بسم الله الرحمن الرحيم

Oxidative Decarboxylation and Krebs Cycle

By

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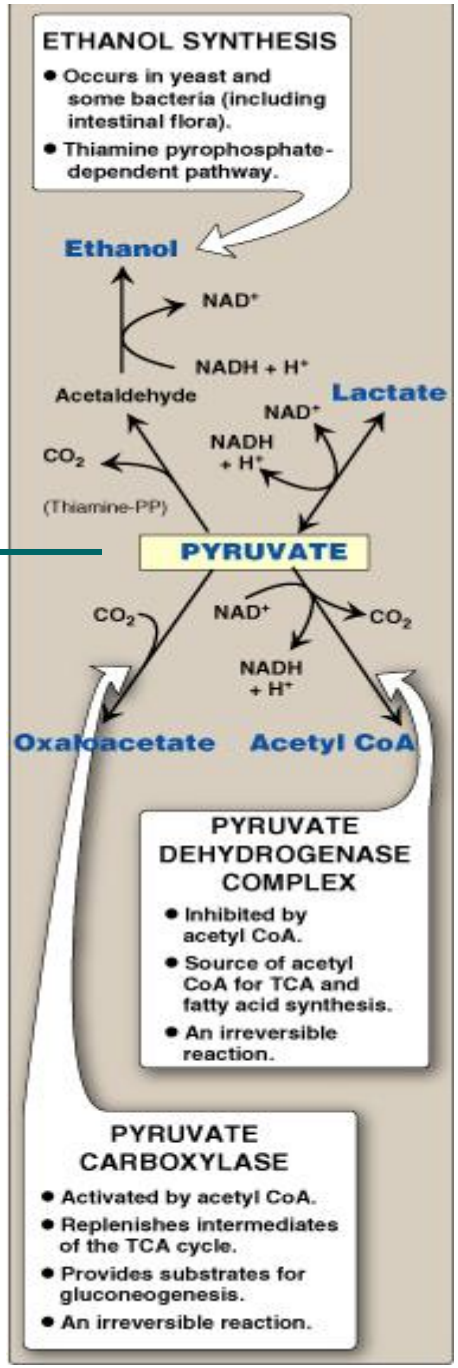
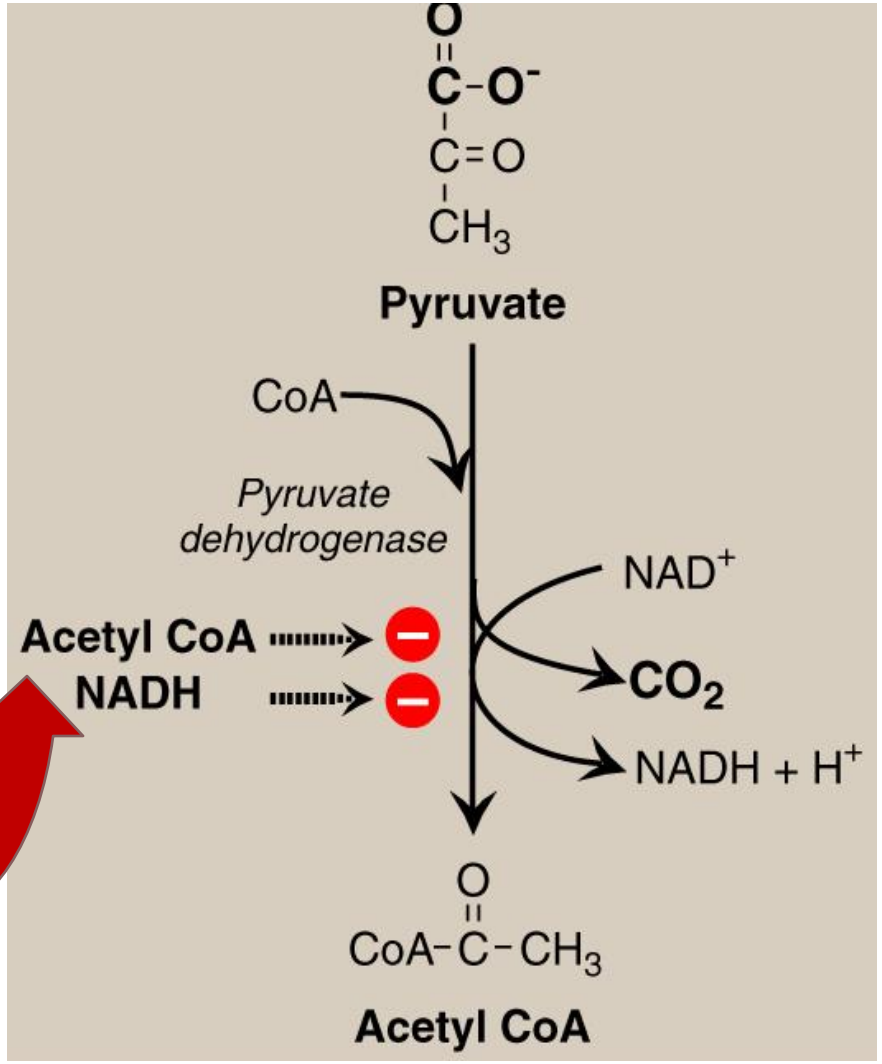
Fates of Pyruvate

