

CHAPTER FORTY FIVE

ENDOGENOUS LIPID TRANSPORT PATHWAY: VLDL AND IDL

You will notice that the endogenous pathway is very similar to the exogenous pathway

What is the average daily amount of triacylglycerol synthesized by the liver ?

25 to 50 grams per day.

What is the main lipoprotein type involved in transporting lipids from the liver to other cells ?

Very low density lipoproteins (VLDLs).

What is this pathway by which lipids are transported from the liver to other cells sometimes called ?

The endogenous pathway (as it transports the lipids that have been synthesized endogenously. This distinguishes it from the exogenous path which transports lipids consumed in the diet.)

What proportion of a VLDL particle is made up of triacylglycerol ?

50%. This is less than the proportion of triacylglycerol in chylomicrons.

What are the VLDL lipoproteins secreted by the liver called ?

Nascent VLDLs.

What are the major apoproteins found in nascent VLDLs ?

Apoprotein B-100 (chylomicrons have the smaller apo B-48 molecule) and small amounts of apo E and C-apoproteins.

What additional apoproteins do VLDLs acquire in the blood ?

They acquire more C-apoproteins and apo-E. The VLDLs are now mature VLDLs.

Where do VLDLs acquire these additional apoproteins from ?

They are transferred to the VLDLs from HDL lipoproteins.

How is some of the triacylglycerol removed from mature VLDLs in the blood ?

The extracellular lipoprotein lipase on the capillaries in muscle and adipose tissue removes some of the triacylglycerol from VLDLs by hydrolyzing it into monoacylglycerol and fatty acids.

What happens to the VLDLs as triacylglycerol is removed from the core ?

They become smaller.

What happens to the phospholipid, free cholesterol and C apoproteins that are shed from the VLDL coat as it becomes smaller ?

They are transferred to HDLs.

How else is triacylglycerol removed from VLDL ?

It is transferred to HDL particles in exchange for cholesterol ester. This process is similar to the triacylglycerol-cholesterol ester exchange that occurs in chylomicrons and again it is catalyzed by Cholesterol Ester Transfer Protein (CETP).

What are the resulting VLDL lipoproteins, which are now depleted of triacylglycerol and enriched with cholesterol ester, called ?

VLDL remnants.

What lipoproteins are found in VLDL remnants ?

Mainly Apo B100 and Apo E.

What happens to VLDL remnants ?

About half of the VLDL remnants, especially those that are larger and that still have multiple copies of apo-E, are taken up by the liver by an apo-E receptor dependent endocytosis similar to that of chylomicrons.

What are the smaller VLDL remnants called ?

The smaller VLDL remnants appear as a distinct band on centrifugation and are called Intermediate density lipoproteins or IDLs. (Some texts will use the terms IDL and VLDL remnants interchangeably. In this book the term IDL refers specifically to the smaller VLDL remnants which are converted to LDLs).

