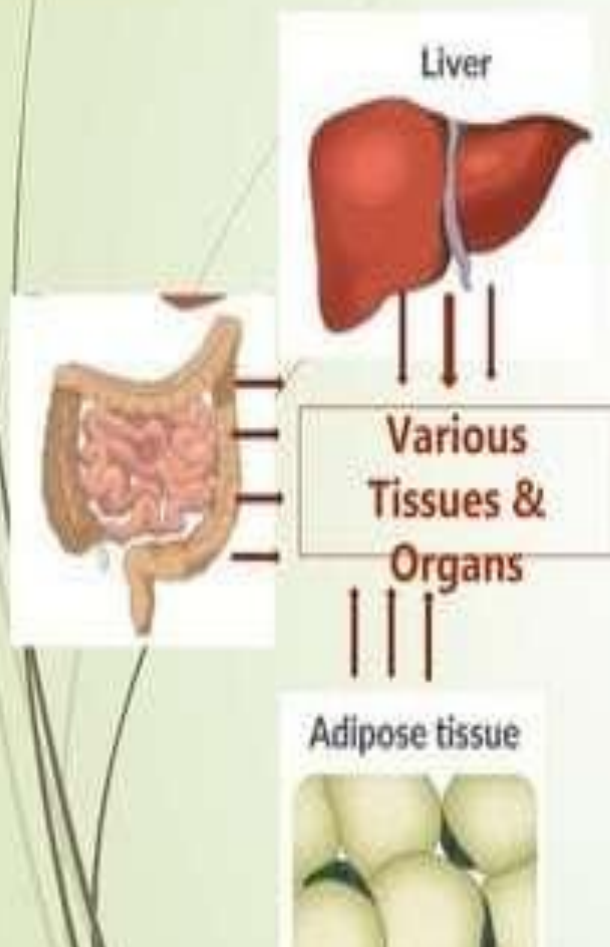


METABOLISM OF LIPOPROTEINS



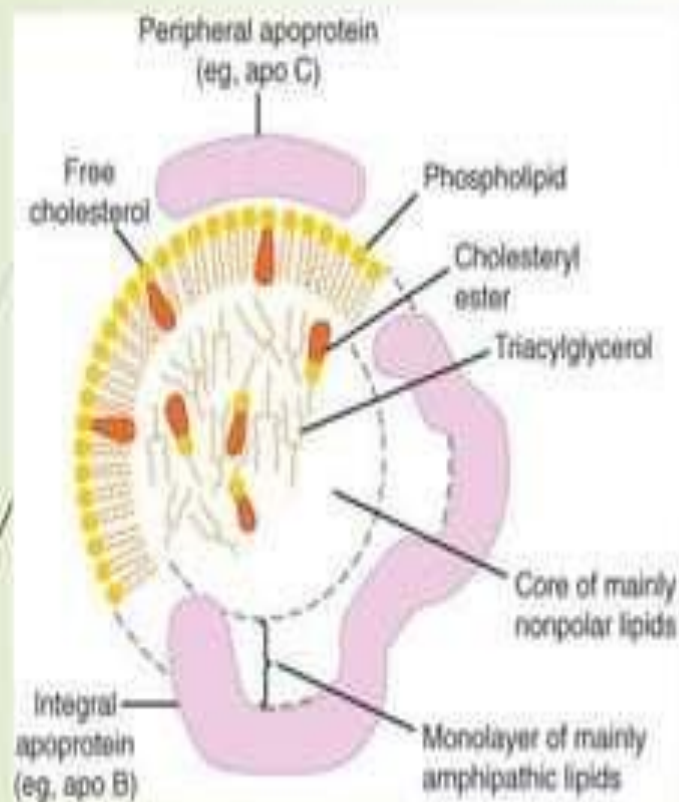
Dr. Farhana Atia
Associate Professor, Biochemistry
Nilphamari Medical College, Nilphamari

