TENDER HEART HIGH SCHOOL, SEC-33B, CHD

CLASS - IX BIOLOGY

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CHAPTER 11 DIGESTIVE SYSTEM

This lesson is for Class 9 for the subject of Biology Topic Role of Small intestine in Digestion which is covered in Chapter 11 titled digestive System starting on Page No 104 of your text book titled Concise Biology Selina Publication

Dear Childsren before taking up the role of small intestine in digestion Let us first understand its structure

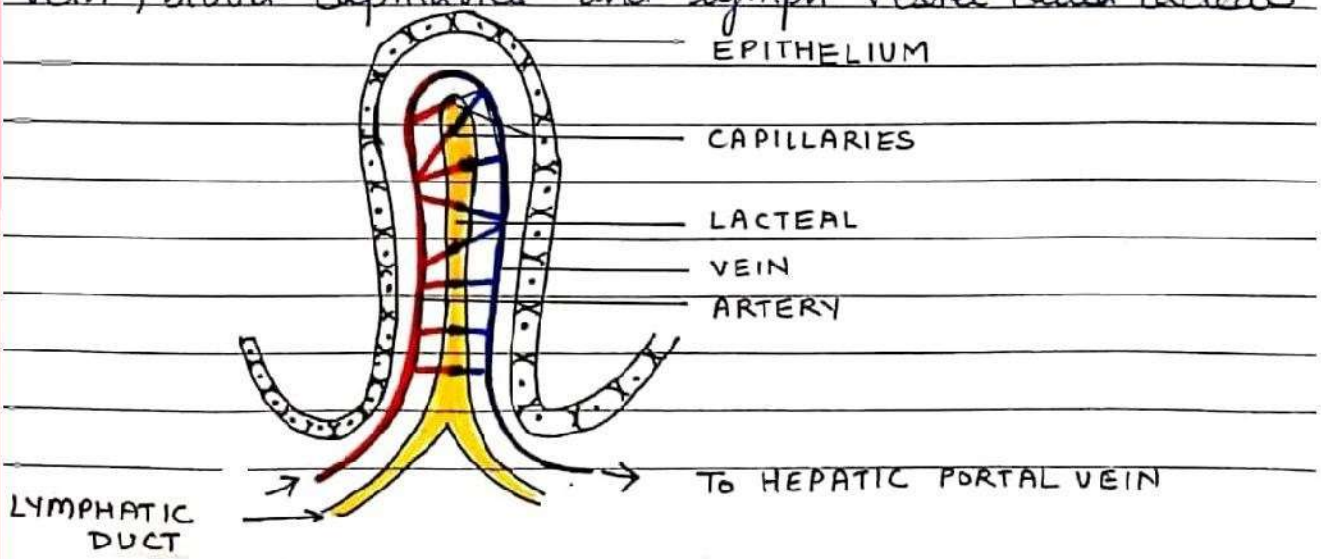
SMALL INTESTINE is long narrow tube of about 7 meters in length highly coiled inside the abdomen It has 3 sub regions -

(i) Duodenum - Short front part, bile duct opens into it
(ii) Jejunum - Middle short region, about 2 meters
(iii) Ileum - longest part about 4 meters in length.

Villi - Inner lining of ileum is made into a number of tiny finger like projections called villi

1) These villi increase the surface area of the intestine which helps in better absorption of food.
2. Villi is covered with single celled epithelium, thus helping in easy exchange of substance ie. absorption of digested food.
3. Ileum is very long which further provides for better absorption of digested food.
4. Ileum is narrow tube which slows down the movement of food thus allowing better absorption Further intestinal juices (enzymes) are secreted by the glandular cells in ileum.

STRUCTURE OF VILLUS - Each villus contains an artery vein, blood capillaries and lymph vessel called lacteal.



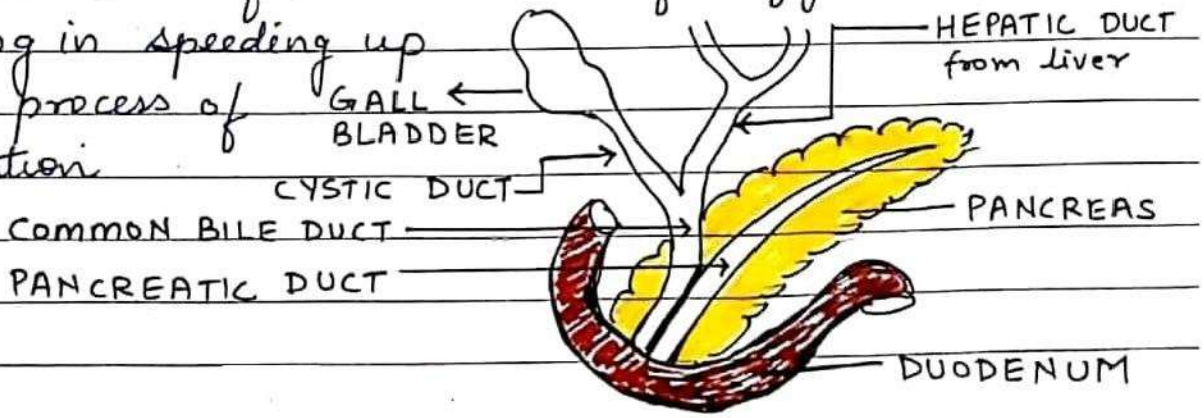
Small intestine serves for digestion and absorption of food. Digestive juices in Small intestine -

