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***MATRIC NO: 18mhs06/060(MEDICAL LAB. SCIENCE)***

***COURSE TITLE: BCH 204***

**ASSIGNMENT**

DESCRIBE THE THREE STAGES OF BETA OXIDATION

Beta oxidation is the primary for catabolism of fatty acids, it begins from Beta carbon, third carbon and takes place in the mitochondria.

The three stages of Beta oxidation

1. Activation of fatty acids
2. Transport of fatty actyl-CoA into the mitochondria
3. Beta oxidation

Activation of fatty acids

Long chain fatty acids: they are activated by ATP and co-enzyme A (Actyl-CoA Syntheses) to form fatty actyl-CoA, while short chainfatty acids are activated in mitochondria.

E.G

Palmtric acid -----------------🡪Palmitoyl CoA

Co-enzyme A

ATP is converted to AMP and pyrophosphate(pp) which is cleaved by pyrophosphate to two inorganic phosphates(2pi) therefore two high energy phosphate bonds are cleaved, so the equivalent of two molecules of ATP is used for fatty acid activation.

Activation of fatty acid takes place on the outer membrane of mitochondrion.

Transport of fatty acytl-CoA into the mitochondria

Fatty acetyl-coA from the outer membrane reacts with the outer mitochondrial membrane forming fatty acylatine the enzyme used is carntine acetyltransferese I (ATI)

Fatty acetyl camtine passes to the inner membrane where it reforms to fatty acetyl-coA which enters the matrix. The enzyme used is carnthine actyltransfrerese II (AII)

Fatty acetyl CoA

Carnitine acetyltransfarase I

Fatty acetyl crinite

Carnitine acetyltransfarase II

Fatty acetyl CoA in matrix of mitochondrion.

Also known as the carnitine shuttle system.

Beta oxidation o fatty acids

Beta oxidation or degradation consists of four sequential stages therefore these stages are repeated until asll carbons of fatty acetyl-CoA.

**For even –chain fatty acids.**

1. FAD accepts hydrogen’s from a fatty acetyl-CoA in the first step. A double bond is produced between the α- and β- carbon to form an enoyl CoA

FADH2 produced interactive with electron transport chain generating ATP.

Enzyme used: Acetyl-CoA dehydrogenate

1. β-Hydroxyacetyl: CoA is oxidized by NAD+ to β-Keto acetyl-CoA NADH produced interacts with electrons transport chain to generate ATP.

Enzyme uses: L-3 hydroxyacyl-CoA dehydrogenates.

**For odd chain fatty acids**

Beta oxidation of odd chain fatty acids produces acetyl CoA and prepionyl-CoA.

As these fatty acids repeat the four steps of Beta oxidation producing acetyl CoA until the last cleavage when the three remaining carbons are released as propionyl-CoA which can be converted to glucose.

**For unsaturated fatty acids**

Beta oxidation of unsaturated fatty acids requires enzymes in addition to the four that the repetitive steps of beta-oxidation. The reaction pathway differs depending on whether the double bond is at an even or odd numbered carbon position.

So, the beta oxidation occurs until a double bond of the unsaturated fatty acid is near the carboxyl end of fatty acetyl chain.

**Overall reaction of beta-oxidation**

**Cn –acetyl-coA + FAD + NAD+ + H2O + CoA 🡪Cn- 2acetyl CoA + FADH2 + NADH + H + acetyl CoA.**