

Difference Between Lipoprotein and Apolipoprotein

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Key Difference – Lipoprotein vs Apolipoprotein

Plasma constitutes of different lipoproteins. Fats and oils upon degradation are packaged into lipoproteins, which are transported through the blood to target organs. Lipoproteins are complex, water-soluble macromolecules composed of a hydrophobic lipid component and one or more specific hydrophilic proteins. Apolipoproteins are protein molecules that form complexes with lipids to form the lipoprotein, and they are specific to each type of lipoprotein. The **key difference** between Lipoprotein and Apolipoproteins is in their constituents. **Lipoproteins are composed of a lipid component and a specific protein component whereas apolipoprotein is the protein component of the complex lipoprotein.**

What is a Lipoprotein?

Lipoproteins are lipid and protein complexes in the plasma of organisms. The lipoproteins are involved in packaging and transportation of triglycerides, cholesterol, and free fatty acids in the plasma to its target organisms. This lipid-protein complex is an amphipathic molecule having both hydrophilic regions and hydrophobic regions. The property of hydrophobicity is brought about by the lipid component which includes phospholipids, cholesterol, and triglyceride, whereas the property of hydrophilicity is brought about by the protein component. Thus, it is partially soluble and form micelle structures in water and bring about transportation of fats.

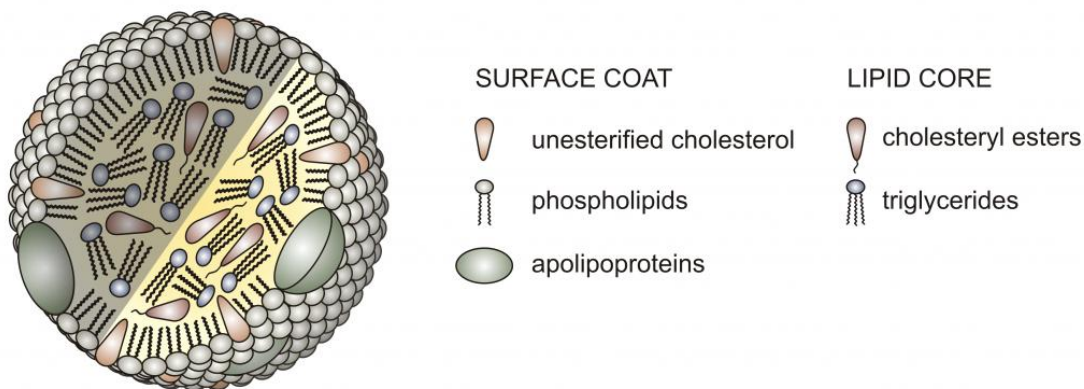


Figure 01: Structure of Lipoprotein

Types of Lipoprotein

There are four main lipoproteins – [Chylomicrons](#), [High Density Lipoproteins \(HDL\)](#), [low density lipoproteins \(LDL\)](#), and [Very low density lipoproteins \(VLDL\)](#). Chylomicrons are the largest types of lipoproteins. They are mainly involved in packaging and transportation of dietary triglycerides and cholesterol. Therefore, they are mainly synthesized and acted upon in the intestine. When the requirement for free fatty acids arises, [lipoprotein lipase](#) acts on the chylomicron and degrades the chylomicron releasing free fatty acids and the chylomicron remnant.

HDL is the smallest lipoprotein which acts as a cholesterol carrier that is present both in the liver and in the intestines. The HDL lipoprotein has the ability to transport cholesterol present in the peripheral tissues of the liver. This will enable to get rid of the excess cholesterol deposits and generally termed as safer.

VLDL and LDL are another important lipoproteins with many functional roles to play. LDL is the degraded product of VLDL. LDL is formed when VLDL undergoes hydrolysis by lipoprotein lipases. Both VLDL and LDL transport triglycerides and cholesterol out of the cells to the periphery leading to conditions of [atherosclerosis](#). Therefore elevated levels of LDL and VLDL suggest increased risk of cardiovascular diseases

What is an Apolipoprotein?

Apolipoprotein is the protein component of the lipoprotein molecule. Since it is a protein component, it can be isolated via [SDS – polyacrylamide gel electrophoresis](#). Apolipoproteins are hydrophilic and thus, facilitate transportation in the plasma. Apolipoproteins regulate the lipoprotein metabolism and are vital components due to the unique properties they possess. The main functions of apolipoproteins are;

- Transport and redistribution of lipids to various peripheral tissues
- Act as [cofactors](#) for some enzymes involved in lipid metabolism
- Maintenance of the structure and integrity of the lipoproteins.

