




Role of salivary gland and stomach in digestion

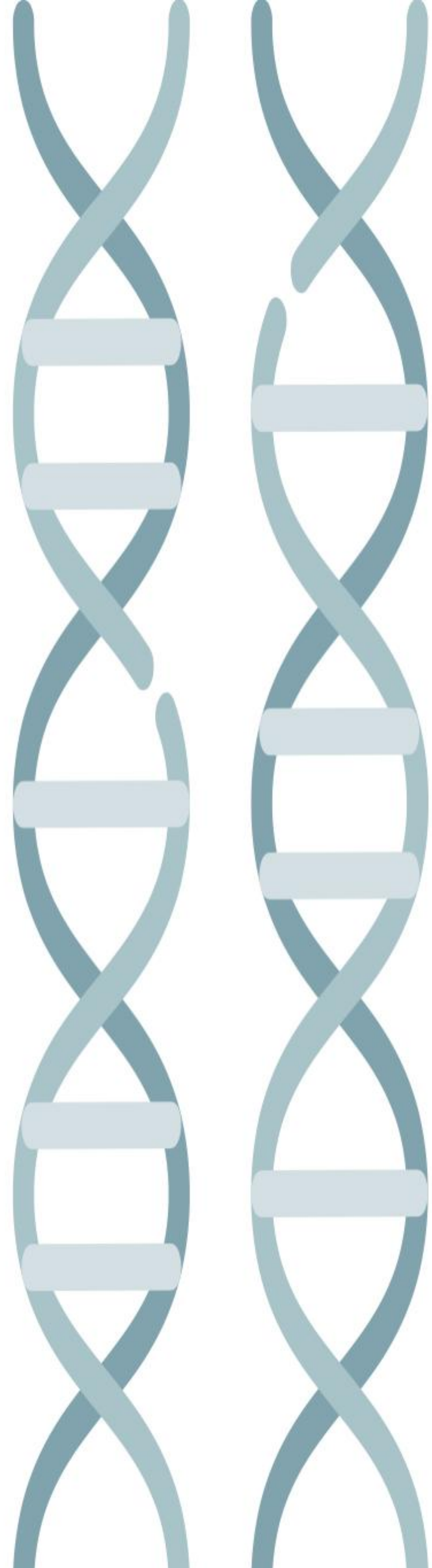
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Objectives

-  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.



Background

Dietary food

Most of dietary foodstuffs are ingested in the form that cannot be readily absorbed from the digestive tract.

Digestion

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

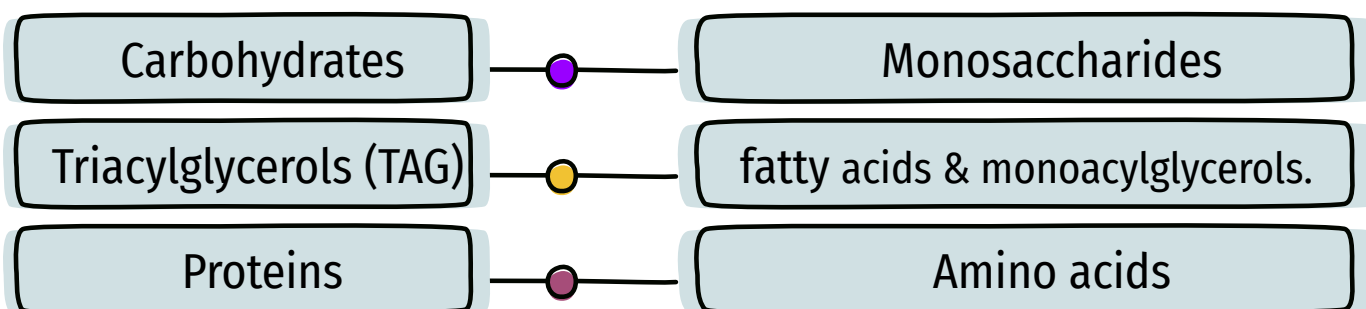
Digestion

1. Mechanical effects e.g. : mastication.
2. Enzymatic effects : digestive enzymes (Hydrolases).

Processes of the digestive system

1. Motility
2. Secretion
3. Absorption
4. Elimination

End products of Digestion :



