

# De-novo synthesis of fatty acids (Lipogenesis)

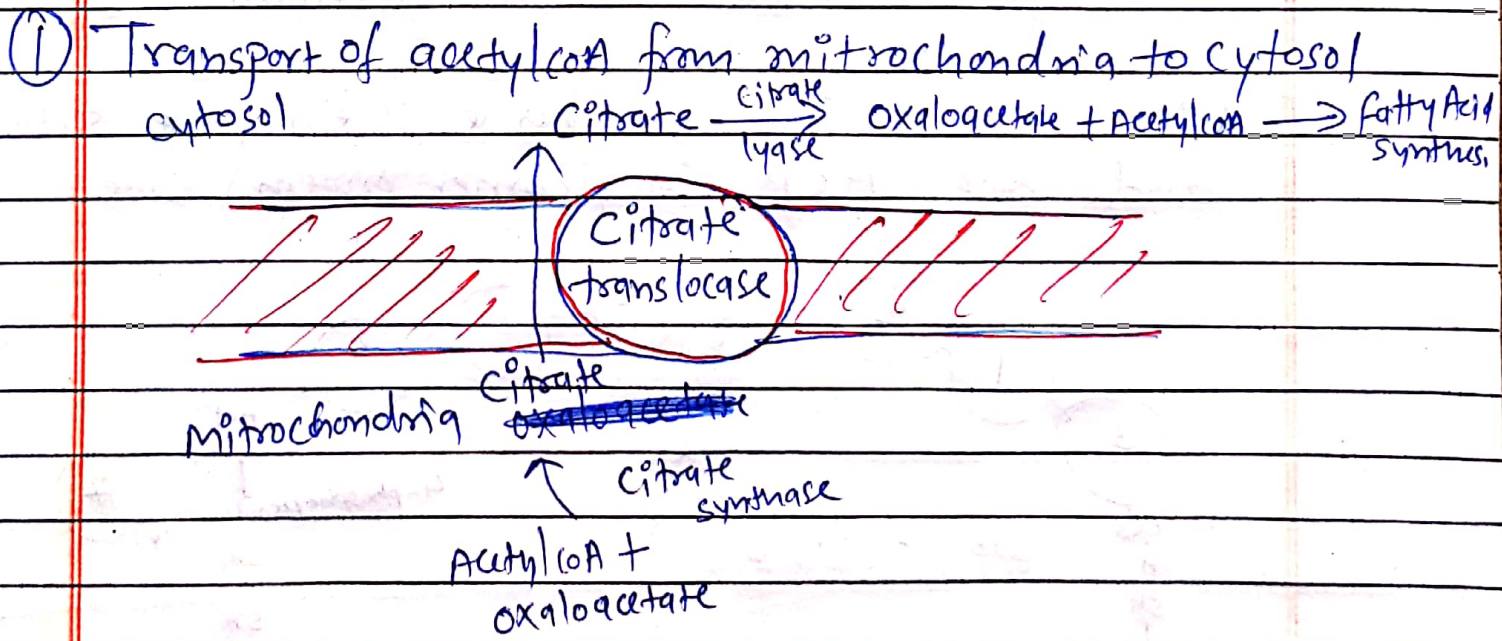
New synthesis of fatty acid from acetyl CoA is called De novo lipogenesis.

⇒ Mainly occurs in liver & lactating mammary glands.

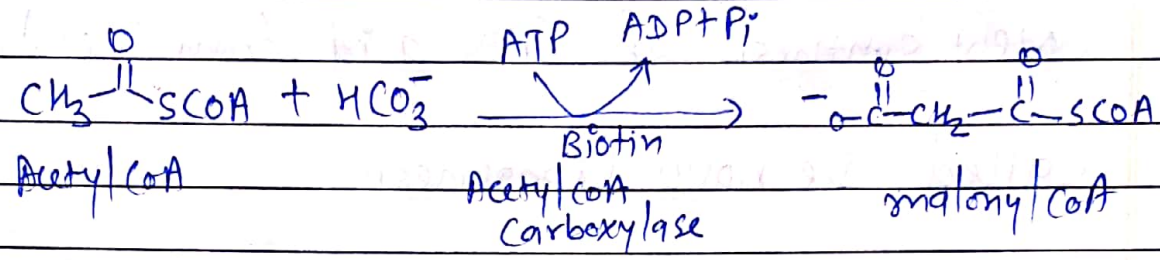
⇒ In minute amount - adipose tissue, kidney & brain cell.

