

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

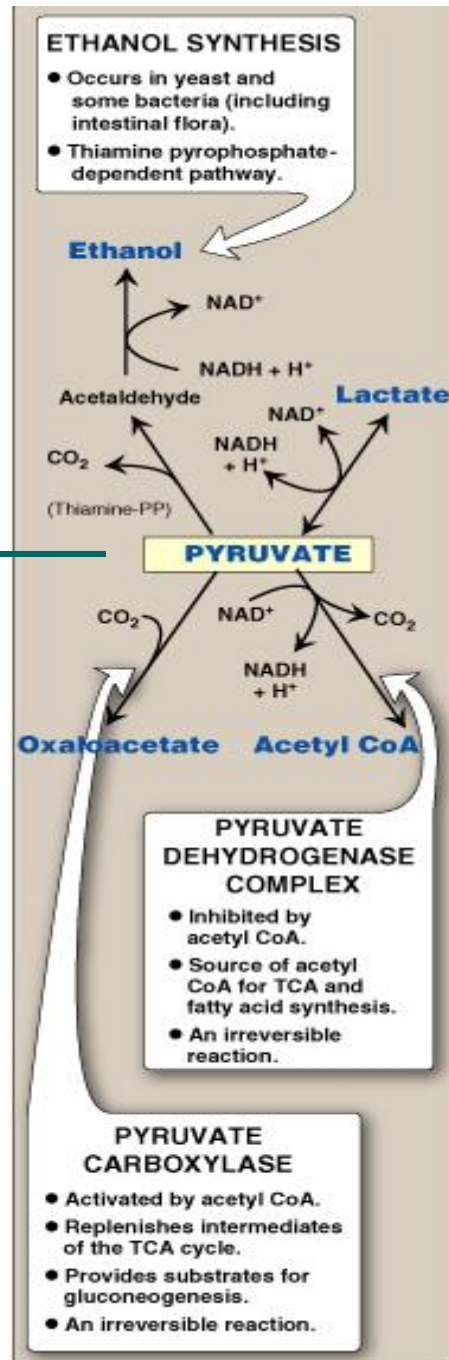
# **Oxidative Decarboxylation and Krebs Cycle**

**By**

***Reem M. Sallam, M.D.; Ph.D.***

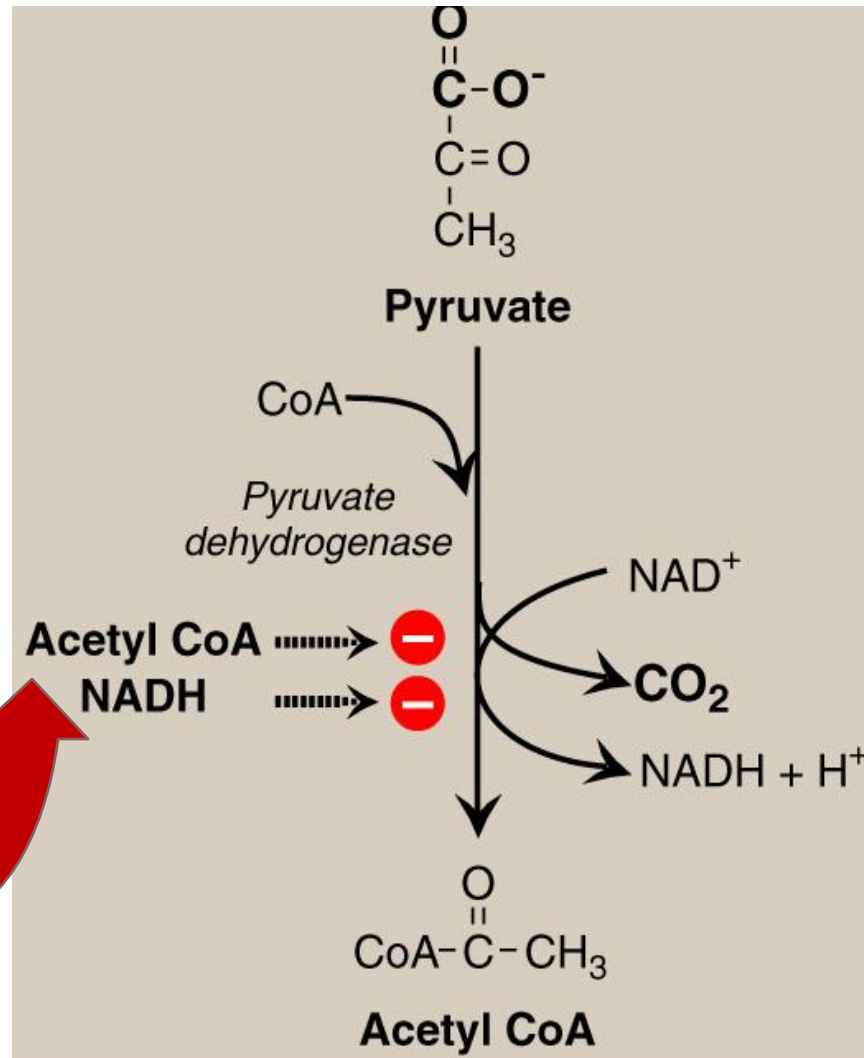
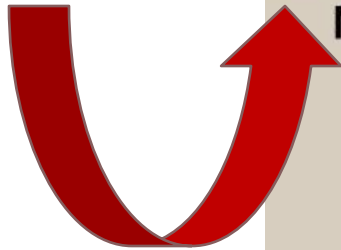
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# Fates of Pyruvate

