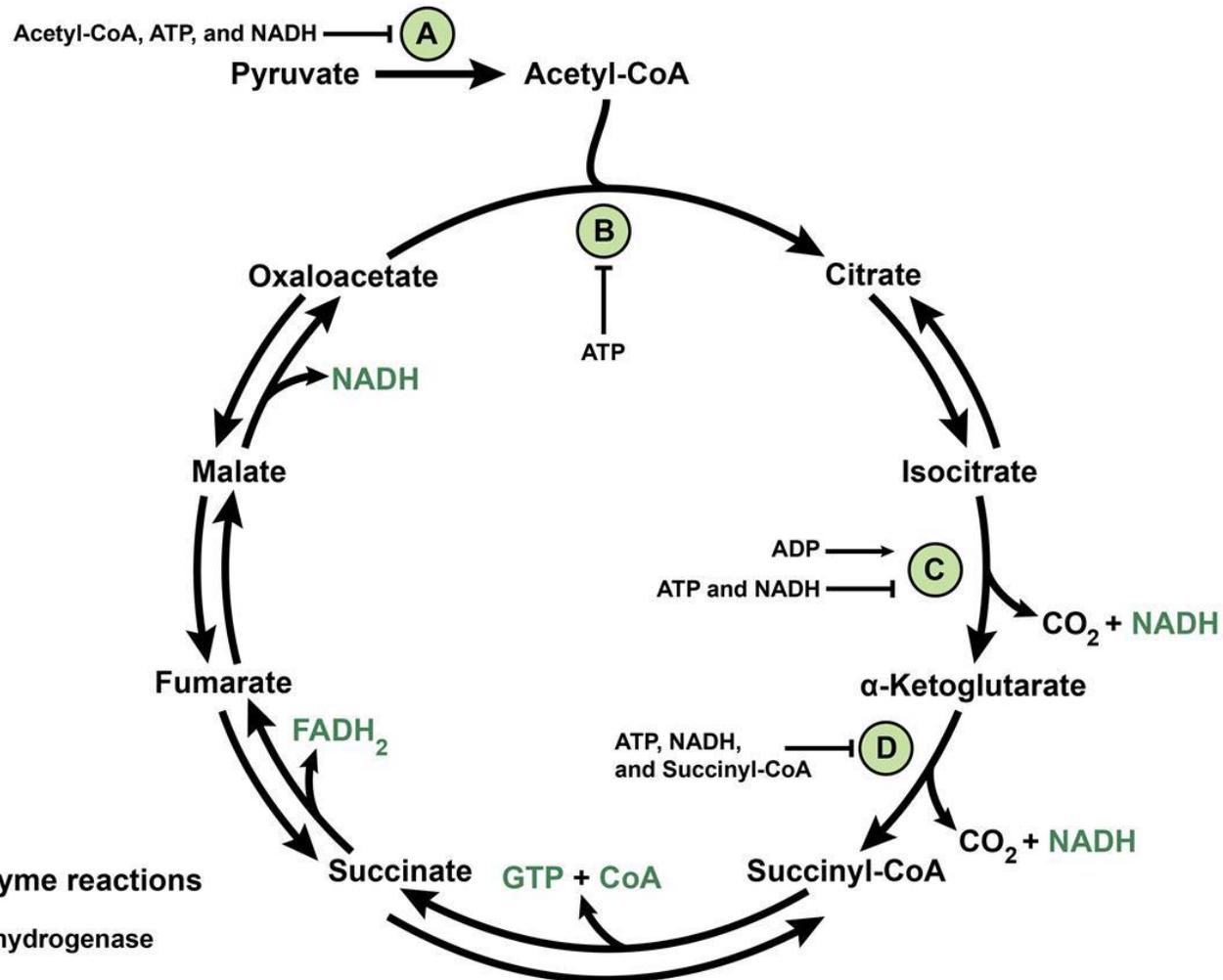


Citric acid cycle (Krebs cycle)

Step	Ir/reversible	Enzyme	Notes	Counter (Net result)			
				NADH	FADH ₂	CO ₂	ATP/GTP
Step 1	Irreversible	Citrate synthase	○ Oxaloacetate is already found in matrix	0	0	0	0
Step 2	Reversible	Aconitase enzyme	○ Pre-required step to prepare substrates for decarboxylation reaction	0	0	0	0
Step 3	Irreversible	Isocitrate dehydrogenase	1. Release of first CO ₂ 2. Formation of first NADH molecule	1	0	1	0
Step 4	Irreversible	Alpha-ketoglutarate dehydrogenase	1. Release of second CO ₂ 2. Formation of second NADH molecule	2	0	2	0
Step 5	Reversible	Succinyl CoA synthetase	○ Generate the first ATP (e.g. brain & heart tissues) or GTP (e.g. liver tissues)	2	0	2	1
Step 6	Reversible	Succinate dehydrogenase	1. The only enzyme found in the inner membrane of the mitochondria 2. It is a stereoselective enzyme 3. Formation of FADH ₂	2	1	2	1
Step 7	Reversible	Fumarase enzyme	○ It is a stereoselective enzyme	2	1	2	1
Step 8	Reversible	Malate dehydrogenase	○ Formation of third NADH molecule	3	1	2	1
At the end of Krebs cycle, the products of oxidation of one glucose via glycolysis and TCA are				10	2	6	4

Stage	ATP produced by substrate-level phosphorylation	Electron-carrier molecule	Total H ⁺ pumped	ATP synthase 4H ⁺ → 1 ATP
Glycolysis	2 ATP	2 NADH	12-20	3-5 ATP
Acetyl CoA production	0	2 NADH	20	5 ATP
Krebs Cycle	2 ATP	6 NADH 2 FADH ₂	60 12	15 ATP 3 ATP

The Citric Acid (Kreb) Cycle



Irreversible enzyme reactions

- (A)** Pyruvate dehydrogenase
- (B)** Citrate synthase
- (C)** Isocitrate dehydrogenase
- (D)** α -Ketoglutarate dehydrogenase