Biological activity of the mummy. Publication 6: Influence on the course of experimental acute radiation sickness

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A large number of studies have been devoted to the study of the effect of mummy on the course of experimental radiation sickness.

A.A. Adzhi-Mollaev and S.Yu. Nikodambaev (1965) studied rabbits subjected to a generalsingle irradiation with X-rays at a dose of 250 roentgens (r). The animals of the experimental group were orally administered mummy in an amount of 0.1 g / kg for 10 days [1]. During the experiment, it was found that in the animals of the experimental group, radiation sickness was mild and was not accompanied by their death. In animals of the control group, acute radiation sickness was of moderate severity and was accompanied by characteristic clinical manifestations [1].

The effect of the mummy preparation on the activity of alkaline phosphatase in irradiated animals was also studied. Before irradiation, the activity of alkaline phosphatase was within 2–3 conventional units [2]. After irradiation, the activity of blood alkaline phosphatase in the experimental group slightly decreased on the 5th day and approached the initial values by 35–45 days. In some animals, the activity of alkaline phosphatase even exceeded the initial data and was in the range of 2.3–2.7 units [2].

Thus, as a result of experimental studies, it was shown that the use of mummy for radiation sickness increases the activity of blood alkaline phosphatase in rabbits [2] and has a regulatory effect on the entire body [2].

V.D. Rogozkin and T. Tukhtaev (1965) studied the effect of the drug mummy on the courseacute radiation sickness in dogs [3]. Outbred dogs of both sexes weighing 11-16 kg at the age from 1 to 5 years were irradiated totally, once with Co gamma rays$_{60}$ on a special installation with a source capacity of 189-200 r / min in doses of 300 (LD$_{90}$) and 250 r (LD$_{46}$) [3].

The dogs of the experimental group received the preparation mumiyo daily orally at 100, 50, 25 mg / kg from the 1st to 20th, from the 3rd to 20th and from the 5th to 25th days after irradiation. The effectiveness of the therapeutic effect of mummy was judged by the survival rate, life expectancy of animals, the clinical picture of radiation sickness and hematological data [3].

The greatest effect from the use of mummy was found in acute radiation sickness caused by irradiation at a dose of 250 r (LD$_{46}$). When the drug was prescribed at a dose of 25 mg / kg from 5–25 days after irradiation, all dogs [6] of the experimental group survived. Two treated animals of this group were additionally prescribed intramuscular injections of streptomycin and penicillin during the period of persistent increase in body temperature. Most dogs in the experimental group had no visible symptoms of the disease and manifestations of hemorrhagic syndrome. Acute radiation sickness in animals of this group was of I and II severity [3].

In the control group, only 7 out of 13 animals survived. In 9 out of 13 animals, severe radiation sickness was observed [3]. Administration of the drug at a dose of 50 mg / kg with irradiation of 250 r did not contribute to the survival of the animals, but facilitated the course of the disease. The clinical manifestations of radiation sickness occurred later than in the control group [3].

There were no positive results from the use of the drug under conditions of acute radiation sickness caused by irradiation at a dose of 300 r. However, the use of the drug in an amount of 25 mg / kg lengthened the average life span of animals by 2–3 days, softened the severity of the disease, and stimulated leukopoiesis. By the 12th day after irradiation, the number of leukocytes in the dogs of the experimental group averaged 25 thousand, and in the control - 1.1 thousand in 1 mm^3 blood [3].

The use of mummy in large doses (according to 100 mg / kg) not only did not have a beneficial effecton irradiated animals, but also aggravated the course of radiation sickness, causing profound changes in the blood system [3]. During the experiment, a stimulating effect of the drug on leukopoiesis was established, and the stimulation occurred mainly due to leukocytes. By the 30th day of the experiment, the number of lymphocytes in the dogs of the experimental group reached the initial level: 1.5 thousand in 1 mm^3 blood; in control animals it was only 500 cells. In dogs of the experimental group, on days 7, 12, 20 after irradiation

an increased number of erythrocytes and hemoglobin was found in comparison with the control group [3].

It was also found that mummy has a stimulating effect on the process of leukopoiesis recovery, including lymphocyte count: by the 45th day in dogs of the experimental group, the number of lymphocytes was on average 100% higher than the initial level, in the control it was 50% lower than the initial level [3].

A. Shamakhmudov and V.A. Karimov (1965), studies were carried out on male white rats (weighing 150-180) [15]. Irradiation was carried out on a gamma device at a dose of 400 r and a dose rate of 29 r / sec [15]. It was found that in the control group of animals, death began from the 10th day after irradiation and continued until the 16th day.

