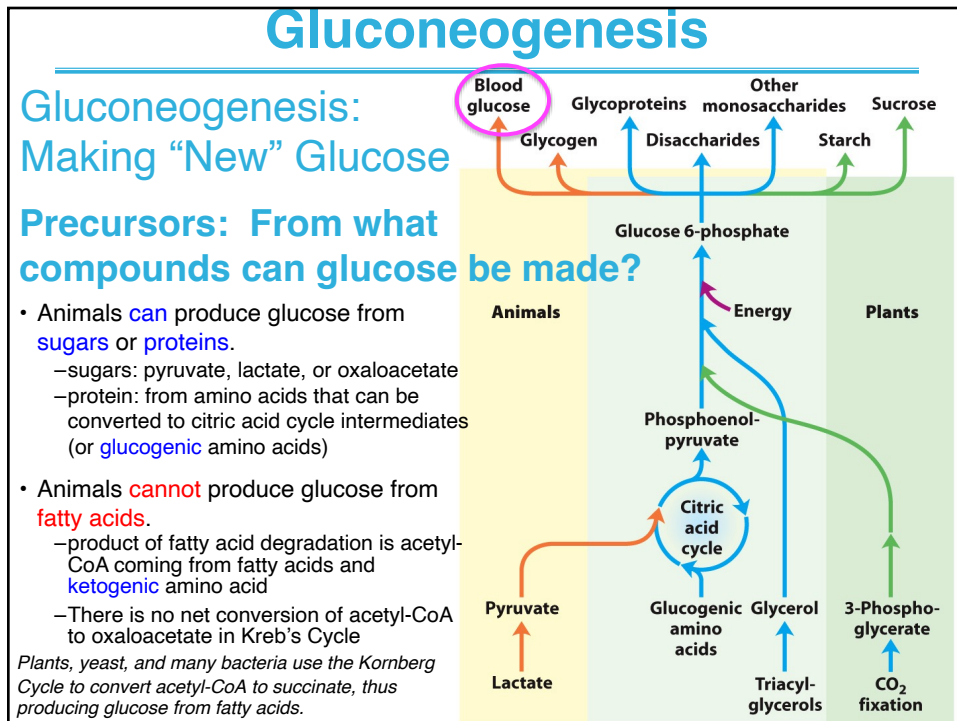


ANABOLISM I

Carbohydrates

Carbohydrate Synthesis in Animals

2

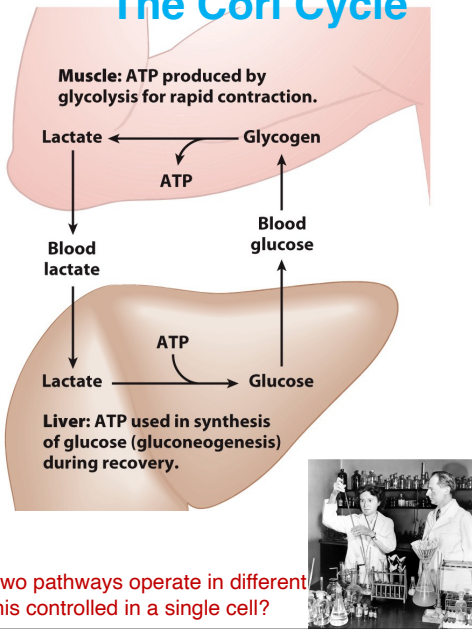


3

Gluconeogenesis

- Blood glucose is largely made in the liver, although other organs can reverse glycolysis, but not deliver free glucose into the blood
- Synthesis of glucose from simpler compounds: **called gluconeogenesis**
- Operates only if ATP and NADH are plentiful
- Other tissues deliver carbon to liver from “waste” products (Ala and Cori Cycles).

The Cori Cycle



As you can see the two pathways operate in different tissues, but how is this controlled in a single cell?

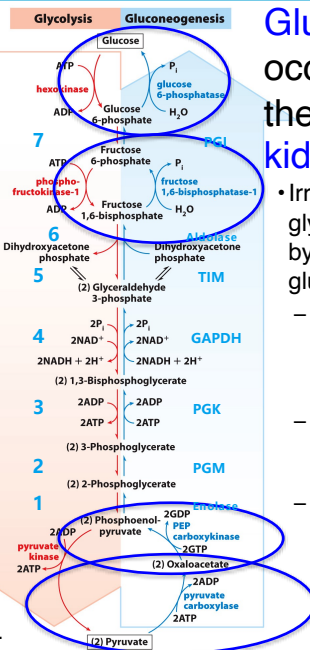
4

Gluconeogenesis

Glycolysis versus Gluconeogenesis

Glycolysis occurs mainly in the **muscle and brain**.

- Opposing pathways that are both thermodynamically favorable:
- Glycolysis: $\Delta G^\circ = -35 \text{ kcal/mol}$
- Gluconeogenesis: $\Delta G^\circ = -9 \text{ kcal/mol}$
 - operate in opposite direction
 - end product of one is the starting compound of the other
- Seven Reversible reactions are used by both pathways.
- Three “glycolysis-specific” steps are reversed with Four “gluconeogenesis-specific” steps.



