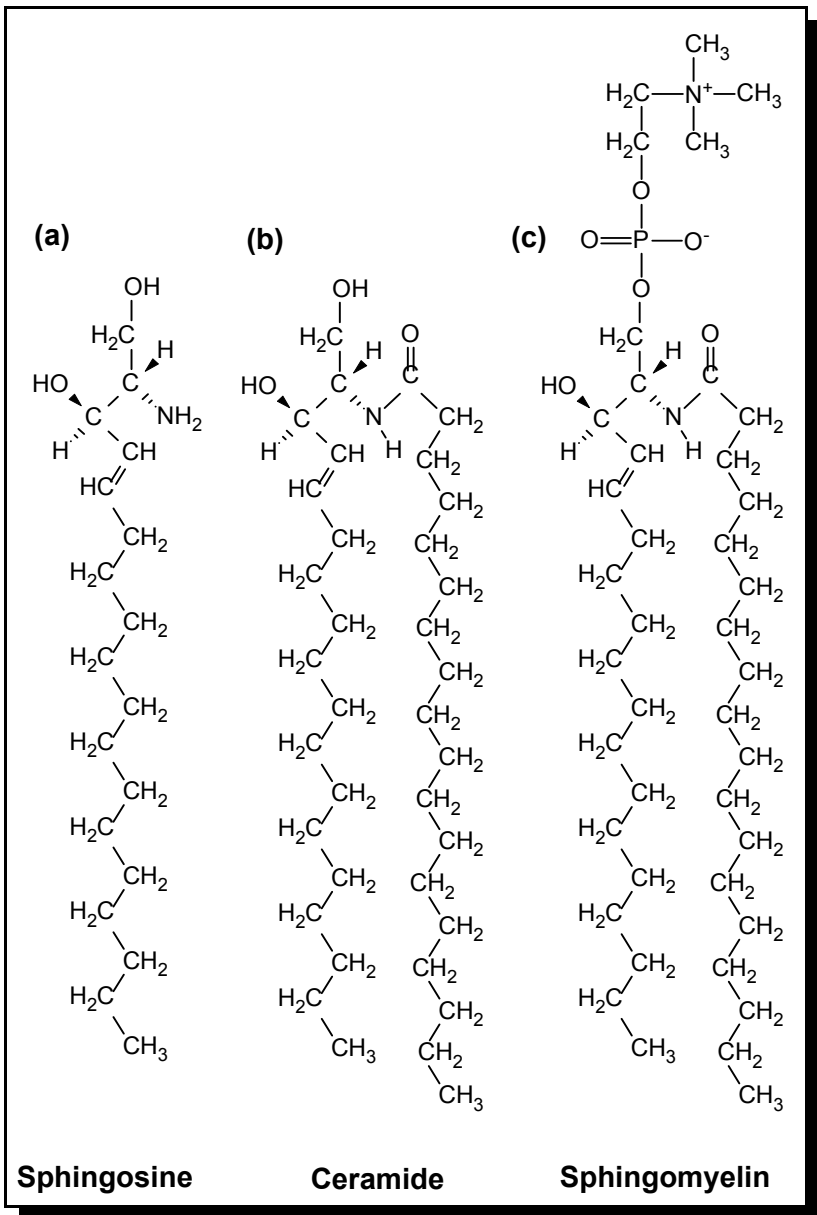


**Figure 2.** Structures of some phosphoglycerides. Note the common phosphatidic acid unit present in each structure.

diacylglycerol and triacylglycerol.



**Figure 3.** Structures of sphingosine, ceramide, and sphingomyelin. **(a)** Sphingosine is a long chain alcohol that serves as the backbone for sphingolipids. **(b)** Ceramide is formed by the attachment of a long-chain fatty acyl group (stearate in this case) to the amine group of sphingosine. **(c)** Sphingomyelin is formed by the addition of a phosphocholine group at the C-1 hydroxyl group of ceramide.

Displayed in figure 2 are the different specific classes of phosphoglycerides. **You should know the structures of the phosphoglycerides.** Notice that two molecules of phosphatidic acid esterified through their phosphate groups to a molecule of glycerol produces **cardiolipin**. Cardiolipin is often called *diphosphatidylglycerol* and is found exclusively in mitochondrial membranes.

The most common phosphoglycerides have fatty acids linked to carbons-1 and 2 of the glycerol backbone *via* ester linkages. In some phosphoglycerides, however, the fatty acid in the one position is not linked by an ester bond. *If the fatty acid in the 1-position is attached by an ether linkage, the lipid is called an ether lipid. If the fatty acid is attached by a vinyl ether linkage, the lipid is called a plasmalogen (a vinyl ether linkage is an ether linkage followed by a carbon-carbon double bond).* Note that the plasmalogens are a subset of the ether lipids.

If a phosphoglyceride loses one of its fatty acids it is called a **lysophospholipid**.

The structure of sphingomyelin is shown in figure 3. Examine the structures of the glycerophospholipids and sphingomyelin. Be sure to note the structural similarities and differences. Notice that sphingomyelin is based on the ceramide backbone, which is based on the sphingosine backbone. Sphingosine is derived from palmitoyl-CoA and serine.

**Discussion Questions for Discussion Group #10, 11/14/01: Atherosclerosis**

(Yes, I know this was on the last test, but it does not hurt to review this area again!)

1. A person with type I diabetes is found to have no signs of ketone bodies in plasma even when in diabetic shock. Which enzyme(s) of ketone body synthesis might be deficient? If cholesterol synthesis were normal, would this be a clue as to which enzyme might be deficient?
2. A patient homozygous for familial hypercholesterolemia (FH) was treated with lovastatin to lower LDL levels in the blood. This treatment did not have any effect on LDL levels. Why? After a number of heart attacks, a heart and liver transplant were done and LDL levels were dramatically lowered. Why were both organs replaced, and how did it help to reduce LDL levels?
3. A deficiency of apoprotein C-II results in the disease hyperlipoproteinemia type I, in which there is a massive increase in the concentration of plasma triacylglycerol. Provide an explanation for the clinical finding.
4. What abnormalities in serum lipoprotein profiles would you predict would occur in patients with each of the following three metabolic defects?
  - (a) An overproduction of VLDL
  - (b) A mutation in the gene for apoA-I resulting in reduced LCAT activity. (Consider both the exchange of cholesterol molecules and their net transfer.)
  - (c) A mutation in the gene for apoD (also called cholesteryl ester transfer protein or CETP) resulting in a defective protein.