

Introduction to lipid breakdown and ketone body metabolism

Triacylglycerols (TAGs) store large amounts of chemical energy. As an energy store, they are very advantageous because 1 g of anhydrous TAG stores six times more energy than 1 g of hydrated glycogen. The complete oxidation of 1 g of TAG yields approximately **38 kJ**, while only 17 kJ are obtained from 1 g of carbohydrates or proteins. A 70 kg man stores approximately **400,000 kJ** in his TAGs - the total weight of a TAG is around 10.5 kg. These supplies could allow us to survive several weeks of starvation. The main site of TAG accumulation is the cytoplasm of adipocytes.

Fatty acid oxidation

Individual types of fatty acid oxidation are indicated by Greek letters, which determine the carbon atom on which the reactions take place. **β -oxidation** taking place in the **mitochondrial matrix** is of major importance. Enzymes catalyzing the so-called **ω -** and **α -oxidation** occur on the membranes of the **endoplasmic reticulum**.

Conversion of fatty acids to glucose

Animals cannot convert fatty acids into glucose. Fatty acids represent a rich source of energy for gluconeogenesis, but glucose is not formed from their carbon atoms (with the exception of fatty acids with an odd number of C). **Acetyl-CoA cannot be converted** to either pyruvate or oxaloacetate - both carbons are split off as CO_2 during the Krebs cycle. The pyruvate dehydrogenase reaction is irreversible. Interestingly, plants also have two other enzymes that allow them to convert AcCoA to OAA, in the so-called **glyoxylate cycle**.

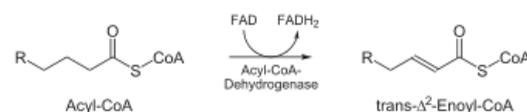
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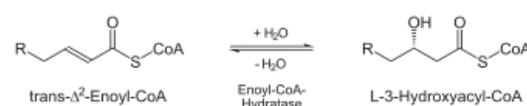
- Ketone bodies
- Glycogen
- Beta oxidation of fatty acids (FBLT)
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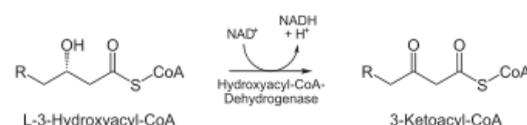
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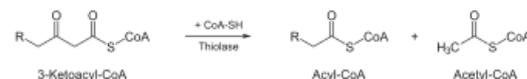
Beta oxidation of fatty acids - 1st step



Beta oxidation of fatty acids - 2nd step



Beta oxidation of fatty acids - 3rd step



Beta oxidation of fatty acids - 4th step