Lipid Transport & Storage



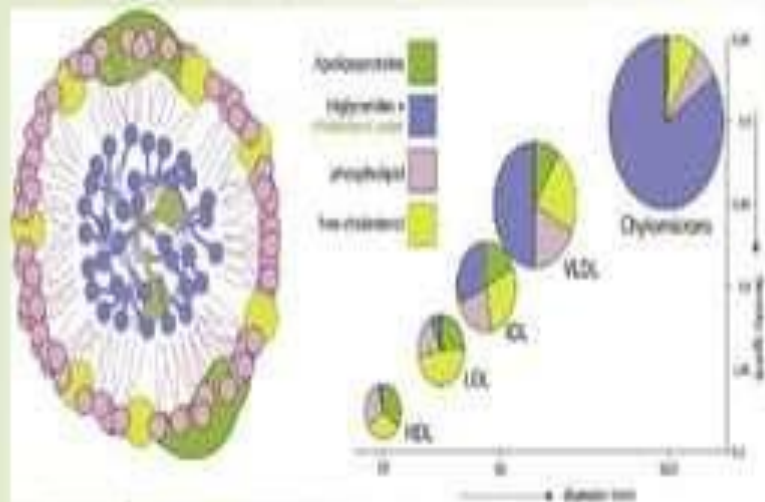
- ▶ Lipids (water insoluble) are transported in plasma as lipoproteins
- ▶ Four major lipid classes are present in lipoproteins (plasma lipids)
 - ▶ Triacylglycerol (16%)
 - ▶ Cholesteryl ester (36%)
 - ▶ Phospholipids (30%)
 - ▶ Cholesterol (14%)
 - ▶ FFA (4%) - metabolically most active

Plasma Lipoproteins

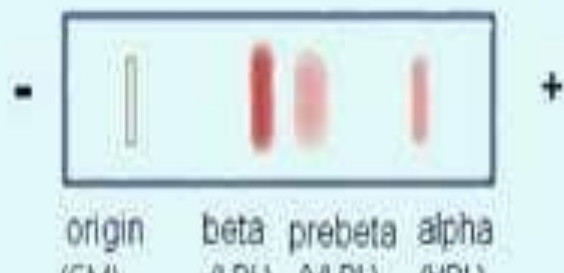


The plasma lipoproteins are spherical macromolecular complexes of lipids and specific proteins (apolipoproteins)

Four major groups of lipoproteins



Electrophoretic Pattern of Serum Lipoproteins



1. Chylomicrons: Derived from intestinal absorption of TAG & other lipids
2. VLDL: Derived from liver for export of TAG
3. LDL: Represents final stage of catabolism of VLDL
4. HDL: Involved in cholesterol transport, VLDL & CM metabolism

COMPOSITION

LPs	TAG	PL	Ch & ChE	Prot.	Apoprotein
CM	90%	3%	5%	2%	B48 CII E
VLDL	60%	15%	20%	5%	B100 CII E
LDL	8%	22%	50%	20%	B100
HDL	5%	30%	25%	40%	A C

Apolipoproteins

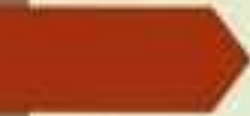
- A-I (Liver & intestine)
- A-II (Liver)

- B-48 (Intestine)
- B-100 (Liver)



