BioChem 330 - Course Outline

- **Metabolism and Bioenergetics (II)**
  - ENZYME CATALYSIS:
    - kinetic constants k_{cat}, K_m
    - Catalytic strategies, the serine proteases
  - CATABOLISM (*breakdown*)
    - Carbohydrates
      - Glycolysis
      - Tricarboxylic Acid Cycle
      - Electron Transport
      - Chemiosmosis and ATPase
    - Fatty acids and amino acids

Fatty Acid Metabolism….. Proof of β oxidation

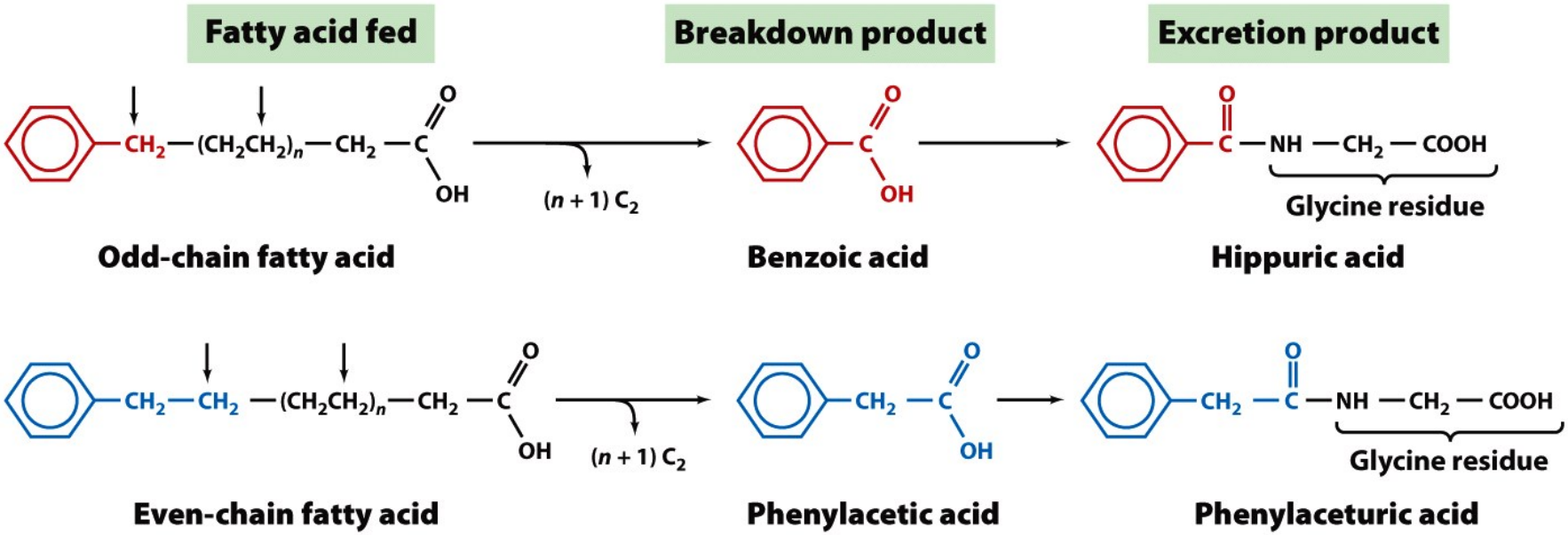
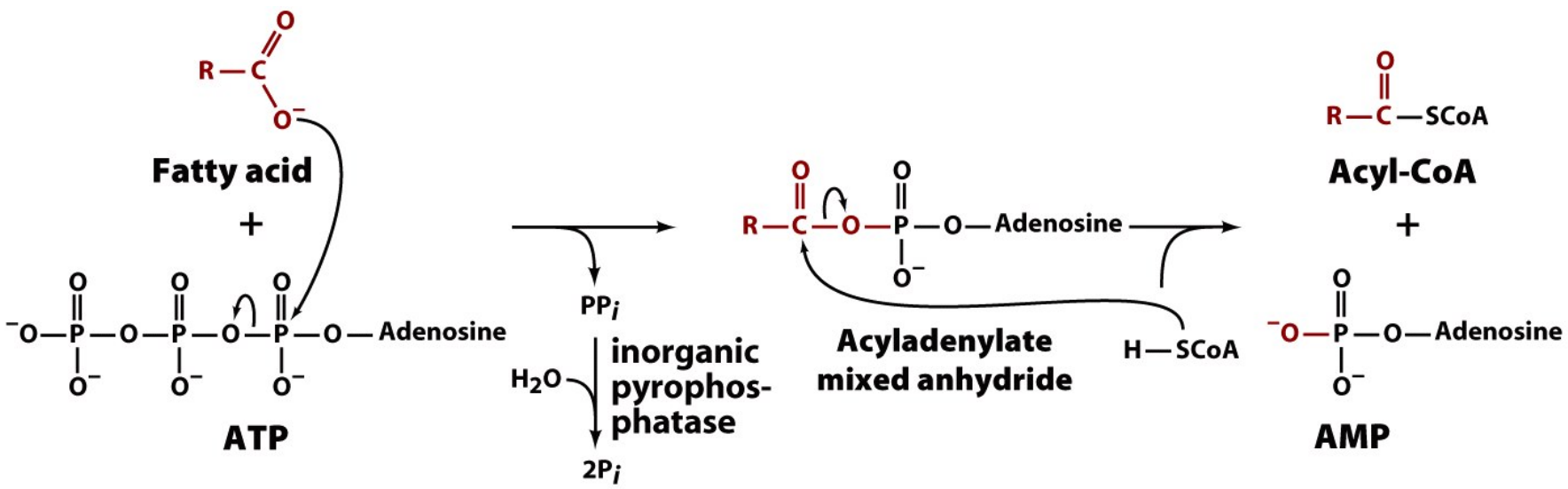