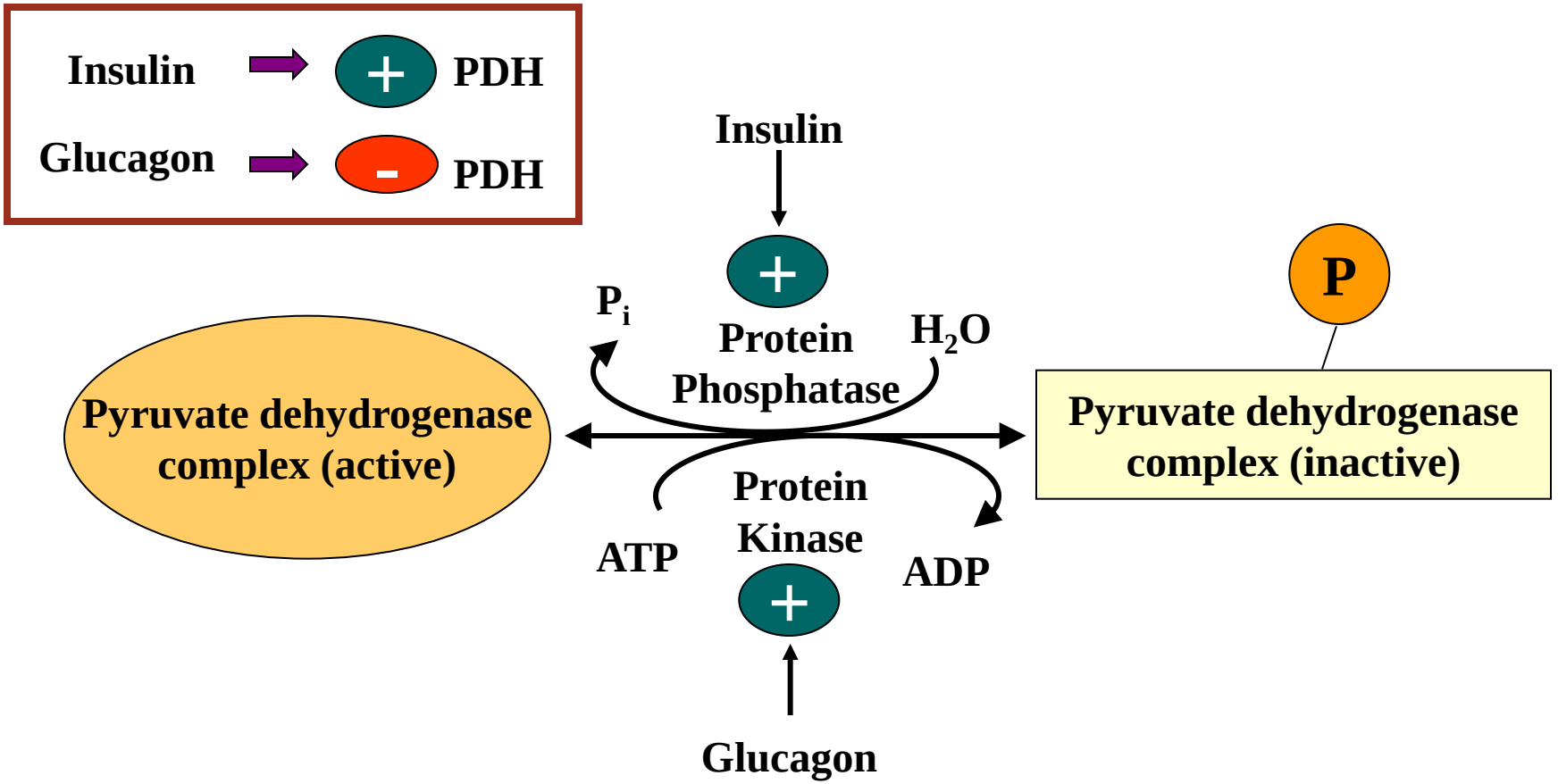


Oxidative Decarboxylation of Pyruvate

Allosteric Regulation



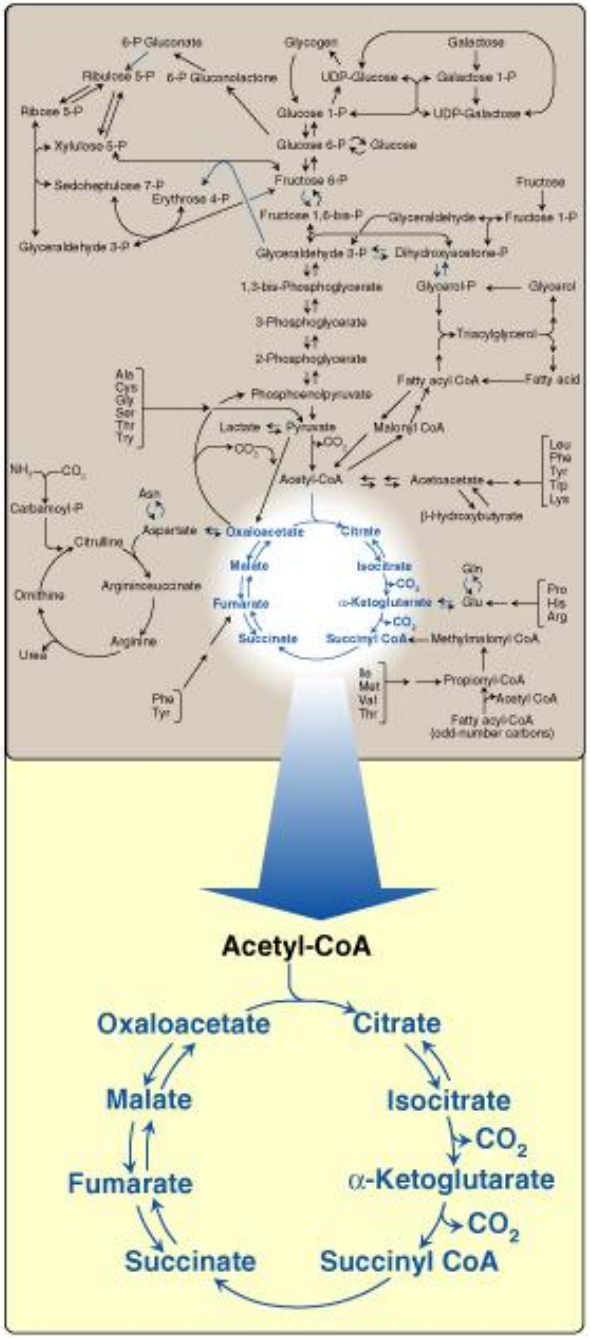
PDH Complex: Covalent Regulation



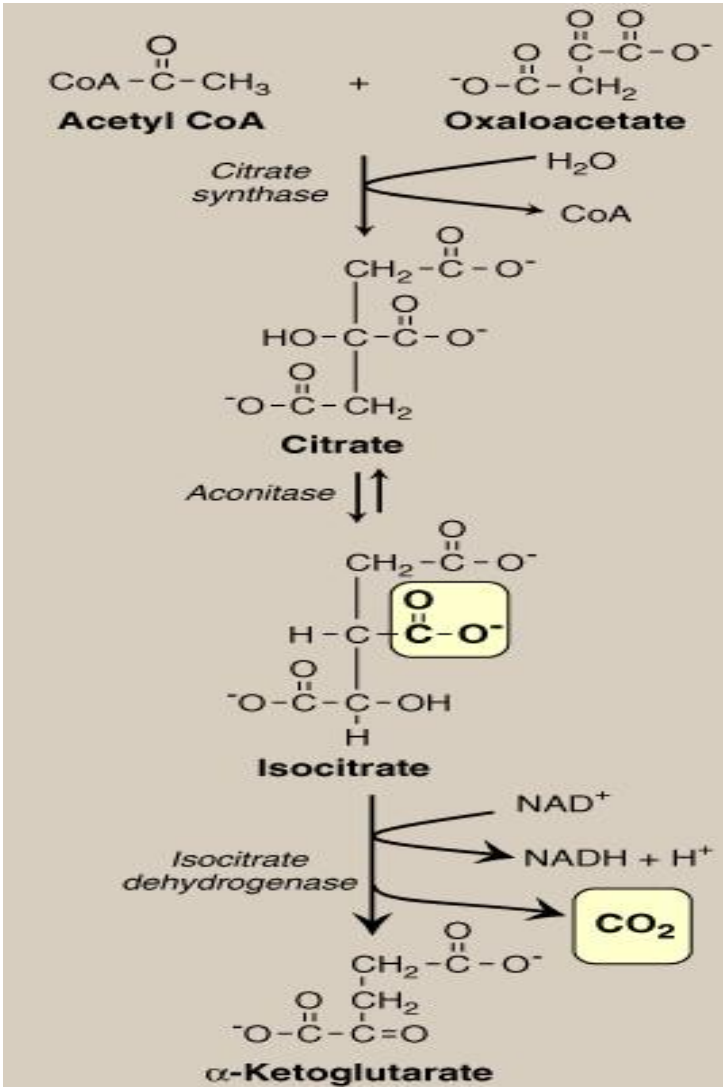
