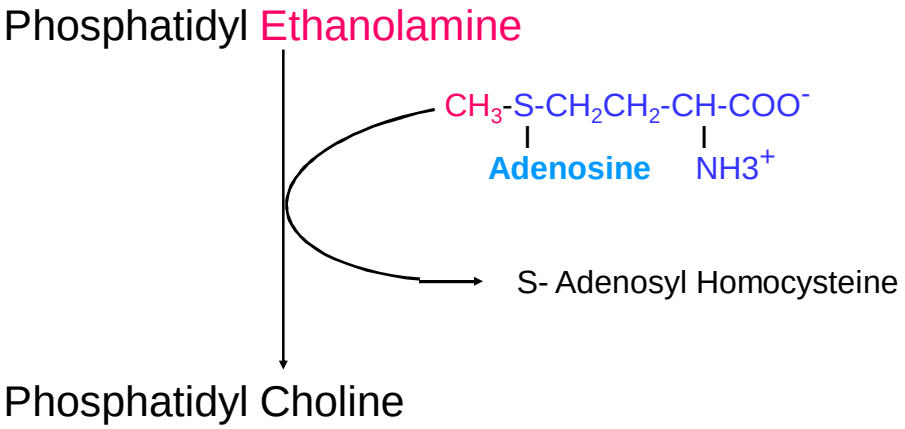
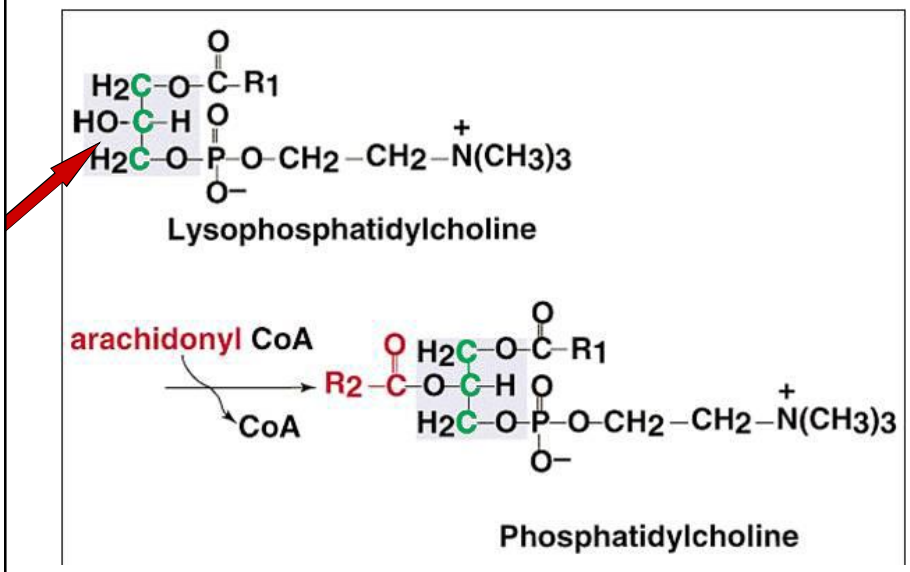
Alteration of Polar Head Group

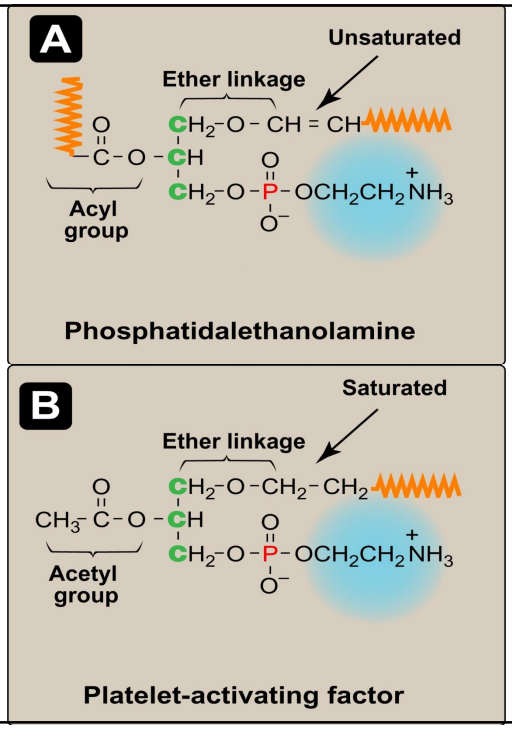
- **Methylation of Phosphatidyl Ethanolamine**