Figure 20-9

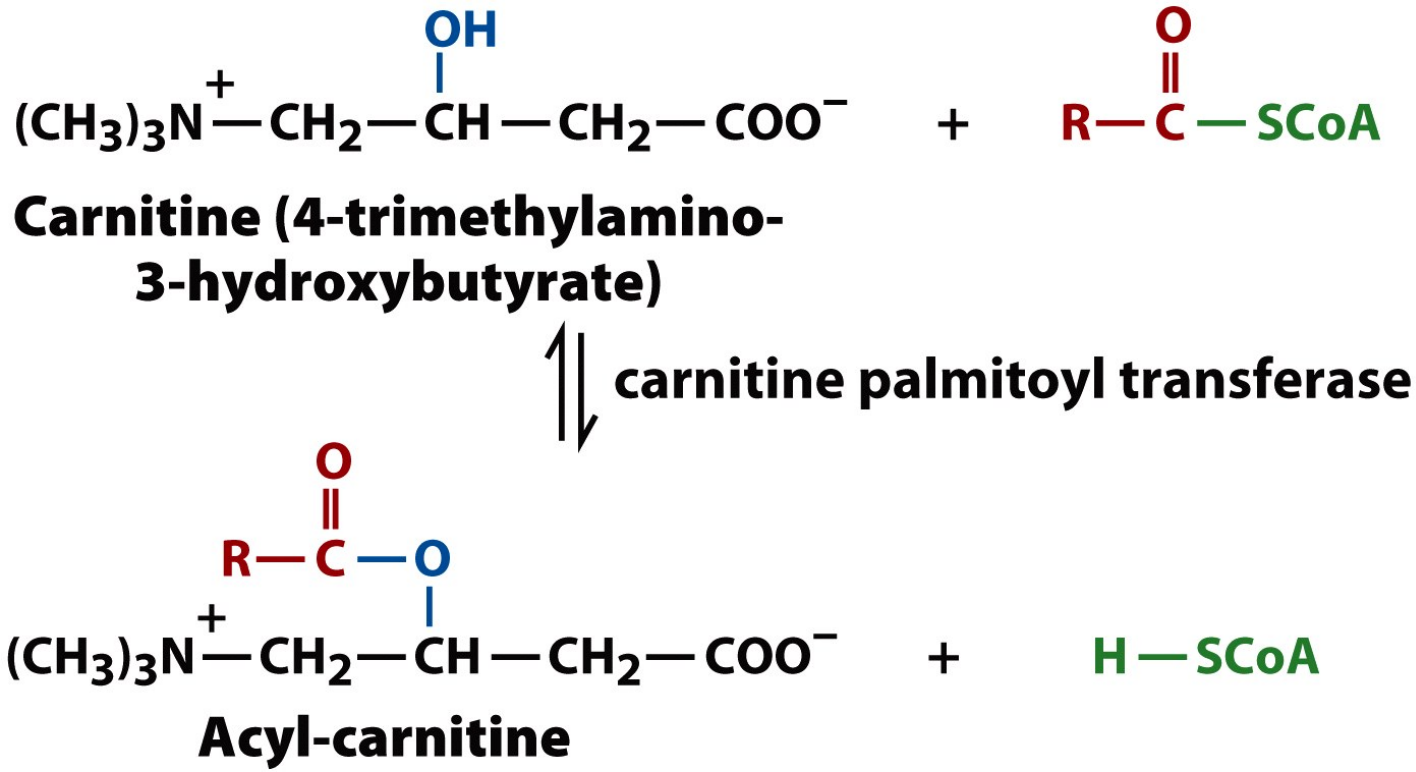
Fatty Acid Metabolism….. Activated by CoA