Tricarboxylic Acid Cycle: Krebs Cycle

- Final common pathway for oxidation
- Exclusively in mitochondria
- Major source for ATP
- Mainly catabolic with some anabolic features
- Synthetic reactions (anabolic features):
  - Glucose from amino acids
  - Nonessential amino acids
  - Fatty acids
  - Heme

Krebs Cycle


Acetyl-CoA
Oxaloacetate
Citrate
Isocitrate
CO_2
α-Ketoglutarate
CO_2
Succinyl CoA
Succinate
Fumarate
Malate

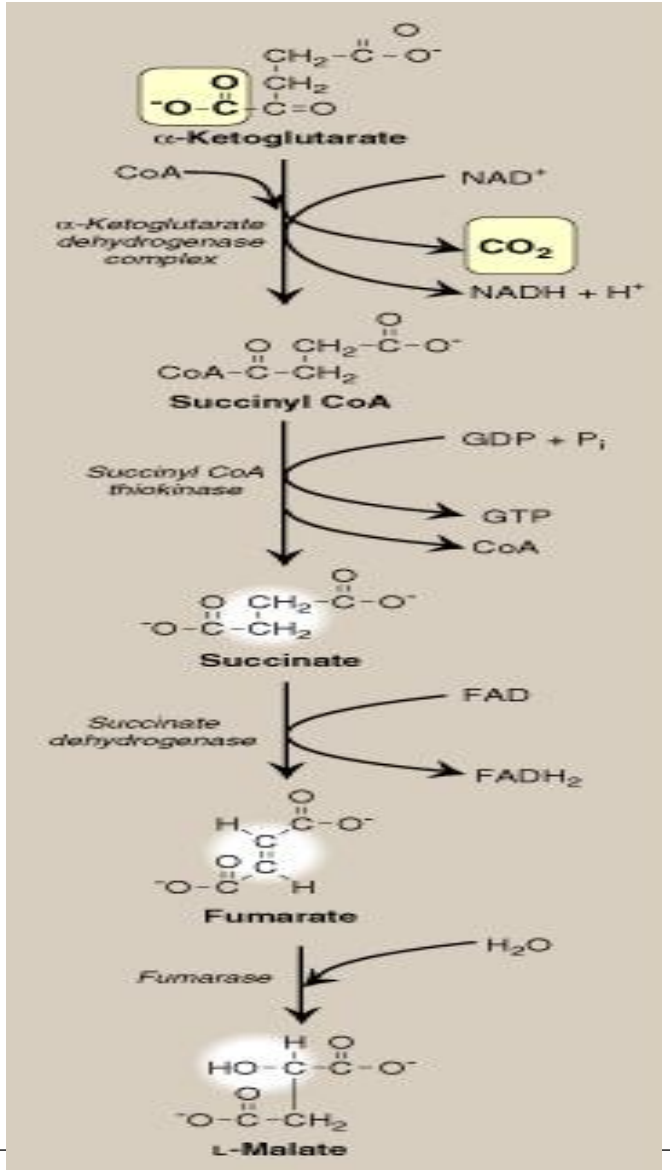
Krebs Cycle Reactions (1)