- Except LDL
- Liver

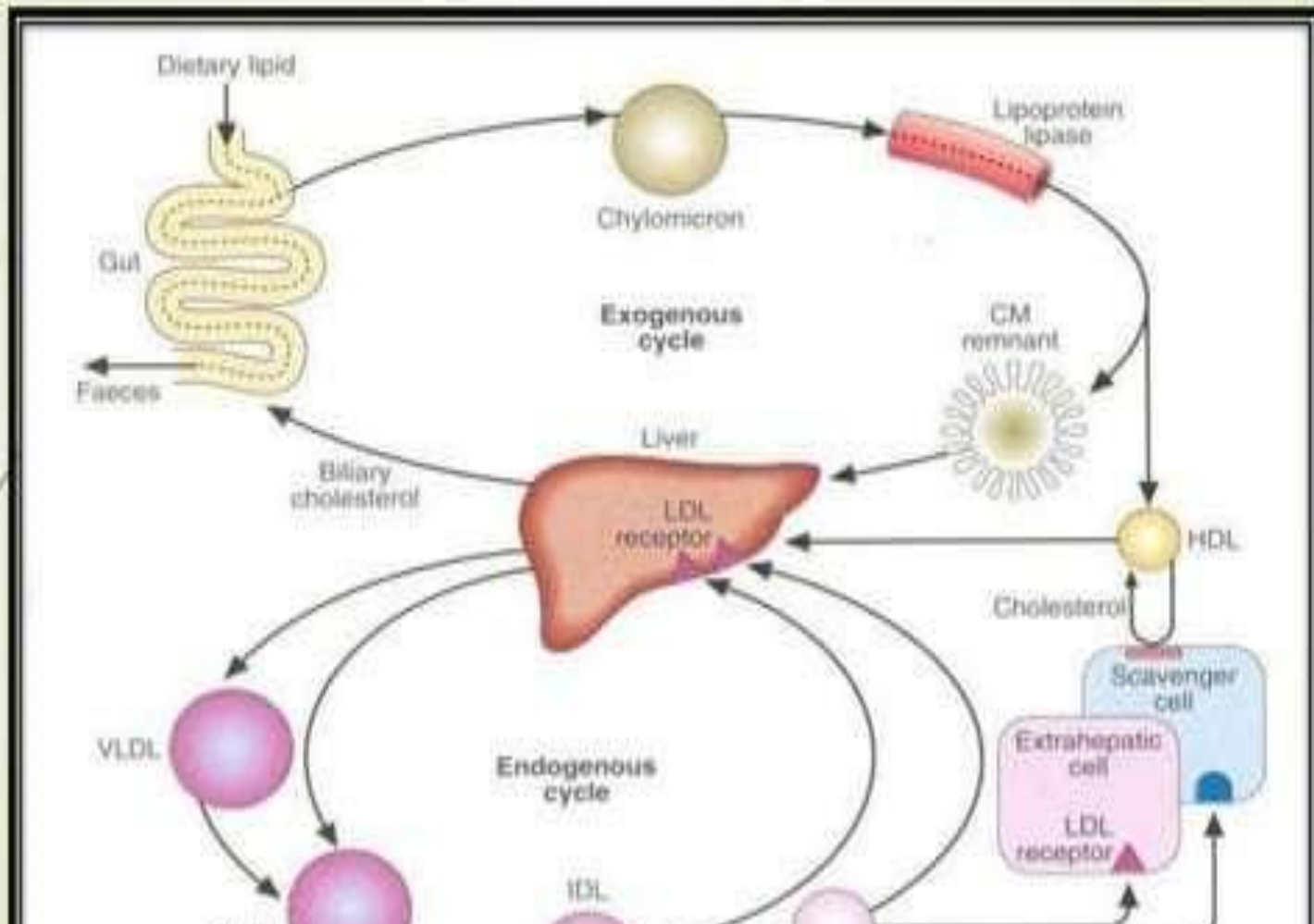
- C-I
- C-II
- C-III



Apolipoproteins have several roles

- ▶ Can form part of structure of lipoprotein [Apo-B]
- ▶ Act as enzyme cofactors [C-II for lipoprotein lipase, A-I for LCAT]
- ▶ Act as enzyme inhibitors [A-II, C-III for lipoprotein lipase]
- ▶ Act as ligands for interaction with lipoprotein receptor in tissue [B-100, E for LDL receptor]

