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1: Describe the three stages of beta oxidation. Show pathways where necessary

Beta-oxidation is the catabolic process by which fatty acid molecules are broken down in the cytosol in prokaryotes and in the mitochondria in eukaryotes to generate acetyl-CoA. There are four distinct stages of oxidation of fatty acids.

- a. Activation: once the triglycerides are broken down into glycerol and fatty acids they must be activated before they can enter into the mitochondria and proceed on with beta-oxidation. This is done by Acyl-CoA synthetase to yield fatty acyl-CoA.
- b. Oxidation: a fatty acyl-CoA is oxidised by Acyl-CoA dehydrogenase to yield a trans alkene. This is done with the aid of an [FAD] prosthetic group
- c. Hydration: the trans alkene is then hydrated with the help of Enoyl-CoA hydratase

$$\text{C}_n\text{-acyl-CoA} + \text{FAD} + \text{NAD}^+ + \text{H}_2\text{O} + \text{CoA} = \text{C}_{n-2}\text{-acyl-CoA} + \text{FADH}_2 + \text{NADH} + \text{H}^+ + \text{acetyl-CoA}.$$