**Oxidation of Monounsaturated Fatty Acids Requires One Additional Reaction**

* Oleate is an 18-carbon monounsaturated fatty acid with a cis double bond between C-9 and C-10.
* Oleoyl-CoA undergoes three passes through the fatty acid oxidation cycle to yield three molecules of acetyl-CoA **(Fig. 17- 10)**.



* 12-carbon unsaturated fatty acid cannot serve as a substrate for enoyl-CoA hydratase, which acts only on trans double bonds.
* Enoyl-CoA isomerase isomerizes the cis-enoyl-CoA to the trans-enoyl-CoA.
* This intermediate is now acted upon by the remaining enzymes of  oxidation to yield acetyl-CoA.
* Altogether, nine acetyl-CoAs are produced from one molecule of the 18-carbon oleate.

**Complete Oxidation of Odd-Number Fatty Acids Requires Three Extra Reactions**

* Long-chain odd-number fatty acids are oxidized in the same pathways as the even-number fatty acids. For example, 17-carbon
* at the last pass, fatty acyl-CoA has five carbon atoms.
* the products are acetyl-CoA and propionyl-CoA.
* the acetyl-CoA can be oxidized in the citric acid cycle, but propionyl-CoA enters a different pathway having three enzymes (**Fig. 17-12)**.
1. Carboxylation of propionyl-CoA
2. Epimerization of D-Methylmalonyl-CoA
3. Production of succinyl-CoA which can enter the citric acid cycle
* 17-carbon fatty acid gives 2 NADH less than 16-carbon fatty acid.



**Fatty Acid Oxidation is Regulated**

* Carnitine acyltransferase 1 is inhibited by malonyl-CoA.
* -hydroxyacyl-CoA dehydrogenase is inhibited by [NADH/NAD+] ratio.
* Thiolase is inhibited by high concentrations of acetyl-CoA.

**17.3 Ketone Bodies**

* In humans and most other mammals, acetyl-CoA formed in the liver during oxidation of fatty acids
* can enter the citric acid cycle or
* can be converted the ketone bodies (**acetoacetate, acetone** and **-hydroxybutyrate**) **(Fig. 17-18)**.





**FIGURE 17-18 Formation of ketone bodies from acetyl-CoA.**

* Acetoacetate and -hydroxybutyrate are transported by the blood to tissues as fuels.
* They are converted to acetyl-CoA **(Fig. 17-20)**.



* Liver does not have -ketoacyl-CoA transferase.
* Acetyl-CoAs are oxidized in the citric acid cycle to provide much of the energy required by tissues such as skeletal and heart muscle, kidney and brain.