Fructose metabolism

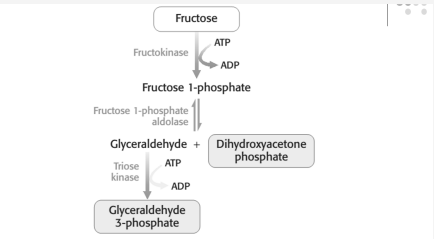
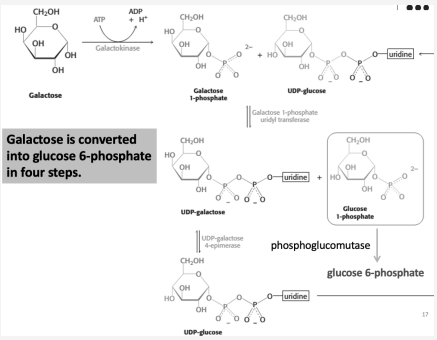
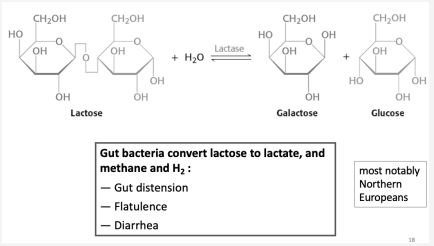


Figure 5. Fructose metabolism.
Fructose enters the glycolytic pathway in the liver through the fructose l-phosphate pathway.

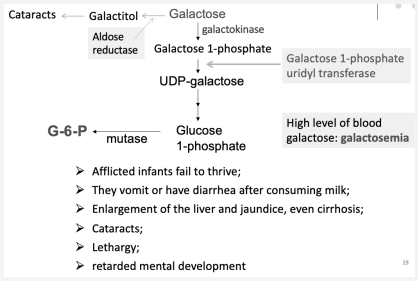
Galactose metabolism



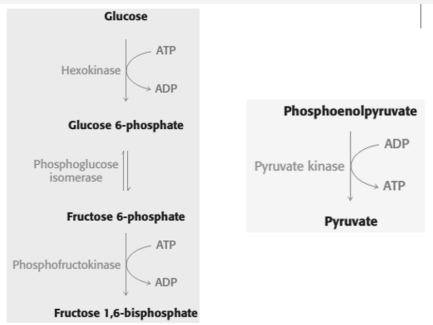
Deficient in Lactase (Lactose intorlerant)



Galactose Is Toxic If Transferase Missing



The Glycolytic Pathway Is Tightly Controlled



3 irreversible reactions in glycolysis

Key Enzymes

1. Hexokinase
2. Phosphofructokinase-1
3. Pyruvate kinase

Methods of regulation

1. allosteric regulation
2. covalent modification

Phosphofructokinase-1 (PFK-1)

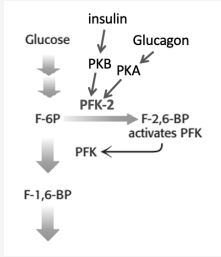
the key point for regulation of glycolysis

allosteric activator：AMP; F-2,6-BP (in the liver)

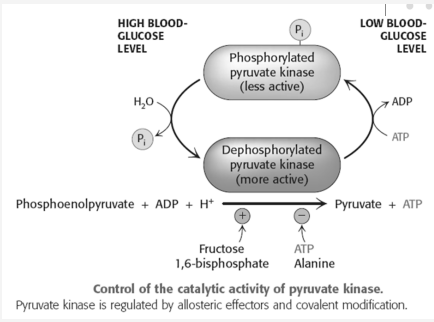
allosteric inhibitor：ATP; citrate

In high concentrations, fructose 6-phosphate (F-6P) activates the enzyme phosphofructokinase (PFK) through an intermediary, fructose 2,6-bisphosphate (F-2,6-BP).

F-6P to PFK if too many Glucose(by insulin)



Pyruvate kinase



Control of the catalytic activity of pyruvate kinase.
Pyruvate kinase is regulated by allosteric effectors and covalent modification.

Hexokinase

Hexokinase is suppressed by its product G-6-P.

Glucokinase in liver, is not inhibited by G-6-P.

Glucokinase phosphorylates glucose only when glucose is abundant

The role of glucokinase is to provide G-6-P for the synthesis of glycogen and for the formation of fatty acids.

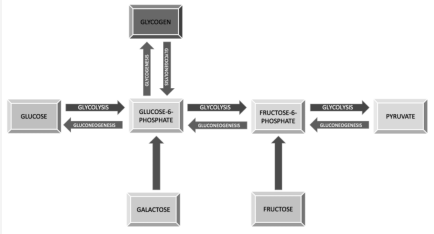
Gives the brain and muscles first call on glucose when its supply is limited, and it ensures that glucose will not be wasted when it is abundant.

Glucose Transporters(GLUTs)

Table Family of glucose transporters

Name	Tissue location	K_M	Comments
GLUT1	All mammalian tissues	1 mM	Basal glucose uptake
GLUT2	Liver and pancreatic β cells	15−20 mM	In the pancreas, plays a role in the regulation of insulin In the liver, removes excess glucose from the blood
GLUT3	All mammalian tissues	1 mM	Basal glucose uptake
GLUT4	Muscle and fat cells	5 mM	Amount in muscle plasma membrane increases with endurance training
GLUT5	Small intestine	—	Primarily a fructose transporter

Glycolysis and Gluconeogenesis back and forth



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from Noncarbohydrate Precursors to Glucose

The gluconeogenic (糖異生) pathway converts pyruvate into glucose.

Gluconeogenesis is not a reversal of glycolysis

Noncarbohydrate precursors are first converted into pyruvate, oxaloacetate, dihydroxyacetone phosphate.

Noncarbohydrate Precursors: lactate, amino acids, and glycerol.

pathway of Gluconeogenesis

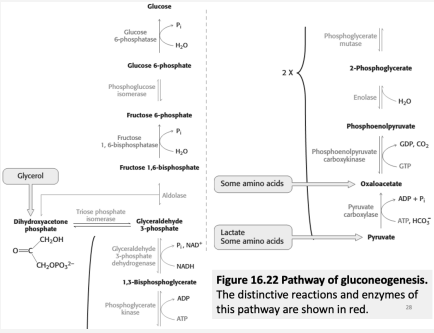


Figure 16.22 Pathway of gluconeogenesis. The distinctive reactions and enzymes of this pathway are shown in red.

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