بسم الله الرحمن الرحيم

Glycolysis and Lactic Acidosis

By

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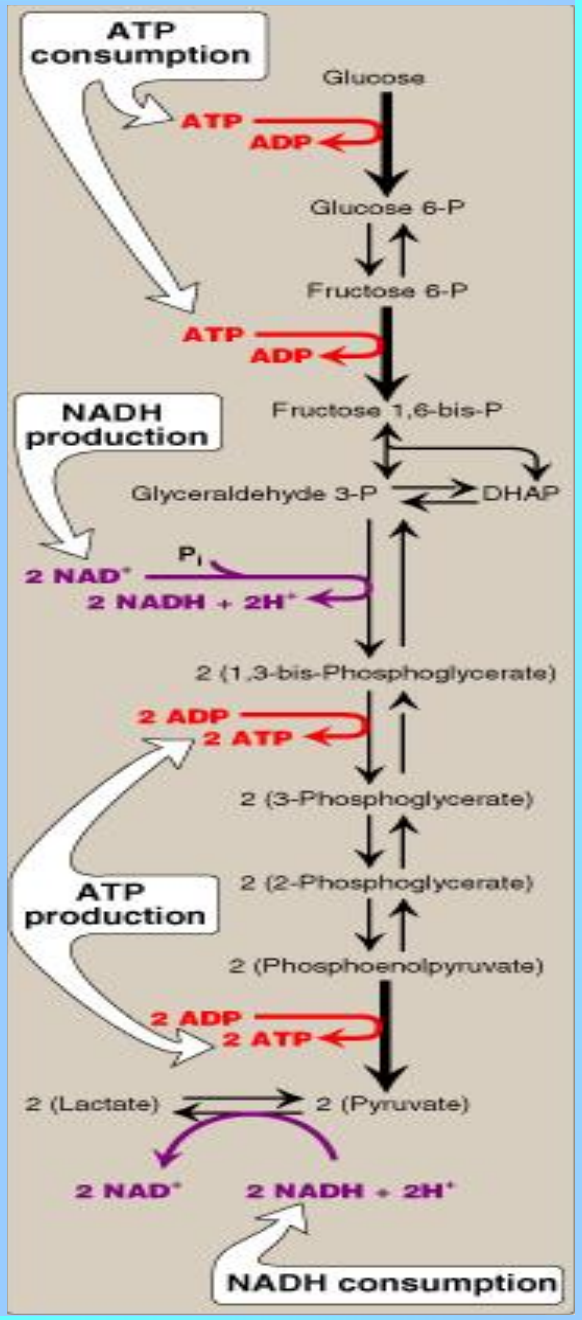
Objectives

- Anaerobic Vs aerobic glycolysis
- Lactate production:
  - Importance and consequences
  - Associated medical diseases
- Lactic acidosis Vs skeletal muscle cramp
- Lactic acidosis as a medical emergency
- Glycolysis in RBCs

Anaerobic Glycolysis



Anaerobic Glycolysis: ATP Production

ATP Consumed:

