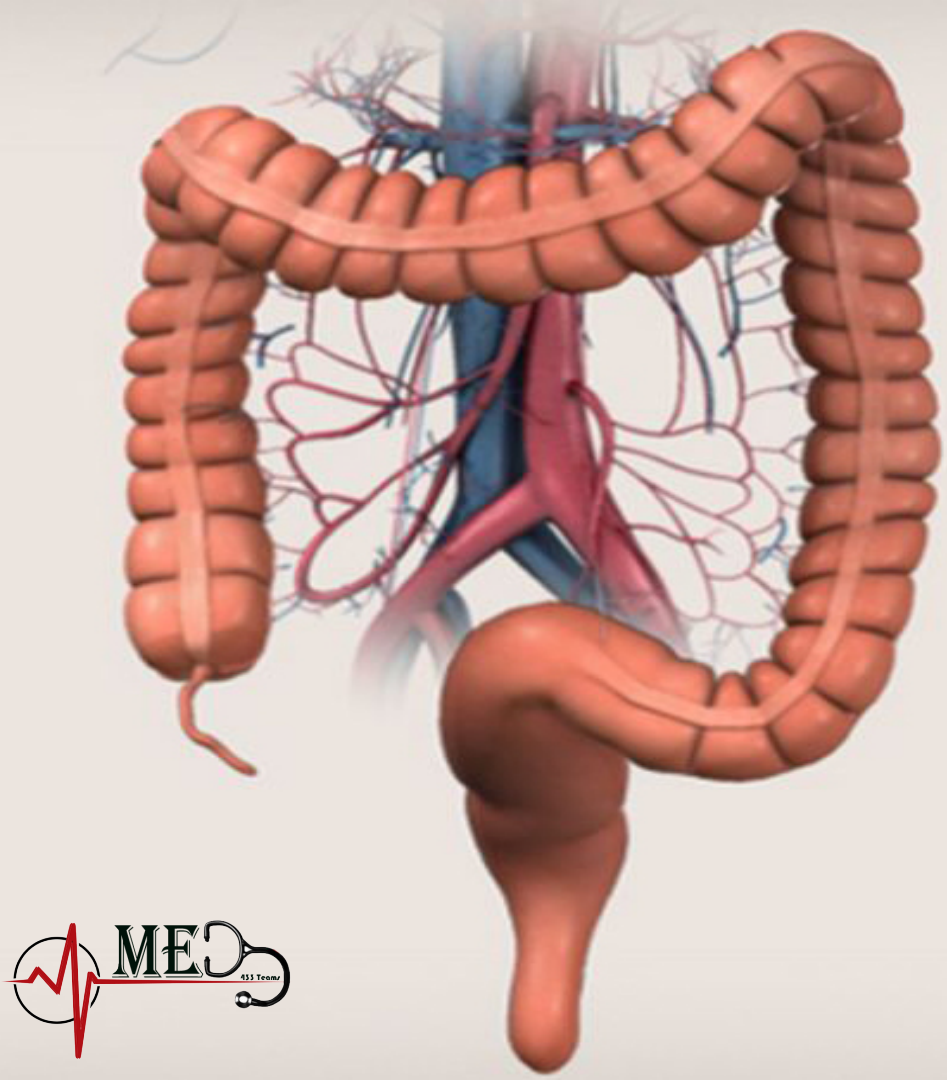

Role of Salivary Glands in Digestion

OBJECTIVES:

- Understand the principle and importance of digestion of dietary foodstuffs
- Understand the role of salivary glands in digestion
- Understand the role of stomach in digestion

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DIGESTION

It includes:

- ❑ Mechanical effects:
  e.g., mastication
- ❑ Enzymatic effects:
  Digestive enzymes (hydrolases)

Definition

The breakdown of the naturally occurring foodstuffs into smaller, easily absorbable forms.