Metabolism of Lipoproteins



Metabolism of Chylomicrons

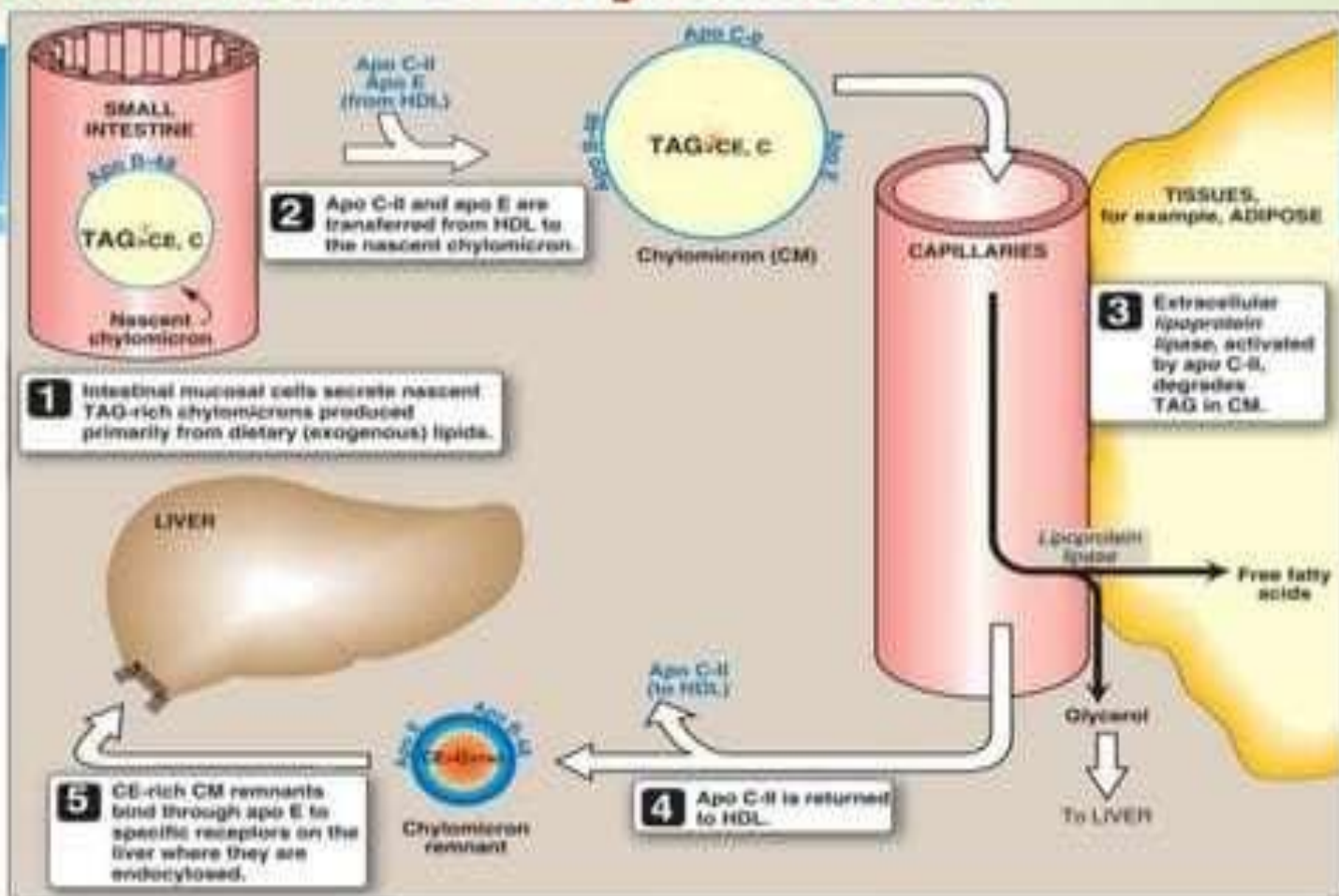


Figure 18.16 Metabolism of chylomicrons. CM = chylomicron; TAG = triacylglycerol; C =

