

DE NOVO SYNTHESIS OF FATTY ACIDS (Palmitic acid)

Unit III: Lipid metabolism

INTRODUCTION TO DE NOVO SYNTHESIS OF FATTY ACIDS (PALMITIC ACID)

Definition: De novo synthesis of fatty acid is the series of reactions which involves the method of production of palmitate from acetyl CoA

De novo means new way of synthesis

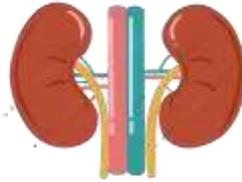
Site of De novo synthesis

De novo synthesis mainly occurs in the places like

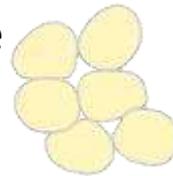
Liver



Kidney



Adipose tissue



Some of the dietary compounds like **Carbohydrates, amino acids** when they consumed in **excess quantity**, they get converted into fatty acids and they will be stored as **Triglycerides**.

De novo synthesis of fatty acids occurs in three stages

1. Production of acetyl CoA and NADPH
2. Conversion of acetyl CoA to malonyl CoA
3. Reactions of fatty acids synthase complex

1. Production of Acetyl CoA and NADPH

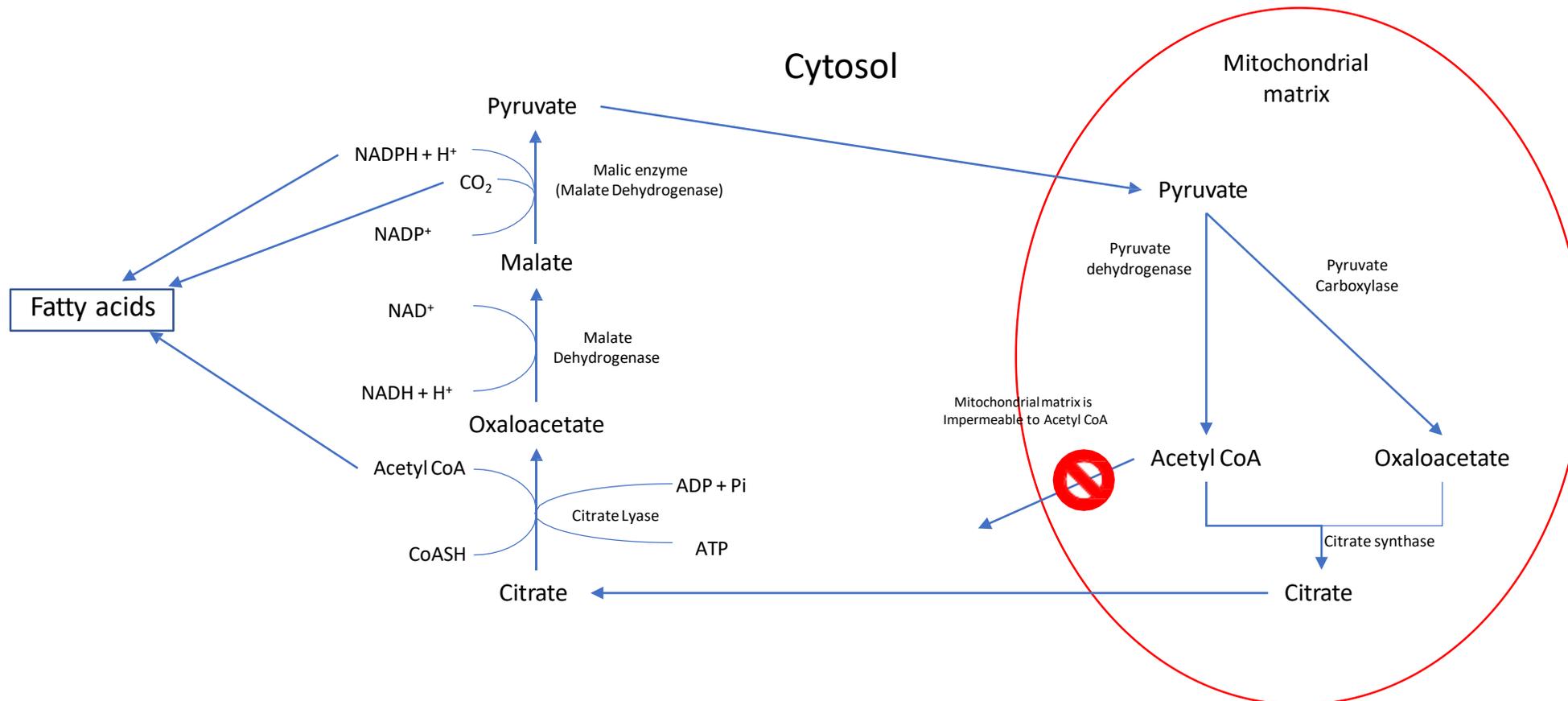
a. **Acetyl CoA** is the main requirement for the production of **fatty acids**. Mainly we get Acetyl CoA by the **oxidation of pyruvate** in mitochondrial matrix and from **amino acids** and from **ketone bodies**.