S- Adenosyl Methionine (SAM); Methyl donor

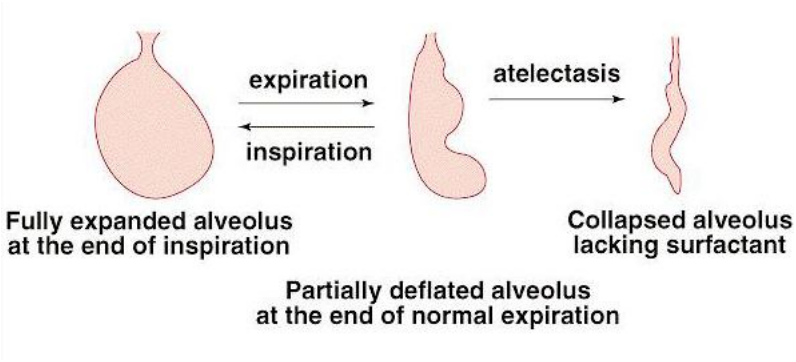


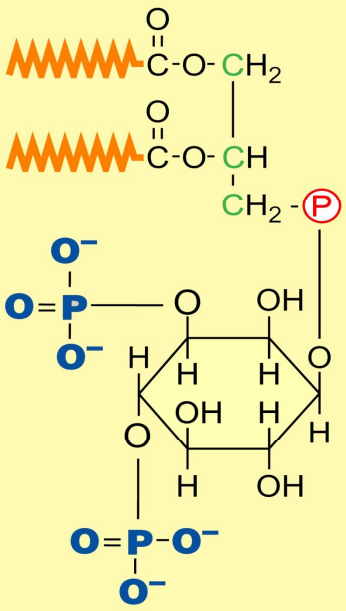
Remodeling Phospholipids: Changing the Fatty Acid



