e. Content for Students of Patliputra University

B.Sc. HONS Part II Paper III (Zoology)

Topic - Physiology of digestion in Mammals

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Q. Give an account of physiology of digestion in mammals.

Ans. Digestion is an adaptation to deal with larger particles in order to break them to such a size that intracellular digestion can take place. In this process digestion occurs outside the cells in the tube called as gut or alimentary canal.

Digestion may be studied under the following heads -

(1) Buccal digestion
(2) Crastric digestion
(3) Intestinal digestion.

(1) Buceal digestion– In buceal cadity, the food is chewed so that it may be swallowed easily; while chewing there is also an increase in the secretion of saliva which softens the food and swallowing became arier.

The saliva coming from salivary glands is viscous and colourless. Its PH ranges from 6.2 to 7.4. The saliva contains a digestive enzymes payalin which by drolyses the strach first to split it into dextrins and then to maltose.

Ruminants (caw, buffalo etc.) have no ptyalin in their saliva. A few other enzymes are also found in human saliva, such as lipse, proteinase, sulphatase etc. Whose function is to digest food particles sticking on the teeth and thus to keep the mouth clean.

(2) Gastric digestion– After swallowin the food passes down the oesophagas by peristaltic movements, Grastric juice is poured out in the stomach. The gastric juice contains 97.99 percent water. The rest of the gastric juice contains HCl, pepsineogen, mucin and inorganic salts.

The enzymes secreted in the stomach are pepsin remain and gastric lipase.

(i) Digestion of protein–

The pepsin is secreted by the chief cells in the inactive state called pepsinogen. The HCl activates this enzyme into pepsin at a PH of 4.6 helow.

$$\text{Native protein} \xrightarrow[\text{PH 1.5-3}]{\text{pepsin}} \text{Proteoses.peptony polypeptides.}$$

$$\text{Calcium casein (milk)} \xrightarrow{\text{pepsin}} \text{Calcium para casein + proteoses.}$$

$$\text{Calcium paracasein} \xrightarrow{\text{pepsin}} \text{Proteoaes, peoptony polypeptides.}$$

The renin is the milk-coagulating protein or enzyme changing soluble protein of the milk (casein) into insoluble paracasein in presence of Ca^{++}

Ranin + milk protein (casein) palacosein.

(ii) Digestion of fat :-

Grastric lipase is produced only in traces by the guestnic glands which digest some of amulsified fet into fatty acids and glycerol.

Grastric lipase + fat ——→ Glycerol + fatty acids.

No digestion of carbohydrates occurs in the stomach.

(3) Intestinal digestion – The gastric chyme moves to the next region, the duodenum by, passing through the pylorus little by little. Here, first of all the panereatic and bile juices mix with the chyme. The average pH of the pancreatic juice ranges from 7.5 to 8.0.

Following enzymes occur in the panereatic juice–

Trypsin, Chymotrypsin, Peptidase, Nuclease, Lipase Amyleso, Esterase, Collagenanse.

Trypsin and chymo truypsin are found in the form of their respective precursors trypsinogen and chymotrypsinogen, which are inactive

$$\text{(i) (a) Native protein} \xrightarrow[\text{Chymtropsis}]{\text{Trypsin}} \text{Proteoes + peptone + polypeptide}$$

$$\text{(b) Proteoses + peptone + polypeptide} \xrightarrow[\text{Chymotrypsin}]{\text{Trypsin}} \text{Polypeptides dispeptides}$$

(ii) Conboxypeptidase– It can not split protein like the above endopeptidase. It is an exopeptidase and acts an proteoses, peptones. palypeptides etc, connecting them into dipeptides and amino acid.

(iii) Amino peptidase –It is also an exopeptidase and its reaction is like that of carboxy peptidase.

$$\text{Proteoses + peptones + polypeptides} \xrightarrow{\text{Aminopeptidase}} \text{dipepdites + Amino acids.}$$

$$\text{Dipeptides} \longrightarrow \text{Amino acids,}$$

(iv) Amylopsin (Amylox) → Lock ptyalin it converts (hydrolyze) starch (carbohydrates), dextrins and glycogen into maltose. It has greater digestive power then salivary anylase.

$$\text{Strach} \xrightarrow{\text{Anylase}} \text{Maltose.}$$

(v) Steapsin (pancreatic lipax) – It hydrolyses fats into glycerol, fatty acids, monoglycerides and diglycerides in a medium having pH between 7 and 8.8.

$$\text{Fats} \xrightarrow{\text{Steapsin}} \text{Fatty acid + glycerol}$$

(vi) Pancreatic renin — It converts remaining milk-protein (casein) into solid parecasein.

