

MY ASSIGNMENT

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MATRIC NO: 18/MHS03/001

DEPARTMENT: human anatomy

COURSE: BCH 204

LEVEL: 200

COLLEGE: medicine and health sciences

Answers

An overview of beta oxidation

Beta oxidation is the process by which fatty acids, specifically saturated fatty acids are broken down for the use in energy production. Beta-oxidation is the catabolic process by which fatty acid molecules are broken down 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.

Steps in beta oxidation

There are four(4) steps involved in the beta oxidation process. The steps involved in beta oxidation are:

1. Loss of hydrogens (dehydrogenation)
2. Addition of water (hydration)
3. Loss of another hydrogen (oxidation)
4. Addition of another CoA. (thiolysis)

Loss of hydrogens / 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.)

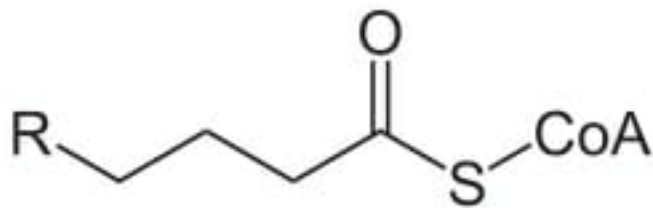
Addition of water / hydration

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.

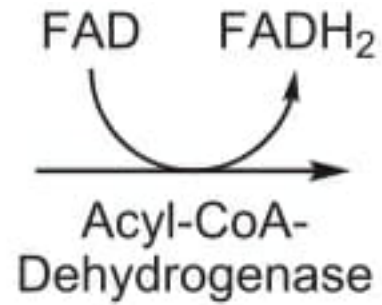
Loss of another hydrogen/ oxidation

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.

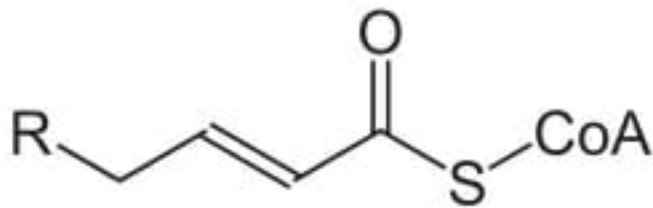
Structures of beta oxidation.



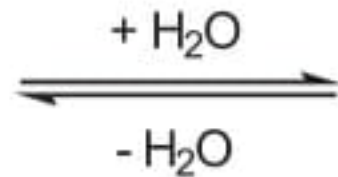
Acyl-CoA



1. HYDROGENATION

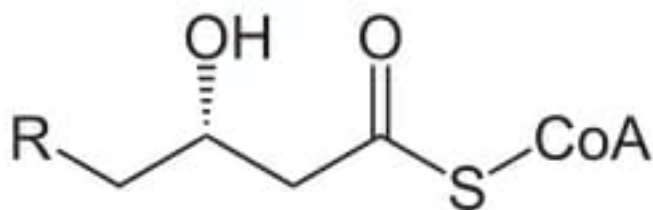


trans- Δ^2 -Enoyl-CoA

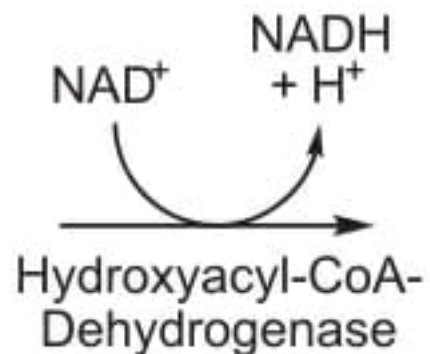


Enoyl-CoA-Hydratase

2. HYDRATION



L-3-Hydroxyacyl-CoA



3. OXIDATION