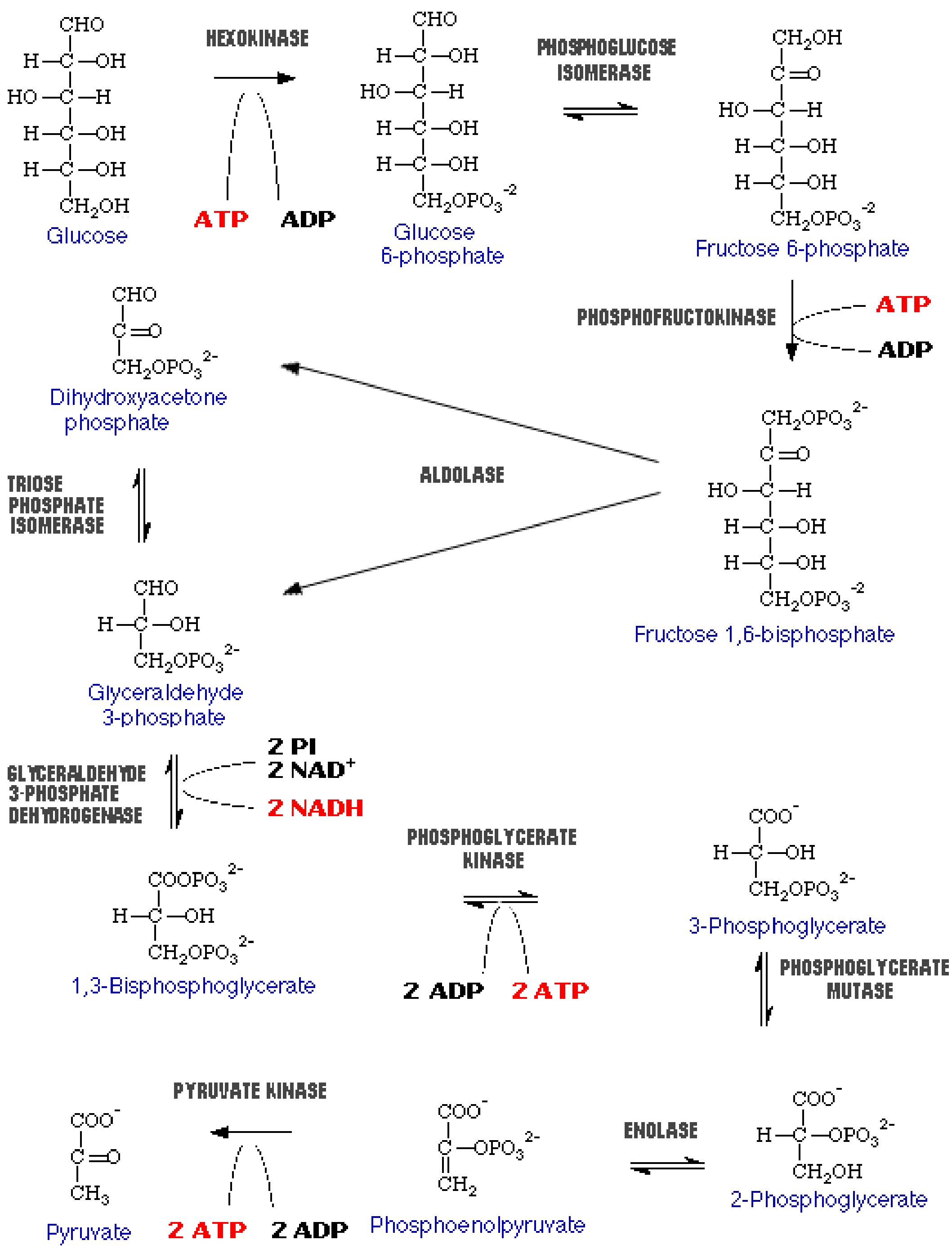
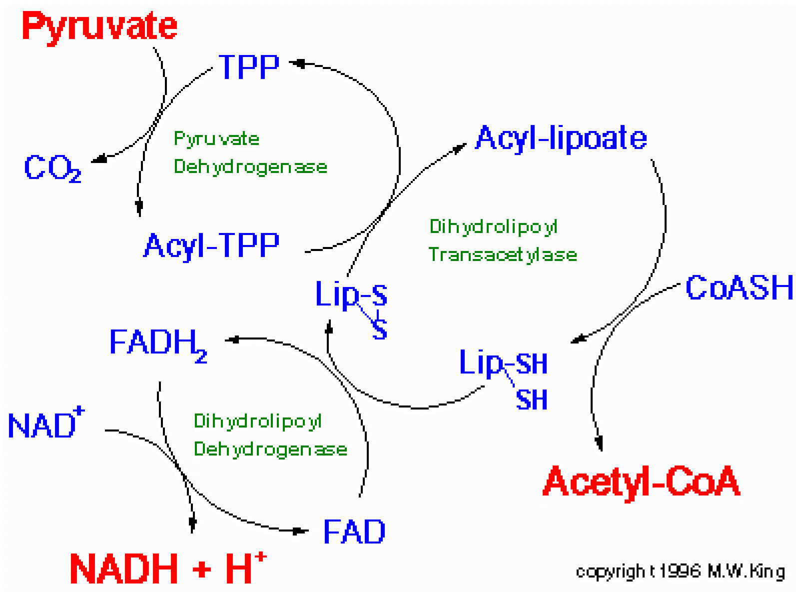


