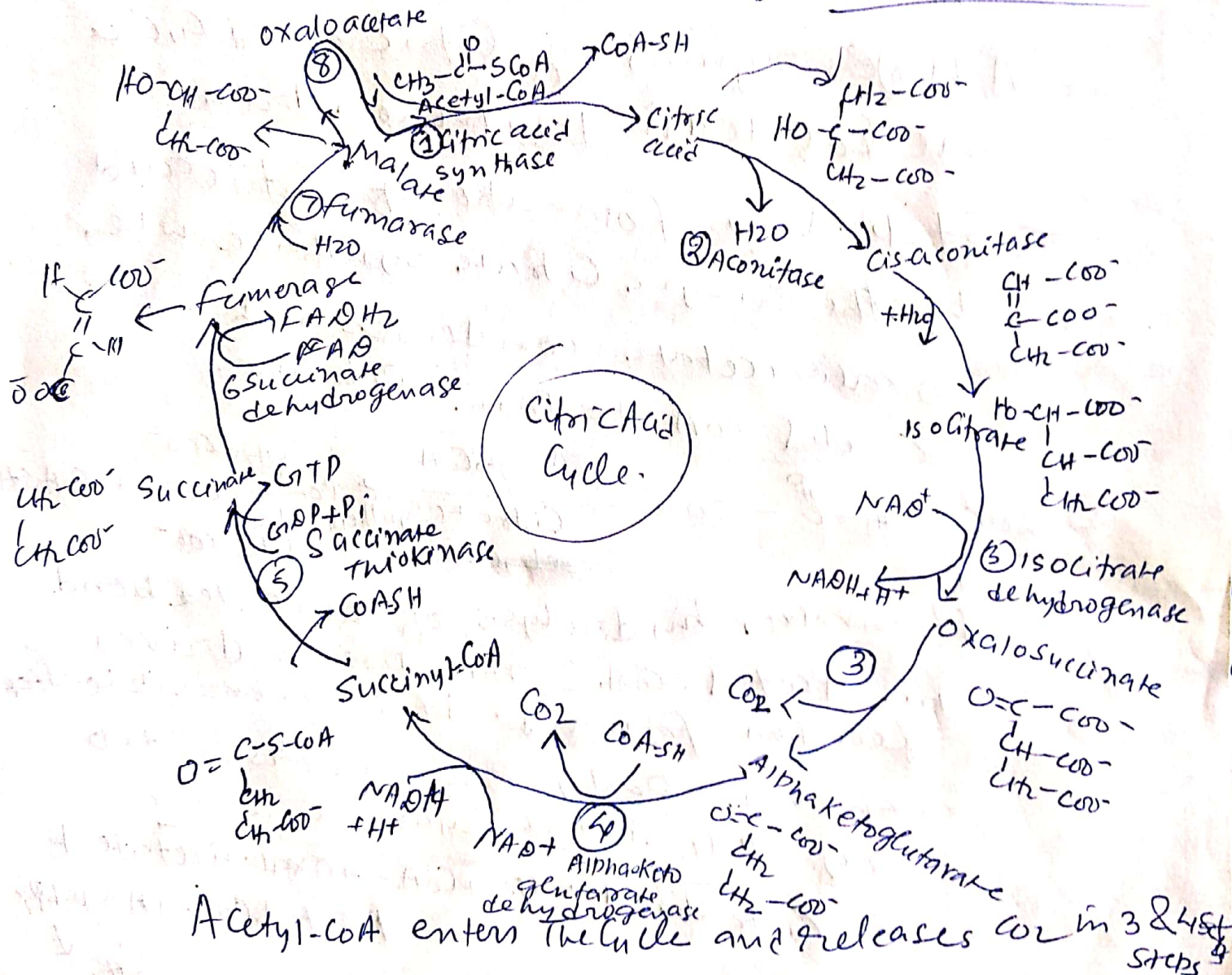


Krebs's Cycle

Systematic Description of various steps involved.