Metabolism of VLDL & LDL

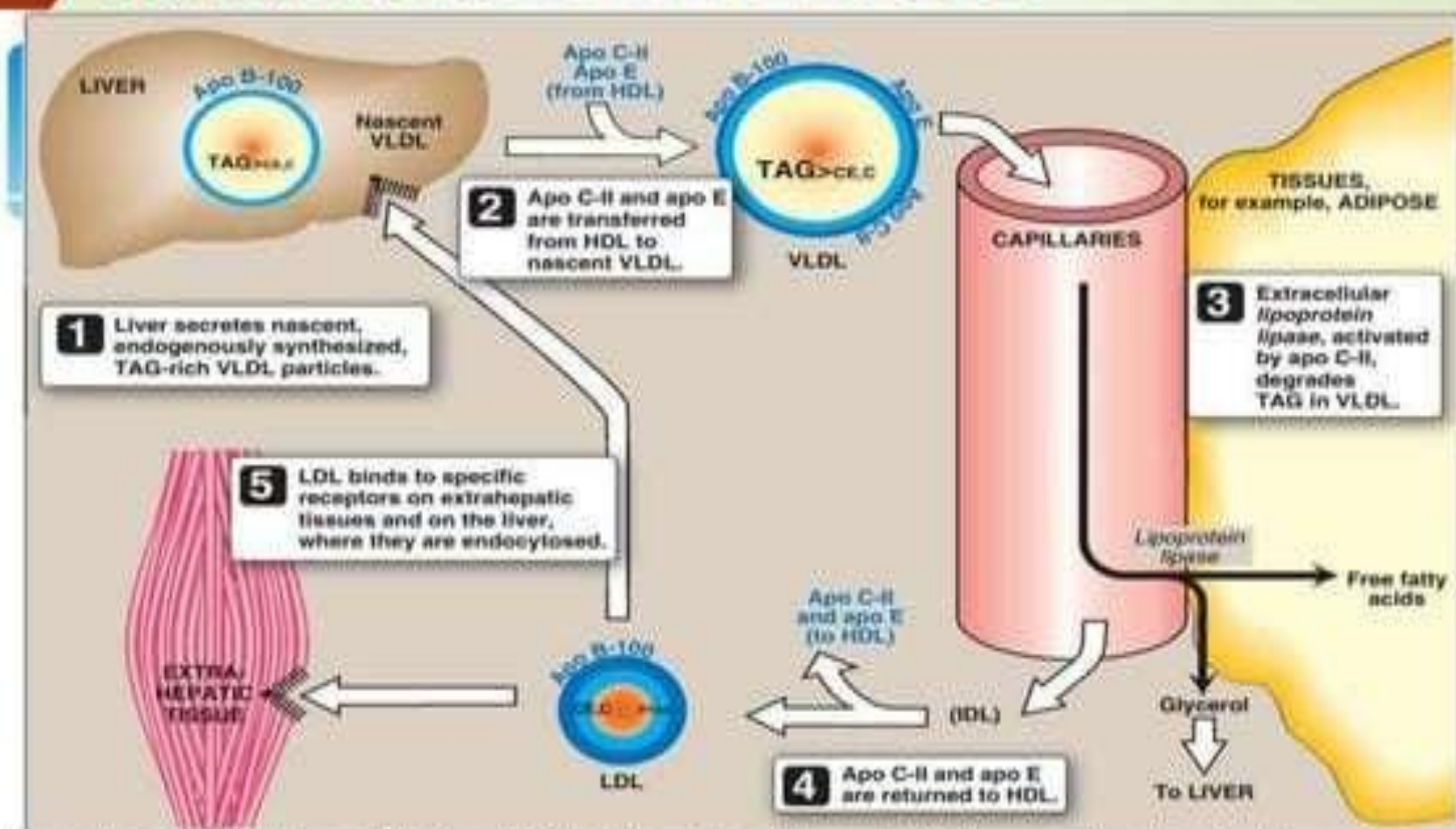
