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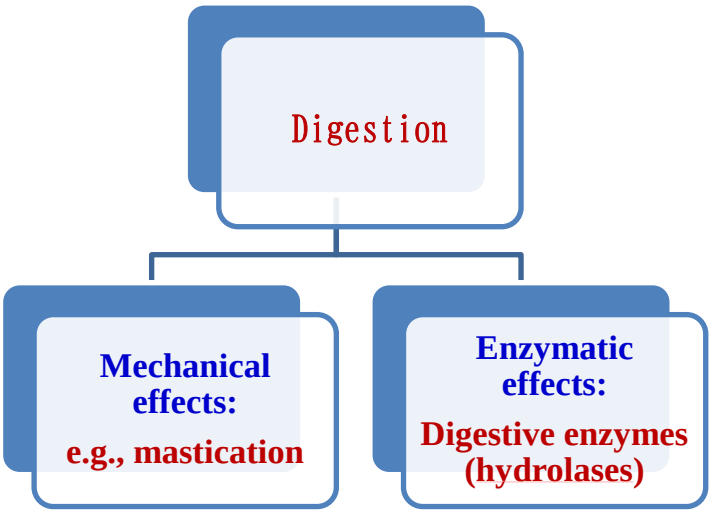


The digestion starts

For carbohydrates → In Mouth

For lipids and protein → In Stomach

End Products of Digestion:

- **Carbohydrates → Monosaccharides**
- **Triacylglycerols (TAG) → Fatty acids & monoacylglycerols**
- **Proteins → Amino acids**

Salivary glands :

They secrete saliva

Saliva :

1.Acts as lubricant 2. Contains salivary α-amylase 3. Contains lingual lipase

Note : We have 2 types of α-Amylase: 1- salivary 2- pancreatic

Carbohydrates in the mouth

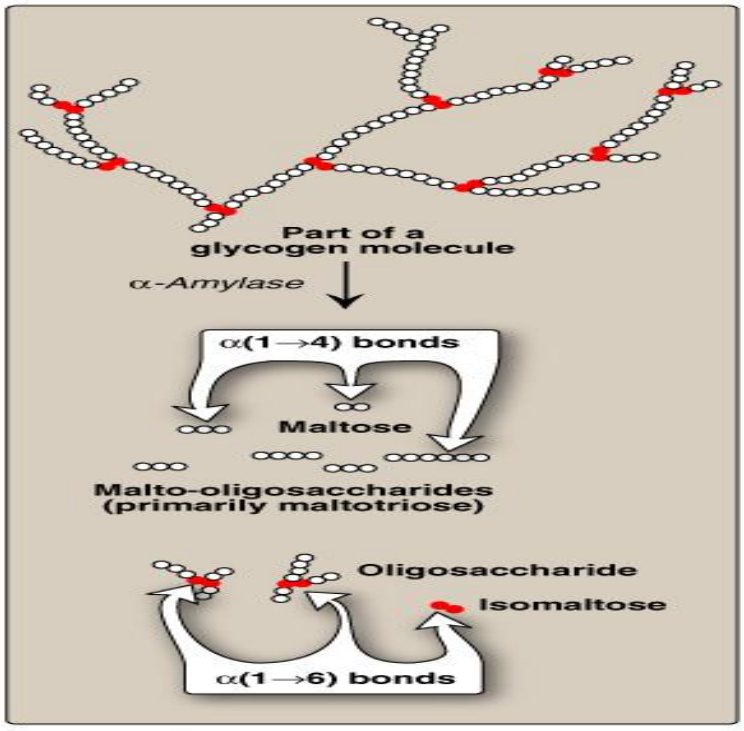
BY : **Salivary α-Amylase**

Glycogen ⟶ **Short, branched oligosaccharides e.g.,**

Maltotriose (3 monosaccharide) **/ Isomaltose**

Salivary α-Amylase

- ♣ **Secreted by: Parotid glands**
- ♣ **Optimum pH: 6.6 – 6.8**
- ♣ **Substrate: Starch and glycogen**
- ♣ **Hydrolyzes: α(1,4) glycosidic bonds**
- ♣ **Produces: Short, branched oligosaccharides**



The glycogen has 2 types of bonds :

1. **α(1,4) glycosidic bonds** connect two molecule of monosaccharide in straight chain (which **Salivary α-Amylase** can only break)
2. **α(1,6) glycosidic bonds** at the branching point

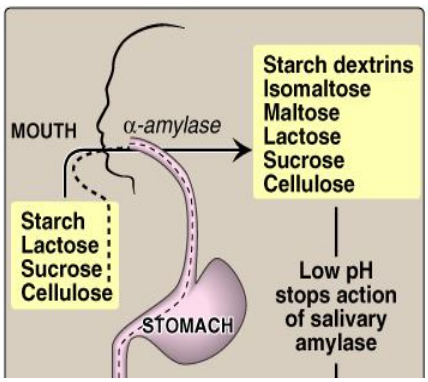
This is why we have short branched oligosaccharide

In cellulous

The bond is **:β(1,4) glycosidic bonds** (**Salivary α-Amylase** cannot act on)

