فريق طوفان الأقصى

METABOLISM

Modifide N.15

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Metabolism of Monosaccharides and Disaccharides

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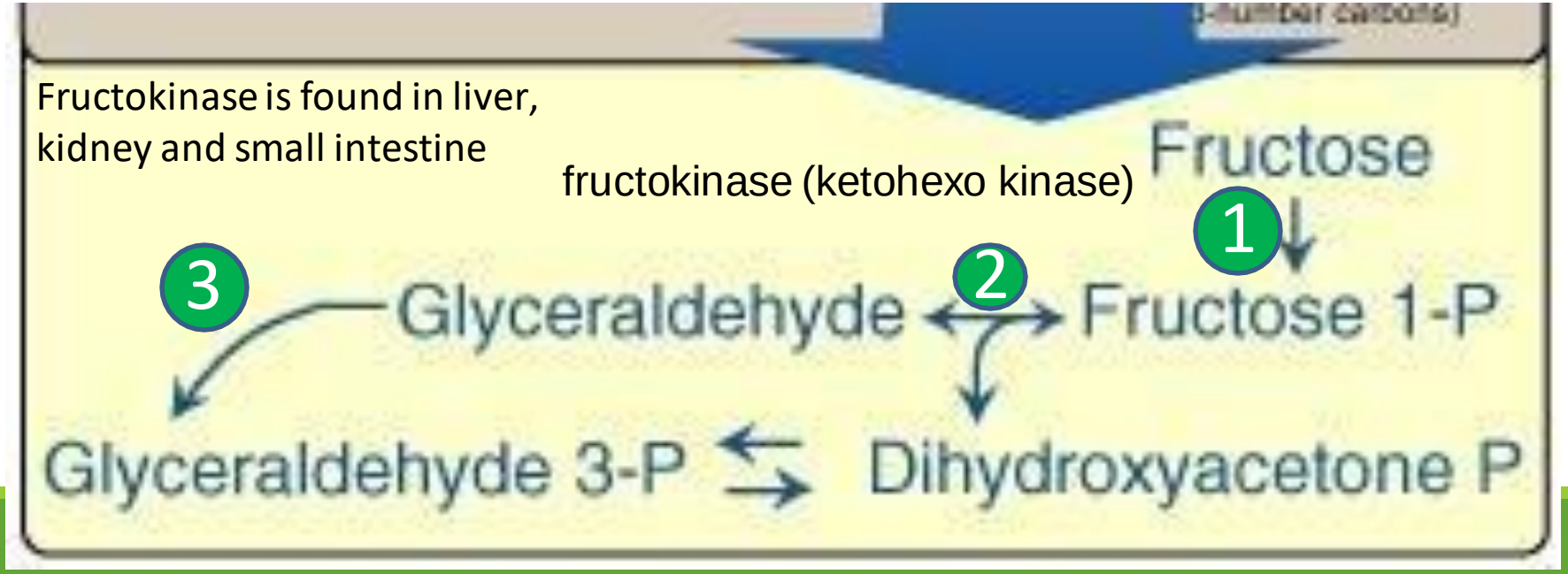
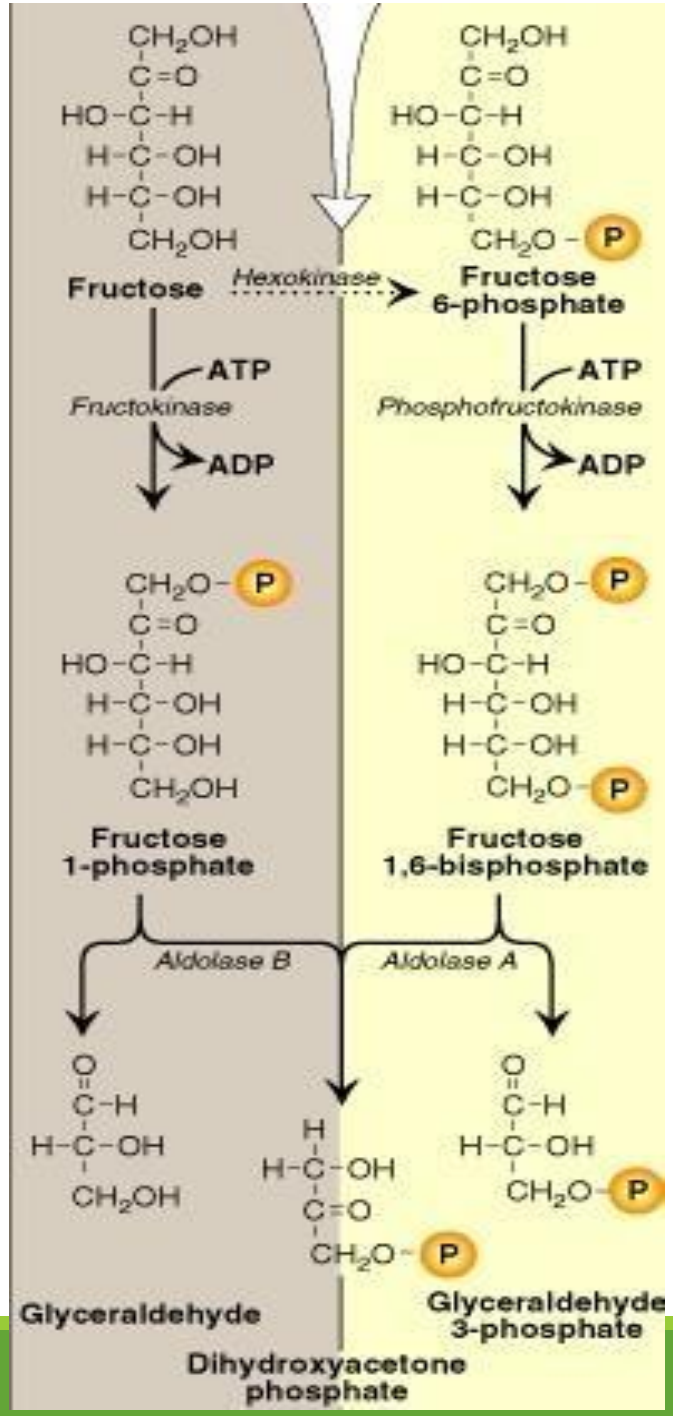
Fructose Metabolism