(vii) Paneneatic lactax – Transforms lactose (sugars) into maltose.

$$\text{Lactose} \xrightarrow{\text{Lactose}} \text{glucose + galactose}$$

(viii) Cholesterol esterase– It esterifies the cholesterol into cholesterol esters which is absorbed.

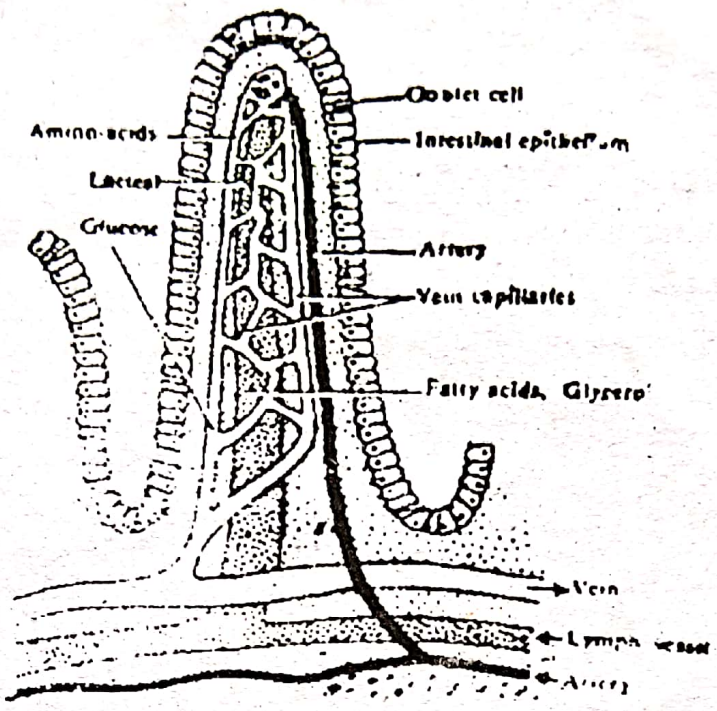
(xi) Pancreatric nucleases – They are found in the pancreatic juices as deoxy ribonuclease and ribonuclease which hydrolize nucleic acids into mononucleodes.

Bile – Bile is a thick mildly alkaline fluid of golden yellow or greenish colour and same what bitter in taste. The water content of the liver bile is 98 percent while that of gall bladder bile is 89 percent. The 11 percent solid portion of the gall bladder bile contains 6 percent, bile dalts, 2.5 percent bile pigment. 6.7 percent cholesterol and 0.8 percent inorganic salt.

Integitinal juice of succus entericus– The integitinal juice is given out from the inestinat glands. Its fill is nearly 7.6 and it contains nearly 1.6 percent soild parts. The enzymes one follows invertax, maltase lactase, sucrose, lipax, entropeptidax. The proteine are hydrolysed very fast in the intestine. The carbohydrats intestine the intestine are mostly in the form of disaccharides which are either those converted into maltase by the action of ptyalin or those in the form of sucrose and lactose taken in directly along with the food. Fats are hydrolysed by the lapax.

Absorption of food–The vill are in constant motion during the digestion and absorption.

(a) Absorption of protein –The smaller peptides and amino acids produced in digestion are quickly absorbed through the intestinal mucosa and reach the hepatic portal vein.



(b) Absorption of carbohydrates– The find digested from the carbohydrates is chiefly in the from of simple monosaccharides. The hexose sugars are absorbed much faster than the pentose sugars. Sugars glucose reaches the blood capillaries and probably in smaller quantities it also reaches the lacteals.

(c) Absorptian of fats– Fats acids and monoglycerides are almost wholly insoluble in water, so they cannot be absorbed directly. Bile salts combine with fatty acids to produce water soluble substances which can be absorbed.

Assimilation– Within the cells, these simple substances (amino acids, glucose, fructose fatty acids glycerale etc.) are again synthesized into complex substance. For example, the amino acids are synthesized into proteins fatty acids into fall, simple sugar into simple sugar etc. How cell substances its produced and this process of converting food substances into living substances is called assimilations.