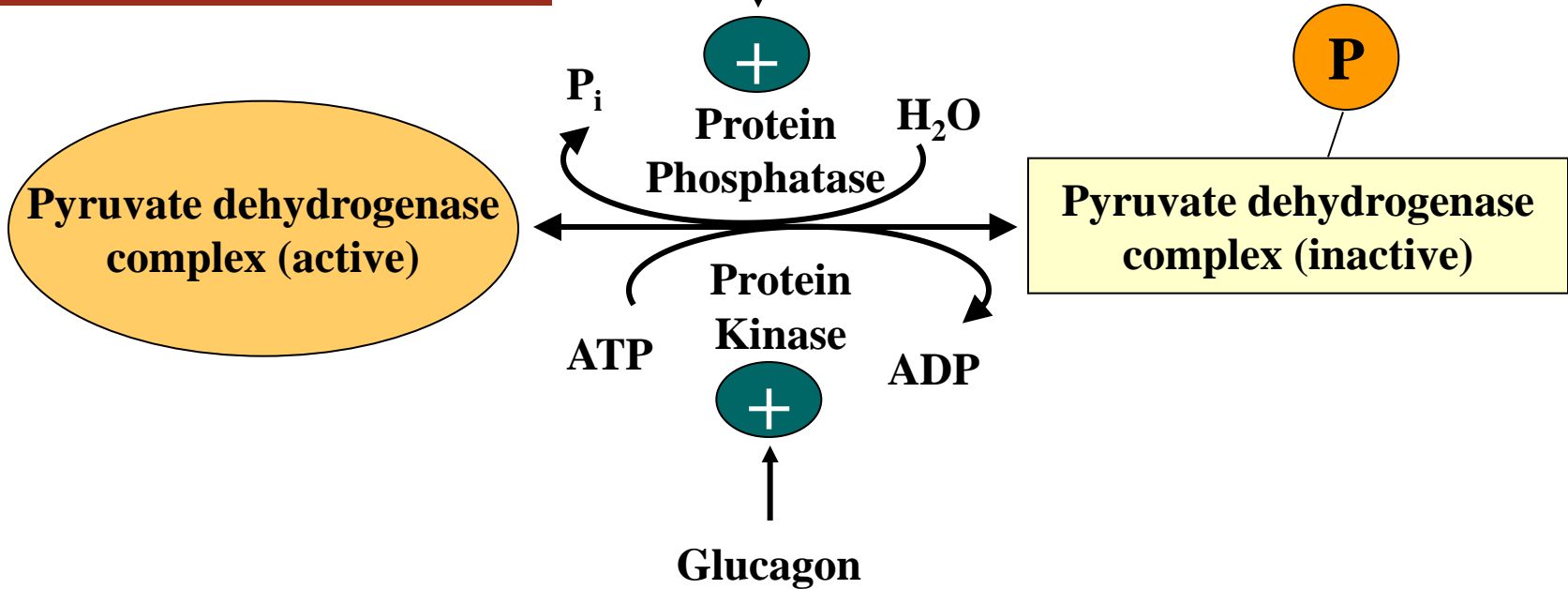
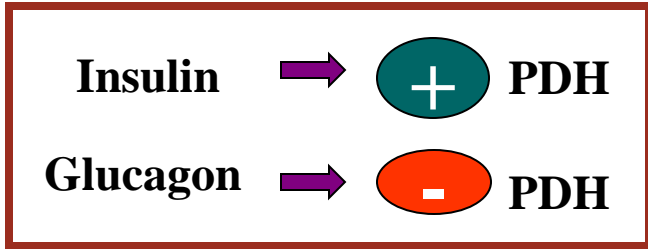


