بسم الله الرحمن الرحيم

Gluconeogenesis

By

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Objectives

Gluconeogenesis:

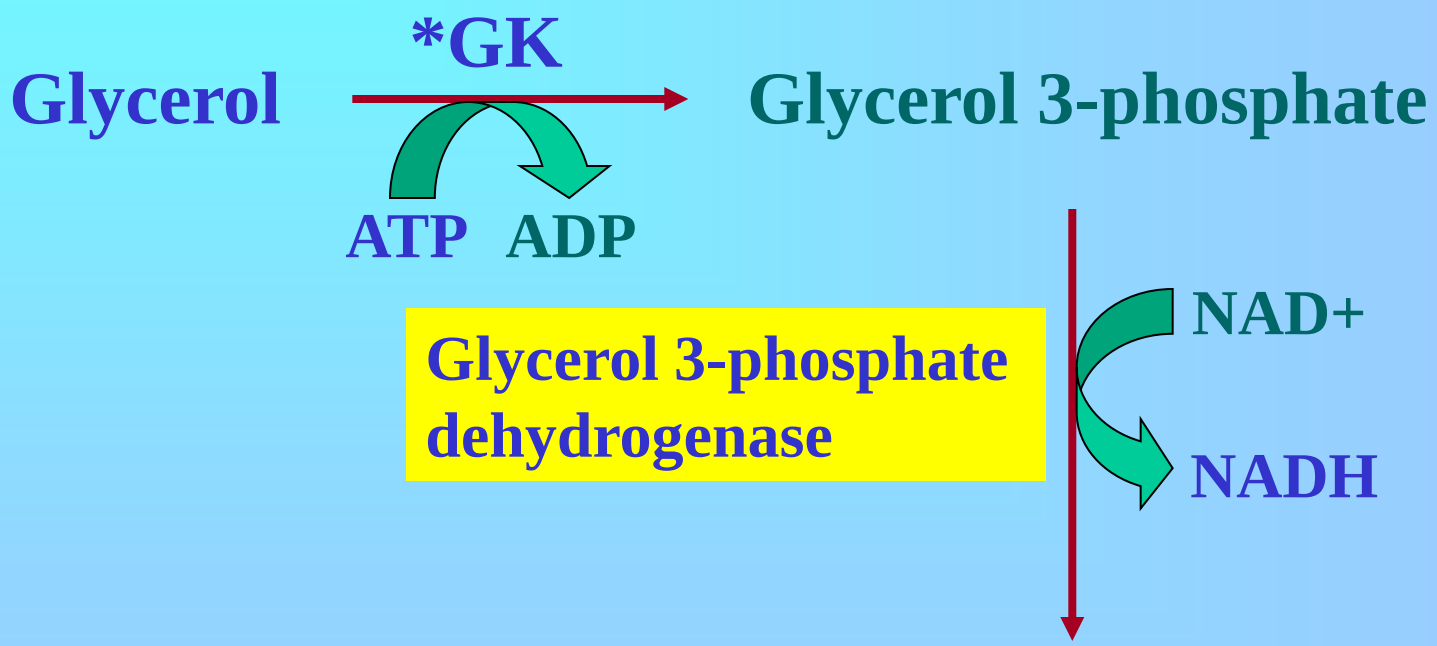
- Important pathway for glucose production
- Main substrates
- The main reactions
- The rate-limiting enzymes
- Reciprocal control with glycolysis

Gluconeogenesis: An Overview

- Liver (mainly) and Kidneys
- Both mitochondria and Cytosol
- Exception: Glycerol, only cytosol
- Gluconeogenic substrates:

