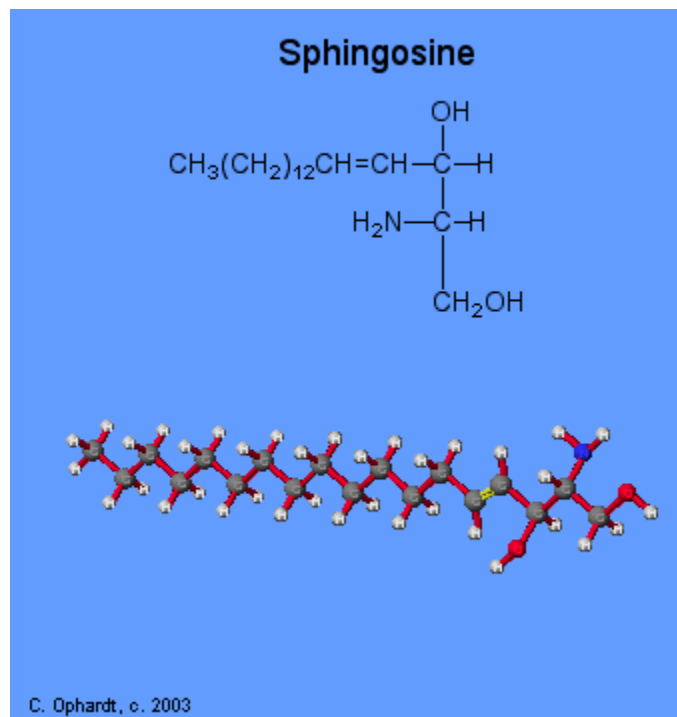


Sphingolipids

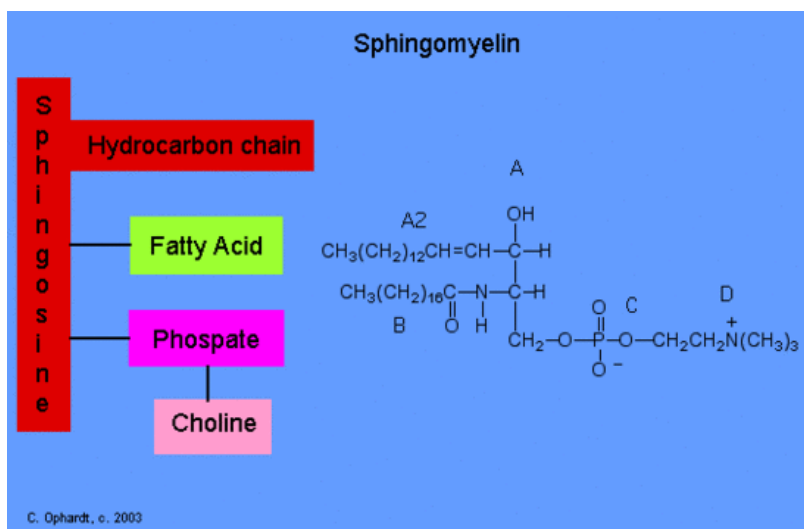
Sphingolipids are named after the sphinx in Greek mythology, part woman and part lion, who devoured all who could not answer her riddles. Sphingolipids appeared to Johann Thudichum in 1874 as part of the dangerous riddle of the brain. Sphingolipids are a second type of lipid found in cell membranes, particularly nerve cells and brain tissues. They do not contain glycerol, but retain the two alcohols with the middle position occupied by an amine.

Introduction

Sphingosine has three parts, a three carbon chain with two alcohols and amine attached and a long hydrocarbon chain. In sphingomyelin, the base sphingosine has several other groups attached as shown in the graphic on the left. A fatty acid is attached to the amine through amide bond. Phosphate is attached through a phosphate ester bond, and again through a phosphate ester bond to choline. The human brain and spinal cord is made up of gray and white regions. The white region is made of nerve axons wrapped in a white lipid coating, the myelin sheath, which provides insulation to allow rapid conduction of electrical signals. Multiple sclerosis caused by a gradual degradation of the myelin sheath.



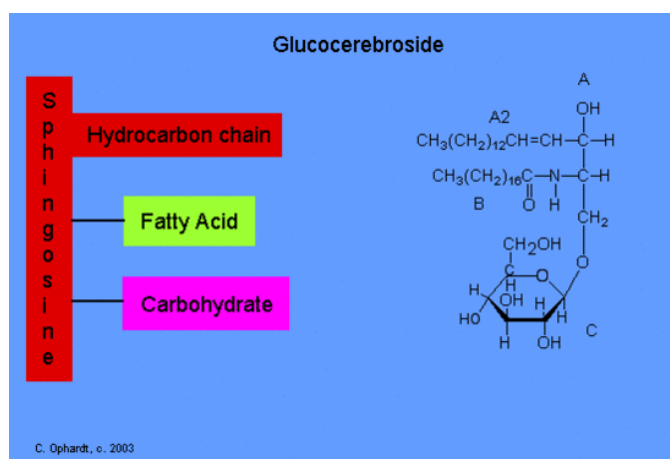
Sphingomyelins are located throughout the body in nerve cell membranes. They make up about 25 % of the lipids in the myelin sheath that surrounds and insulates cells of the central nervous system. Niemann-Pick disease is caused by a deficiency of an enzyme that breaks down excessive sphingomyelin, which then builds up on the liver, spleen, brain, and bone marrow. An affected child usually dies within several years.



Glycolipids and Cerebrosides

Glycolipids are complex lipids that contain carbohydrates. Cerebrosides are an example which contain the sphingosine backbone attached to a fatty acid and a carbohydrate. The carbohydrates are most often glucose or galactose. Those that contain several carbohydrates are called gangliosides. The example on the left is shown with glucose. Glucocerebroside has the specific function to be in the cell membranes of macrophages, (cells that protect the body by destroying foreign microorganisms. Galactocerebroside is found almost exclusively in the membranes of brain cells.

There are several genetic diseases resulting from the absence of specific enzymes which breakdown the glycolipids. Tay-Sachs, which mainly effects Jewish children, results in a build up of gangliosides and result in death in several years. Gaucher's disease results in the excessive build up of glucocerebroside resulting in severe anemia and enlarged liver and spleen.



Source: http://chemwiki.ucdavis.edu/Biological_Chemistry/Lipids/Non-glyceride_Lipids/Sphingolipids