(1) Bile (from liver) - yellowish/green fluid (containing pigments - biliverdin and bilirubin) Bile produced in liver is taken through hepatic duct originating from liver (hepatic word relates to liver) Hepatic duct is joined by the cystic duct to form the common bile duct. (Cystic duct connects the gallbladder to hepatic duct) Bile may be released/poured directly into small intestine (duodenum) or may be temporarily stored in gall bladder

Functions of Bile -

(1) Bile contains Sodium bicarbonate, which neutralises the acidic chyme (food coming from stomach is acidic in nature due to functioning of HCl in stomach) Thus the acid content of food coming from stomach gets neutralised and food content becomes alkaline which now enables the pancreatic and intestinal enzymes to act. [Enzymes work at a particular pH. Stomach enzymes need acidic environment and intestinal enzymes need alkaline environment to function)

(2) Bile salts reduce the surface tension of fats and break them into tiny droplets called emulsification of fats'. Tiny droplets means more surface area for the action of enzymes Thus helping in speeding up the process of digestion.



Now before going further let us take a short break and answer the following question during the break in your notebooks

Q 1) Name the 3 sub regions of small intestine

Q 2) Give the term given to the lymph vessels present in villi of small intestine

Q 3) Name the substance present in bile that neutralises the acidic chyme coming from stomach

Now you may pause the lesson for 3 mins break

Break is over children. Listen to the correct answers

A1) Duodenum, Jejunum and Ileum

A2) Lacteals are lymph vessels in small intestine

A3) Sodium bicarbonate

Now let us resume the topic with discussion of -

2 Pancreatic Juices - Pancreatic duct opens into the duodenum (small intestine) by an aperture common to that of bile duct

Location of Pancreas - behind the stomach in the abdominal cavity.

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Enzymes in Pancreatic juices -

(i) Amylopsin / Pancreatic amylase - starch digesting enzyme
It converts starch into maltose

(ii) Trypsin - Protein digesting enzyme., first secreted as inactive trypsinogen. Inactive trypsinogen is activated to Trypsin by an enzyme enterokinase released from duodenum.

(i) Trypsinogen $\xrightarrow[\text{(from duodenum)}]{\text{Enterokinase}}$ Trypsin

(ii) Protein & peptides $\xrightarrow{\text{Trypsin}}$ Smaller Peptides + amino acids

Trypsin converts proteins & polypeptides to smaller peptides and amino acids (break down products of proteins)

(iii) Steapsin is a fat digesting enzyme. It acts on emulsified fats (produced after the action of Bile on fats) to break them down into fatty acids and glycerol

Emulsified fats $\xrightarrow{\text{Steapsin}}$ Fatty acids + Glycerol

3 Intestinal juices - released from the walls of intestine

Enzymes in intestinal juices -

(i) Erepsin protein digesting enzyme

Peptides $\xrightarrow{\text{Erepsin}}$ Amino acids

(ii) Carbohydrate digesting enzymes - Maltase, Lactase and Sucrase breaks down the carbohydrates as -

Maltose $\xrightarrow{\text{maltase}}$ Glucose

Sucrose $\xrightarrow{\text{sucrase}}$ Glucose + fructose

Lactose $\xrightarrow{\text{Lactase}}$ Glucose + galactose

iii Lipase - fat digesting enzyme

Emulsified fats $\xrightarrow{\text{Lipase}}$ Fatty acids + glycerol

ABSORPTION OF FOOD

Digested food is mainly absorbed in the small intestine itself as -

Break down product of proteins (i.e amino acids) and carbohydrates (i.e. glucose, fructose, galactose - simple sugars) are absorbed through villi of small intestine and reaches the blood capillaries and thus comes into blood circulation and reaches all parts of body.

Break down products of fats (i.e. fatty acids and glycerol) are absorbed into lacteals (i.e. lymph vessels) and enter the lymphatic system

[Like we have blood and blood vessels forming circulatory system in our body, similarly we have lymph and lymphatic vessels forming lymphatic system in the body. Lymph majorly contains white blood cells hence is providing immunity to the body by helping us to fight with germs]

NOTE Food moves very slowly through alimentary canal It stays in stomach for about 3 hours Similarly it takes 4 hours to pass through the small intestine

With this I am ending todays discussion children On the basis of your understanding of today's topic all students are required to answer the following home assignment questions in the notebooks

HOME ASSIGNMENT

1. Students are required to learn and write Table 11.1 (Page 111) Summary of digestion in various parts of alimentary canal.
2. Do the following 'Review Questions' (Page 115 & 116) in notebook -

C. Short Answer Type - Q No. 2
D Long Answer Type - Q.No 3
E Structured / Application Type - Q No 2 & 3

3. Draw a well labelled diagram of intestinal villus in your notebook.