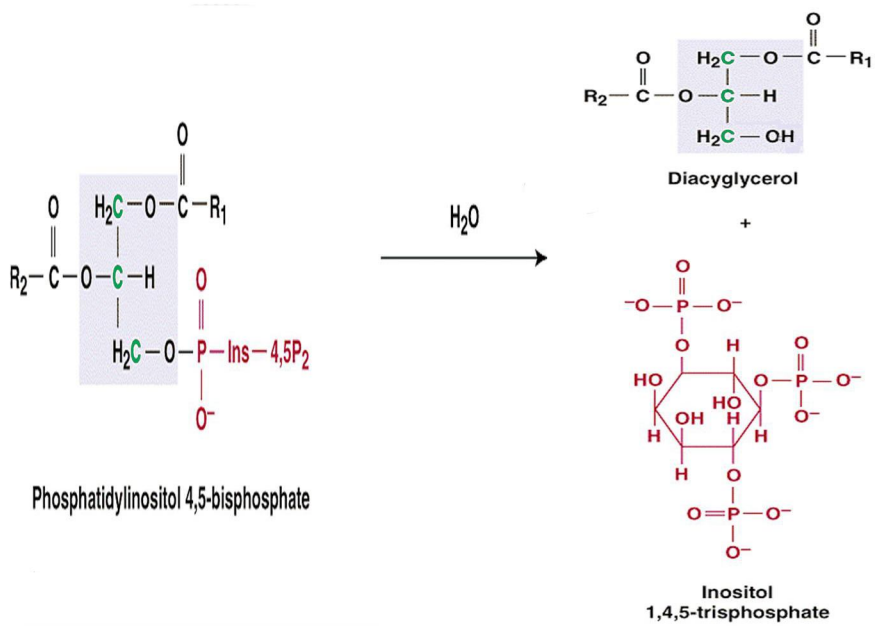


Surfactant Action of Phospholipids





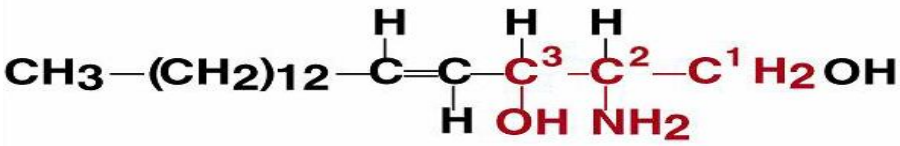
Phosphatidylinositol 4,5-bisphosphate



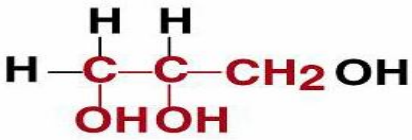
Metabolism of Sphingolipids

Sphingophospholipids
Glycosphingolipids
Lippincott's Chapter 17

Sphingosine; Amino Alchol



Sphingosine



Glycerol

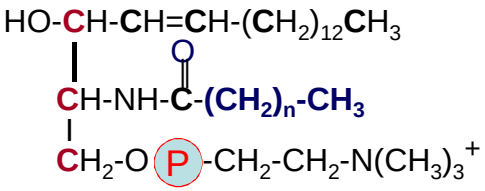
Sphingosine; Amino Alchol

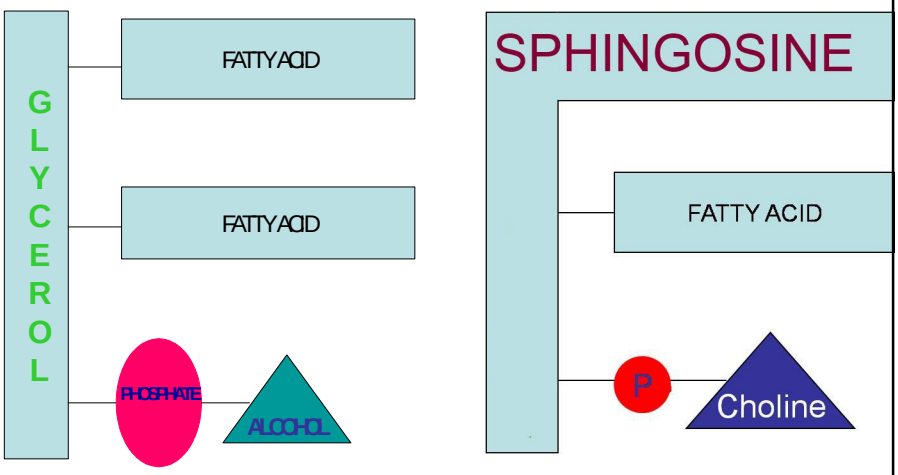
HO-**C**H-**C**H=**C**H-(**C**H$_2$)$_{12}$**C**H$_3$
|
CH-NH$_2$
|
CH$_2$-OH

Ceramide: Fatty Acid to joined to Sphingosine

HO-**C**H-**C**H=**C**H-(**C**H$_2$)$_{12}$**C**H$_3$
|
CH-NH-**C**-(**CH$_2$)$_n$-CH$_3$**
|
CH$_2$-OH

Sphingomyelin is Phosphocholine Ester of Ceramide





PHOSPHOACYLGLYCEROL **Sphingophospholipids**

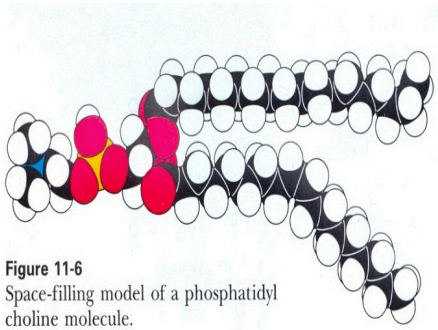


Figure 11-6
Space-filling model of a phosphatidyl choline molecule.

