

Topic: Krebs Cycle
Class: B.Sc Part -III (Hons.)
Paper- V
Group - A

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Reactions of Krebs Cycle

- ▶ Step:1 Formation of citrate
- ▶ Oxaloacetate condenses with acetyl CoA to form Citrate, catalysed by the enzyme citrate synthase
- ▶ Inhibited by:
- ▶ ATP, NADH, Citrate – competitive inhibitor of oxaloacetate.

Steps 2 & 3 Citrate is isomerized to isocitrate

- Citrate is isomerized to isocitrate by the enzyme aconitase
- This is achieved in a two stage reaction of dehydration followed by hydration through the formation of an intermediate –cis–aconiase

Steps 4 & 5 Formation of alpha- ketoglutarate

- Isocitrate dehydrogenase (ICDH) catalyses the conversion of (oxidative decarboxylation) of isocitrate to oxalosuccinate & then to alpha- ketoglutarate.
- The formation of NADH & the liberation of CO₂ occur at this stage.
- Stimulated (cooperative) by isocitrate, NAD⁺, Mg²⁺, ADP, Ca²⁺ (links with contraction).
- Inhibited by NADH & ATP

Step: 6 Conversion of alpha-ketoglutarate to succinyl CoA

- Occurs through oxidative decarboxylation, catalysed by alpha-ketoglutarate dehydrogenase complex.
- alpha-ketoglutarate dehydrogenase is a multienzyme complex.
- At this stage of TCA cycle, second NADH is produced & the second CO₂ is liberated.

Step: 7 Formation of succinate

- Succinyl CoA is converted to succinate by succinate thiokinase.
- This reaction is coupled with the phosphorylation of GDP to GTP.
- This is a substrate level phosphorylation.
- GTP is converted to ATP by the enzyme nucleoside diphosphate kinase.

Step: 8 Conversion of succinate to fumarate

- Succinate is oxidized by succinate dehydrogenase to fumarate.
- This reaction results in the production of FADH₂.
- Step: 9 Formation of malate: The enzyme fumarase catalyses the conversion of fumarate to malate with the addition of H₂O.

Step:10 Conversion of malate to oxaloacetate

- Malate is then oxidized to oxaloacetate by malate dehydrogenase.
- The third & final synthesis of NADH occurs at this stage.
- The oxaloacetate is regenerated which can combine with another molecule of acetyl CoA & continue the cycle.

