

## FATTY ACID as FUELS

- Fatty Acids are the major fuel used by tissues but Glucose is the major Fuel in extracellular fluids

<u>Fuel type</u>	<u>Amount in Fluids gram</u>	<u>Amount used /12 hours gram</u>
FA	0.5	60 (540 Kcal)
Glucose	20	70 (280 Kcal)

## Mobilization of stored fats The need for hormonal signal

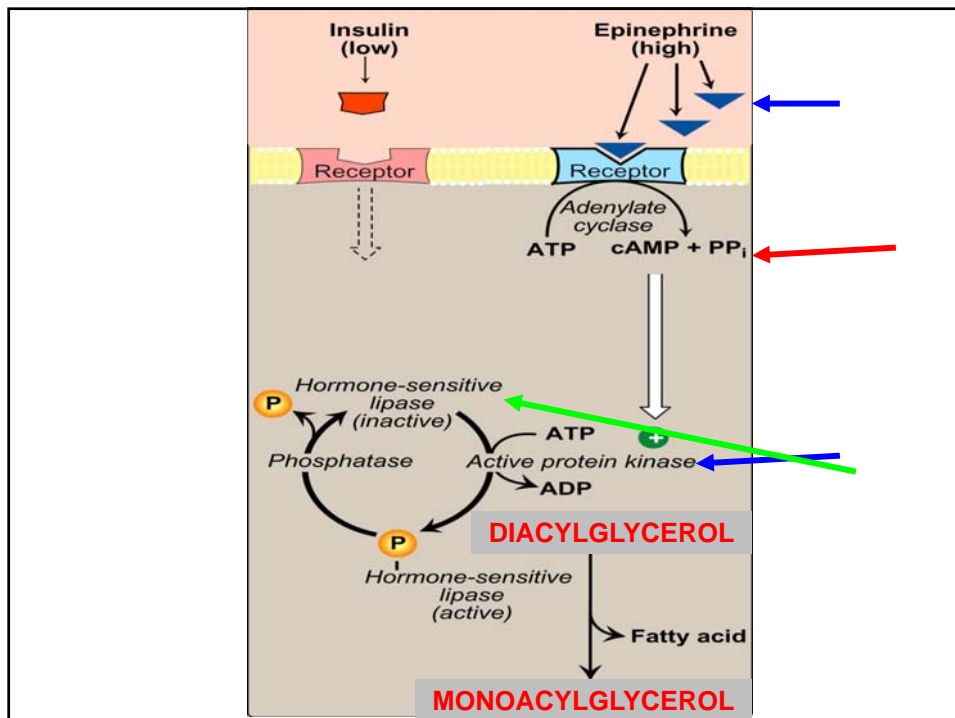
- Fat is stored in Adipose tissue
- When needed a hormonal signal must reach the adipocytes.
- Hydrolysis of TAG