# Oxidative Decarboxylation of Pyruvate

Allosteric  
Regulation



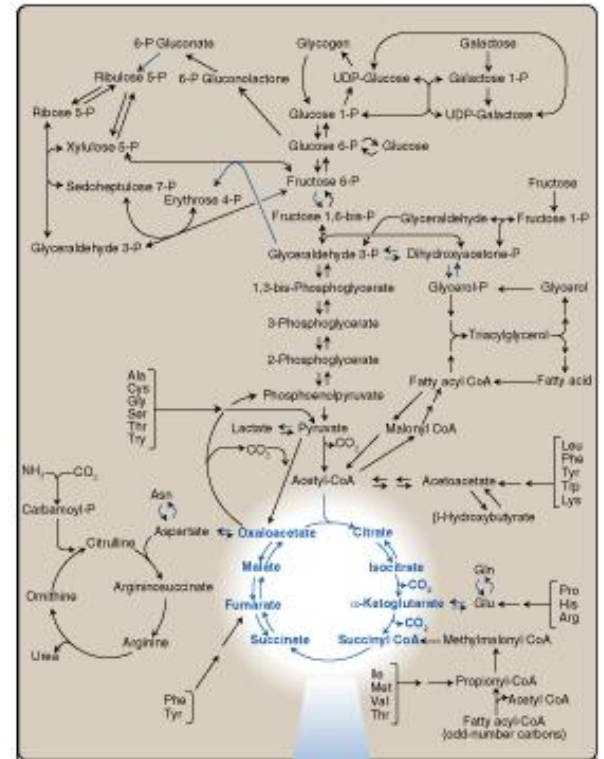
# PDH Complex: Covalent Regulation



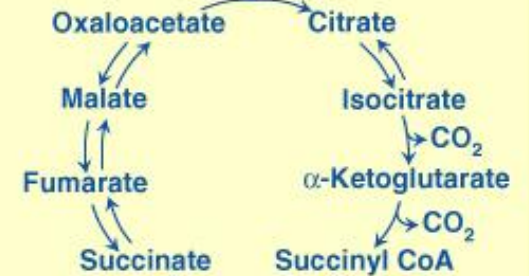
# **Tricarboxylic Acid Cycle: Krebs Cycle**

