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Anyone
having Guts?



**UNIT
05**

Animal Form and Function
Animal Nutrition 1

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SAMPATH LANKADHEERA

Unit
05 Animal Form and Function
Nutrition 1

This tutorial covers

5.2.1 Nutrition in Animals

5.2.2 Human digestive system

ADVANCED LEVEL

Biology

Unit - 05

Animal Form and Function

o Nutrition 1

Print 2024 August

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- These sphincters help to regulate the passage of materials between these organs.
- Small intestine is the longest organ in the alimentary canal. It is divided into three regions: duodenum, jejunum and ileum.
- The duodenum: C shaped curve, around the head of the pancreas.
- The jejunum is middle part of the small intestine. The ileum is the terminal part of the small intestine.
- The surface area of the small intestine is greatly increased by permanent circular folds and villi.
- The villi are tiny finger like projections of the intestinal wall.
- Most of the digestion is completed in the duodenum. The major sites for nutrient absorption are jejunum and ileum.

(b) Describe the functions carried out by each of these.

Functions of stomach

- Act as a temporary reservoir for food due to high convolution and very elastic wall.
- Mechanical digestion of food by churning action due to muscular contraction.
- Produce gastric juice which starts the chemical digestion of proteins to polypeptide by pepsin
- Absorption of some materials such as water, alcohol and some drugs
- Non specific defense-HCl kills microbes
- Small jets of gastric contents push out through pyloric sphincter as chyme
- Secretion of gastrin hormone which regulates digestion in the stomach.
- Function of small intestine.
- Carbohydrate digestion
- Carbohydrates to monosaccharides
- Protein digestion
- Proteins to amino acids.
- Lipid digestion.
- Lipids to monoglycerides and fatty acids.
- Active and passive absorption of monosaccharides, amino acids, glycerol and fatty acids.
- Recovery of water and ions mostly occur in the small intestine.

(c) Explain how chyme is passed from the stomach to the small intestine.

- Transport of chyme to small intestine
- Transport of stomach content to pylorus by peristalsis.
- Strong contractions in transport release liquid food in small volumes in to small intestine.

4. (a). Describe the basic structure of large intestine of man and briefly describe function carryout by it.

Answer

1. Large intestine is the terminal end of the alimentary canal.
2. It is divided into three regions: colon cecum and rectum.
3. The small intestine is connected to the large intestine at a 'T' shaped junction.
4. One arm of the 'T' junction is colon and the other arm is a small pouch called cecum.
5. A finger like projection in the cecum is called the appendix.
6. The colon leads to the rectum and anus.
7. Cecum is important for fermentation of indigested materials by microbes especially in animals that eat large amount of plant matter.
8. In addition to nutrient absorption, recovery of water and ions mostly occur in the small intestine.
9. In addition to the water intake (about 2 L) digestive juices add more water (about 7 L) into the small intestine.
10. Most of this water is reabsorbed via osmosis.

11. The colon: completes the reabsorption of water,
12. synthesize some vitamin B complexes, Vitamin K and folic acid with the help of microbes
13. and move feces (consists of undigested matter such as fibres) along the colon by peristalsis.
14. The rectum stores feces until they are eliminated.
15. Presence of two sphincters between the rectum and anus can regulate feces movement.
16. Strong contractions in the colon trigger the defecation.

16 x 3 = 48

ADVANCED LEVEL

Biology

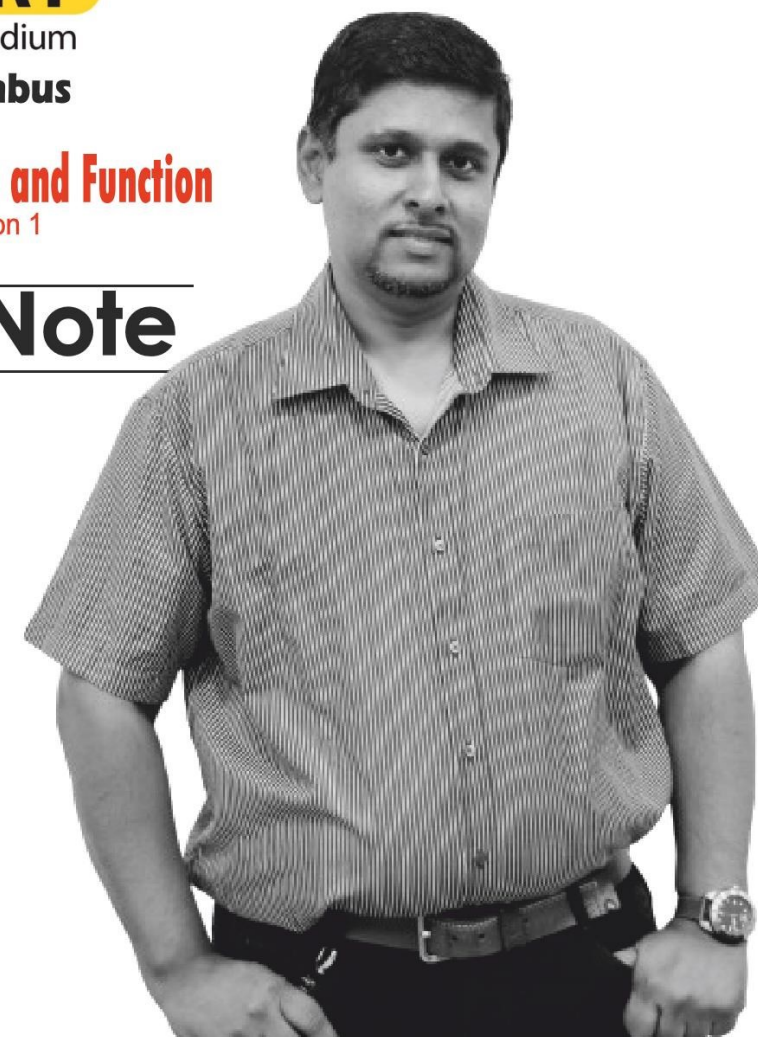
THEORY

in English Medium

New Syllabus

Unit 05 **Animal Form and Function**
 ◦ Animal Nutrition 1

Smart Note



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Exhilarating experience of delving in to Biology



Competency Level 5.2.1 : Explores heterotrophic nutrition in animals

Nutrition in Animals

- Heterotrophic nutrition is the process by which the organisms obtain organic food molecules by ingesting other organisms or by substances derived from other organisms.
- Other than animals, fungi and majority of bacteria are heterotrophs.
- There are two type of heterotrophic nutrition namely, holozoic nutrition and symbiosis.

1. Describe what happens to a carbohydrate meal ingested by man.

In the buccal cavity of man;

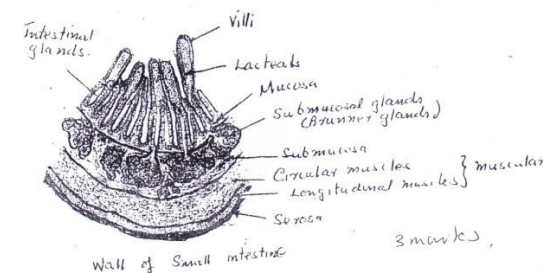
1. Food is chewed (by teeth) and mechanical brake down
2. mixed with saliva.
3. Digestion of (cooked) starch.
4. By salivary amylase/ ptyalin.
5. Food bolus is formed and
6. is passed to pharynx.
7. Bolus is swallowed.
8. Involuntarily.
9. Passes to esophagus and.
10. Then passes to the stomach.

