

# Biosynthesis of phosphoglycerides

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- Phospholipids together with cholesterol form tissue lipids that are not consumed during starvation, so they were known as **constant fat**

- **Phospholipids include:**

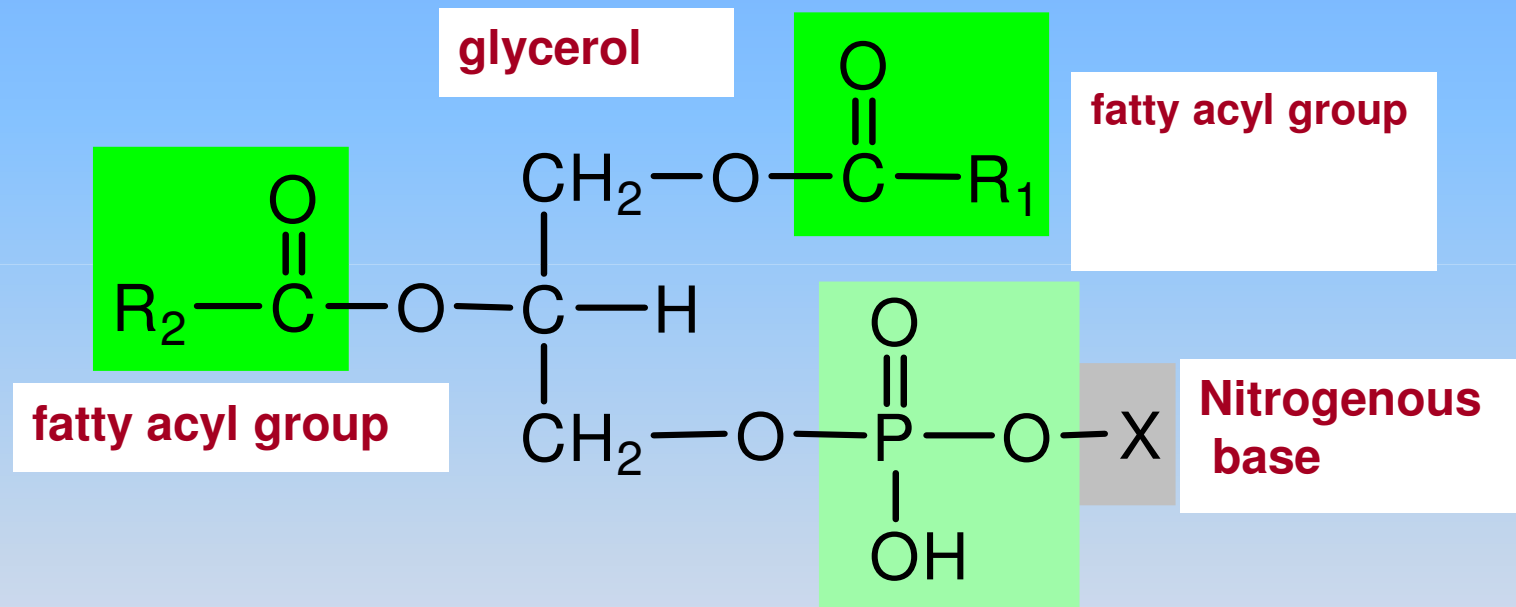
- a- Glycerophospholipids:**

- Lecithin (phosphatidyl choline) (PC)
    - Cephalin (phosphatidyl ethanolamine) (PE)
    - Phosphatidyl serine (PS)
    - phosphatidyl inositol (PI)
    - phosphatidylglycerol (PG)

