



## **History of the development of radioprotective drugs**

**Kamil T. Ishmukhametov, Marina Yu. Gallyamova,  
Ramzi N. Nizamov, Gulnaz I. Rakhmatullina, Ilnar R. Yunusov,  
Konstantin N. Vagin,\*<sup>+</sup> and Nikolay M. Vasilevsky**

*Federal Center for Toxicological, Radiation and Biological Safety. Nauchny Gorodok-2.  
Kazan. 420075. Republic of Tatarstan. Russia. E-mail: kostya9938@yandex.ru*

\*Supervising author; <sup>+</sup>Corresponding author

**Keywords:** radioactive contamination, caesium-137, sorbents of inorganic and biological nature.

### **Abstract**

The protection of living resources in USSR in the post-war years was given the least attention. The first steps to create anti-radiation devices were taken, mainly in connection with the 1956 accident at the «Mayak» software. For many years, this tragedy remained closed to the whole world. The 1986 disaster at the Chernobyl nuclear power plant was one of the main reasons for many people to rethink their attitude to the "peaceful" atom, but this accident gave an impetus to the accelerated development in our country of such a direction of applied science as anti-radiation protection of humans and animals.

This article is one of the first in a series of publications devoted to the history of the development of radioprotective drugs in the Department of Radiobiology of the Federal Center for Toxicological, Radiation and Biological Safety.

This article discusses the sequence of selection and testing of the sorbing activity of substances of living and inanimate nature: zeolite and montmorillonite made from clay rocks of the Main deposit of the Ulyanovsk region and clays from the Zelenodolsk district of the Republic of Tatarstan, phyto-genic aromatic natural polymer lignin, zoogenic coal from animal blood, phyto-genic coals from sawdust of various wood species and some other simple and complex compounds made during the experiments.

In the course of studies, substances of various classes were identified that have the ability to bind radioactive caesium in an aqueous environment up to 8-23 times more actively than a pharmacopoeial control drug. After loading these substances with iron hexacyanoferrate, their sorption activity increased on average up to 2 times.

**For citation:** K.T. Ishmukhametov, M.Yu. Gallyamova, R.N. Nizamov, G.I. Rakhmatullina, I.R. Yunusov, K.N. Vagin, N.M. Vasilevsky. History of the development of radioprotective drugs. *Butlerov Communications C*. 2021. Vol.1. No.1. Id.12. DOI: 10.37952/ROI-jbc-C/21-1-1-12

## References

- [1] M.I. Rylov, M.I. Tikhonov. Radiation geography of Russia as an object of system research. In 2 volumes. *St. Petersburg: LLC "Press-Service". 2014. Vol.1. 323p. (Russian)*
- [2] I.I. Kryshev, R.M. Aleksakhin, I.N. Ryabov, K.P. Makhonko, etc. Radioecological consequences of the Chernobyl accident. Edited by M. I. Kryshev. *Moscow: I.V. Kurchatov Institute of Nuclear Physics. 1991. 190p. (Russian)*
- [3] A.A. Yaroshinskaya. Chernobyl. Crime without Punishment. 25 Years Later. *NY. 2017. 409p. [Electronic resource]. URL: <https://doi.org/10.4324/9781315081465> (date of the application 13.02.2021)*
- [4] B. Strauch. Investigating Human Error: Incidents, Accidents, and Complex Systems. *NY. 2018. 648p. [Electronic resource]. URL: <https://doi.org/10.4324/9781315183053> (date of the application 13.02.2021)*
- [5] R.F. Mould. Chernobyl Record. The Definitive History of the Chernobyl Catastrophe. *NY. 2020. 320p. [Electronic resource]. URL: <https://doi.org/10.1201/9781420034622> (date of the application 13.02.2021)*
- [6] G.V. Konyukhov, K.T. Ishmukhametov, N.B. Tarasova, N.M. Vasilevsky. Radionuclides in regions with different ecological situations. *Veterinary Doctor. 2017. No.3. P.51-56. (Russian)*
- [7] K.N. Vagin, G.I. Rakhmatullina, I.R. Yunusov, K.T. Ishmukhametov. Radiation and environmental monitoring in regions with different levels of radioactive contamination. *Kazan: Science and innovation in the agro-industrial complex of the XXI century. Materials of the All-Russian Scientific and Practical Conference of Young Scientists dedicated to the 145th anniversary of the Academy. 2018. P.18-21. (Russian)*
- [8] V.A. Kirshin, V.A. Budarkov. Veterinary anti-radiation protection. *Moscow: Agropromizdat. 1990. 208p. (Russian)*
- [9] G.I. Rakhmatullina, K.T. Ishmukhametov, K.N. Vagin, I.R. Yunusov. Radioecological safety of objects of veterinary supervision, food and animal feed. *Chelyabinsk: Materials of the Ural Interdisciplinary scientific and practical Forum "Ural Veterinary medicine and medicine". 2017. P.45-46. (Russian)*
- [10] N.B. Tarasova, V.P. Shashkarov, K.T. Ishmukhametov, V.A. Guryanova, K.N. Vagin. Development of means and methods of production of ecologically "clean" livestock products in zones of technogenic radiation pollution. *Yoshkar-Ola: Topical issues of improving the technology of production and processing of agricultural products. 2018. No.20. P.339-342. (Russian)*
- [11] M.Yu. Gallyamova, K.T. Ishmukhametov, A.V. Frolov, A.M. Idrisov, N.M. Vasilevsky. Radioprotective effect of composite apisogenic-montmorillonite preparation. Edited by O. S. Larionova, I. A. Sazonova. *Saratov: Zykinsky Readings. Materials of the national scientific and practical conference dedicated to the memory of the Doctor of Medical Sciences, Professor L.F. Zykin. 2020. P.54-59. (Russian)*
- [12] K.N. Vagin, R.N. Nizamov, M.Yu. Gallyamova, K.T. Ishmukhametov, R.N. Nizamov, N.M. Vasilevsky. Design of radioprotective preparations based on substances of microbial, animal and inorganic origin. Reports of the TSHA named after K. A. Timiryazev: A collection of articles. Iss.292. Part IV. *Moscow: Publishing House RGAU-MSHA. 2020. P.199-204. (Russian)*
- [13] G.V. Konyukhov, N.B. Tarasova, R.N. Nizamov, V.P. Shashkarov, N.M. Vasilevsky, K.T. Ishmukhametov, N.A. Novikov. Development of methods and means for reducing the intake and accelerating the elimination of radionuclides from the animal body. *Scientific notes of educational institutions Vitebsk Order of the Badge of Honor State Academy of Veterinary Medicine. 2018. Vol.54. No.4. P.58-61. (Russian)*
- [14] A.V. Ivanov, R.N. Nizamov, G.V. Konyukhov, N.B. Tarasova, I.R. Yunusov, K.T. Ishmukhametov, R.R. Gaizatullin, A.A. Ivanov, V.A. Konyukhova. A method for obtaining a drug for removing radiocesium from the animal body. *Patent of the Russian Federation No. 2497376 C2. 10.11.2013. (Russian)*