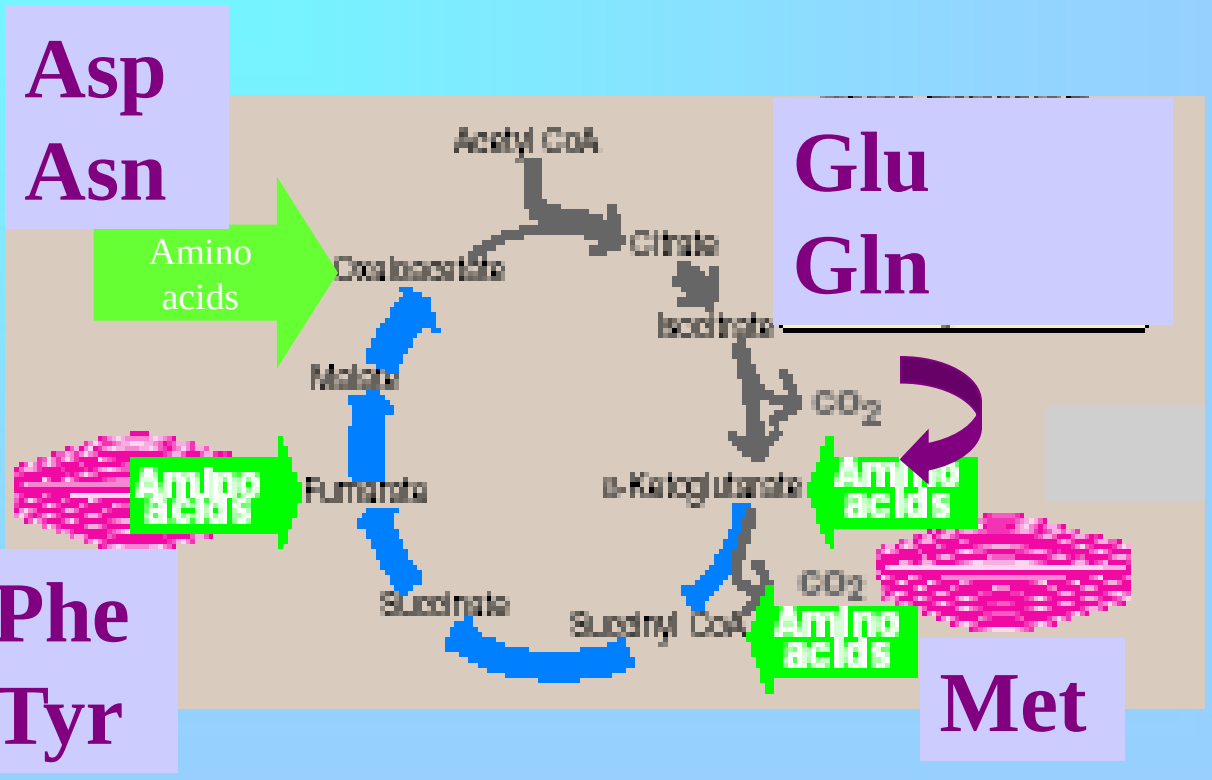
  Glycerol
  Lactate
  Glucogenic amino acids

