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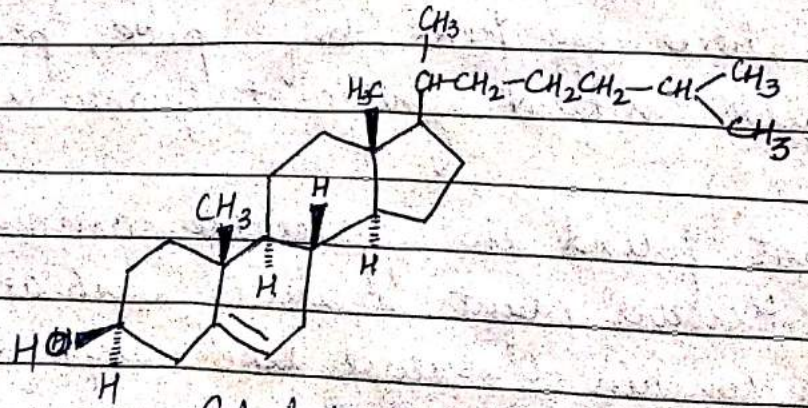
Sterol lipids - Steroids and Sterols

Sterol lipids, such as Cholesterol and its derivatives, are an important component of membrane lipids along with the glycerophospholipids and sphingomyelins. Cholesterol is widespread in biological membranes especially in animals. The presence of Cholesterol in membrane can modify the role of membrane-bound proteins. Cholesterol has number of important functions including its role as a precursor of other steroids and of vitamin D. Steroids contain the same fused four-ring core structure They contain three six membered rings and one five membered ring. There are many important steroids including sex hormones. All steroid hormones are derived from Cholesterol. However, Cholesterol is best known for its harmful effects on health when it is present excess in the blood. Its excess in the blood develops a condition in which lipid deposits block the blood vessels and lead to heart disease.



Cholesterol

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Cholesterol

Cholesterol belongs to the steroid group of lipids. The name Cholesterol is derived from the Greek words, Chole, means bile and stereos (solid) followed by the suffix -ol for an alcohol. It is an essential structural component of mammalian cell membranes and is required to establish proper membrane permeability and fluidity. In addition, Cholesterol is an important component for the manufacture of bile acids steroid hormones and vitamin D. Cholesterol is the principal sterol synthesised by animals. In vertebrates, it is predominantly formed in the liver.

Although Cholesterol is important and necessary for human health, high levels of cholesterol in the blood have been linked to damage arteries and cardiovascular disease.

Dietary Source of Cholesterol

Animal fats are complex mixtures of triglycerides with lesser amounts of phospholipids and cholesterol. All foods containing animal fat contain Cholesterol in varying amounts. Major dietary sources of cholesterol are cheese, egg yolks, beef, pork, poultry & fish. Human breast milk contains significant quantities of Cholesterol.

Cholesterol is not found in appreciable amounts in plant sources. However plant products such as flax seeds and peanuts contain cholesterol like compounds called phytosterols. Phytosterols. Phytosterols have been proved to posses LDL Cholesterol lowering efficacy. Phytosterols compete with cholesterol for absorption in the intestine.

Physiology and Biological Importance of Cholesterol

Since Cholesterol is essential for all animal life. It is primarily synthesised from simpler substances with in the body. When we take more Cholesterol from dietary sources, it increase the Cholesterol levels in the blood.

Cholesterol is recycled. It is excreted by the liver via the bile into the digestive tract. About 50% of the excreted Cholesterol is reabsorbed by the small intestine back into the bloodstream. Phytosterol can compete with Cholesterol reabsorption in the intestinal tracts, thus reducing Cholesterol reabsorption.

Cholesterol is required to build and maintain membranes It modulates membrane fluidity over the range of physiological temperatures. The hydroxyl group on Cholesterol interacts with polar head groups of membrane phospholipids and sphingolipids, While the bulky steroid and hydrocarbon chain are embedded in the membrane, along side the non-polar fatty acid chain of other lipids. Thus Cholesterol increase membrane packing, which reduces membrane fluidity. In this structure role, Cholesterol reduces the permeability of the plasma membrane to neutral solutes, protons and sodium ions.

Within the cell membrane, cholesterol also functions in intracellular transport, cell signaling & nerve conduction. Within cells, Cholesterol is the precursor molecule in several biochemical pathways. In the liver, Cholesterol is converted to bile, which is then stored in the gall bladder

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Bile contains bile salts, which solubilise fats in the digestive tract and aid in intestinal absorption of fat molecules as well as fat soluble vitamins A, D, E & K. Cholesterol is an important precursor molecule for the synthesis of vitamin D and steroid hormone including adrenal gland hormones cortisol and aldosterone as well as sex hormones, progesterone, estrogen & testosterone and their derivatives.