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KREBS CYCLE

Subject – Biochemistry

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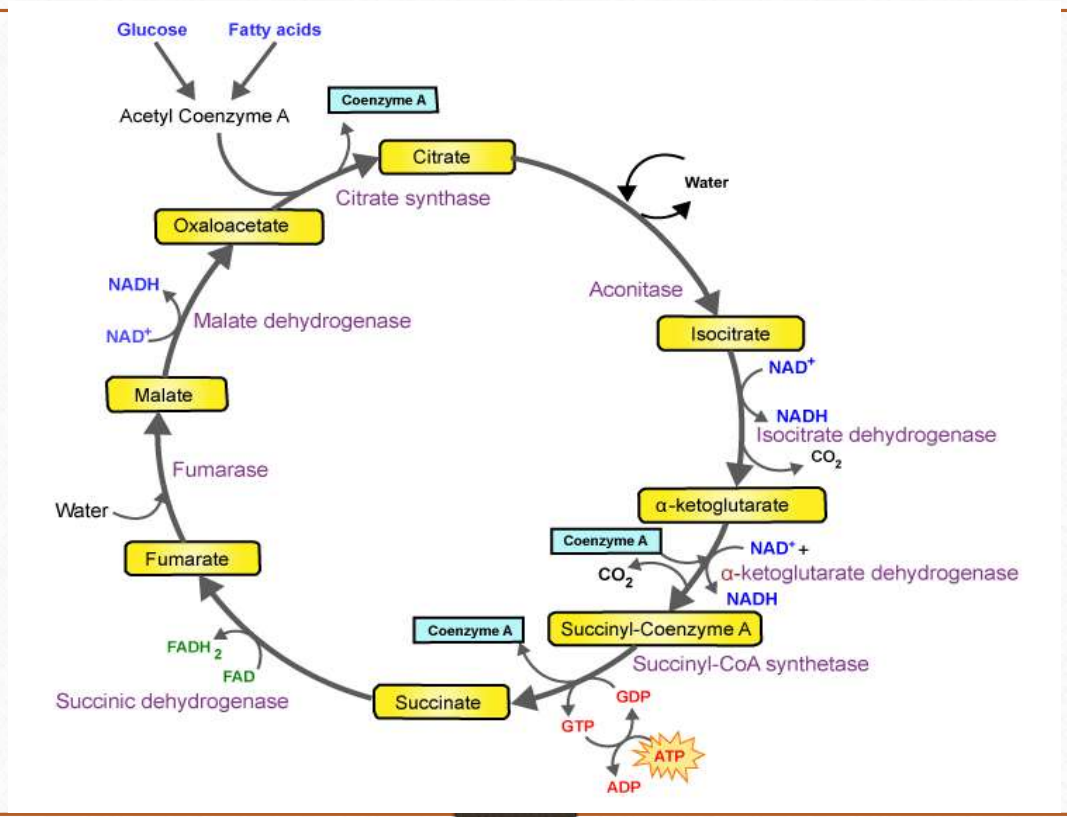
Krebs cycle/TCA(tricarboxylic acid cycle)

- **Introduction**
- The Krebs cycle or TCA cycle (tricarboxylic acid cycle) or Citric acid cycle is a series of enzyme catalysed reactions occurring in the mitochondrial matrix, where acetyl-CoA is oxidised to form carbon dioxide and coenzymes are reduced, which generate ATP in the electron transport chain.
- Krebs cycle was named after Hans Krebs, who postulated the detailed cycle. He was awarded the Nobel prize in 1953 for his contribution.

Krebs cycle

- It is a series of eight-step processes, where the acetyl group of acetyl-CoA is oxidised to form two molecules of CO_2 and in the process, one ATP is produced. Reduced high energy compounds, NADH and $FADH_2$ are also produced. Krebs cycle occurs in the mitochondrial matrix.
- Two molecules of acetyl-CoA are produced from each glucose molecule so two turns of the Krebs cycle are required which yields four CO_2, six NADH, two $FADH_2$ and two ATPs.

CYCLIC PATHWAY OF KREBS CYCLE



TRICK TO LEARN KREBS CYCLE

- **CAN I KEEP SEELING SWEETS FOR MONEY OFFICER ?**
- **C- CITRATE**
- **I- ISOCITRATE**
- **K- ALPHA KETO GLUTARATE**
- **S- SUCCINYL –CO-A**
- **S- SUCCINATE**

- **F- FUMARATE**
- **M- MALATE**
- **O-OXALOACETATE**

Krebs Cycle Steps

- It is an eight-step process. Krebs cycle or TCA cycle takes place in the matrix of mitochondria under aerobic condition.
- **Step 1:** The first step is the condensation of acetyl CoA with 4-carbon compound oxaloacetate to form 6C citrate, coenzyme A is released. The reaction is catalysed by *citrate synthase*.
- **Step 2:** Citrate is converted to its isomer, isocitrate. The enzyme *aconitase* catalyses this reaction.

Krebs Cycle Steps

- **Step 3:** Isocitrate undergoes dehydrogenation and decarboxylation to form 5C **α**-ketoglutarate. A molecular form of CO_2 is released. *Isocitrate dehydrogenase* catalyses the reaction. It is an NAD^+ dependent enzyme. NAD^+ is converted to NADH.
- **Step 4: α**-ketoglutarate undergoes oxidative decarboxylation to form succinyl CoA, a 4C compound. The reaction is catalyzed by the ***α**-ketoglutarate dehydrogenase* enzyme complex. One molecule of CO_2 is released and NAD^+ is converted to NADH.

Krebs Cycle Steps

- **Step 5:** Succinyl CoA forms succinate. The enzyme *succinyl CoA synthetase* catalyses the reaction. This is coupled with substrate-level phosphorylation of GDP to get GTP. GTP transfers its phosphate to ADP forming ATP.
- **Step 6:** Succinate is oxidised by the enzyme *succinate dehydrogenase* to fumarate. In the process, FAD is converted to $FADH_2$.

Krebs Cycle Steps

- **Step 7:** Fumarate gets converted to malate by the addition of one H_2O. The enzyme catalysing this reaction is *fumarase*.
- **Step 8:** Malate is dehydrogenated to form oxaloacetate, which combines with another molecule of acetyl CoA and starts the new cycle. Hydrogens removed, get transferred to NAD^+ forming NADH. *Malate dehydrogenase* catalyses the reaction.


THANK YOU