- [15] M.Yu. Gallyamova, R.N. Nizamov, K.T. Ishmukhametov, R.N. Nizamov. The use of substances of microbial, animal and inorganic origin for the creation of anti-radiation drugs. Under the general editorship of A.V. Tugolukov. *Topical issues of the development of education and science in modern society. Collection of scientific papers based on the materials of the international scientific and practical conference*. **2019**. P.215-220. (Russian)
- [16] G.V. Konyukhov, R.N. Nizamov, K.T. Ishmukhametov. Testing of the sorption activity of apiphytopreparations under in vitro conditions. In the collection: *Points of growth in the efficiency of the agro-industrial complex in an unstable market. International Scientific and Practical Conference: Collection of materials. FSBEI DPO "Tatar Institute of Retraining of Agribusiness personnel"*. **2018**. P.386-392. (Russian)
- [17] M.M. Shakurov, R.N. Nizamov, K.N. Vagin, K.T. Ishmukhametov, M.Yu. Gallyamova. Study of radioprotective properties of preparations based on E. coli metabolic products and natural minerals. In the collection: *The state and prospects of development of the agro-industrial complex. Anniversary collection of scientific papers of the XIII International Scientific and Practical Conference dedicated to the 90th anniversary of the Don State Technical University*. In 2 volumes. **2020**. P.415-418. (Russian)
- [18] Yu.V. Karyakin, I.I. Angelov. Pure chemical substances. Guidelines for the preparation of inorganic reagents and preparations in the laboratory. Ed. 4-e revised and supplemented. *Moscow: "Chemistry"*. **1974**. P.360-361. (Russian)
- [19] Z.V. Pruchkina, G.P. Somov, L.V. Krasnova, E.N. Nenada. A method for obtaining a diagnosticum for conducting a bentonite flocculation reaction. *Author's Certificate. SU 952260 AI*. 23.08.**1982**. (Russian)
- [20] *SanPiN 2.6.1.2523-09* Radiation safety standards NRB-99/2009. Resolution No.47 of June 07, **2009**. *Moscow: Ministry of Health of the Russian Federation*. [Electronic resource]. URL: <http://docs.cntd.ru/document/902170553> (accessed 13.02.2021)
- [21] *SP 2.6.1.2612-10* Basic sanitary rules for Radiation safety (OSPORB 99/2010). *Resolution No.40 of April 26, 2010* (as amended on September 16, 2013) [Electronic resource]. URL: <http://docs.cntd.ru/document/902214068> (accessed 13.02.2021)
- [22] K.T. Ishmukhametov. Clinical condition of sheep on the radioactive trace of the Chernobyl NPP emergency release [Text]: PhD Thesis (*Candidate Level on Biological Science 3.00.01*). K.T. Ishmukhametov; All-Union Scientific Research Veterinary Institute. *Kazan*. **1993**. 183p. On the rights of the manuscript. (Russian)
- [23] Kamil T. Ishmukhametov, Marina Yu. Gallyamova, Ramzi N. Nizamov, Gulnaz I. Rakhmatullina, Ilnar R. Yunusov, Konstantin N. Vagin, Nikolay M. Vasilevsky. History of the development of radioprotective drugs. *Butlerov Communications*. **2021**. Vol.65. No.3. P.62-68. DOI: 10.37952/ROI-jbc-01/21-65-3-62 (Russian)