- b- Sphingophospholipids:**

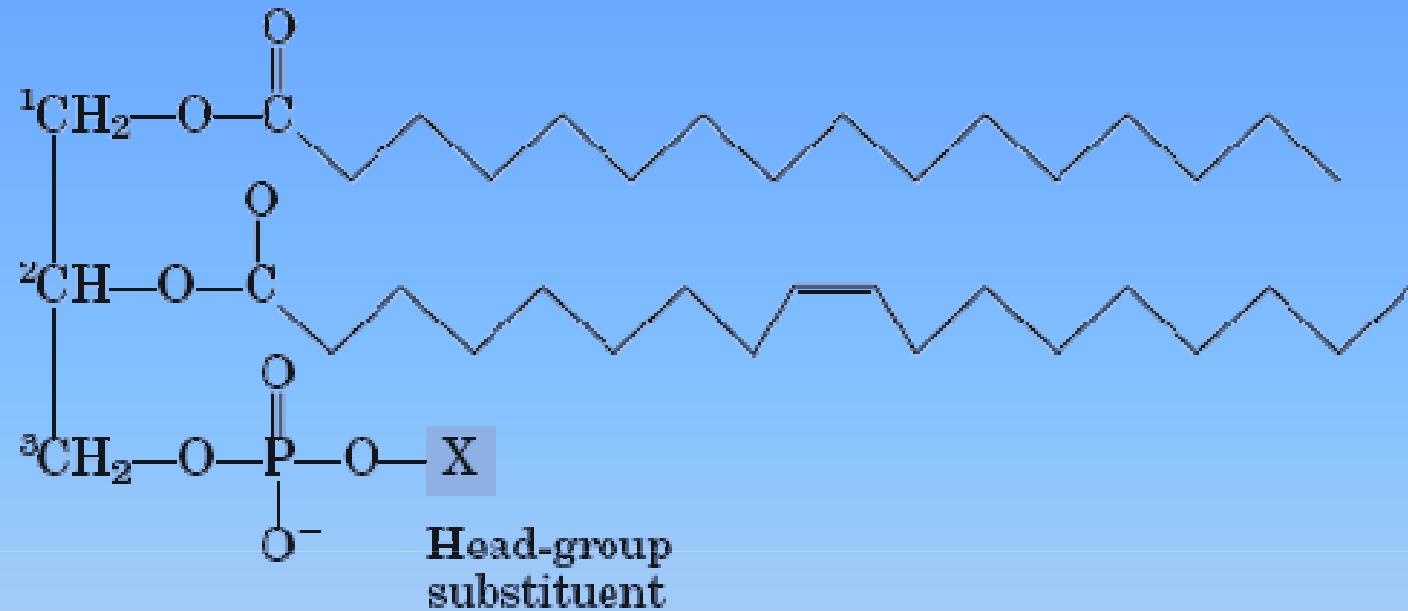
- Sphingomyelin

- **Glycerophospholipids** are lipids consists of a glycerol, 2 fatty acids, a phosphate group and a nitrogenous base.



## The basic structure of glycerophospholipid

Glycerophospholipid  
(general structure)



- In general, glycerophospholipids contain a **saturated fatty acid** at **C-1** and an **unsaturated fatty acid** (usually arachidonic acid) at **C-2**.

# Some common glycerophospholipid

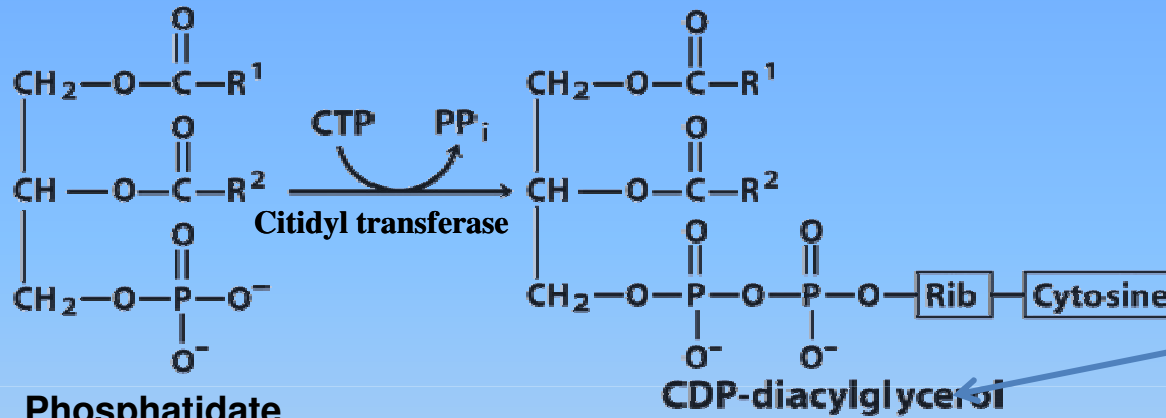
Name of glycerophospholipid	Name of X	Formula of X
Phosphatidic acid (PA)	—	— H
Phosphatidylethanolamine (PE)	Ethanolamine	— CH <sub>2</sub> —CH <sub>2</sub> — $\overset{+}{N}H_3$
Phosphatidylcholine (PC)	Choline	— CH <sub>2</sub> —CH <sub>2</sub> — $\overset{+}{N}(CH_3)_3$
Phosphatidylserine (PS)	Serine	— CH <sub>2</sub> —CH— $\overset{+}{N}H_3$   COO <sup>-</sup>
Phosphatidylglycerol (PG)	Glycerol	— CH <sub>2</sub> —CH—CH <sub>2</sub> —OH   OH