## 3 Steps involved for lipogenesis. (C<sub>16</sub> Palmitic Acid synthesis)

- (1) Transport of acetyl CoA from mitochondria to cytosol
- (2) Carboxylation of acetyl CoA to form malonyl CoA
- (3) Reaction of fatty acid synthesis using fatty acid synthase Complex



② Carboxylation of acetyl-CoA to malonyl-CoA



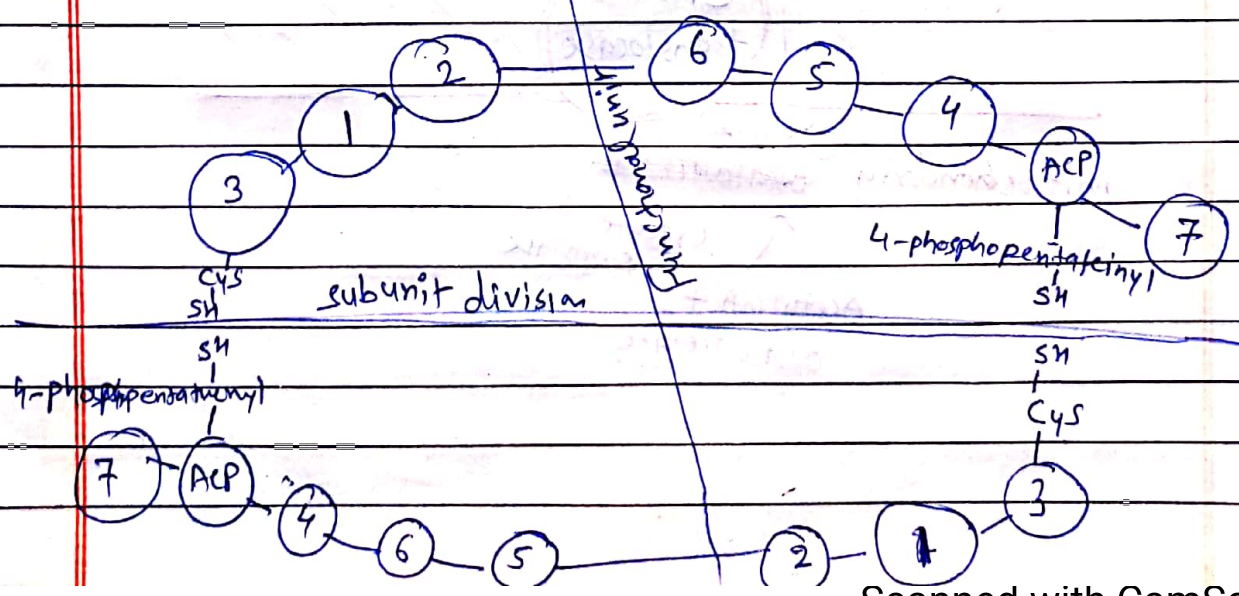
The carboxylation of acetyl-CoA is the rate limiting step in fatty acid synthesis

③ Reactions of fatty acid synthase complex

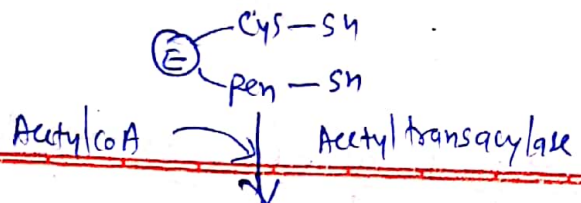
Fatty acid synthase complex is a multi enzyme complex which have different catalytic reaction ~~place~~ site on it.

The active complex is dimeric and arrange in head to tail fashion.