- **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**

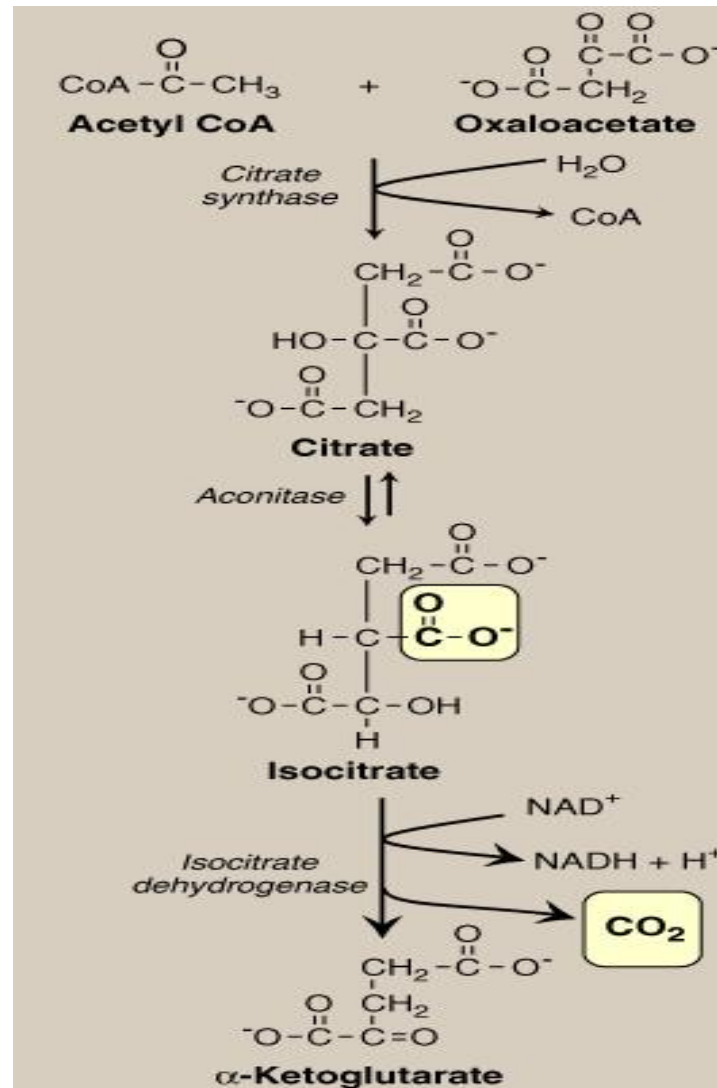
# Krebs Cycle



Acetyl-CoA