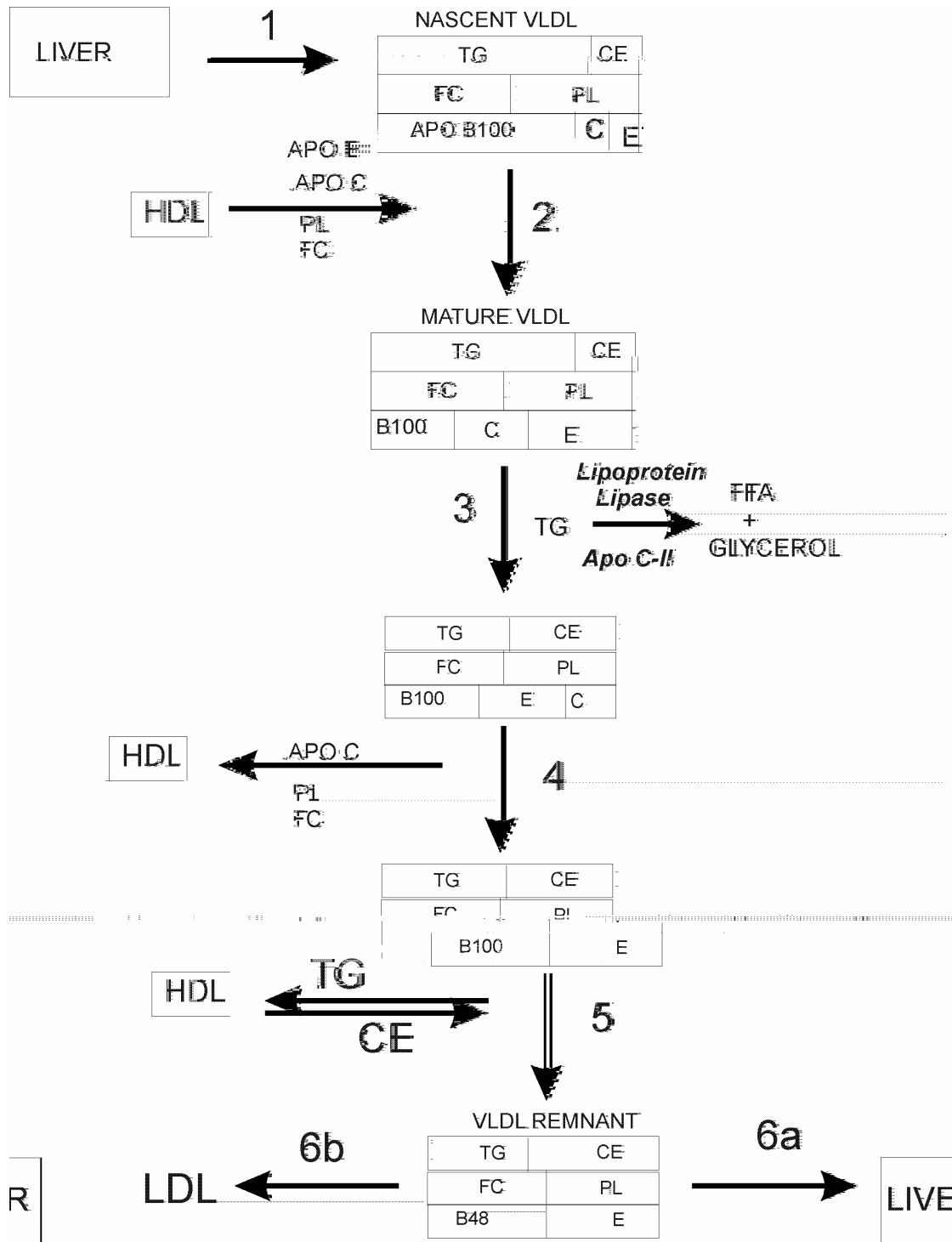
What happens to IDLs ?

They are further metabolized into low density lipoproteins (LDLs) - see next chapter.

What are the three functions of VLDLs ?

- The major function is to transport triacylglycerols synthesized in the liver to the extrahepatic cells such as muscle and adipose tissue.
- The second function is to transport cholesterol ester from the liver to the peripheral cells by means of LDLs (which some of the VLDLs are converted into).
- Finally, VLDLs are, like chylomicrons, involved in the pathway that transports cholesterol from peripheral cells to the liver.

Draw an outline of the first part of the endogenous lipid transport pathway and the metabolism of VLDLs. Include the apoproteins associated with each lipoprotein particle and any other important proteins or enzymes.



The six important stages are numbered in the diagram. (PL = Phospholipid, FC=unesterified (free) cholesterol, FFA = Free fatty acid, CE = cholesterol ester, TG = triglyceride).

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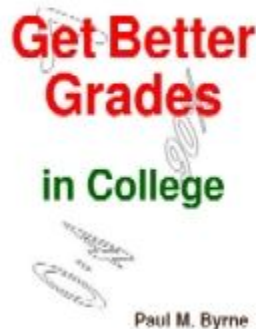
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