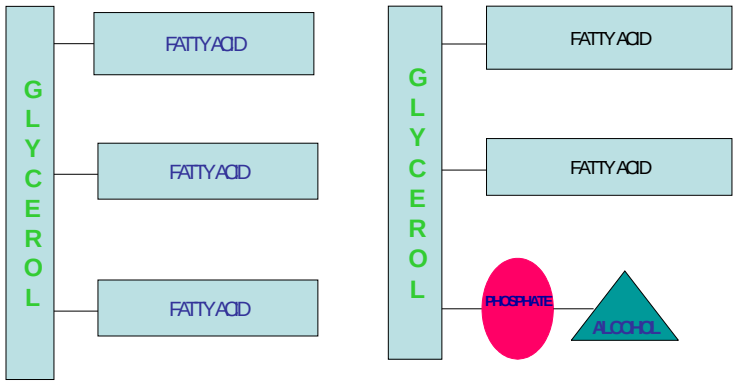
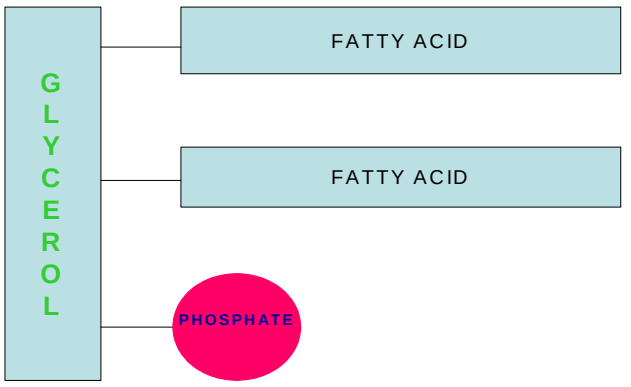
Biosynthesis of Triacylglycerol & Phosphoacylglycerol



Phosphotadic Acid is Common Intermediate



Biosynthesis of Triacylglycerol

Requires

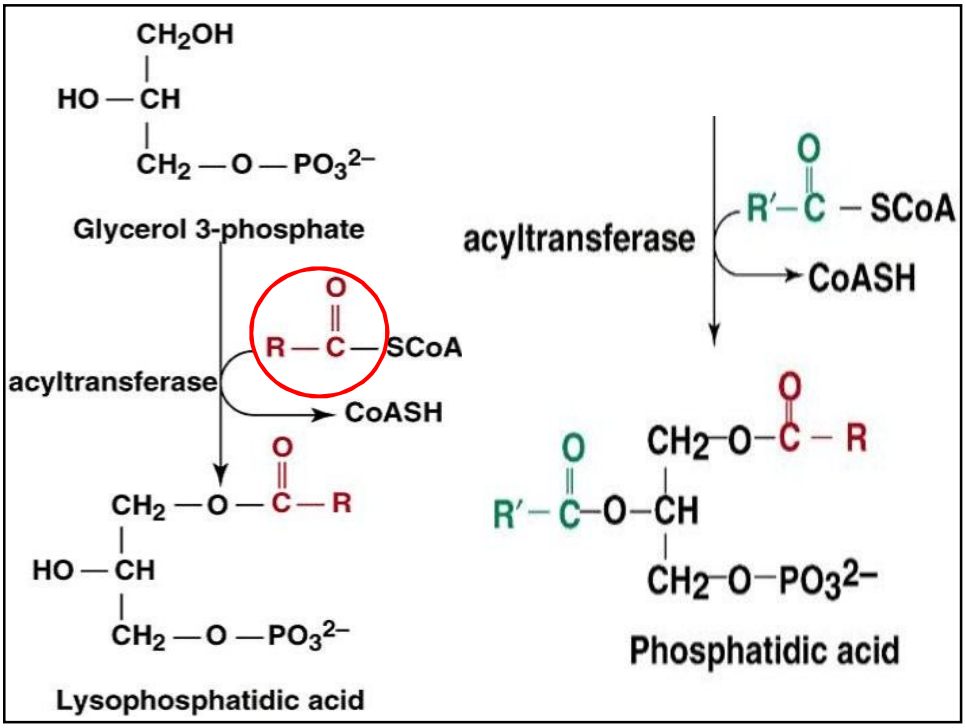
- Acyl~CoA (Active form of FA)
- Glycerol Phosphate

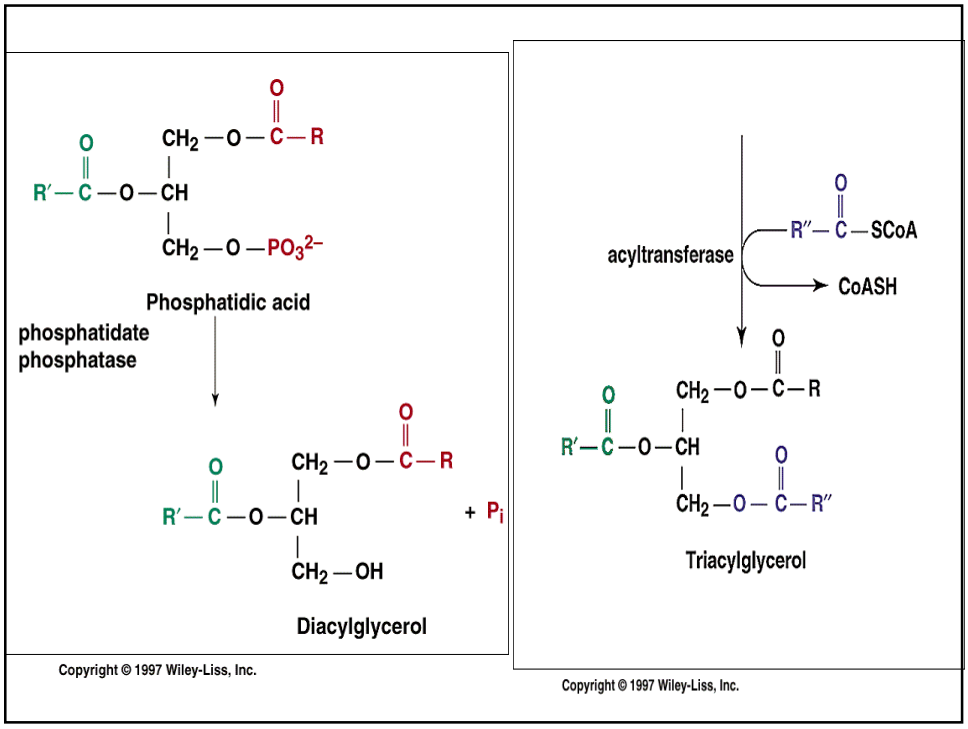
Why Active form?