Gluconeqgenic Substrate: Glycerol



*GK: Glycerol kinase only in liver & kidneys

Glucogenic Amino Acids



Gluconeogenic Substrates

Lactate
Ala

Pyruvate

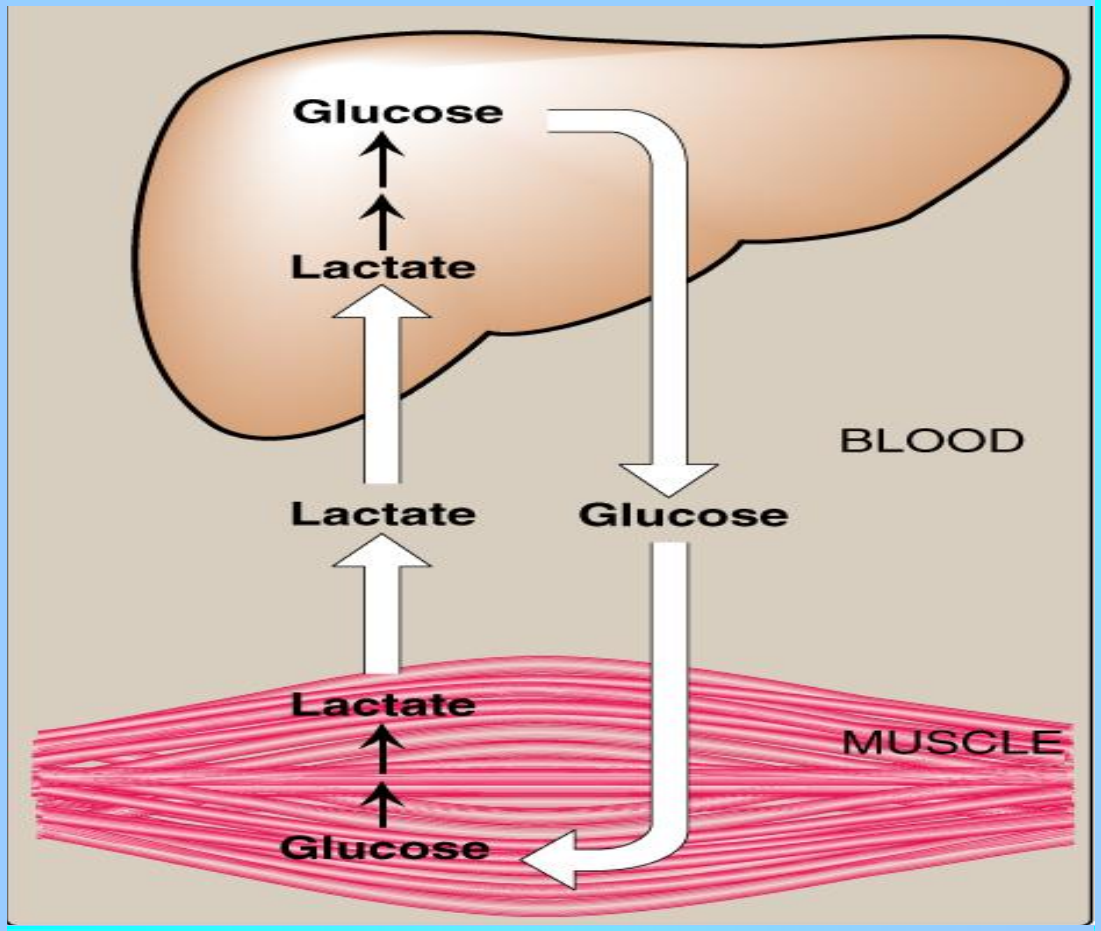
Asp
Asn

Glu
Gln

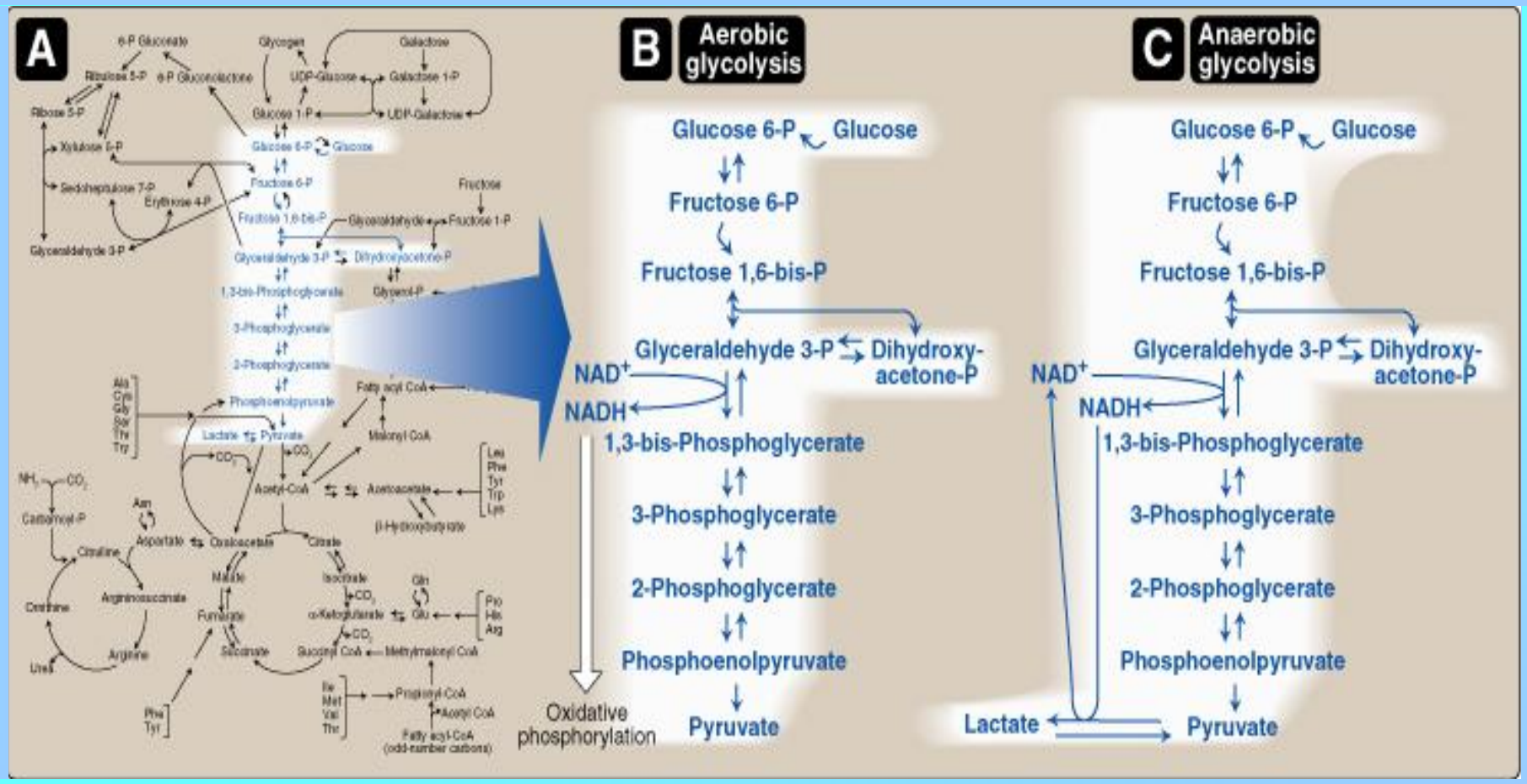
Phe
Tyr

Met

Gluconeogenic Substrate: Lactate (Cori Cycle)

