Correction of the Secondary Immunodeficiency at Radiation Sickness with the Help of Herbal Remedies

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Abstract: The influence of herbal remedies on immunological and hematological parameters in mice with radiation sickness was studied. It has been revealed that the supromed, pro-vision, biomyrin and biophthysetham correct the inhibited immune response to erythrocytes of the sheep under radiation exposure, and also the studied means promote the increase in the number of erythrocytes and leukocytes in the blood in mice with radiation sickness. Under the influence of biomyrin, the number of blood leukocytes increases by 1.25 times, providas by 1.33 times, supercedes by 1.42 times and biofetizoetham by 1.47 times.

Keywords: irradiation, secondary immunodeficiency, erythrocytes, leukocytes, sucrromed, proweed, biomyrine, bioftizoetam.

I. Introduction

Herbal remedies are widely used in medical practice in the treatment of diseases of various etiologies [2,4,5-9]. It is known that many diseases are accompanied by disorders in the immune system (secondary immunodeficiencies), which require appropriate correction [1,3]. In this respect, preparations of plant origin (for example, immunal) have proved to be very useful. Deep secondary immunodeficiency develops under the influence of various types of radiation on the organism [6,10,11].

The aim of the study was to study the effect of herbal remedies on immunological and hematological parameters in mice with radiation sickness (RS).

II. MATERIAL AND METHODS

To simulate RS white mongrel mice weighing 20-22 g once completely irradiated at a dose of 4 Gy. After 5 days, they were intraperitoneally immunized with erythrocytes of a ram (SRBC) at a dose of 2×10^8 and after 4 days the number of antibody-forming cells (ABPC) in the spleen was determined by a direct method of local hemolysis by the method of Jerne N.K. and Nordin A.A.(1963) [12]. The number of ABPC was calculated for the whole spleen (absolute index) and for 1 million spleen cells (relative indicator). The total number of nucleated cells of the spleen (NCS) was counted. In the peripheral blood of mice, the number of erythrocytes and leukocytes was determined. The investigated herbal remedies were injected once intragastrically on the day of immunization with SRBC. The animals were divided into 6 groups. Group 1 - intact mice immunized with SRBC; 2nd group (control) - mice with RS, immunized with SRBC; The third group - mice with RS received SRBC and a preparation of sucrromed in a dose of 25.0 mg / kg; The 4th group - mice with RS received SRBC and proline preparation in a dose of 25.0 mg / kg; The 5th group - mice with RS received SRBC and a preparation of biomyrin in a dose of 75.0 mg / kg; 6th group - mice with RS received SRBC and a preparation of biofizoetam at a dose of 75.0 mg / kg.

III. RESULTS AND DISCUSSION

The results of studies on the effect of herbal preparations on immunological reactivity in mice with RS are given in Table 1. As can be seen from this table, in the spleen of mice of the control group, an average of 7668.8 ± 245.0 ABPC is formed, and in

animals with RS in 14.4 times less. Consequently, after the radiation exposure, a deep secondary immunodeficiency is formed. It is established that all the studied herbal preparations have the ability to correct to a certain extent the violations in the immune status in irradiated mice. In mice receiving sukromed, 1643.8 ± 58.4 ABPC formed in the spleen, which is significantly 3.10 times higher in comparison with the immunodeficiency group. In the groups of animals with RS that received prowid and biomyrinin, the immune response to SRBC in comparison with untreated mice rises by 2.61 and 2.11, respectively. Immunostimulating activity of sucrromed significantly exceeds that of Provid and Biomyrine, and the immunostimulating activity of Provid is higher than that of Biomyrine.

Consequently, the immunostimulatory activity of plant preparations is significantly different from each other. Under the influence of biofthisoetam, the immune response to SRBC in the irradiated mice increased 3.61 times. The immunostimulatory activity of this herbal preparation is significantly higher than that of the previous three agents.

When calculating ABPC for 1 million spleen cells, the following results were obtained. In the control group this indicator is equal to 45.9 ± 1.8 ABPC, while in mice with RS it is 3.53 times less.

Table 1: **The effect of herbal remedies on the immune response to the sheep red blood cells in mice with radiation sickness (RS) (M ± m)**

Group	Dose, mg / kg	Number of NCS $\times 10^6$	IR	Number of ABPC at			
				whole spleen	IR	10^6 cells of the spleen	IR
intact (n = 8)	-	173,3± 4,2	-	7668,8 ±245,0	-	45,9±1,8	-
2.RS (control) (n = 8)	-	42,2± 1,0[a]	-4,10	531,3± 19,5[a]	-14,4	13,0±0,5[a]	-3,53
3.RS + Sukromed (n = 8)	25,0	57,0± 1,4[ab]	+1,35	1643,8 ±58,4[ab]	+3,10	29,8±1,2[ab]	+2,29
4.RS + Provid (n = 8)	25,0	53,2± 1,3[ab]	+1,26	1387,5 ±50,9[abc]	+2,61	27,0±1,1[ab]	+2,08
5.RS + biomyrine (n = 8)	75,0	51,1± 1,3[abc]	+1,21	1118,8 ±40,5[abcd]	+2,11	22,6±0,9 [abcd]	+1,74
6.RS + biotizoetham (n = 8)	75,0	58,3± 1,4[abcd]	+1,38	1918,8 ±70,3[abcdf]	+3,61	34,0±1,3 [abcdf]	+2,62

