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RADIOPROTECTIVE PROPERTIES OF VENOM OF TRANSCAUCASIAN VIPERA (MACROVIPERA LEBETINA OBTUSA DYIGUBSKY, 1832)

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Doi: https://doi.org/10.52340/jecm.2022.07.10

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TRANSCAUCASIAN VIPERA - ს ვენომის რადიოპროტექტორული თვისებები (MACROVIPERA LEBETINA OBTUSA DYIGUBSKY, 1832)

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რეზიუმე

სტატიაში მოცემულია ექსპერიმენტული მონაცემები Transcaucasian Vipera-ს ვენომის რადიოდამცავი ეფექტის შესწავლის შესახებ, რომელიც ემყარება აქტივაციის რეაქციის არასპეციფიკურ მექანიზმებს.

კვლევის შედეგებმა აჩვენა, რომ გველის შხამს აქვს გამოხატული რადიოპროტექტორული ეფექტი. Transcaucasian vipera-ს (*Macrovipera lebetina obtusa*) არატოქსიკური დოზით ინექციის დროს ადგილი აქვს ხანგრძლივ პროტექტორულ ეფექტს, რომელსაც შეუძლია დაიცვას ცოცხალი ორგანიზმი ფრაგმენტული გამა დასხივებისგან.

Introduction. Snake venoms are a complex set of biologically active substances possessing extremely diverse properties and the ability to affect the main integrating systems of the body: blood and the nervous system Toxic and medicinal properties of them are known to people since ancient times. However, only from the twentieth century their scientifically-based use with a therapeutic and diagnostic purpose began [1,2,3].

Snake venom is a complex mixture of organic compounds. Many of these compounds produce a variety of path physiological effects including local tissue damage and/or systemic effects in the affected individual [7,8,9,10].

The three-dimensional (3D) structures of several disintegrins such as acostatin [11], kistrin [12], echistatin [13], triflavin (trimestatin) [14], salmosin [15] and rhodostomin have been elucidated by NMR or X-ray crystallographic studies.

The problem of increasing the resistance of the organism to the action of ionizing radiation has recently become increasingly urgent [4,5].

Authors in 2006 years (Koryagin) studied the ability of bee venom at the course of administration at a dose of 0.1 mg / kg to increase the body's resistance to fractional gamma irradiation. The results of the study showed that bee venom had a clearly expressed radio protective effect [6].

However, research is needed to identify and study the radio protective properties of snake venom.

The use of snake venom as a radio protector may have advantages over known agents because of its naturalness. At the same time, it can be assumed that these properties of vipera venom are based on its general property, that is, in increasing of the general resistance of the organism to pathological processes occurring in living organisms under the influence of radiation and snake venom.

The aim of this work was to study the radio protective properties of venom of *Transcaucasian Vipera (Macrovipera lebetina obtusa* Dyigubsky, 1832), the effect of venom of vipera on the survival of experimental animals in the post-fracture period after fractional gamma irradiation.

Materials and methods. The material of the studies were samples of venom of vipera, dried in a desiccator over sodium chloride vapor. Irradiation of mice with small doses of γ-radiation (γ-radiation D=0.6 Gy/sec) was spent on K-25 isotope installation with application of 60Co. The mice were subjected to fractional gamma irradiation for 6 days (0.6 Gy / day) at a dose rate of 1 Gy / min. (The total dose was 3 Gy).

Results. As a result of experimental studies carried out by us, it was found that with the injection of venom of vipera to 1 before the irradiation of mice with gamma radiation to doses of 1, 2, 3, 4, 5, 6 Gy, a significant increase in the life span of the experimental animals was observed (table 1).

The increase in the lifespan of mice previously irradiated to doses of 1 and 2 Gy compared with the control group of mice treated with only the venom of the vipera at a dose of 2 and 4 mg / kg of body weight increased by 1.6-4.75 and 2-5 times, respectively.

The increase in the lifespan of mice pre-irradiated to doses of 3 and 4 Gy compared with the control group of mice treated with only the venom of the jaws at a dose of 2 and 4 mg / kg of body weight increased by 2.3-6.5 and 2.8-8.5 times, respectively.

The increase in the lifespan of mice pre-irradiated to doses of 5 and 6 Gy compared with the control group of mice treated with only the venom of the vipera at a dose of 2 and 4 mg / kg of body weight increased by 3.2-10.0 and 3.7-12.5 times, respectively.

Thus, we detected the anti-radiation effect of vipera venom. It should be noted that an increase in the dose of irradiation of mice to doses of A = 1.2, 3, 4, 5, 6 Gy contributed to 100% death of experimental animals.

However, experimental studies confirmed the effectiveness of radiation protection, which depended on the effective dose of venom. When the dose of irradiation was lower than 1 Gy, the survival of animals did not change significantly. Thus, the survival rate of mice that had been injected with a vipera venom within 1-2 hours before irradiation was 1.6 to 12.5 times higher than the survival of control animals 10 days after the lesion.

