

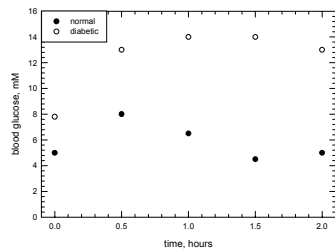
Gluconeogenesis

Definition of Gluconeogenesis

Gluconeogenesis- formation of glucose from noncarbohydrate precursors such as pyruvate, lactate and alanine (the three most common)

Importance of Gluconeogenesis

Brain and RBCs require glucose as fuel, but glucose falls between meals without synthesis.



Location of Gluconeogenesis

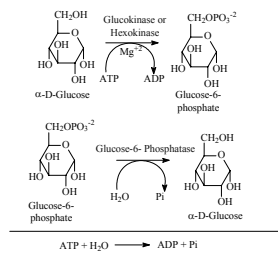
liver and kidney cortex
mitochondria, cytoplasm and ER

Must Prevent Futile Cycling

Futile cycle- the net release of thermal energy by the hydrolysis of ATP

Three strategies to prevent futile cycling:

- High energy intermediate
- Compartmentation
- Allosteric regulation



Three Irreversible Reactions of Glycolysis and Their Bypasses

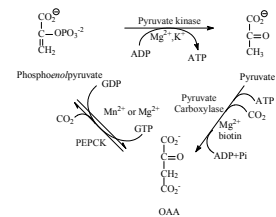
Pyruvate Kinase reversed by Pyruvate Carboxylase and PEPCK

Pyruvate carboxylase (PC) mitochondrial

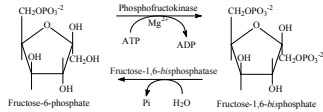
PEPCK depends on species

PC stimulated by acetyl CoA, inhibited by ADP

PEPCK hormonal regulation



Three Irreversible Reactions of Glycolysis and Their Bypasses



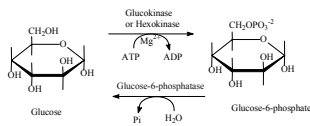
PFK is bypassed by Fructose-1,6-bisphosphatase
Allosteric regulation: *inhibited* by Fru-2,6-P₂ when phosphorylated

FBPase Regulation

Enzyme	Phosphorylated	Dephosphorylated
FBPase	inactive	active
PFK	active	inactive

- Note the identity to glycogen synthase/phosphorylase previously discussed

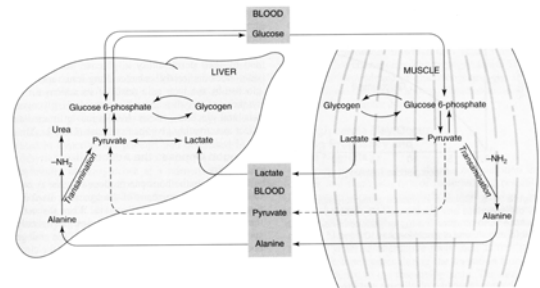
Three Irreversible Reactions of Glycolysis and Their Bypasses



Hexokinase is bypassed by Glucose-6-phosphatase
G6Pase localized to the ER
G6Pase is a complex: transporters plus enzyme

The Cori Cycle

Fig. 21-4 Harper's ROB 24th Ed.



Glycogenesis

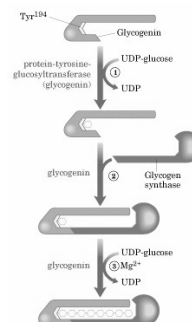
Reactions (board)

glucokinase
phosphoglucomutase
UDP-Glc pyrophosphorylase
glycogen synthase
branching enzyme

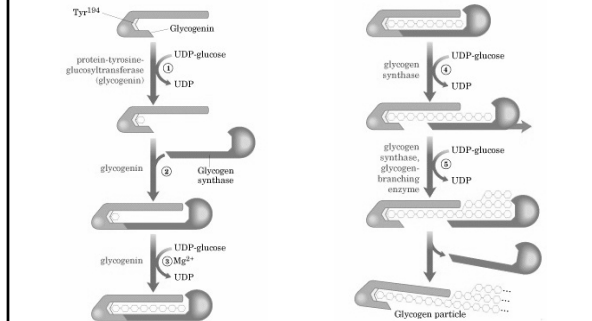
Prevention of futile cycling in glygogenesis/
glygogenolysis

Glycogenin

Fig. 17-2 Lehninger POB 3rd Ed.



Glycogenin



Prevention of Futile Cycling in Glycogenesis/Glycogenolysis

Enzyme	Phosphorylated	Dephosphorylated
Synthase	inactive	active
Phosphorylase	active	inactive

Phosphorylase kinase vs. Phosphorylase kinase phosphatase

Insulin induces "nonphosphorylated" state

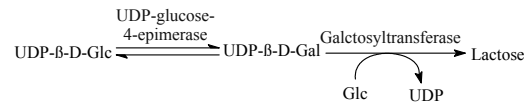
Glucagon induces "phosphorylated" state

Adrenaline induces "phosphorylated" state

Starch Synthesis

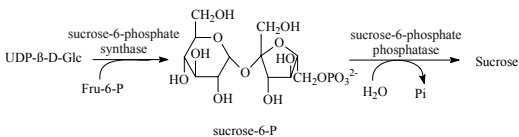
ADP-glucose instead of UDP-glucose
Activated by sucrose

Lactose Synthesis



- New thing here is specificity of GalT
- Normally, attaches to GlcNAc in GP synthesis
- Specificity changes during lactation

Sucrose Synthesis



- Fru-6-P: glucokinase and phosphoglucoisomerase
- UDP-Glc: glucokinase, phosphoglucomutase and UDP-Glc pyrophosphorylase