Rule of salivary glands in digestion :

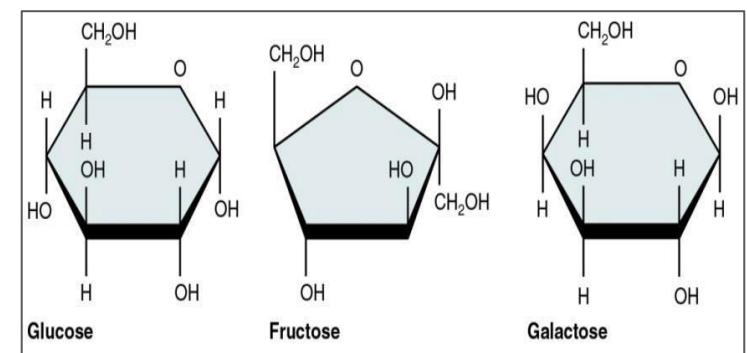
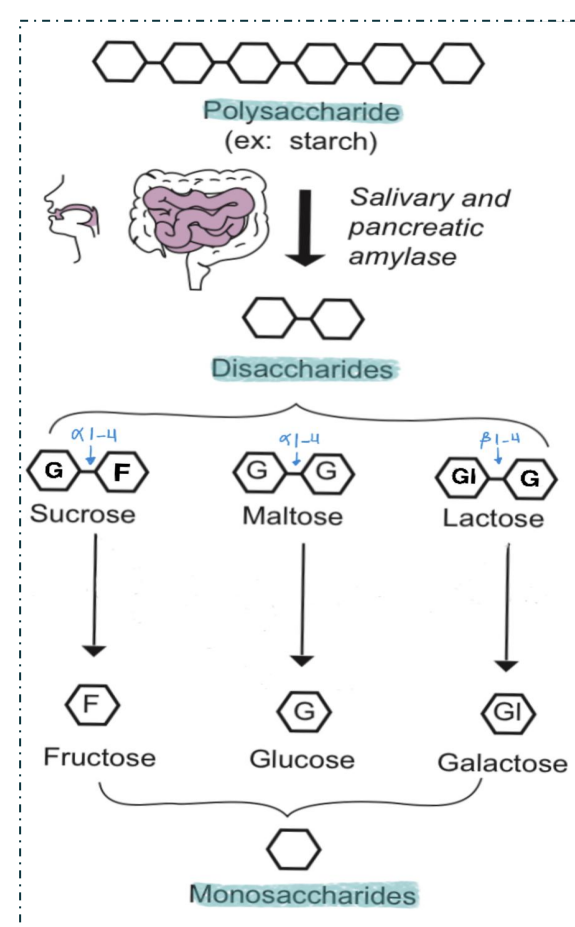
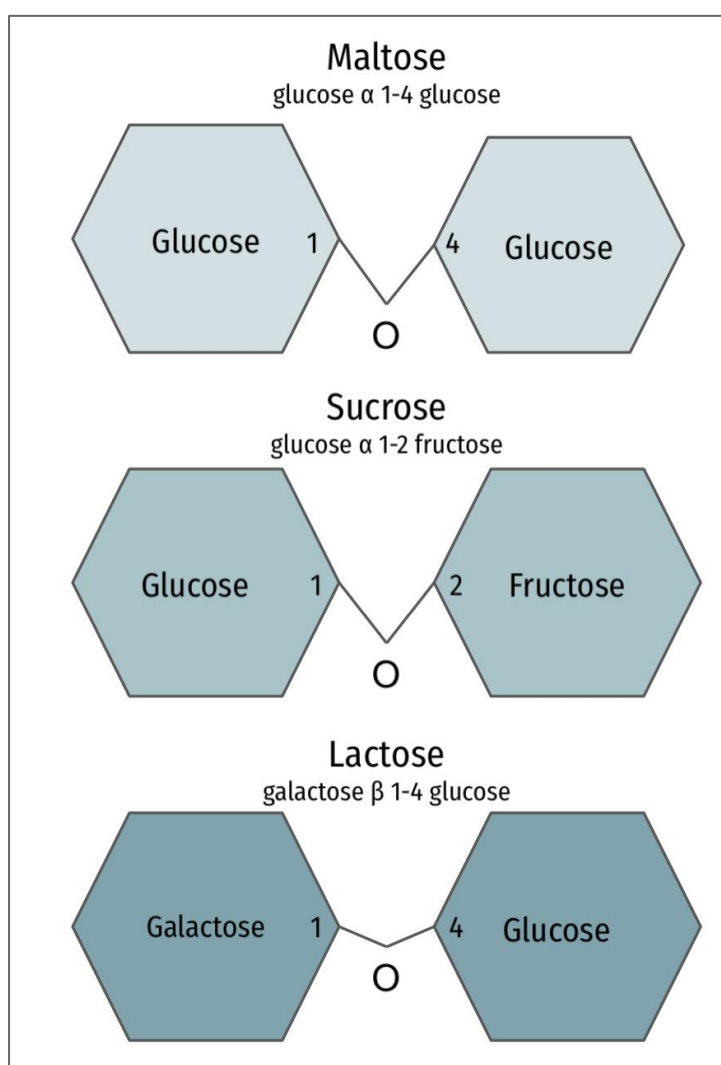
They secrete **saliva** that acts as **lubricant** and contains:

- 1 salivary α -amylase
- 2 lingual lipase

Type of sugar

Disaccharides

Simple sugars

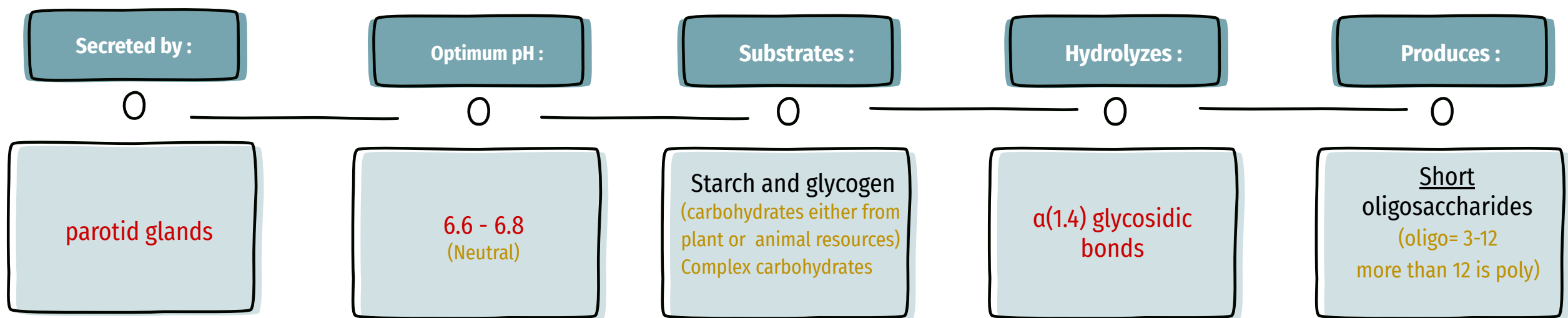


Note:

Glucose - galactose - fructose. are the simplest carbs.

The Doctor was mentioning what are the components of disaccharides such as (sucrose is made of glucose and fructose) so maybe you should revise them.