$TAG + H_2O \longrightarrow DAG + FA \quad \Delta G$ –ve

$DAG + FA \longrightarrow TAG + H_2O \quad \Delta G$ +ve

$DAG + Acyl\sim CoA \longrightarrow TAG \quad \Delta G$ –ve



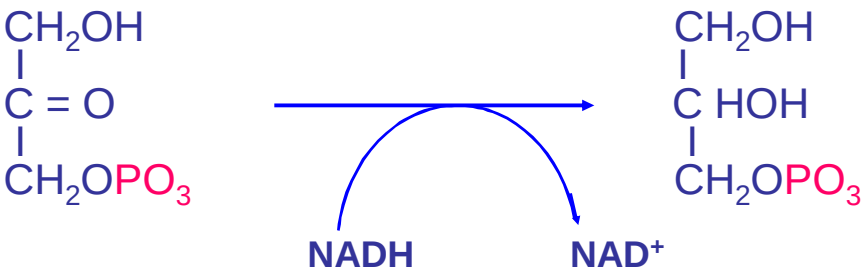


Production of Glycerol Phosphate

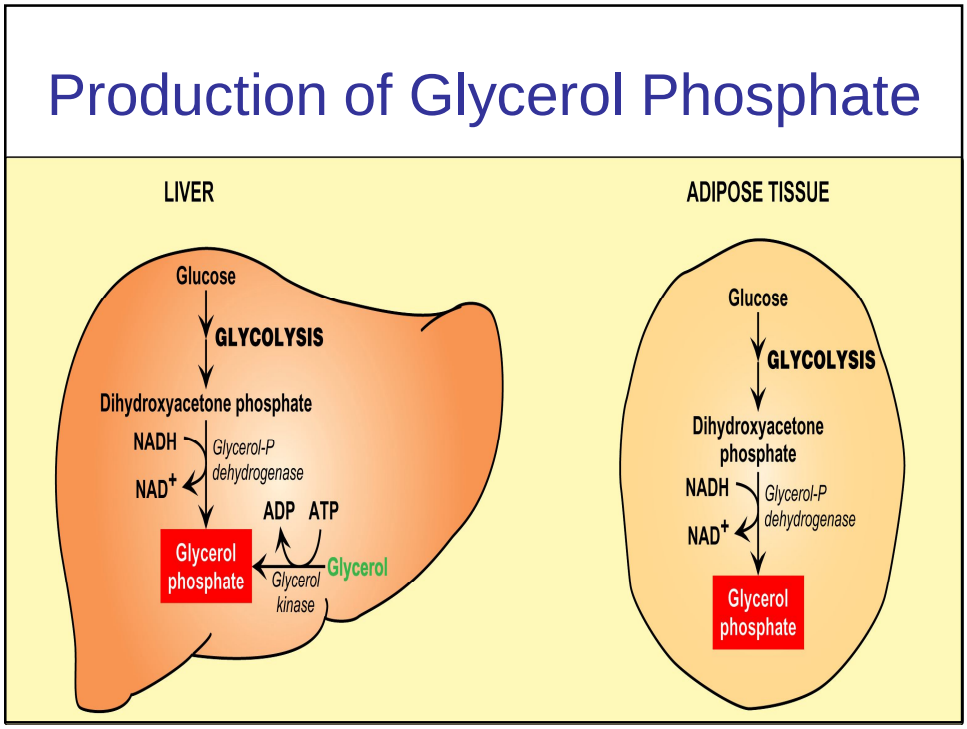
- Glycerol + ATP ---→ Glycerol 3 Phosphate