In the experimental group of animals that received a solution of mumiyo at a dose of 25 mg / kg for 7 days before irradiation, a single death was noted on the 16th day after irradiation. The survival rate was 92%. In the experimental group of animals that received mummy at a dose of 50 mg / kg for 7 days before irradiation, the survival rate was 78%. Rats receiving mummy at a dose of 25 mg / kg after irradiation survived in 54%, and at a dose of 50 mg / kg - 67% [15].

The life expectancy of animals of the experimental group, which was injected with a solution of mummy at a dose of 25-30 mg / kg for one week before irradiation, increased 2.3-2.5 times compared with the control and was, respectively, 23.5-25, 3 days. In animals of the experimental group, treated from the 2nd to the 8th day after irradiation with a mummy solution at a dose of 25-50 mg / kg, the lifespan increased 1.5-1.8 times compared with the control and was 17.5 –20 days [15].

The results of the study of peripheral blood showed that the total number of leukocytes in control rats on the 33rd day after irradiation decreased to 12% of the initial level. In animals that received mummy solution before or after irradiation, the total number of leukocytes decreased to 18–23% of the initial level. By the 15th day of irradiation, the total number of leukocytes in the rats of the control group was 67%. In groups of rats that received mummy for one week daily before and after irradiation at a dose of 25 mg / kg and during the same time after irradiation at a dose of 50 mg / kg, the total number of leukocytes in the peripheral blood was completely restored by 15 days after irradiation. to the initial level [15].

In control animals, with a single irradiation at a dose of 1000 r, death occurred starting from the second day after exposure. The same high mortality was noted among animals that received mummy at a dose of 150 mg / kg before irradiation. When comparing the life expectancy for these groups, no significant difference was found: the average life span of the rats in the control group was 56 hours, and that of the experimental group was 61 hours [15].

Among the animals of the experimental group, who received a solution of mummy for one week before irradiation at the rate of 100 mg / kg, death began later - from 4 days, and the average life span was 98 hours [15].

Thus, the study showed an improvement in a number of important indicators of the body's vital functions: survival, average life expectancy, and restoration of the number of leukocytes in the peripheral blood, which indicates the beneficial effect of mummy in acute radiation sickness [15].

A series of studies devoted to the study of the effect of mummy on hematopoiesis and lymphopoiesis in acute radiation sickness was carried out by T. Tukhtaev et al. [4-13] on small (400 outbred mice weighing 18-22 g [4, 6-8, 11-13] and 650 rats [4, 11-13] weighing 180-220 g of both sexes) and large (rabbits [7] and 101 dogs [4, 11–13]) laboratory animals. The animals were irradiated once totally on a Co gamma unit^{60} at a power of 190 [11] and 220–240 [12]. The radiation dose for mice was 500, 600, 700 r; for rats - 600, 650, 750 rubles [12].

Blood for complete morphological analysis was taken from the tail vein [11]. To take smears - prints of the bone marrow and spleen, as well as to study the number of hematopoietic cells in the bone marrow of the thigh, small laboratory animals were sacrificed by decapitation [11].

The drug was administered orally once in the form of an aqueous solution at doses of 250 [7] (within two weeks), 500 [11] and 1000 [12] mg / kg from the 1st to the 20th day (1 series) and from the 3rd x on the 25th day (series 2) after irradiation. Control animals received saline [11, 12].

The effectiveness of the drug was judged on the basis of the clinical course of acute radiation sickness [11, 12]: animal survival [11, 12], life expectancy [11, 12], changes in the morphological composition of peripheral blood [11], hematopoiesis in the bone marrow [12, 13]], lymphopoiesis in the spleen [12, 13], determination of the absolute number of nucleated bone cells

brain, spleen [7], femur and mitotic index (based on smears-prints for 2000 cells) [11].

As a result of the studies, it was found that the drug mumiyo, administered from the 1st to the 20th day after irradiation, helps to restore the composition of the peripheral blood of rats in acute radiation sickness. The elements of the myeloid series are stimulated. The total number of leukocytes in the peripheral blood in treated rats 3-4 days after administration of the drug began to increase due to lymphocytes [11]. Starting from the 10th day after irradiation, the number of peripheral blood lymphocytes in smears-imprints of the bone marrow and spleen in the treated animals was significantly higher than in the control animals. Subsequently, this difference continued to increase. A similar picture was observed in the bone marrow and spleen [11].