Review of Pyruvate Dehydrogenase (PDH) Complex

The fate of pyruvate depends on the cell energy charge. In cells or tissues with a high energy charge pyruvate is directed toward fatty acid synthesis, but when the energy charge is low pyruvate is preferentially oxidized to CO_2 and H_2O in the TCA cycle, with generation of 15 equivalents of ATP per pyruvate.



What is the Pyruvate Dehydrogenase (PDH) Complex ?

The PDH Complex is a series of biological step that prepare the pyruvate produced in glycolysis to go into the TCA cycle. These processes chemically convert pyurvate to Acetyl-CoA that can then enter the TCA cycle.

What are the reactants for the PDH cycle?

Pyruvate from glycolysis

What is the product of the PDH cycle?

Acetyl-CoA

What is the advantage of using this process?

This process allow for the chemical conversion of pyruvate into Acetyl-Co A which can then be inserted into the TCA cycle for processing.

Review of Citrus Acid Cycle

1.What is the Citrus Acid Cycle?

Krebs cycle or the citric acid cycle or tricarboxylic acid cycle is the common pathway to completely oxidize fuel molecules that mostly is **acetyl CoA**, the product from the oxidative decarboxylation of pyruvate. It enters the cycle and passes ten steps of reactions that yield energy and CO_2.

Where does the Citrus Acid Cycle occur?

The mitochondrial membrane

Does the TCA Cycle need or use oxygen?

Yes. The Citrus Acid Cycle does need oxygen.

How much energy does the TCA cycle produce?

Per turn of the TCA cycle 3 NADH, 1 $FADH_2$, and 1ATP

What is the reactant of the TCA cycle?

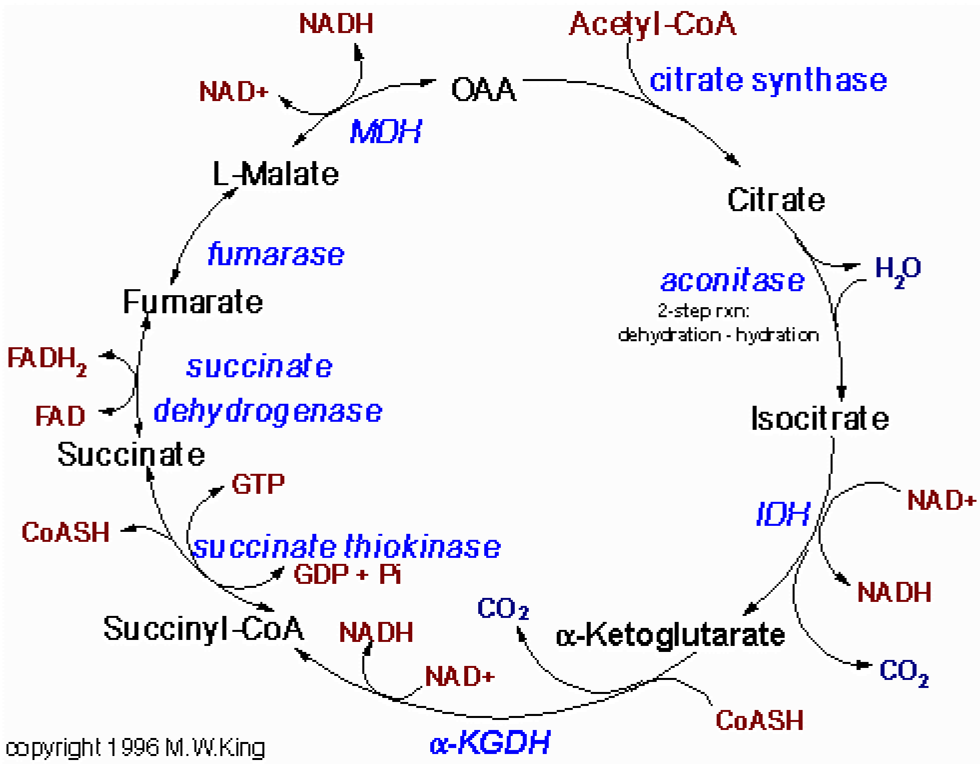
Acetyl-CoA produced from the pyruvate from glycolysis and converted by the PDH complex. Citrate is also a reactant, which can come from OAA in the citrus acid cycle.

