1. Why are high density lipoproteins (HDLs) considered the “good cholesterol”? In your answer explain specifically what HDLs do that cause it to be considered the “good cholesterol”.

High density lipoproteins are called the good cholesterol because it acts as a transporter of the LDL which means that it is responsible in bringing or taking up the low density lipoprotein or the so called “bad cholesterol” in the liver for the enzymatic breakdown or processing into more soluble forms.

2. Why are low density lipoproteins (LDLs) considered the “bad cholesterol”? In your answer explain specifically what LDLs do that cause it to be considered the “bad cholesterol”.

Low density lipoproteins are composed of 21% proteins and 79% lipids therefore, owing it to the fact that it has the highest amount of cholesterol. This lipoproteins when present in great amounts can build up in the walls of the arteries which may lead to atherosclerosis or it may result to dyslipidemia.

3. What is the role of the phospholipid monolayer at the outer surface of lipoprotein particles? (Question 1 of case study)

The phospholipid in the outer surface of lipoproteins are mainly amphipathic lipids which means that it has the characteristic of both being hydrophilic and hydrophobic. This special characteristic will allow the transport of differents substances across the membrane.

4. Why are cholesterol, cholesteryl esters, and triglycerides preferentially contained inside lipoprotein particles? (Question 2 of case study)

The phospholipid membrane of lipoproteins is oriented in a way that the hydrophilic head are oriented outside and the hydrophobic tails are oriented inside. Therefore, the cholesterol, cholesteryl esters, and triglycerides which are hydrophobic and are of the same components as the tails of the making it preferentially inside the core of lipoproteins.

5. What are the two sources of cholesterol in the human body?

The liver synthesizes most of the cholesterol content or needed by the body. It metabolizes lipids, fatty acids as well as the breakdown of substances that forms cholesterol. Another source is from the diet or food intake which is a direct source of cholesterol may it be from meats or plants.

6. What is a "committed step" in a biochemical pathway? (Question 3 of case study)

Committed step in biochemical pathway or biosynthesis is the particular process controlled by the enzyme. This reaction is irreversible which means that it controls the reaction making it impossible to happen without the rate limiting enzyme.

7. Looking at Figure 4 of case study (the reaction pathway from acetyl-CoA), which enzyme is likely to be the target of the statin mevastatin? (Question 6 of case study)

In cholesterol synthesis the needed substrate is acetyl-coa which will condense to form hmg-coa and this will further be reduced to mevalonate which is catalyzed by the enzyme hmg-coa reductase. In this particular reaction the hmg-coa reductase is the rate- limiting enzyme and the action of mevastatin is to inhibit the reaction to happen by competitively binding to the active site in the receptor for this enzyme.

8. What are four (4) ways that HDL levels can be increased in the body?

1. Diet is the main source of hdl which includes, fats from fishes such as salmon, tuna and mackerel. These are all good source of omega-3 fatty acids which are sources of HDL.

2. Exercise is another factor to consider to elevate the production or generation of hdl by producing hormones that hasten the reaction in the liver and intestine.

3. Avoid drinking alcoholic beverages since HDL is mainly metabolized in the liver.

4. Eat healthy foods to increase production of enzymes necessary for lipogenesis.

9. What type of inhibitor (non-competitive OR competitive) are statins with respect to HMG-CoA reductase enzyme activity? Explain why.

Statins are competitive inhibitors of HMG-CoA reductase. It binds to the specific site on the receptor in which the HMG-CoA reductase binds to in the process of biosynthesis.

10. How were cholesterol-lowering statin drugs first discovered?

The discovery that hmg-coa regulates the biosynthesis of cholesterol paved way to the discovery of statins. It is a result of his experiment on rats using fungal extracts which has a components that inhibits cholesterol synthesis by competitively inhibiting hmg-coa reductase.

Resources:

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