Table 1. The lifetime data of mice with a preliminary gamma irradiation

Irradiation up to doses of 1 Gy (M ± m)		
A dose of vipera venom	The lifespan of mice in minutes	
	Control	Control
2 mg/kg body weight	28-30	50.0±2.7
4 mg/kg body weight	15-20	95.0±6.2
Irradiation up to doses of 2 Gy (M ± m)		
A dose of vipera venom	The lifespan of mice in minutes	
	Control	Control
2 mg/kg body weight	28-30	60.0±5.3
4 mg/kg body weight	15-20	100.0±8.1
Irradiation up to doses of 3 Gy (M ± m)		
A dose of vipera venom	The lifespan of mice in minutes	
	Control	Control
2 mg/kg body weight	28-30	70.0±15.1
4 mg/kg body weight	15-20	130.0±12.5
Irradiation up to doses of 4 Gy (M ± m)		
A dose of vipera venom	The lifespan of mice in minutes	
	Control	Control
2 mg/kg body weight	28-30	85.0±11.5
4 mg/kg body weight	15-20	170.0±19.3
Irradiation up to doses of 5 Gy (M ± m)		
A dose of vipera venom	The lifespan of mice in minutes	
	Control	Control
2 mg/kg body weight	28-30	95.0±13.5

4 mg/kg body weight	15-20	200.0±29.0
Irradiation up to doses of 6 Gy (M ± m)		
A dose of vipera venom	The lifespan of mice in minutes	
	Control	Control
2 mg/kg body weight	28-30	110.0±15.5
4 mg/kg body weight	15-20	250.0±20.7

In subsequent experiments, we studied the ability of vipera venom with a course of injection at a dose of 0.2 mg / kg to increase the body's resistance to fractional gamma irradiation. Mice of the experimental group were injected with venom for 3 days at a frequency of once a day. The control group of animals was injected with physiological saline.

One day after the end of the injections, the animals of the control and experimental groups were subjected to fractional gamma irradiation for 5 days (0.6 Gy / day) at a dose rate of 1 Gy / min. The total dose was 3 Gy Control mice were not subjected to any influences.

The results of experimental studies showed vipera venom had a pronounced radio protective effect.

As a result of experimental studies, it was revealed that in fractional gamma irradiation of mice, for 6 days (0.6 Gy / day) at a dose rate of 1 Gy / min. (The total dose was 3 Gy), the experimental animals were not subjected to any side effects, which gives the right to state a pronounced radio protective effect of vipera venom possessing a long-acting radio protective property capable of effectively protecting the body from fractional gamma irradiation in a nontoxic dose.

DISCUSSION. As a result of experimental studies of the radioprotective properties of snake venom for the first time, in a comparative analysis of the action of vipera venom, the survivability of rats in the post-abortion period has shown that when a physiological solution and fractional gamma irradiation are injected within 3-5 minutes, all animals die in the post-blasted period. With the preliminary injection of snake venom throughout days, a survival rate of 30% to 80% of the experimental animals is observed.

Thus, snake venom at the course of injection in a non-toxic dose is a long-acting radio protector capable of effectively protecting the body from fractional gamma irradiation. We believe that the basis for its anti-radiation effect is the non-specific mechanisms of the activation reaction.

CONCLUSION:

1. The radio protective effect of the venom of snake was revealed. An increase in the dose of irradiation of mice to 1.2, 3, 4, 5, 6 Gy contributed 100% to the death of experimental animals. With the course of injection venom of vipera at a dose of 0.2 mg / kg and fractional gamma irradiation for 5 days (0.6 Gy / day) at a dose rate of 1 Gy / min. (The total dose was 3 Gy), vipera venom had a pronounced radio protective effect.
2. It was revealed that during preliminary irradiation of mice to doses of D = 1.2, 3, 4, 5, 6 Gy with subsequent intoxication of 2 mg / kg and 4 mg / kg by venoms doses promoted an increase in the life span of mice from 28-30 and 15 -20 minutes to 50.0 ± 2.7, 95.0 ± 6.2; 60.0 ± 5.3, 100.0 ± 8.1; 70.0 ± 15.1, 130.0 ± 12.5; 85.0 ± 11.5, 170.0 ± 19.3; 95.0 ± 13.5, 200.0 ± 29.0; 110.0 ± 15.5, 250.0 ± 20.7 minutes, respectively.
3. It was experimentally established that the survival rate of mice that were injected prior to irradiation of vipera venom, 10 days after the lesion, was 1.6 to 12.5 times higher than the survival of control animals.

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SUMMARY

The article presents experimental data on the study of the anti-ray effect of venom of Transcaucasian vipera (*Macrovipera lebetina obtusa*), which is based on nonspecific mechanisms of the activation reaction.

The results of the study showed that snake venom has a pronounced radioprotective effect.

It was found experimentally that, in fractional gamma irradiation of mice at doses of 1.2, 3, 4, 5, 6 Gy, followed by 2 mg / kg and 4 mg / kg of poisoning, observed an increase in the life span of mice from 28-30 and 15 -20 minutes to 50.0 ± 2.7, 95.0 ± 6.2; 60.0 ± 5.3, 100.0 ± 8.1; 70.0 ± 15.1, 130.0 ± 12.5; 85.0 ± 11.5, 170.0 ± 19.3; 95.0 ± 13.5, 200.0 ± 29.0; 110.0 ± 15.5, 250.0 ± 20.7 minutes respectively.

The results of the study of the radio protective properties of snake venom revealed that venom of Transcaucasian vipera (*Macrovipera lebetina obtusa*), at injection in a non-toxic dose, is a long-acting radio protector capable of effectively protecting living organisms from fractional gamma irradiation.

Keywords: venom, radioprotective properties, *Macrovipera lebetina obtusa*, gamma irradiation