What is the product of the TCA cycle?

In fact since the TCA cycle feed backs into itself there is no net products. However, TCA cycle 3 NADH, 1 $FADH_2$, and 1ATP are produced each turn.

What is the advantage of the TCA cycle?

The advantage of the TCA cycle is that it cycles that it can cycle which means that it can repeat for several times to accumulate several products which can be either used as direct energy or put into the oxidative phosphorylation pathway which can produce large amounts of energy.



Citrus Acid Cycle Steps

Step 1:

Reaction: Acetyl CoA+Oxaloacetate to Citrate
Enzyme: Citrate synthase
Reaction type: Condensation
Description: Acetyl CoA condenses with oxaloacetate first,to form citryl CoA. Then citryl CoA is hydrolyzed to citrate and CoA

Step 2.

Reaction: Citrate to cis-Aconitate
Enzyme: Aconitase
Reaction Type: Dehydration
Description: Citrate is isomerized to isocitrate by this first dehydration and yields cis-aconitate as an intermediate.

Step 3.

Reaction: cis-Aconitate to Isocitrate
Enzyme: Aconitase
Reaction Type: Hydration
Description: Hydration of cis-aconitate gives the interchange of H atom and OH group from the step 2.

Step 4.

Reaction: Isocitrate to alpha-Ketoglutarate
Enzyme: Isocitrate dehydrogenase
Reaction Type: Oxidative decarboxylation
Description: Dehydrogenation of isocitrate occurs and yields oxalosuccinate as an intermediate.Then CO_2 leaves to have alpha-ketoglutarate.This reaction gives NADH.

Step 5.

Reaction: alpha-Ketoglutarate to Succinyl CoA
Enzyme: alpha-Ketoglutarate dehydrogenase complex
Reaction Type: Oxidative decarboxylation
Description: This mechanism is almost as same as the reaction of the oxidative decarboxylation of pyruvate to acetyl CoA by pyruvate dehydrogenase complex. This reaction gives one NADH.

Step 6.

Reaction: Succinyl CoA to Succinate
Enzyme: Succinyl CoA synthetase
Reaction Type: Substrate-level phosphorylation
Description: The thioester bond of succinyl and CoA is an energy rich bond. Thus only this step gives a high-energy phosphate compound,GTP from the couple reactions of the thioester bond cleavage and the phosphorylation of GDP.

Step 7.

Reaction: Succinyl CoA to Succinate
Enzyme: Succinate dehydrogenase
Reaction Type: Oxidation
Description: The two hydrogens of succinate leave to an acceptor, FAD. Then this reaction yields fumarate and $FADH_2$.

Step 8.

Reaction: Succinate to Fumarate
Enzyme: Succinate dehydrogenase
Reaction Type: Oxidation
Description: The two hydrogens of succinate leave to an acceptor, FAD. Then this reaction yields fumarate and $FADH_2$.

Step 9.

Reaction: Fumarate to Malate
Enzyme: Fumerase
Reaction Type: Not described.
Description: Not described.

Step 10.

Reaction: Malate to Oxaloacetate
Enzyme: Malate dehydrogenase
Reaction Type: Oxidation
Description: Malate is dehydrogenated to form oxaloacetate. The hydrogen acceptor is NAD. So this reaction yields NADH.