Disorders of lipid metabolism/Questions and case studies

Questions

1. **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
2. **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
3. **Squalene is an intermediate metabolite in the biosynthesis of:**
   - A – cholesterol
   - B – β-hydroxybutyrate
   - C – unsaturated fatty acids
   - D – sphingomyelin
   - E – acylcarnitine
4. **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
5. **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
6. **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
7. **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
8. **Fatty acids serve as an energy source for (list all)**:
   - A – liver
   - B – brain
   - C – musculature
   - D – red blood cells
9. **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
10. **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
11. **Why are VLDL particles increased in alcoholics?**
12. **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 normotriacylglycelemia, 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 β 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.