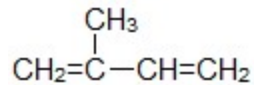


Name of sphingolipid	Name of X	Formula of X
Ceramide	—	— H
Sphingomyelin	Phosphocholine	$\text{P}-\text{O}-\text{CH}_2-\text{CH}_2-\text{N}(\text{CH}_3)_3$
Neutral glycolipids Glucosylcerebroside	Glucose	
Lactosylceramide (a globoside)	Di-, tri-, or tetrasaccharide	
Ganglioside GM2	Complex oligosaccharide	

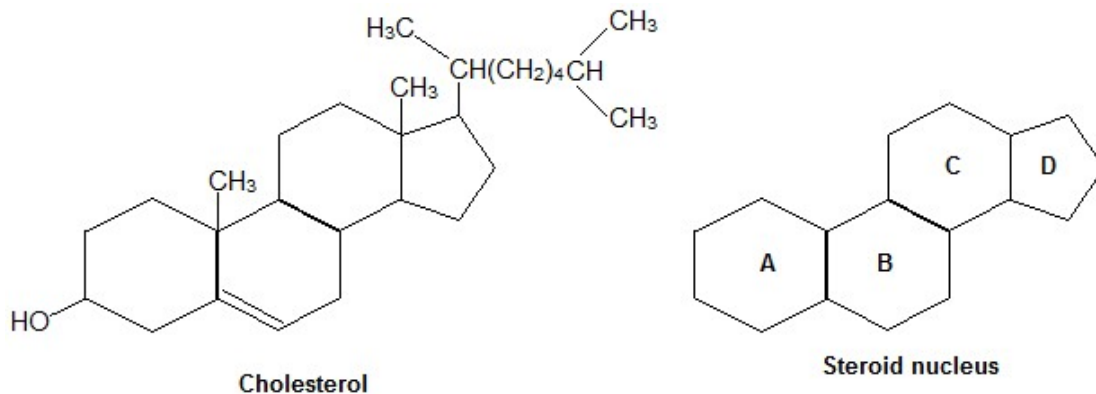
## Steroids:

The terpenoids, sometimes called isoprenoids, are a large and diverse class of naturally occurring organic chemicals similar to terpenes, derived from five-carbon isoprene units assembled and modified in thousands of ways. Most are multicyclic structures that differ from one another not only in functional groups but also in their basic carbon skeletons. These lipids can be found in all classes of living things, and are the largest group of natural products. About 60% of known natural products are terpenoids.

**Isoprene**

The steroids and sterols in animals are biologically produced from terpenoid precursors. Sterols are structural lipids present in the membranes of most eukaryotic cells. In fact, sterols, also known as steroid alcohols, are a subgroup of the steroids and an important class of organic molecules. Therefore, the characteristic structure of this group of membrane lipids is the steroid nucleus, consisting of four fused rings, three with six carbons and one with five. The steroid nucleus is almost planar and is relatively rigid; the fused rings do not allow rotation about C-C bonds.

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.

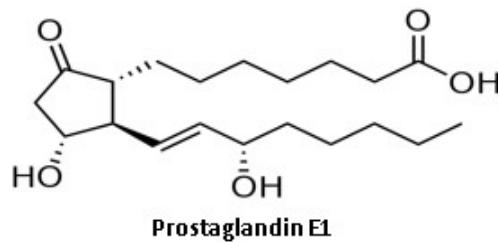


In addition to their roles as membrane constituents, the sterols serve as precursors for a variety of products with specific biological activities. Steroid hormones, for example, are potent biological signals that regulate gene expression. Bile acids are polar derivatives of cholesterol that act as detergents in the intestine, emulsifying dietary fats to make them more readily accessible to digestive lipases.

### **Prostaglandins:**

The prostaglandins are a group of physiologically active lipid compounds having diverse hormone-like effects in animals. Prostaglandins have been found in almost every tissue in

humans and other animals. Their name comes from the prostate gland because they were first discovered and isolated from human semen. Prostaglandins are unsaturated carboxylic acids, consisting of a 20 carbon skeleton, including a 5-carbon ring. They are biochemically synthesized from the fatty acid, arachidonic acid. Specific prostaglandins are named with a letter (which indicates the type of ring structure) followed by a number (which indicates the number of double bonds in the hydrocarbon structure). For example, prostaglandin E1 is abbreviated PGE1 or PGE<sub>1</sub>, and prostaglandin I2 is abbreviated PGI2 or PGI<sub>2</sub>.



There are a variety of physiological effects of prostaglandins including:

1. Activation of the inflammatory response, production of pain, and fever. When tissues are damaged, white blood cells flood to the site to try to minimize tissue destruction. Prostaglandins are produced as a result.
2. Blood clots form when a blood vessel is damaged. A type of prostaglandin called thromboxane stimulates constriction and clotting of platelets. Conversely, PGI<sub>2</sub>, is produced to have the opposite effect on the walls of blood vessels where clots should not be forming.
3. Prostaglandins are involved in several other organs such as the gastrointestinal tract (inhibit acid synthesis and increase secretion of protective mucus), increase blood flow in kidneys, and leukotrienes promote constriction of bronchi associated with asthma.

### **Lipoproteins:**

A lipoprotein is a biochemical assembly that contains both proteins and lipids, lipids bound to the proteins, whose purpose is to transport hydrophobic lipid molecules in water, as in blood or extracellular fluid. They have a single-layer phospholipid and cholesterol outer shell, with the hydrophilic portions oriented outward toward the surrounding water and lipophilic portions of each molecule oriented inwards toward the lipids molecules within the particles. Many enzymes, transporters, structural proteins, antigens and toxins are lipoproteins. Lipoproteins

differ in the ratio of protein to lipids, and in the particular apoproteins and lipids that they contain. For examples the plasma lipoprotein particles classified as chylomicrons, VLDL, LDL and HDL.

- 1- Chylomicron (largest; lowest in density due to high lipid/protein ratio; protein content approximately 1 % of weight).
- 2- VLDL (very low density lipoprotein; protein content approximately 10 % of weight).
- 3- LDL (low density lipoprotein, protein content approximately 25 % of weight).
- 4- HDL (high density lipoprotein, protein content approximately 45 % of weight).