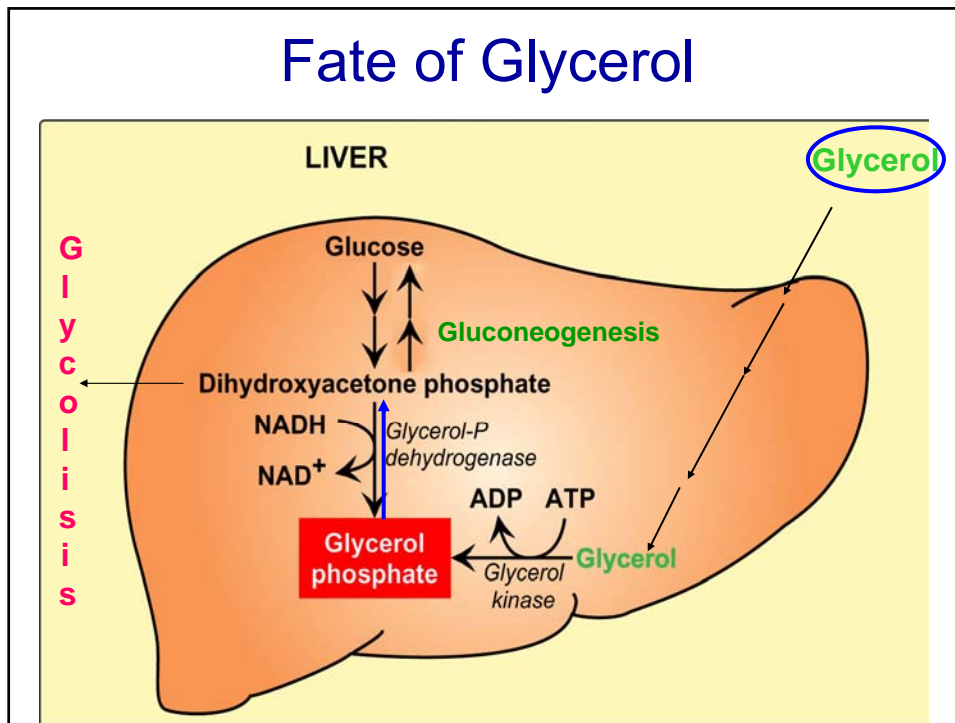
**LIPASE** :Hormone Sensitive Lipase

## Hormones that activate the Hormone Sensitive Lipase

- Glucagon
- Epinephrine
- Norepinephrine
- ACTH

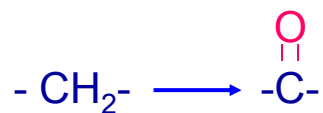


## Fate of Glycerol

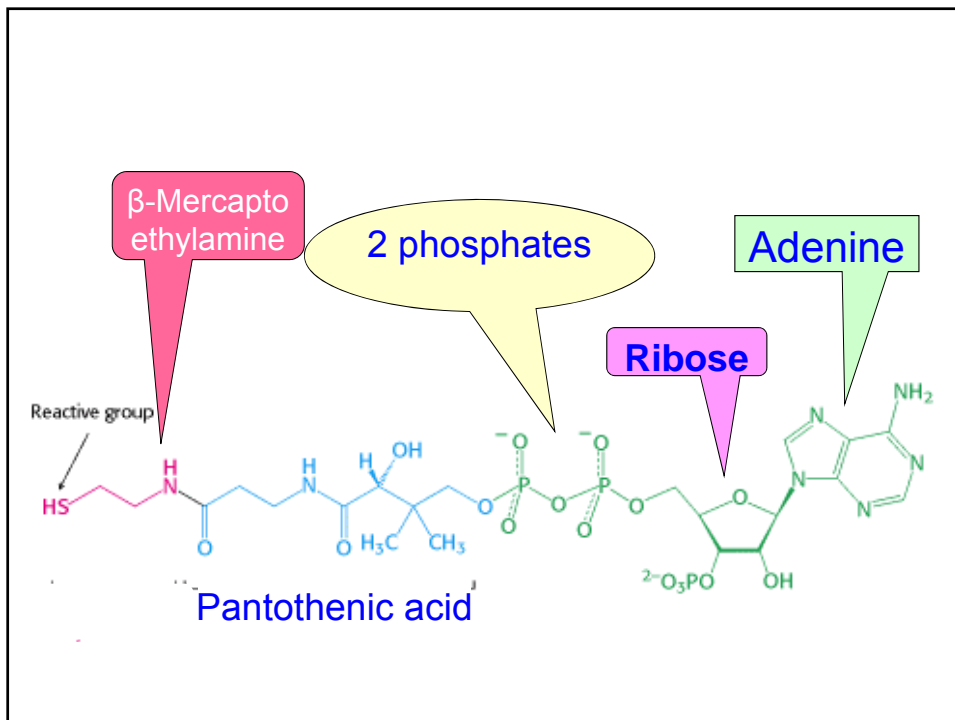
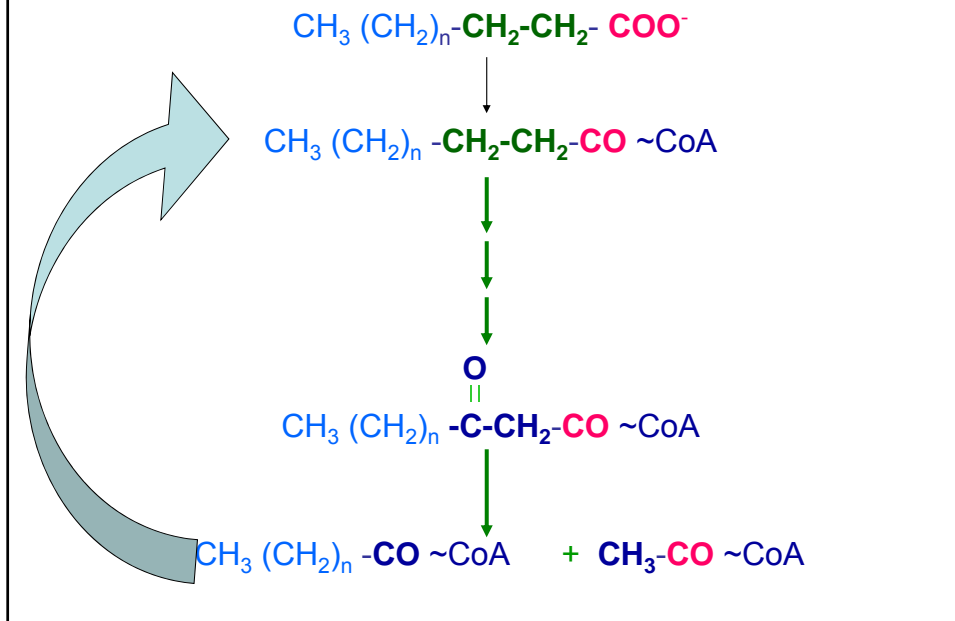