In the stomach

11. Bolus is broken and
 12. Mixed with gastric juices.
 13. Digestion of starch stops
 14. Due to low pH.
 15. Food stored temporarily and
 16. Passes to small intestine /duodenum.
- In the duodenum/Small intestine.**
17. Food (Chyme) is mixed with intestinal juice.
 18. and pancreatic juice.
 19. pH is increased.
 20. Starch is digested/ Broken down to maltose
 21. By pancreatic amylase.
 22. Intestinal disaccharidases catalyze the conversion of disaccharides into monosaccharides.
 23. Maltose is digested / broken down to glucose
 24. by maltase.
 25. Sucrose is digested / broken down to glucose and fructose.
 26. By sucrose.
 27. Lactose is digested / broken down to glucose and galactose
 28. By lactase.
 29. Monosaccharides absorbed into the cell of the epithelium of the small intestine.
 30. Actively
 31. or passively
 32. by carriers.
 33. Some disaccharides are absorbed into epithelial cells.
 34. and digested to monosaccharides (within cells).
 35. These monosaccharides pass into stream/ blood capillaries villi.
 36. These are then used for metabolism/ to release energy / for respiration / converted to glycogen.
 37. Undigested carbohydrates/ matter passes to large intestine.
 38. And to rectum and.
 39. Passes out (through anus) (38 x 4 = 152 (Maximum 150)

2. (a) Describe the basic structure of the small intestine.

1. Small intestine is the longest organ in the alimentary canal.
2. It is divided into three regions: duodenum, jejunum and ileum.
3. The duodenum is the C shaped curve of the initial part of the small intestine, which is located around the head of the pancreas.
4. The jejunum is middle part of the small intestine.
5. The ileum is the terminal part of the small intestine.
6. For effective absorption, the surface area of the intestinal wall has been increased with three structural modifications:
7. heavy permanent foldings,
8. finger projections called villi in the intestinal wall
9. and finger like microscopic projections called microvilli in the epithelial cells of the villi.
10. These micro villi are exposed into the intestinal lumen, it gives the appearance of brush (brush border).
11. Most of the digestion is completed in the duodenum.
12. The major sites for nutrient absorption are jejunum and ileum.



3 marks

(b) Briefly explain the functions of the small intestine of man.

20. Pancreatic amylase catalyze the conversion of polysaccharides (starch) into disaccharides.
21. Intestinal disaccharidases catalyze the conversion of disaccharides into monosaccharides.
22. Tripsin and Chymotripsin catalyze the conversion of small polypeptides into smaller polypeptides.
23. These smaller polypeptides are converted to small peptides and amino acids by the catalytic action of Pancreatic carboxypeptidases.
24. Proteases secreted by the intestinal epithelium (Dipeptidases, Carboxypeptidases and Aminopeptidases) catalyze the conversion of small peptides into amino acids.
25. In digestion of fats (triglycerides), bile salts emulsify fats.
26. Pancreatic lipase catalyze the conversion of these fats into fatty acids.
27. Intestinal Lipase is also involved in digestion of fats into fatty acids and glycerols
28. Digestion of nucleic acids start in the small intestine.
29. Pancreatic nucleases catalyze the conversion of DNA and RNA into nucleotides
30. These nucleotides are eventually converted into nitrogenous bases, Pentose sugars and phosphates
31. by the catalytic action of intestinal Nucleotidases, Nucleosidases and Phosphatases
32. Absorption in the small intestine
33. Fructose is absorbed by facilitated diffusion.
34. Amino acids, small peptides, vitamins, and most glucose molecules are actively transported into the epithelial cells,
35. Fatty acids and monoglycerides are absorbed into the cell through microvilli.
36. Within the cells triglycerides are reformed and they are incorporated into water soluble globules called chylomicrons.
37. These chylomicrons are transported into the lacteal and then into the blood vessels through lymph
38. In addition to the water intake (about 2 L) digestive juices add more water (about 7 L) into the small intestine.
39. Most of this water is reabsorbed via osmosis.

Any 36 x 4 marks = 144 marks

Basic plan in a cross section = 3 marks,

Wall of small intestine = 3 marks

3. (a) Describe the external and internal appearance of the human stomach, duodenum and small intestine.

Stomach

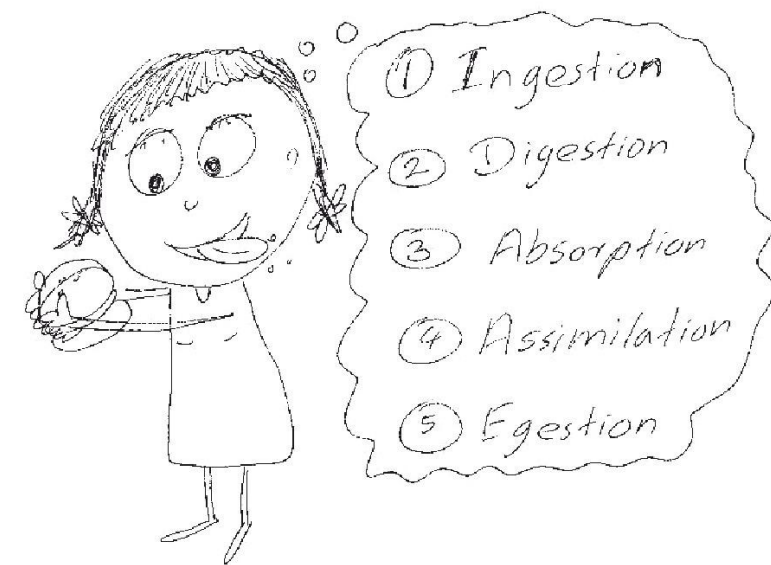
- The stomach is a J- shaped dilated sac in the abdominal cavity.
- The inner surface of the stomach is highly folded and contains large number of pits that leads to gastric glands.
- The stomach wall is very elastic. Distal part of the stomach connects with the small intestine.
- Sphincters are found at the junctions between esophagus and stomach (cardiac sphincter) and stomach and the small intestine (pyloric sphincter).
- They are made up of circular smooth muscles.



Lined writing area for student notes.

Holozoic nutrition

Lined writing area for student notes.



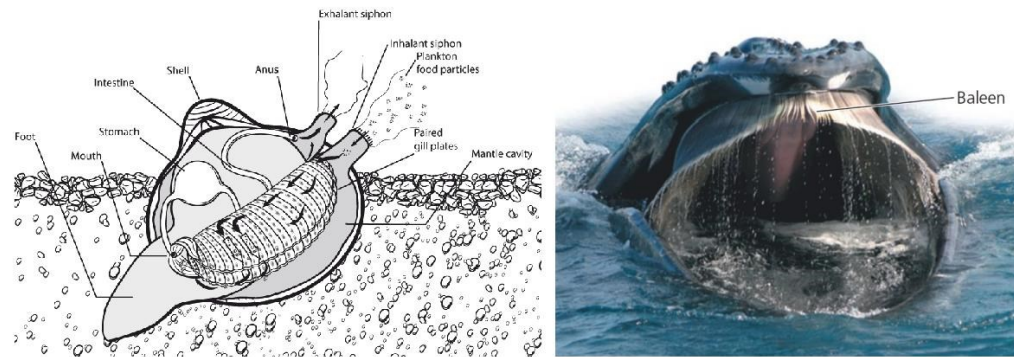
Main stages in holozoic nutrition/Food Processing

- 1. Ingestion:**
 - This is the first stage where the act of eating or feeding happens.
 - Food sources differ among animal species and they possess different modes of ingestion according to the diet or environment.
- 2. Digestion:**
 - Food is broken down into molecules small enough to pass through the membranes and enter the cells of organisms.
 - Digestion could occur mechanically (by teeth or muscle contractions) and chemically (by enzymes).
 - During mechanical digestion, food is broken down in to smaller fragments thus increase the surface area for efficient chemical digestion.
 - During chemical digestion enzymes break bonds in large molecules into small molecules.
 - The last two stages of food processing occur after the food is digested.
- 3. Absorption:**
 - In this stage, the animal's cells take up small molecules. Eg. simple sugars, amino acids
- 4. Assimilation:**
 - Assimilation is the process of utilization of absorbed nutrients for various functions of the body.
- 5. Elimination:** In this process undigested materials are passed out from the alimentary canal.