Cytoplasmic enzyme: acyl CoA synthetase

Figure 20-10

Fatty Acid Metabolism….transported through mito via transferase – PART A



Fatty Acid Metabolism….transported through mito via transferase -PART B

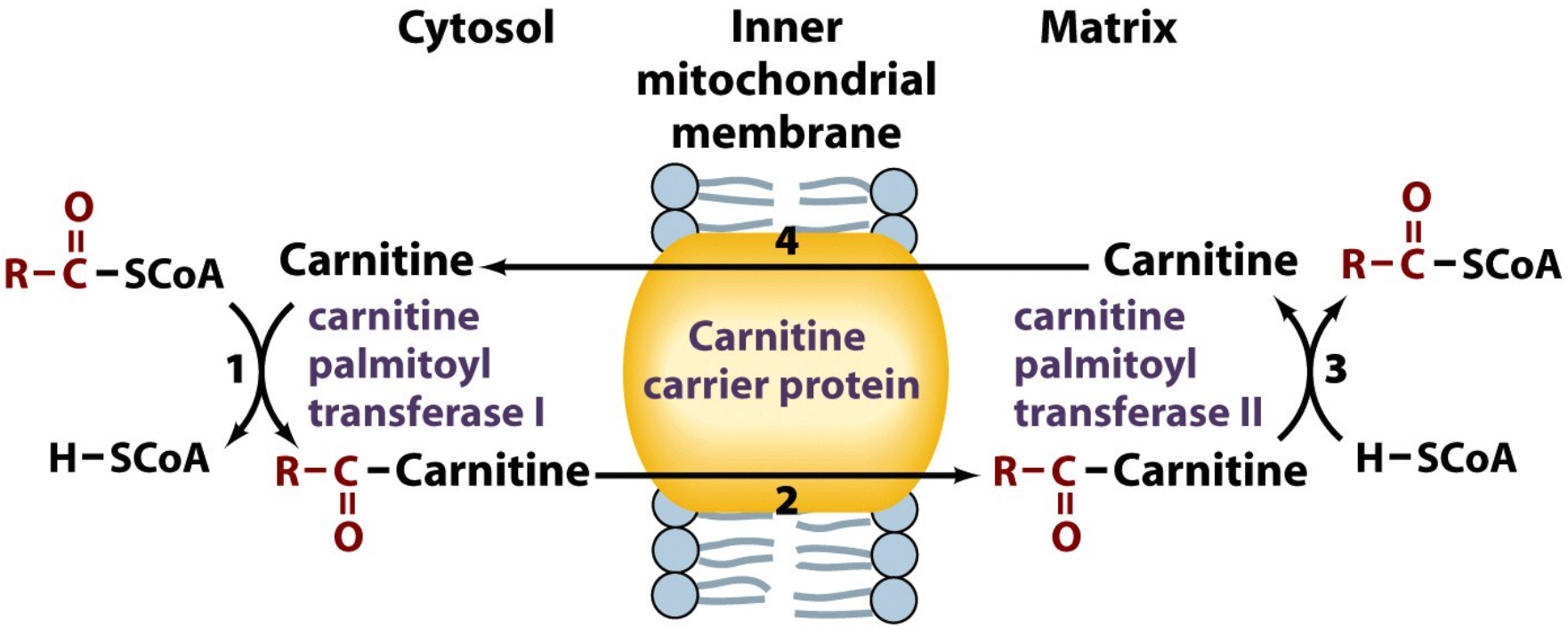


Figure 20-11

Fatty Acid Metabolism – the mitochondrial details

Trifunctional complex in mitochondrialmembrane

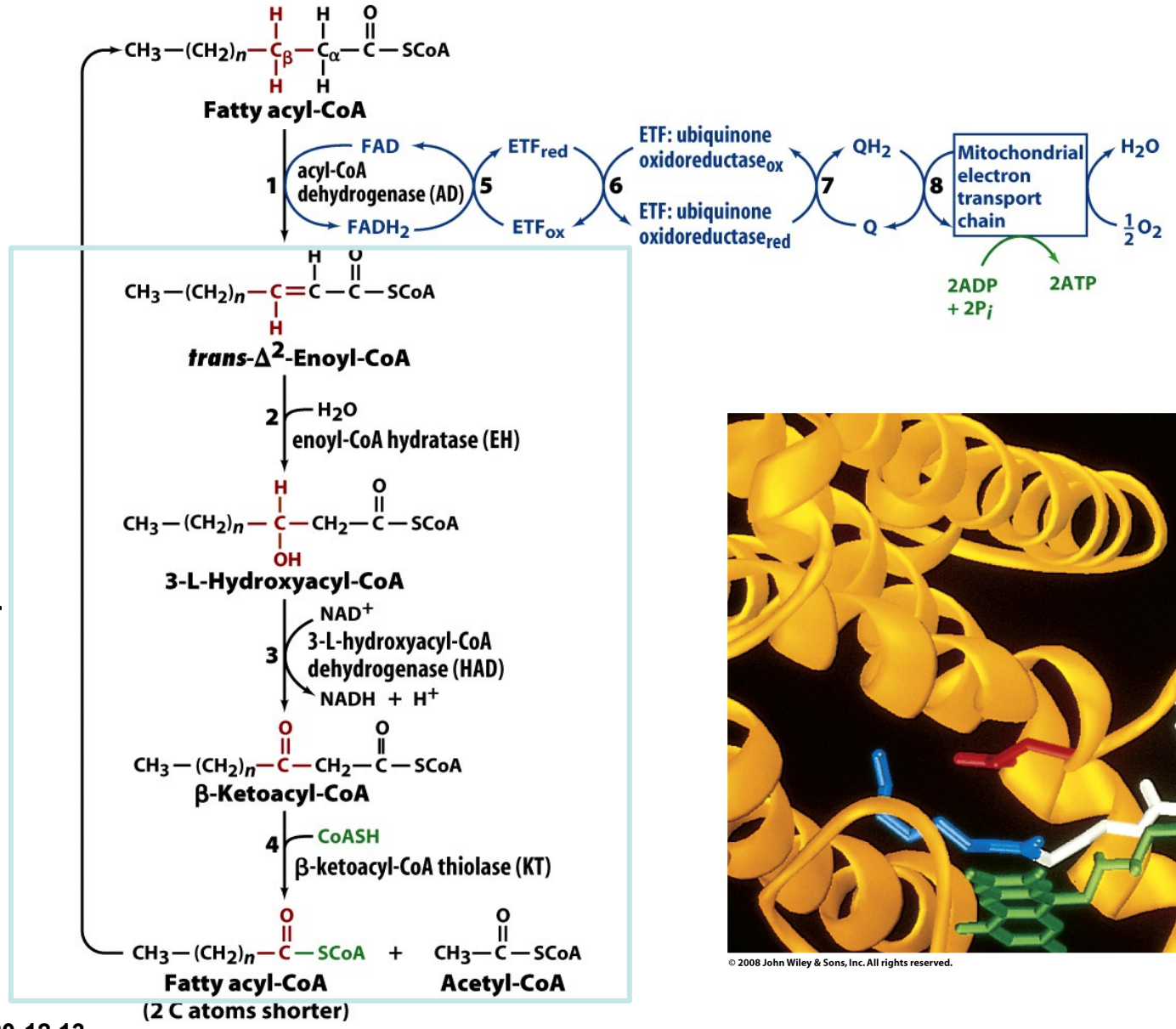


Figure 20-12,13

Fatty Acid Metabolism – FAM-4 KT details

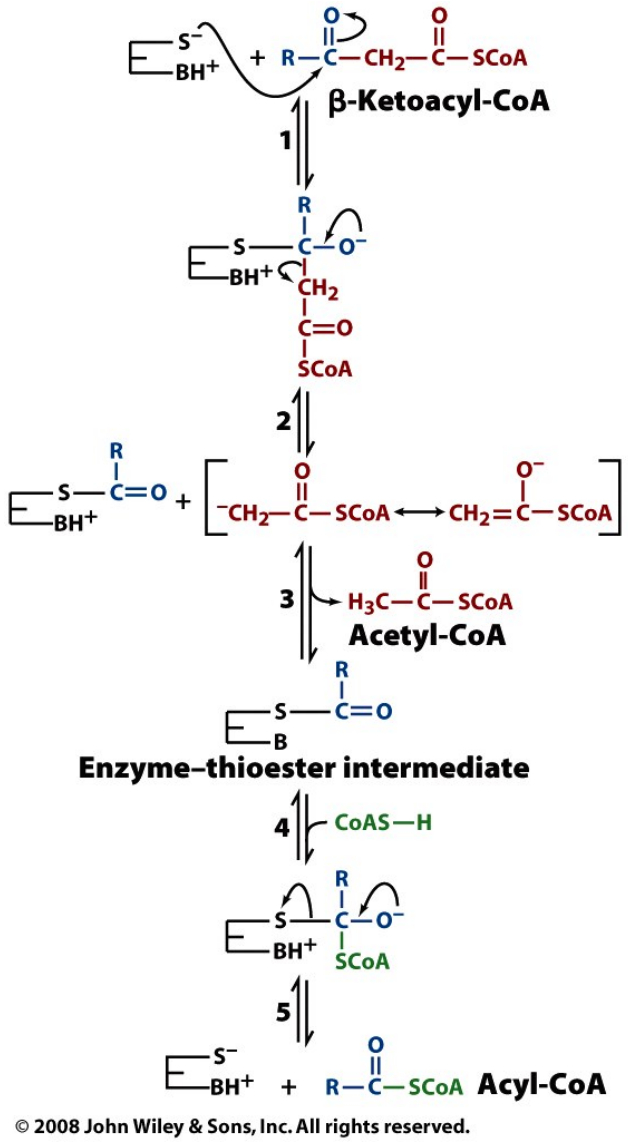


Figure 20-14

CLAISEN ESTER CLEAVAGE