## $\beta$ Oxidation of Fatty Acids

- Fatty Acids are transported to tissues bound to albumin
- Degraded by oxidation at  $\beta$  carbon followed by cleavage of two carbon units



## $\beta$ Oxidation of Fatty Acids (overview)



## Activation of Fatty Acids

- Joining F.A with Coenzyme A
- RCO~SCoA (Thioester bond)



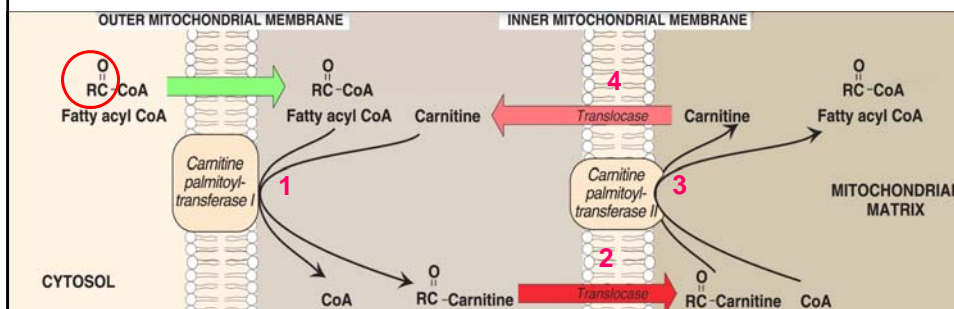
## Activation of Fatty Acids (cont.)

- ATP conversion to AMP + 2 P<sub>i</sub> is equivalent to hydrolysis of 2 ATP to 2ADP
- Enzyme: thiokinase (Acyl CoA Synthetase)
- Location: - outer mitochondrial membrane  
 - mitochondrial matrix ( for short and medium chain FA )