# Krebs Cycle Reactions (1)

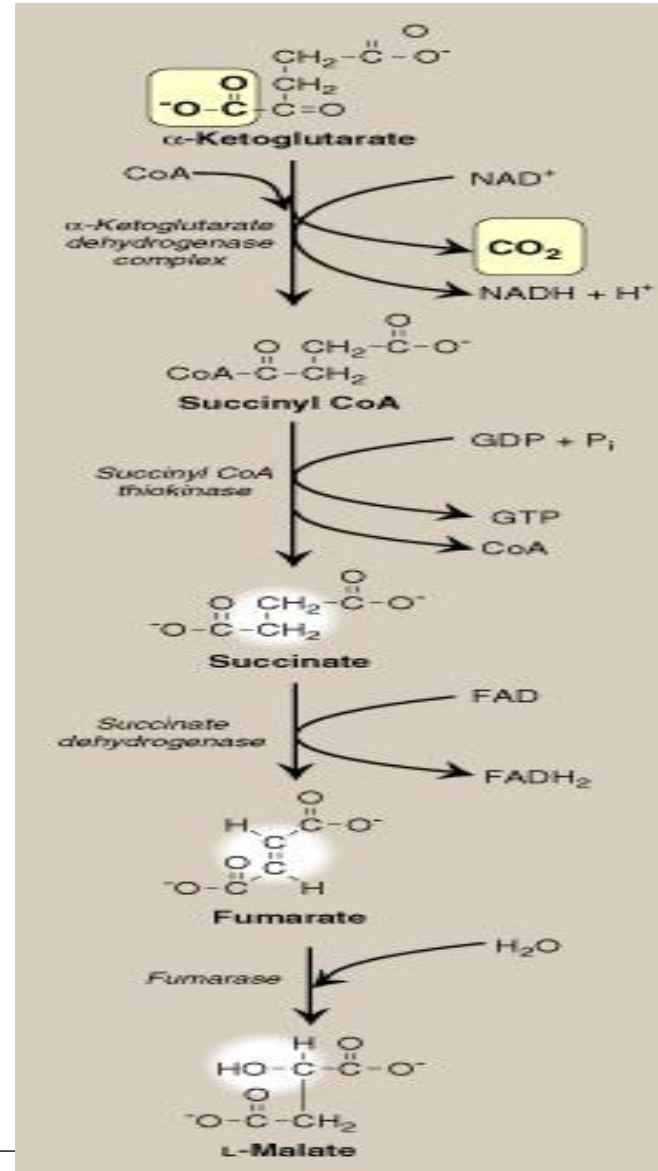




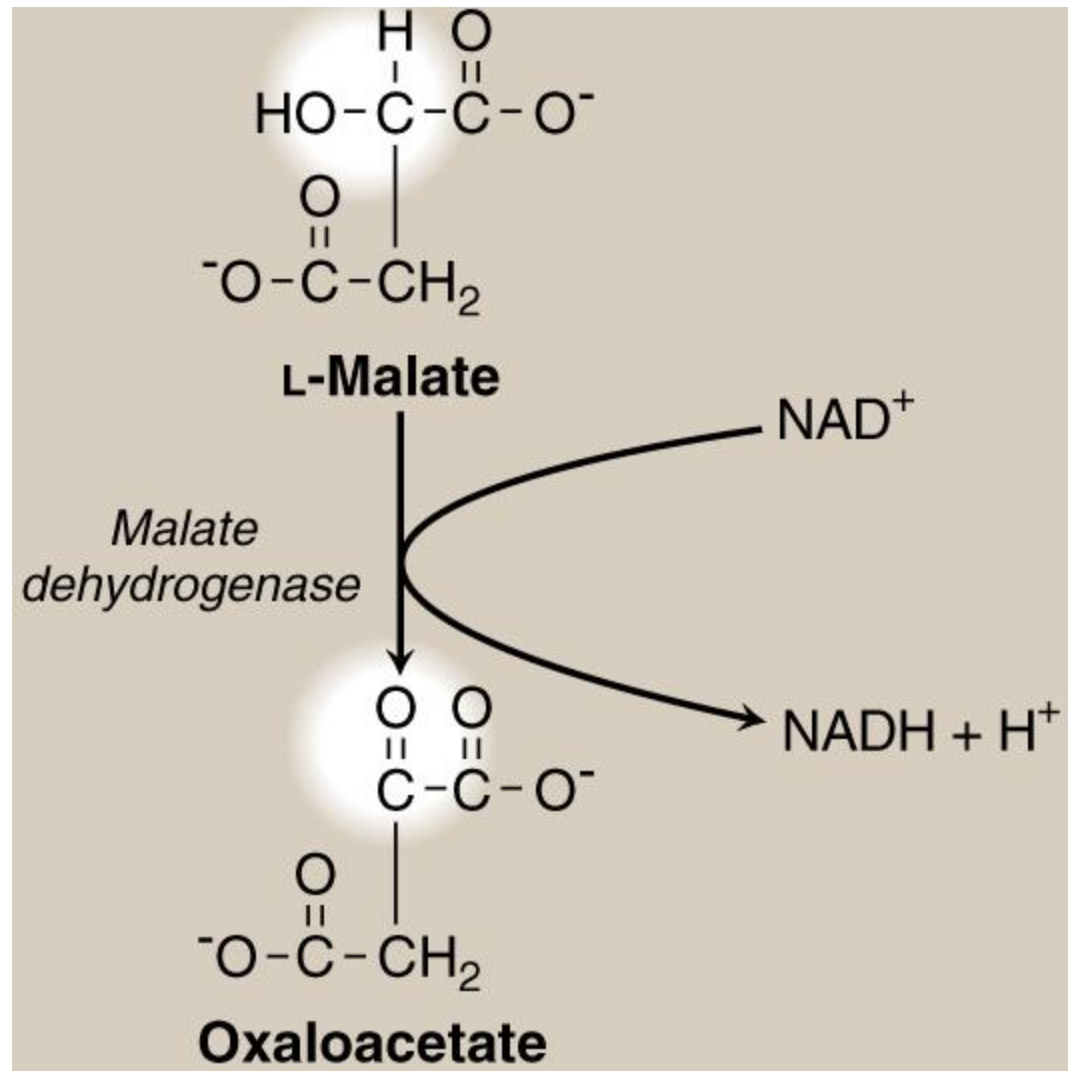
# Krebs Cycle Reactions (2)