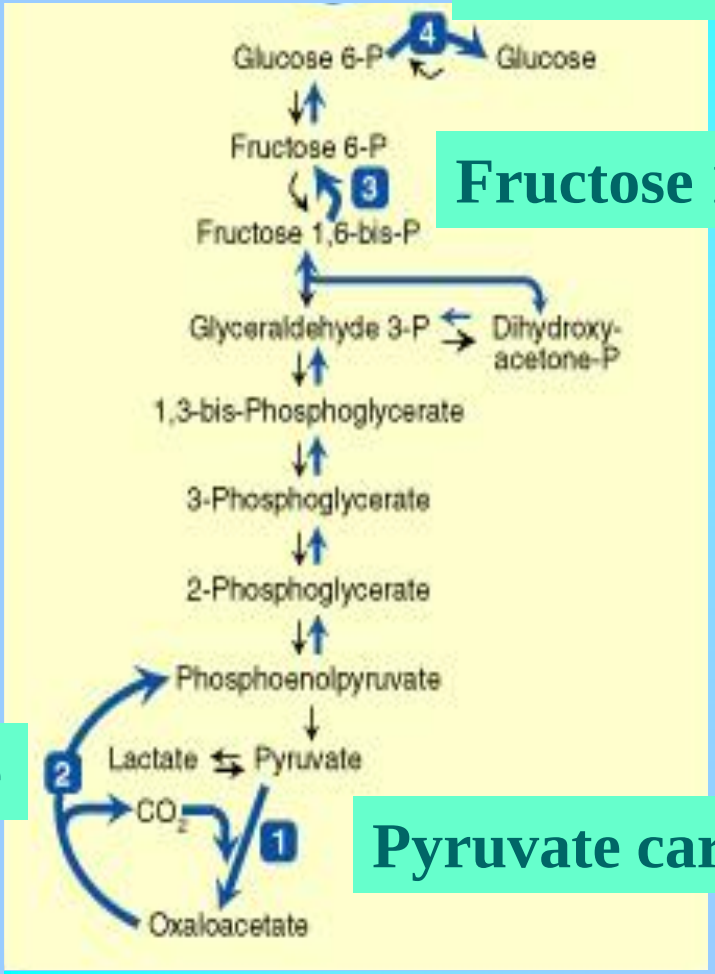


Aerobic Glycolysis



Gluconeogenesis Pathway

Glucose-6-phosphatase



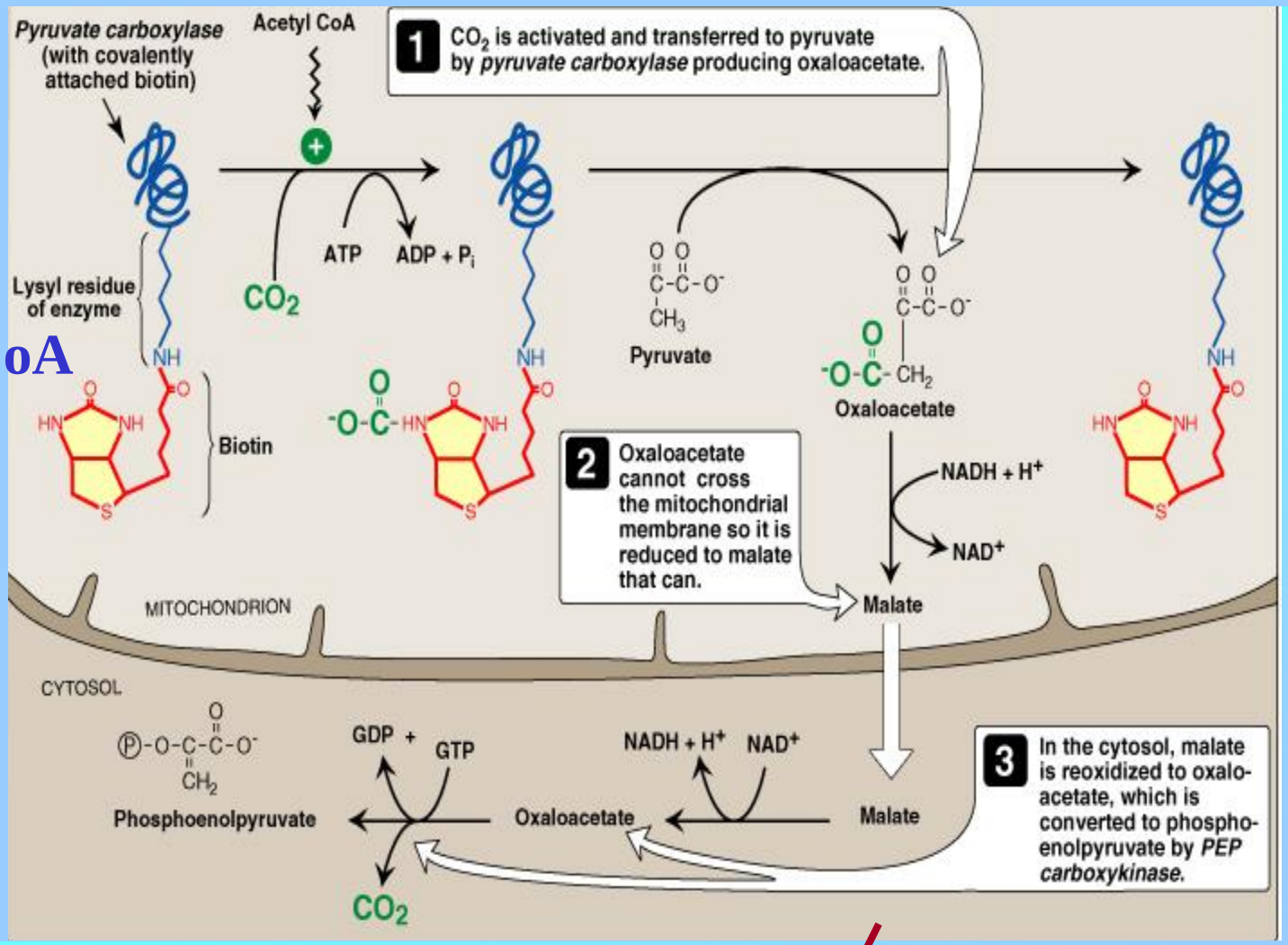
Fructose 1,6-bisphosphatase

PEP-Carboxy kinase

Pyruvate carboxylase

Pruvate Carboxylase and PEP-CK

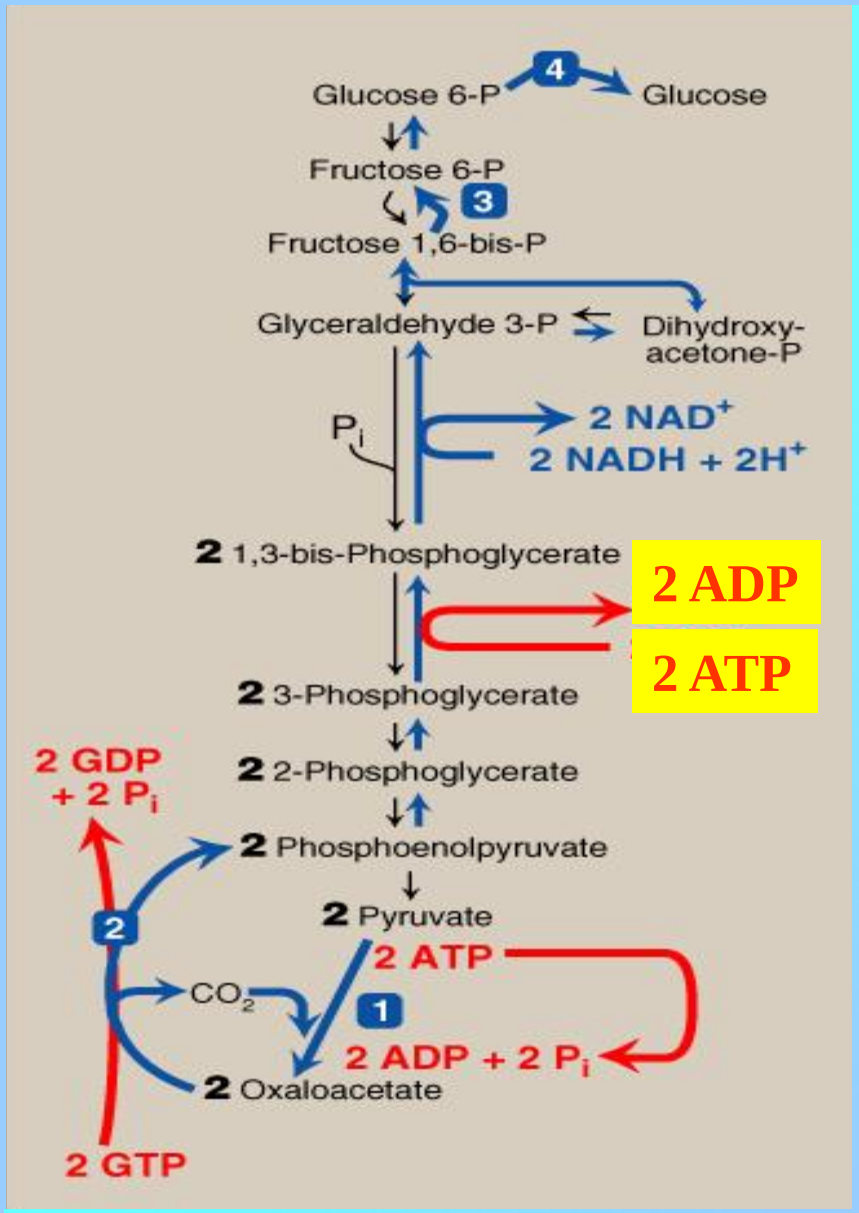
Fasting:
↑ Acetyl CoA
(FAO)



Pyruvate carboxylase + PEP-CK ≠ Pyruvate kinase

Gluconeogensis: E- Consumed

Six High-Energy Phosphate Bonds For Pyruvate to Glucose



Gluconeogenesis: Regulation

- **Reciprocal control**

  Gluconeogenesis & Glycolysis

- **Allosteric:**

  ↑ Acetyl CoA (Pyruvate carboxylase)

  ↓ AMP or ↑ ATP

  ↓ F 2,6-Bisphosphate } **F 1,6-bisphosphatase**

- **↑ Glucagon (↓ I/G ratio)**

  Allosteric (↓ F 2,6-Bisphosphate)

  Covalent modification (Pyruvate kinase)

  Induction (PEP-CK)