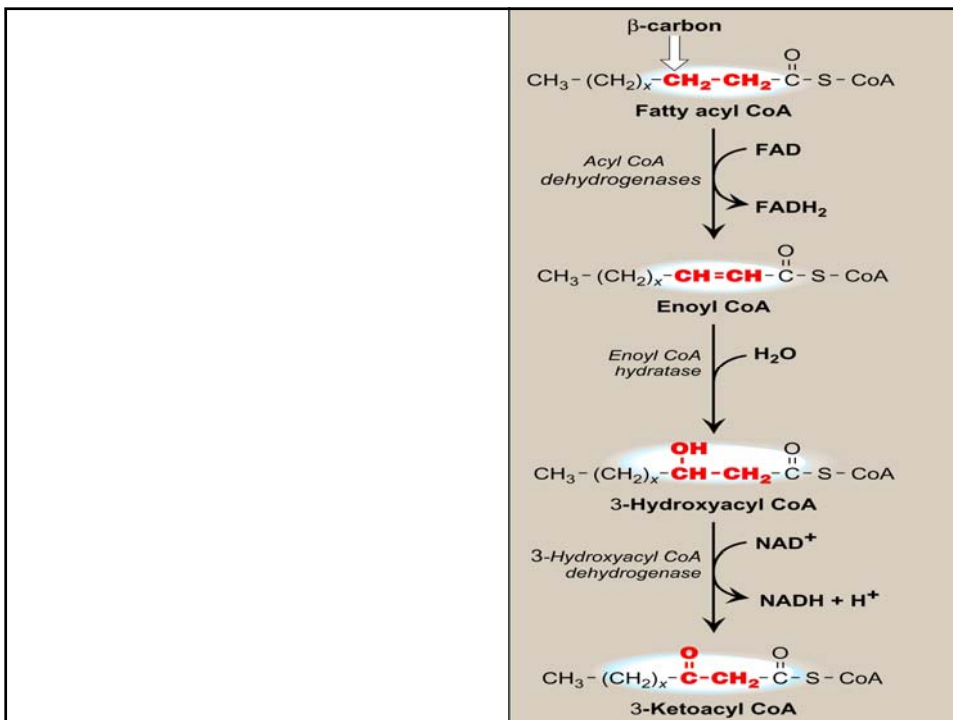
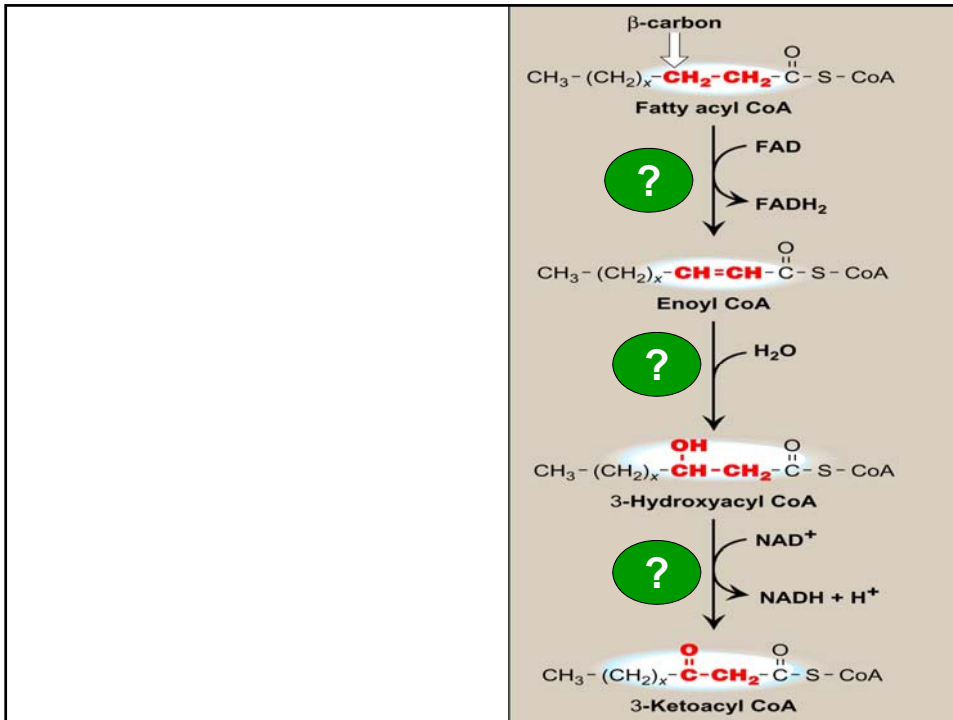
## Transport of long chain Acyl CoA across inner mitochondrial membrane