# Synthesis of Glycerophospholipids

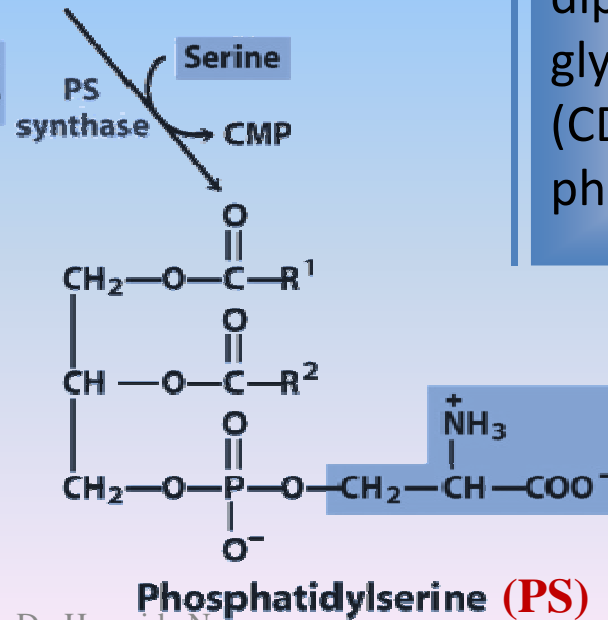
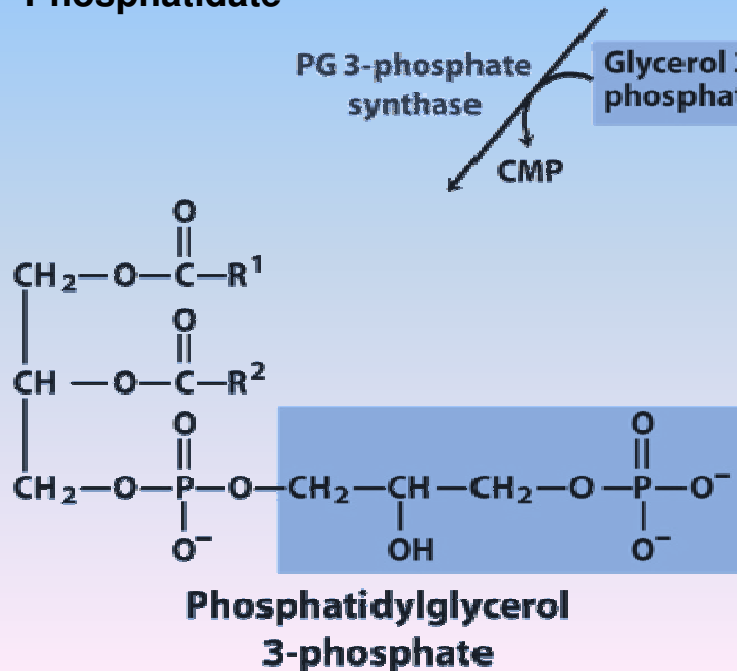
- **Location:**
  - All tissue of body, especially liver & kidney
  - Endoplasmic reticulum
- **Sources**
  - FA, Glycerol: from carbohydrate
  - poly unsaturated fatty acid from plant oil
  - Choline, ethanolamine, serine, inositol: from food or synthesis in body
  - ATP, CTP
  - Enzymes and cofactors