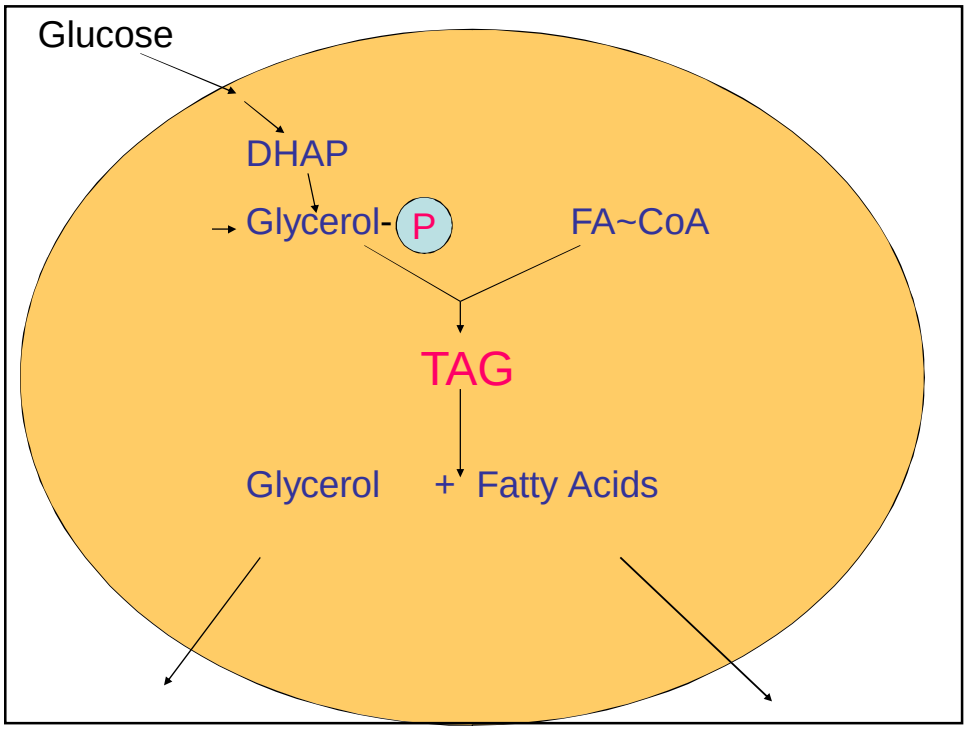
Enz: Glycerol Kinase

Not in Adipose tissue



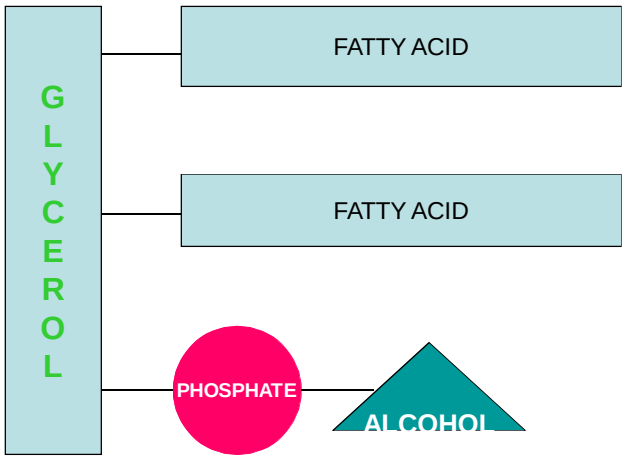
Production of Glycerol Phosphate



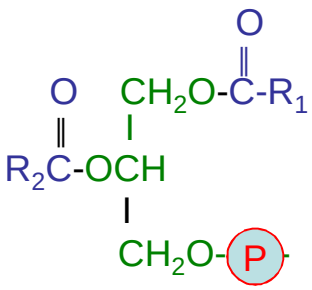


Biosynthesis of Glycerophospholipids

also known as
Phosphoglycerides or
Phosphoacylglycerol
Lippincott's Ch 17



PHOSPHOACYLGLYCEROL

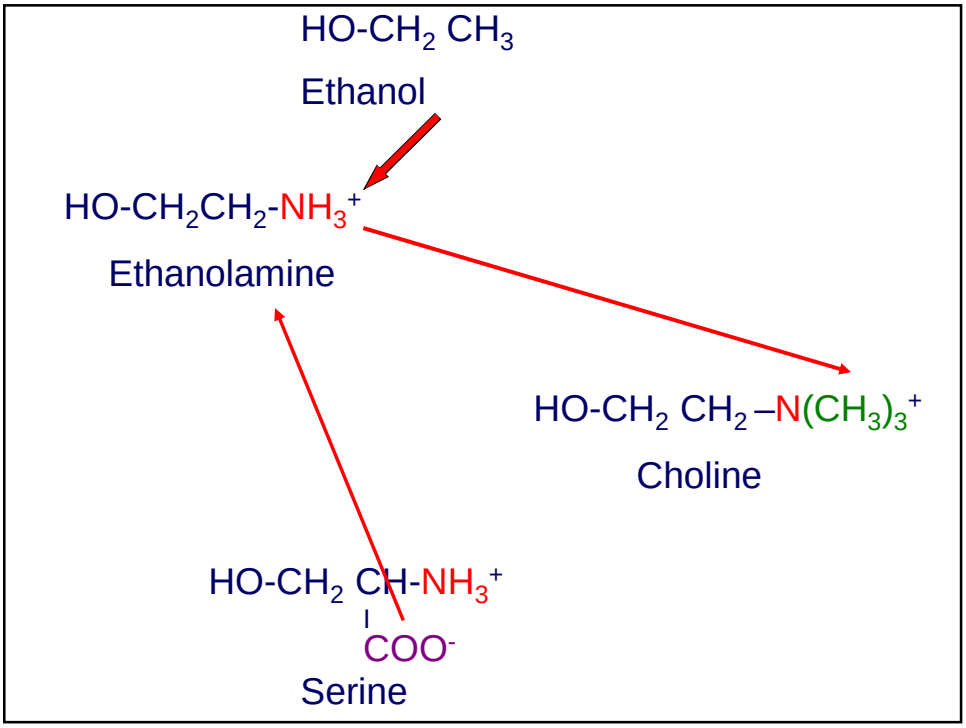


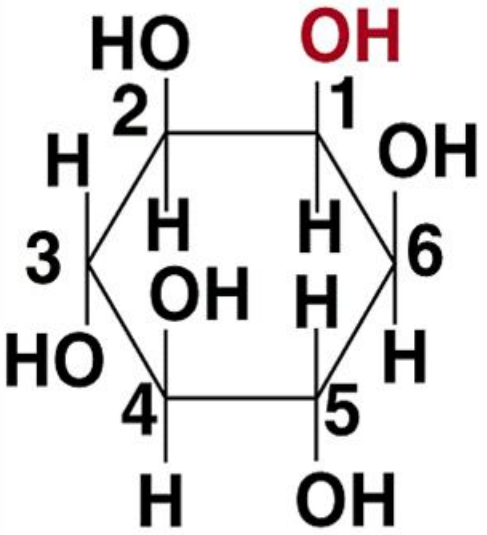
Phosphatidic Acid

Can Form Ester with Alchol:

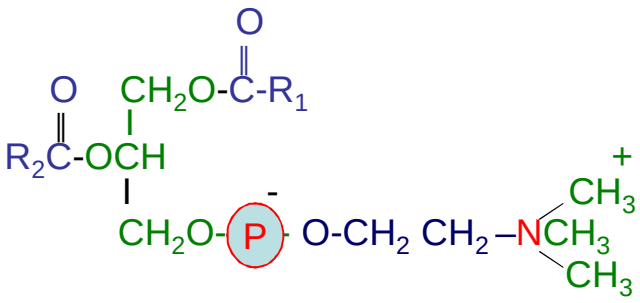
- **Serine**
- **Ethanolamine**
- **Choline**
- **Inositol**
- **Glycerol**

Phosphatidyl -





myo-Inositol



Phosphatidyl Choline (Lecithin)

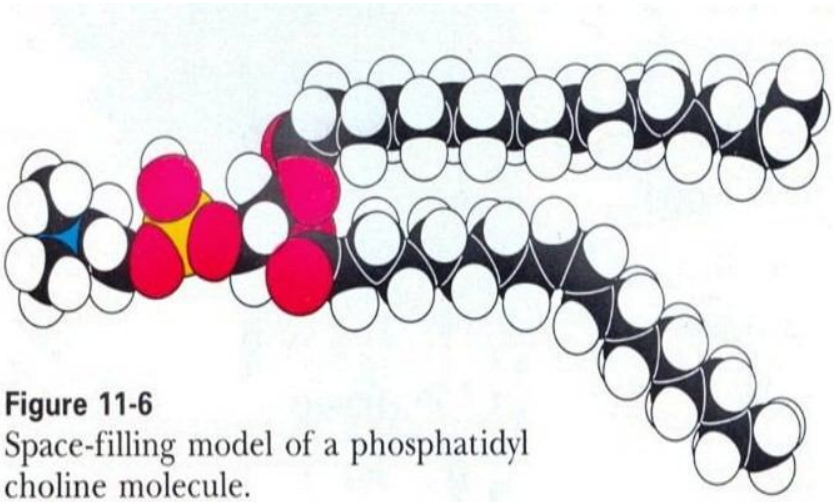
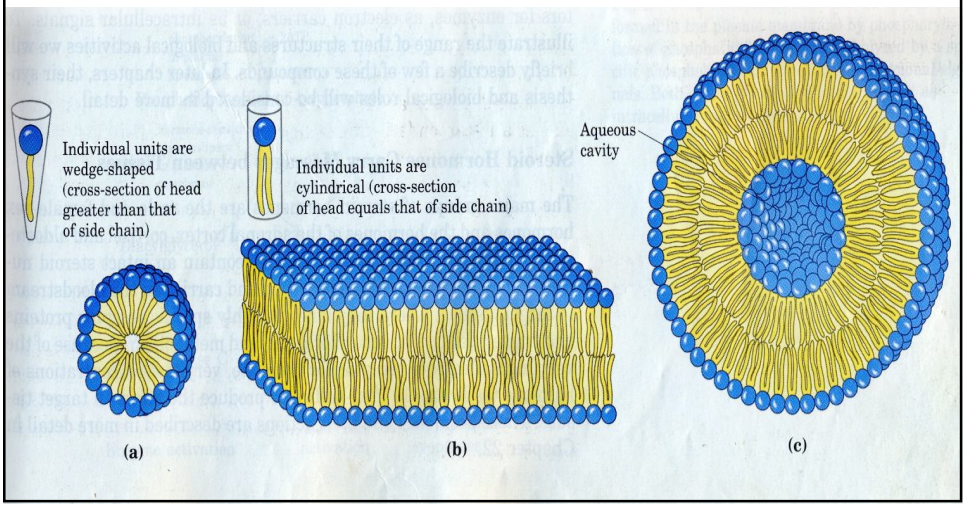
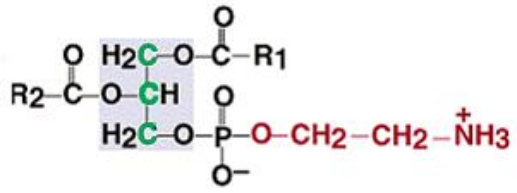


Figure 11-6
Space-filling model of a phosphatidyl choline molecule.





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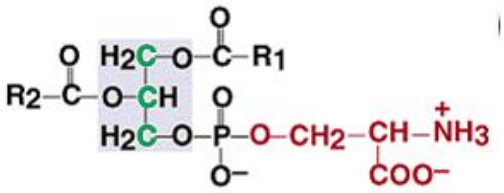