Krebs Cycle is proposed by Sir Hans Krebs (1937). It is also called tricarboxylic acid (TCA) cycle, or ~~Citric~~ Citric acid cycle.

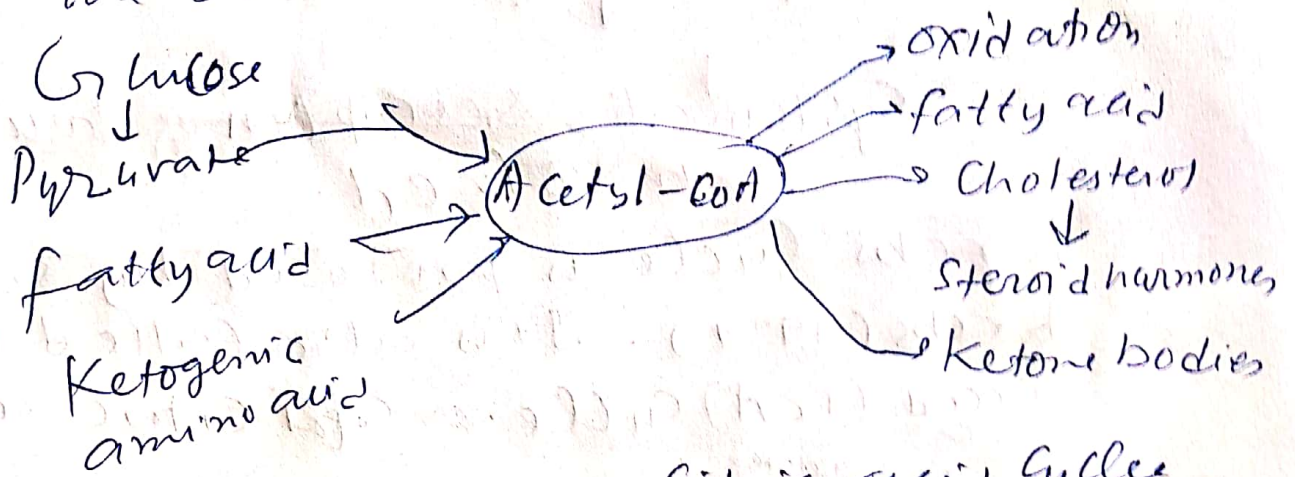


Acetyl-CoA enters the cycle and releases CO₂ in 3 & 4 steps.

⑧ - Malate dehydrogenase convert Malate into Oxaloacetate, and NAD⁺ converted to NADH + H⁺

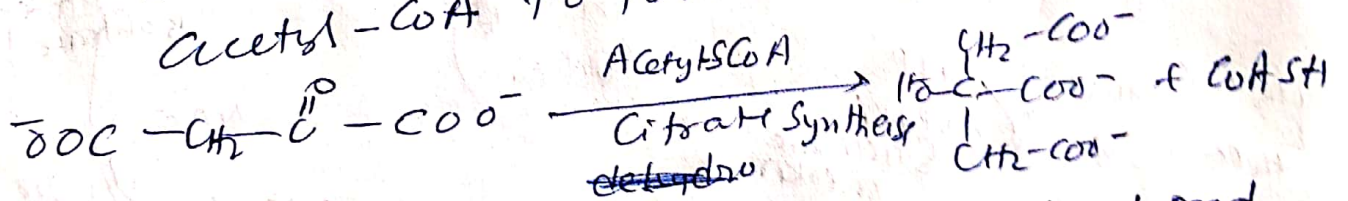
$$\text{Malate} \rightarrow \begin{array}{c} \text{O}=\text{C}-\text{COO}^- \\ | \\ \text{CH}_2-\text{COO}^- \end{array} \xrightarrow{\text{Ac-CoA}} \text{Citrate}$$