Feeding Mechanisms of animals

Filter feeders:

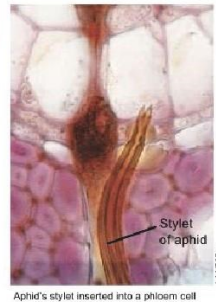
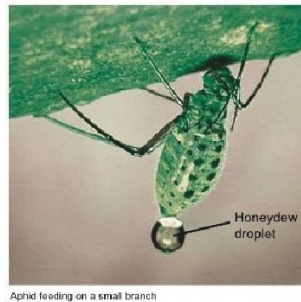
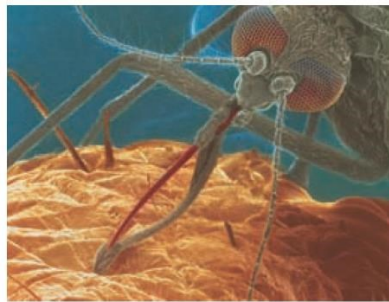
Eg. Clams and oysters - feed on small pieces of food in the water that passes over their gills. Cilia in the gills sweep the food particles to the animal's mouth in a film of mucus.
Whales - Filter feeding of Baleen whales.



Fluid feeders:

- They suck nutrient rich fluid from a living host using well adapted mouth parts.

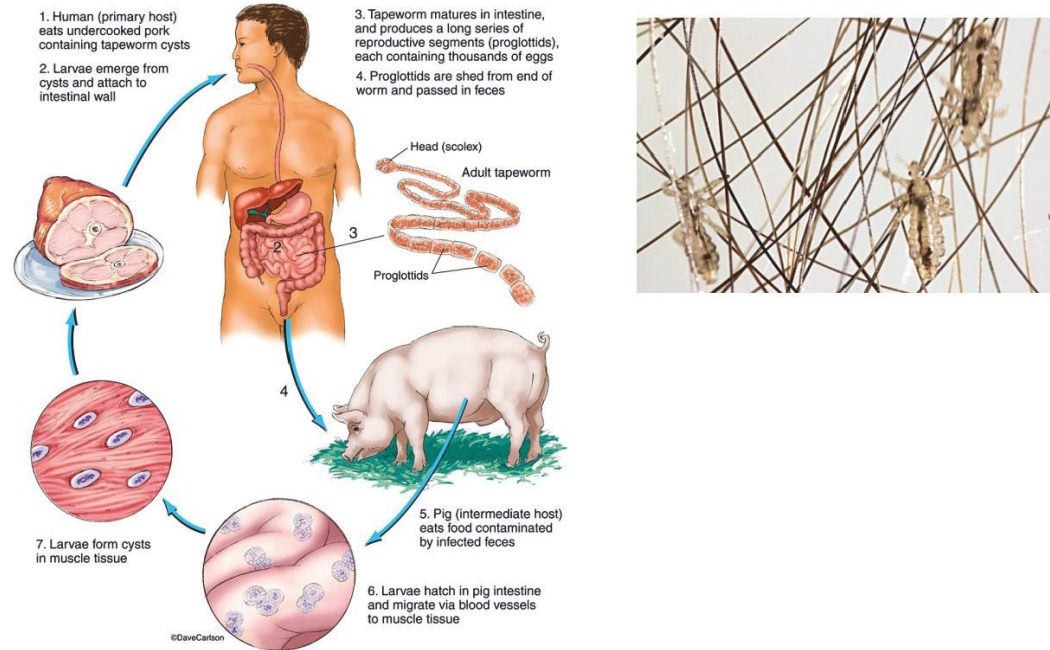
Eg: Mosquitoes - Suck human blood,
Aphids – Suck phloem sap of plants,
Bees and humming birds suck - Honey from flowers



A large area of horizontal dotted lines for writing notes.

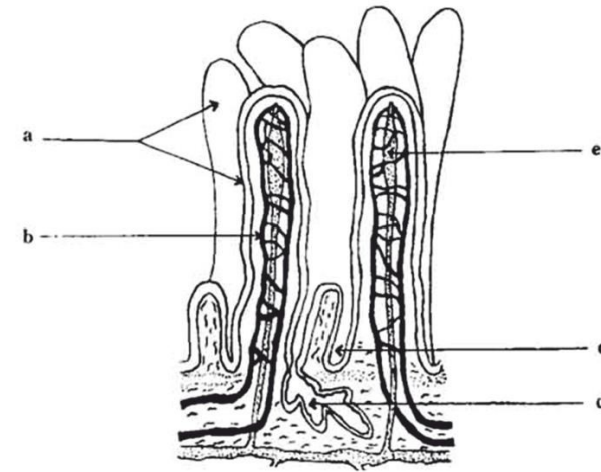
Parasitism:

- It is a close association between two living organisms of different species which is beneficial to one (parasite) and harmful to the other (host).
 - Parasites live either within or on the host and derive its nourishment
- Eg. Tape worm and humans, Lice and humans



Commensalism:

- It is a close association between two living organisms of different species which is beneficial to one and does not affect the other (neither harmful or beneficial)
- Eg. Barnacles attached to whales
Cow and crane



Name the structures labelled as a, b, c, d and e and state one major function of each of these structures.

Structure	Function
(i) a
(ii) b
(iii) c
(iv) d
(v) e

(c) (i) Name the sites in the human small intestine where the following enzymes act.

Enzyme	Site
Maltase
Nucleotidase

- (ii) Which one of the enzyme to activate remaining pepsinogen?
.....
- (iii) What is the main function of lipase?
.....
- (iv) What is meant by emulsification of fat ?
.....
- (v) What causes the emulsification of fat in the human intestine?
.....

(ii) How is the surface area for absorption increased in the small intestine of man?

.....
.....
.....

(iii) What is peristalsis?

.....
.....

(iv) What is the effect of stimulation of parasympathetic nervous system on peristalsis?

.....

D. (i) What is meant by essential amino acids?

.....
.....

(ii) Name three proteolytic enzymes in the pancreatic juice of man.

.....
.....
.....

(iii) What are the functions of amino-peptidases in the intestinal juice?

.....
.....

(iv) Name two substances found in the bile are not found in other secretions of human alimentary canal.

.....

1999 Zoology

1. A (i) What is an alimentary canal?

.....

(ii) Name in sequence the main parts of the human alimentary canal.

.....

(iii) In the course of evolution, the animal group in which an alimentary canal first developed belonged to the phylum

(iv) Name a multicellular animal phylum in which the organisms lack an alimentary canal.

.....

(v) Name a triploblastic animal phylum in which the organisms lack an alimentary canal.

.....