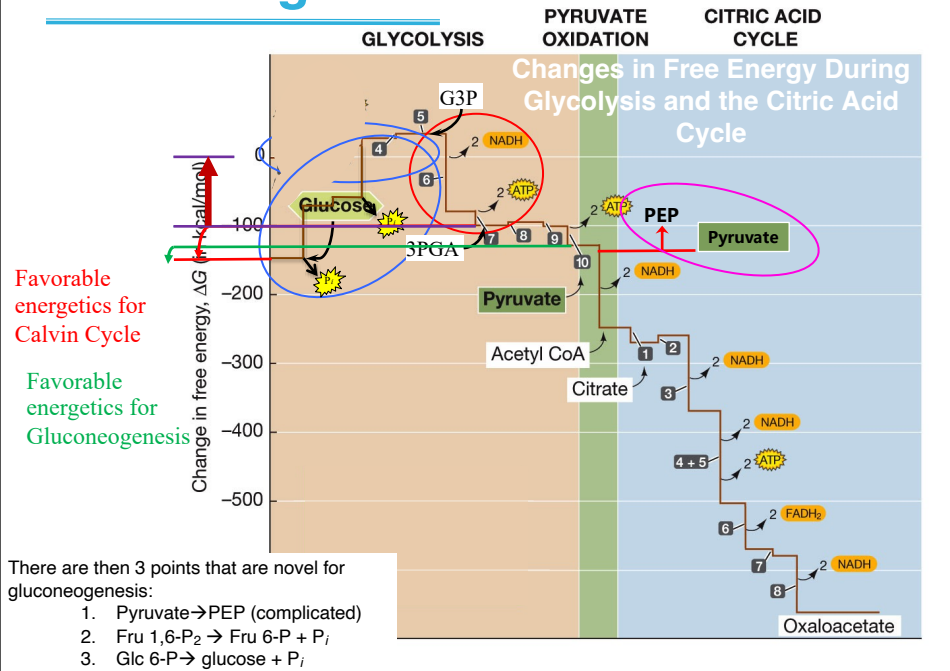
Gluconeogenesis occurs mainly in the **liver and kidney cortex**.

- Irreversible reactions of glycolysis must be bypassed in gluconeogenesis.
 - no ATP generated during gluconeogenesis; instead, 6 ATPs and 2 NADH needed per Glc.
 - Some different enzymes results in the different pathways
 - differentially regulated to prevent a futile cycle

Let's look at the energetics of making glucose.....

5

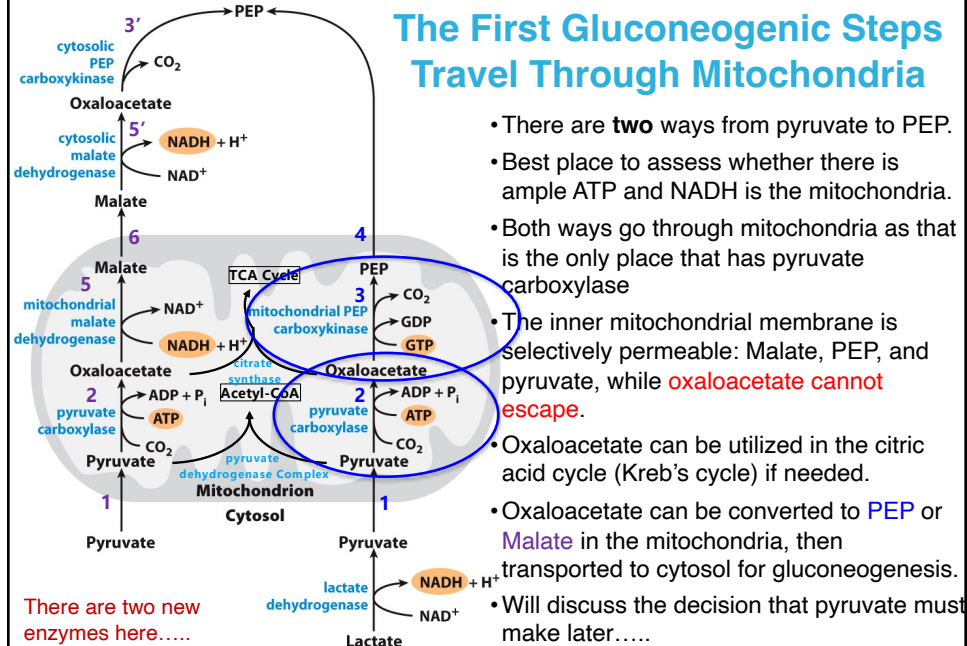
Gluconeogenesis



6

Gluconeogenesis

The First Gluconeogenic Steps Travel Through Mitochondria



7

Gluconeogenesis

Pyruvate to Phosphoenolpyruvate

