# DIGESTION

## INTRODUCTION

Every organism requires energy supply to carryout different life activities and to maintain body homeostasis.

The energy sources are self generated by plats they are also called as autotrophs and animals are heterotrophs as they depend upon the other living organisms for food.

The component of normal diet includes carbohydrates and lipids and fats vitamins and minerals . Hence carbohydrates and proteins are high molecular weight compounds and these cannot be absorbed directly and are converted to simpler substances .

The chemical conversion of larger molecules into smaller forms is called digestion

## DIGESTION

- it is the breakdown of the foods that we eat in a soluble form are suitable for absorption .
- it is a process of a enzymatic hydrolyses in which the covalent bonds are broken down
- This process releases glucose, aminoacids and mineral salts and fatty acids and glycerol

Ingestion : it is the intake of food into the alimentary canal

Propulsion : This mixes and moves the contents along the alimentary canal.

Digestion

Mechanical digestion : breakdown of food by masticating and chewing

Chemical digestion : breakdown of food into smaller molecules by enzymes

Assimilation: distribution of digested food materials to all cells and tissues .

## INTRACELLULAR AND EXTRACELLULAR DIGESTION

## INTRACELLULAR DIGESTION

It means digestion with in the body cells where the food is ingested into the cell by formation of food vacuole which is also called as temporary stomach .

The food present in the stomach is digested by acid hydrolases whereas enzymes like proteases, lipases and glycosidases and phospholipases are utilized in digestion.

The digested food is directly absorbed into cytoplasm . such vacuoles are called as residual vacuoles .

They send their contents by exocytosis . storage excretion is seen in some animals like protozoans and ceolentrates .

**EXTRACELLULAR DIGESTION**

It is digestion outside the animal body or extracellular spaces . It is carried in a tube called gastrovascular cavity . the cells lining the cavity secrete enzymes into the lumen where they breakdown food into micro units .

In higher animals it is extracellular which generally has mouth,salivary glands , esophagus , stomach , pancreas, large intestine and anus .

**DIGESTION OF CARBOHYDRATES**

The food material consists of carbohydrates which includes starch and disaccharide sugars such as lactose and glucose

STARCH

It is a polymer of glucose units joined by glycosidic bonds . it consists of two parts amylase and amylopectin .

The amylase is simple , unbranched and helicoids polysaccharides glucose units are linked by α1-4 glycosidic bonds .

The amylopectin is large , complex and branched polysaccharide whose glucose units are joined by two types of glycosidic linkages α1-4 glycosidic bonds and α1-6 glycosidic bonds.

During digestion the α1-4 bonds in amylase are broken by α- amylase , while α1-6 linkages are releases by α- glucosidase . sucrose is a disaccharide composed of gliucose and fructose linked by α1-2 glycosidic bond broken by intestinal sucrose.

**PROCESS**

- ✓ It starts in the mouth where teeth grind and breakdown the food into smaller pieces which increases the surface area for better action of enzymes
- ✓ Man has three pairs of salivary glands secretion has 99.5% and 0.5% electrolytes and protein .
- ✓ The salivary proteins are α amylase and mucus and lysozyme
- ✓ Salivary glands facilitate swallowing, moistening food particles .
- ✓ Saliva is antibacterial carried by lysozyme .
- ✓ The salivary amylase acts on starch and glycogen and digests them into maltose and maltotriose and limit dextrins at neutral pH 6.8
- ✓ The epithelial lining of the stomach wall secretes gastric juice which contains high concentration of HCL
- ✓ The digestive juice mixed with food due to churning action of smooth muscles of the stomach wall.

- ✓ The food paste is called as acid chime which further digested in alkaline medium in small intestine.
- ✓ The acid chime of the stomach enters the small intestine through as small opening regulated by pyloric sphincter.
- ✓ The bile also neutralises acid chime

**DIGESTION OF PROTEINS**

- Animal proteins are rich in essential aminoacids and are required in less quantity
- The digestion of proteins is breakdown of peptide bonds and releases aminoacids and are again used by the body for the synthesis of required proteins
- Digestion of proteins involves enzymes like proteases . the endopeptidases cleaves Polypeptide at the anterior peptide bonds exopeptidases are classified into aminopeptidases and carboxypeptidases
  - Digestion of proteins takes in the stomach the pepsin and rennin are secreted as zy mogens called pepsinogen and prorennin
  - The HCL of gastric juice kills the bacteria disturbs secondary and tertiary protein structure by exposing peptide bonds
  - The rennin is found in stomach of infants and calves for digestion of milk
  - After activation by pepsin it acts mainly on protein casein and paracaseinate
  - And in the presence of calcium curdling process of milk forms calcium paracaseinate.

Rennin (active form)

Casein ⟶ Calcium paracaseinate

- Then partially digested food from stomach passes into duodenum where it is acted by pancreatic enzymes i.e., typsin, chymotrypsin, elastase and corboxypeptidase which function in alkaline medium (pH 7-9).
- All these are produced as zymogens ie trypsinogen, chymotrypsinogen, proelastage and procarboxypeptidase.
- Trypsinogen is activated by intestinal enzyme enteropeptidase (formerly called as enterokinase) to trypsin, which activates remaining trypsinogen in autocatalytic process. It also activates other three enzymes and forms chymotripsin, elastase and carboxypeptidase. Carboxypeptidase is exopeptidase while other three are endopeptidases.
- Carboxypeptidase breaks peptide bonds at carboxy end of peptide and results in free amino acids.
- Trypsin attacks at interior peptide bonds at carboxy end of basic amino acids like arginine and lysine.

Trypsinogen (inactive) ⟶ Trypsin (active)

## Digestion of Lipids

Then lipid digestion is completed in the small intestine with the help of bile, pancreatic and intestinal sections. The acidic chime with partially digested food mixes with liver and pancreatic sections. Bile salts i.e., sodium glycocholate and taurocholate emulsify fats and facilitate digestion. Pancreatic and intestinal lipases act in alkaline medium (pH 8). Pancreatic lipase cleaves ester linkages at positions 1 and 3 tryacylglycerols and leaves second linkage intact. This results in monoacylglycerol and fatty acids.