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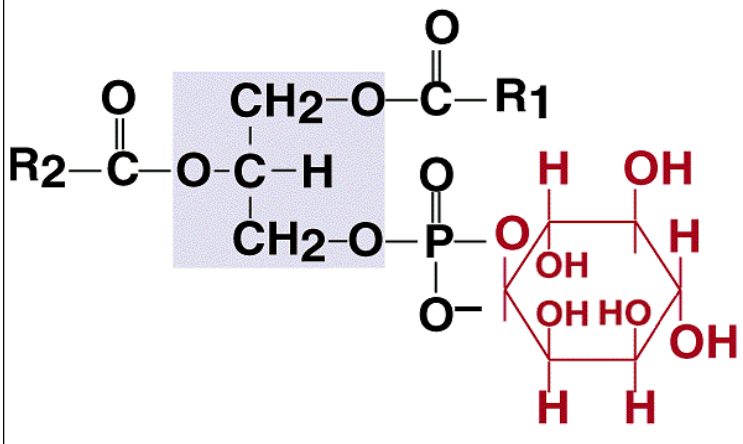
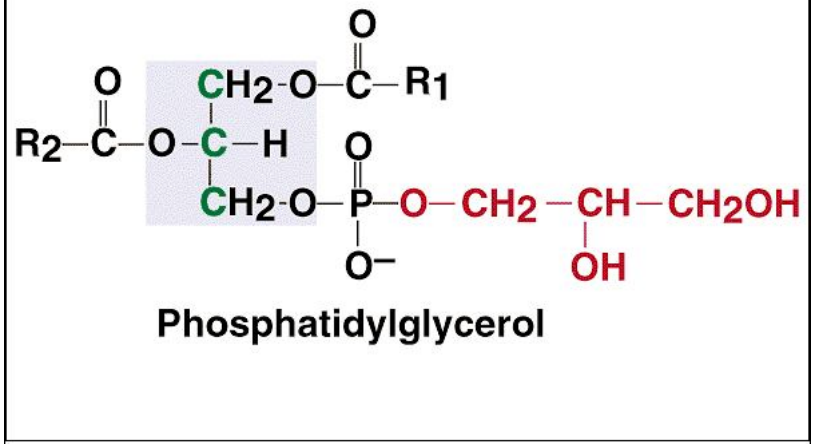
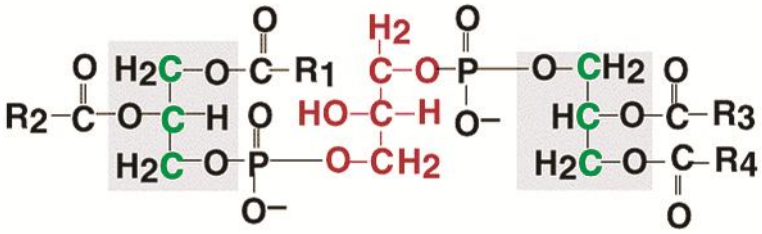
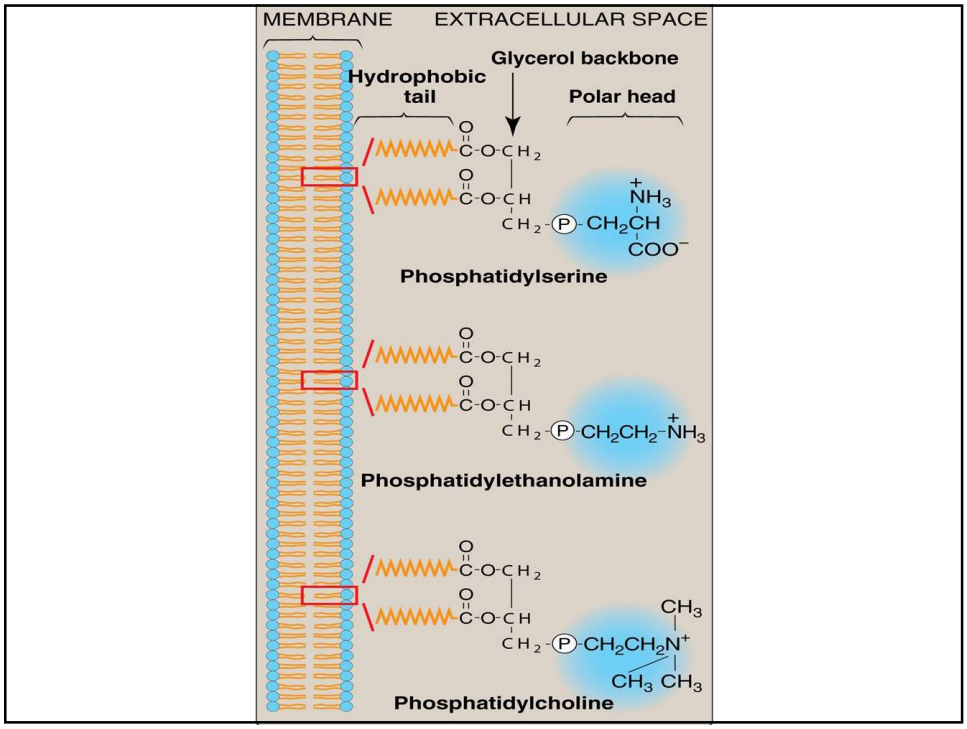


