

Name of the program: BR10764944 "Development of methods for analytical control and monitoring of food safety"

Relevance: Ensuring the safety of livestock products is one of the important state strategic goals aimed at preserving the health of the nation. In addition, one of the key conditions for the participation of the exporting country in the food trade is its ability to ensure the quality and safety of products in accordance with the regulations of the importing countries, WHO, FAO and OIE. Therefore, the improvement of methods for determining contaminants hazardous to human health in livestock products is always a priority for both domestic and world veterinary science.

Purpose: Development of methods for monitoring the safety of livestock products.

Expected results:

Upon completion of the program:

Methods for analytical control and monitoring of the safety of meat and milk for the content of antibiotics will be developed; fish - for the content of antibiotics, salts of heavy metals, radionuclides and infection with helminthiases and bacterioses.

An analysis of the risks of the emergence of resistance to antibiotics in pathogenic microflora isolated from animals and from raw materials and products of animal origin will be carried out.

A multiplex RT-PCR test system will be developed for accelerated monitoring of food safety of milk and determination of antibiotic resistance loci in pathogenic staphylococci and streptococci.

A method will be developed for the study of cows' milk in bacterial infections.

An immunochromatographic assay (LFT) will be developed for rapid detection of the causative agent of campylobacteriosis in livestock products.

A rapid method (LFT) will be developed to assess the safety of livestock products (residue of antibiotics in meat and milk).

Will be developed and published:

- methodological recommendations on methods of analytical control and monitoring of fish safety for the content of antibiotics, salts of heavy metals, radionuclides and contamination with helminthiases and bacterioses;

- methodological guidelines for risk analysis of the emergence of resistance to antibiotics in pathogenic microflora isolated from animals and from raw materials and products of animal origin.

Applications will be submitted for obtaining 4 patents of the Republic of Kazakhstan:

- for a multiplex PCR-RT test system to detect pathogenic cocci and determine the loci of antibiotic resistance of pathogens;

- for methods of research of milk of cows at bacterial infections;
- for immunochromatographic analysis (LFT) for express detection of the causative agent of campylobacteriosis in livestock products;
- for the express method (LFT) for assessing the safety of livestock products (the residual amount of antibiotics in meat and milk).

At least 3 articles will be published in peer-reviewed foreign scientific journals with a non-zero impact factor and at least 20 publications in foreign and domestic journals recommended by COXON, 1 (one) monograph is prepared for publication.

Achieved results for 2021.

The synthesis of guide RNAs using in vitro transcription was carried out. The ribonucleoprotein complex of CRISPR-Cas endonuclease systems with guide RNAs was assembled. The ability of the Cas12a enzyme to form a complex with guide RNAs was determined by the presence of hydrolysis of the target sequences. Evaluated endonuclease and collateral activity against target sequences, obtained a set of target sequences, consisting of primers for isothermal amplification of specific regions of pathogen genomic DNA.

A collection of bacterial strains of *Bacillus* sp., which are sensitive to broad-spectrum antibiotics, has been created. The optimal conditions for cultivation of the *Bacillus* sp.T2 strain, which has the maximum sensitivity to the minimum concentration of antibiotics, have been selected. The parameters for visual detection of the growth of the *Bacillus* sp.T2 strain in liquid and solid nutrient media were determined.

Conjugates of antibiotics with carrier proteins have been prepared, schemes for immunization of laboratory animals have been worked out, which make it possible to obtain specific antibodies in high titers.

Genetic constructs containing genes for two diagnostic proteins *Campylobacter jejuni* Omp18 and MOMP were obtained. The Omp18 and MOMP genes of *C. jejuni* were synthesized under de novo conditions. The expression activity of the pET28/Omp18, pET28/MOMP, pET32/Omp18, and pET32/MOMP plasmids in the *E. coli* BL21 strain was rather high. Recombinant *C. jejuni* Omp18 and MOMP proteins showed antigenic activity in ELISA against specific antibodies.

In the reservoirs of Northern and Western Kazakhstan, infection of fish with eggs of *Capillaria* spp., metacercariae of *Diplostomum spathaceum*, *Opisthorchidae*, *Pseudamphistomum tuncatum* and the larval stage of *Posthodiplostomum cuticola* and *Ligula intestinalis* was established.

On the territory of Kostanay, North Kazakhstan and Akmola regions, the circulation of pathogens of zoonotic enteropathogenic infections was established: *Salmonella* spp., *S. aureus*, *E. coli*, *Campylobacter* spp., *L. monocytogenes*, which have a high level of resistance to individual antibiotics.

The level of prevalence of antibiotic-resistant pathogens and antibiotic resistance loci of *Staphylococcus aureus* and *Streptococcus agalactiae* were determined. The *mecA*, *TEM*, *ermC*, *mef(A)* and other genes were selected to determine the sensitivity to antimicrobials.

Achieved results for 2022.

An experimental kit for the isolation of pathogens' genomic DNA from milk with a sensitivity of 10^3 CFU/ml was prepared, and the optimal parameters and specificity of microorganisms' DNA detection in milk were determined. The conditions for the detection of broad-spectrum antibiotics in milk have been optimized, and a protocol for analytical control has been developed. Hybridomas clones producing monoclonal antibodies specific to oxytetracycline, streptomycin, and chloramphenicol, as well as to *Campylobacter jejuni* recombinant proteins were obtained. It has been established that pathogens of zoonotic enteropathogenic infections, such as *Salmonella* spp., *Staphylococcus aureus*, *Escherichia coli*, *Campylobacter* spp., and *Listeria monocytogenes* circulate on the territory of the northern regions of the Republic of Kazakhstan (RK). The study of the genotypic profiles of isolated microorganisms' cultures showed the presence of resistance genes to β -lactams, aminoglycosides, tetracyclines, sulfonamides, and macrolides. Primers and fluorescently labeled probes were selected for specific regions of the genes of *S. aureus* and *Str. agalactiae*; a highly specific PCR was developed with diagnostic sensitivity for the target genes of nuclease (*nuc*) and glucose kinase (*glck*) equal to 13 and 12 copies/ μ l, respectively. The ecological safety of fish in terms of food contaminants has been studied and the main fish parasitosis in the western, northern and central regions of the RK have been described.