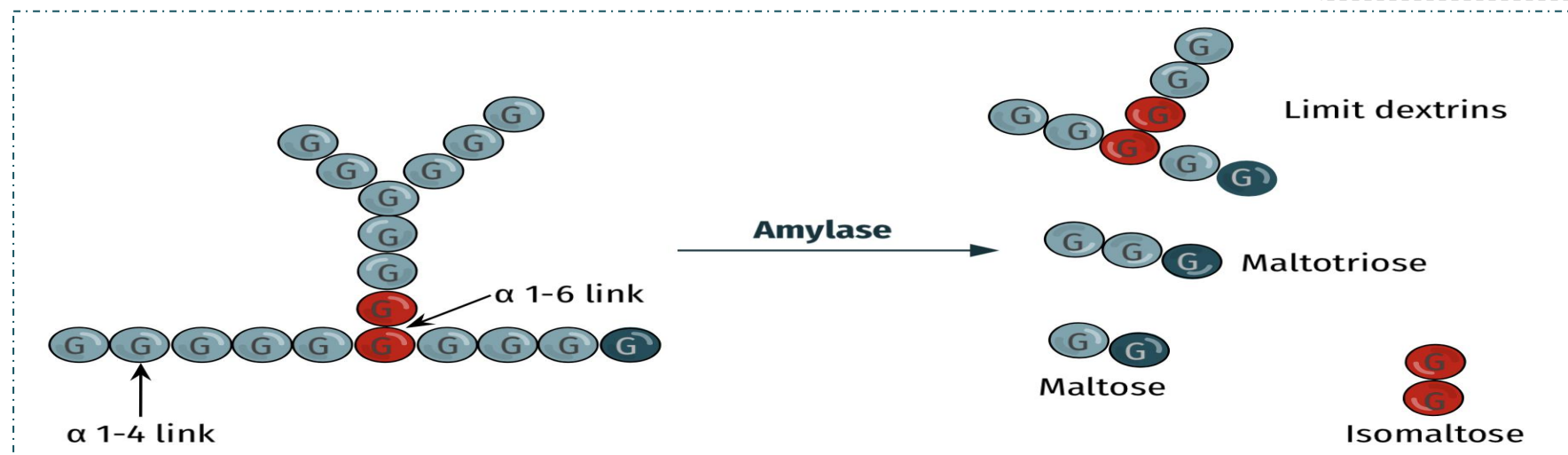
Salivary α - Amylase (Important)



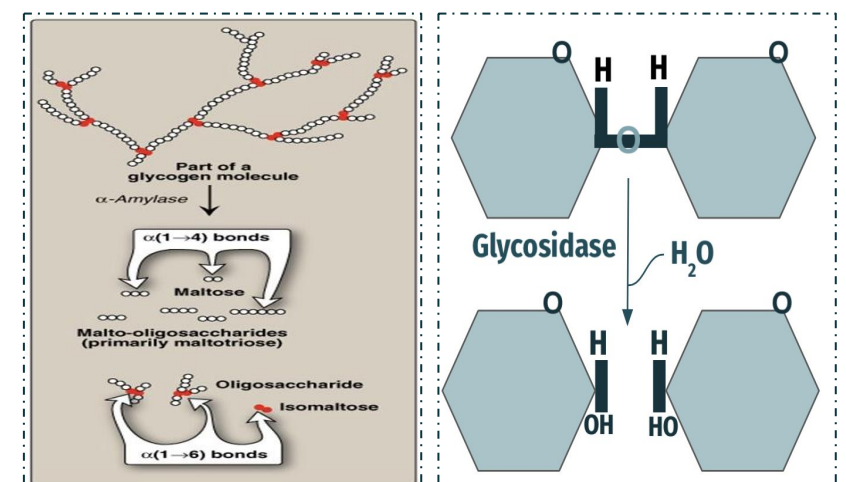
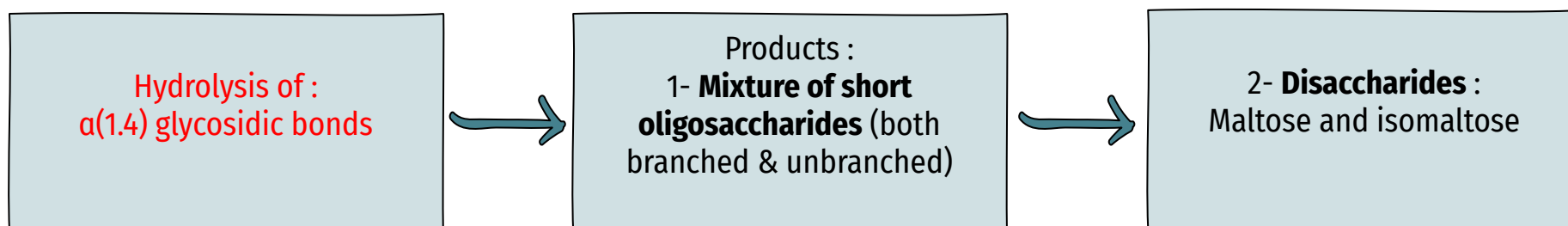
Digestion:

Pre-stomach (in the mouth) salivary amylase : α 1-4 endoglycosidase.