The source & utilization of Acetyl-CoA

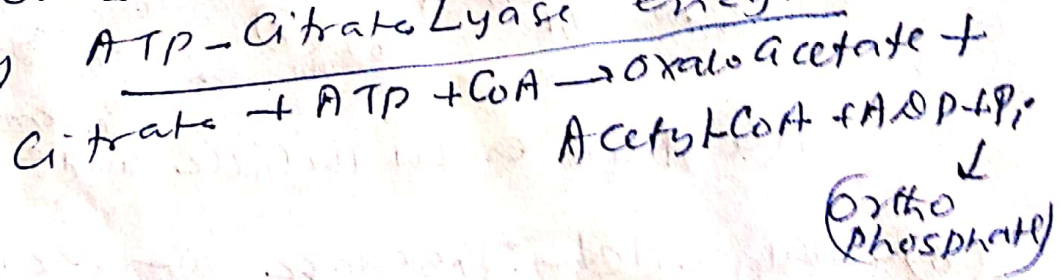


- All 8 enzymes of Citric acid cycle are located in Mitochondria

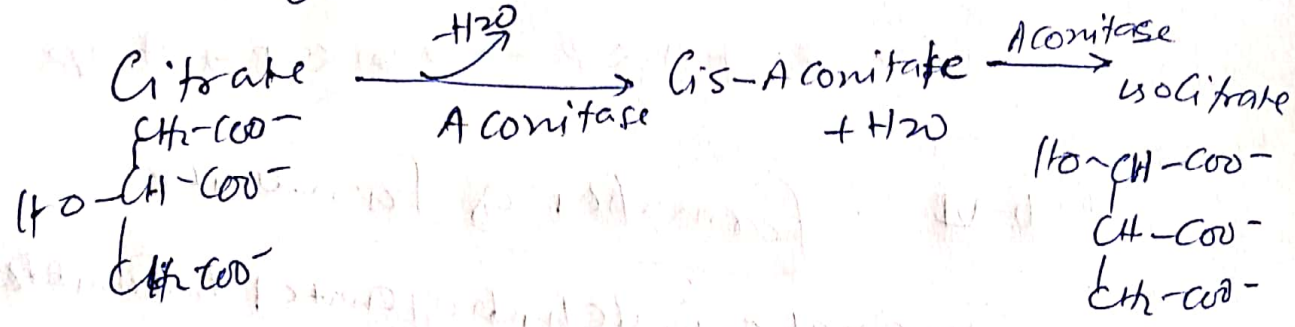
- Step: - I → formation of Citric acid by the enzyme Citrate Synthase when Oxaloacetate condenses with Acetyl-CoA to form Citrate.



It involves hydrolysis of the ester bond in Acetyl-CoA & this process drives reaction forward. It is irreversible step however body can reverse step by ATP-Citrate Lyase enzyme.

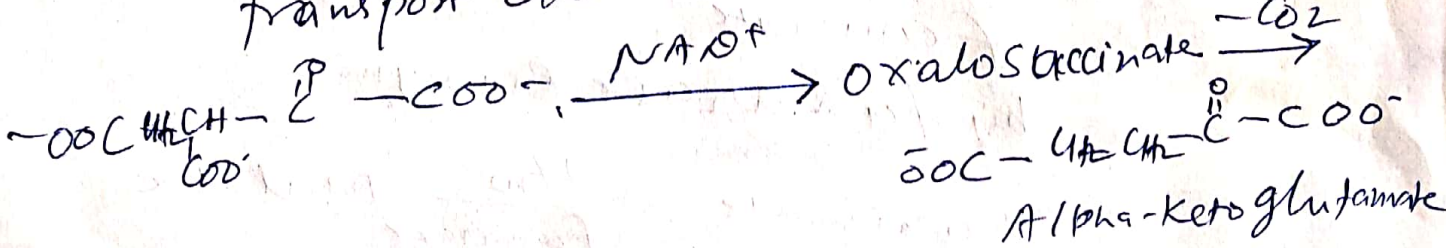


Step-II → It involves isomerisation of Citrate to Isocitrate by Aconitase in two steps via the formation of Cis-aconitate