The mitotic index and the absolute number of nucleated cells of the femoral bone marrow on the 10th, 15th and 20th days after irradiation were higher in rats of the experimental group.

The greatest effect on the blood system (increased survival rate up to 35% [11]) was observed when the drug was administered to mice at a dose of 1000 mg / kg from 1–5 to 25 days (radiation dose 600–700 r) and to rats at a dose 500 mg / kg from 3-5 to 25 days (radiation dose 650-750 r) [12]. In this case, the radiation sickness proceeded more easily than in the control animals. Lethargy, tousled coat, diarrhea and the phenomenon of hemorrhagic syndrome were observed less frequently in the experimental group than in the control [12]. Some stimulating effect on erythropoiesis was found during the recovery period of acute radiation sickness [11]. The number of platelets in both experimental groups did not differ significantly from the control groups [11].

The preparation of mummy when administered at a dose of 500 and 1000 mg / kg for 14 days before irradiation (LD_{92} and LD_{94}) showed no prophylactic effect in experiments on rats and mice. When used within 14 days before irradiation and from the 1st to the 25th day after irradiation, an increase in the survival rate of protected animals by an average of 20% was observed [12]. The greatest therapeutic efficacy of the drug was observed when administered at a dose of 500 and 1000 mg / kg from 3-5 to 25 days after irradiation (LD_{70-94}) [12]. High therapeutic activity for mice (increased survival up to 35%) was revealed at a dose of 1000 mg / kg [12].

The positive effect of the drug mummy was also found in the study of bone marrow hematopoiesis. It was shown that on days 1–10 in animals receiving the drug at a dose of 500 mg / kg, the number of nucleated cells of the femoral bone marrow was higher than the initial values. The number of nucleated cells in the spleen in animals treated with the drug at a dose of 500 mg / kg was significantly higher compared to the initial data [7].

Analysis of the leukocyte formula, myelo and lienograms showed that the stimulation of hematopoiesis occurs due to the lymphoid elements of the blood [7]. No significant changes were found in the picture of red blood. Administration of the drug at a dose of 250 mg / kg had a weak stimulating effect on hematopoiesis compared with a dose of 500 mg / kg [7]. Analysis of bone marrow hematopoiesis indicates a positive effect of the drug on the stimulation, mainly of leukopoiesis [7]. The restoration of the amount of hematopoietic elements in white blood occurred due to the restoration of bone marrow lymphocytes [7].

Based on the results of experimental studies, mummy was classified as an effective stimulant of lymphopoiesis. After its administration, a significant increase in the amount of lymphoid elements was observed in the spleen and bone marrow of the treated rats: in the spleen imprints, the lymphoid elements in the treated animals on the 10th, 15th and 20th days after irradiation were 72, 69 and 81%, respectively, and in the control group - 37, 42, 62%. The number of reticular cells on the 10th, 15th and 20th days after irradiation also differed. In three experimental groups of animals, their number was, respectively, 19%, 7% and 4%, and in three control groups - 5%, 3% and 1% [13].

The dependence of the stimulation of lymphopoiesis on the timing of the administration of the drug was also revealed. The drug had the most pronounced stimulating effect on lymphopoiesis when administered, starting from the third day after irradiation [13].

In the course of the study, it was also shown that the administration of the drug mummy in acute radiation sickness, in contrast to other stimulants of hematopoiesis, has a stimulating effect on erythro and lymphopoiesis. In the bone marrow, spleen, and peripheral blood of treated animals (mice, rats, dogs), the restoration of the number of lymphocytes is much more intensive ($P < 0.01$) compared to controls. The established dependence of the stimulation of hematopoiesis on the dose and timing of administration of the mummy drug correlates with the change in the concentration of trace elements in the body of animals after irradiation [13]. Correlation of other biologically active substances of mummy by this parameter was not investigated * (* - authors' note).

It is known that the concentration of some trace elements in the early stages of acute radiation sickness increases sharply. The stimulating effect of the mummy drug on hematopoiesis is carried out to some extent through the pituitary gland - adrenal cortex system. The functional state of this system plays a certain role in the pathogenesis of acute radiation sickness and has a significant effect on proliferative processes in the hematopoietic organs after exposure to ionizing radiation. The introduction of the drug mummy in acute radiation sickness has a normalizing effect on the content of 11-hydroxycorticosteroids in plasma. Therefore, it is possible that the decrease in the level of the hormone in the plasma under the influence of mummy is one of the factors in the reduction of hematopoiesis, especially lymphopoiesis, after irradiation [11].