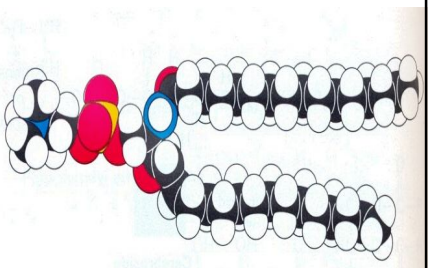
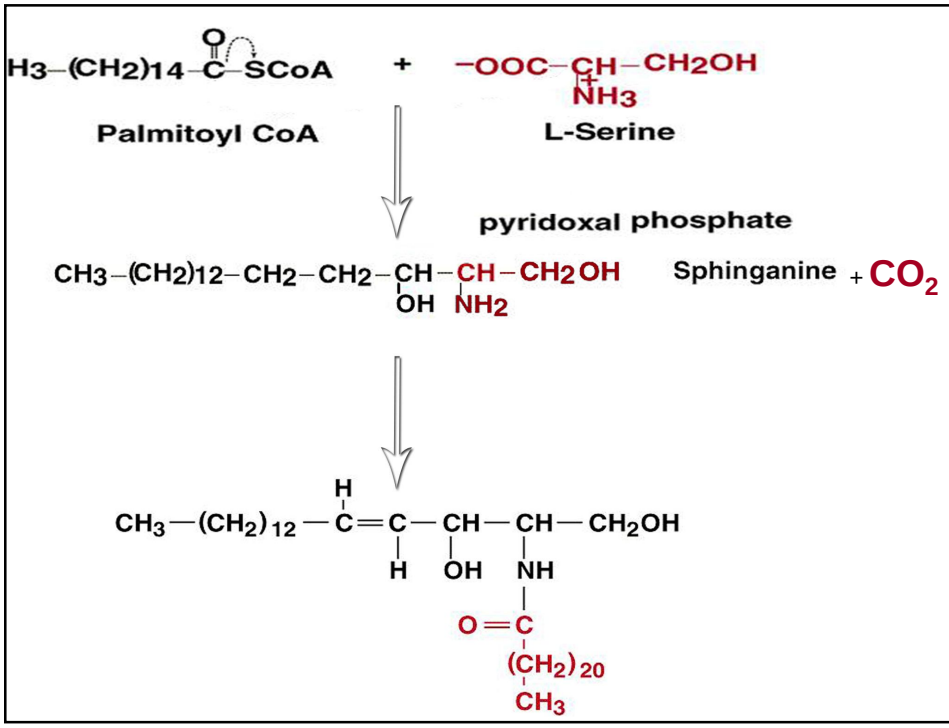
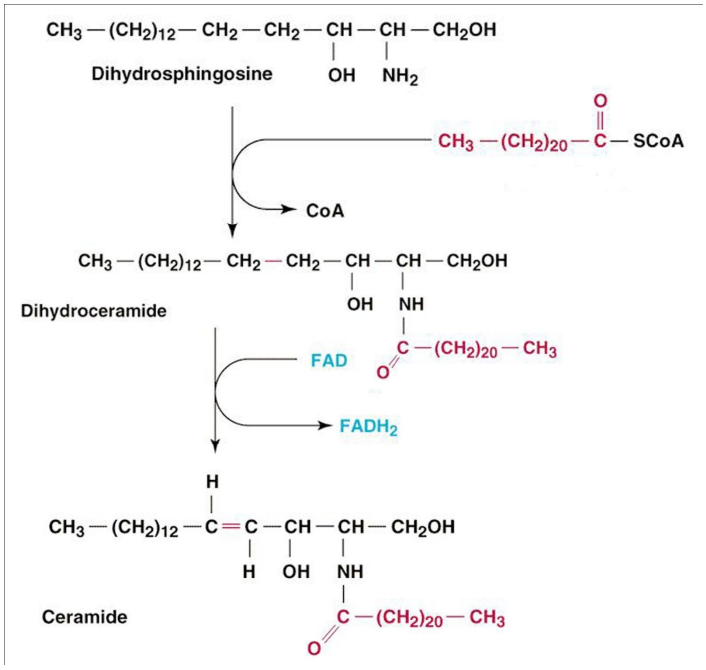
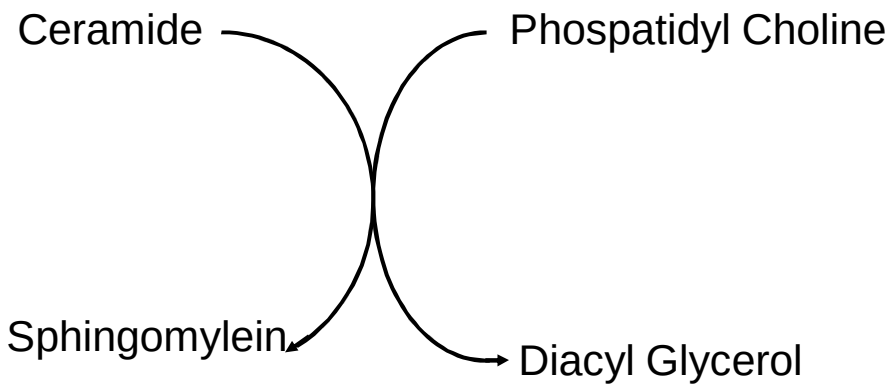


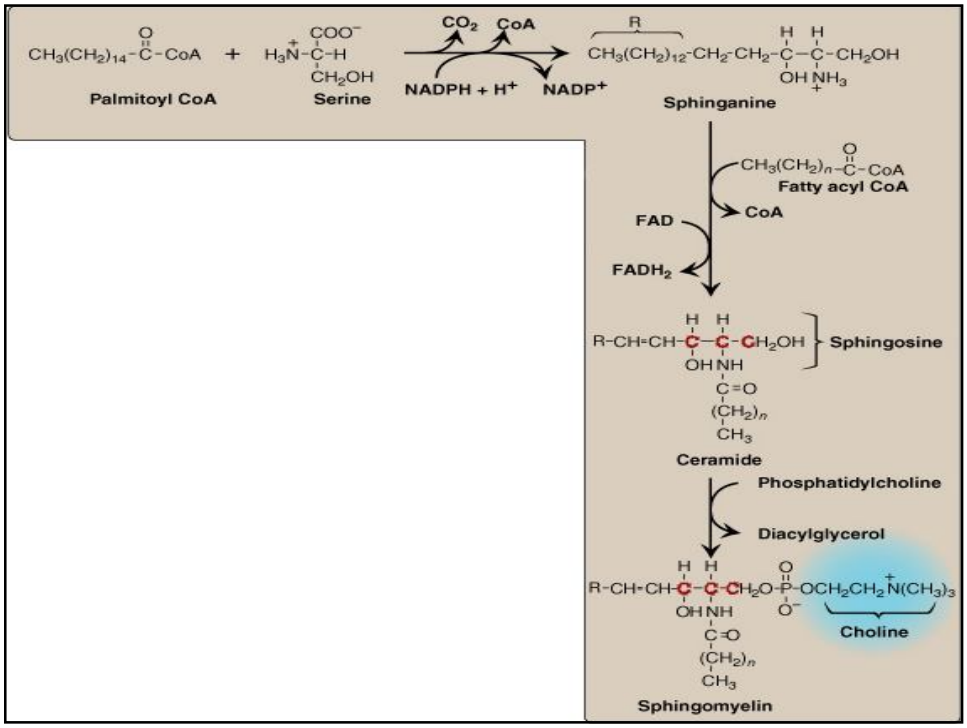
Figure 11-7
Space-filling model of a sphingomyelin molecule.





