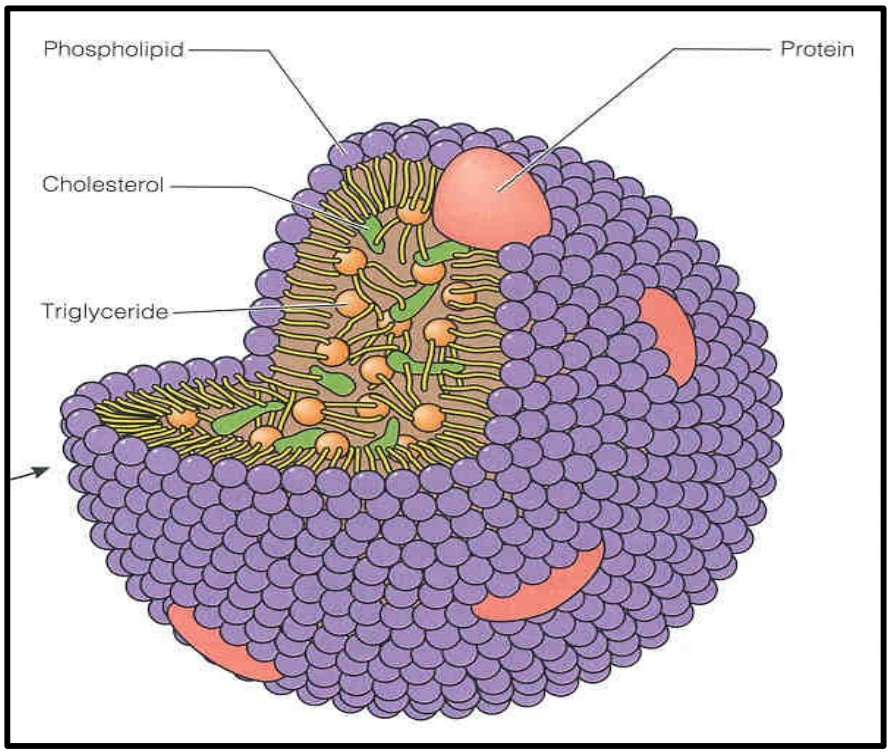
Lipoproteins

A lipoprotein is a heterogenous particle containing both lipids and proteins and allows the transport of lipids in aqueous environment.



Classification of lipoproteins :

(1) Chylomicrons

(2) Very-low-density lipoprotein (VLDL)

(3) Low-density lipoprotein (LDL)

(4) High-density lipoprotein (HDL)

Chylomicrons

These carry triglycerides from the intestine, i.e., dietary fat, to the liver and various tissues. They are high in triglycerides content. Chylomicrons contain about 1-2 % protein, 98% lipids (85-88% triglycerides, 6~8% phospholipids, and 1-3% cholesterol).

Very Low-Density Lipoproteins (VLDL)

These carry triglycerides from liver to various tissues. They are composed of 5-12% protein and 90 % lipids (50-55% triglycerides, 18-20% phospholipids, 12-15% cholesterol esters and 8-10% cholesterol).

Low-Density Lipoproteins (LDL)

These carry cholesterol from liver to various tissues. Low-density lipoproteins contain the highest percentage of cholesterol. LDL are composed of about 20 % protein and about 80 % of lipids (45% cholesterol, 22% phospholipids and about 10-15% triglycerides).

High-Density Lipoproteins (HDL)

These carry cholesterol from various body tissues to liver .They are composed of approximately 45% protein and approximately 55% lipids (26-46% phospholipids, 15-30% cholesterol esters, 2-10% cholesterol and 3-15% triglycerides).

Lipid profile: The pattern of lipids in the blood

It measures:

1. **Total cholesterol**

   This measures overall cholesterol level which is an established risk factor of cardiovascular disease (CVD).

2. **Triglycerides**

   This measures overall triglycerides level, an excess of which is associated with CVD and pancreatitis.

3. **HDL cholesterol (HDL-C)**

   This type of "good cholesterol" helps reduce the accumulation of cholesterol in blood vessels and a higher level would decrease risk of CVD.

4. **LDL cholesterol (LDL-C)**

   This type of cholesterol, known as "bad cholesterol," can collect in blood vessels and increase risk of cardiovascular disease (CVD).

5. **VLDL cholesterol (VLDL-C)**

Why is lipid profile done:

- **To screen** for suspected hyperlipidemia or dyslipidemia. It can be used to identify if a person is at high risk of cardiovascular disease before he develops problems like coronary heart disease.
- **To monitor efficacy of:**
  . Lipid lowering therapy like statins
  . Life style changes like diet or exercise on lipid levels

The optimal or target level for each part of the standard lipid profile is listed below:

- Total cholesterol: Below 200 mg/dL
- HDL-C (good cholesterol): Above 60 mg/dL
- LDL-C (bad cholesterol): Below 100 mg/dL (For people with diabetes: Below 70 mg/dL)
- Triglycerides: Below 150 mg/dL

LDL-C Level

Optimal : less than 100 mg/dl

- **Elevated but not High** = 100 - 129 mg/dl
- **Borderline High** = 130 to 159 mg/dl
- **High** = 160 to 189 mg/dl
- **Very High** : greater than 190 mg/dl
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Estimation of LDL-C level by calculation

LDL-C level can be calculated by Friedewald formula in which:

LDL-C = T. Chol – HDL-C – (TG/5)

According to the assumption that VLDL-C = T G / 5

and because **LDL-C = T. Chol – HDL-C – VLDL-C**

Then LDL-C = T. Chol – HDL-C – (TG/5)

HDL-C Level

- **Low:** less than 40 mg/dl for men OR < 50 mg/dl for women
- **Optimal or High** : higher than 60 mg/dl

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Measurement of HDL-C:

The most commonly used method depends on a selective precipitation of Apo B containing lipoproteins (VLDL and LDL) by the effect of a mixture of phosphotungstic acid/$MgCl_2$. The precipitant is then sedimented by centrifugation and the supernatant is taken and analyzed for cholesterol level by enzymatic method and in this case would reflect cholesterol level of only HDL particles which remained in the supernatant or it means (HDL-C). Note: Cholesterol is always carried on HDL or VLDL or LDL.

Procedure:

A-Precipitation step:

1- Pipette into test tube :

	Standard	Sample
Precipitation reagents (ml)	**0.4**	**0.4**
Standard (µL)	**0.2**	**------**
Sample (µL)	**------**	**0.2**

2- Mix and incubate for 10 Min at room temperature.

3- Centrifuge for 10 min at 4000 r.p.m or 2 min at 12000 r.p.m.

B-Colorimetric step:

1- Pipette into test tubes:

	Blank	Standard	Sample
Working reagents (ml)	**1.0**	**1.0**	**1.0**
Standard (µL)	**------**	**50**	**------**
Supernatan (µL)	**------**	**------**	**50**

2- Mix and incubate for 5 min at 37 ºC or 10 min at room temperature.

3- Read the absorbance of the samples and standard against Blank at a wavelength of 500 nm.

- **Calculation:**

HDL-C conc. = (Absorbance of sample/absorbance of standard) × conc. of HDL-C standard

➢ Conc. of HDL-C standard = 50 mg/dl

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