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ANALYSIS OF THE COMPLETE BLOOD COUNT IN MALE WISTAR RATS EXPOSED TO DIFFERENT DOSES OF ORALLY ADMINISTERED SODIUM SELENITE

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ABSTRACT — AIMS: To compare the structure of the formula and morphological characteristics of the blood cells after an acute experiment in laboratory rats with oral administration of sodium selenite at a concentration of selenium (Se) 0.5, 1 and 2 maximum permissible concentration (MPC).

METHODS: Four groups of Wistar rats weighing 260–300 g (a control group and three experimental ones: Se group of 0.5 MPC, 1 MPC and 2 MPC) were given sodium selenite in the respective concentrations for 5 days (except for the control group). After the rats were removed from the experiment, blood was taken from the caudal artery and a biochemical blood test was performed and the data obtained were evaluated and compared with the norm.

RESULTS: Changes in the cell composition of rat blood were determined by the dose of selenium. There were no changes in the "Se 0.5 MPC" group compared to the control group. In the Se 1 MPC group, the main difference was a decrease in the number and morphological changes in red blood cells, as well as an increase in the number of eosinophils. Hypochromic anemia and lymphocytopenia were found in the Se 2 MPC group.

CONCLUSION: During an acute experiment, when selenium is given to rats at a dosage equal to the maximum permissible concentration and more, changes in the blood formula are observed, reflecting the pathological processes related to selenium poisoning: anemia, eosinophilia, lymphocytopenia.

KEYWORDS — sodium selenite, maximum permissible concentration, red blood cells, anemia, eosinophilia, lymphocytopenia.

INTRODUCTION

The huge and still growing market of biologically active supplements has product groups aimed

at correcting function of metabolism, antioxidant and cardiovascular systems. They even claim to have antitumor activities. Some of them may contain compounds of selenium. [1, 2] However, due to a relatively narrow therapeutic index of selenium, a person with a normal level of selenium (13 to 30 mg), who takes such a supplement, may easily exceed the therapeutic dose and receive a toxic dose.

In many ways, the effect of high doses of selenium on the body has not been observed. [1] In our work we investigated the effect of selenium at different concentrations on the blood of rats to predict its toxic effect in humans.

METHODS

Laboratory male rats of the Wistar line weighing 260–300 g were used in the study. The rats were divided into 4 groups: control group (n=10), group Se 0.5 MPC (n=10), group Se 1 MPC (n=10), group Se 2 MPC (n=10). The rats of the experimental groups (Se) were given a solution of sodium selenite once a day for five days at a dose of 2.5 mg/kg, 5 mg/kg and 10 mg/kg of weight, based on the MPC = 5 mg/kg of weight.

The rats were kept, cared for, fed and removed from the experiment in accordance with the requirements for the provision of human treatment of animals, the rules of clinical trials in the Russian Federation approved by the Ministry of Health of the Russian Federation on December 29, 1998, the provisions of the Helsinki Declaration (2000).

RESULTS

The blood formula of rats of the control and experimental groups is presented in Table 1.

Changes in the blood formula of rat blood correlated with the dose of selenium (Table 1) [5].

It can be stated, that in the experimental group "Se 0.5 MPC" there were no significant differences in the blood formula of animals of the control and experimental groups.

Considerable differences in the group of rats "Se 1 MPC" were observed due to a decrease in the number of red blood cells and an increase in eosinophils

Table 1. Blood formula of control group (K) of rats and test groups exposed to selenium at doses of 0.5, 1, 2 MPC, $X \pm m$, $n=10$, LII — leukocyte intoxication index [3]

Levels	Group of rats			
	control	Se 0,5 MPC	Se 1 MPC	Se 2 MPC
Red blood cell	4,78±0,09		3,76±0,14	
Basophils	0	0	0	0
Eosnophis	1,5±0,21	2,5±0,23	3,0±0,32	5,0±0,34
Neutrophils:				
- young	0	0	0	0
- rod-shaped	3±0,3	3,5±0,2	3,3±0,25	2,0±0,34
- segmented	29±2,7	28±3,5	30±1,9	49±3,7
Armeth count, units	0,10	0,13	0,11	0,04
Lymphocytes	65,3±4,9	65,5±5,1	60,3±4,7	40,6±4,2
Monocytes	1,5±0,12	2±0,12	2±0,14	1±0,09
LII	0,2	0,2	0,2	0,2

compared to the control group. Hypochromasia of erythrocytes was noted in blood smears of animals of this group. Poikilocytosis and anisocytosis are weakly expressed, which indicates the initial signs of anemia. It was also morphologically established that single lymphomonocytic cells were in a state of dystrophy and lysis. Besides, the obtained data indicate a weakening of humoral immunity.

In the "Se 2 MPC" group of our studies the development of lymphocytopenia in rats was observed. This can be considered as a result of a decrease in the immune response. At the same time, the leukocyte intoxication index does not differ from the control one. Blood smears of animals of the "Se 2 MPC" group are characterized by the aggregation of erythrocytes. Most smears showed poikilocytosis and hypochromasia, which indicates hypochromic anemia. It is confirmed by a decrease in their number and a decrease in hemoglobin levels in rats of this experimental group.

CONCLUSION

After oral administration of sodium selenite at a dose of "Se 1 MPC", a toxic effect on the body of laboratory animals was revealed: slight deviations in the leukocyte count and morphology of blood cells were noticed. The rats received "Se 2 MPC" showed a more significant toxic effect of selenium, which is manifested by leukopenia and hypochromic anemia and indicates acute selenium poisoning.

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