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Lipoproteins

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4. Be familiar with the general structure of lipoproteins.
    a. Neutral lipid core
    b. Single layer of phospholipid membrane
    c. Apoproteins in membrane
    d. Cholesterol in membrane
5. Know the characteristics of lipoproteins and the function of the apoproteins.
    a. Chylomicrons - least dense, least protein, most triglyercide content, largest size, ApoB-48, ApoC-II
    b. VLDL - ApoC-II
    c. IDL - ApoC-II
    d. LDL - ApoB-100
    e. HDL - most dense, most protein, least triglyceride content, smallest size, ApoA-I, ApoC-II
6. Know the source and function of the different lipoproteins.
    a. Chylomicrons - carry fat from intestines to liver and to adipose tissue
    b. VLDL - carry newly synthesized triglycerides from liver to adipose
    c. IDL - ?
    d. LDL - carry cholesterol from liver to cells of body
    e. HDL - collect cholesterol from body tissue to liver
7. Know the pathways involved in the transport of triglycerides and cholesterol by lipoproteins.
    a. Small intestine cells absorb lipid from diet
    b. Assembled w/ B-48 into chylomicrons
    c. Chylomicrons travel in bloodstream
    d. Lipoprotein lipase liberates free fatty acids to adipose and muscle
    e. Remnants get to liver and interact w/ remnant receptor
    f. Remnants hydrolyzed
    g. Liver reassembles triglycerides into VLDLs w/ ApoB-100
    h. VLDLs can undergo lipoprotein lipase rxn
    i. VLDL remnants (IDLs) hydrolyzed to LDLs
    j. LDL binds to target tissue via LDL receptors
    k. LDLs hydrolyzed in tissue to HDLs
8. Understand the lipoprotein lipase reaction.
    a. Lipoprotein lipase sits on cell membranes
    b. When it interacts w/ ApoC-II (required), it hyrdrolyzes the triglyceride (1 and 3 FA) to 2 FA + 1 monoglyceride
    c. The monoglyceride is then further hydrolyzed to a FA and glycerol molecule
9. Know the sequence of events involved in the uptake of LDL and the release of cholesterol.
    a. ApoB-100 in LDL binds to LDL receptors
    b. Receptor mediated endocytosis w/ coated pit
    c. LDL receptors recycled
    d. Lysosome forms; cholesterol and amino acids released
    e. Increase in cholesterol increases synthesis of ACAT
    f. Increase in cholesterol decreases HMG-CoA reductase synthesis and LDL receptor synthesis
10. Know the mechanism for the feedback regulation by cholesterol.
    a. See above
11. Know the function of HDL.
    a. HDL takes cholesterol off tissues
    b. LCAT esterifies the cholesterol w/ phosphatidylcholine (abundant in HDL)
    c. The cholesterol ester is then either sent to the liver to be excreted as bile or transferred to other lipoproteins to eventually end up in the liver

    d. HDL is the good cholesterol because of this function
12. Know the LCAT reaction.
    a. Lecithin-Cholesterol Acyltransferase
    b. Takes the FA2 off phosphatidylcholine and transfers it to the 1-OH on cholesterol
    c. Creates the cholesterol ester
    d. Requires ApoA-I for the reaction
13. Know the general pathway for the synthesis of bile acids and how the synthesis is regulated.
    a. 7-alpha-hydroxylase is rate limiting enzyme
        i. Found only in liver
        ii. Induced by glucocorticoids, thyroid hormone and cholesterol
    b. Products are taurine and glycine