

Experimental Evaluation of the Feasibility of the Cerebrospinal Fluid for Stimulation of The Erythropoietic Chematopoietic Lineage

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The aim of the present study is to evaluate the stimulating effect of the cerebrospinal fluid on the erythropoietic hematopoietic lineage of the red bone marrow of calves. The observations were carried out for over 30 days. Hematologic and hematopoietic studies were performed with the use of conventional methods of the veterinary medicine. The studies conducted allow to recommend the use of subcutaneous injection of the cattle cerebrospinal fluid, irradiated with ultraviolet rays, into the area of biologically-active points responsible for hemogenesis to stimulate erythropoiesis in the commercial cattle breeding.

Key words: Cattle, cerebrospinal fluid, ultraviolet radiation, Erythropoietic hematopoietic lineage, stimulation.

The problem of the structure and function of the hematopoietic system and its regulation is a priority for fundamental human and veterinary medicine¹. Many pathologies often manifest as anemia syndromes, one of the reasons of which is the lack of red blood cell production due to violation of red bone marrow hemogenesis^{2,3}. It is known that at the chronic deficiency of nutritional factors the function of the erythroid hematopoietic lineage, as well as the formation of erythroid cells are disturbed, their maturation is delayed³. The cellular and humoral defenses of the animal organism are inextricably connected with the hematopoietic system^{2,4}. At the present time unconventional methods are being actively implemented for the correction of various

pathological conditions⁵⁻⁸. These methods are based on the use of biologically-active drugs, including the cerebrospinal fluid^{1, 4, 6, 9, 10}. In the cerebrospinal fluid there are found many biologically-active substances involved in hemogenesis: thymosin contributes to the conversion and maturation of progenitor cells into T-lymphocytes; interferon adjusts the strength of the immune response, activates macrophages, T-cells; interleukin – 1 β – stimulates T-cells and B-cells, priming of the cells of the immune response, synthesis of acute phase proteins; interleukin-6 is an inducer of megakaryocytic maturation; interleukin-10 stimulates thymocytes, B-cells, etc.^{4, 11-14}. The studies of a number of authors have shown some definite prospects for intravital use of the obtained cerebrospinal fluid as a biologically active drug, as well as a biogenic stimulator of hemogenesis^{9-11, 15}. The study of the various influences on the biologically active points of the animal organism showed the feasibility of their use in the correction schemes of pathological conditions associated with hemogenesis

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suppression^{7, 8}. Targeted comparative studies of the cerebrospinal fluid, optic radiations and their combinations, as well as the impact of these factors on hemogenesis when used in the area of biologically-active points of animals of different species have not been conducted. The problem of anemia and stimulation of hemopoiesis of animals currently remains relevant.

METHODS

In order to conduct the studies the cerebrospinal fluid was obtained from cows aged 3-4 years old prior to their slaughter. Animal welfare was confirmed by veterinary documents, as well as at postmortem examination of carcasses and organs.

The experiments were performed on black-

and-white female calves at the age of 2 (two) months. By the principle of analogs there formed three groups of animals (control groups and two experimental groups), 5 (five) animals in each group. The calves of the first experimental group were injected in biologically-active points responsible for hemogenesis, with native cerebrospinal fluid at a dose of 0.1 ml per one kilo of the body weight.

The calves of the second group were injected in biologically-active points responsible for hemogenesis, with native cerebrospinal fluid irradiated with ultraviolet rays in the same dose. The cerebrospinal fluid in experiment immediately prior to injection to animals was irradiated with ultraviolet rays in devices for ultraviolet irradiation of liquids specially developed by the authors.

Withdrawal of blood and red bone marrow

Table 1. Dynamics of cytosynthesis of the erythropoietic hematopoietic lineage of the calves after their injection with the cerebrospinal fluid

S. No.	Indicators	Control	3rd day	10th day	30th day
1	Erythroblasts	single	0.15±0.01	2.03±0.03*	2.43±0.03*
2	Normocytes	6.50±0.35	7.84±0.19*	8.57±0.32*	14.87±0.23*
3	basophilic	2.27±0.15	1.97±0.09	1.53±0.12*	5.50±0.15*
4	polychromatophil	0.83±0.03	1.70±0.06*	1.97±0.12*	2.40±0.06*
5	oxyphil	3.40±0.21	4.17±0.03*	5.07±0.15*	6.97±0.12*
	Total number for erythroblastic line	6.50±0.35	7.97±0.05*	10.60±0.32*	17.30±0.22*
6	Number of nucleated bone marrow cells, thous./mcL	102.62±0.88	108.15±0.58*	119.17±0.36*	107.42±0.89*
7	Leucoerythroblastic index	1:0.2	1:0.5	1:0.4	1:0.6
8	Maturation index of erythronormoblasts	0.7	0.7	0.7	0.6

*≤0.05.

Table 2. Dynamics of cytosynthesis of the erythropoietic hematopoietic lineage of the calves after their injection with the cerebrospinal fluid irradiated with ultraviolet rays

S. No.	Indicators	Control	3rd day	10th day	30th day
1.	Erythroblasts	Single	Single	Single	Single
2.	Normocytes	6.50±0.35	31.73±0.09*	25.56±0.29*	18.06±0.03*
3.	basophilic	2.27±0.15	5.43±0.03*	4.60±0.31*	3.50±0.06*
4.	polychromatophil	0.83±0.03	2.16±0.03*	2.40±0.10*	2.73±0.06*
5.	oxyphil	3.40±0.21	24.14±0.06*	18.56±0.03*	11.83±0.03*
	Total number for erythroblastic line	6.50±0.35	31.73±0.09*	25.56±0.30*	18.06±0.07*
6.	Number of nucleated bone marrow cells, thous./mcL	102.62±0.88	123.80±0.84*	286.21±3.63*	104.60±1.38
7.	Leucoerythroblastic index	1:0.2	1:0.3	1:0.6	1:1.2
8.	Maturation index of erythronormoblasts	0.7	0.9	0.8	0.8

*≤0.05.

of experimental animals was carried out on the 3rd, 10th and 30th day of the study after injection of cerebrospinal fluid and results were compared with the results obtained from animals of the control group. Hematological studies were carried out using conventional veterinary methods. In the punctate of the red bone marrow there defined the total number of nucleated cells and deduced the myelogram, as well as the leucoerythroblastic index and maturation index of erythronormoblasts were counted under conventional methods.