b. The reaction which is taking place in **mitochondria that is impermeable to Acetyl CoA**. So **to transfer acetyl CoA alternative arrangement is made**.

c. The **acetyl CoA** is **condensed to oxaloacetate and forms the citrate**.

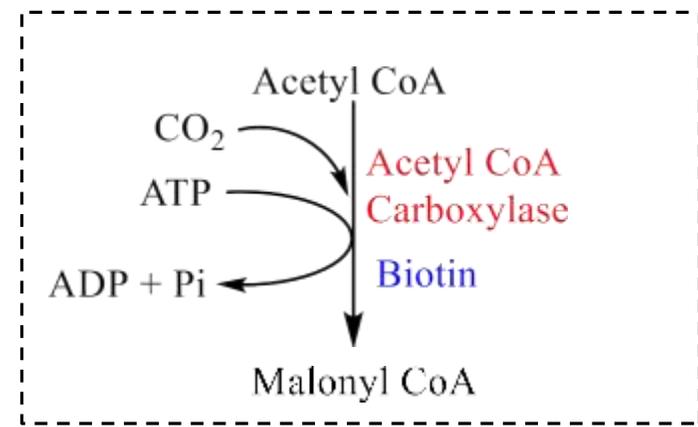
The formed citrate is easily transported out of the mitochondrial matrix to cytosol matrix

d. The formed citrate undergoes series of reaction with particular enzymes and produces fatty acids.



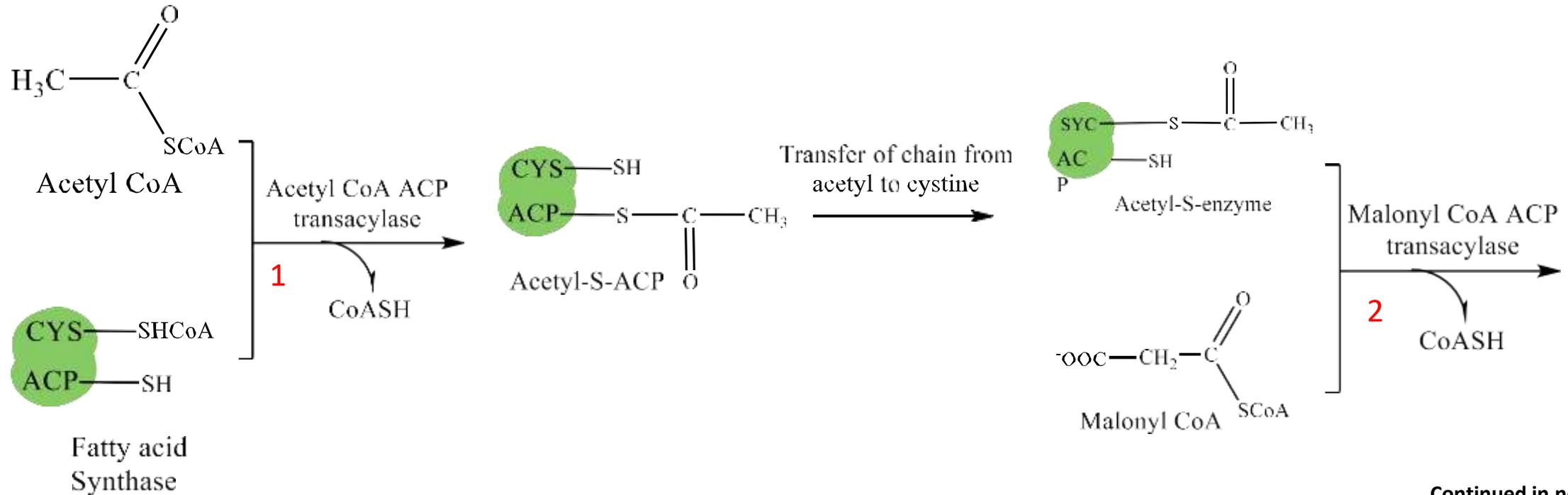
2. Conversion of acetyl CoA to malonyl CoA