B. Questions (i) - (v) are based on the simplified diagram of a part of the small intestine of man given below.

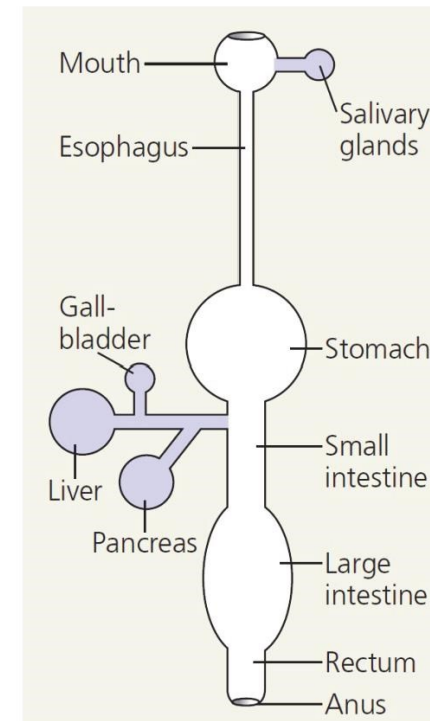
Competency Level 5.2.2 : Relates the structure of the hum and digestive system to its functions

Human Digestive System

Structure and function of the human digestive system

.....
.....
.....

- Human digestive system consists of alimentary canal and associated glands.
- The alimentary canal consists of the following parts: oral cavity, pharynx, esophagus, stomach, small intestine, large intestine, rectum and anus.
- The associated glands include salivary glands, pancreas and liver.



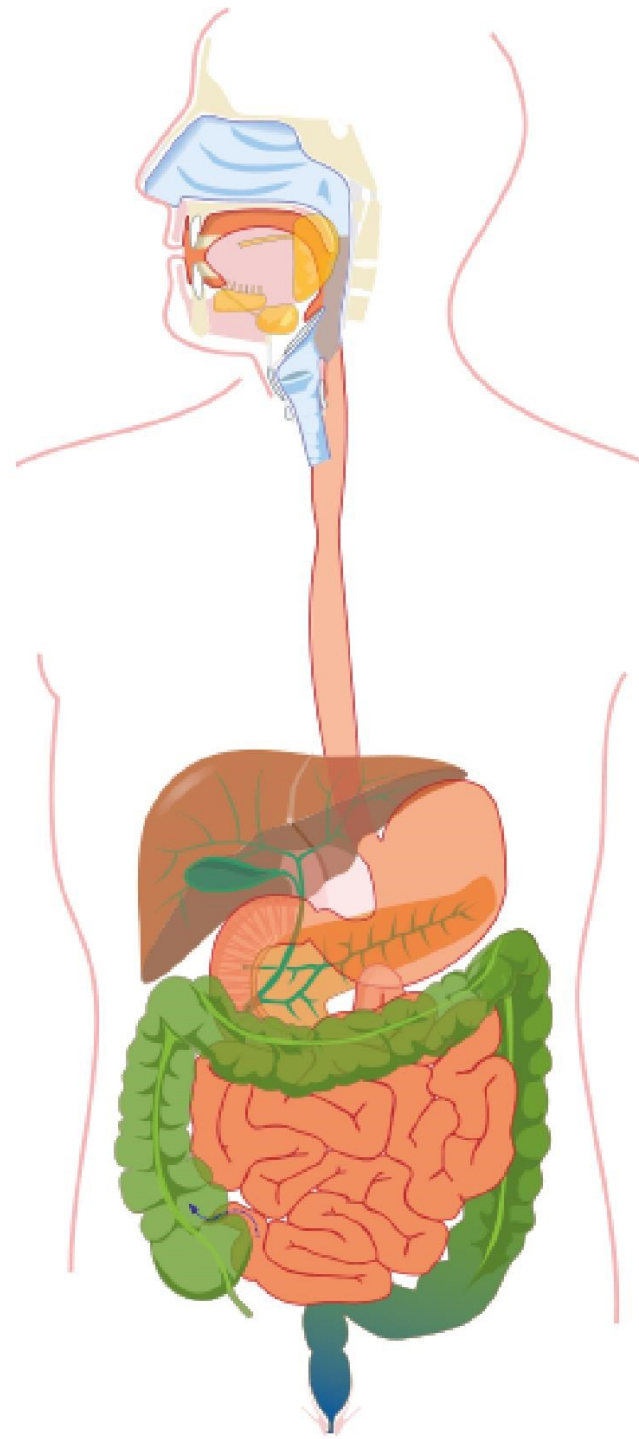


Fig 5.8: Human digestive system

- (v) What is the function of ptyalin present in human saliva?

- B. (i) In which part of the human alimentary canal are the smooth muscle layers most developed?

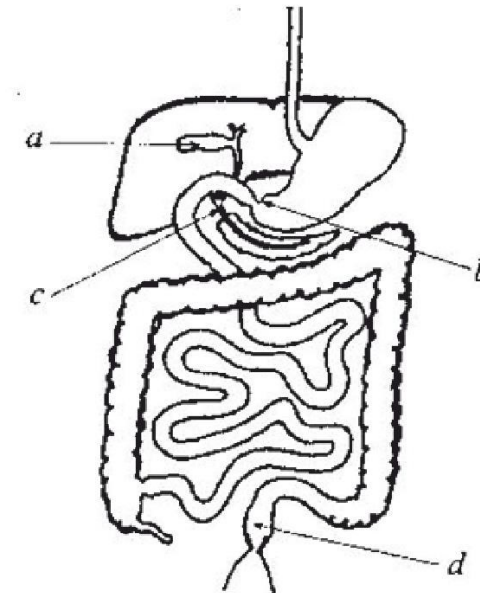
- (ii) Name the main type of tissue found in the submucosa of the human alimentary canal.

- (iii) How are the contents in the stomach prevented from entering the oesophagus in man?

- (iv) State three functions of the human gastric juice other than digestion.
 1
 2
 3
- (v) What is the function of the Brunner's glands?

- C (i) Name the parts labeled as a, b, c and d in the above diagram and state the main function of each of these parts

Part	Main function
a
B
c
d



22. Select the incorrect statement regarding human saliva.
 (1) It is a mixture of salivary and oral mucus glands secretions. (2) It contains more than one enzyme.
 (3) Some nitrogenous waste products found in it. (4) It aids in speech.
 (5) It is essential for complete digestion of starch. (AL/2009)
23. Which one of the following statements regarding the digestive enzymes of **man** is **incorrect**?
 (1) Amylase converts starch into maltose. (2) Lipase converts fats into fatty acids and glycerol.
 (3) Pepsin converts proteins into amino acids. (4) Lactase converts lactose into glucose and galactose.
 (5) Chymotrypsin converts small polypeptides into smaller polypeptides. (AL/2003)
24. Which one of the following statements is correct regarding the human alimentary canal?
 (1) Intestinal glands are found in the villi.
 (2) Most of the consumed vitamins are absorbed in the small intestine.
 (3) Protein digestion begins in the buccal cavity.
 (4) Muscle layers are most developed in the small intestine
 (5) Colon is the main site of production of vitamin B₁₂. (AL/2004)
25. Identify the proteolytic enzyme which acts in alkaline medium.
 (1) Trypsin (2) Pepsin (3) Protease (4) Renin (5) None
26. Which of the following is not a secretion of pancreas?
 (1) Pepsinogen (2) Trypsinogen (3) Chymotrypsinogen (4) Lipase (5) Amylase

2007 AL Paper

2. A. (i) What is meant by nutrition?

- (ii) State the main processes of the holozoic mode of nutrition.

