CHAPTER 3. STRUCTURES AND TYPES OF LIPID COMPONENTS IN BIOLOGICAL MEMRANES

Membrane lipids are amphipathic: one end of the molecule is hydrophobic, the other hydrophilic.

Their hydrophobic interactions with each other and their hydrophilic interactions with water direct their packing into sheets called membrane bilayers.

Glycerophospholipids Are Derivatives of Phosphatidic Acid

Glycerophospholipids, also called phosphoglycerides, are membrane lipids in which two fatty acids are attached in ester linkage to the first and second carbons of glycerol, and a highly polar or charged group is attached through a phosphodiester linkage to the third carbon.

Sphingolipids Are Derivatives of Sphingosine

Sphingolipids are major constituents of the plasma membrane. Sphingolipids have a polar head group and two nonpolar tails, but unlike glycerophospholipids and galactolipids they contain no glycerol. Sphingolipids are found in membranes of both plant and animal cells.

Ceramide

Carbons C-1, C-2, and C-3 of the sphingosine molecule are structurally analogous to the three carbons of glycerol in glycerophospholipids. When a fatty acid is attached in amide linkage to the -NH2 on C-2, the resulting compound is a ceramide, which is structurally similar to a diacylglycerol. Ceramide is the structural parent of all sphingolipids.

Glycosphingolipids

Glycosphingolipids, which occur largely in the outer face of plasma membranes, have head groups with one or more sugars connected directly to the -OH at C-1 of the ceramide moiety; they do not contain phosphate.

Sterols

Sterols Have Four Fused Carbon Rings Sterols are structural lipids present in the membranes of most eukaryotic cells. The characteristic structure of this fifth group of membrane lipids is the steroid nucleus, consisting of four fused rings, three with six carbons and one with five. Cholesterol, the major sterol in animal tissues, is amphipathic, with a polar head group (the hydroxyl group at C-3) and a nonpolar hydrocarbon body (the steroid nucleus and the hydrocarbon side chain at C-17), about as long as a 16-carbon fatty acid in its extended form.