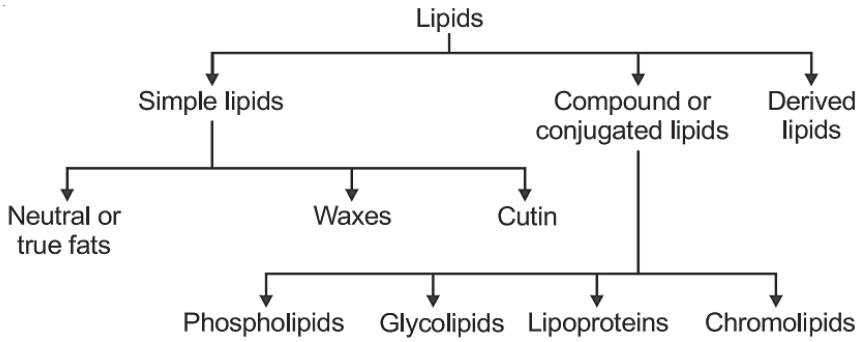
## LIPIDS

Lipids, consisting predominantly of carbon and hydrogen with minimal oxygen, exhibit water insolubility but dissolve in organic solvents like ether, benzene, and acetone. Unlike polymers, lipids are assembled from smaller molecules through dehydration reactions. They encompass simple fatty acids, glycerol (trihydroxy propane), and various complex structures with phosphorus and phosphorylated organic compounds.

### Classification of Lipids

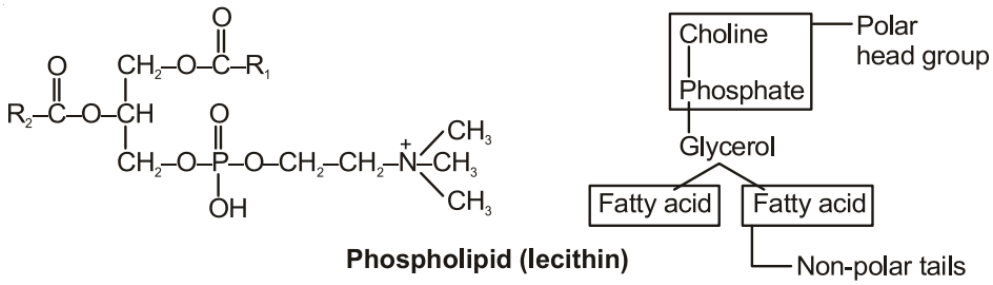



**Simple Lipids:**

- **Neutral or True Fats (Glycerides):** These are esters of fatty acids with glycerol, termed glycerides. A fat molecule typically comprises one glycerol molecule and one to three molecules of identical or different long-chain fatty acids.
- Glycerol, with three carbons each carrying a hydroxyl (-OH) group, forms the backbone.
- Fatty acids, unbranched carbon chains with a carboxylic group and an R group, may be saturated (no double bond) or unsaturated (one or more double bonds).
- Example: Palmitic acid, stearic acid (saturated); Oleic acid, linoleic acid, linolenic acid, arachidonic acid (unsaturated).
- Classification based on the number of fatty acids attached: Monoglyceride (one), Diglyceride (two), and Triglyceride (three).
- Classification based on melting point: Fats (high melting point, solid at room temperature) - e.g., butter, ghee; Oils (low melting point, liquid at room temperature) - e.g., gingelly oil, sunflower oil.
- **Waxes:** These are esters of fatty acids with high molecular weight alcohols instead of glycerol.
  Examples: Bee wax, lanolin.
- Role in protection: Form water-insoluble coatings on surfaces like hair, skin, stems, leaves, and fruits.
- Bee wax is formed from palmitic acid and myricyl alcohol. Lanolin, or wool fat, creates a waterproof coating around animal fur.
- Bacteria causing diseases like tuberculosis and leprosy produce wax (wax-D) contributing to their pathogenicity.

**Compound or Conjugated Lipids:**

- **Phospholipids:** Composed of glycerol or another alcohol with (a) a phosphate group linked to one -OH group, (b) two fatty acid molecules connected to the remaining -OH groups, and (c) a nitrogen-containing choline molecule bound to the phosphate group.
- Found in cell membranes; lecithin is an example.

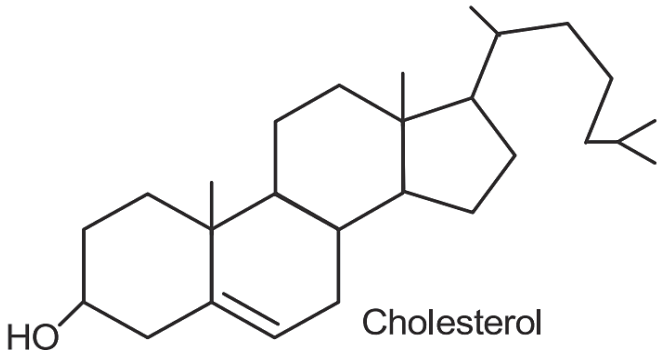



**Phospholipid (lecithin)**

- **Glycolipids:** Contain fatty acids, alcohol (sphingosine), and sugar (galactose or other). Present in the myelin sheath of nerve fibers and the outer surface of chloroplast cell membranes.
- **Lipoproteins:** Include lipids (mainly phospholipids) and proteins in their molecules, constituting cell membranes.
- **Chromolipids:** Contain pigments like carotenoids (e.g., Carotene, vitamin A).

**Derived Lipids**

**Steroids:** While not containing fatty acids, steroids share lipid properties due to four fused carbon rings. Steroids, particularly sterols like cholesterol, are prominent in animal tissues and play a vital role in cell membrane structure. Cholesterol, abundant in animal plasma membranes, is synthesized in the liver and obtained from animal fat-rich foods.




Cholesterol