- (iii) What is a balanced diet?

- (iv) What is the dental formula of an adult person?

Mouth/ Oral cavity:

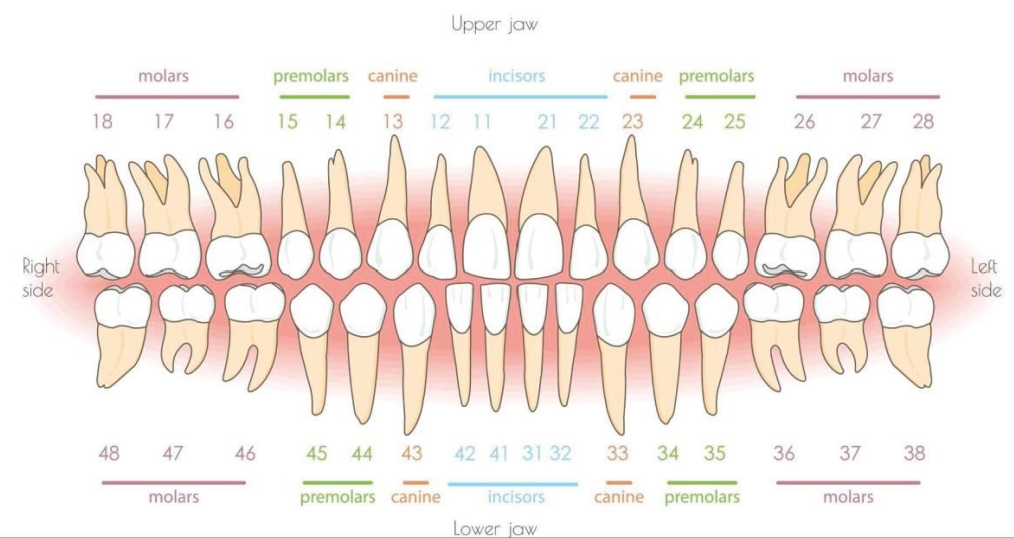
- Oral cavity consists of the tongue, teeth and salivary glands.
- Ingestion and initial steps of digestion are carried out in the oral cavity.
- In the mouth both mechanical and chemical digestion is carried out.
- There are four types of teeth in the mouth: incisors, canines, premolars and molars.
- Food is cut, mashed and ground by different types of teeth with different shapes.
- This makes it easier to swallow food and increase the surface area for digestion.

Milk teeth

$$\left. \begin{array}{l} \text{Incisors, I} = 2 \\ \text{Canines, C} = 1 \\ \text{Molars, M} = 2 \end{array} \right\} \frac{212}{212} \times 2 = 20$$

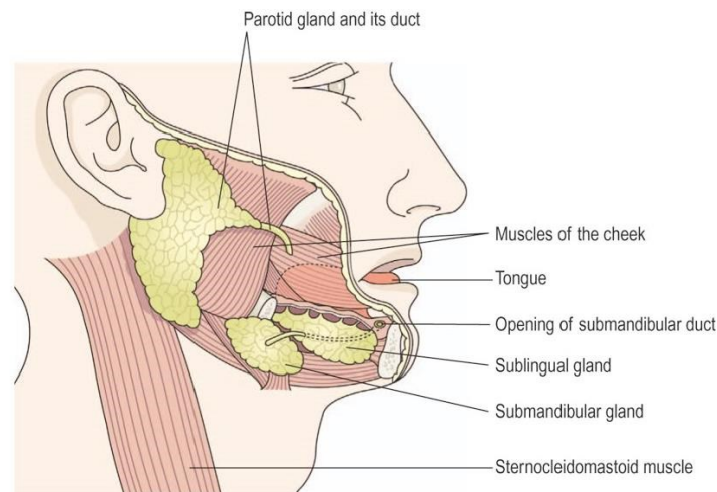
Permanent teeth

$$\left. \begin{array}{l} \text{Incisors, I} = 2 \\ \text{Canines, C} = 1 \\ \text{Premolar, PM} = 2 \\ \text{Molars, M} = 3 \end{array} \right\} \frac{2123}{2123} \times 2 = 32$$



Salivary glands

- Salivary glands release saliva into the oral cavity through ducts.
- Releasing saliva into the oral cavity occurs when food enters the oral cavity due to a nervous reflex.
- Saliva is also released into the mouth before food is ingested due to various other stimuli. Eg. Sight, odor of food, etc.
- Saliva contains water, amylase, mucus (a viscous mixture of salts, cells and slippery glycoprotein called mucins).
- In addition to that, saliva composed of buffers and anti microbial components.



Functions of the saliva

- Salivary amylase:**
 - Chemical digestion of polysaccharides (Eg. Starch) into smaller polysaccharides and disaccharide maltose.
- Water:**
 - Liquefy food and provide watery medium for chemical digestion. Aids in taste reception.
- Mucus:**
 - Lubrication of food which makes it easier for swallowing. Clean the mouth and protects the lining of the mouth from abrasion.
- Antimicrobial substances such as immunoglobulin and lysozymes:**
 - Protect against bacteria that enter the mouth.
 - Buffers prevent tooth decay by neutralizing acid

- Select the false statement:
 - (1) Stomach is a reservoir for food. (2) Churning due to muscular contraction (3) Hcl kills microbes (4) Small jets of gastric content push out (5) Stomach absorb some alcohol
- Which of the following is not a secretion of pancreas?
 - (1) Pepsinogen (2) Trypsinogen (3) Chymotrypsinogen (4) Lipase (5) Amylase
- Identify the smallest salivary gland of man.
 - (1) Parotid (2) Sublingual (3) Submaxillary (4) Submandibular (5) Parotid and sublingual
- Find incorrect statement regarding anatomy of small intestine?
 - (1) Longest organ (2) Ileum a part of it (3) Permanent foldings present (4) Villi present (5) Major site of absorption Ileum

Questions Nos. 15 and 16 are based on the following table. In this table column 1 indicates digestive enzyme of man. Column 2 indicates the main sites of their production and Column 3 indicates the substrates on which they act.

Column 1 enzyme	Column 2 main site of production	Column 3 substrate
A = lipase	E = stomach	P = trypsinogen
B = rennin	F = small intestine	Q = lipids
C = enterokinase	G = pancreas	R = caseinogen

- Which of the following indicates the correct order of main sites of production of enzymes A, B and C?
 - (1) F, G, E (2) E, G, F (3) G, E, F (4) G, F, E (5) F, E, G

(AL/2000)
- Which of the following indicates the correct order of substrates of enzymes A, B and C?
 - (1) Q,P,R (2) R,Q,P (3) P,R,Q (4) Q,R,P (5) R,P,Q

(AL/2000)
- Select the incorrect statement regarding human saliva.
 - (1) It is a mixture of salivary and oral mucus glands secretions. (2) It contains more than one enzyme. (3) Some nitrogenous waste products found in it. (4) It aids in speech. (5) It is essential for complete digestion of starch.

