

UDC 612.017.2 : 615.241.3

Boiko Yu.O.¹, Broshkov M.M.², Boiko I.A.³

¹Candidate of Biological Sciences, Associate Professor, Odessa State Agrarian University

²Doctor of Veterinary Sciences, Professor, Odessa State Agrarian University

³Candidate of Biological Sciences, Associate Professor, Odessa National Medical University

THE EFFECT OF HUMIC ACIDS ON THE ADAPTIVE PROPERTIES OF THE RAT ORGANISM DURING EXPERIMENTAL STRESS

Introduction. For the first time stress as a special state was described by T.R. Glynn in 1910. This concept refers to a nonspecific reaction of a living organism to any action - physical or psychological, capable of disrupting its homeostasis. The widespread use of the term "stress" is associated with the works of Hans Selye, the founder of the theory of the "general adaptation syndrome".

According to its effect on the body, stress is divided into positive (mobilizing) - eustress, and negative (destructive) - distress. Depending on the duration, acute stress (short-term, shock) and chronic stress (long-term, which has a more severe effect on the body) are distinguished.

The development of a stress reaction and subsequent adaptation to it go through several successive stages. The first stage, which occurs when homeostasis is threatened, is characterized by the activation of the nervous and endocrine systems, the development of an anxiety state and includes the phases of shock and anti-shock. If the body's defense mechanisms are effective, anxiety decreases and physiological processes return to normal. With prolonged exposure to the stressor, the second stage occurs - the stage of resistance (resistance), during which the body maintains defensive reactions through the rational use of adaptive resources. If stress continues, the third stage develops - the stage of exhaustion, which is characterized by a decrease in adaptive reserves, a violation of the regulation of defensive mechanisms and the occurrence of functional and morphological disorders.

The duration of each stage and the transition from one to another depend on the level of resistance of the body and the strength of the stressor.

Since humans and animals constantly experience stressful influences, the search for pharmacological drugs that help strengthen the body's adaptive abilities is relevant.

The aim of the work was to study the effect of a mixture of humic acids on the adaptive abilities of the organism.

Materials and methods. The work used 20 outbred young male rats, weighing 150-180 g, which were kept on a mixed vivarium diet. All studies were performed in compliance with bioethical standards for conducting experimental work with vertebrate animals. The animals were divided into two equal groups of 10 animals. The first group of animals (experimental) was orally administered a hydrogen solution of a mixture of humic acids at a dose of 1.5 ml/kg of 8% solution. The second group (control) received saline of the same volume. Frequency of administration: once every two days, for fourteen days. Starting from the 7th day of administration of the drug or saline, an experimental stress reaction was formed in the animals by immobilization. For this purpose, the animals were placed in mesh cages made of transparent plastic, the size and shape of the cages did not allow the animals to make even limited movements. The walls of the cages did not injure the skin and did not restrict respiratory movements. The animals were immobilized in a horizontal position for 2 hours, every day, for 7 consecutive days. Before and after the end of the immobilization period, blood was taken from the tail vein. In the blood samples, the formed element composition (erythrocytes, platelets, leukocytes) and leukocyte formula were determined by flow cytometry, biochemical indicators (glucose, urea, ALT, AST, LF and glucocorticoids) were determined using test systems. Statistical analysis was performed with the determination of the mean and standard deviation of the mean, the significance of differences was determined using the Student's test.

Results and discussion. An informative marker of the development of a stress state is an increase in the level of glucocorticosteroids. In animals of the control group, before the start of the induction of a stress state, the cortisol level was 60 ± 15 ng / l, after the end of the stress effect, the cortisol level increased to 74.2 ± 20 ng / l, the significance of the difference in the mean is 0.05. For animals of the experimental group, the cortisol level was 72.9 ± 9.3 ng / l, after the end of the stress effect, the cortisol level increased to 74.4 ± 22.3 ng / l, the significance of the difference in the mean is 0.91. Forced immobilization leads to a stress response, which is confirmed by an increase in the plasma concentration of glucocorticoids in animals of the control group. In animals of the experimental group, an increased concentration of cortisol was observed already at the beginning of the experimental stress, which did not increase during the action of the stress factor. Among other studied indicators, an increase in the number of lymphocytes was noted in the animals of the experimental group, from 8 to 9 G/l, while in the animals of the control group a decrease in this population of leukocytes was observed (from 7.4 to 5.6 G/l). Analyzing the obtained data, it is possible to state the

complex effect of humic acids on both the immune system of rats and the general adaptive properties in general.

Conclusions. The obtained data require further more thorough research to identify possible mechanisms of influence of humic acids on the immune and endocrine systems, as well as on the adaptive capabilities of the organism.