**Succinate Thiokinase**

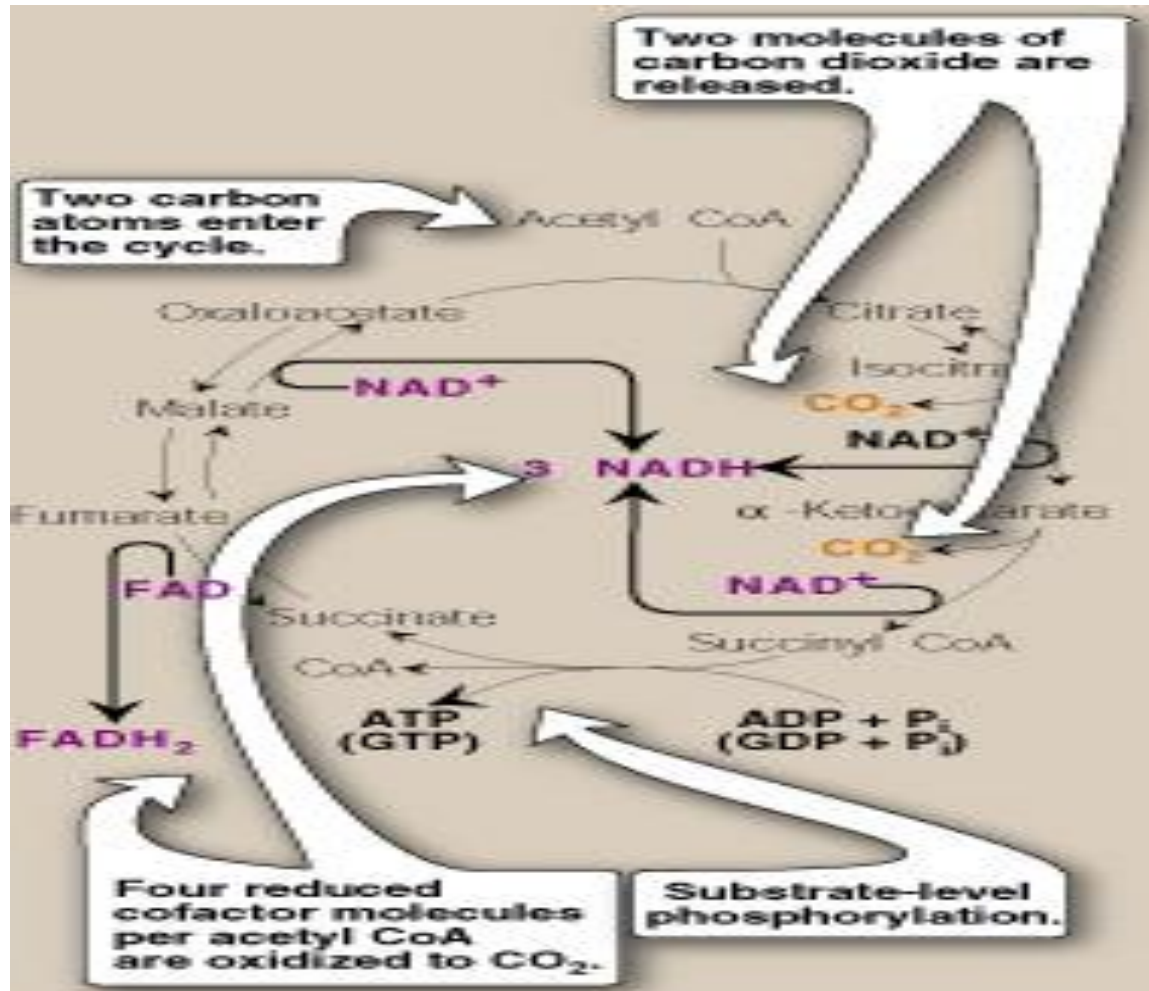
**Substrate-Level Phosphorylation**



# Krebs Cycle Reactions (3)



# Krebs Cycle: Energy Yield



# Krebs Cycle: Energy Yield

Energy-producing reaction	Number of ATP produced
$3 \text{ NADH} \longrightarrow 3 \text{ NAD}^+$	9
$\text{FADH}_2 \longrightarrow \text{FAD}$	2
$\text{GDP} + \text{P}_i \longrightarrow \text{GTP}$	1
	<hr/>
	12 ATP/acetyl CoA oxidized

# Net ATP Production by Complete Glucose Oxidation

<b>Aerobic glycolysis:</b>		<b>8 ATP</b>
<b>Oxidative decarboxylation:</b>	<b>2 X 3 =</b>	<b>6 ATP</b>
<b>Krebs cycle:</b>	<b>2 X 12 =</b>	<b>24 ATP</b>
<hr/>		
<b>Net:</b>		<b>38 ATP</b>

# 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**