- 10% of the daily calorie intake
- Sources: sucrose, Fruits, honey, high-fructose corn syrup
- Entry into cells is not insulin dependent.
- Does NOT promote the secretion of insulin



- **The complement in this slide:**
- Previously we talked about the metabolism of glucose specifically, in the next lectures we will be discussing the metabolism of monosaccharides like fructose and galactose, and the metabolism of some disaccharides like lactose.
- We will start in this lecture with fructose.
- Sucrose metabolism yields fructose (remember it's a disaccharide made of glucose + fructose).
- High-fructose corn syrup is a cheap and widely used sweetener made from corn starch.
- In general, fructose doesn't raise the blood sugar levels as much as glucose.
- In terms of metabolism, fructose can enter the glycolytic pathway through phosphorylation by hexokinase (on C6) producing fructose-6-phosphate then continuing the normal glycolytic pathway.
- Or it can use its own pathway through phosphorylation by fructokinase (on C1) producing fructose-1-phosphate which is cleaved directly by Aldolase B unlike in glycolysis.
- The results of this cleavage are two familiar molecules, Glyceraldehyde (without a phosphate) and Dihydroxyacetone phosphate.

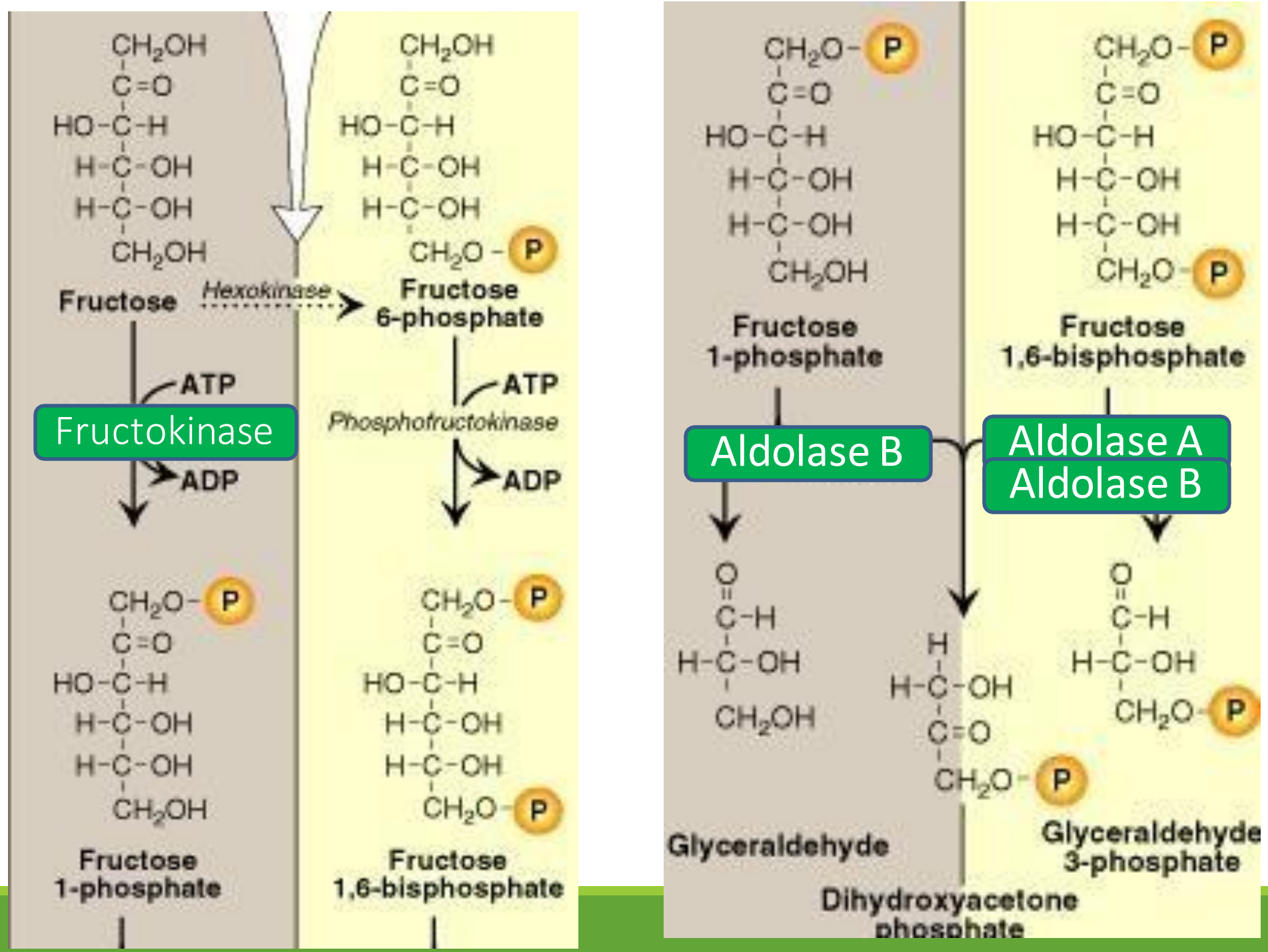


Fructose Metabolism

Hexokinase affinity to fructose is low

- The rate of fructose metabolism is more rapid than that of glucose because the trioses formed from fructose 1-phosphate bypass *phosphor fructokinase-1-P* the major rate-limiting step in glycolysis

- **The complement in this slide:**
- Dihydroxyacetone phosphate can be isomerized by triose phosphate isomerase (the same enzyme in glycolysis) to G3P and then enters glycolysis.
- Glyceraldehyde (without a phosphate) now must be phosphorylated to G3P and then enters glycolysis.
- This pathway is favored over the general pathway (the one using hexokinase) because it skips phosphofructokinase, which is the slowest step in glycolysis (rate limiting step).


Fructose
Hexokinase
Fructose 6-phosphate
ATP
Fructokinase
ADP
ATP
Phosphofructokinase
ADP
Fructose 1-phosphate
Fructose 1,6-bisphosphate
Fructose 1-phosphate
Fructose 1,6-bisphosphate
Aldolase B
Aldolase A
Aldolase B
