

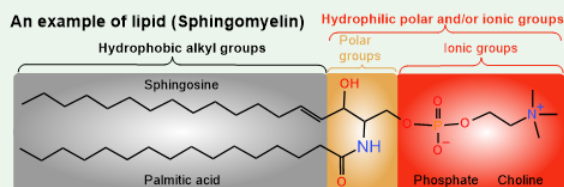
6.1: What are lipids?

Learning Objectives

- Define lipids and understand the basic characteristics of their structural components.

Lipids

Lipids can be defined as hydrophobic or amphiphilic biochemicals, where **hydrophobic** means water-hating or non-polar and **amphiphilic** means having both **hydrophilic**, i.e., water-loving or polar and **lipophilic**, i.e., fat-loving or non-polar components within the same molecule, but overall water insoluble.



Lipids have a long alkyl group that imparts hydrophobic or lipophilic character to the lipids and, usually, a polar and/or ionic group that is a hydrophilic component of the molecule, as illustrated in the figure on the right.

Lipids are a diverse group of biomolecules, including waxes, fats, fat-soluble vitamins (such as vitamins A, D, E, and K), phospholipids, steroids, terpenes, and others. They have a common property of being water insoluble. They can be dissolved in nonpolar solvents like ether or chloroform. Lipids have different functions in living things, including energy storage, signaling, hormonal activities, acting as structural components of cell membranes, etc.

Classification of lipids

Lipids are divided into eight categories: 1) fatty acyls; 2) glycerolipids; 3) glycerophospholipids; 4) sphingolipids; 5) saccharolipids; 6) polyketides; 7) steroids; and 8) prenol lipids. Six of the lipid categories are illustrated in Figure 6.1.1.

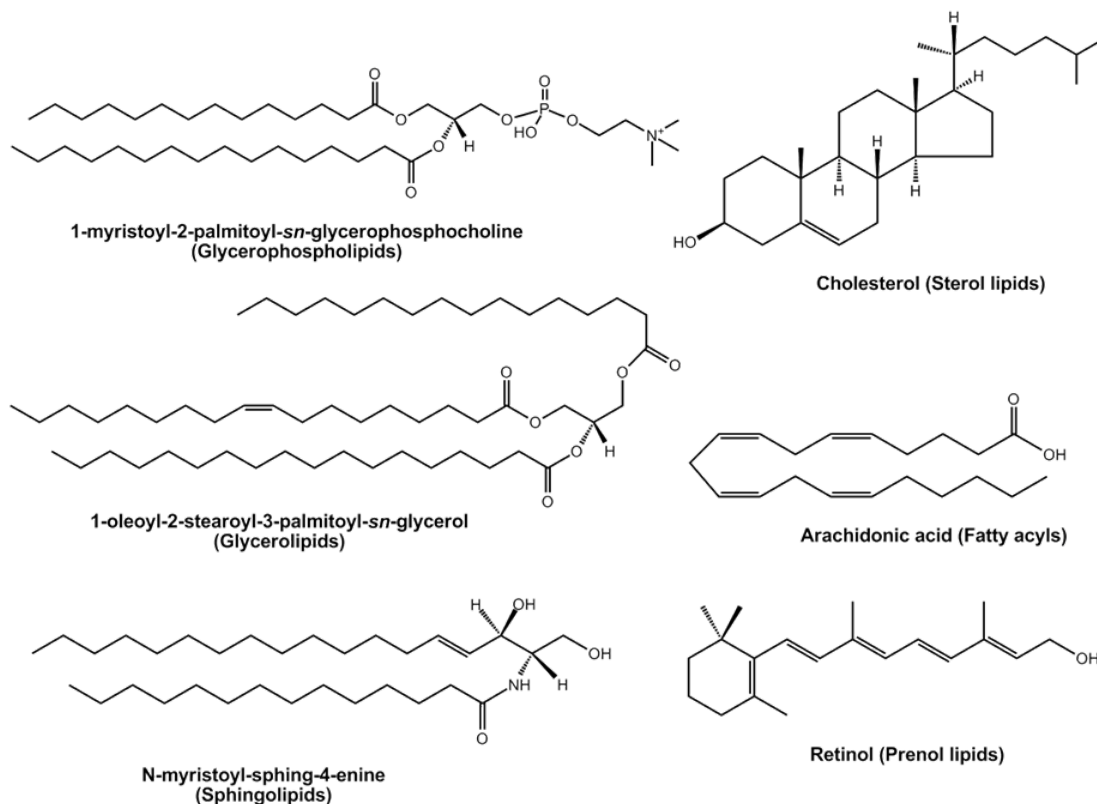
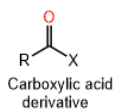
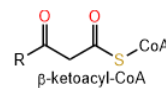


Figure 6.1.1: Examples of some lipid categories. (Copyright; Lmaps, GFDL 1.2, via Wikimedia Commons)

Five lipid categories contain long alkyl chain carboxylic acids or carboxylic acid derivatives. These include fatty acyls, glycerolipids, glycerophospholipids, sphingolipids, and saccharolipids. Polyketides are derived from condensation reactions of β -



ketoacyl subunits. Steroids and prenols are derived from condensation reactions of isoprene subunits. These categories of lipids are described in the following sections.



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