Onwughalu Chiamaka Vivian 18/MHS07/044 BCH204

Assignment: Describe the three (3) stages of beta oxidation. (Show pathways where necessary)

Answer:

Catabolism of fatty acid pathway is beta oxidation.

It is called beta oxidation because the oxidation starts from the beta carbon(the third carbon)

Fatty acid oxidation is the mitochondrial aerobic process of breaking down a fatty acid into acetyl-CoA units. Fatty acids move in this pathway as CoA derivatives utilizing NAD and FAD.

There are three stages of fatty acid oxidation;

- Activation of fatty acid(takes place in the outer mitochondrial membrane)to give fatty acyl CoA
- Transportation of the fatty acid(transport to the mitochondria)
- Oxidation/degradation of the fatty acid(inside mitochondria)

Activation;

Fatty acids are activated by fatty acyl CoA synthetase.

The reaction:

$$R$$
-COOH + CoASH + ATP <--> R -CO-SCoA + AMP + PP_i

The subsequent hydrolysis of PPi draws the reaction in the forward direction, maintaining a low cytosolic free fatty acid concentration: $PP_i + H_2O --> 2 P_i$

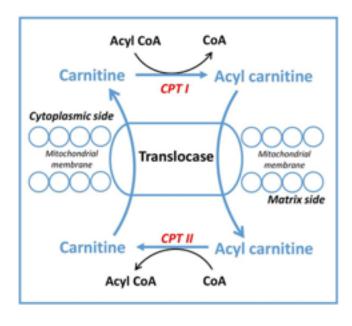
The reaction occurs in the endoplasmic reticulum and the outer

mitochondrial membrane.

Transport

The fatty acyl group is transported into the mitochondrial matrix, where it undergoes beta-oxidation.

In the intermembrane space of the mitochondria, fatty acyl CoA reacts with carnitine in a reaction catalyzed by carnitine acyltransferase I (CAT-I), yielding CoA and fatty acyl carnitine. The resulting fatty acyl carnitine crosses the inner mitochondrial membrane.



the carnitine shuttle system. Fatty acyl CoA is first converted to acyl carnitine. Acyl carnitine enters the mitochondria by <u>transloease</u>. The acyl group is transferred back to CoA.

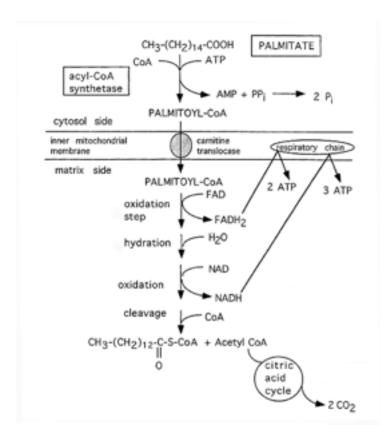
Enzymes are associated with the endoplasmic reticulum and outer mitochondrial membrane and require ATP Acyl CoA ligases (thiokinases). Inorganic pyrophosphatase.

Steps Involved in fatty acid transport are: Formation of Acyl-CoA Exergonic hydrolysis of PPi

There are different Acyl-CoA Synthases for fatty acids of different chain lengths It is associated with endoplasmic reticulum membranes and the outer mitochondrial membrane.

Fatty acid degradation; is the process in which fatty acids are broken down into their metabolites, in the end generating acetyl-CoA, the entry molecule for the citric acid cycle, the main energy supply of animals. It includes three major steps:

- Lipolysis of and release from adipose tissue
- Activation and transport into mitochondria
- β-oxidation



Beta-oxidation is the process by which long chain fatty acyl CoA is degraded. The **products of beta-oxidation** are: acetyl CoA. FADH₂, NADH and H.

THE REACTION OF BETA OXIDATION

This pathway degrades fatty acids, 2C a time.

•Oxidation of acyl CoA by an acyl CoA dehydrogenase to give enoyl CoA.

Fatty acyl CoA

Acetyl CoA