

The logo of Galgotias University is a stylized circular emblem composed of several overlapping, curved segments in shades of yellow, orange, and blue, resembling a sun or a globe.

# **Lipoprotein**

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- A **lipoprotein** is a **biochemical** assembly whose primary purpose is to transport **hydrophobic lipid** (also known as **fat**) molecules in water, as in **blood plasma** or other **extracellular fluids**.
- They consist of a Triglyceride and Cholesterol center, surrounded by a **phospholipid** outer shell, with the **hydrophilic** portions oriented outward toward the surrounding water and **lipophilic** portions oriented inward toward the lipid center.
- A special kind of protein, called **apolipoprotein**, is embedded in the outer shell, both stabilizing the complex and giving it a functional identity that determines its fate.

(Gofman et al., 1950)

# Transmembrane lipoproteins

- Some transmembrane **proteolipids**, especially those found in **bacteria**, are referred to as lipoproteins; they are not related to the lipoprotein particles that this article is about ([Gofman et al., 1950](#)).
- Such **transmembrane proteins** are difficult to isolate, as they bind tightly to the lipid membrane, often require lipids to display the proper structure, and can be water-insoluble.
- **Detergents** are usually required to isolate transmembrane lipoproteins from their associated biological membranes.

# Plasma lipoprotein particles

- VLDL: very low density lipid
- LDL: Low density lipid
- HDL: High density lipid
  
- LDL: **Bad cholesterol**
- HDL: **Good cholesterol**

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# HDL good cholesterol

- Epidemiological studies have shown that high concentrations of HDL (over 60 mg/dL) have protective value against cardiovascular diseases such as ischemic stroke and myocardial infarction.
- Low concentrations of HDL (below 40 mg/dL for men, below 50 mg/dL for women) increase the risk for atherosclerotic diseases.

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# Composition of VLDL/LDL/HDL


Composition	HDL	VLDL	LDL
Protein	50 %	10 %	20 %
Phospholipid	30 %	20%	25 %
Cholesterol	15 %	20%	45 %
Triglyceride	5 %	50 %	10%

Satyanarayana, U. (2002). *Biochemistry* (2nd ed. ISBN 8187134801. OCLC 71209231

# VLDL

- 3Fatty acid + glycerol  $\longrightarrow$  Triglyceride
- Triglyceride + cholesterol+ apoprotein+ Phospholipid= VLDL (Liver)
- VLDL apoprotein:
  - Apo- CII
  - Apo- E
  - ApoB-100

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- VLDL  At tissue Apo-CII activate  
**lipoprotein lipase enzyme (tissue)**  
It release free fatty acid utilized be tissue
- Remnant called IDL (less triglyceride + cholesterol) back taken by liver by receptor mediated endocytosis
- Apo-E + Apo-B100 help in receptor mediated endocytosis and convert into LDL



# HDL

- With a size ranging from 5 to 17 nm, HDL is the smallest of the lipoprotein particles.
- It is the densest because it contains the highest proportion of protein to lipids.
- Its most abundant apolipoproteins are apo A-I and apo A-II
- Increasing concentrations of HDL particles are strongly associated with decreasing accumulation of atherosclerosis within the walls of arteries

# Discoidal (Nascent) HDL

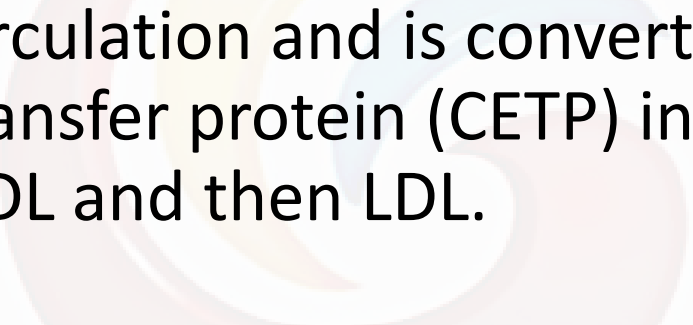
- **Discoidal (Nascent) HDL:** Initially, HDL is discoidal in shape because it lacks esterified cholesterol but as it keeps accumulating free cholesterol in it, the enzyme LCAT keeps esterifying the free cholesterol.
- When the HDL molecule is cholesterol rich, its shape is changed into more spherical and it becomes less dense (HDL 2).
- This is carried to the liver to release all the esterified cholesterol into the liver

**Certain changes in diet and exercise may have a positive impact on raising HDL levels:**

1. Decreased intake of simple carbohydrates
2. Aerobic exercise
3. Weight loss
4. Avocado consumption
5. Magnesium supplements raise HDL-C.
6. Addition of soluble fiber to diet
7. Consumption of omega-3 fatty acids such as fish oil or flax oil
8. Consumption of pistachio nuts
9. Increased intake of unsaturated fats
10. Removal of trans fatty acids from the diet

# LDL

- It is B lipoprotein
- It form from VLDL from Blood circulation
- It transport cholesterol from Liver to tissue
- . The liver serves as the key organ for cholesterol metabolism and regulation of plasma levels of cholesterol.
- The process of LDL formation begins when intrahepatic cholesterol, either from gut absorption or de novo synthesis, is repackaged by the liver (along with proteins, triglycerides, and phospholipids) into VLDL.
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- The logo of Galgotias University is a circular emblem with a stylized 'G' shape in the center. The 'G' is composed of several overlapping, curved segments in shades of yellow, orange, and blue. The background of the emblem is a light, textured grey.
- VLDL then enters the circulation and is converted by lipoprotein lipase and cholesteryl ester transfer protein (CETP) into more cholesterol enriched species, first IDL and then LDL.
  - The liver regulates the concentration of these circulating lipoprotein species primarily by their clearance through LDL receptors on the hepatic surface.

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# References

- Feingold KR, Grunfeld C: Introduction to Lipids and Lipoproteins. In: De Groot LJ, Beck-Peccoz P, Chrousos G, et al, eds. Endotext. South Dartmouth (MA), 2000.
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Thanks