Role of salivary glands in digestion

They secrete saliva

- Acts as lubricant
- Contain salivary α-amylase
- Contain lingual lipase

End products of digestion

Carbohydrates	Monosaccharides
Triacylglycerol (TAG)	Fatty acids & monoacylglycerols
Proteins	Amino acids

salivary α-amylase

Substrate

- ❑ Starch
- ❑ Glycogen

Optimum PH

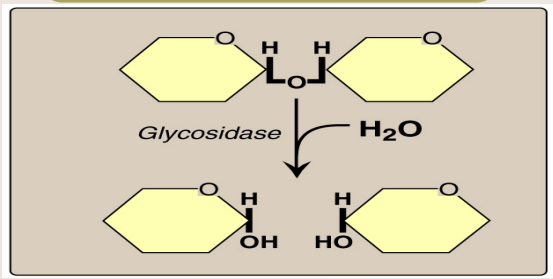
6.6 – 6.8

Secreted by

Parotid glands

Action

Hydrolysis of α(1,4) Glycosidic Bonds



Activity

- ❑ **Its digestive action on the polysaccharides is of <u>little significance because of the short time during which the enzyme can act on the food in the mouth</u>**
- ❑ **Salivary amylase is <u>inactivated by the acidity of stomach (The enzyme is inactivated at pH 4.0 or less)</u>**

Products

- ✓Mixture of short oligosaccharides(both branched & unbranched)
- ✓Disaccharides: Maltose and isomaltose

NOTE:

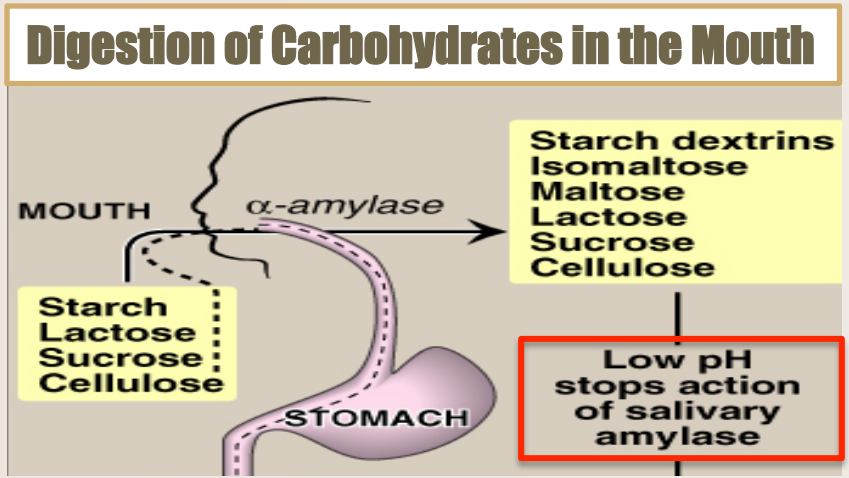
- **Salivary α-amylase <u>DOES NOT</u> hydrolyze:**