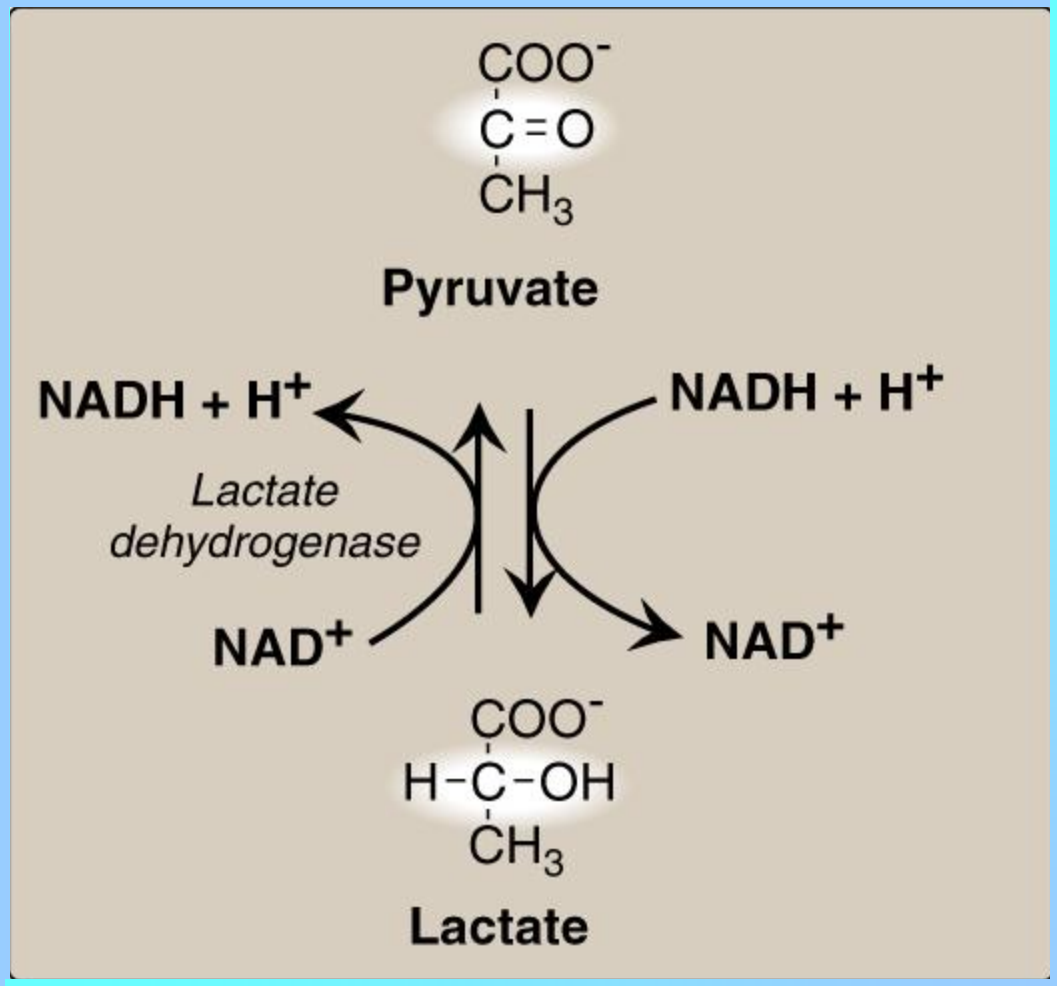
		2	ATP

ATP Produced:

Substrate-level	2 X 2 =	4	ATP
~~Oxidative-level~~	~~2 X 3 =~~	~~6~~	~~ATP~~
Total		4	ATP

Net:	4 – 2 =	2	ATP

Lactate Dehydrogenase



Pyruvate Dehydrogenase Deficiency: Congenital Lactic Acidosis

E1 deficiency of PDH complex

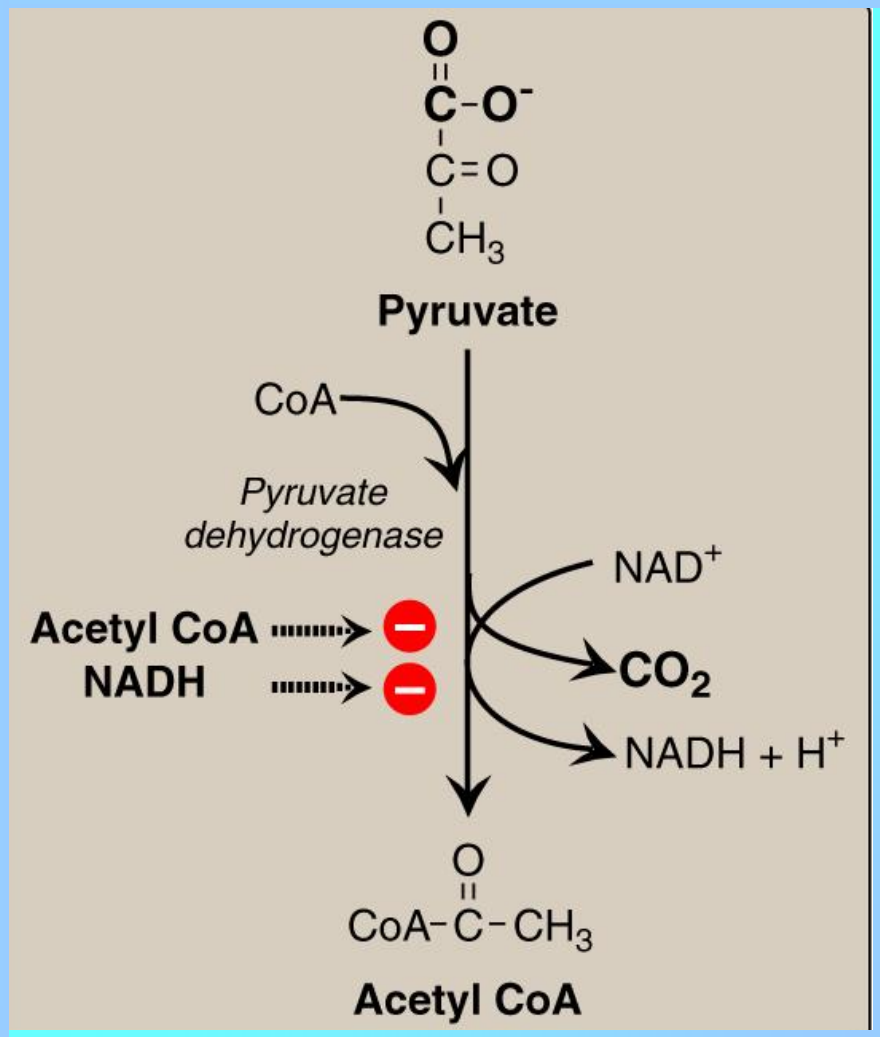
X-linked dominant

Affects mainly brain

Clinically:

- **Lactic acidosis**
- **Developmental defects of nervous system**
- **Muscular spasticity**
- **Early death**

Oxidative Decarboxylation of Pyruvate

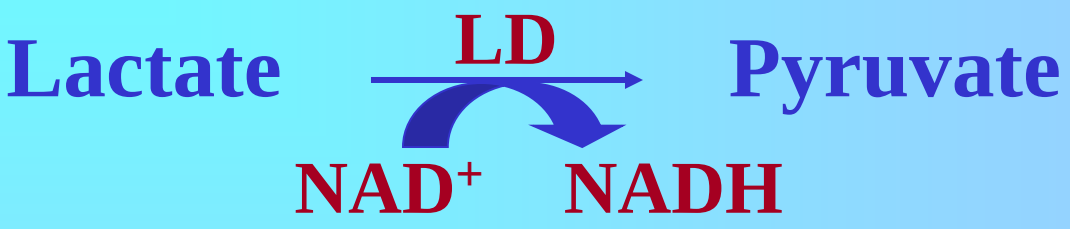


Acquired Lactic Acidosis

Circulatory collapse:

- Myocardial infarction
- Pulmonary embolism
- Severe hemorrhage
- Shock

Lactate Consumption



Liver: Pyruvate to glucose (Gluconeogenesis)
Pyruvate to active acetate ($CO_2 + H_2O$, Krebs)

Heart: Pyruvate to active acetate ($CO_2 + H_2O$, Krebs)

Lactate

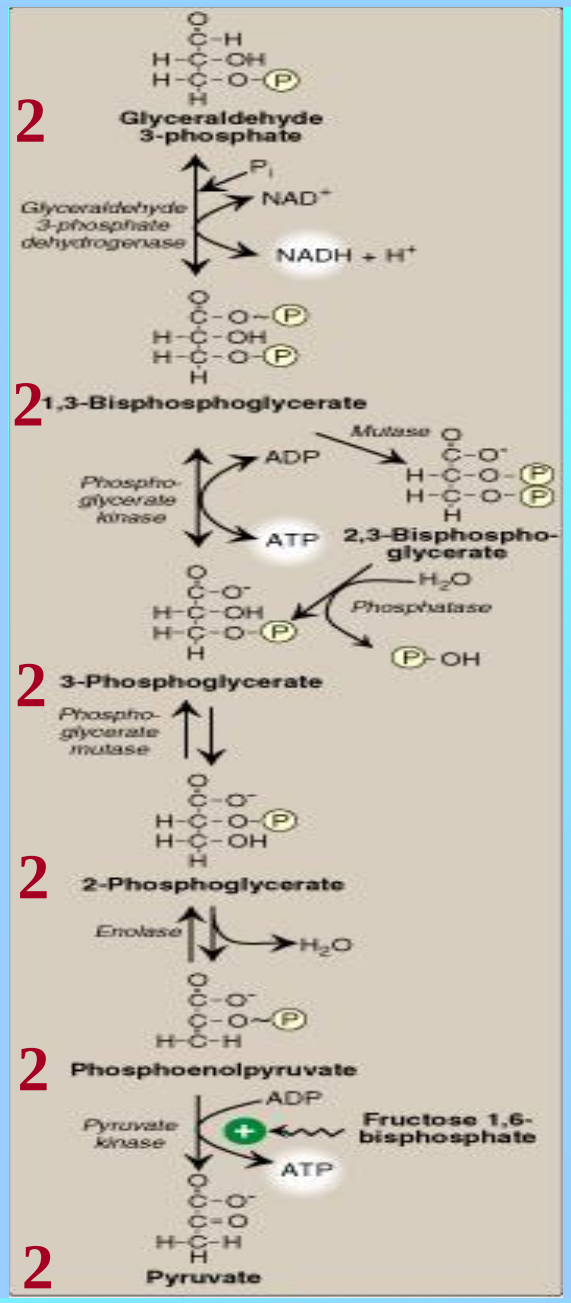
↑ Lactate in muscle: Muscle cramps

↑ Lactate in blood: Lactic acidosis

Blood lactate level: Monitors patient's recovery

Oxygen debt

Glycolysis in RBCs
2,3-BPG Shunt



Glycolysis in RBCs

ATP Consumed:

		2	ATP

ATP Produced:

Substrate-level	OR	2 X 2 =	4	ATP
		1 X 2 =	2	ATP
~~Oxidative-level~~		~~2 X 3 =~~	~~6~~	~~ATP~~
Total			4	ATP

Net:	OR	4 – 2 =	2	ATP
		2 – 2 =	0	ATP

Glycolysis in RBCs: Summary

End product:

Lactate

No net production or consumption of NADH

Energy yield:

No 2,3-BPG shunt	**2 ATP**
2,3-BPG shunt	**0 ATP**

PKD hemolytic anemia depends on:

Degree of PKD

Compensation by 2,3-BPG