It's called (endo) because it only breaks the bonds in the middle not in the peripheral.

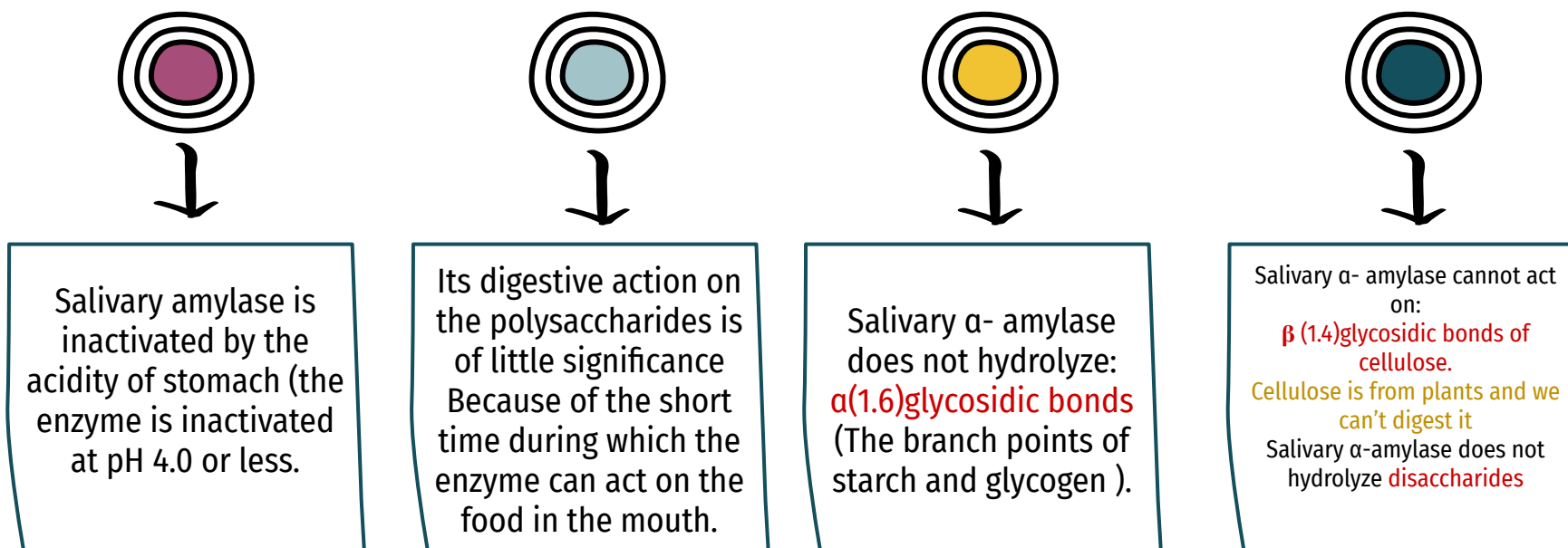


Effect of α - amylase on glycogen (Important)



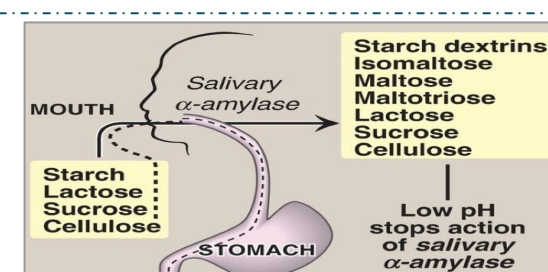
Salivary α - amylase :

(the word salivary is used because there is another pancreatic alpha amylase)



Picture is important

Digestion of Carbohydrates in the Mouth



Role of Stomach in Digestion

- 1 No further digestion of carbohydrates.
- 2 Lipid digestion begins by lingual and gastric lipases.
- 3 Protein digestion begins by pepsin and rennin.