Note: here and in Table 2, NCS - nucleated cells of the spleen; ABPC - antibody-producing cells; IR - the index of the ratio: (-) - in relation to 1 gr., (+) - in relation to 2 gr., A - authentically to 1 gr., B - authentically to 2g., C - authentically to 3g. , D - authentically to 4 g., F - authentically to 5 g. ($p < 0.05$)

In the group of animals with RS that received sucrromed and prodigal, the number of ABPC per 1 million of the spleen cells increased, respectively, by 2.29 and 2.08 times. Stimulating activity of these drugs is not significantly different from each other. Less pronounced stimulating effect was detected in biomyrin: the number of ABPC per 1 million splenocytes is 1.74 times higher than in untreated mice. Under the influence of Bioftizoetam , the number of ABPC per 1 million spleen cells in mice with RS increases 2.62 times. Immunostimulating activity of biophthysoetham is significantly higher than in all other herbal preparations.

Thus, when calculating the ABPC for both the whole spleen and 1 million splenocytes, the ability of the studied herbal remedies to significantly enhance immunological reactivity in mice after radiation exposure was established.

As can be seen from Table 1, the total number of NCS in the control is 173.4 ± 4.2'106, and after the radiation exposure this index decreases by 4.1 times. With the introduction of Provid and Biomyrine, the total number of splenocytes in mice with

RS increases, respectively, in 1.26 and 1.21 times. The stimulating activity of the preparations does not differ significantly from each other.

More pronounced stimulating activity in relation to the total number of NCS in irradiated mice is possessed by sucrromed and biophthysoetham: the number of splenocytes significantly increases in 1.35 and 1.38 times, respectively. Their stimulating activity is significantly higher than that of provid and biomyrin.

Thus, the studied herbal preparations have the ability to increase the immunological reactivity of the organism and the total number of NCS in mice with RS.

The results of studies on the evaluation of the effect of herbal remedies on hematologic indices are given in Table 2. In the control group, the number of blood erythrocytes is $5.3 \pm 0.05 \times 10^9$ / ml, and in irradiated mice 2.52 times less.

In the groups of irradiated mice that received sucromed, provid and biomyrin, the number of erythrocytes in the blood increases in 1.33, 1.29 and 1.19 times, respectively. A more pronounced stimulating effect on the red germ of hematopoiesis is biofizoetam: the number of erythrocytes increases by 1.43 times. The stimulating activity of biofi-zoetam significantly exceeds that of other agents.

The number of blood leukocytes in irradiated mice is reduced by 2.10 times (7.5 ± 0.1'106 / ml - control, $3.6 \pm 0.07 \times 10^6$ / ml - irradiation). Under the influence of biomyrin, the number of blood leukocytes increases by 1.25 times, provid by 1.33 times, supercedes by 1.42 times and Bioftizoetam by 1.47 times. The stimulating activity of biophthysoetham and sucrromed is significantly higher than that of provid and biomyrin.

Table 2: **Influence of funds on the number of erythrocytes and leukocytes in peripheral blood in mice with radiation sickness (RS) (M ± m)**

Group	Dose, mg / kg	Erythrocytes $\times 10^9$/мл	RI	Leukocytes $\times 10^6$/мл	IR
1.Intact (n = 8)	-	5,3 ± 0,05	-	7,5 ± 0,1	-
2.RS (n = 8)	-	$2,1 \pm 0,02^{a}$	-2,52	$3,6 \pm 0,07^{a}$	-2,10
3.RS + Sukromed (n = 8)	25,0	$2,8 \pm 0,03^{ab}$	+1,33	$5,1 \pm 0,09^{ab}$	+1,42
4.RS + Provid (n = 8)	25,0	$2,7 \pm 0,03^{abc}$	+1,29	$4,8 \pm 0,09^{abc}$	+1,33
5.RS + biomyrine (n = 8)	75,0	$2,5 \pm 0,02^{abcd}$	+1,19	$4,5 \pm 0,08^{abcd}$	+1,25
6.RS + biotizoetham (n = 8)	75,0	$3,0 \pm 0,03^{abcdf}$	+1,43	$5,3 \pm 0,1^{abcd}$	+1,47

On the basis of the data obtained, it can be concluded that the studied herbal remedies have the ability to increase the primary immune response to SRBC and correct the disorders in the hematopoietic system in mice with RS.

IV. CONCLUSIONS

1. Sukromed, Provid, Biomyrine and Bioftizoetam corrected the inhibited immune response to erythrocytes of the ram under radiation exposure.

2. The studied means promote an increase in the number of erythrocytes and leukocytes in the blood of irradiated mice.

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