

- Digestion of dietary lipids releases two important primary end products namely; **fatty acids** and **glycerol**.
- **Fatty acids** thus formed release a large amount of **energy** on oxidation, which involves **three major steps**.
- In the first stage called  $\beta$  oxidation, 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.
- In the second stage of fatty acid oxidation, the acetyl groups of acetyl CoA are oxidized to  $\text{CO}_2$  in the citric acid cycle, which also takes place in the mitochondrial matrix. Acetyl CoA derived from fatty acids thus enters a final common pathway of oxidation with the acetyl CoA derived from glucose via glycolysis and pyruvate oxidation.
- The first two stages of fatty acid oxidation produce the reduced electron carriers NADH and  $\text{FADH}_2$ .
- In the third stage, NADH and  $\text{FADH}_2$  donate electrons to the mitochondrial respiratory chain, through which the electrons pass to oxygen with the concomitant phosphorylation of ADP to ATP. The energy released by fatty acid oxidation is thus conserved as ATP.

### 1. Steps in beta-oxidation of fatty acids:

- **Step I:** Activation of a fatty acid by conversion to a fatty acyl CoA;
- **Step II:** Transport of fatty acid from cytosol into mitochondria via the acyl carnitine/carnitine transporter;
- **Step III:** Beta oxidation.

#### 1.1. Beta oxidation of saturated fatty acids;

#### 1.2. Beta oxidation of unsaturated fatty acids;

#### 1.3. Beta oxidation of odd number of fatty acids.