

# Disorders of lipid metabolism/Questions and case studies

## Questions

- Which of the following statements regarding LDL is true?**
  - A - participates in the supply of triacylglycerols through peripheral tissue
  - B - the main component of the surface part is cholesterol esters
  - C - apolipoprotein C is needed for its function
  - D - this particle is removed from the circulation by receptor-mediated endocytosis
- Which of the following is not involved in esterification in centripetal cholesterol transport?**
  - A - lecithin-cholesterol acyltransferase (LCAT)
  - B - phosphatidylcholine
  - C - apolipoprotein A
  - D - apolipoprotein B
- Squalene is an intermediate metabolite in the biosynthesis of:**
  - A - cholesterol
  - B -  $\beta$ -hydroxybutyrate
  - C - unsaturated fatty acids
  - D - sphingomyelin
  - E - acylcarnitine
- The following does not apply to triacylglycerol hormone-sensitive lipase:**
  - A - catalyzes the breakdown of triacylglycerols, which are transported in the core of VLDL particles
  - B - is induced by insulin
  - C - is regulated by phosphorylation and dephosphorylation
  - D - is an integral part of HDL
- What results from a complete lack of apolipoprotein B-48?**
  - A - VLDL cannot be formed
  - B - chylomicrons cannot be formed
  - C - LDL particles cannot be formed
  - D - cholesterol synthesis in the liver is impaired
- Fatty acids released from adipose tissue are transported by circulation:**
  - A - bound to albumin
  - B - as triacylglycerols carried by chylomicrons
  - C - as lecithin on the surface of HDL particles
  - D - by no specified mechanism
- Fatty acid catabolism stimulates gluconeogenesis in all of the following ways except:**
  - A - by contributing to the production of NADH
  - B - by providing carbons for the glucose backbone
  - C - by activating pyruvate carboxylase
  - D - by contributing to the production of ATP
- Fatty acids serve as an energy source for (list all):**
  - A - liver
  - B - brain
  - C - musculature
  - D - red blood cells
- Which statement about HDL is correct?**
  - A - has an antiatherogenic effect
  - B - arise in adipose tissue
  - C - carry triacylglycerols in their nucleus
  - D - enable centripetal transport of cholesterol
  - E - in the circulation they transmit apolipoprotein E and C to chylomicrons
- The proliferation of LDL particles is more dangerous from the point of view of atherogenicity than the proliferation of chylomicrons or VLDL because:**
  - A - LDL particles are smaller than VLDL or chylomicrons, so they penetrate the pores of the blood capillary wall and reach the target cells, to which they deliver cholesterol.
  - B - contain lecithin-cholesterol acyltransferase, which esterifies cholesterol into non-polar cholesteryl esters.
  - C - are taken up by target cells by endocytosis controlled by specific receptors
  - D - their increased amount in circulation stimulates the endogenous formation of cholesterol in the endothelium of vascular capillaries
- Why are VLDL particles increased in alcoholics?**
- Which lipoprotein particles are increased in the absence of lipoprotein lipase?**

## Answers

## Case reports

## Patient with hypertension and ischemic heart disease

A woman, 52 years old, with hypertension (controlled by medication), ischemic heart disease was examined for a lipid profile. The findings showed an increase in LDL-cholesterol (4.62 mmol/l), a decrease in HDL-cholesterol (0.90 mmol/l) and an increase in triacylglycerols (2.85 mmol/l). Her brother had mild hypercholesterolemia, but a significant decrease in HDL-cholesterol and normotriacylglycerolemia, her sister had marked triacylglycerolemia.

### Questions:

1. **What are the main risk factors for coronary heart disease?**
2. **What adverse effect can poorly treated diabetes have on lipoprotein metabolism?**
3. **What does oxidized LDL-particles cause?**

### Answers

## Patient after acute myocardial infarction

A 53-year-old man who suffered an acute myocardial infarction was followed by the attending physician. Triacylglycerol level: 1.6 mmol/l, HDL-cholesterol: 0.89 mmol/l, cholesterol: 9.5 mmol/l, calculated LDL-cholesterol also significantly increased. His younger brother had a family history of "high cholesterol".

### Questions:

1. **What is the most likely form of hyperlipoproteinemia in this patient?**
2. **What is the mechanism of the therapeutic effect of cholestyramine (bile acid sequestrant) and statins?**

### Answers

## A patient with hyperlipidemia

In a 65-year-old man, hyperlipidemia was discovered during a routine examination: cholesterol: 8.8 mmol/l, triacylglycerols: 2.4 mmol/l. The patient had periorbital edema, dry skin and hair, there was no family history of cardiovascular disease.

### Questions:

1. **What can be the causes of combined hyperlipoproteinemia?**
2. **What other examinations do you recommend for differential diagnosis?**

### Answers

### Answers

**Note:** the thyroid disorder must be treated primarily, hyperlipoproteinemia usually resolves.

## Patient with xanthomas and hypercholesterolemia

A 55-year-old, obese woman came to the general practitioner with nodules about 2 cm in diameter on her forearm. She had yellowish streaks on her palms (palmar striae).

### Laboratory examination:

- cholesterol: 11,9 mmol/l
- triacylglycerides: 8.7 mmol/l
- ELFO of lipoproteins: broad  $\beta$  fraction

### Questions:

1. **What type of hyperlipoproteinemia is it?**

### Answers

## A 46-year-old manager on a preventive check-up

His father had a history of acute myocardial infarction at the age of 57, but he lived to be 79 years old. The patient is obese (104 kg, 175 cm), blood pressure 170/100 mmHg.

### Laboratory examination:

- cholesterol: 6,5 mmol/l
- triacylglycerols: 2.9 mmol/l
- HDL cholesterol: 0.84 mmol/l

### Questions:

## 1. What are the health risks for this patient?

### Answers

## Links

### related articles

- Lipids
- Cholesterol
- Atherosclerosis
- CHD

### Source

- MASOPUST, Jaroslav – PRŮŠA, Richard. *Patobiochemie metabolických drah*. 1. edition. 1999. 182 pp. pp. 80-85. ISBN 80-238-4589-6.