Outline

Metabolism of Carbohydrates: Glycolysis and Gluconeogenesis , Citric Acid Cycle [Tricarboxylic acid (TCA) cycle] [Krebs cycle]

Pyruvate Dehydrogenase Links Glycolysis to the Citric Acid Cycle

The Citric Acid Cycle Oxidizes Two-Carbon Units

Entry to the Citric Acid Cycle and Metabolism Through It Are Controlled

The Citric Acid Cycle Is a Source of Biosynthetic Precursors

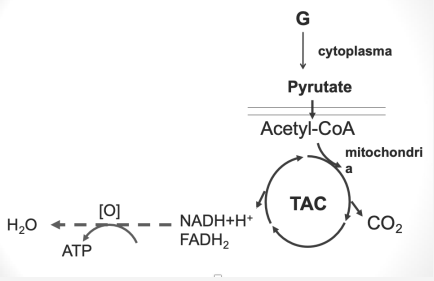
The citric acid cycle is the final common pathway for the oxidation of fuel molecules.

Most fuel molecules enter the cycle as acetyl coenzyme A.

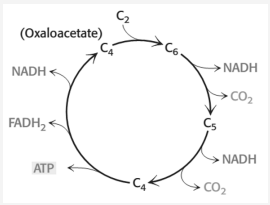
The function of the citric acid cycle is the harvesting of high energy electrons from carbon fuels.

The citric acid cycle itself neither generates a large amount of ATP nor includes oxygen as a reactant.

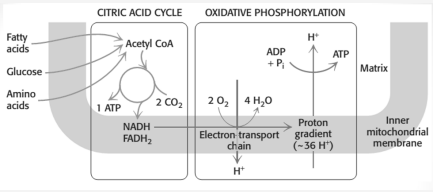
Overview of glucose aerobic oxidation



Overview of TCA cycle



Cellular respiration



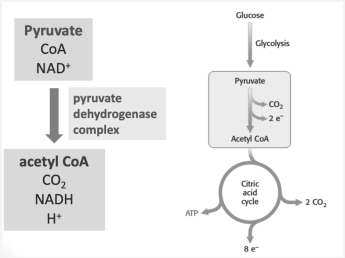
Cellular respiration

The citric acid cycle constitutes the first stage in cellular respiration, the removal of high-energy electrons from carbon fuels in the form of NADH and FADH2 (left).

These electrons reduce O2 to generate a proton gradient (red pathway),

which is used to synthesize ATP (green pathway). The reduction of O2 and the synthesis of ATP constitute oxidative phosphorylation.

Pyruvate Dehydrogenase links gly to tca



Pyruvate Dehydrogenase complex

Pyruvate dehydrogenase component	E1	TPP
Dihydrolipoyl transacetylase	E2	Lipoamide
Dihydrolipoyl dehydrogenase	E3	FAD
E1		Oxidative decarboxylation of pyruvate
E2		Transfer of acetyl group to CoA
E3		Regeneration of the oxidized form of lipoamide

E1-Carbanion of TPP Carbanion of TPP + Pyruvate -> Hydroxyethyl-TPP

E1-Hydroxyethyl-TPP + Lipoamide -> Carbanion of TPP + Acetyllipoamide(high energy)

E2-Coenzyme A+Acetyllipoamide -> Acetyl CoA(high energy)+Dihydrolipoamide

E3-Dihydrolipoamide+FAD->Lipoamide-+FADH2--NAD+-->FAD+NADH+H+