KT binds substrate at C_β via a active site thiol

Tetrahedral Intermediate is formed with thioester

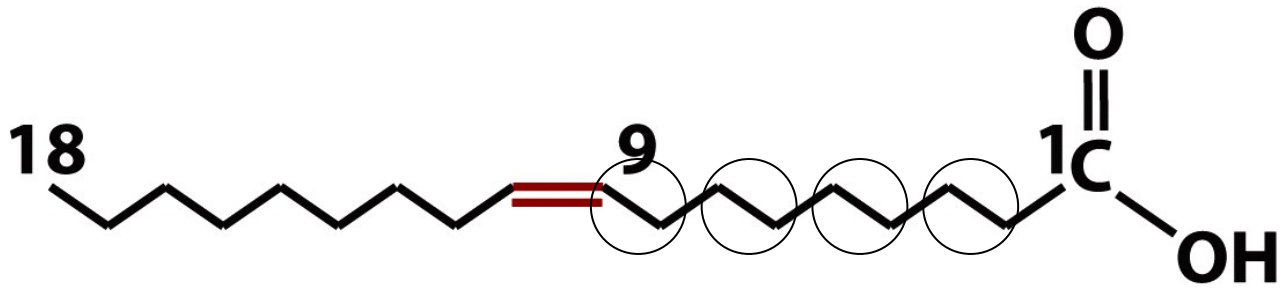
Bond cleavage between C_α-C_β occurs with collapse of this intermediate

Product 1, acetyl CoA liberated

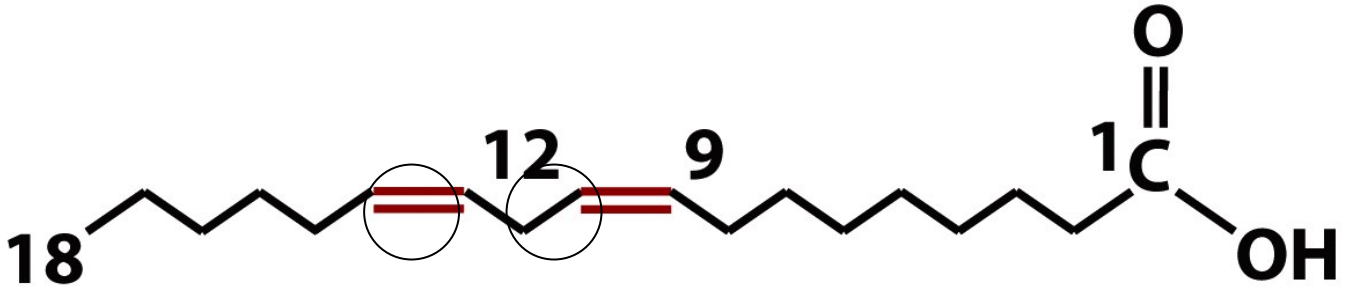
Product 2, acyl CoA ready for another round

http://www.huffingtonpost.com/2009/11/16/paul-nicklens-unbelievabl_n_359623.html

Fatty Acid Metabolism – dealing with unsaturation



Oleic acid
(9-*cis*-octadecenoic acid)



Linoleic acid
(9,12-*cis*-octadecadienoic acid)