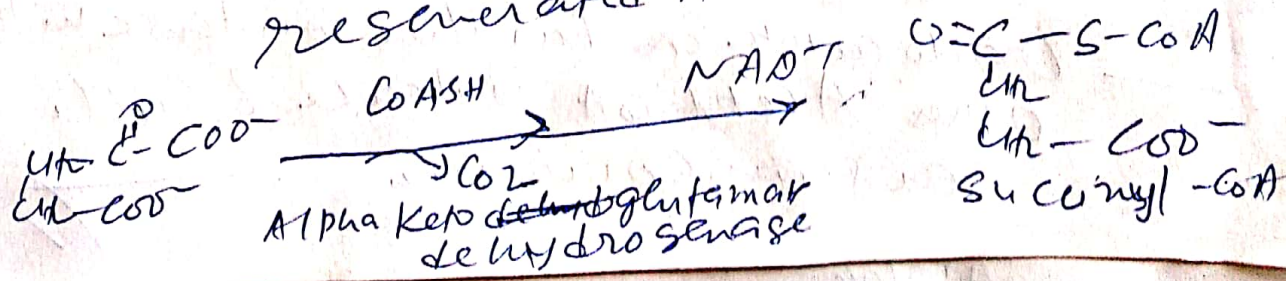


Step-III - Formation of Alpha ketoglutarate

It involves formation of Oxalosuccinate from Isocitrate by catalysis of Isocitrate dehydrogenase enzyme followed by spontaneous decarboxylation to form Alpha ketoglutarate. NADH formed in this step is later oxidized in electron transport chain (ETC) to generate (ATPs)



Step-IV → In this step Alpha ketoglutarate is decarboxylated to Succinyl-CoA by Alpha ketoglutarate dehydrogenase enzyme & NADH is formed & regenerated ATP by ETC process

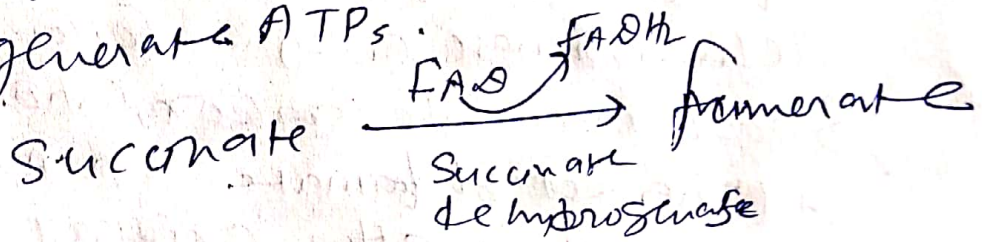


Step-V — Generation of Succinate
It involves Succinate thiokinase enzyme gives Succinate

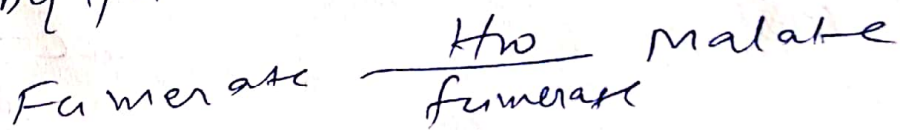


Step-VI — formation of fumarate

Succinate is dehydrogenated to fumarate by Succinate dehydrogenase enzyme. FAD accepts H-atom FADH₂ formed which enters into ETC process to generate ATPs.



Step-VII — ~~malate~~ is hydrated to malate by fumarase enzyme



Step-VIII — Regeneration of Oxaloacetate
Malate dehydrogenase enzyme oxidises malate to oxaloacetate. NAD⁺ is coenzyme which gives NADH which enters in ETC process to give ATPs.
— Oxaloacetate can further condense with other Acetyl-CoA molecules & cycle again continues