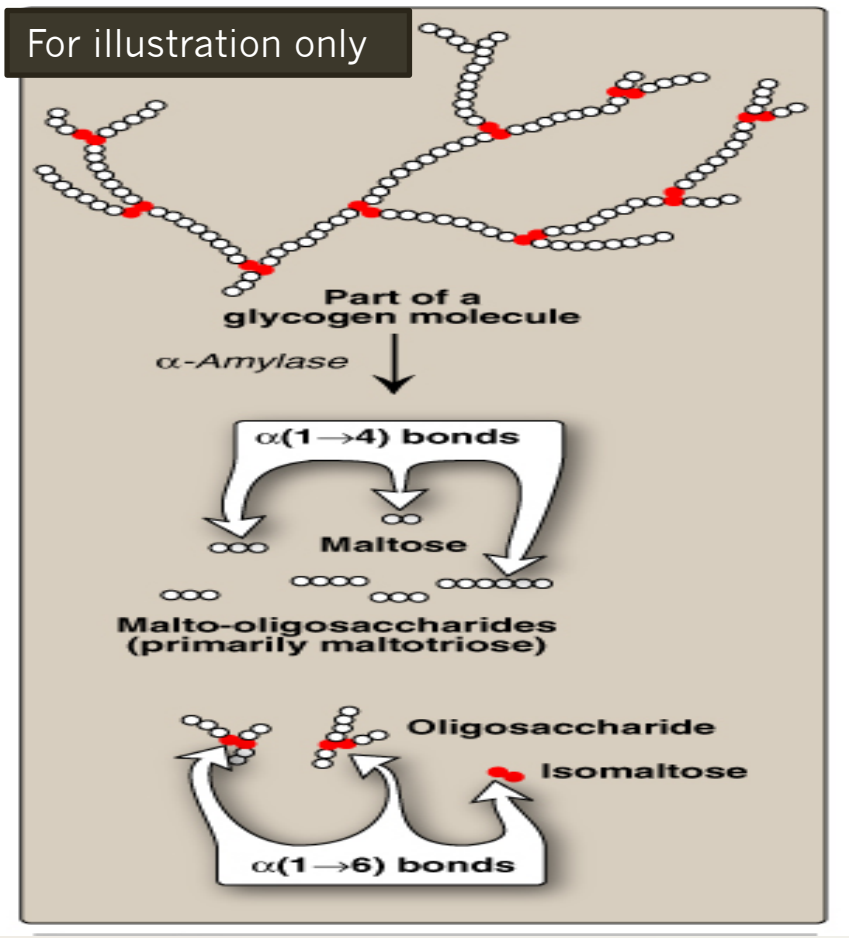
α(1,6) glycosidic bonds

(The branch points of starch and glycogen)

- **Salivary α-amylase <u>CANNOT</u> act on:**

β(1,4) glycosidic bonds of cellulose





Lingual and Gastric Lipases (Acid-Stable Lipases)

little significance in adult human because lipids in the stomach are not yet emulsified. (Emulsification occurs in duodenum)

Role in digestion

2-monoacylglycerols and fatty acids

Products

✓Lingual lipase[1] is secreted by the **dorsal surface of the tongue (Ebner's glands)**

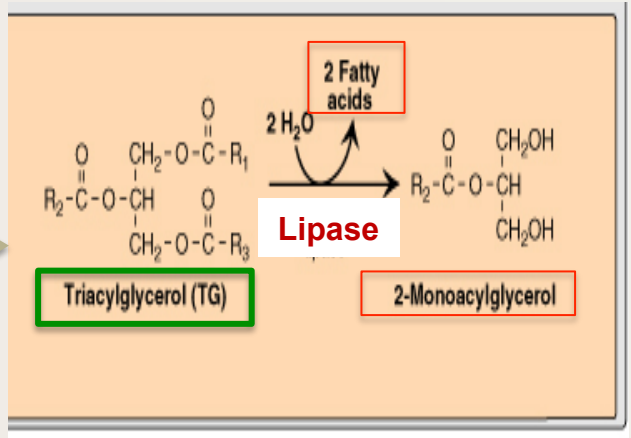
Secreted by

Important in

- **Neonates and infants for the digestion of TAG of milk**
- **Patients with pancreatic insufficiency[2] where there is absence of pancreatic lipase**

Substrate

TAG molecules, containing **medium- and short-chain fatty acids.**
such as found in milk fat



1: Released in the tongue but act in stomach for digestion of TAG
2: e.g. Cystic fibrosis

NO further digestion of carbohydrates

Protein digestion **BEGINS** by pepsin and rennin

Lipid digestion **BEGINS** by lingual and gastric lipases

Role of stomach in digestion

Digestion of Dietary Proteins in Stomach

HCl:

1) Denatures proteins

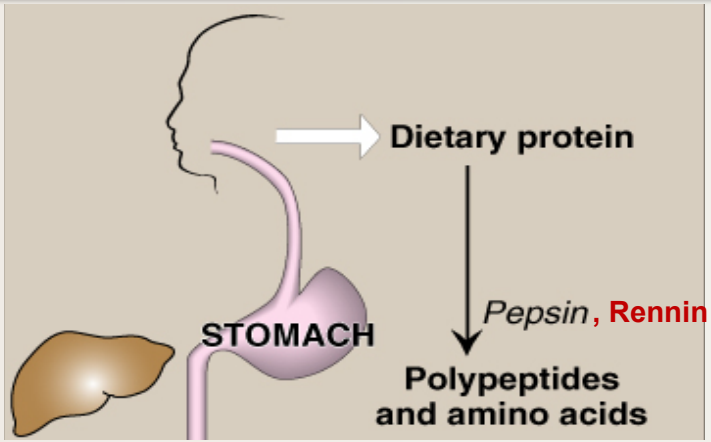
2) Activates pepsin

Pepsin:

Cleaves proteins into polypeptides

Rennin:

Formation of milk clot



Rennin

Secreted by → Chief cells of stomach in **neonates and infants.**

Substrate:

Casein of milk (in the presence of calcium)

↓

End product:

Paracasein with the formation of milk clot

Effect:

It prevents rapid passage of milk from stomach, allowing more time for action of pepsin on milk proteins.