Main body

After the female calves were injected with the cerebrospinal fluid in biologically-active points, the study of peripheral blood revealed a significant increase in the number of erythrocytes, most expressed on the 10th day of the experiment conducted.

It has been established that the injection of animals with the cerebrospinal fluid in biologically-active points has led to a marked increase in the percentage of cells of the erythroblasticematopoietic lineage, significantly expressed by 10 and 30 days of the study conducted. An increase in leucoerythroblastic index indicated the stimulating effect of the injected drug on the cells of the erythropoietichematopoietic lineage. An increase in the index of erythronormoblastic maturation indicated the stimulation of erythronormocyte maturation and hemoglobinezation.

In the second series of experiments, the calves of the experimental group were injected in the area of biologically-active points responsible for hemogenesis, with the cattle cerebrospinal fluid irradiated with ultraviolet rays at a dose of 0.1 ml per one kilo of body weight (Table 2).

In this series of experiments in the study of the peripheral blood of animals the experience-reliable quantitative and qualitative changes have not been detected.

It has been established that the injection of animals with the cattle cerebrospinal fluid irradiated with ultraviolet rays in biologically-active points responsible for hemogenesis has led to a sharp increase in the number of nucleated bone marrow cells during the first ten days of the experiment.

An injection of the drug has led to expressed stimulation of the erythroidhematopoietic

lineage. During the first 10 (ten) days indicated a sharp increase in total number of bone marrow cells (more than two times). There occurred an increase in the maturation index of erythronormoblasts, that is typical for stimulation of erythropoiesis and accelerated erythronormocyte hemoglobinezation.

DISCUSSION

Analyzing the data obtained and comparing them with the published information on the studied scientific field, it should be noted that the process of hemogenesis subject to complex regulation, that ensures the change in quantity and quality of blood cells in accordance with the needs of the organism^{2,3,11,15}. A wide range of biologically-active substances of the cerebrospinal fluid allows to successfully use it for stimulation of certain physiological and pathological organism states, including for hemogenesis activation⁹. Currently in the veterinary and medical practice actively introduced innovative methods of treatment of various diseases (including hemodepressive diseases) with the use of quantum radiation and activation of biologically-active points by different ways⁸. Considering the comparative aspect of the reaction of erythropoietic hematopoietic lineage of the cattle red bone marrow on the subcutaneous injection of the cattle native cerebrospinal fluid in the biologically-active points responsible for hemogenesis, and on the injection of the xenogenic cattle cerebrospinal fluid, irradiated with ultraviolet rays, it follows that the cerebrospinal fluid injected in the area of biologically-active points responsible for hemogenesis, stimulates erythropoiesis of the cattle. Biologically-active substances in the cerebrospinal fluid in ratios optimal for organism functioning may condition an expressed biological response of hematopoietic tissue, while the irradiation of the cerebrospinal fluid with ultraviolet rays increases its pharmacological activity, allowing to achieve a stronger erythropoiesis stimulation, that indicates an excitation of composite components of the cerebrospinal fluid under the influence of quantum radiation.

The data obtained in the course of the experiment are consistent with the results obtained by the other researchers in this scientific

field^{3, 10, 15, 16}.

As a result of the conducted studies a method for stimulation of the cattle erythropoiesis has been developed, tested on animals and introduced.

CONCLUSION

The conducted studies have shown that the subcutaneous injection of calves with the native cattle cerebrospinal fluid in the area of biologically-active points responsible for hemogenesis, and the injection of the cattle with the cerebrospinal fluid irradiated with ultraviolet rays, have caused an expressed response of hematopoietic tissue of the cattle under study. The drugs showed an expressed effect of the erythropoietic stimulator. The stimulatory effect of the cerebrospinal fluid is connected with the presence of many biologically-active substances in its structure, that causes an expressed biological response of the hematopoietic tissue. More pronounced effect of the irradiated cerebrospinal fluid indicates the activation of biologically-active substances under the influence of ultraviolet radiation. The observed effect suggests the pre-saturation of pharmaceutical products with the energy of quantum radiation shall allow to reduce the dosage of medical drugs.

Results of the study

1. It has been established that the injection of calves with the native cerebrospinal fluid irradiated with ultraviolet rays in the area of biologically-active points responsible for hemogenesis, stimulates the erythropoiesis.
2. It has been shown that after the experimental animals were injected with the cerebrospinal fluid irradiated with ultraviolet radiation in the area of biologically-active points responsible for hemogenesis, within the first 10 (ten) days of the experiment there observed a significant increase in the total number of nucleated bone marrow cells, compared with the injection of native drug product.
3. After injection of drug products there indicated an increase in maturation index of erythronormoblasts, that is typical for stimulation of erythropoiesis and accelerated erythronormocyte hemog-

lobineization.

4. The invention patent of the Russian Federation No. 2390346 was obtained for the aboveproposed method for the stimulation of the cattle erythropoiesis on January 11, 2009.

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