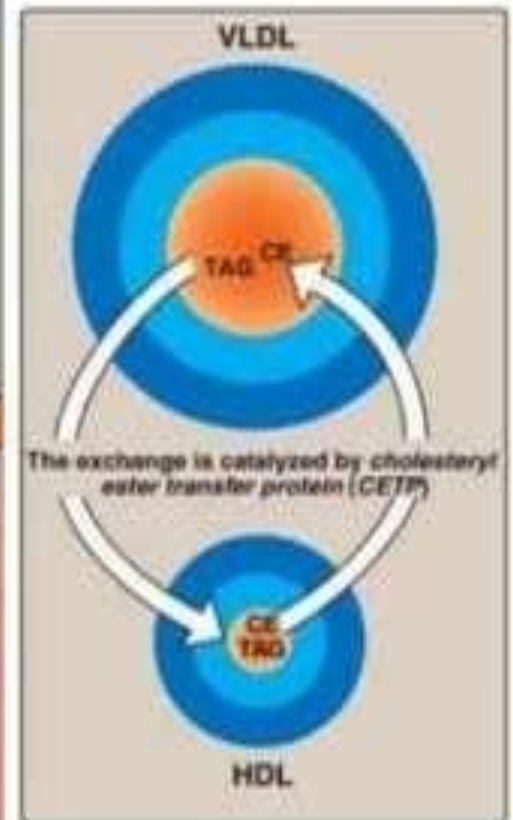
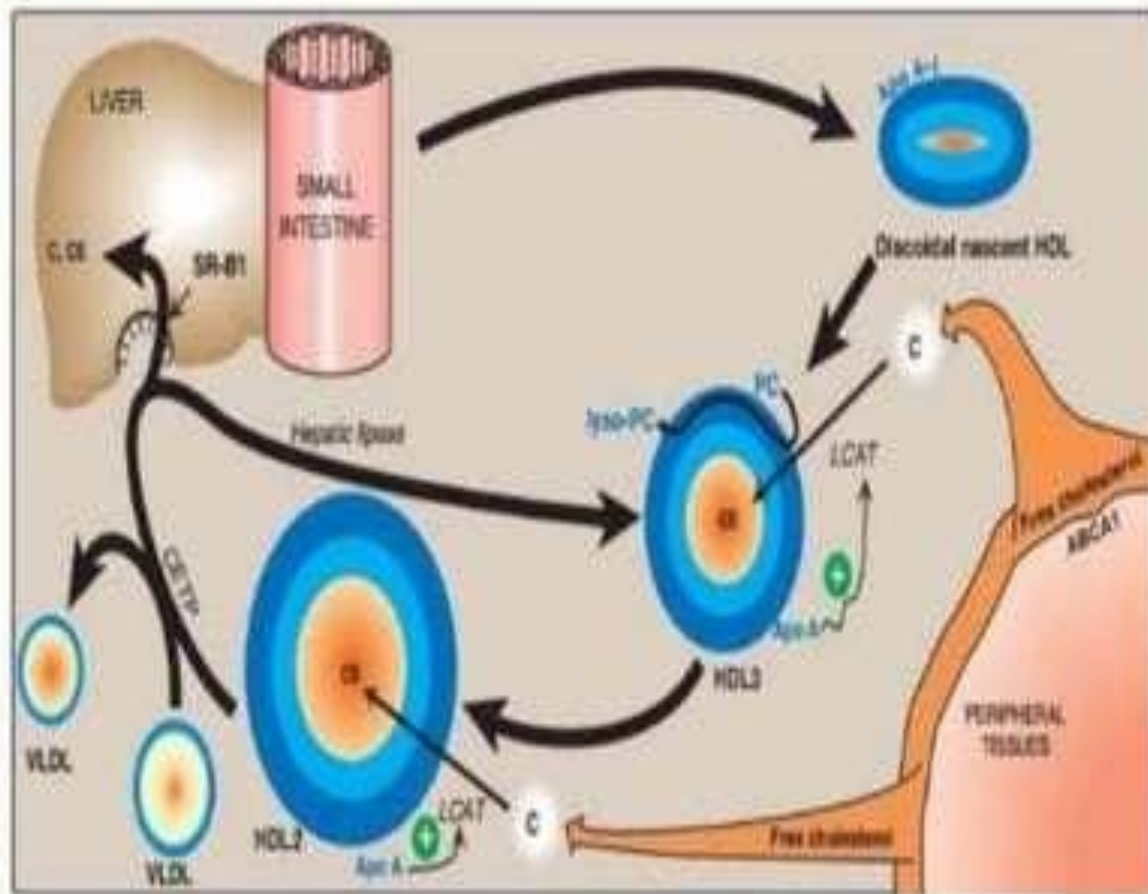


