

Glucose metabolism disorders / Questions and case reports

Questions

- During fasting, which enzyme is responsible for the production of free glucose in the liver**
 - A – Glucagon
 - B – Glucose-6-phosphate dehydrogenase
 - C – Glucokinase
 - D – Hexokinase
 - E – Glucose-6-phosphatase
- Which of the following metabolites cannot provide carbon atoms for gluconeogenesis?**
 - A – Alanine
 - B – Pyruvate
 - C – Lactate
 - D – Palmitate
 - E – Oxalacetate
- Insulin accelerates**
 - A – hepatic glucose production
 - B – glucose uptake in muscles
 - C – excretion of fatty acids from adipose tissue
 - D – conversion of glycogen to glucose in the liver
 - E – conversion of amino acids to glucose in muscles
- Which of the following enzymes plays a role in the Cori cycle?**
 - A – Lactate dehydrogenase
 - B – Glucose-6-phosphate dehydrogenase
 - C – Pyruvate dehydrogenase
 - D – Glucokinase
 - E – Hydroxymethylglutaryl-CoA reductase
- Insulin is secreted after a meal (mixed diet). This increase in insulin causes a normal person to: (fill incorrectly if something is rising, falling or not changing)**
 - A – release of glucose from the liver ...
 - B – glucose uptake by muscle and adipose tissue ...
 - C – gluconeogenesis in the liver ...
 - D – synthesis of fatty acids ...
 - E – secretion of glucagon ...
- Glucagon controls the function of target cells by first binding to a specific membrane receptor, thereby increasing within the cell:**
 - A – neurotransmitter
 - B – a specific peptide that activates certain enzymes
 - C – cAMP (cyclic adenosine monophosphate)
 - D – nucleic acids
 - E – synthesis of enzymes
- What are the metabolic causes of hyperglycemia in diabetes mellitus?**
 - A – Reduction of glucose utilization in tissues
 - B – Gluconeogenesis in muscles
 - C – Gluconeogenesis in the liver
 - D – Glucose transfer across the hepatocyte membrane due to insulin deficiency
 - E – Increase of renal threshold for glucose
 - F – Increased glucagon effect over insulin
 - G – Inhibition of lipolysis (breakdown of fatty acids)
- What are the metabolic causes of diabetic ketoacidosis? (more options)**
 - A – Reduced breakdown of ketone bodies in the liver
 - B – Combination of insulin deficiency with glucagon excess
 - C – Conversion of acetoacetate to acetone
 - D – Fatty acid catabolism (lipolysis)
 - E – Increased acetyl CoA production in the liver
 - F – Increased hydroxymethylglutaryl-CoA production in mitochondria
- What are the main causes of hyperosmolar coma in diabetes mellitus?**
 - A – Osmotic diuresis for hyperglycemia with insufficient water supply
 - B – Complete lack of insulin combined with excess glucagon
 - C – Insulin deficiency reduces glucose utilization in the brain, causing disruption in the brain centres controlling water and electrolyte metabolism
 - D – Glycation of collagen in the basement membrane of glomeruli, which leads to increased permeability

Answers

Case reports

Overweight patient with abdominal pain

A 49-year-old woman with a long history of thickness without attempting to diet and reduce weight. She has pelvic pain. Gynaecologist finding: chronic pelvic inflammation. At the last visit, increased blood pressure, and fasting blood glucose 15.8 mmol / l.

Questions:

1. What type of diabetes is the patient likely to suffer from?
2. What causes elevated glucagon?
3. What causes increased urinary urea excretion in diabetes mellitus?

Answers

Woman, 21 years old with type 1 diabetes

Admitted to the hospitalizations in an obsessive state with tachypnea. Feel the fruity smell on your breath. A history of acute respiratory infections. Laboratory finding:

- blood: glucose 22 mmol/l, bicarbonate 9,5 mmol/l
- serum: urea 11,8 mmol/l, Na⁺ 136 mmol/l, K⁺ 5,7 mmol/l

Questions:

1. What is the diagnosis?
2. How would you explain the low level of bicarbonate (pathobiochemical background)?
3. Why are urea and K⁺ levels increased?

Answers

Nurse, 24 years old

She used to have recurrent hypoglycemia. Laboratory examination showed the following results: β-glucose repeated 0.9 - 1.1 mmol / l, C-peptide: 0.01 pmol / l to undetectable (repeated)

Question:

1. What is the most likely cause of hypoglycemia?

Answer

Patient on parenteral nutrition

Man, 32 years old, in advanced Crohn's disease (ileitis terminalis), in a state of severe malnutrition was on parenteral nutrition. Laboratory examination:

- B-glucose (not fasting): 9,8 mmol/l
- S-phosphate: 0,3 mmol/l
- S-albumin: 27 g/l
- S-Ca: 1,96 mmol/l

Question:

1. What is the explanation of laboratory values?

Answers

Links

Other chapters from the book MASOPUST, J., PRŮŠA, R .: Pathobiochemistry of metabolic pathways

Source

- MASOPUST, Jaroslav and Richard PRŮŠA. *Pathobiochemistry of metabolic pathways*. 1st edition. Prague: Charles University, 1999. 182 pp. 24–33. ISBN 80-238-4589-6 .