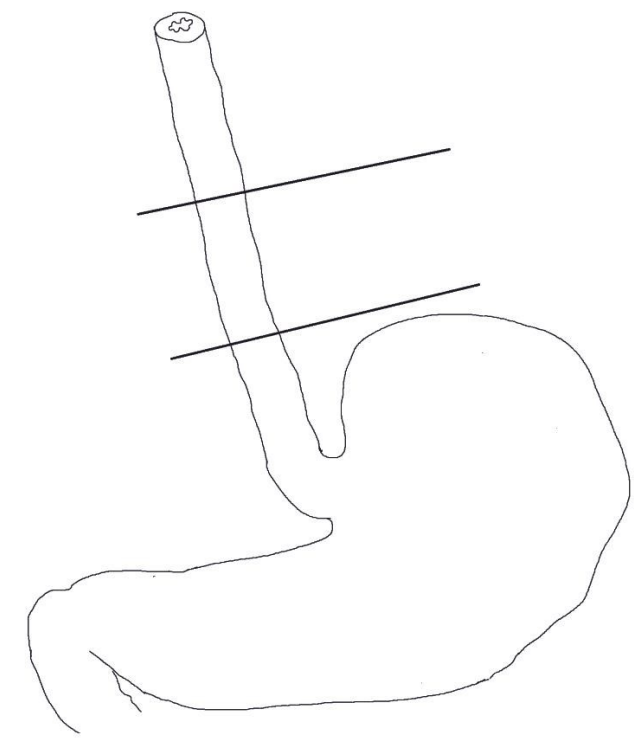
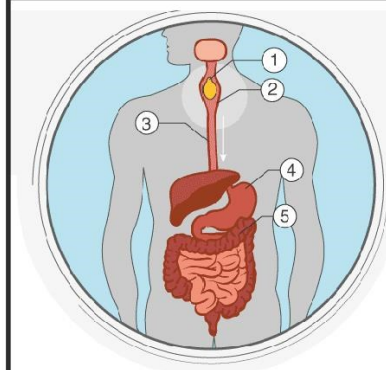
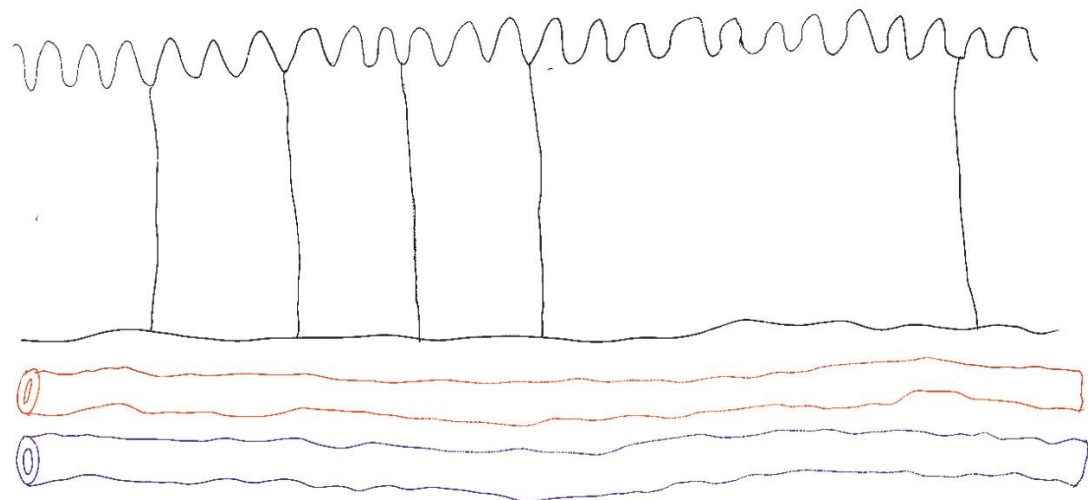
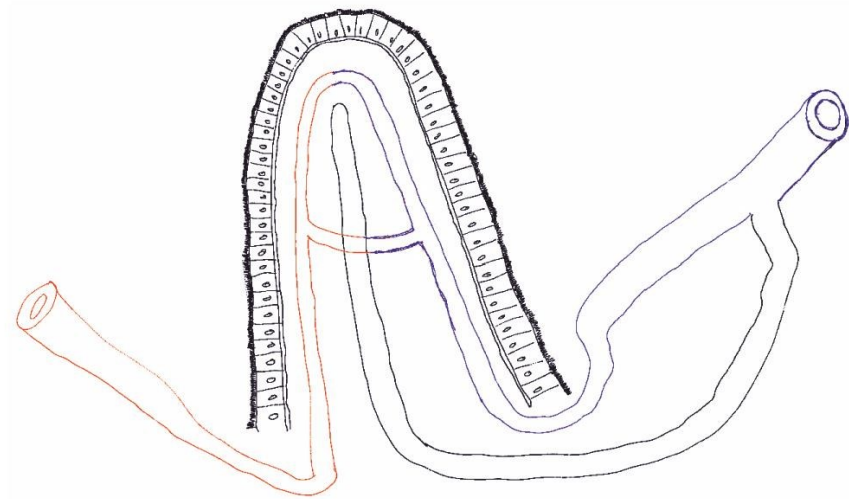
(AL/2009)
- Which one of the following statements regarding the digestive system of man is correct?
 - (1) Skeletal muscle fibres are present in the muscularis mucosa of some regions of the gut. (2) Gastric cavity is lined by cuboidal epithelium. (3) Lipase is present in interstitial juice and pancreatic juice. (4) The most proximal part of the large intestine is the ascending colon. (5) Pancreatic juice contains the enzymes that act on disaccharides.
- Which of the following statements regarding human stomach is correct?
 - (1) It is involved in mechanical and chemical digestion of food. (2) Non specific defence by HCl (3) Secretion of Gastric hormones regulate digestion (4) Phyloric sphincter release chyle. (5) It is the broadest part of the alimentary tract.

(AL/2013/old/17)
- Human stomach
 - (A) is located in the upper right region of the abdominal cavity. (B) contains endocrine and exocrine tissues. (C) secretes enzymes that are functionally similar to those in saliva. (D) absorbs a small amount of end-products of lipid digestion. (E) contains a fluid which has a pH value of around 4-5.

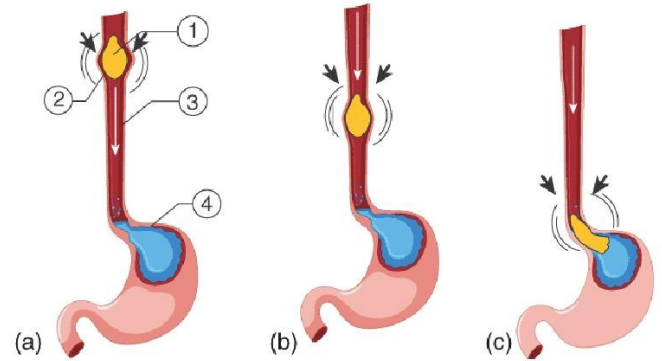
(AL/2015/43)
- Function of which one of the following enzymes of man cannot be substituted by any other enzyme?
 - (1) Dipeptidase (2) Trypsin (3) Chymotrypsin (4) Carboxypeptidase (5) Maltase

(AL/2013/9)