Transfer of Phosphocholine to Ceramide Produces Sphingomylein





Glycolipids are Formed by Linking one or More Sugars to Ceramide

Ceramide +

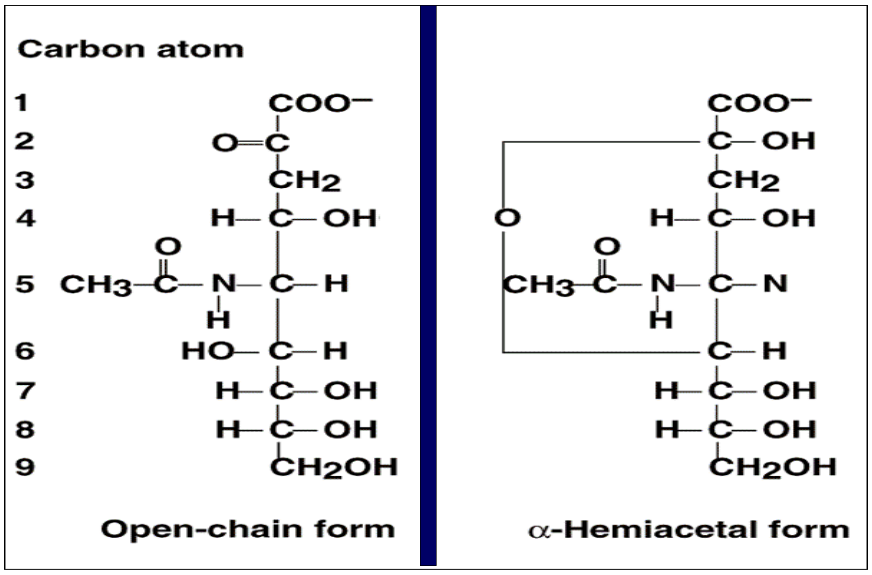
-Glucose or Galactose => Cerebroside

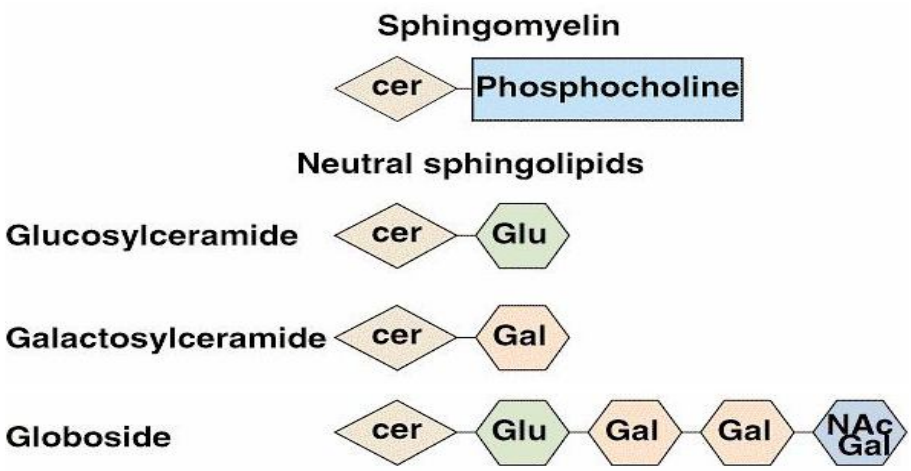
-Sulfated Galactose => Sulfoglycosphingolipids