Figure 18.17 Metabolism of VLDL and LDL. TAG = triacylglycerol; VLDL = very-low-density lipoprotein; LDL = low-density lipoprotein; IDL = intermediate-density lipoprotein; C = cholesterol; CE =

Metabolism of HDL



Reverse Cholesterol Transport

- ❑ The selective transfer of cholesterol from peripheral cells to HDL, from HDL to liver for bile acid synthesis or disposal via the bile and to steroidogenic cells for hormone synthesis
- ❑ It is a key component of cholesterol homeostasis

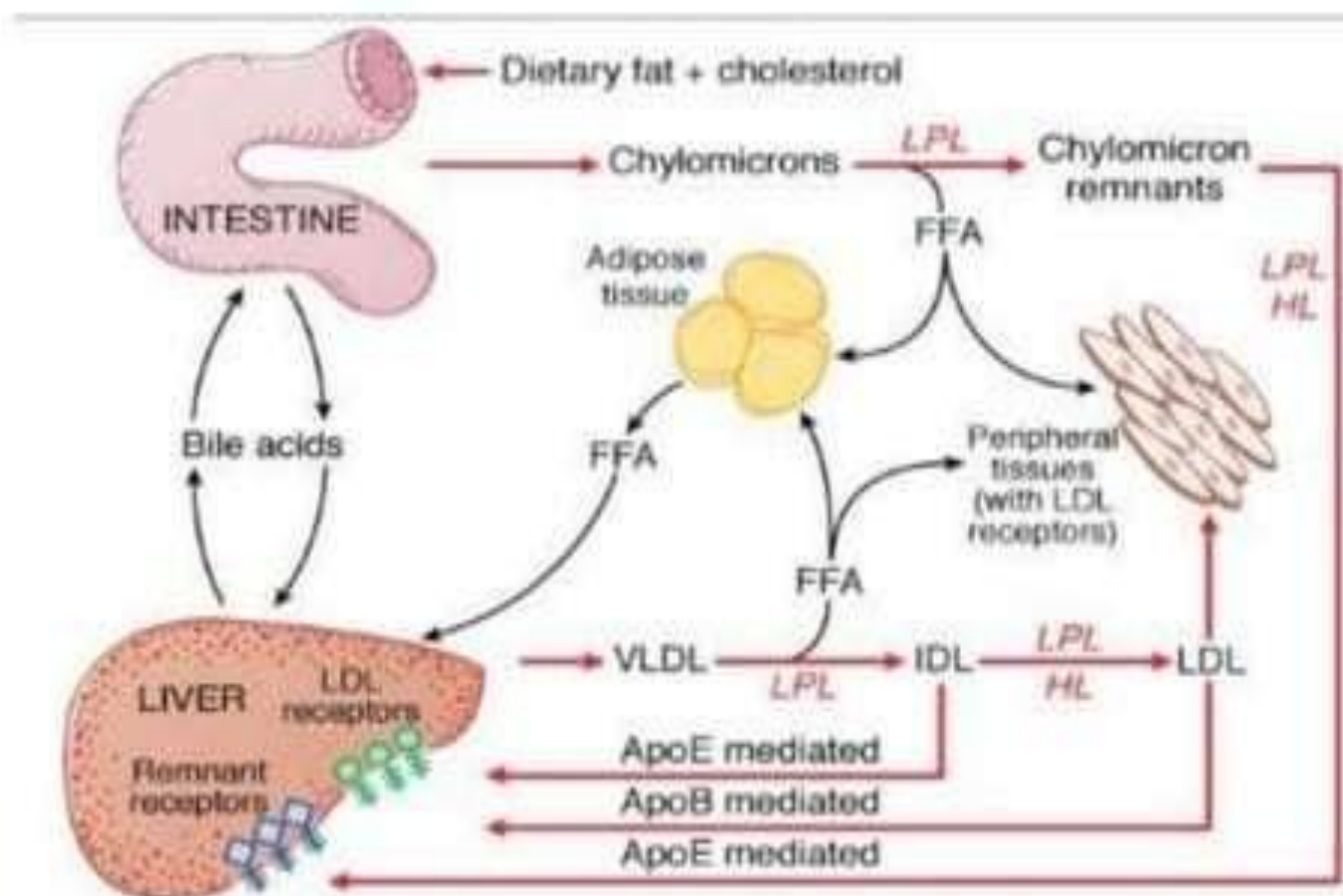
Reverse Cholesterol Transport involves

1. Efflux of Ch from peripheral cell to HDL
2. Esterification of Cholesterol by LCAT
3. Binding of ChE rich HDL to liver & steroidogenic cells
4. Selective transfer of ChE into these cells. Then Ch is used
5. Release of lipid depleted HDL

LP	Origin/Source	Fate
CM	Small intestine (mucosal cell)	CM remnants are taken up by Liver through receptor mediated endocytosis
VLDL	Liver (Parenchymal cell)	<ol style="list-style-type: none">1. Can be converted to IDL (VLDL remnants) → go to liver → taken up by receptor mediated endocytosis2. Major fate: Converted to LDL by<ul style="list-style-type: none">• losing TAG• gives back apo C-II, apo E to HDL• receiving some cholesterol from HDL