# Phospholipid Synthesis

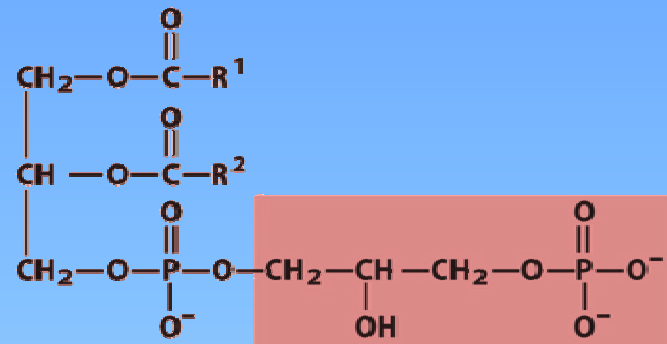
## (CDP-Diacylglycerol pathway, De Novo synthesis)



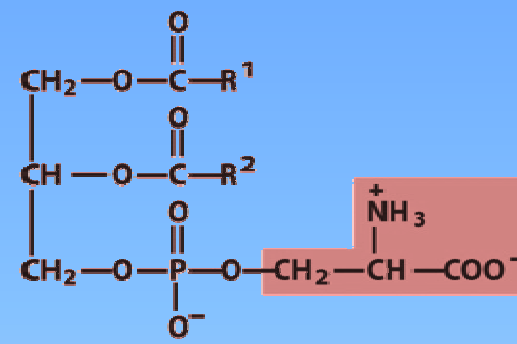
Formation of cytidine diphosphodiacylglycerol (CDP-DAG, activated phosphatidyl unit)