Glyceraldehyde
Dihydroxyacetone phosphate
Glyceraldehyde 3-phosphate

- **The complement in this slide:**
- **The cleavage in the general pathway (the glycolytic pathway) can happen by the two isoforms of the enzyme aldolase, Aldolase A and Aldolase B.**
- **But in the specific pathway only Aldolase B can perform the cleavage.**
- **In summary:**
- **When fructose enters our body, it undergoes degradation through two main pathways: the general pathway and the specific pathway.**
- **The general pathway is less preferred as it has a low affinity for fructose. It initiates with the phosphorylation of C6 of fructose, resulting in the production of F6P. This compound is then further phosphorylated, continuing through the glycolytic pathway.**
- **On the other hand, the specific pathway, which is more favored, begins with the phosphorylation of C1 of fructose, producing F1P. Aldolase B then directly cleaves F1P, generating Glyceraldehyde and Dihydroxyacetone. Glyceraldehyde is phosphorylated and continues the glycolytic pathway, while Dihydroxyacetone is isomerized to G3P, also continuing the glycolytic pathway.**
- **It's worth noting that the general pathway can utilize both Aldolase A and B, while the specific pathway exclusively relies on Aldolase B**


فلسطين
اللهم كُن لفلسطين عونًا
اللهم إنّا لا نملك إلا الدعاء
لهم فيارب لا ترد لنا دعاء ولا تخيب لنا رجاء
اللهم أنصر ضعفهم فإن ليس لهم سواك

V2: slide no. 11:

This paragraph has been added:

NADH is the electron carrier that is most abundant and needed as NAD+ during reactions when we want to oxidize something (it will be reduced). On the other hand, NADPH is the electron carrier that is most abundant as NADPH and gets oxidized during reactions when we want to reduce something. In simpler terms, NADH is like a superhero that helps with oxidation, while NADPH is like a superhero that helps with reduction.

Slide no. 6:

reduction of NAD+ to NADH.

Slide no. 9:

(NADPH gets oxidised to form NADP+ and reducing O2)

Slide no. 7:

the ratio of NADH to NAD+ increase

Slide no. 3: **Ethanol can function as both a hydrophobic and hydrophilic molecule. Its hydrophobic nature enables it to easily pass through membranes.**

Slide no. 11:

by the enzyme ALDH into acetate.