LP	Origin	Fate
LDL	VLDL in plasma	<p>LDLs are taken up by extrahepatic tissues and liver by receptor mediated endocytosis</p> <p>About 30% of LDL are degraded by EHT and 70% in the liver</p>
HDL	Liver Intestine	<p>HDL chE enter into liver- the final site of their degradation.</p> <p>The chE are degraded to cholesterol and utilized for the synthesis of</p> <ul style="list-style-type: none"> • Bile acid • Lipoproteins • Steroids

Metabolism of Lipoproteins: Overview



Dyslipoproteinemias

1. Primary dyslipoproteinemia
 - Inherited defect in LP metabolism
 1. Hypolipoproteinemia
 2. ↑ Hyperlipoproteinemia ↓
2. Secondary abnormal LP pattern
 - DM
 - Hypothyroidism
 - Nephrotic Syndrome
 - Atherosclerosis

Frederickson's classification of hyperlipoproteinemia

Type	Defect	Elevated LP	Elevated lipid in plasma	Risk of atherosclerosis	Name
I	Deficiency in LPL	CM	TAG	No	Familial LPL deficiency
IIa	Defective LDL receptor	LDL	Cholesterol	↑↑	Familial hypercholesterolemia
IIb	Overproduction of apo-B	LDL VLDL	TAG Cholesterol	↑↑	
III	Abnormality in apo-E	CM IDL	TAG Cholesterol	↑↑	Familial dysbetalipoproteinemia
IV	Overproduction of	VLDL	Cholesterol	↑	Familial



Thank You