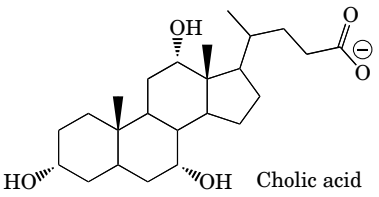
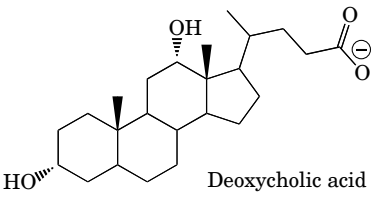
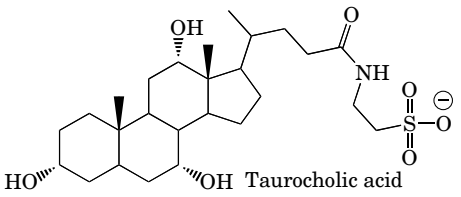
Lipid Transport



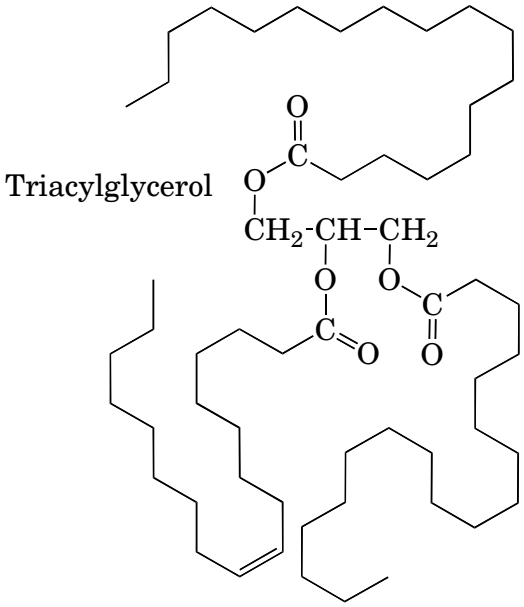
Cholic acid

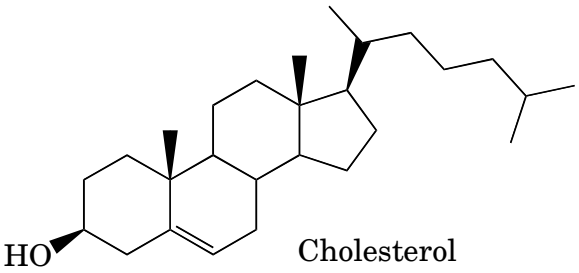


Deoxycholic acid

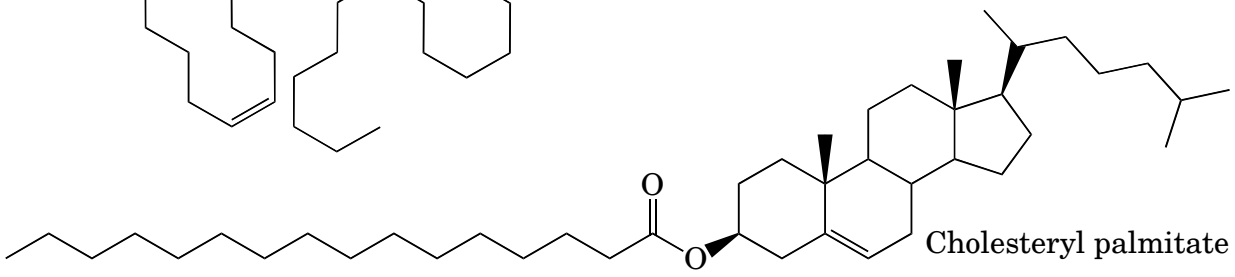


Taurocholic acid

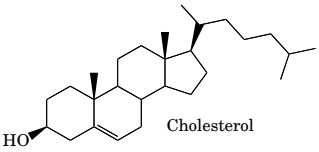