Lingual Lipase

- Secreted by the dorsal surface of the tongue (**Ebner's glands**)
- Acts in the stomach for the digestion of TAG *so secreted in mouth but works in stomach.*
- Produces fatty acids and monoacylglycerols
- Its role is of little significance in adult humans *because pancreatic enzymes has to emulsify fats in the duodenum.*

Lingual and Gastric Lipases (Acid-Stable Lipases)

Substrate

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

End product

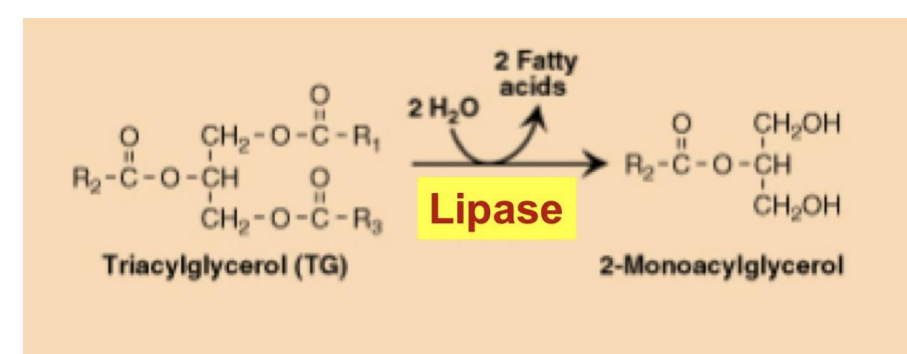
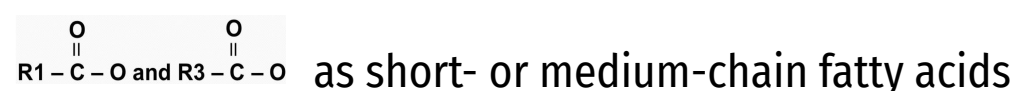
2-Monoacylglycerols and fatty acids.

Role

Lipases role in lipid digestion is of little significance in adult human (the lipid in the stomach is not yet emulsified, short-chain fatty acids; Emulsification occurs in duodenum).

(Acid-Stable Lipases)

Target substrate for **acid-stable lipases** is TAG containing:



Lingual and Gastric Lipases They are important in:

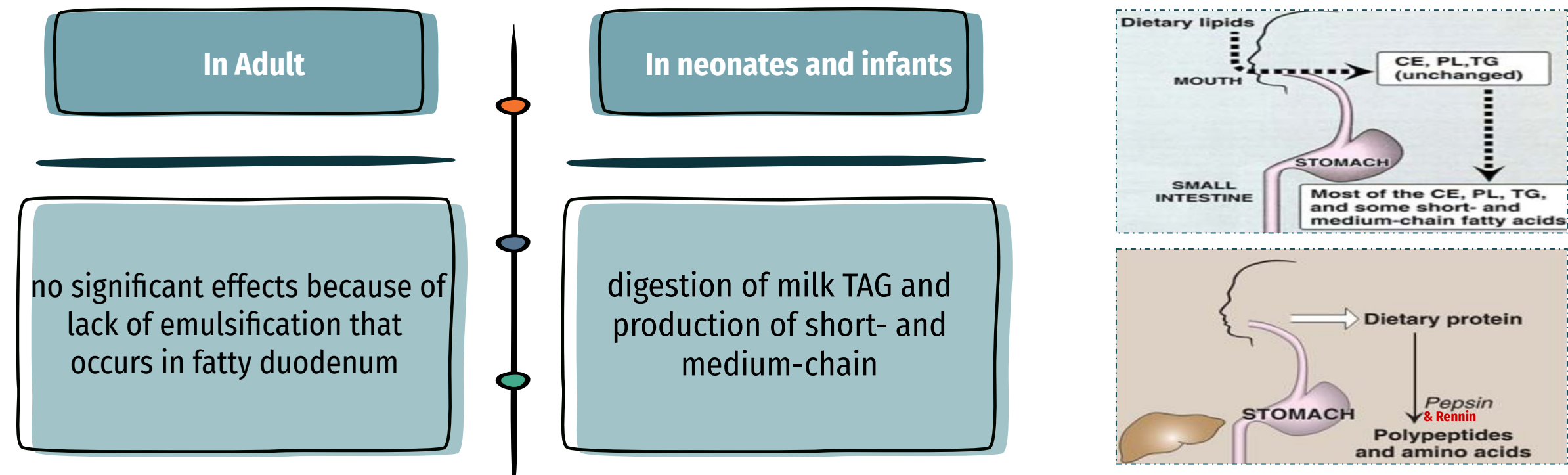
Neonates and infants

☉ For the digestion of TAG of milk

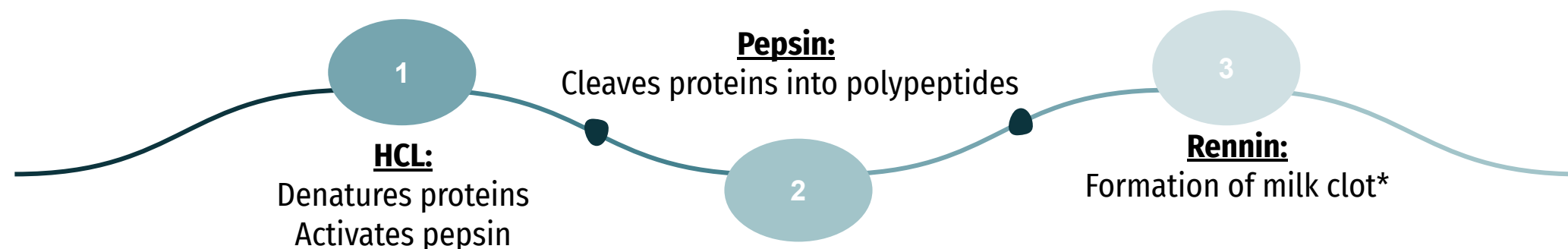
Patients with pancreatic insufficiency

☉ Because there's absence of pancreatic lipase

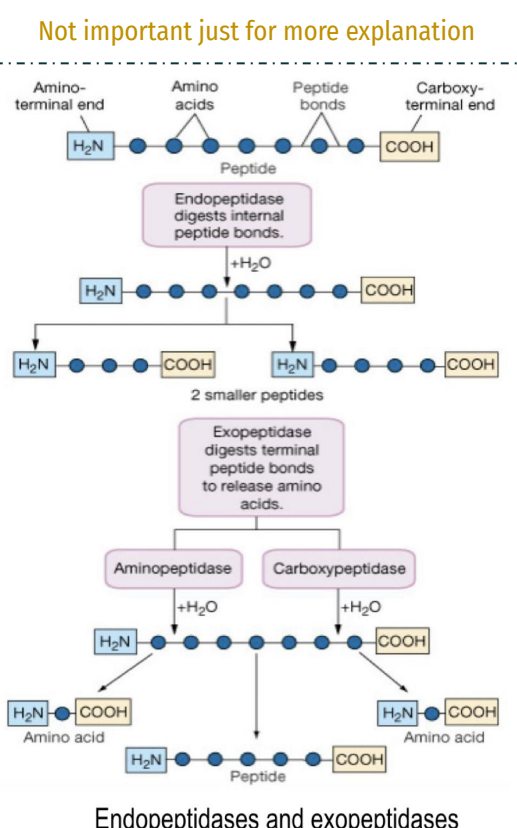
Digestion of Lipids in Stomach



Digestion of Dietary Proteins in Stomach



	Rennin	Pepsin
Secreted by	chief cells of stomach in neonates and infants	chief cells of stomach as inactive proenzyme, pepsinogen
Substrate	Casein of milk (in the presence of calcium)	denatured dietary proteins (by HCl)
End product	Paracasein with the formation of milk clot	Smaller polypeptides not amino acids directly
Additional	Effect: It prevents rapid passage of milk from stomach, allowing more time for action of pepsin on milk proteins	Acid-stable, endopeptidase*. Activated by HCl and autocatalytically by pepsin. Hcl converts pepsinogen to pepsin which is the active form, then pepsin itself can activate other pepsinogens and that process is called autocatalysis Endopeptidase means that the enzyme will work on peptide bonds in the middle not at the ends