Fatty Acid Metabolism – dealing with unsaturation

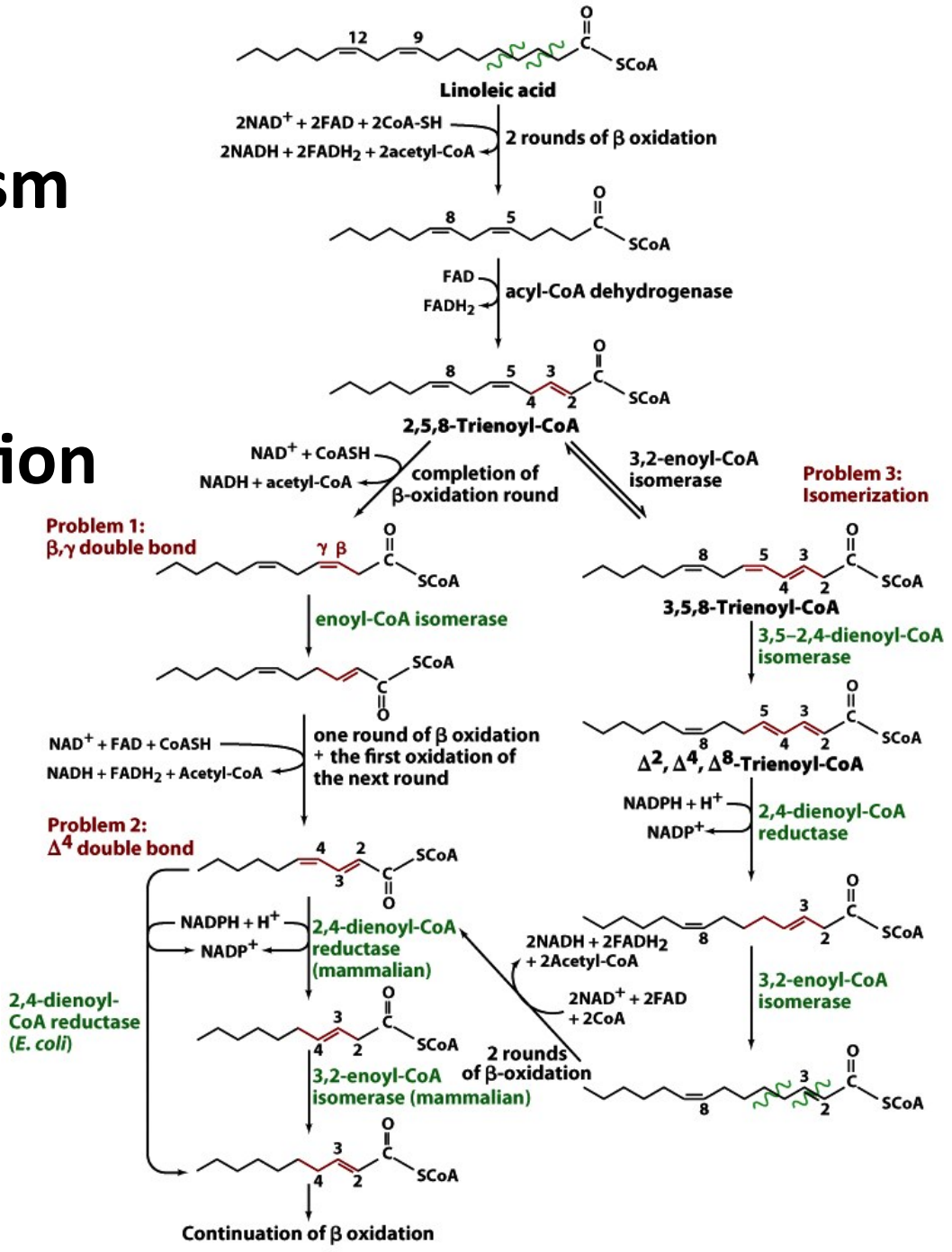


Figure 20-15

Fatty Acid Metabolism – dealing with odd chain lengths

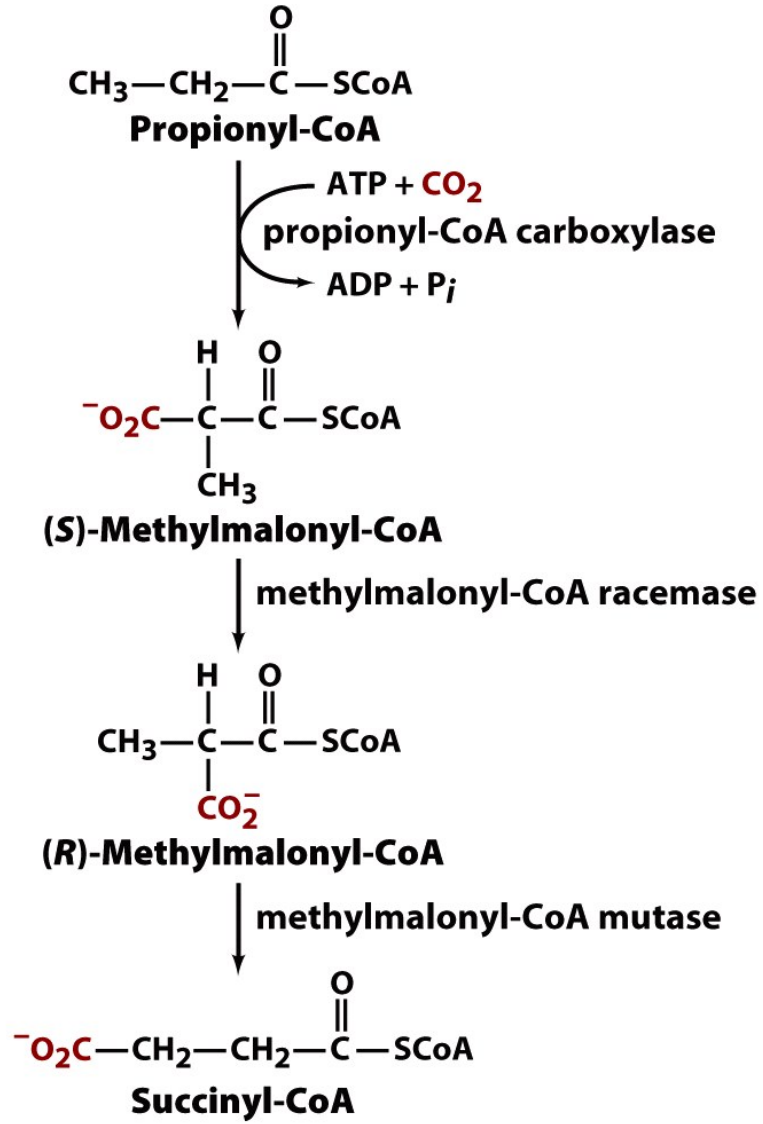
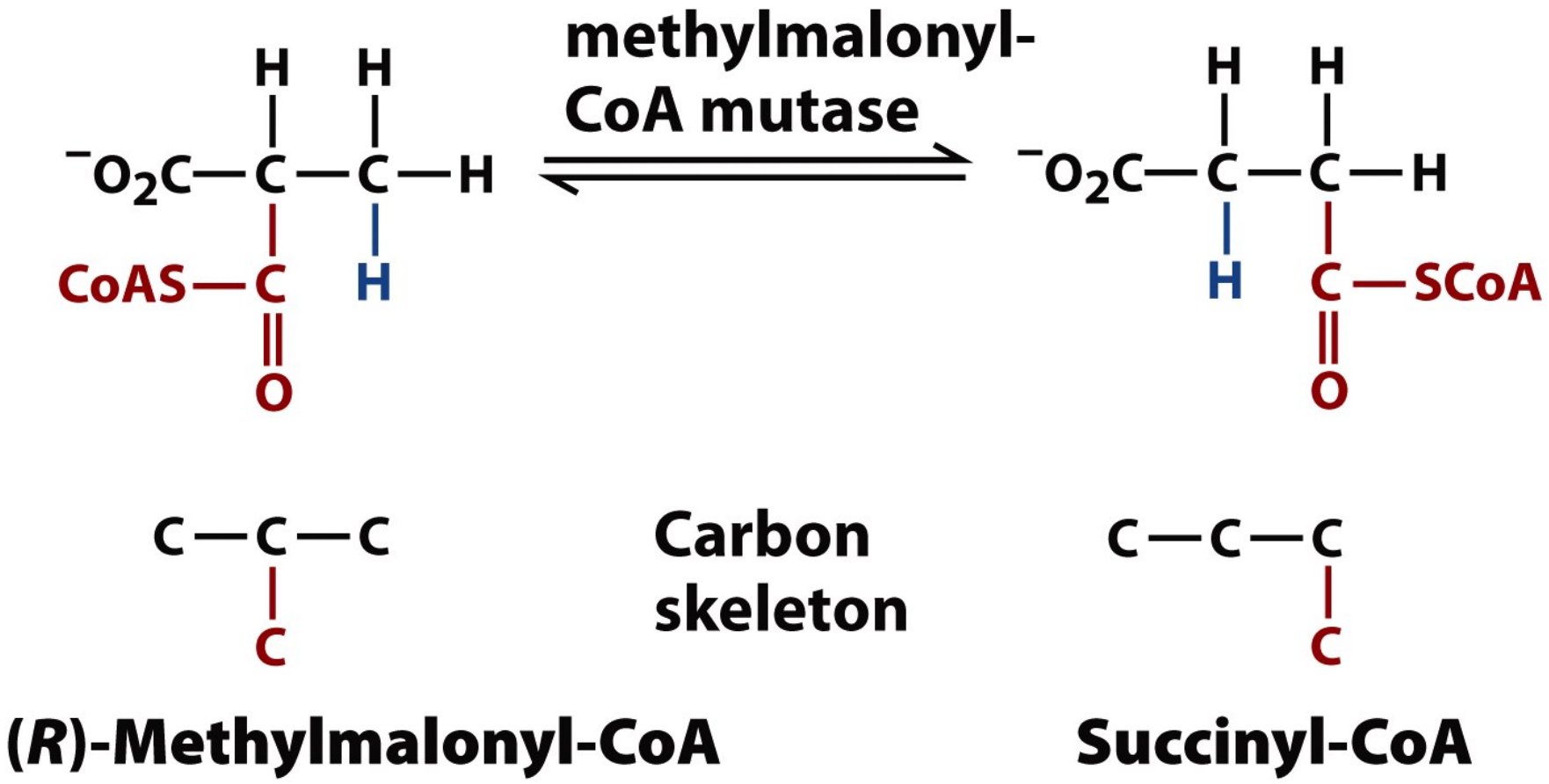


Figure 20-16

Three step process to convert the three C propionyl to four carbon succinyl CoA

1. Enzyme has biotin and resembles pyruvate decarboxylase.
2. Racemization from S to R stereoisomer
3. STRANGE C skeleton rearrangement that uses vitamin B12 (deficiency is known as pernicious anemia)