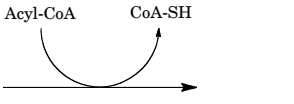
Cholesterol

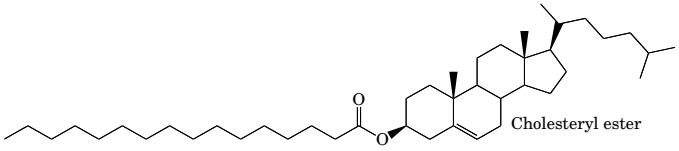


Cholesteryl palmitate

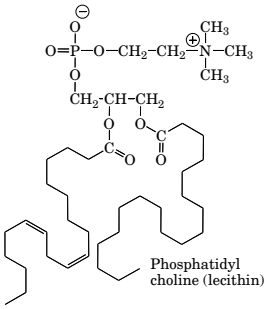


Cholesterol

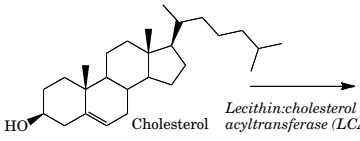




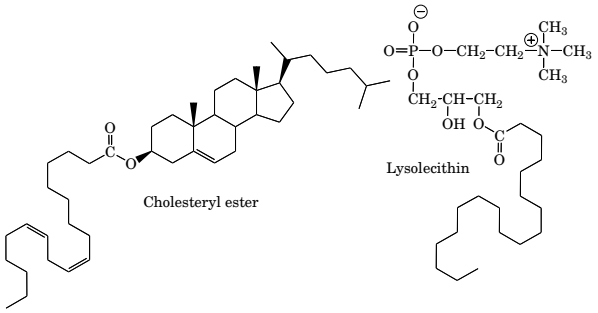
Cholesteryl ester



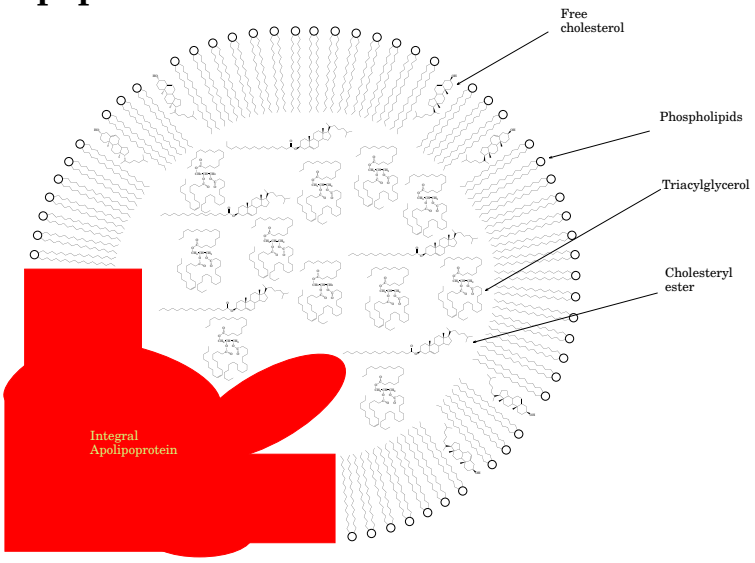
Phosphatidyl
choline (lecithin)



