food.
 - Chyle is present in small intestine.
 - **Contents of chyle:**
 - * glucose
 - * fructose
 - * galactose
 - * amino acid
 - * fatty acid
 - * glycerol

Absorption

Definition

- Absorption is a process.
- There is transfer of food in absorption.
- The food transfers from lumen of gut into:
 - blood

-
- lymph
 - **Cause:** Absorption occurs by physicochemical processes.

Sites of absorption {#sub:Sites of absorption}

- **Buccal cavity:**
 - There is no absorption in buccal cavity.
- **Stomach:**
 - There is very little absorption in stomach.
 - The components absorbed are:
 - * alcohol
 - * aspirin
- **Small intestine:**
 - There is maximum absorption in small intestine.
 - **Structure of small intestine:**
 - * The outermost lining of small intestine is mucosa.
 - * Mucosa is provided with villus.
 - * Each villus has a network of:
 - blood capillaries
 - lymphatic vessels
 - * Lymphatic vessels are also termed as lacteals.

Types of Absorption {#sec:Types of Absorption}

The types of absorption are:

- Active absorption
- Passive absorption

Passive absorption {#sub:Passive absorption}

- **Location:** Passive absorption occurs in between
 - mucosal epithelial cells
 - intestinal lumen
- Passive absorption occurs along the concentration gradient.
- The concentration gradient is from
 - higher concentration
 - to lower concentration
- The higher concentration is present at the intestinal lumen.
- The lower concentration is present at mucosal epithelial cells
- **Rate of absorption:** Passive absorption is very slow.
- **Requirement of Energy:** Passive absorption doesnot require energy.
- **Process of passive absorption:** Passive absorption occurs by:
 - Simple diffusion
 - Facilitated diffusion
 - Endocytosis

Limitations:

- Passive absorption cannot absorb:
 - * nutrients from intestinal lumen
- **Examples:**
 - Passive absorption absorbs monosachharaides.
 - Passive absorption absorbs amino acids.

Active Absorption {#sub:Active Absorption}

- **Location:** Active absorption occurs between
 - mucosal cells

-
- blood
 - Active absorption occurs against the concentration gradient.
 - Active absorption occurs from low concentration gradient into high concentration gradient.
 - The low concentration gradient is at intestinal lumen.
 - The high concentration gradient is at blood.
 - **Requirement of Energy:**
 - Active absorption requires energy.
 - Energy for active absorption is provided by the hydrolysis of .
 - **Absorption of Fats:**
 - Fatty acids are incorporated into micelles.
 - Micelles are:
 - * small
 - * spherical
 - * water soluble
 - * droplets
 - Micelles are formed by the help of bile salts.
 - Micelles are absorbed by facilitated diffusion.
 - The components incorporated along with the absorption of Micelles are:
 - * fatty acids
 - * glycerol
 - * fat soluble vitamins
 - **Examples:** Active absorption absorbs:
 -
 - glucose
 - galactose
 - amino acids

Assimilation

- Assimilation is the process of utilization of absorbed nutrients.
- The nutrients are utilized into:
 - body cells
 - energy
 - growth
 - repair

Egestion

- Egestion is the process of removal of food stuffs that are:
 - undigested
 - unabsorbed
- Egestion is passed in the form of faeces.
- The colour of faeces is due to stercobilin.
- Stercobilin is a derivative of bilirubin.