Pepsin

Secreted by → Chief cells of stomach as **pepsinogen** (inactive proenzyme)[2]

Activated by →
1. HCL
2. Autocatalytically by Pepsin

Substrate:

Denatured dietary proteins[1]

↓

End product:

Smaller polypeptides

NOTE: **It is Acid-stable, endopeptidase**

1. Also called Zymogenes
2. It is denatured by HCL

SUMMARY

- **Digestion:** The breakdown of the naturally occurring foodstuffs into smaller, easily absorbable forms
- **Types of Digestions:** - Mechanical effects(e.g., mastication) - Enzymatic effects(digestive enzymes "hydrolases")
- **Notices:**
  - ✓ Saliva: -Acts as lubricant - Contains salivary α-amylase -Contains lingual lipase
  - ✓ Digestion of Carbohydrates (except cellulous) in the Mouth
  - ✓ Stomach contains: - Gastric Lipases. - Pepsin. – Rennin.
  - ✓ Lipid digestion* (TAG only) and Protein digestion happen in stomach.

* In adults, no significant effects because of lack of emulsification المستحلب that occurs in duodenum

Enzyme	Secreted by	Substrate	Action	Product	Can't digest	Notes
α-Amylase	Parotid glands	Starch glycogen	Hydrolysis of α(1,4) glycosidic bonds	Short oligosaccharides - short oligosaccharides (both branched & unbranched) - Disaccharides: Maltose and isomaltose	- α(1,6) glycosidic bonds (The branch points of starch and glycogen) - β(1,4) glycosidic bonds of cellulose	-Optimum pH: 6.6 - 6.8 - it has little significance because short time of acting on food in mouth. - inactivated by the acidity of stomach (ph ≤ 4)
Lingual Lipase	dorsal surface of the tongue (Ebner's glands) but it Acts in the stomach	TAG containing medium- and short-chain fatty acids as found in milk fat	Acid-Stable Lipases	fatty acids and monoacylglycerols	-	- little significance in adult humans - important in neonates and infants and pancreatic insufficiency patients(there is absence of pancreatic lipase)
Gastric Lipases	Stomach					
Pepsin	chief cells of stomach as inactive proenzyme pepsinogen	denatured (by HCl) dietary proteins (milk protein)	Acid-stable, endopeptidase	Smaller polypeptides	-	Activated by HCl and autocatalytically
Rennin	chief cells of stomach	Casein of milk (milk protein)	prevents rapid passage of milk from stomach, allowing more time for action of pepsin on milk proteins	Paracasein with the formation of milk clot		In neonates and infants is significance

Done by: Maha AlZhery

1) The final product of carbohydrates is?
A- Polysaccharides
B- Amino acids
C- Fatty acids
D- Monosaccharides

2) Salivary α-amylase is secreted by:
A- Sub-lingual glands
B- Sub-mandibular glands
C- Parotid glands
D- Ebner's glands

3) Salivary α-amylase is inactivated by which ONE of the following:
A- High PH
B- Low PH
C- Certain digestive enzymes
D- None of the above

4) Which ONE of the following statements is true regarding salivary α-amylase ?
A- It doesn't' hydrolyze α(1,4) Glycosidic Bonds
B- It doesn't' hydrolyze α(1,6) Glycosidic Bonds
C- It hydrolyzes β(1,4) glycosidic bonds of cellulose
D- All the statements are wrong

5) Which ONE of the following is found in saliva?
A- Gastric lipase
B- Pepsin
C- Rennin
D- Lingual lipase

6) Emulsification of lipids occur in :
A- Duodenum
B- Stomach
C- Pancreas
D- Gall bladder

7) Which ONE of the following statements is NOT true regarding role of stomach in digestion
A- No further digestion of of carbohydrates.
B- Protein digestion begins by pepsin and rennin
C- Lipid digestion begins by lingual and gastric lipases
D- Emulsification of lipids.

8) Which ONE of the following enzymes is secreted by chief cells of stomach in neonates and infants?
A- Rennin
B- Pepsin
C- Salivary α-amylase
D- Lingual lipase

9) All the following enzymes are of little significance in adult human EXCEPT:
A- Salivary α-amylase
B- Lingual lipase
C- Gastric lipase
D- Pepsin

Answers: 1) D 2) C 3) B 4) B 5) D 6) A 7) D 8) A 9) D

Thank You!

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