

## LESSON № 13

### Topic: CELL PATHOLOGY

**Aim of the lesson:** to study causes and mechanisms of cell damage, consequences of subcellular structure injury and cell compensative reaction.

#### QUESTIONS:

1. Types of cell injuries. Causes and main mechanisms of cell damage.
2. The main etiopathogenic variants of cell injury. Ischemic and hypoxic injury. Free radical-induced injury. Toxic injury.
3. Reversible and irreversible ischemic/hypoxic cell injury.
4. Causes and consequences of cell energy production disturbance.
5. Changes in the cellular genome or disorders of its realization.
6. Membrane damage. Oxidative stress as general mechanism of cell injury. Mechanisms of antioxidative defense.
7. Ionic distribution in extra- and intracellular space. Role of ions in the cell function during pathological conditions.
8. The mechanisms of transcellular communication (eicosanoids, hormones and cellular growth factors).
9. Disorders of intracellular regulatory mechanisms. Role of calcium in cell function and injury.
10. Derangement of the subcellular structures and components. Consequences of organelles injury (membrane, nuclear, mitochondria, ribosome, ect.).
11. Dystrophy.
12. Dysplasia.
13. Necrosis as general mechanism of accidental cell death. Role of calcium, lysosomal ferments and reactive oxygen spaces in necrosis development.
14. Apoptosis. The mechanisms of initiation of apoptosis. Stages of apoptosis. Consequences of apoptosis disturbance.
15. Comparing characteristic of apoptotic and necrotic cell death.
16. Mechanisms of cell defense against damaging factors. Reparative processes in injured cells.

## Tasks

### 1

A technician of the chemical laboratory was not careful working with a toxic volatile chemical. He dropped a flask containing the toxic substance and smashed it. Before he left the room, he had inhaled noxious vapours of the chemical. Two days later he was admitted to hospital with the following complaints: malaise, somnolence, headache, nausea, back pains, blood in the urine. Blood analysis: erythrocytes  $2.7 \times 10^{12}/l$ , Hb 80 g/l, platelets  $120 \times 10^9/l$ , leukocytes  $3,1 \times 10^9/l$ ; compensated acidosis (metabolic and renal). The results of the special blood biochemistry analysis: an increased concentration of free fatty acid, lipid hydroperoxides, and adenosinephosphate; an elevated total creatinephosphate kinase (CPK) activity and potassium content.

- One of the consequences of the patient's poisoning is a significant depletion of cells in the peripheral blood. What are the possible mechanisms of this effect?
- According to the results of the special blood tests what mechanisms of the cell injury can you propose? Which of them caused damage to the membrane of the formal particles? Explain your point of view.
- What are the origin and consequences of acidosis in this case?
- Why did the signs of intoxication develop in the patient not immediately but two days after the incident?

### LITERATURE:

1. Lecture material.
2. General and clinical pathophysiology / ed. by A.V. Kubyshkin – Vinnytsa: Nova Knyha Publishers. – 2011. – P. 134-164.
3. Litvitsky P.F., Pirozhkov S.V., Tezиков E.B. Pathophysiology: Concise Lectures, test, clinic-pathophysiological situations and clinic-laboratory problems. Students manual / Moscow «Geotar-Media», 2012. – P. 19-22.
4. Pathology / ed. by E. Rubin and J.L. Farber, 2<sup>nd</sup> ed. – 1994. – P. 1-32.
5. General and systematic pathology / ed. by J. C.E. Underwood. 2<sup>nd</sup> ed. – 1996. – P. 111-137.

## **Topic: RADIATION SICKNESS**

**Aim of the lesson:** to study the pathogenesis radiation sickness.

### **QUESTIONS:**

1. Radiation. Issues and power of different radiation rays.
2. Units of radiation assay.
3. Mechanisms of radiation inflow on the organism. Water radiolysis, lipid peroxidation and DNA mutations.
4. Clinical types of radiation sickness. Dependence from dose.
5. Pathophysiology of bone marrow form of radiation sickness. Its stages.
6. Mechanisms of remote consequences of radiation inflow on the organism.

### **LITERATURE:**

1. Lecture material.
2. General and clinical pathophysiology / ed. by A.V. Kubyshkin. – Vinnytsa: Nova Knyha Publishers. – 2011. – P. 59-80.
3. General and systematic pathology / ed. by J.C.E. Underwood. – N. Y., 1996. – P. 127-136.

