

**Name of the project:** «Development of measures to reduce the epidemiological risks of the spread of zoonoses in Kazakhstan».

**Aim of project.** Identification of veterinary objects of epidemiological significance in the territory, country and development of methods for visualizing and analyzing data using information and communication technologies that allow forecasting and assessing the risk of the spread of diseases of contagious etiology for the subsequent development of effective preventive measures.

**Relevance.** The territory of Kazakhstan is historically considered unfavorable for many diseases of contagious etiology common to humans and animals. And if some nosological forms have a natural focal character, then other diseases are anthroponotic, that is, the development of the epizootic process of such diseases depends directly on human activity. In this regard, the objects that a person uses in animal husbandry, in the processing of animal products, can potentially be the link where the pathogen, directly or through transmission factors, can be transmitted to susceptible animals.

Information about epidemically significant veterinary objects is one of the important parameters necessary for assessing and interpreting the manifestation of the epizootic process and planning anti-epizootic measures. Therefore, the definition and identification of epidemically significant veterinary objects will make it possible to compile a single register of data on such objects, with their characteristics and the degree of potential danger.

In the future, using the methods of mathematical modeling and information and communication technologies, an assessment of the risk of occurrence, transmission and possible spread of socially significant infections common to animals and humans in the study areas will be implemented, taking into account the location of epidemically significant objects.

**Expected results.** As a result of the project, at least 2 (two) articles and (or) reviews will be published in peer-reviewed scientific journals indexed in the Science Citation Index Expanded of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five). Also, at least 2 (two) articles or reviews will be published in a peer-reviewed foreign or domestic publication recommended by the Committee for Quality Assurance in Science and Higher Education of the Republic of Kazakhstan.

Based on the results of the research, a monograph "Application of ICT technology in assessing the risk of the territory of Kazakhstan in terms of biological safety categories, for certain socially significant animal diseases" will be prepared and published.

An electronic atlas of epidemically significant veterinary facilities in the regions will be developed, with the visualization of objects on electronic maps and the possibility of assessing the risk of their impact on the epidemiological situation of a particular infection. Guidelines will be developed and published for the use of the geographic information system ArcGIS in mapping epidemiologically significant veterinary objects.

As a result of scientific research, identification and ranking according to the classification of veterinary objects of epidemiological significance located on the territory of the Republic of Kazakhstan will be carried out. A database has been formed on veterinary objects of epidemiological significance, with their epidemiological and production characteristics and an assessment of potential well-being. Symbols have been created for designating veterinary objects of epidemiological significance for use in visualizing the objects under study on electronic maps. Methods of quantitative epidemiology will be used to model and predict the epidemiological process and assess the risks of the emergence and spread of socially significant animal diseases.

Table 1 - Members of the research group

№	Surname, first name, education,	Main place of work, position	Position in the project	Hirsch Index, Researcher ID, ORCID, Scopus Author ID
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	degree, academic title			
1	Mykhanbetkaliyev Yersyn Yergazyevich Candidate of Veterinary Sciences, Associate Professor	NCJSC «S.Seifullin KATRU», Head of the Department of Veterinary Medicine	Scientific supervisor	Hirsch Index 4 <a href="https://orcid.org/0000-0003-3320-7182">https://orcid.org/0000-0003-3320-7182</a> , <a href="https://www.scopus.com/authid/detail.uri?authorId=57194544992">https://www.scopus.com/authid/detail.uri?authorId=57194544992</a> , Researcher ID: S-8811-2016, <a href="https://publons.com/researcher/S-8811-2016">https://publons.com/researcher/S-8811-2016</a>
2	Abdrakhmanov Sarsenbay Kadyrovich, Doctor of Veterinary Sciences, Professor	NCJSC «S.Seifullin KATRU»	Chief Scientific Officer	Hirsch Index 6 <a href="http://orcid.org/0000-0003-3707-3767">http://orcid.org/0000-0003-3707-3767</a> , <a href="https://www.scopus.com/authid/detail.uri?authorId=57189578133">https://www.scopus.com/authid/detail.uri?authorId=57189578133</a> , Researcher ID: O-5800-2017, Author ID 57189578133
3	Korennoy Fedor I., Candidate of Geographical Sciences	FGBI «Federal Centre for Animal Health», Senior Researcher	Senior Researcher	Hirsch Index 9 <a href="http://orcid.org/0000-0002-7378-3531">http://orcid.org/0000-0002-7378-3531</a> , Researcher ID: I-9428-2016, Scopus Author ID: 46461328200
4	Mykhanbetkaliyeva A.A., Candidate of Veterinary Sciences, Associate Professor	NCJSC «S.Seifullin KATRU», Associate Professor of the Department of Veterinary Medicine	Senior Researcher	индекс Хирша 1 <a href="https://orcid.org/0000-0003-3232-9831">https://orcid.org/0000-0003-3232-9831</a> , Researcher ID: O-8690-2017
5	Bayniyazov Aslan Abdulkhanovich, Candidate of Veterinary Sciences, Associate Professor	NCJSC «S.Seifullin KATRU», Associate Professor of the Department of Veterinary Sanitation	Research Associate	Hirsch Index – 1 ORCID: 0000-0003-3232-9831
6	Bakishhev Temirlan Gomarovich, Doctor of PhD	NCJSC «S.Seifullin KATRU», Senior lecturer of the Department of Veterinary Sanitation	Research Associate	Hirsch Index 1 <a href="https://orcid.org/0000-0001-7845-975X">https://orcid.org/0000-0001-7845-975X</a> , Scopus Author ID: 56007665400
7	Kadyrov Ablaihan S.		Research Associate	Hirsch Index 3 <a href="https://orcid.org/0689-0986">https://orcid.org/0689-0986</a>
8	Akmambayeva Botakoz Yesimovna	NCJSC «S.Seifullin KATRU», senior lecturer of the Department of	Junior research assistant	<a href="https://orcid.org/0000-0002-9427-6432">https://orcid.org/0000-0002-9427-6432</a>