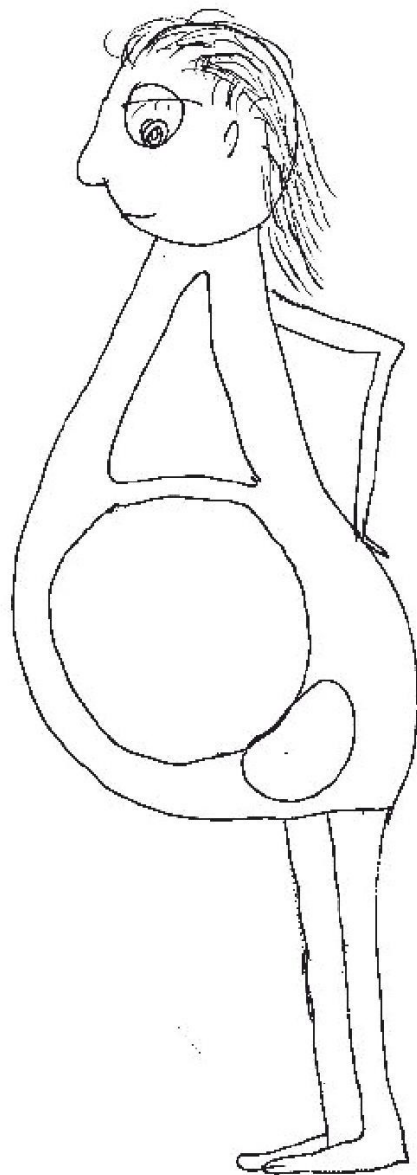


ESOPHAGEAL PERISTALSIS



Stomach/Gaster

- The stomach is a J - shaped dilated sac in the abdominal cavity.
- The stomach wall is very elastic.
- Distal part of the stomach connects with the small intestine.
- Sphincters are found at the junctions between esophagus and stomach (cardiac sphincter) and stomach and the small intestine (pyloric sphincter).
- They are made up of circular smooth muscles.
- These sphincters help to regulate the passage of materials between these organs.



Fat digestion

- Digestion of fats (triglycerides) starts in the small intestine.
- First bile salts emulsify fats. Next Pancreatic lipase catalyse the conversion of these fats into fatty acids, glycerol and monoglycerides.

Nucleic acid digestion

- Digestion of nucleic acids start in the small intestine.
- Pancreatic nucleases catalyse the conversion of DNA and RNA into nucleotides.
- These nucleotides are eventually converted into nitrogenous bases, sugars and phosphates by the catalytic action of intestinal Nucleotidases, Nucleosidases and Phosphatases.

Absorption in the small intestine

- For effective absorption, the surface area of the intestinal wall has been increased with three structural modifications: heavy permanent foldings, finger like projections called villi in the intestinal wall and finger like microscopic projections called microvilli in the epithelial cells of the villi.
- These micro villi are exposed into the intestinal lumen, it gives the appearance of brush (brush border).
- Transport of the nutrients across the epithelium may be active or passive. For example Fructose is absorbed by facilitated diffusion. Amino acids, small peptides, vitamins, and most glucose molecules are actively transported into the epithelial cells.
- Then these nutrients from the epithelial cells are transported into the blood capillaries in the villi. Those blood capillaries are converged into the hepatic portal veins.
- These nutrients are carried in to the liver via the hepatic portal veins. From the liver, this nutrient filled blood is transported into the tissues.
- But absorption of some products of fat digestion takes place in a different pathway:
- Fatty acids and monoglycerides are absorbed into the cell through microvilli.
- Within the cells triglycerides are reformed and they are incooperated into water soluble globules called chylomicrons.
- These chylomicrons are transported into the lacteal and then into the blood vessels through lymph.
- Then they are transported throughout the body via the circulatory system.
- In addition to nutrient absorption, recovery of water and ions mostly occur in the small intestine.
- In addition to the water intake (about 2L) digestive juices add more water (about 7L) into the small intestine. Most of this water is reabsorbed via osmosis.



Chemical digestion in the small intestine

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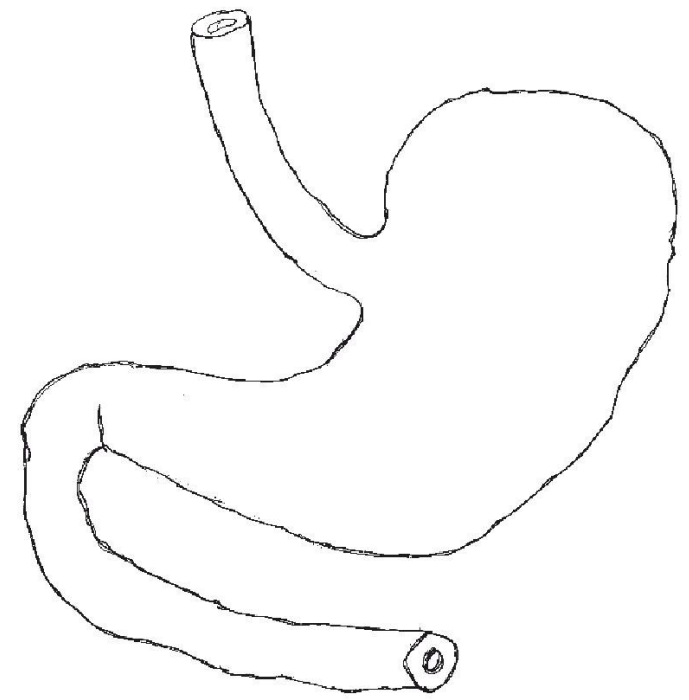
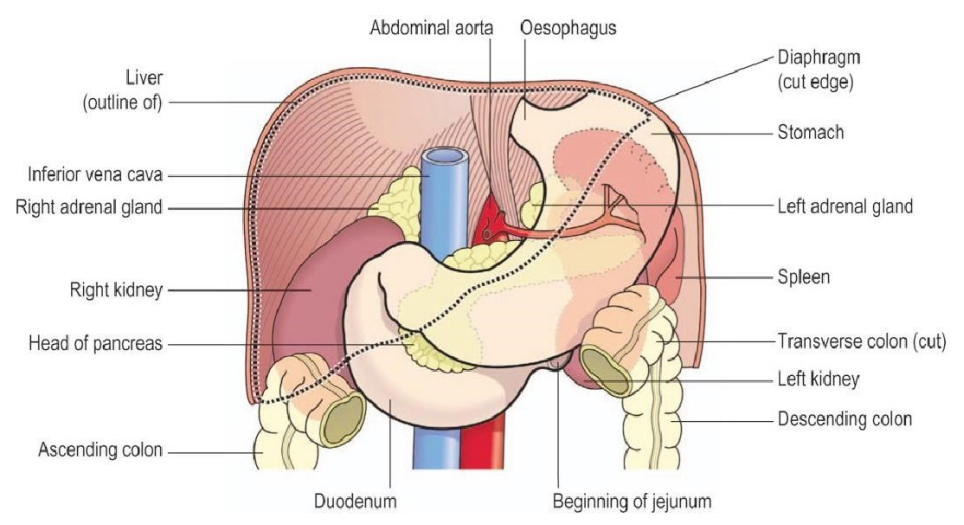
- Glands of the intestinal wall secrete enzymes such as Disaccharidases, Dipeptidases, Carboxypeptidases, Aminopeptidases, Nucleotidases, Nucleosidases and Phosphotases.
- Some of these enzymes are secreted to the lumen and others are bound to the surface of the epithelium.
- Two hormones namely cholecystokonin and secretin secreted by duodenum stimulates the release of pancreatic juice and the bile.
- Pancreatic juice contains enzymes such as Trypsin, Chymotrypsin, Pancreatic amylase, Pancreatic Carboxypeptidases, Pancreatic Nucleases and Pancreatic Lipases.
- In addition it also contains bicarbonates.
- The liver secretes Bile which is stored in the gall bladder until released into the duodenum.
- The Bile contains Bile salts which act as emulsifiers that help in fat digestion and absorption.