In the course of this study, some features of the action of the drug mumiyo in acute radiation sickness were revealed: 1) the greatest efficiency was found in “absolutely non-fatal injuries” [11]; 2) the higher the organization of the animals, the lower the optimal therapeutic dose; 3) the drug should be prescribed from the period of manifestation of the first signs of regeneration in the blood system [11].

In later works by T. Tukhtaev (1968), the efficacy of the mumiyo drug was studied inthe effect of ionizing radiation on large laboratory animals [6]. The experiments were carried out on 27 mongrel dogs of both sexes weighing from 12 to 20 kg at the age from 1.5 to 5 years. All animals were kept in the vivarium on a regular diet. The dogs were irradiated totally, once, using a gamma device. The radiation dose was 250 r (SD46) [6].

Experienced dogs (14) received daily oral preparation of mummy 25 mg / kg in the period from 5th to 25th days after irradiation. The effectiveness of the therapeutic action was judged by the survival rate, life expectancy of the dead animals, the clinical picture of radiation sickness, as well as hematological parameters [6].

In the course of the study, it was found that at the indicated dose of radiation, the majority of dogs developed acute radiation sickness of the II-III degree of severity. The introduction of mummy had a beneficial effect on the course of acute radiation sickness: out of 14 experimental animals, 12 survived, while in the control group of 13 animals - only 7; the life expectancy of the treated animals was 7 days longer than that of the control animals [6]. The clinical picture of the disease in the treated animals appeared 3-4 days later than in the control animals and was less pronounced. Temperature reaction in treated animals was observed in 35% of cases from 16–20 days after irradiation, and in control animals - from 16–17 days and was observed in 84% of cases. Lethargy and loss of appetite in the treated dogs averaged 28.5%.

In the treated animals, severe hemorrhagic syndrome in the form of diarrhea with mucus, blood, hemorrhages in the skin and visible mucous membranes, bleeding from the nose and mouth was observed in only two dogs. In control animals, similar phenomena occurred in 9 out of 13 dogs. In addition, the hemorrhagic syndrome in the control group appeared 3–7 days earlier than in the treated animals [6].

The positive effect of the drug mummy was also found in the study of the blood system: the number of erythrocytes in 1 mm^3 blood in the treated animals was within the normal range until the end of the experiment and was higher than in the control animals. A significant difference between the treated and control animals was also found in the content of hemoglobin. Its content in treated animals at all periods of the study was higher than in control animals [6].

After irradiation, the complete disappearance of reticulocytes in the peripheral blood was found. They appeared in treated animals as early as 12 days after irradiation, while their appearance in control animals occurred after 20 days. By the end of the experiment, the number of reticulocytes in the peripheral blood in the treated animals was 2-2.5 times higher than the initial level (142 ± 52 thousand), while in the control animals it did not reach the initial values (50 ± 13 thousand) [6].

In some periods of acute radiation sickness, the difference between the treated and control animals was found in the content of the number of platelets. The content of the latter on the 7–12th day after irradiation in the treated animals was higher than in the control ones [6].

The stimulating effect of the mummy drug was manifested on the content of leukocytes in the peripheral blood. The content of the latter in the treated animals on the 12th and 30th days after irradiation was higher ($P < 0.01$) than in the control animals. There were no differences in the number of neutrophils between treated and control animals [6]. The administration of the mummy preparation promoted a more rapid restoration of the number of lymphocytes in the peripheral blood in the treated animals. On the 30th day after irradiation, their number in the treated animals averaged 1.01 ± 0.12 thousand, which is significantly ($P < 0.01$) more than in the control (0.89 ± 0.1 thousand) ... By the 45th day after irradiation, the number of lymphocytes in the treated animals exceeded the initial values and was significantly

more (P <0.01) compared with the control groups [6].

Thus, the mummy has a beneficial effect on the course and outcome of acute radiation sickness in dogs, increases the survival rate, and lengthens the life span of animals. Most of the experimental animals had practically no visible symptoms of the disease, manifestations of hemorrhagic syndrome [6], and the content of erythrocytes and hemoglobin in them during all periods of the study was higher than in controls. The treated animals showed the fastest recovery in the number of reticulocytes. In addition, the administration of the drug mumiyo contributed to a smaller drop in the number of platelets at the onset of acute radiation sickness. The treated animals showed a rapid recovery of the number of lymphocytes in the peripheral blood [6].

