

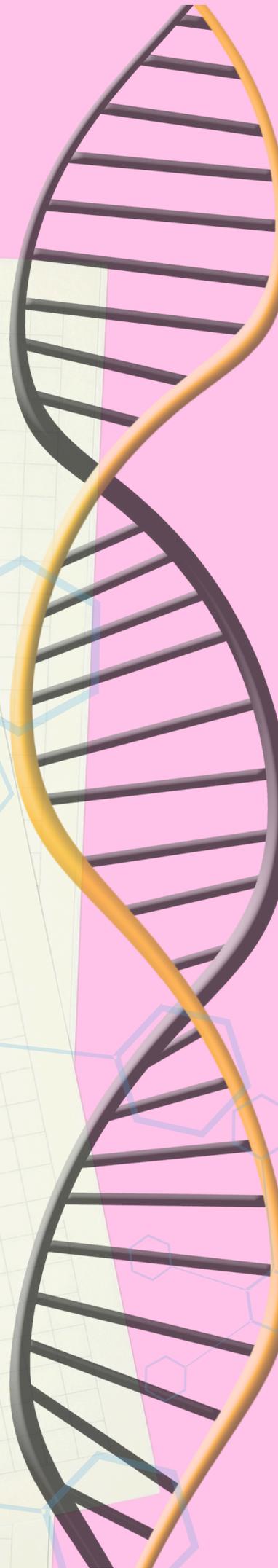
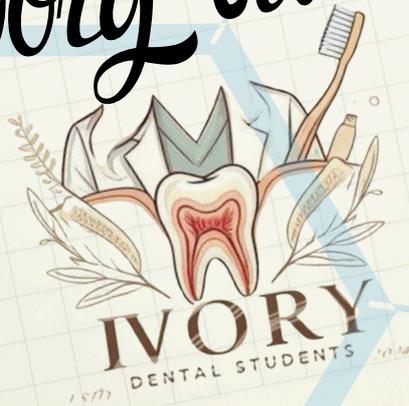
لجنة
طب الأسنان
جامعة مؤتة

Biochemistry

Summaries of
carbohydrates metabolism

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Ivory batch



carbohydrate

polysaccharide
Starch, glycogen
and cellulose

disaccharide
sucarous and
lactose

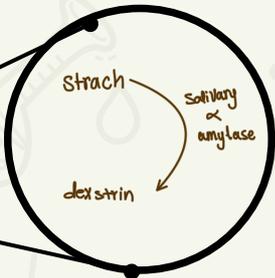
monosaccharide
mainly glucose
and fructose

Carbohydrate metabolism

hydrolysis of glycosidic linkage and conversion of carbohydrates into monosaccharides.

