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DEPT: PHARMACOLOGY

LEVEL:300L C.O

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BETA-OXIDATION

Beta-oxidation is also known as the complete oxidation of fat, to produce 8.1 ATP per carbon. It takes place in mitochondria and requires the help of several different enzymes; it requires 2 carrier proteins to enter the mitochondria which are carnitine acyltransferase 1 and 2.

Three steps of beta-oxidation

The first stage: the fatty acids undergo oxidative removal of successive two-carbon units in the form of acetyl-CoA, starting from the carboxyl end of the fatty acyl chain. For example, the 16-carbon fatty acid palmitic acid (palmitate at pH 7) undergoes seven passes through this oxidative sequence, in each pass losing two carbons as acetyl-CoA. At the end of seven cycles the last two carbons of palmitate (originally C-15 and C-16) are left as acetyl-CoA. The overall result is the conversion of the 16-carbon chain of palmitate to eight two-carbon acetyl-CoA molecules. Formation of each molecule of acetyl-CoA requires removal of four hydrogen atoms (two pairs of electrons and four H+) from the fatty acyl moiety by the action of dehydrogenases.

The second stage: the acetyl residues of acetyl-CoA are oxidized to CO2 via the citric acid cycle, which also takes place in the mitochondrial matrix. Acetyl-CoA derived from fatty acid oxidation thus enters a final common pathway of oxidation along with acetyl-CoA derived from glucose via glycolysis and pyruvate oxidation.

The third stage: electrons are donated into the mitochondria respiration chain, through which the electrons are carried to oxygen, Coupled to this flow of electrons is the phosphorylation of ADP to ATP