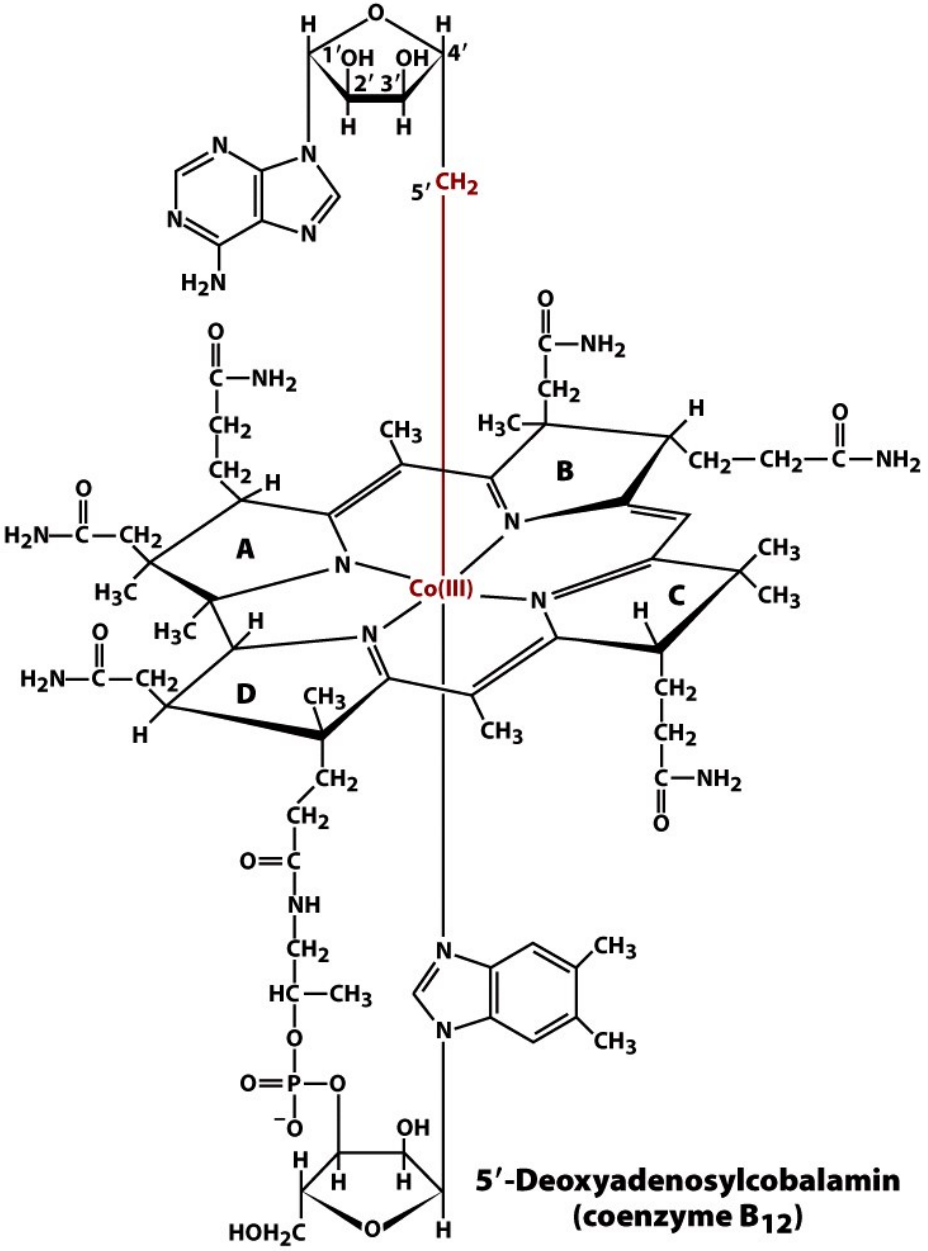
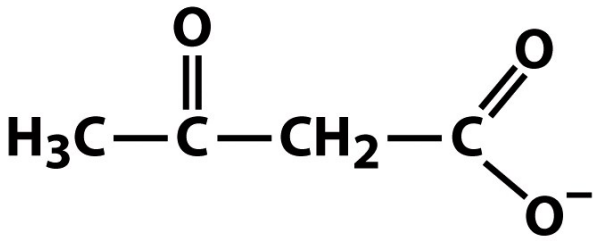
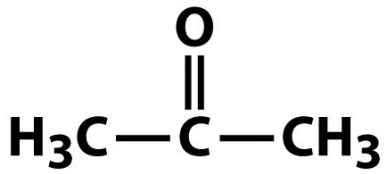


Figure 20-17

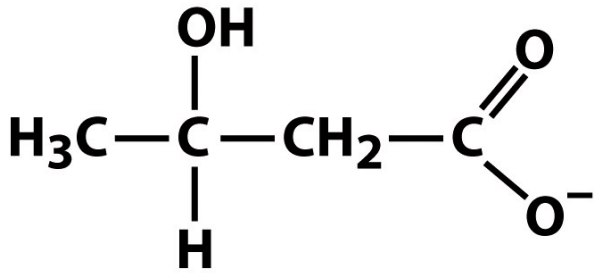
Fate of acetyl CoA in liver is not TCA…..
but KETONE BODIES



Acetoacetate



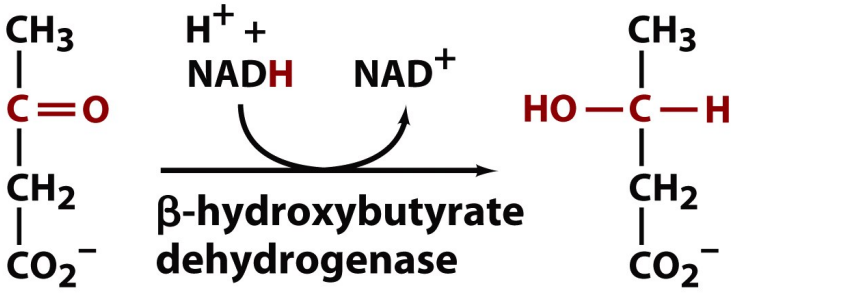
Acetone



D-β-Hydroxybutyrate

Three enzymic reactions transform acetyl CoA to beta keto acid

Liver releases acetoacetate and β-hydroxybutyrate to the blood to peripheral tissue for alternative fuels…