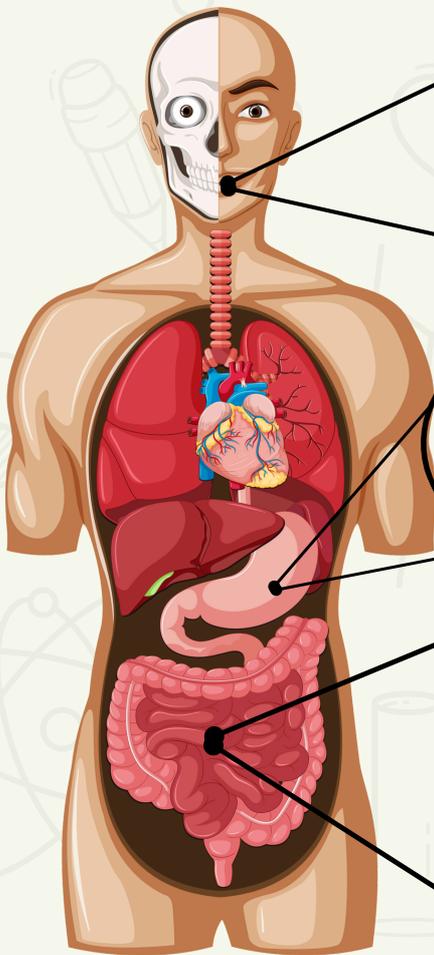
Digestion

In the Mouth



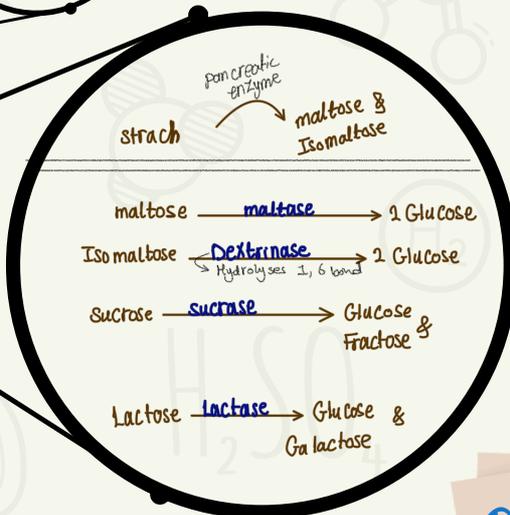
salivary α amylase
(ptyalin)

- Produced by: salivary glands.
- Optimum pH : 6.7
- Activated by : chloride ions.
- Acts on: α 1-4 glycosidic bonds in cooked starch



In the stomach

Salivary α amylase stopped after few minutes due to high acidity of stomach which inactivate the enzyme



Pancreatic enzyme

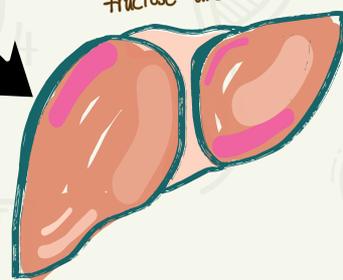
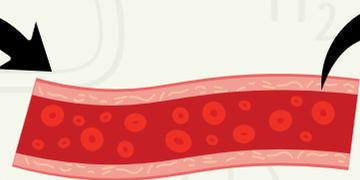
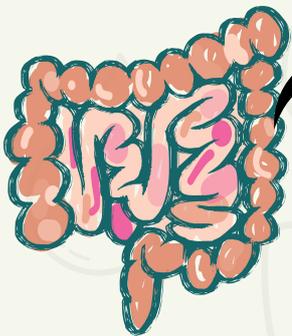
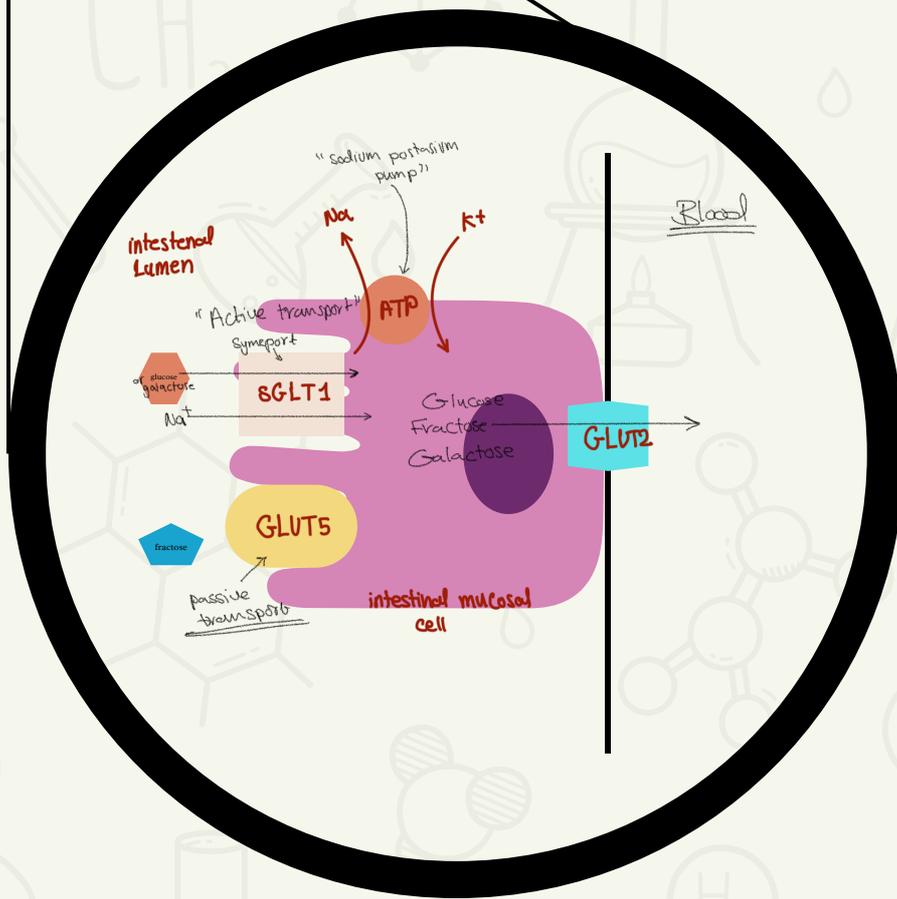
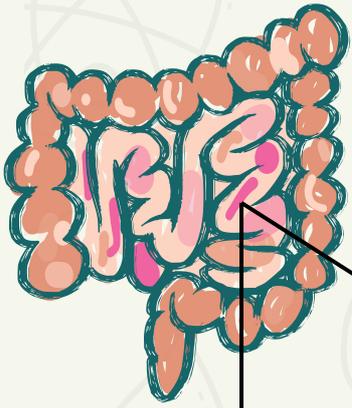
- Produced by: pancreatic juice.
- Optimum pH : 7.1
- Activated by : chloride ions.
- Acts on: α 1-4 glycosidic bonds in cooked and uncooked starch converting them into maltose and isomaltose