Taking into account the ability of mummy to enhance regenerative processes in hematopoietic tissues under the action of ionizing radiation, T. Tukhtaev (1968) studied the effect of the drug on recoveryfunctions of the adrenal cortex and lymphopoiesis in irradiated animals [5]. Outbred rats of both sexes weighing 180–220 g were irradiated once, totally, on an EGO-2 gamma device at a power of 190 r / min at a dose of 600 r (SD 65). The drug was administered orally once in an amount of 0.5 g / kg from the 1st to the 20th day after irradiation [5].

In animals, the parameters of peripheral blood, the total number of nucleated cells of the bone marrow and spleen were studied. Myelogram and lienogram were counted in smears-prints (per 500 cells). Determined the weight of the spleen and the content of corticosterone in plasma (according to Silber-Busch, 1958). The rats were sacrificed by decapitation at various times after irradiation [5].

In the course of the research, a definite relationship was established between the proliferative processes in the hematopoietic organs and the functional state of the adrenal cortex in acute radiation sickness. A sharp increase in the content of corticosterone in the blood plasma and inhibition of lymphopoiesis in the hematopoietic organs in irradiated animals were found. The administration of mummy to irradiated rats largely prevented an increase in the concentration of corticosterone in plasma and promoted a more rapid recovery of lymphopoiesis [5].

On the 3rd day after irradiation, the plasma corticosterone content in the treated animals was 20.6 ± 1.6 μg%, and in the control animals - 29.0 ± 0.9 μg% (P <0.01). By the 7th day after irradiation, the hormone content in the plasma in the treated animals still decreased (12 ± 3 μg%, P <0.02) and completely returned to normal on the 20th day. In control animals, the corticosterone content on the 7th day still increased (29.7 ± 5 μg%), and on the 20th day it exceeded the initial values [5].

Simultaneously with the normalization of the content of corticosterone in the blood plasma in the treated animals, there was a gradual restoration of lymphopoiesis. On the 10th, 15th, 20th days after irradiation, the number of lymphocytes in smears-prints of the bone marrow and spleen in the treated animals was significantly higher (P <0.01) than in the control animals. Significant differences (P <0.01) between the control and treated animals were also found in the determination of the mitotic index and the absolute number of nucleated cells of the bone marrow and spleen on days 10, 15, and 20 after irradiation. In the experimental animals, a more rapid recovery of the spleen weight was observed [5].

Thus, the experimental studies carried out made it possible to establish the dependence of the rate of lymphopoiesis recovery in irradiated animals on the functional state of the adrenal cortex and to suggest that a decrease in the hormone level in plasma under the influence of the mummy preparation is one of the factors contributing to the restoration of hematopoiesis, especially lymphopoiesis after irradiation [5].

Experimental studies carried out by T. Tukhtaev et al. (1972) testifythat the stimulating effect of the mummy is also manifested at the cellular level. The drug enhances nucleic acid metabolism and promotes the accelerated passage of cells through the mitotic cycle, which leads to their enhanced division and an increase in the number [10].

L.L. Fedorovsky et al. (1965) studied the effect of the drug mumiyo on the functionalthe state of the liver in conditions of external irradiation. In experiments with mongrel dogs weighing 12–19 kg, the content of bilirubin and cholesterol in the blood, some blood serum enzymes were investigated, and a protein sediment sublimate test was performed [12]. The dogs were divided into 4 groups (3–5 dogs in each): a control group and three experimental groups, in which the animals were irradiated with gamma rays at doses of 300 and 250 r at a power of 189–200 r / min. and were treated orally with different doses of the drug (100, 50, and 25 mg / kg body weight) from the first day after irradiation [14].

The results obtained indicate a beneficial effect of mummy on the liver function of irradiated animals. In dogs of the experimental group, blood pseudocholinesterase and sublimate test changed less. Significant difference in pseudocholinesterase content in dogs treated with

the drug in doses of 50 and 100 mg / kg was not found. In the study of the protein sediment sublimate test in dogs irradiated with a dose of 300 r, a progressive decrease was noted by the end of life to 1.5–1.4 ml (normally 1.7–1.8 ml). In animals of the experimental group, the sublimate test turned out to be more stable [14].

The effectiveness of the drug administered at a dose of 25 mg / kg was more pronounced when animals were irradiated at a dose of 250 r. The decrease in the level of pseudocholinesterase either did not occur at all, or was short-lived. The same relationship was observed in relation to the content of cholesterol in the blood [14]. There were no significant changes in liver pigment function and transaminase content [14]. Morphological examination of the liver revealed some differences in the nature of the lesion in animals that survived acute radiation sickness. In dogs of the experimental group, in comparison with the control, dystrophic and necrobiotic changes in the cells of the hepatic parenchyma were less pronounced [14].