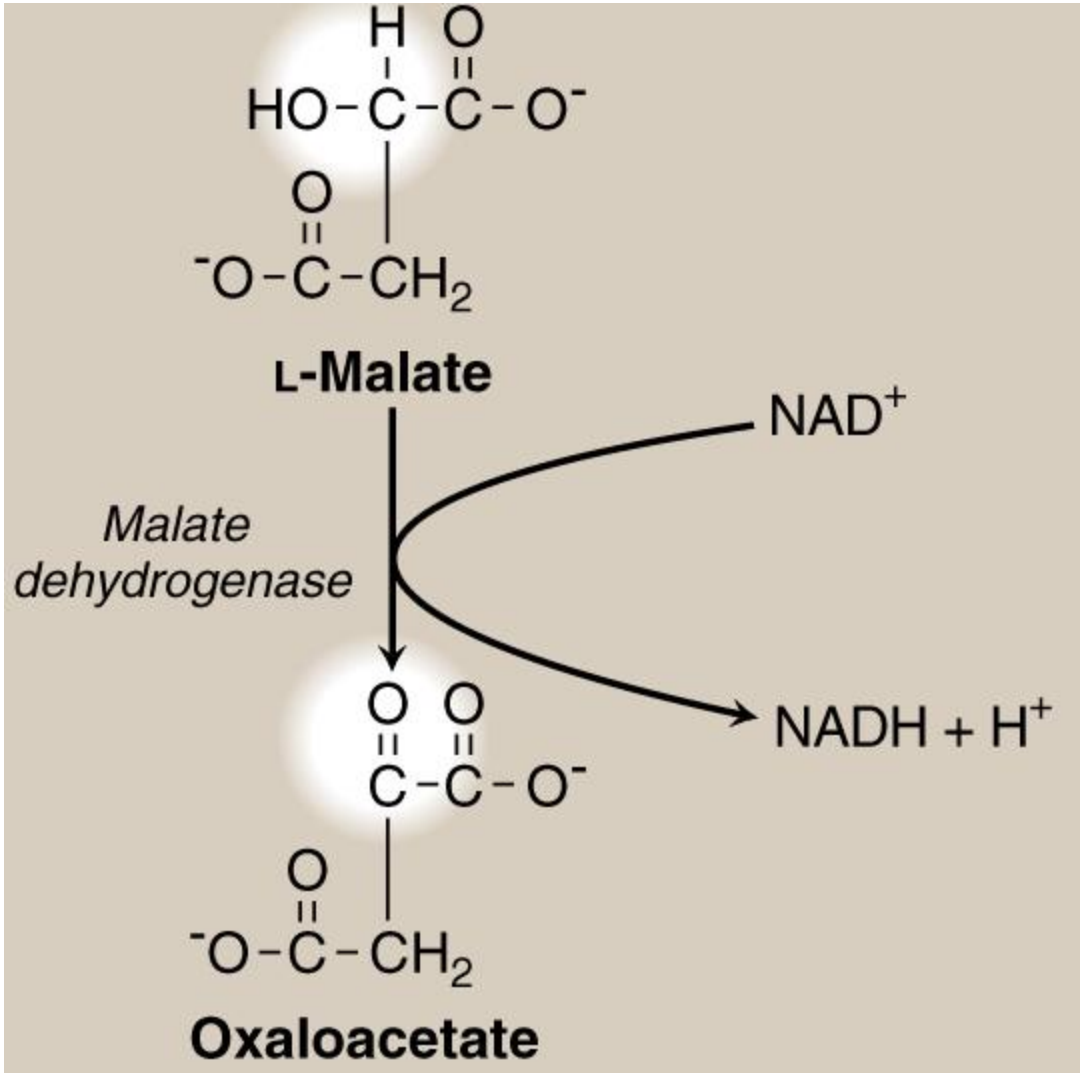
Krebs Cycle Reactions (2)

