

Dehydrogenation

In the first step, acyl-CoA is oxidized by the enzyme acyl CoA dehydrogenase. A double bond is formed between the second and third carbons (C2 and C3) of the acyl-CoA chain entering the beta oxidation cycle; the end product of this reaction is trans- Δ^2 -enoyl-CoA (trans-delta 2-enoyl CoA). This step uses FAD and produces FADH₂, which will enter the citric acid cycle and form ATP to be used as energy. (Notice in the following figure that the carbon count starts on the right side: the rightmost carbon below the oxygen atom is C1, then C2 on the left forming a double bond with C3, and so on.)

Hydration

In the second step, the double bond between C2 and C3 of trans- Δ^2 -enoyl-CoA is hydrated, forming the end product L- β -hydroxyacyl CoA, which has a hydroxyl group (OH) in C2, in place of the double bond. This reaction is catalyzed by another enzyme: enoyl CoA hydratase. This step requires water.

Oxidation

In the third step, the hydroxyl group in C2 of L- β -hydroxyacyl CoA is oxidized by NAD⁺ in a reaction that is catalyzed by 3-hydroxyacyl-CoA dehydrogenase. The end products are β -ketoacyl CoA and NADH + H. NADH will enter the citric acid cycle and produce ATP that will be used as energy.