Thus, the mummy preparation has some positive effect on the liver of irradiated animals and, according to the researchers, can be recommended for the treatment of acute radiation sickness [14].

The discussion of the results

The results of our information and analytical research were summarized in table. 1.

From the data table. 1 shows that in the 60s – 70s of the XX century, numerous experimental studies were carried out to study the effect of mummy on the course and outcome of experimental radiation sickness of various small and large laboratory animals.

Despite a significant number of works, all of them are, as a rule, a discussion of the results of the experiment. Almost all of them have common disadvantages: lack of characteristics of the research object - the name of the drug; deposit of raw materials used to obtain the drug; method of cleaning raw materials; concentration of the drug, methods and doses of its administration; models used in the experiment; experiment technique. Nevertheless, the positive effect of mummy on the course of experimental acute radiation sickness can be considered established using the described models.

On the basis of numerous experimental studies of irradiated animals, it has been shown that the drug helps to restore the composition of peripheral blood, increases the average life span of animals, has a stimulating effect on the entire body and, in particular, on leuko-, lymph, erythro- and hematopoiesis.

Table 1

Influence on the course of experimental acute radiation sickness

№ п/п	Автор исследования, библиографическая ссылка	Год	Характеристика объекта исследования				Результаты исследований
			Название препарата и его концентрация	Способ и дозы введения	Опытные животные, доза облучения	Место отбора проб мумиё	
1.	А.А. Аджи-Моллаев и С.Ю. Никодамбаев [1]	1965	препарат мумиё	перорально в дозе 0,1 г/кг	кролики; доза облучения – 250 р.	не указано	Повышает активность щелочной фосфатазы и оказывает стимулирующее влияние на организм.
2.	В.Д. Рогозкин и Т. Тухтаев [3]	1965	препарат мумиё	перорально в дозе 25, 50, 100 мг/кг	собаки обоего пола, весом 11–16 кг, возраст от 1 до 5 лет; доза облучения – 300 ($ЛД_{90}$) и 250 р ($ЛД_{40}$)	не указано	Оказывает стимулирующее влияние на процесс восстановления лейкопоэза за счет лейкоцитов и лимфоцитов.
3.	А. Шамахмудов и В.А. Каримов [15]	1965	препарат мумиё	перорально в дозе 25, 30, 50, 100, 150 мг/кг	белые крысы-самцы, весом 150–180 г; доза облучения – 400 р.	не указано	Улучшает показатели жизнедеятельности организма: увеличивает выживаемость и продолжительность жизни, восстанавливает количество эритроцитов в периферической крови.
4.	Л.Л. Федоровский с соавт. [14]	1965		перорально в дозе 25, 50 и 100 мг/кг	беспородные собаки весом 12–19 кг; доза облучения – 250 и 300 р.	не указано	Положительное влияние на печень: меньше изменяется уровень псевдохолинэстеразы крови, сулемовая проба. Менее выражены дистрофические и некробиотические изменения в клетках печеночной паренхимы.
5.	Т. Тухтаев с соавт. [4–13]	1965–1974	препарат мумиё	перорально в дозе 250, 500 и 1000 мг/кг	– беспородные мыши весом 18–22 г; доза облучения – 500, 600, 700 р [5, 7, 11, 13];		Способствует восстановлению состава периферической крови [7, 11]. Стимулирует эритро- и лимфопоэз [13].
				перорально в дозе 250, 500 и 1000 мг/кг	– крысы обоего пола весом 180–220 г; доза облучения – 600, 650, 750 р [5, 7, 11, 13];		Способствует восстановлению состава периферической крови [7, 11]. Стимулирует эритро- и лимфопоэз [13]. Восстанавливает функцию коры надпочечников [5].
				перорально в дозе 25 мг/кг	– беспородные собаки обоего пола весом от 12 до 20 кг и в возрасте от 1,5 до 5 лет; доза облучения – 250 р ($СД_{40}$) [6].		Увеличивает выживаемость, удлиняет продолжительность жизни; препятствует падению числа тромбоцитов в начале острой лучевой болезни; способствует восстановлению числа лимфоцитов и лейкоцитов в периферической крови [6].

In order to introduce mummy preparations into clinical practice according to these indications, it is necessary to conduct experimental and clinical studies on standardized samples of dry mummy extract in specific doses.

Thus, mummy extract is a promising substance for the treatment of acute radiation sickness.

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