Cholesterol



Lipoproteins



Lipoprotein nomenclature

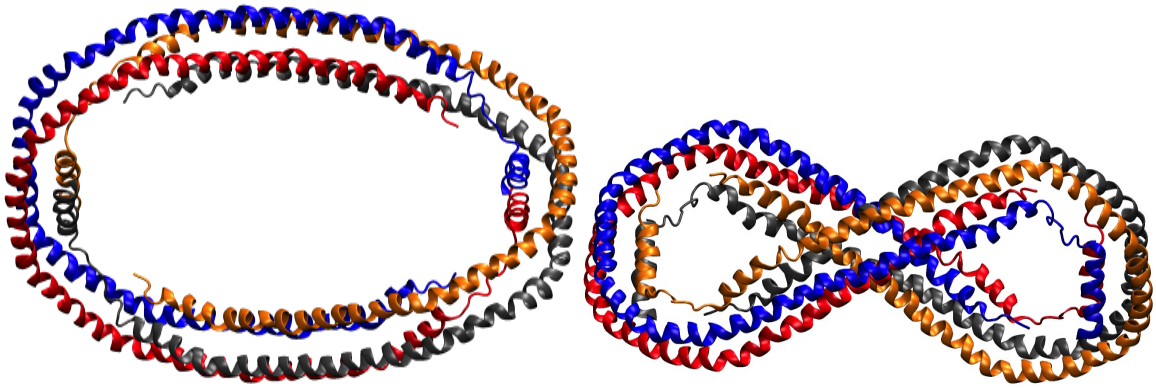
Name	Full name	Primary function
Chylomicron	–	TAG transport
VLDL	Very low density lipoprotein	TAG transport
IDL	Intermediate density lipoprotein	LDL precursor
LDL	Low density lipoprotein	Cholesterol transport
HDL	High density lipoprotein	Cholesterol transport, Apoprotein exchange
Chylomicron remnant		Cholesterol transport

Name	Density (g/ml)	Mass (MDa)	% Protein	% Cholesterol[1]
Chylomicron	<0.95	400	1.5-2.5	4-8
VLDL	<1.006	10-80	5-10	15-25
IDL	1.006-1.019	5-10	15-20	35
LDL	1.019-1.063	2.3	20-25	40-50
HDL	1.063-1.20	0.18-0.36	40-55	15-20

(Modified from Table 12-6 in *Biochemistry*, Voet & Voet, 2011)
[1]Includes both free cholesterol and cholesteryl esters

Apolipoproteins

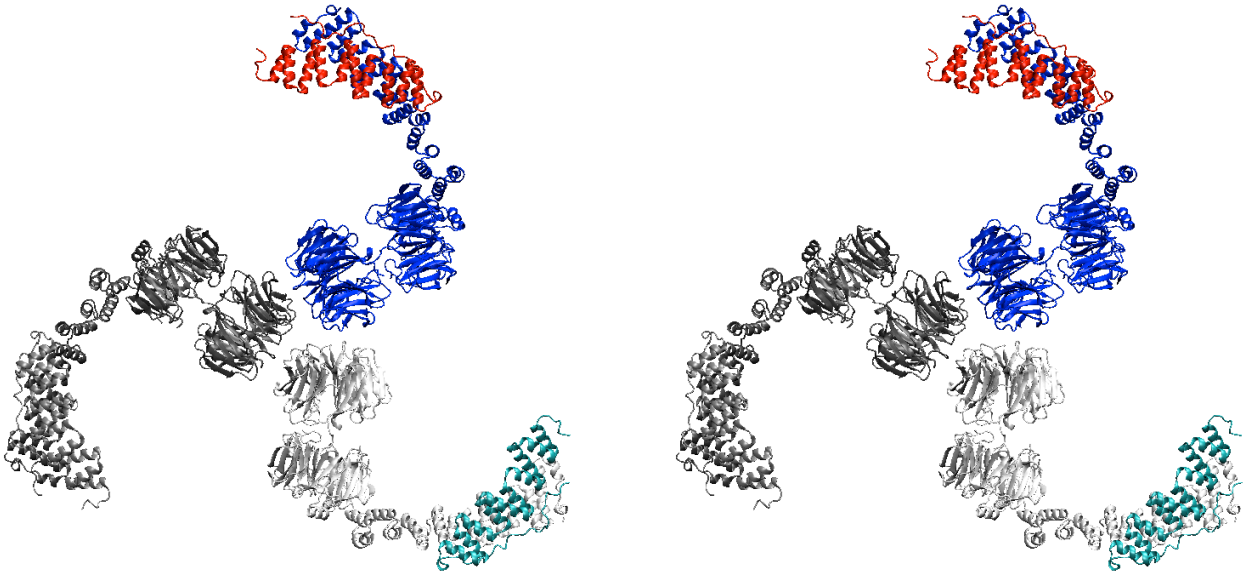
Apo-A-I (pdb ID 1AV1)



