

THE RESPONSE OF HUMORAL IMMUNITY TO COMBINED EFFECTS OF MODERATELY LOW TEMPERATURES AND LOW FREQUENCY ELECTROMAGNETIC RADIATION

Olena Litovchenko

Kseniia Zub

V.N. Karazin Kharkiv National University

Department of molecular biology and biotechnology

Head of department – prof. Bozhkov A.I.

Kharkiv National Medical University

Department of hygiene and ecology №2

Head of department – prof. Zavgorodnii I.V.

Scientific advisor – prof. Bozhkov A.I.

Actuality. All the biological objects are daily subjected to simultaneous influence of several factors. Nowadays there is a rapidly growing interest to the body's response to electromagnetic radiation (EMR) of industrial frequency within various microclimatic conditions. The immune system is known to be extremely sensitive to the effects of environmental factors, therefore, the precise study of immune system adaptation to particular environmental factors is extremely relevant.

Aim. To establish the peculiarities of humoral immunity response to moderately low temperatures combined with low-frequency electromagnetic radiation within experiment.

Materials and methods. An experiment was carried out for 30 days, involved male rats (WAG line, n=72); the age: 6 months. The animals were divided into 4 equal groups: group №1 was put in moderately low temperature (MLT): $+4\pm 2^{\circ}\text{C}$, group №2 was in comfortable temperature conditions and subjected to EMR (70 kHz, 600 V/m), group №3 was simultaneously exposed to MLT and EMR, group №4 - a control group. Immunological reactions were evaluated due to serum concentration of complement system components (C3, C4, C5) and IgA, IgM, IgG. The indicators were studied on 5th, 15th, 30th days of the experiment. Statistical analysis was performed via Mann-Whitney test and Pearson correlation analysis.

Results. On the 5th day the group №1 showed a decrease in C4-component. Moreover, a decrease in C4-component in groups №2 and №3 was also observed. Correlation analysis showed a strong negative relationship between C4-component and IgM in the 3rd group ($r=-$

0.93). On the 15th day IgM level increased in all experimental groups; IgG concentration reduced in group №1; the opposite effect was observed in group №3; MLT increased C4-level; isolated EMR as well as in combination with MLT reduced the concentration of C4 concentration. A strong direct correlation was observed between the C4-component and IgM in the 3rd group ($r=0.8$). At the stage of 30 days an increase in IgM level and C5-component was observed in all experimental groups. An increase in IgG was noted in groups №1 and №3, the 2nd group had reduced level of the indicator. The concentration of C4 component was increased in groups №1 and №2; the 3rd group showed a decrease in level of C4-component. There is a strong direct correlation between C5-component and IgM in the group №3 ($r=0.88$). All changes were significant: $p<0.05$.

Conclusions. Thus, the response of humoral immunity to the combined effect of moderately low temperatures and low frequency electromagnetic radiation was modified comparing to isolated effects of these factors due to criteria: concentration of IgM, IgG and C4-component. The correlation analysis of parameters in the combined exposure group confirms the role of immunoglobulins in the activation of complement system.