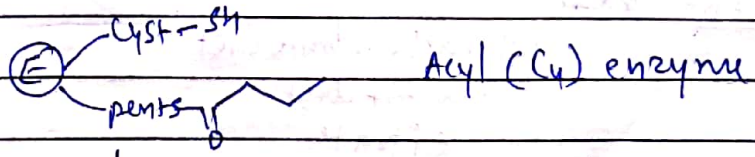
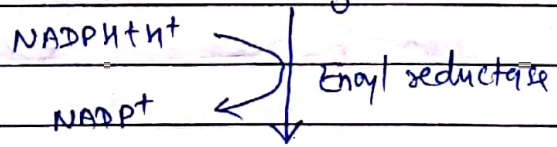
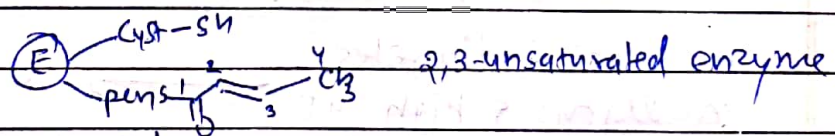
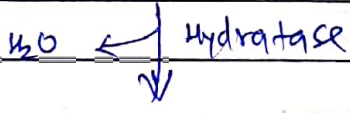
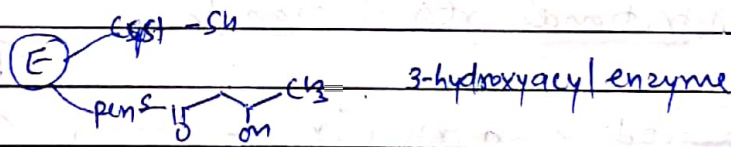
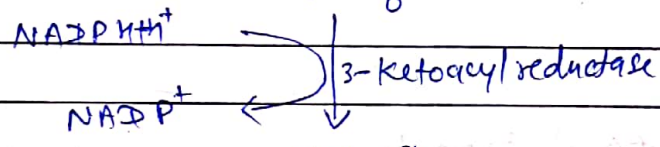
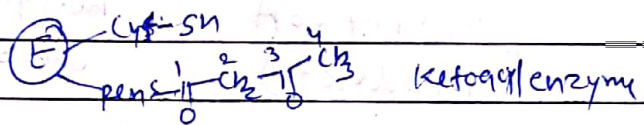
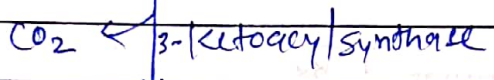
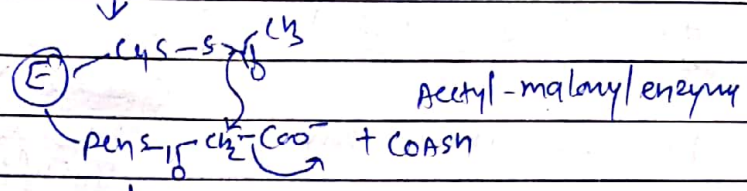
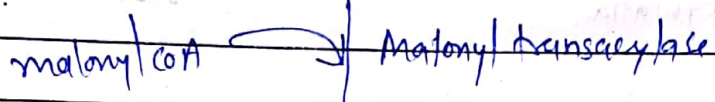
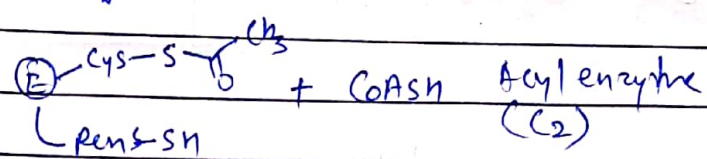
This synthase complex have 7 enzyme site and one ACP (acyl carrier protein) site.



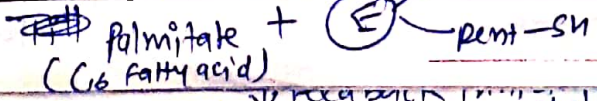
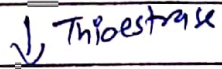
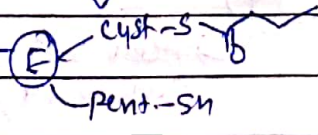
Reactions



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Till C<sub>16</sub> Palmitate form



# Regulation of De novo fatty acid synthesis Page no: \_\_\_\_\_

Enzymatic regulation

Acetyl CoA Carboxylase

Rate limiting enzyme

Activated by Citrate

Inhibited by Palmitoyl CoA (Product)

Hormonal regulation

~~Glucagon~~  
~~Epinephrine~~  
Insulin

Activate Acetyl CoA Carboxylase

Glucagon  
Epinephrine

Inactivate Acetyl CoA Carboxylase

## Nutritional regulation:

If food taken rich in Carbohydrate & low fat

↑ synthesis

↑ activity of Acetyl CoA Carboxylase

starvation, diabetes mellitus & high fat diet

↓ synthesis of Acetyl CoA Carboxylase enzyme

## In short:

High Carbohydrate diet  
Low fat diet  
Citrate  
Insulin

(+)

Acetyl CoA Carboxylase

(-)

Epinephrine, Glucagon  
Palmitoyl-CoA, Starvation  
High Fat diet