# Phospholipid Synthesis (cont...)

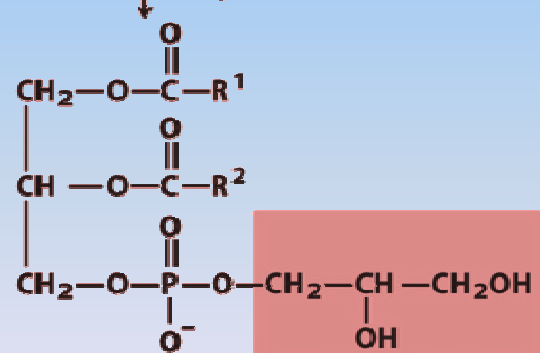


**Phosphatidylglycerol  
3-phosphate**



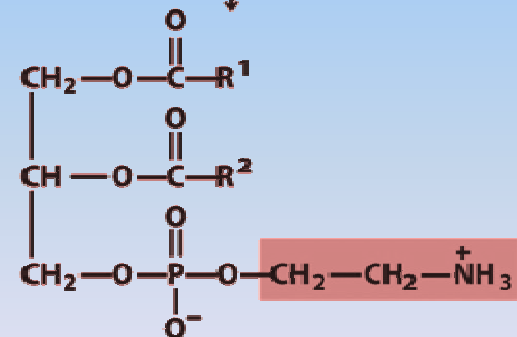
**Phosphatidylserine**

PG 3-phosphate  
phosphatase  
 $\xrightarrow[\text{P}_i]{\text{H}_2\text{O}}$



**Phosphatidylglycerol (PG)**

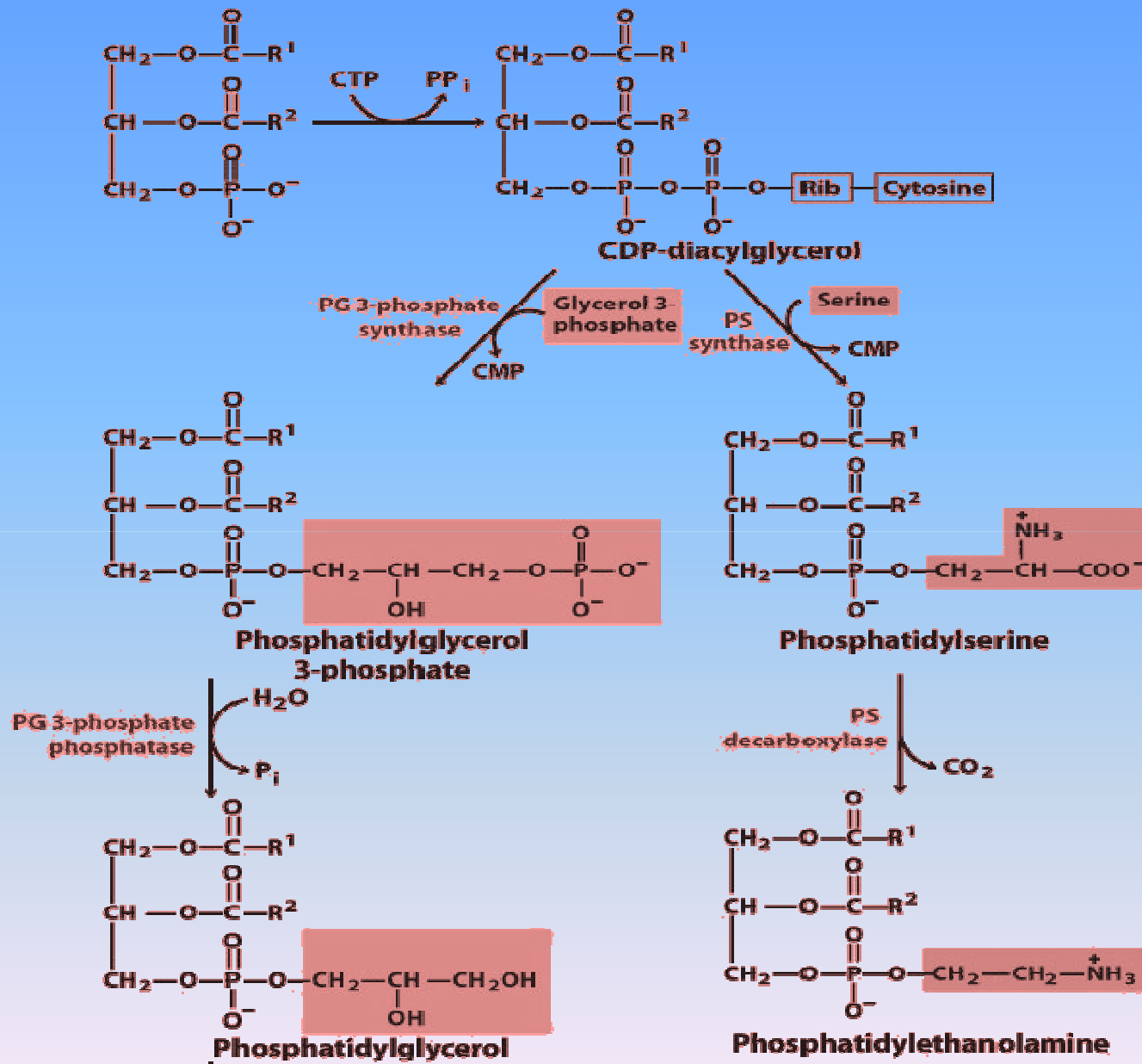
PS  
decarboxylase  
 $\xrightarrow[\text{CO}_2]{}$



**Phosphatidylethanolamine (PE)**



# Phospholipid Synthesis



# Phosphatidylcholine Synthesis in Mammals (salvage pathway)

- **In mammals**, phosphatidyl choline (PC) (lecithin) is synthesized by pathway that utilizes choline obtained from diet (It is the **major** pathway)
- Also phosphatidylethanolamine ( PE) ( cephalin) can be synthesized from ethanolamine by similar reactions (salvage pathway) primary pathway for synthesis of PE in liver and brain

