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SOME BIOCHEMICAL AND HEMATOLOGIC PARAMETERS IN PERYPHERAL BLOOD OF RATS UNDER CHLORPYRIFOS EXPOSURE. EFFECT OF VITAMIN A AND E

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We studied the action of A and E vitamins on the basic hematological and biochemical parameters of peripheral blood under the chlorpyrifos (CPF) intoxication.

The study was conducted on 20 adult male Wistar rats of 180-220 g body weight. The animals were kept in standard vivarium conditions, with 12-hour dark/light mode and unlimited access to water and lab food. All manipulations with animals were carried out under the European Convention «On protection of vertebrate animals used for experimental and scientific purposes» (Strasbourg, 1986) and «General ethical principles of animal experimentation», approved by the First National Congress of Bioethics (Kyiv, 2001).

Animals were devided to four groups: 1 control (C) and 3 experimental (E1, E2, E3) groups of 5 rats each. Group E1 was exposed to 70 mg/kg chlorpyrifos in oil solution; E2 group received 0.055 g vitamin A (in the retinol palmitate form) and 0.1 g vitamin E (alpha tocopherol in the acetate form; E3 group was exposed to both CPF solution (70 mg/kg) and vitamins A (0.055) and E (0.1 g). All exposures were conducted *via* oral probe.

Exposure to 70 mg/kg CPF caused a decrease in the total number of red blood cells, platelets, and hemoglobin content. Under conditions of correction of intoxication with vitamins A and E, a less significant decrease in the total number of red blood cells and hemoglobin content was found. It was observed a decrease in the acid hemolysis resistance of red blood cells in peripheral blood of CPF-poisoned rats. Red blood cells are highly sensitive to oxidative damage. Proteins in the membranes can be damaged due to the formation of covalent cross-links (cross-linking) and aggregation, caused, in particular, by superoxide anion radicals and hemoglobin autooxidation products: methemoglobin (containing trivalent Iron) and ferryl hemoglobin (with tetravalent Iron); the latter has strong oxidizing properties. Iron in the ferryl hemoglobin molecule is unstable and can change its valence from Fe^{+4} to Fe^{+3} in the reaction with specific amino acids in the hemoglobin chain. Formation of ferryl hemoglobin may be caused by drugs and xenobiotics. Because of its instability, it can interact with components of cell membranes, stimulating hemolysis and formation of lipid peroxides. At 12 hours after exposure, a significant decrease in platelet count was observed in the peripheral blood of E1 group rats, which is consistent with results of our previous studies. Also, in this group was found a significant decrease in the number of red blood cells (by 14 %) and hemoglobin content (by 8 %), compared with control values.

In the blood of E3 group we found a decreased number of red blood cells (by 11 %) and the total hemoglobin (by 7 %), compared to the control. We have not detected significant intergroup differences between E1 and E3 groups. Minor changes in the number of red blood cells in peripheral blood may be associated with changes in physical and chemical properties of erythrocyte membranes and duration of their life.

Changes in the number of red blood cells are due to the increase of the α-tocopherol content in their membranes, disrupting the ROS formation cycle. Also, we know that lipid peroxidation can cause changes in rheological properties of erythrocyte membranes and membrane potential, increase their permeability for different ions that can initiate the process of hemolysis, and thus reduce the lifespan of erythrocytes. Combined exposure to CPF and vitamins A and E caused an increase in hemolysis resistance of erythrocytes, so that it approached the control values. Vitamins A and E had a reversive effect on the production of lipid peroxidation products at E 3 group. We found that vitamins A and E caused corrective effects on rat's erythrocytes.