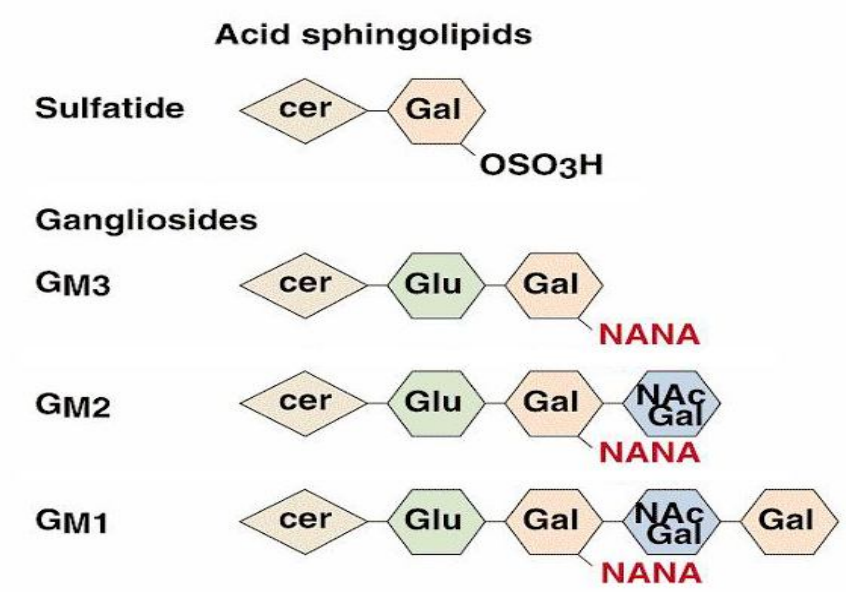
-Oligosaccharide => Globoside

-Oligosaccharide with NANA => Gangliosides

N-Acetylneuraminic Acid (NANA)

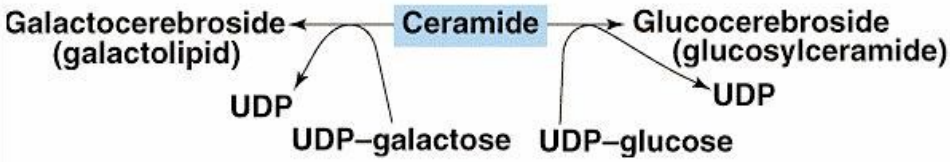


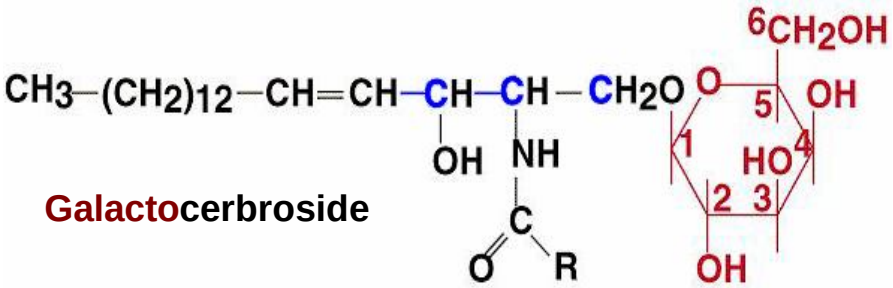




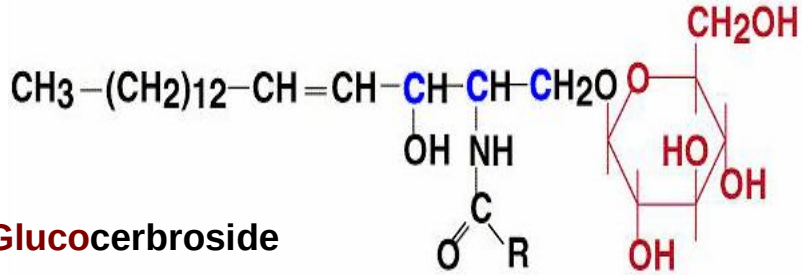
Activated Donors in Glycolipids Synthesis

- UDP-**Glucose**
- UDP-**Galactose**
- UDP-**N-Acetylgalctoseamine**
- CMP- **N-Acetylneuraminic Acid**