		Veterinary Medicine		
9	Abenova Asem Zhandarbekova	NCJSC «S.Seifullin KATRU», assistant of the Department of Veterinary Medicine	Junior research assistant	Scopus Author ID: 58177236900 <a href="https://orcid.org/0000-0002-8360-1527">https://orcid.org/0000-0002-8360-1527</a>

**Significant publications of the project manager and members of the research group:**

1. Sultanov A.A., Abdrakhmanov S.K., Paul Torgerson et.al. Rabies in Kazakhstan PLOS Neglected tropical diseases Published: August 3, 2016. PLoSNeglTrop Dis 10(8). DOI: 10.1371/journal.pntd.0004889. (Web of science 4,487, Q1, Cite Score 95).

2. Abdrakhmanov S.K., Beisembayev K.K., Korennoy, F.I., Kushubaev D.B., Yessembekova G.N. Revealing spatio-temporal patterns of rabies spread among various categories of animals in the Republic of Kazakhstan, 2010-2013 // Geospatial Health 2016, volume 11:455, 199-205 pp. doi:10.4081/gh.2016.455.

3. Abdrakhmanov S.K., Sultanov A.A., Beisembayev K.K., Korennoy F.I., Kushubaev D.B. Kadyrov A.S. Zoning the territory of the Republic of Kazakhstan as to the risk of rabies among various categories of animals // Geospatial Health. – 2016. – 11:429. – P. 174-181. **DOI:10.4081/gh.2016.429; Q3, Cite Score 64.**

4. Abdrakhmanov S.K., Mykhanbetkaliyev Y.Y., Korennoy F.I., Sultanov A.A., Kushubaev D.B., Bakishev T.G. Maximum entropy modeling risk of anthrax in the Republic of Kazakhstan // Preventive Veterinary Medicine. – 2017. – Vol. 144. – P. 149-157; **DOI: [10.1016/j.prevetmed.2017.06.003](https://doi.org/10.1016/j.prevetmed.2017.06.003); Q1, Cite Score 98.**

5. Abdrakhmanov S.K., Beisembayev K.K., Korennoy F.I., Spatiotemporal analysis of foot-and-mouth disease outbreaks in the Republic of Kazakhstan, 1955 – 2013. Transboundary and Emerging Diseases, 2018. DOI: 10.1111/tbed.12864, (Web of science 3,554, Q1, Cite Score 99).

