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ASSIGNMENT

In biochemistry and metabolism, beta-oxidation is the catabolic process by which fatty acid molecules are broken down[1] in the cytosol in prokaryotes and in the mitochondria in eukaryotes to generate acetyl-CoA, which enters the citric acid cycle, and NADH and FADH2, which are co-enzymes used in the electron transport chain. It is named as such because the beta carbon of the fatty acid undergoes oxidation to a carbonyl group. Beta-oxidation is primarily facilitated by the mitochondrial trifunctional protein, an enzyme complex associated with the inner mitochondrial membrane, although very long chain fatty acids are oxidized in peroxisomes.

WHERE DOES BETA OXIDATION OCCUR?

Beta oxidation occurs in the mitochondria of eukaryotic cells and in the cytosol of prokaryotic cells. However, before this happens, fatty acids must first enter the cell and, in the case of eukaryotic cells, the mitochondria.

BETA OXIDATION STEPS

Beta oxidation takes place in four steps:

- Dehydrogenation,
- Hydration,
- Oxidation and
- Thyolisis

Each step is catalyzed by a distinct enzyme.Briefly, each cycle of this process begins with an acyl-CoA chain and ends with one acetyl-CoA, one FADH2, one NADH and water, and the acyl-CoA chain becomes two carbons shorter. The total energy yield per cycle is 17 ATP molecules.

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-Δ2-enoyl-CoAThis step uses FAD and produces FADH2, which will enter the citric acid cycle and form ATP to be used as energy.

HYDRATION

In the second step, the double bond between C2 and C3 of trans-Δ2-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 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.

REFERENCE: Wikipedia
Biologydictionary.net