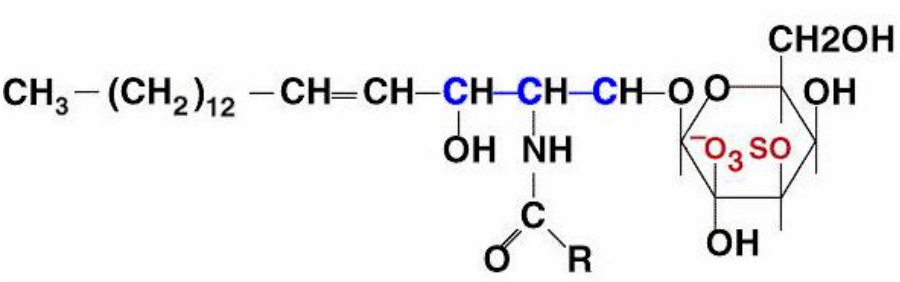


Galactocerbroside

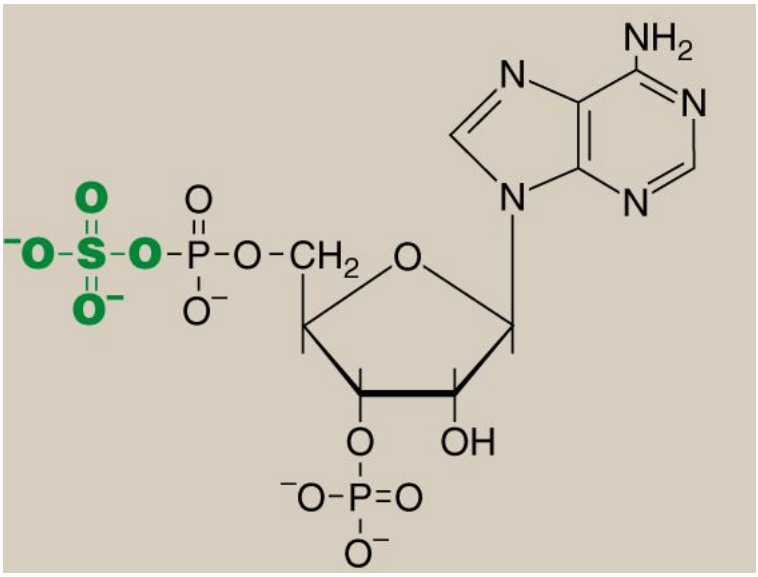


Glucocerbroside

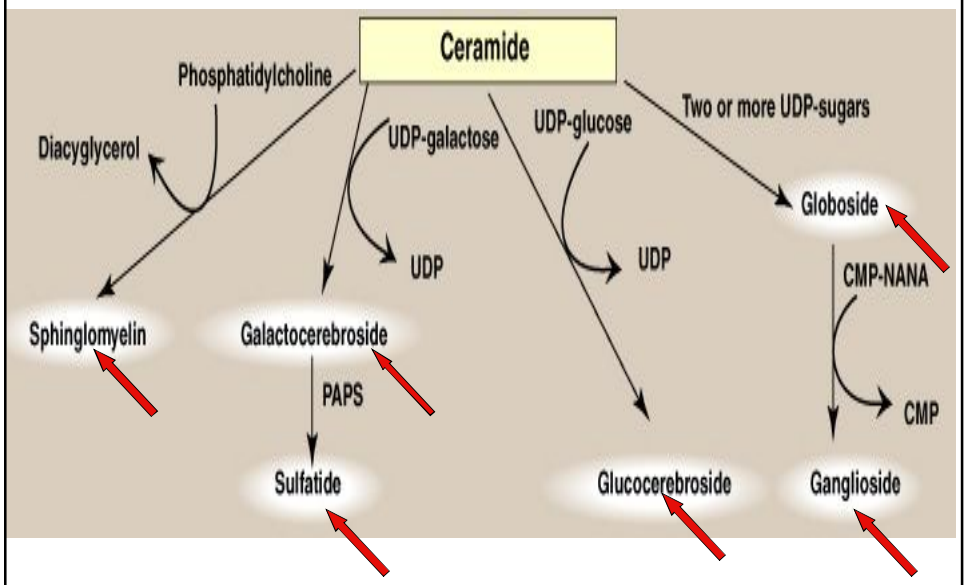
Transfer of Sulfate Group to Galactocerbroside Produces **Sulfogalatocerbroside** (Sulfatide)