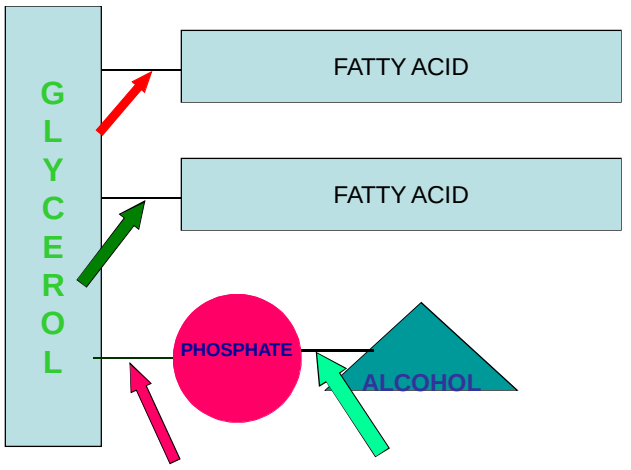
Phosphatidylinositol





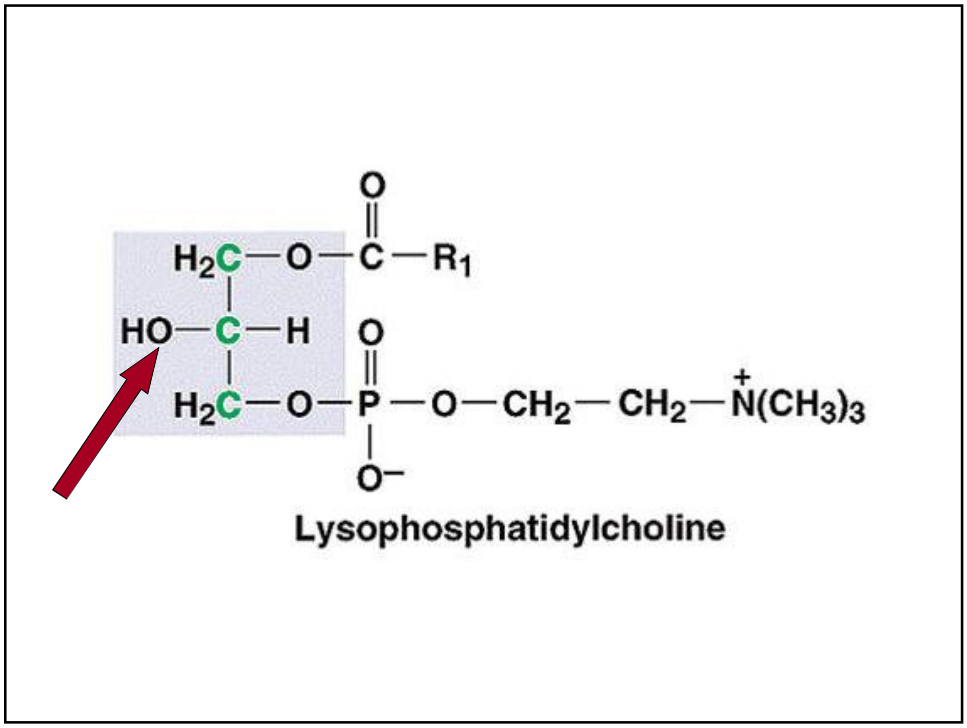
Cardiolipin: Two molecules of Phosphatidic Acid Connected through **Glycerol**

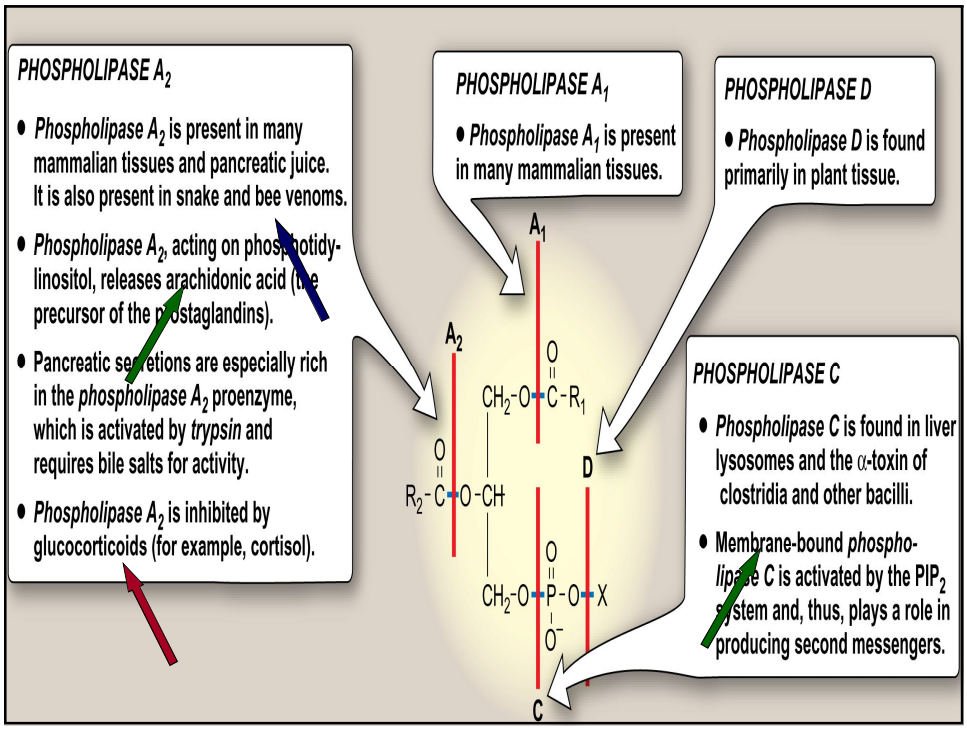


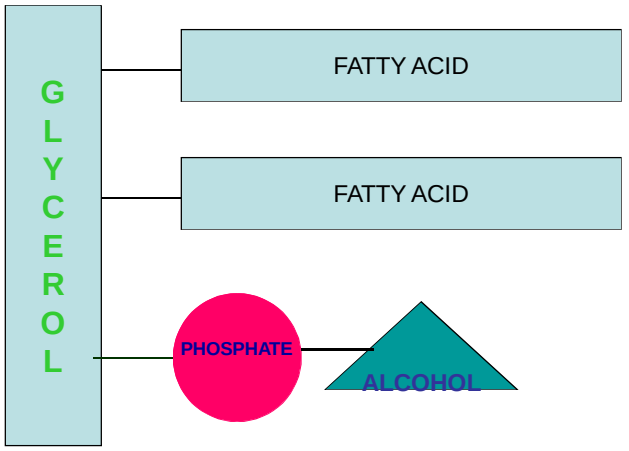


Degradation of Phospholipids:

Phospholipase A_1
Phospholipase A_2
Phospholipase C
Phospholipase D


Lysophosphatidylcholine


PHOSPHOLIPASE A2
• Phospholipase A2 is present in many mammalian tissues and pancreatic juice. It is also present in snake and bee venoms.
• Phospholipase A2, acting on phosphotidylinositol, releases arachidonic acid (the precursor of the prostaglandins).
• Pancreatic secretions are especially rich in the phospholipase A2 proenzyme, which is activated by trypsin and requires bile salts for activity.
• Phospholipase A2 is inhibited by glucocorticoids (for example, cortisol).
PHOSPHOLIPASE A1
• Phospholipase A1 is present in many mammalian tissues.
PHOSPHOLIPASE D
• Phospholipase D is found primarily in plant tissue.
PHOSPHOLIPASE C
• Phospholipase C is found in liver lysosomes and the α-toxin of clostridia and other bacilli.
• Membrane-bound phospholipase C is activated by the PIP2 system and, thus, plays a role in producing second messengers.
A1
A2
D
C



Biosynthesis of glycerophospholipids

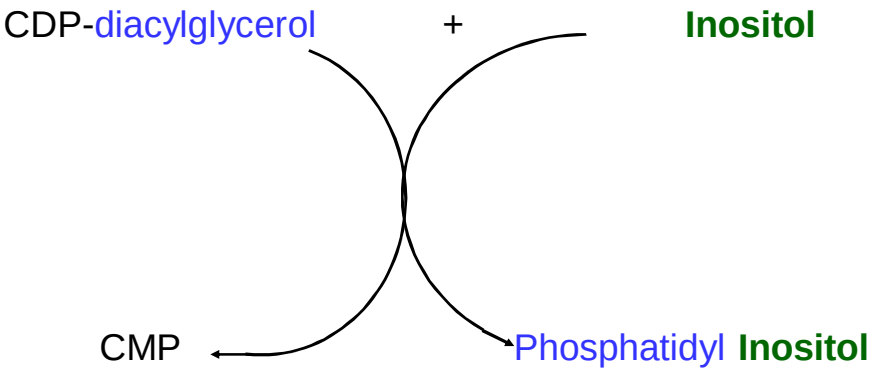
Alcohol$_1$ **Phosphate** **Alcohol$_2$**

Transfer ~(Phosphate-Alcohol$_1$) to Alcohol$_2$ or

Transfer ~(Phosphate-Alcohol$_2$) to Alcohol$_1$

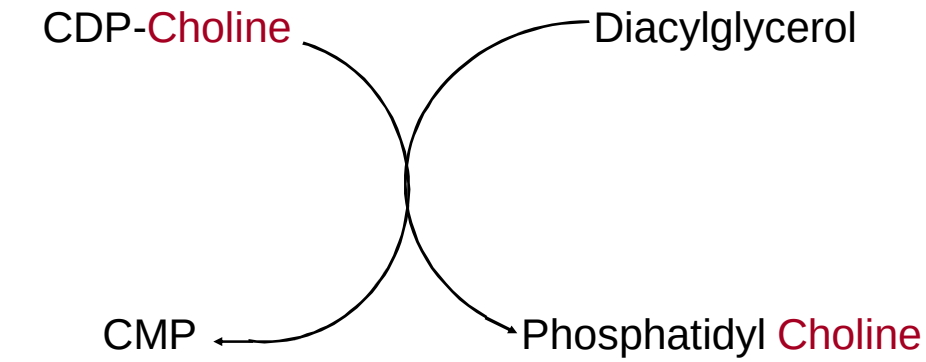
Synthesis of Phosphatidyl Inositol

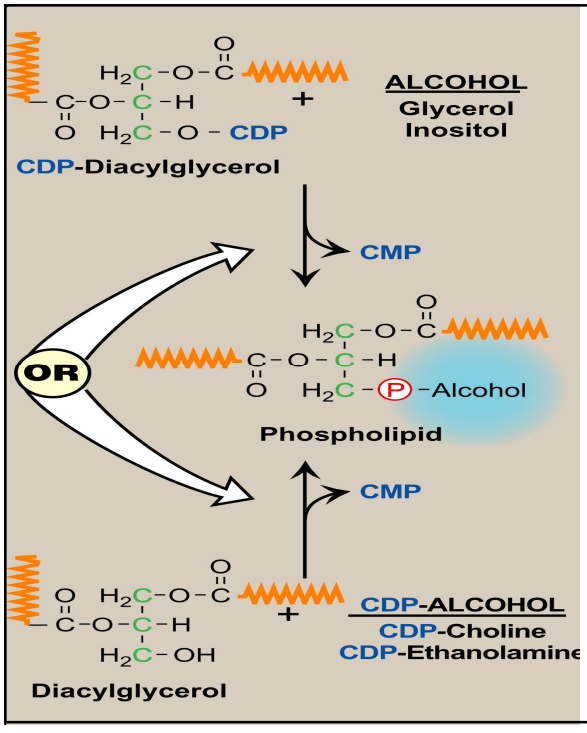
Transfer or Phosphatidic acid to Inositol