In the small intestine

Disaccharidases:

- Produced by: (secreted from intestinal mucosal cells)

Absorption of monosaccharides



Liver where Galactose and fructose are converted into glucose.

GLUCOSE UPTAKE BY TISSUE

- GLUT1: present mainly in red blood cells, and retina.
- GLUT2: present in liver, kidneys, pancreatic B cells and lateral border of small intestine. For rapid uptake & release of glucose
- GLUT3: present mainly in brain.
- GLUT4: present in heart, skeletal muscles, and adipose tissues. It is for insulin-stimulated uptake of glucose (insulin-dependent).
- GLUT5: small intestine and the testes transporter for fructos
- SGLUT1: present in small intestine and kidneys

STORAGE OF GLUCOS

Excess glucose is converted into:

- a) Glycogen (Glycogenesis) and stored in liver and muscles
- b) Lipid (lipogenesis) and stored in adipose tissue

GLUCOSE UTILIZATION BY TISSUE

Oxidation:

a- Major pathway : Mainly for production of energy: glycolysis, and
Kreb's cycle.

b- Minor pathway : Not for energy production:
- Pentose shunt for synthesis of pentoses and
NADPH+H.

□ Synthesis of other CHO substances as:

1. Galactose for lactose synthesis in mammary gland.
2. Fructose in seminal vesicles. formation.
3. Amino-sugar (glucosamine) for mucopolysaccharides formation.
4. Glucuronic acid for mucopolysaccharides formation

EXCRETION OF GLUCOSE

Under normal condition, glucose is not excreted in urine

✓ When blood glucose level exceeds glucose renal threshold (180 mg/dL), glucose is excreted in urine because the kidney reaches the maximal tubular reabsorption

Defects of absorption of carbohydrates

LACTASE DEFICIENCY (LACTOSE INTOLERANCE)

✓ Causes: Due to Deficiency of lactase enzyme which digest lactose into glucose and galactose.

✓ Effect: Accumulation of lactose in the intestine and its fermentation by intestinal bacteria with production of acids and gases with increase in the osmotic pressure.

✓ Manifestations: Distention, abdominal cramps, osmotic diarrhea and dehydration.

✓ Treatment: For infant : prevent the child from taking his mother's milk , and giving him lactose free milk formula

For adult : lactose free diet , yoghurt, green vegetables to ensure adequate calcium intake

SUCRASE DEFICIENCY

✚ Rare condition

✓ With the symptoms and signs of lactase deficiency in early childhood