Sulfate Group Donor

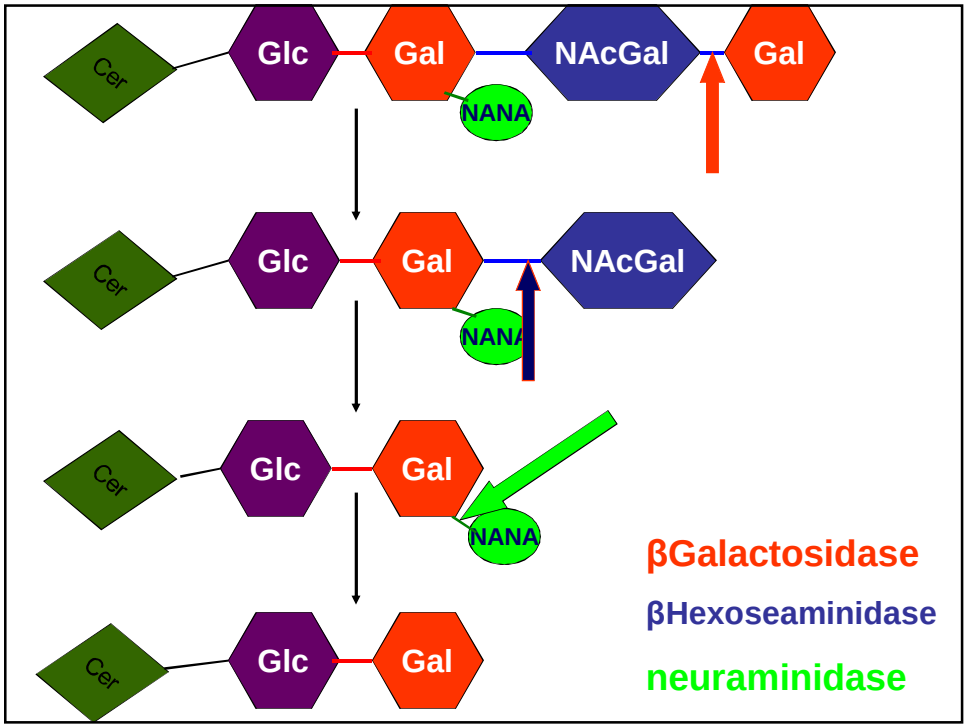


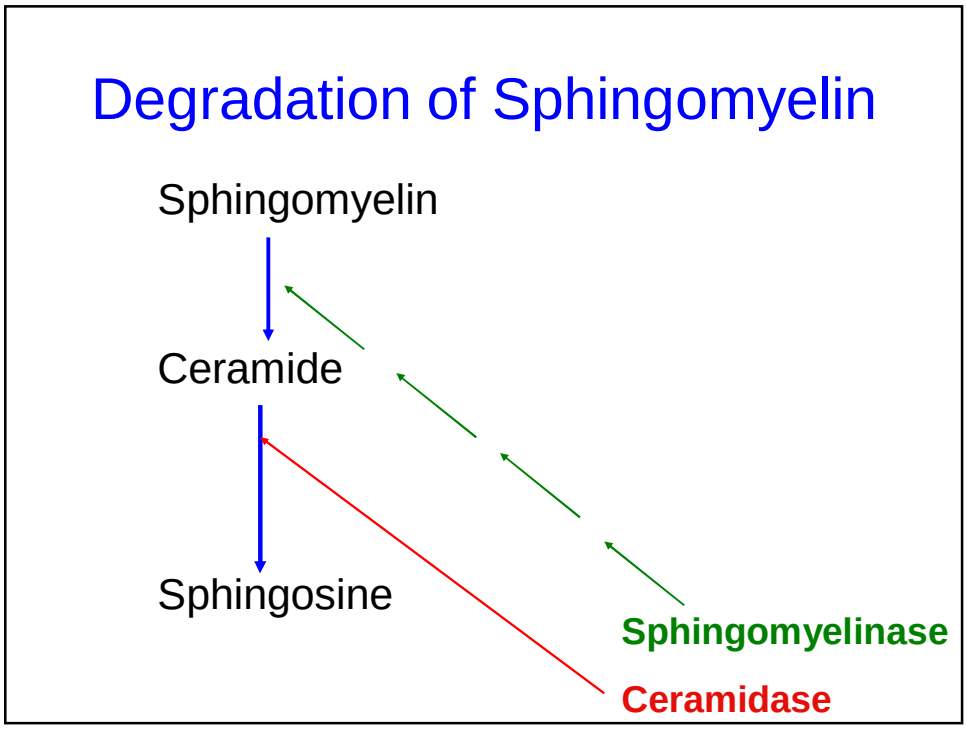
3 Phosphoadenosine 5 Phosphosulfate PAPS



Degradation of Sphingolipids

- Hydrolytic Enzymes, Specific for the Sugar
- - α **Galactosidase**
  - β **Galactosidase**
  - **neuraminidase**
  - **Hexoaminidase**
- In Lysosomes
- Enzymes are firmly Bound to Lysosomal Membrane.
- The pH Optimum 3.5-5.5
- Stepwise Sequential Process
- “Last on, First off”


Cer
Glc
Gal
NAcGal
Gal
NANA
Cer
Glc
Gal
NAcGal
NANA
Cer
Glc
Gal
NANA
Cer
Glc
Gal
βGalactosidase
βHexoseaminidase
neuraminidase


Degradation of Sphingomyelin
Sphingomyelin
Ceramide
Sphingosine
Sphingomyelinase
Ceramidase

Sphingolipidoses

- **Lipid Storage Diseases**
- **Defect in one of the Enzyme**
- **Inherited as Autosomal RecessiveDisease**
- **Accumalation of Specific Lipid**

  Substrate of the Defective Enzyme
- **Brain is Mostly Affected.**
- **Extent of Enzyme deficiency is the same in Different Tissues.**