6. Kanankege K., Abdrakhmanov S., Alvarez J., Glaser L., Bender J., Mukhanbetkaliyev Y., Korennoy F., Kadyrov A., Abdrakhmanova A., Perez A. Comparison of spatiotemporal patterns of historic natural Anthrax outbreaks in Minnesota and Kazakhstan // PlosONE. – 2019. – Vol. 14(5): e0217144; **DOI: [10.1371/journal.pone.0217144](https://doi.org/10.1371/journal.pone.0217144); Q2, Cite Score 89.**

7. Abdrakhmanov S., Mukhanbetkaliyev Y., Ussenbayev A., Satybaldina D., Kadyrov A., Tashatov N. Modeling the Epidemiological Processes of Economically Significant Infections of Animals // Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics). – 2019. – Vol. 11621. Springer, Cham. 2019; **DOI: [10.1007/978-3-030-24302-9\\_39](https://doi.org/10.1007/978-3-030-24302-9_39); Cite Score 51.**

8. Abdrakhmanov S.K., Mykhanbetkaliyev Y.Y. Zoning of the republic of Kazakhstan as to the risk of natural diseases in animals: The case of rabies and anthrax. // Geography, Environment, Sustainability, 2020; **DOI: [10.24057/2071-9388-2020-10](https://doi.org/10.24057/2071-9388-2020-10); Cite Score 37.**

9. Shopagulov O., Tretyakov I., Ismailova A., Aitimova U., Beisembayev K., Mukhanbetkaliyeva A. An expert system for diagnosis cow diseases // Journal of Theoretical and Applied Information Technology. – 15th August 2020. – Vol.98. – No 15. – P. 3106-3115. **<https://jaitit.org/volumes/Vol98No15/17Vol98No15.pdf>, Cite Score 30.**

10. Schettino D.N., Abdrakhmanov S.K., Beisembayev K.K., Korennoy F.I., Sultanov A.A., Mukhanbetkaliyev Y.Y., Kadyrov A.S., Perez A.M. Risk for African Swine Fever Introduction into Kazakhstan // Frontiers in Veterinary Science. 11 February 2021. Volume 8. Article 605910. **DOI: [10.3389/fvets.2021.605910](https://doi.org/10.3389/fvets.2021.605910); Q1, Cite Score 82.**

11. Abdrakhmanov S.K., Mukhanbetkaliyev Y.Y., Sultanov A.A., Yessembekova G.N., Borovikov S.N., Namet A., Abishov A.A., Perez A.M., Korennoy F.I. Mapping the risks of the

spread of peste des petits ruminants in the Republic of Kazakhstan // *Transboundary and Emerging Diseases*. 2021;1–10. DOI:10.1111/tbed.14237; Q1, Cite Score 98.

12. Abdrakhmanov S.K., Beisembayev K.K., Sultanov A.A., Mukhanbetkaliyev Y.Y., Kadyrov A.S., Ussenbayev A.Y., Zhakenova A.Y., Torgerson P.R. Modelling bluetongue risk in Kazakhstan // *Parasites & Vectors*, 14, 491 (2021), <https://doi.org/10.1186/s13071-021-04945-6>; Q1, Cite Score 74.

13. Zakharova O.I., Korennoy F.I., Iashin IV., Toropova N.N., Gogin A.E., Kolbasov D.V., Surkova G.V., Malkhazova S.M., Blokhin A.A. Ecological and Socio-Economic Determinants of Livestock Animal Leptospirosis in the Russian Arctic // *Frontiers in Veterinary Science*. 11 February 2021. Volume 8. Article 605910. <https://doi.org/10.3389/fvets.2021.658675>; Q1, Cite Score 82.

14. Uakhit, R., Smagulova, A., Syzdykova, A., Abdrakhmanov, S., Kiyani, V. Genetic diversity of *Echinococcus* spp. in wild carnivorous animals in Kazakhstan. *Veterinary World*, 2022, 15(6), pp. 1489–1496. (Web of Science Q2, Cite Score 79).

15. Nkamwesiga, J., Korennoy, F., Lumu, P., ...Kiara, H., Muhanguzi, D. Spatio-temporal cluster analysis and transmission drivers for Peste des Petits Ruminants in Uganda. *Transboundary and Emerging Diseases*, 2022

#### **Information about existing patents and other security documents.**

1. Abdrakhmanov S K., Mykhanbetkaliyev Y.Y., Kushubaev D.B., Kadyrov, A.S., Balji Y.A. A method for visualizing an epizootic focus, using GIS technology. Innovative patent №03090, from 16.01.2016

**Information for potential users.** The target consumers of the research results will be the veterinary and medical services of the country. The generated data on objects of epidemiological significance can be used in planning and organizing preventive and anti-epizootic measures.

The results obtained will have an impact on the development of veterinary epidemiology, and will serve as the basis for further application of mathematical modeling and quantitative epidemiology in ensuring the epidemiological well-being of the country in other socially significant zoonanthroponic diseases.

The obtained scientific results will be used to ensure the veterinary and biological safety of the country. That is, the results of the study, by improving the epidemiological well-being in certain territories, will help increase the country's export potential for livestock products, thereby providing the country with a subsequent multiplicative economic effect.