

Lipoproteins

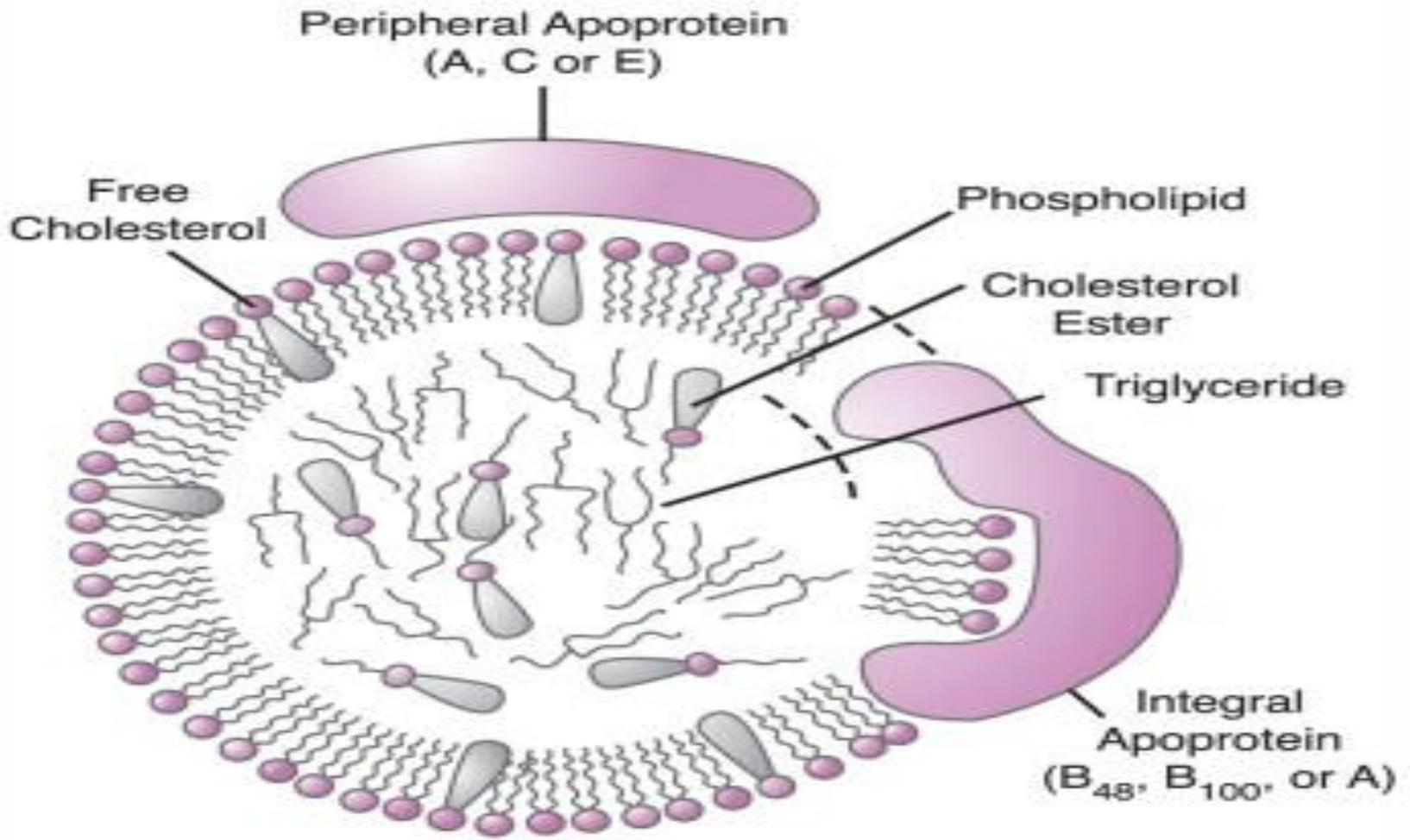
Introduction

- Complex of lipid and protein is called lipoproteins
- They are made up of lipid and proteins
- Lipids are insoluble in water.
- As the lipids are insoluble in water, so they get attached with protein to form a structure called lipoprotein
- Lipids are transported to various tissue for their utilization and storage
- Protein part of lipoprotein is called Apolipoprotein

Structure of lipoprotein

- It is made up of inner core
- To the inner core there is a outer monolayer of amphipathic lipid (phospholipid and cholesterol)
- Inner core of lipoprotein is mainly composed of triglycerides and cholesterol ester.
- Outer core is having a peripheral proteins and integral proteins

Lipoprotein Structure



Classification

a. Classification based on their density (by ultracentrifugation)

➤ The highest lipoproteins settled down the bottom.

1. Free fatty acid complex with albumin
2. HDL (High density lipoprotein)
3. LDL (Low density lipoprotein)
4. IDL (Intermediate density lipoprotein)
5. VLDL (Very low density Lipoprotein)
6. Chylomicron

Density of different lipoproteins

Chylomicron	< 0.95 g/l
VLDL	0.95 – 1.006
IDL	1.006 – 1.019
LDL	1.019 – 1.063
HDL	1.063 – 1.125
FFA-albumin	> 1.125

b. Electrophoretic mobility

Ultracentrifugation



Lipo-
proteins
(density g/L)

Chylomicron

VLDL

IDL

LDL

HDL

FFA

Electrophoresis

Negative



Lipo-
proteins
(mobility)

Chylomi-
cron (origin)

LDL (beta)

IDL (broad β)

VLDL (pre- β)

HDL (alpha)

FFA-albumin

Positive

VLDL = very low density lipoproteins; IDL = intermediate density lipoproteins; LDL = low density lipoproteins; HDL = high density lipoproteins; FFA = free fatty acid

Characteristic

	Chylomicro n	VLDL	IDL	LDL	HDL
Density	least				Highly
Protein content	1%	7-10%	11%	21%	30-60%
Lipid content	99%	90-93%	89%	79%	40-70%
Major lipid present	Triacyl glycerol, phospholipi d and cholesterol	Tri acyl glycerol	cholesterol	cholesterol	phospholip id and cholesterol
Apolipoprot ein	B-48, Apo- A,C,E	B-100, Apo- C I, II, III	B-100, Apo-E	B-100	Apo-A I,II Apo-C I,II,II Apo D, Apo E

Functions of lipoproteins

Chylomicron : transport endogenous triacylglycerol from gastrointestinal tract to peripheral tissue (muscle and adipose tissue)

VLDL: Transport triacylglycerol from liver to peripheral tissue (muscle and adipose tissue)

LDL: Transport cholesterol from liver to peripheral tissue (muscle and adipose tissue). It is called as bad cholesterol. It get deposited to the peripheral tissue and cause atherosclerosis.

HDL: Known as good cholesterol. It is responsible for reverse transport of cholesterol (i.e from peripheral tissue to liver). The enzyme responsible for reverse transport of cholesterol is Lecithin cholesterol Acyl transferase.

Function of Apolipoprotein

- Form the structure of lipoprotein
- They are responsible for activation of certain enzyme
Ex: Apo A activate Lecithin cholesterol Acyl transferase
Apo C II activate lipoprotein lipase
- Responsible for inhibition of certain enzymes
Ex: Apo A II and Apo C III inhibit lipoprotein lipase