Digestive Action On The Polysaccharides Is Of Little Significance Because:

- **the short time during which the enzyme can act on the food in the mouth**
- **the enzyme is inactivated by the acidity of stomach (The enzyme is inactivated at pH 4.0 or less)**

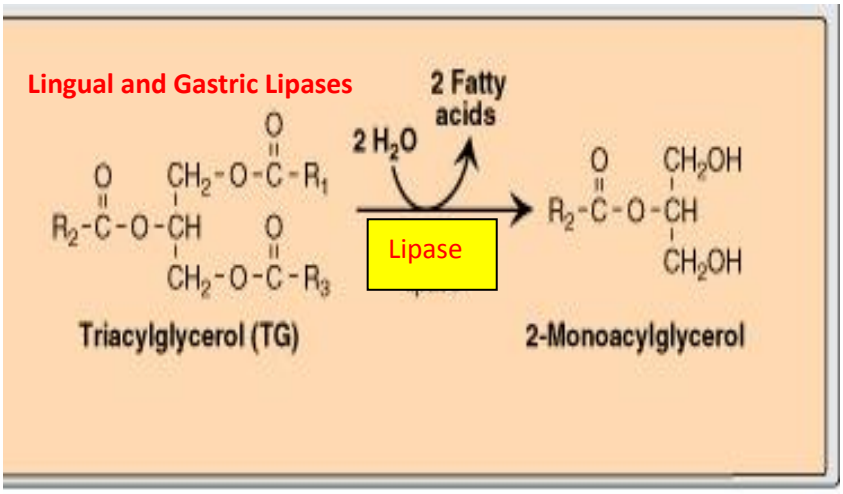


Role of Stomach in Digestion

- **No further digestion of carbohydrates**
- **Lipid digestion begins by lingual and gastric lipases**
- **Protein digestion begins by pepsin and rennin**

Lipids And Protein In Stomach

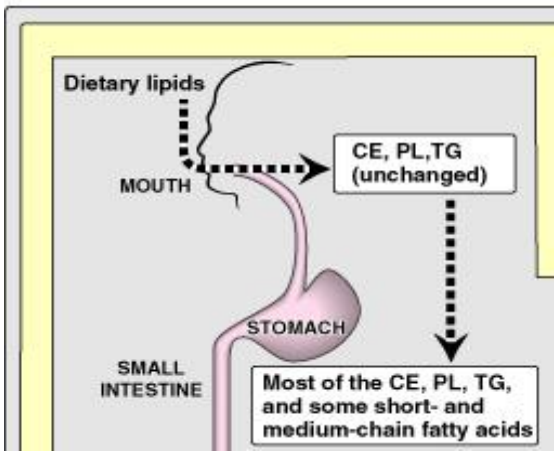
	Lingual and Gastric Lipases	Pepsin	Rennin
Secreted by	Lingual lipase →dorsal surface of the tongue (Ebner's glands)	chief cells of stomach as inactive proenzyme, pepsinogen	chief cells of stomach in neonates and infants
Substrate	TAG molecules, containing medium- and short-chain fatty acids; such as found in milk fat	denatured dietary protein	Casein of milk (in the presence of calcium)
end products	2-monoacylglycerols and fatty acids	Smaller polypeptides	Paracasein with the *formation of milk clot*
Note	The role of both lipases in lipid digestion is of little significance in adult human (lack of lipid emulsification that occurs in duodenum)	*Activated by HCl and autocatalytically by pepsin * Acid-stable, endopeptidase	Effect: It prevents rapid passage of milk from stomach, allowing more time for action of pepsin on milk proteins
Important for	*In neonates and infants for the digestion of TAG of milk *In patients with pancreatic insufficiency where there is absence of pancreatic lipase		



Target substrate for acid-stable lipases is TAG containing:

R1 – C(=O) – O and R3 – C(=O) – O as short- or medium-chain fatty acids

Digestion of Lipids in Stomach



In adults,
no significant effects because of lack of emulsification that occurs in duodenum
In neonates and infants, digestion of milk TAG and production of short- and medium-chain fatty acids

Digestion of Dietary Proteins in Stomach

HCl:

- **Denatures proteins**
- **Activates pepsin**

Pepsin:

Cleaves proteins into polypeptides

Rennin:

Formation of milk clot

Take Home Message..

- **Digestion involves both mechanical and enzymatic processes**
- **Digestion makes dietary foodstuffs readily absorbable by the digestive tract**
- **Salivary α-amylase is of limited, but initial effect on digestion of starch and glycogen in the mouth**
- **Salivary α-amylase converts starch and glycogen into short, branched oligosaccharides**
- **Limited digestion of TAG begins in the stomach by**
- **both lingual and gastric lipases**
- **producing 2-monoacylglycerols and fatty acids**
- **Digestion of proteins begins in the stomach by pepsin**
- **producing smaller polypeptides**
- **In neonates and infants, digestion of milk occurs in stomach by:**
    - **Acid-stable lipases for digestion of milk fat**
    - **Rennin and pepsin for digestion of milk proteins**