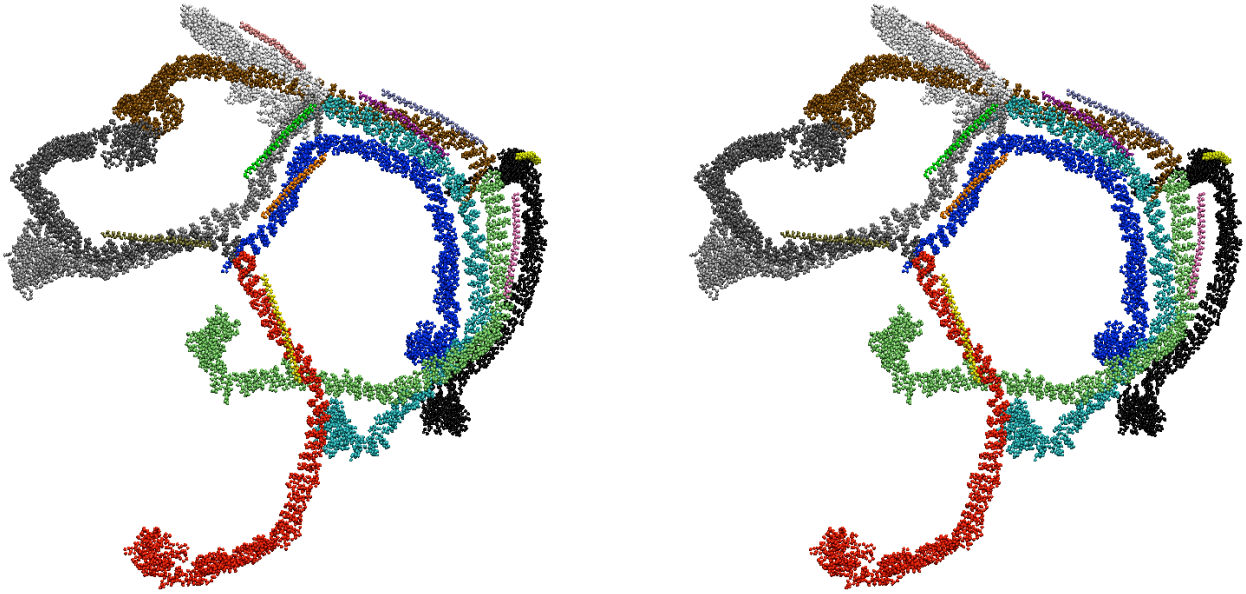
Apoliprotein	Gene product (AA)	Particle	Comments
A-I	267	HDL, chylomicrons	Chromosome 11; stimulates export of cholesterol from tissues for transport to liver; cofactor for LCAT
A-II	100	HDL, chylomicrons	Chromosome 1; mutations cause some types of hypercholesterolemia
A-IV	396	Chylomicrons	Chromosome 11; activator of LCAT.
A-V	366	HDL	Chromosome 11; may be upregulated in liver injury. Mutations result in hypertriglyceridemia.
B-100	4563	LDL, VLDL	Chromosome 2; **LDL receptor ligand**. Point mutations (*e.g.*, R3500Q) may interfere with LDL-R binding and therefore result in hypercholesterolemia
B-48	2179	Chylomicrons	mRNA edit CAA to UAA
C-I	83	VLDL	Chromosome 19; expressed in liver and activated macrophages.
C-II	101	VLDL, chylomicrons (from HDL)	Chromosome 19; **activates** lipoprotein lipase to release free fatty acids for cellular uptake.
C-III	99	VLDL	Chromosome 11; **Inhibits** lipoprotein lipase and hepatic lipase, and therefore decreases rate of catabolism of particle, and therefore elevated levels cause hypertriglyceridemia. Close proximity to Apo-A-I and IV genes, which may have a regulatory role.
D	189	HDL	Chromosome 3; similar to serum retinol binding protein and other lipocalins. Associated with LCAT
E	317	Chylomicrons, VLDL	Chromosome 19 in cluster with C-I and C-II genes; required for binding to Apo-E receptor and endocytosis of chylomicron remnants and general catabolism of chylomicrons and VLDL particles. ApoE4 variant (~15% of population) is associated with Alzheimer's and heart disease
F	326		Chromosome 12; found at low concentrations in plasma; associates with lipoproteins, and thought to be involved in lipid transport and cholesterol esterification.
LCAT	440	HDL	Chromosome 16; lecithin:cholesterol acyl transferase