Succinate Thiokinase

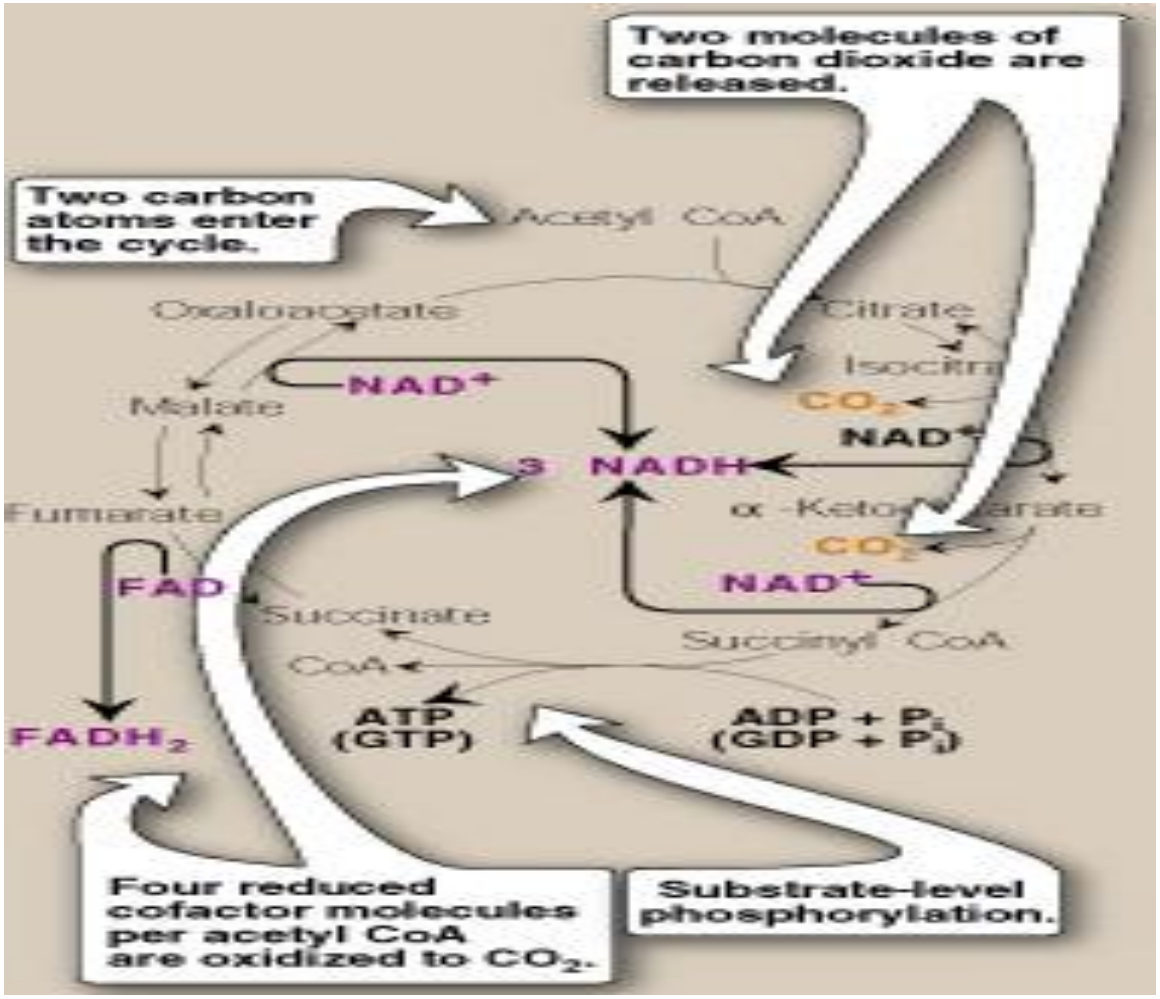
Substrate-Level Phosphorylation



Krebs Cycle Reactions (3)



Krebs Cycle: Energy Yield



Krebs Cycle: Energy Yield

Energy-producing reaction	Number of ATP produced
3 NADH $\longrightarrow$ 3 NAD^+	9
$FADH_2 \longrightarrow FAD$	2
GDP + $P_i \longrightarrow$ GTP	1
	12 ATP/acetyl CoA oxidized

Net ATP Production by Complete Glucose Oxidation

Aerobic glycolysis:		**8 ATP**
Oxidative decarboxylation:	**2 X 3 =**	**6 ATP**
Krebs cycle:	**2 X 12 =**	**24 ATP**
Net:		**38 ATP**

Take Home Message

- Pyruvate is oxidatively decarboxylated by PDH to acetyl CoA inside the mitochondria
- Krebs cycle:
  - Final common pathway for the oxidation of carbohydrates, fatty acids and amino acids
  - occurs in the mitochondria
  - Aerobic
  - Mainly catabolic, with some anabolic reactions
- The complete oxidation of one glucose molecule results in a net production of 38 ATP molecules

Thank you