Take Home Messages



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

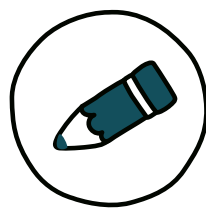


Digestion of proteins begins in the stomach by pepsin producing smaller polypeptides



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





Summary

Enzymes	Salivary amylase	Lingual and gastric lipase	Pepsin	Renin
Secreted by:	Parotid gland	Dorsal surface of the tongue (Ebner's glands)	Chief cells in the stomach	Chief cells in the stomach in neonates and infants
Optimum pH	6.6 - 6.8 Neutral or little acidic	Acid-stable lipases Acts in the stomach	Acid-stable lipases	-
Substrate	Starch and glycogen	TAG molecules	Denatured dietary proteins	Casein of milk (in the presence of calcium)
Produces	Short oligosaccharides	<ul style="list-style-type: none">One molecule of 2-monoacylglyceride2 fatty acid molecules	Smaller polypeptides	Paracasein + formation of milk clot
Comments	<ul style="list-style-type: none">It hydrolyses "adds water" to α (1,4)glycosidic bond.It doesn't hydrolyse α (1,6)glycosidic bond (branch points of starch and glycogen)It Can NOT hydrolyse β(1,4) glycosidic bond of cellulose.	<ul style="list-style-type: none">It has little significant in adult human.It is important in neonates and infants for digestion of TAG of milk and production of short and medium-chain fatty acids.Also it is important in pancreatic insufficiency patients where there is absence of pancreatic lipase	Activated by: 1. Hcl 2. Autocatalytically by pepsin.	It prevents rapid passage of milk from stomach allowing more time for action of pepsin on milk proteins.

 **MCQs**

1- which of the following is one of the Processes of the digestive system ?

A- Secretion

B- Absorption

C- Elimination

D- all of them

2- Salivary α - amylase optimum pH is ?

A- 6.6 - 6.8

B- 4.0 - 6.8

C- 6.6 - 7.5

D- 6.6 - 9

3- End products of Triacylglycerols (TAG) ?

A- Amino acids

B- Fatty acids

C- Monoacylglycerols

D- Both B & C

4- Where lingual lipase secreted from ?

A- Parotid gland

B- Dorsal surface of the tongue
(Ebner's glands)

C- Sublingual gland

D- Chief cells

5- What's the end product of pepsin ?

A- Fatty acids

B- Monosaccharides

C- Smaller polypeptides

D- Paracasein

6- Role of stomach in digestion?

A- Digestion of carbohydrates

B- Digestion of proteins

C- Digestion of lipids

D- B+C

Answers key

1- D

2- A

3- D

4- B

5- C

6- D

SAQs

1- What's the role of salivary glands in digestion ?

They secrete saliva which will act as : 1 - lubricant 2 - Contains salivary α -amylase 3 - Contains lingual lipase

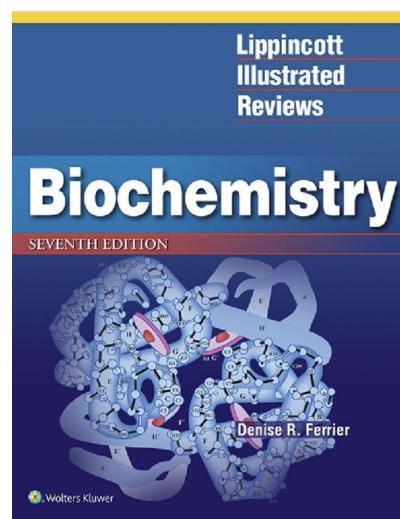
2- What's the effect of rennin ?

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

3- What are the processes of digestion ?

1. Motility
2. Secretion
3. Absorption
4. Elimination

Resources Click on the book to download the resource

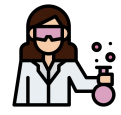




Leaders



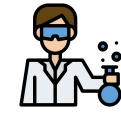
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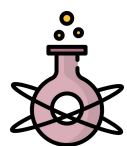
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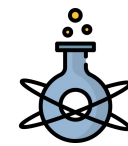
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Special thanks to Fahad AlAjmi for designing our team's logo.