Clathrin

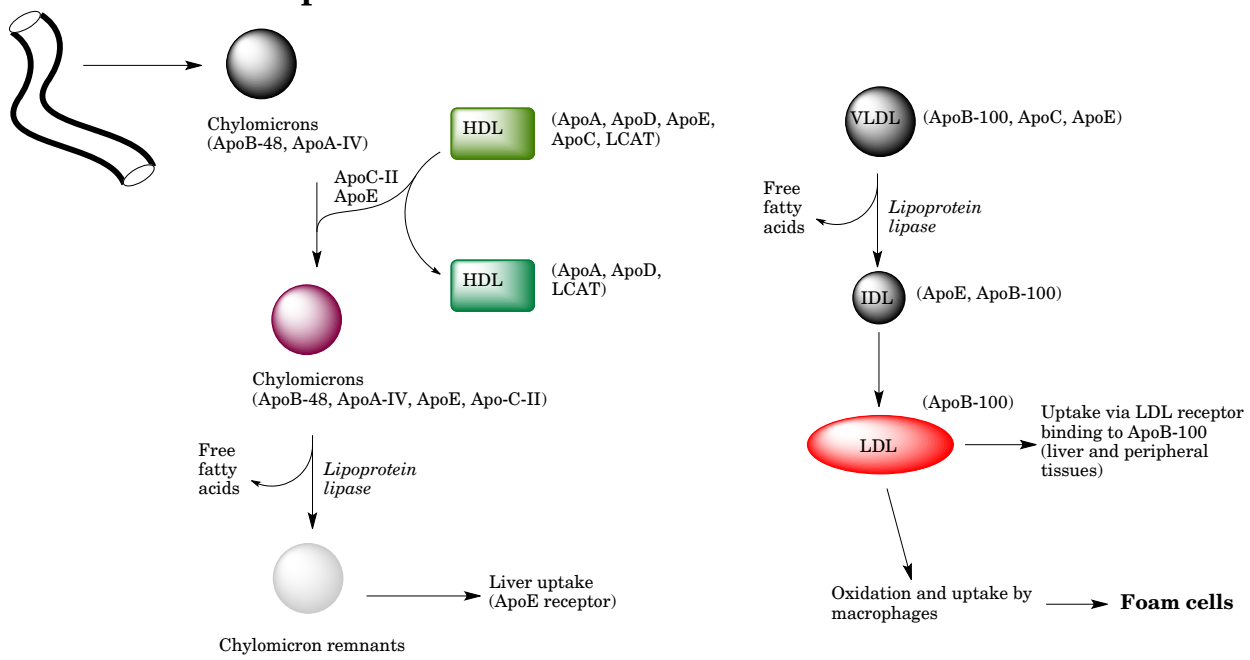
Clathrin triskelion (PDB ID 3MKQ)