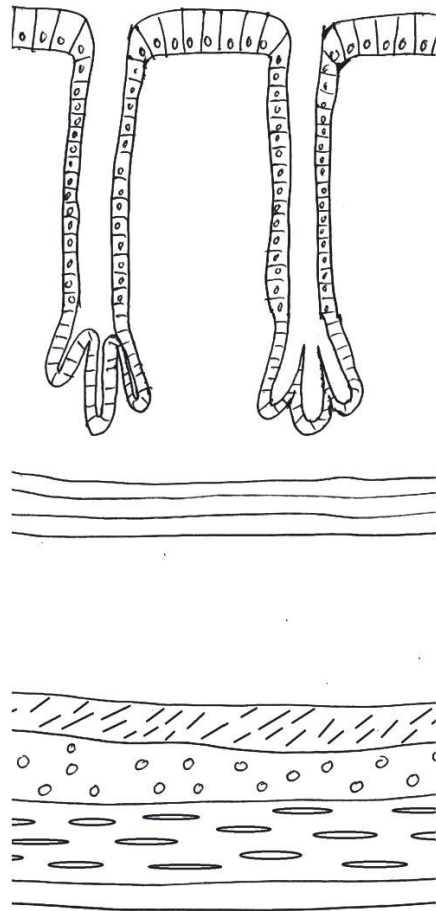
Carbohydrate digestion

- Pancreatic amylase catalyze the conversion of polysaccharides (Eg. Starch) into disaccharides. Intestinal disaccharidases catalyze the conversion of disaccharides into monosaccharides.

Protein digestion

- Trypsin and Chymotripsin catalyse the conversion of small polypeptides into smaller polypeptides.
- These smaller polypeptides are converted to small peptides and amino acids by the catalytic action of Pancer-atic carboxypeptidases.
- Proteases secreted by the intestinal epithelium (Dipeptidases, Carboxypeptidases and Aminopeptidases) catalyse the conversion of small peptides into amino acids.



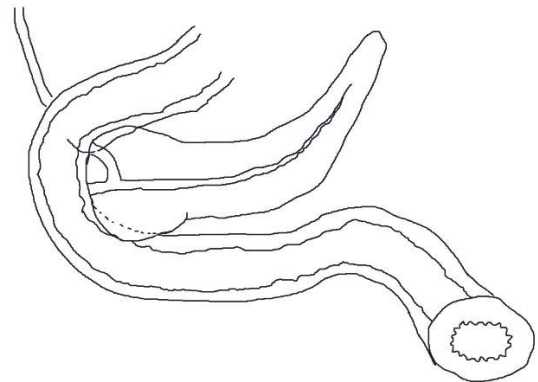


- The inner surface of the stomach is highly folded and contains large number of pits that leads to gastric glands.

Gastric Glands

- Gastric glands contain three types of cells: mucus cells, chief cells and parietal cells.





Chemical digestion in the stomach

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- Pepsinogen is initially converted into pepsin by HCl.
- These activated pepsin help to activate remaining pepsinogen molecules.
- This activated pepsin initiates the chemical digestion of proteins in the stomach.
- The churning action of the stomach facilitates the chemical digestion.
- This is a series of muscle contraction and relaxation. This process mixes the swallowed food with gastric juice.
- Proteins are hydrolyzed to small polypeptides by pepsin. In the stomach food is mixed with gastric juice forming chyme (partially digested semisolid, acidic, food mass).
- The stomach lining is protected from the digestion of HCl and pepsin in several ways:
 1. Enzymes are secreted in to the lumen as an inactive enzyme.
 2. Gastric glands secrete mucus that protect against self-digestion of the stomach lining.
 3. Every three days, cell division adds a new epithelial cell layer which replaces the destroyed/ damaged cells in the lining of the stomach.

Functions of the Stomach

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Small intestine

- It is the longest organ in the alimentary canal.
- It is divided into three regions: duodenum, jejunum and ileum.
- The duodenum is the C shaped curve, which is located around the head of the pancreas.
- The jejunum is middle part of small intestine.
- The ileum is the terminal part of the small intestine.
- The surface area of the small intestine is greatly increased by permanent circular folds and villi.
- The villi are tiny finger like projections of the intestinal wall.
- Most of the digestion is completed in the duodenum.
- The major sites for nutrient absorption are jejunum and ileum.

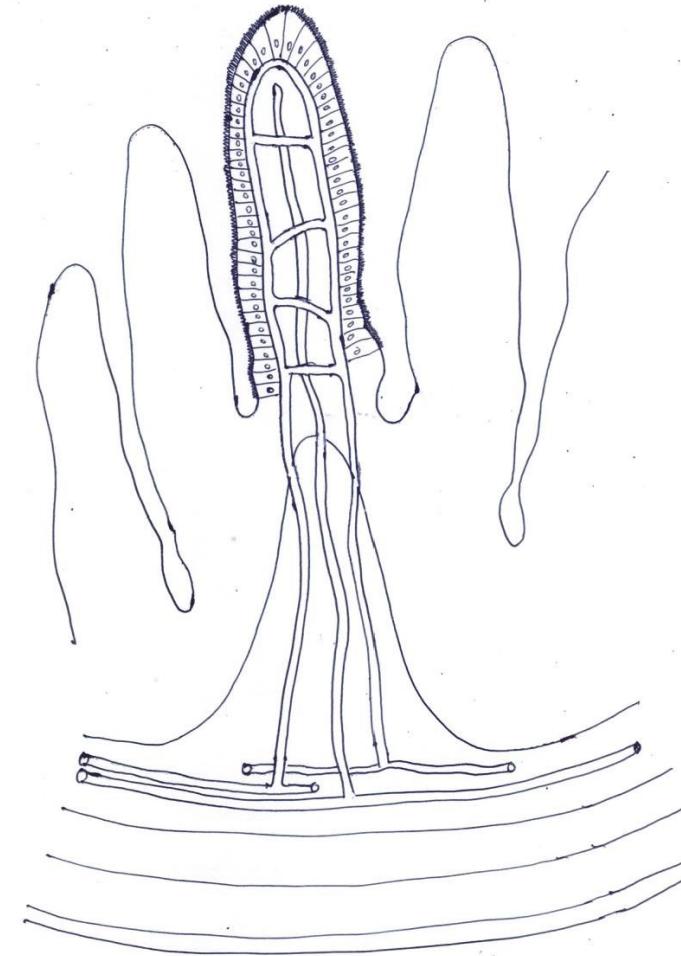
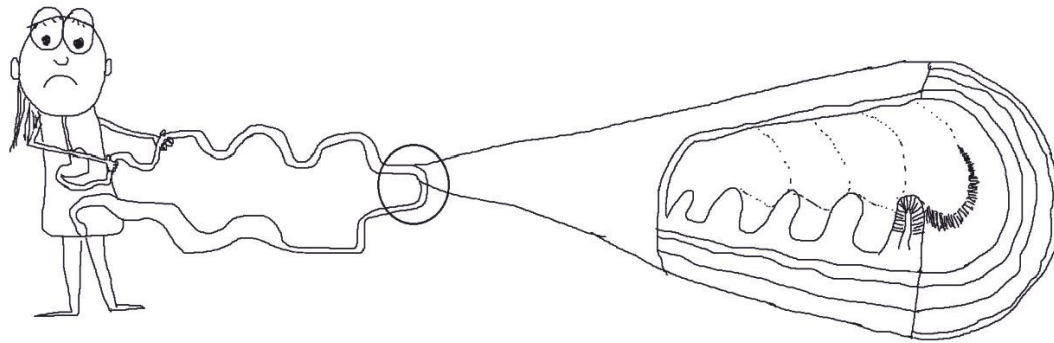


Fig 5.9: Structure of the villus