

At the end of the glycolysis -

Pyruvate is the product of glycolysis which comes from glucose. It may also come from some amino acids.

This reaction takes place in the mitochondrion, an oxidation reaction which results in the formation of an NADH.

One carbon is removed from pyruvate in the form of carbon dioxide

This leaves just two carbons remaining from pyruvate. The addition of the coenzyme A to the acetate acts to conserve the energy released from the reaction and to energize the acetate.

Krebs Cycle

(Krebs, 1937, 1940, Nobel Prize 1953; Tricarboxylic Acid Cycle or TCA, Citric Acid Cycle).

It operates in the matrix of mitochondria or power-houses of the cell. Pyruvic acid enters mitochondria. It is decarboxylated oxidatively outside the Krebs cycle to produce acetyl CoA, NADH and CO₂ with the help of enzyme complex pyruvate dehydrogenase (decarboxylase, TPP, lipoic acid, transacetylase, Mg²⁺).

It is called gateway step or link reaction.

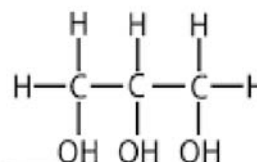
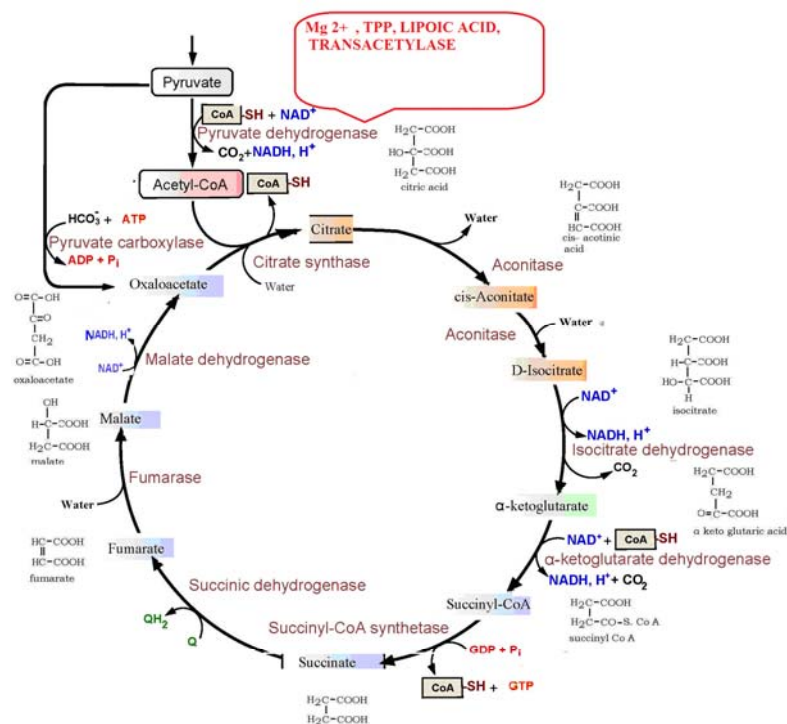
Acetyl CoA is a common intermediate of carbohydrate and fat metabolism. This also act as a link between glycolysis and Krebs cycle. Acetyl CoA combines with oxaloacetic acid to form citric acid in the presence of enzyme citrate synthetase .

Citric acid is changed into its isomer isocitric acid in the presence of iron containing enzyme aconitase.

Isocitric acid is first oxidised to oxalosuccinate (enzyme isocitrate dehydrogenase, Mn²⁺) giving NADH in the process. Oxalosuccinate is decarboxylated (enzyme decarboxylase) to form α-ketoglutaric acid and CO₂ α-ketoglutaric acid is again decarboxylated oxidatively to form succinyl CoA, NADH and CO₂ (enzyme complex α-ketoglutarate dehydrogenase). Succinyl CoA forms succinic acid (enzyme succinyl thiokinase).

ATP/GTP/ITP is synthesised in the process. Succinic acid is dehydrogenated first into fumaric acid (enzyme succinate dehydrogenase) producing FADH₂. Fumaric acid is changed to malic acid (enzyme fumarase) which undergoes dehydrogenation (enzyme malate dehydrogenase) to form oxaloacetate and NADH. In total there are five oxidations and three decarboxylations (one decarboxylation and one oxidation outside Krebs cycle).

The net products from two pyruvates are 8NADH, 2FADH₂ and 2ATP (equivalent to 30 ATP/15 per pyruvic acid or in Krebs cycle 24 ATP/12 per acetyl CoA). Krebs cycle is also called amphibolic (both catabolic and anabolic) as a number of Krebs cycle intermediates are used in anabolic pathways.



Citric Acid Cycle