- a. Acetyl CoA undergoes carboxylation reaction to produce malonyl CoA.
- b. This is an ATP dependent reaction and requires biotin for CO₂ fixation.

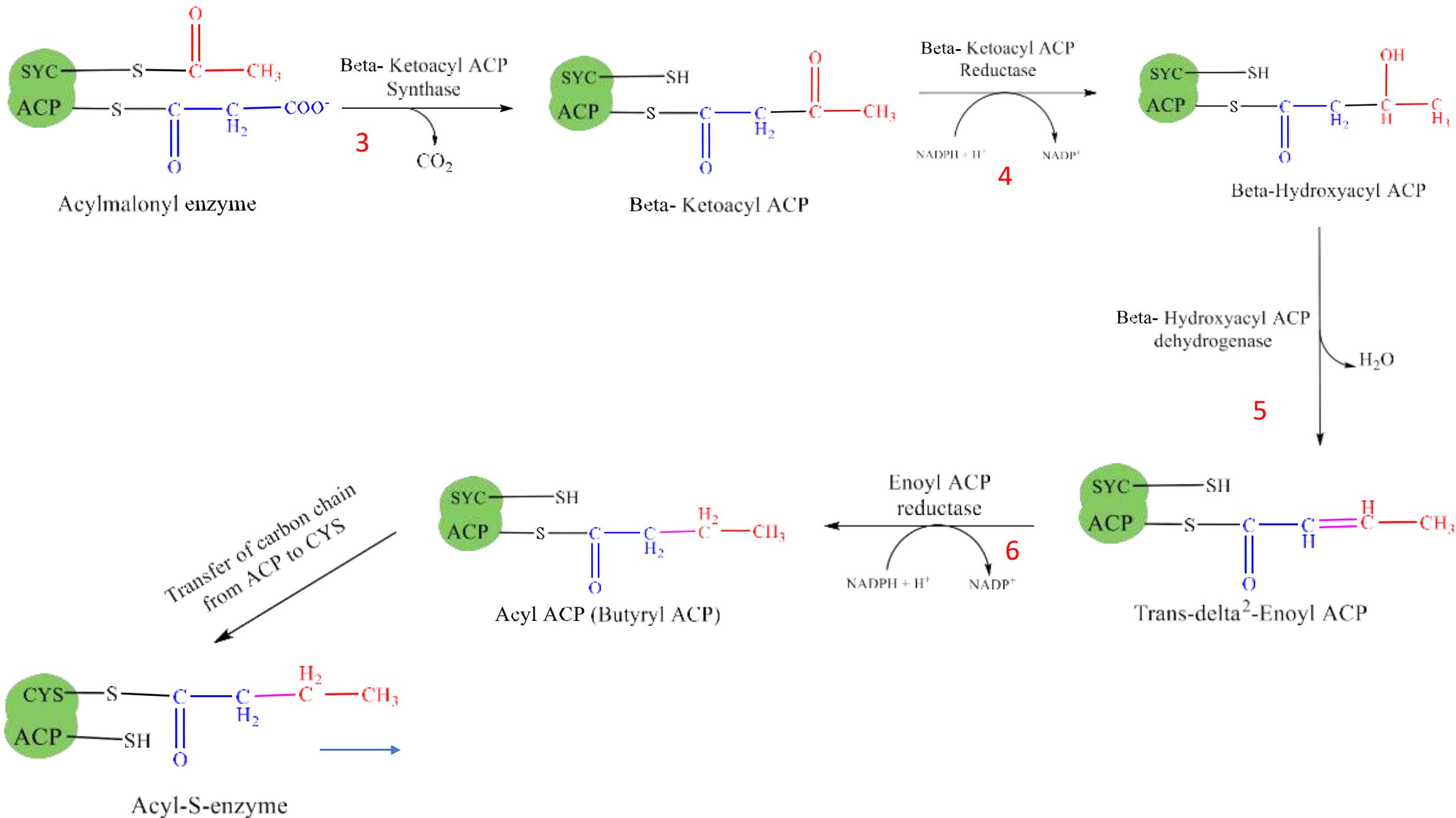


3. Reactions of fatty acids synthase complex

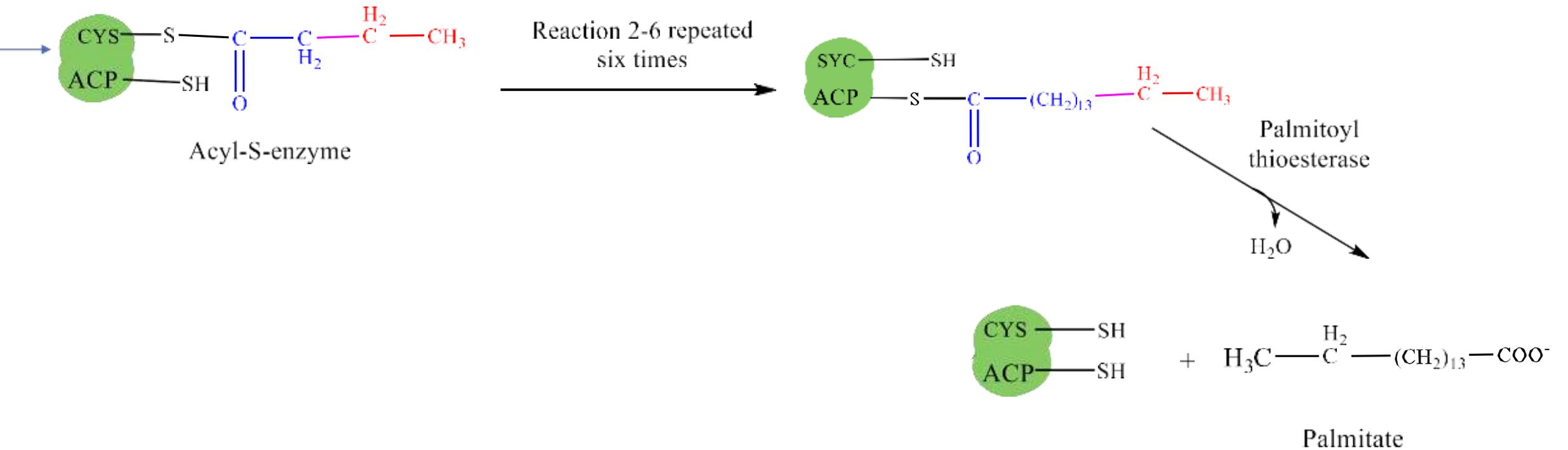
- a. Reactions of fatty acid synthase are catalysed by a multifunctional enzyme known as fatty acid synthase (FAS) complex.
- b. Each monomer possesses the activity of different enzymes and an acyl carrier protein (ACP).
- c. This sequence of reaction will be discussed below.



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Summary of Palmitate synthesis:

In palmitate it consists of 16 carbon atoms and in this only 2 carbon atoms come from Acetyl CoA and the remaining 14 carbon atoms come from malonyl CoA.

The overall reaction of palmitate is summarized by



THANK YOU