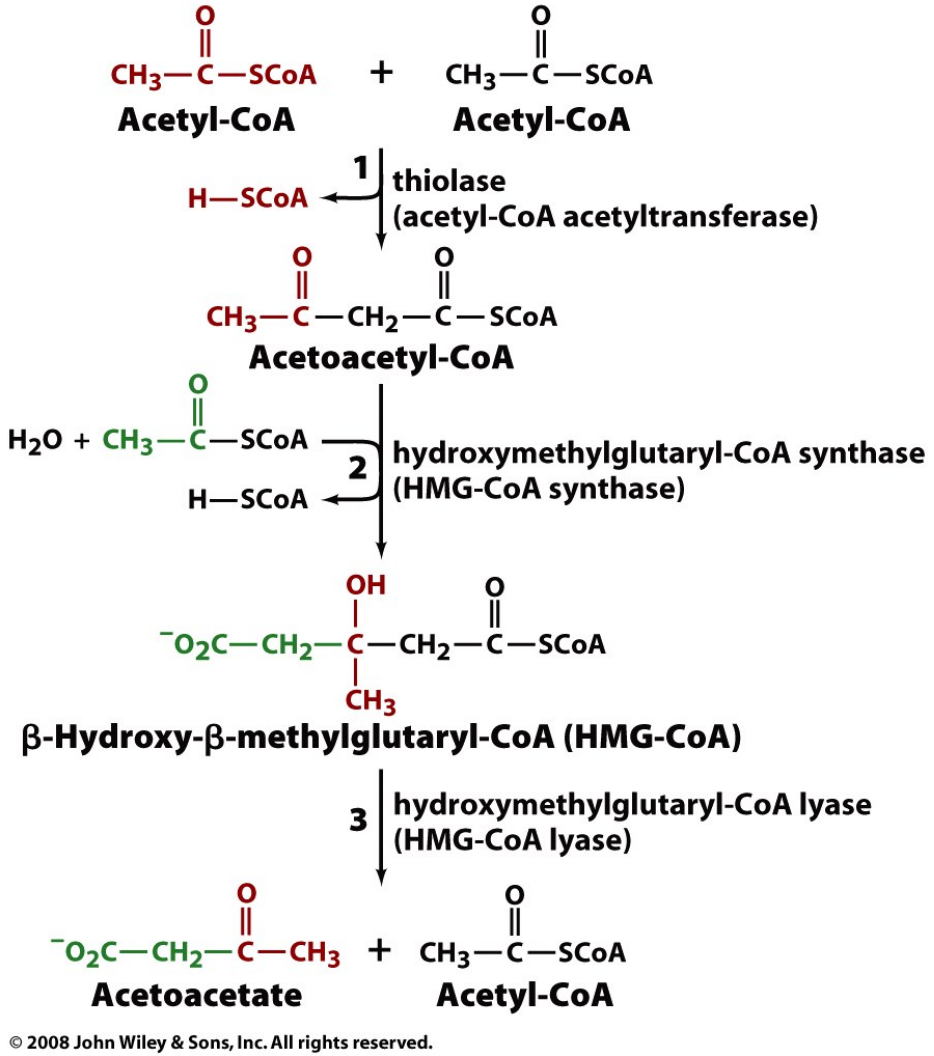


Figure 20-21

Fatty Acids are made in the cytoplasm in processes that are the reverse of beta oxidation

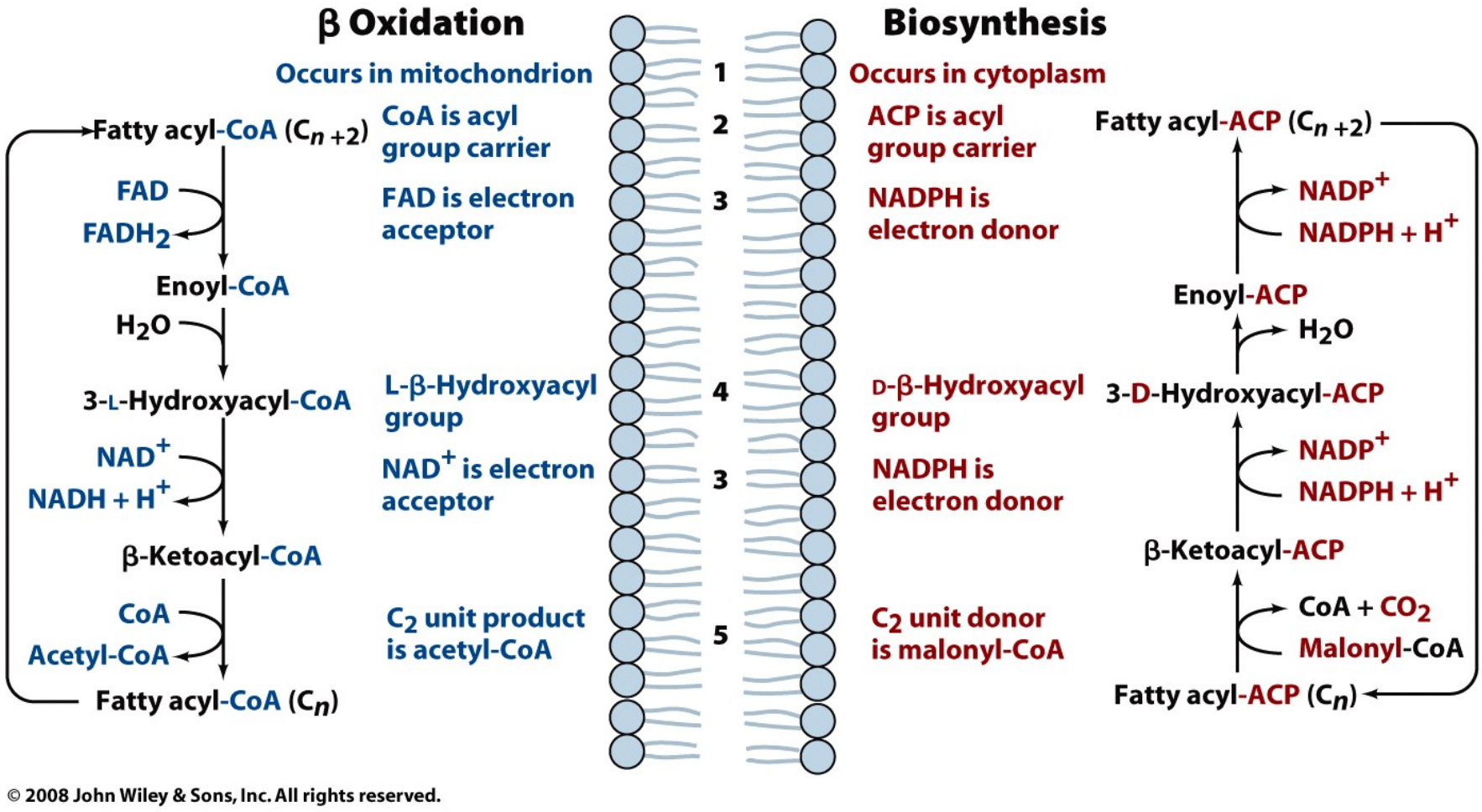


Figure 20-23