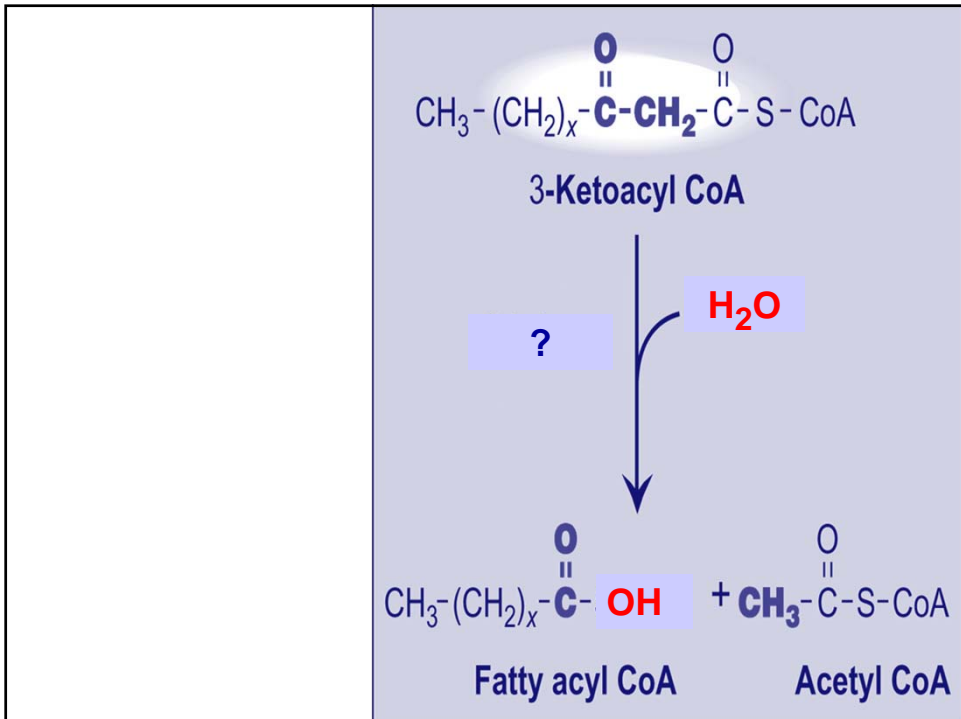
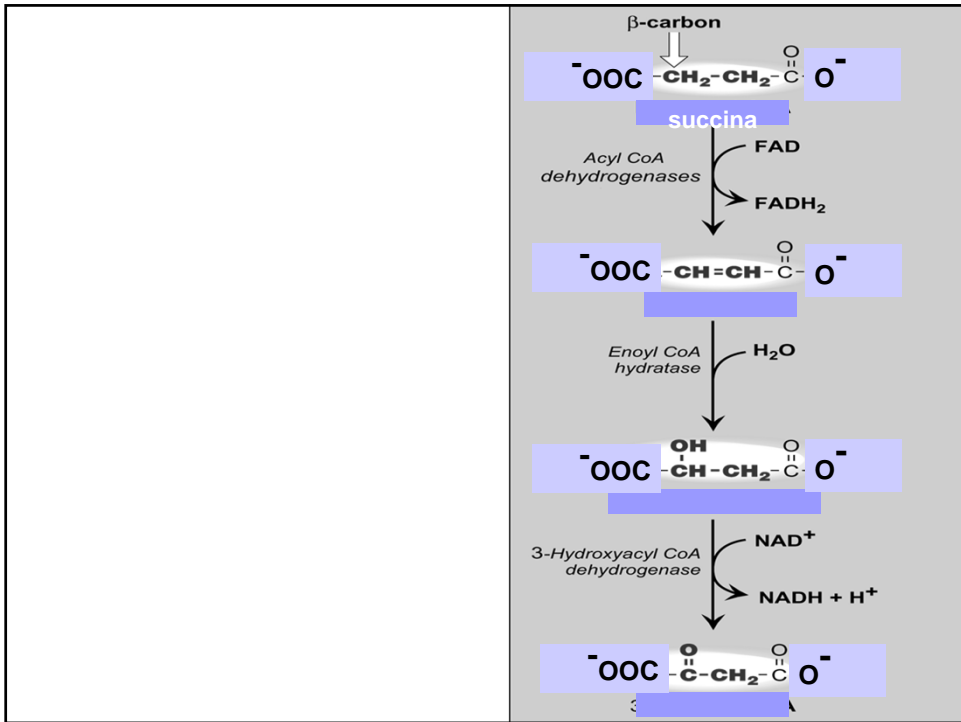
- Inner mitochondrial membrane is impermeable to Acyl CoA
- Carrier system is required (Carnitine Shuttle)
- It consists of:
  - Carrier molecule
  - Two enzymes
  - Membrane transport protein

## CARNITINE SHUTTLE



For Long chain fatty acids  
 Inhibited during fatty acid synthesis  
 Not required for medium and short chain fatty acids

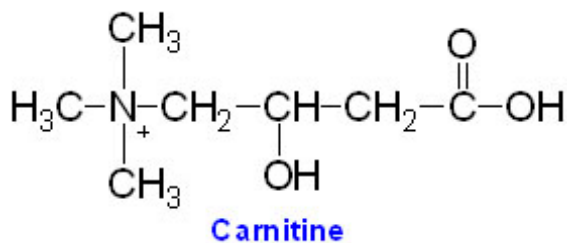








## Carnitine



### \* Other functions:

- Export of branched chain acyl groups from mitochondria
- Excretion of acyl groups that cannot be metabolized in the body

## Carnitine Deficiencies



- ↓ Ability to use FA as a fuel
- Accumulation of F.A and branched Acyl groups in cells