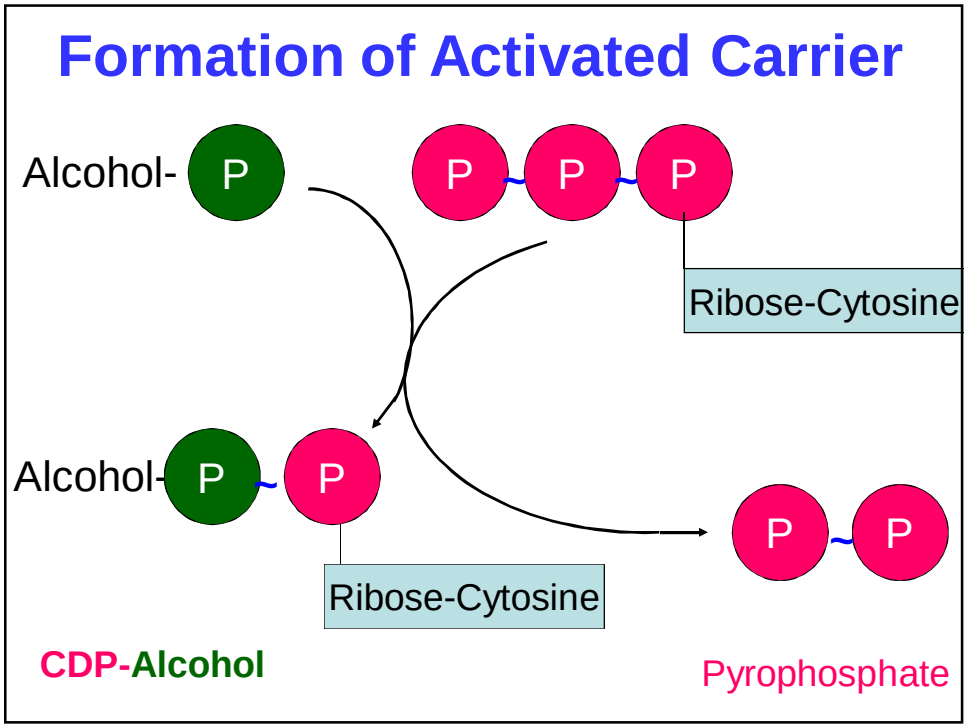


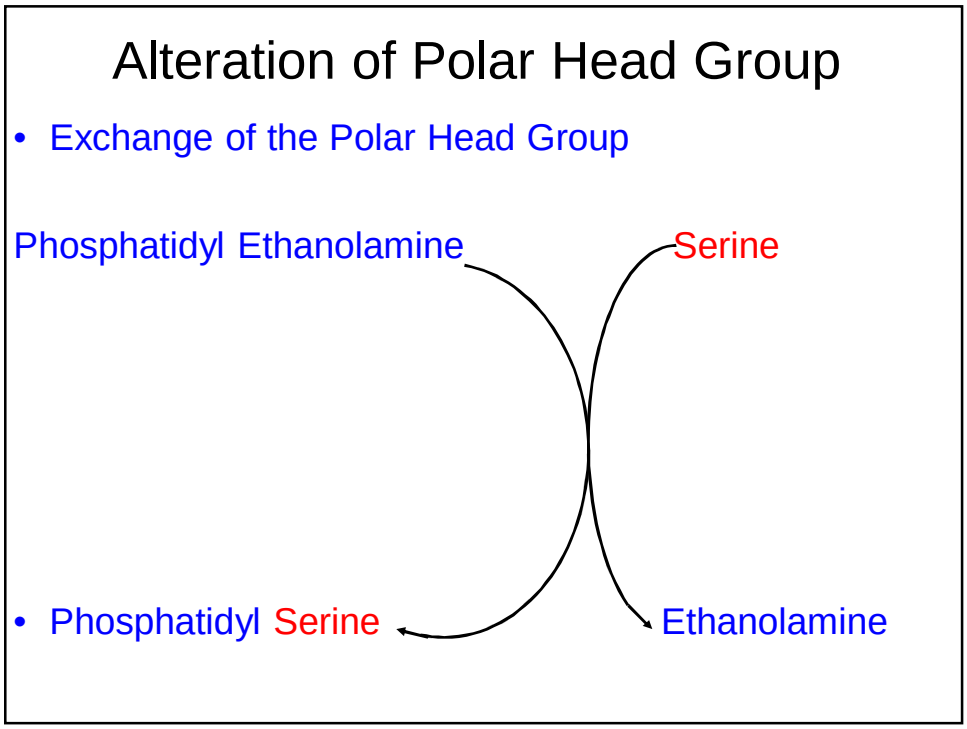
Synthesis of Phosphatidyl Choline

Transfer or Phosphocholine (Ethanolamine) to Diacylglycerol



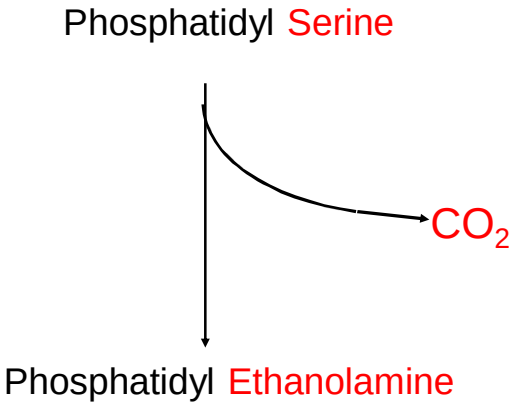



Formation of Activated Carrier
Alcohol-
P
P
P
P
Ribose-Cytosine
Alcohol-
P
P
Ribose-Cytosine
P
P
CDP-Alcohol
Pyrophosphate


Alteration of Polar Head Group
• Exchange of the Polar Head Group
Phosphatidyl Ethanolamine
Serine
• Phosphatidyl Serine
Ethanolamine

Alteration of Polar Head Group

- **Decarboxylation of Phosphatidyl Serine**



Alteration of Polar Head Group

- **Methylation of Phosphatidyl Ethanolamine**

S- Adenosyl Methionine (SAM); Methyl donor