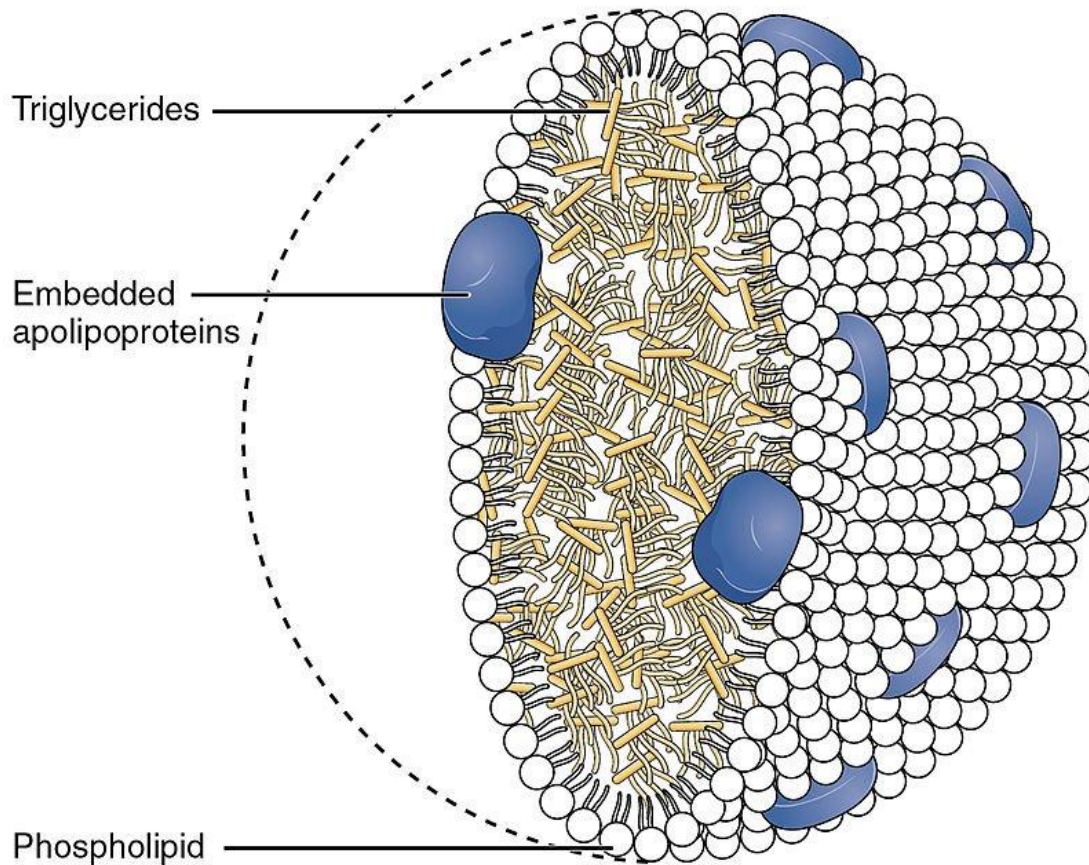


Figure 02: Apolipoproteins

Types of Apolipoprotein

There are four main apolipoproteins namely; apo-A, apo-B, apo-C and apo-E

Apo-A or Apolipoprotein A has subtypes; namely, apoA- I, apoA- II and apoA – IV

ApoA – I is the primary component in HDL and is also found in Chylomicrons and rarely in VLDL or its remnants. ApoA – I is synthesized both in the liver and the intestines. The apoA – I synthesized in the liver is packaged into chylomicrons but is soon transferred to HDL particles. Hepatic apoA – I is directly associated with HDL. ApoA – I also serves as a cofactor for lecithin cholesterol acyl transferase (LCAT), which is an enzyme used to form cholesteryl esters.

ApoA – II, similar to apoA – I, occurs primarily in HDL, and the primary site of synthesis is the liver. Thus, both apoA – I and II are involved in transporting lipids into the liver.

ApoA – IV is the prominent apolipoprotein in chylomicrons and thus, synthesized primarily in the intestines and the liver. It is abundantly found in the plasma. Its functions are similar to apoA I and II and facilitates transportation of lipids (triglycerides)

Apo B is of two main types; apoB – 100 and apoB – 48. ApoB – 100 is the major obligatory component of VLDL and LDL whereas apoB-48 is the major component found in chylomicrons and chylomicron remnants. ApoB – 100 is the protein determinant in LDL that recognizes the LDL receptor in order to initiate LDL catabolism.

Apo C is characterized by the low molecular weight of these apolipoproteins. They are constituents of chylomicrons, VLDL and HDL. They act as surface molecules in these lipoproteins. ApoC also has three main forms as ApoC – I, II and III where ApoC-III is the most abundant type.

ApoE is an important apolipoprotein with many diverse functions and is a constituent in chylomicrons, chylomicron remnants, HDL and VLDL. Their functions range from cholesterol transport to metabolism; receptor-mediated uptake of lipoproteins, heparin binding, the formation of cholesteryl ester particles, and inhibition of mitogenic stimulation of lymphocytes; all of them are complex mechanisms.

What are the Similarities Between Lipoprotein and Apolipoprotein?

- Both form the functional molecules named as lipoproteins.
- Both are essential in fat and cholesterol metabolism.
- Both are involved in the transport and distribution of triglycerides and cholesterol.
- Both act as biomarkers for various cardiovascular states and metabolic imbalances.

What is the Difference Between Lipoprotein and Apolipoprotein?

Lipoprotein vs Apolipoprotein

Lipoproteins are complex, water-soluble macromolecules which are composed of a hydrophobic lipid component and one or more specific hydrophilic proteins.

Apolipoproteins are protein molecules which form complexes with lipids to form the lipoprotein. The apolipoproteins are specific to each type of lipoprotein.

Polarity

Lipoproteins are amphipathic containing both polar and nonpolar components.

Apolipoproteins are hydrophilic thus, they contain polar components.

Summary – Lipoprotein vs Apolipoprotein

Lipoproteins and apolipoproteins are interrelated terms where lipoproteins are formed from a lipid component and a specific apolipoprotein whereas Apolipoproteins are specific for different lipoproteins. Their major function is to facilitate transportation and distribution of lipids (in the form of triglycerides) and cholesterol in the body. This can be taken as the difference between Lipoprotein and Apolipoprotein.

Reference

1. Mahley, R W, et al. "Plasma lipoproteins: apolipoprotein structure and function." *Journal of Lipid Research*. [Available here](#)

Image Courtesy:

1. 'Structure of a Lipoprotein' By AntiSense – Own work ([CC BY-SA 3.0](#)) via [Commons Wikimedia](#)

2. '2512 Chylomicrons Contain Triglycerides Cholesterol Molecules and Other Lipids' By OpenStax College – Anatomy & Physiology, [Connexions Web site](#). Jun 19, 2013. ([CC BY 3.0](#)) via [Commons Wikimedia](#)

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