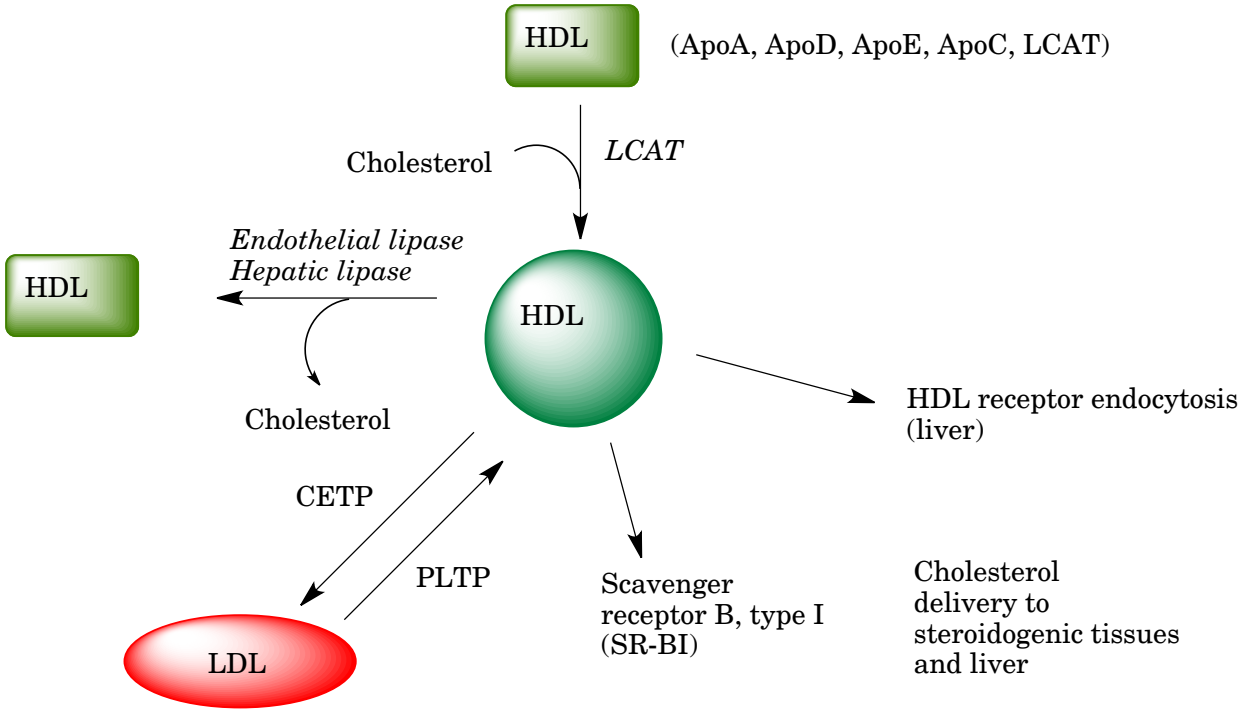


Clathrin coated pit structure
PDB ID 3IYV



Cholesterol Transport





APOBEC – Apo-B mRNA Editing Enzyme – a member of the cytidine deaminase family (chromosome 22 contains seven genes or pseudogenes). These proteins have both roles in cells function and cell-cycle control, and have antiviral activity. APOBEC3G is an inhibitor of HIV; the HIV Vif gene product inhibits APOBEC3G to allow HIV infection.

ApoE4 allele is associated with late onset Alzheimers disease and HIV gp120 neurotoxicity.

LPA – lipoprotein(a) or Lp(a) – serine protease that decreases activity of tissue plasminogen activator I; cleavage of Lp(a) results in fragments that bind atherosclerotic lesions and stimulate clot formation. (Chromosome 6)

LRP8 – Apo-E receptor, which is a member of the LDLR family. The gene (chromosome 1) yields a variety of alternate transcripts.

(Apo H is also called β-2-glycoprotein I)

H	345		Chromosome 17; probably involved in lipid metabolism, coagulation, and in immune or autoimmune responses to phospholipids.
L	337		Chromosome 22 for L2; Cytoplasmic protein that is thought to be involved in intracellular lipid transport.
M	188		Chromosome 6; Member of lipocalin family. Thought to be involved in lipid transport across the plasma membrane from HDL and LDL
O	198	HDL, LDL, VLDL	Chromosome X; glycosylated with chondroitin-sulfate. Thought to prevent lipid accumulation in myocardium.