During the reporting period, 13 original papers were published, among them: 11 (ten) - in journals recommended by the Committee for Control in Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan for the publication of the main results of scientific research, 1 (one) - in a journal included in the Russian Scientific Index citations, and 1 (one) - in the journal included in the Scopus database. In addition, the results of research were published in the proceedings of conferences (Appendix E,F,G,H). All the papers have references to the received earmarked funding, indicating the Individual Registration Number of the Program (No.BR10764944) and the source of funding.

Results achieved for 2023

The program ended with the development of scientific-technical documentations for the following diagnostical test-systems:

- LFT- kit for determining STP, OTC and CAF in milk and meat;
- LFT- kit for detecting *Campylobacter* in animal products;
- RT-PCR kit for identifying *Staphylococcus aureus* and *Streptococcus agalactiae* and determining antibiotic resistance loci;
- Kit for testing milk for bacterial infections.

Guidelines was published for workers in food safety laboratories on:

- use of a method for monitoring the safety of milk for the content of antibiotics;
- veterinary and sanitary assessment of fish and fish products;
- analysis of the risks of the emergence pathogenic microflora resistance to antibiotics;
- determination of pathogenic microorganisms sensitivity to antimicrobial

drugs.

The monograph was published: Quality control and food safety: monograph / edited by A.K. Bulashev.- Astana: KazATRU Publishing House, 2023.- 291 p., ISBN 978-601-257-479-1.

In 2023, 19 scientific articles were published, among them: 12 (twelve) - in publications recommended by the Committee for Quality Assurance in Science and Higher Education, Ministry of Education and Science, and Russian Science Citation Index, and 7 (seven) – in journals included in the Scopus/Wes of Science database. All articles have links to the received targeted funding indicating the program IRN (No. BR10764944). In addition, 5 (five) patents of the Republic of Kazakhstan were received.

During the implementation of the program, 4 (four) implementers defended dissertations for the PhD academic degree.

Study group members:

Program leader: Bulashev Aitbai Kabykeshovich, Doctor of Sciences in Veterinary Sciences, Professor

Scopus Author ID:

<https://www.scopus.com/authid/detail.uri?authorId=7801312328>; Researcher ID: O-7397-2017

ORCID: <http://orcid.org/0000-0002-8427-509X>

Publons: <https://publons.com/researcher/1608963/aitbay-bulashev/>

Chief Researcher, Ph.D., Associate Professor Borovikov S.N.

Scopus Author ID:56058619600

Researcher ID: AAE-7841-2022

ORCID:0000-0002-9721-9732

Leading Researcher, Doctor of Science, Professor Abdrakhmanov S.K.

Scopus Author ID: 57189578133

Researcher ID: O-5800-2017

ORCID: 0000-0003-3707-3767

Leading Researcher, Doctor of Biological Sciences, Associate Professor Mukantaev K.N.

Scopus Author ID: 57211138932

Researcher ID: AAM-8674-2020

ORCID: 0000-0002-6048-0232

Senior Researcher, Doctor PhD Tursunov K.A.

Scopus Author ID: 57193579180

Researcher ID: N-6319-2017

ORCID: 0000-0001-8260-2563

Senior Researcher, M.Sc., Syzdykova A.S.

Scopus author ID 57193998019
Researcher ID AAE-7700-2022
ORCID:0000-0002-5405-2469

Researcher, M.A.S., Zhumalin A.Kh.
Scopus Author ID: 57192061558
Researcher ID: P-9068-2017
ORCID:0000-0002-8661-7348

Junior Researcher, M.Sc., Galimova M.E.
Scopus Author ID: 57193998942
Researcher ID:
ORCID:0000-0003-1767-2623

Laboratory assistant, MD, Zhakhina A.A.
Scopus Author ID:
Researcher ID:
ORCID:0000-0002-6226-5544

Project Manager, Ph.D., Akanova Zhannara Zhuldasovna
Scopus Author ID: 57193343546
Researcher ID: O-8725-2017
ORCID: <https://orcid.org/0000-0002-7414-7860>

Leading researcher, Ph.D., Kuybagarov M.A.
Scopus Author ID: 57220278412
Researcher ID: AAU-8085-2020
ORCID: <https://orcid.org/0000-0001-7428-7620>

Senior Researcher, Ph.D., Associate Professor Suranshiev Zh.A.
Scopus Author ID: 57193346147
Researcher ID: O-7678-2017
ORCID: <https://orcid.org/0000-0002-6608-2294>

Senior Researcher, Ph.D., Ass.Professor Akibekov O.S.
Scopus Author ID: 56606295400
Researcher ID: O-7690-2017
ORCID: <https://orcid.org/0000-0002-8647-0083>

Senior Research Fellow, PhD Zhagipar F.S.
Researcher ID: AAE-7613-2022
ORCID: <https://orcid.org/0000-0001-5296-1127>

Researcher, Ph.D. Otepova G.M.
ORCID: <https://orcid.org/0000-0002-7519-5821>

Researcher, M.Sc. Temirgaziev B
Scopus Author ID: 57204859183
Researcher ID: AAE-6897-2022
ORCID: <https://orcid.org/0000-0001-6994-3478>

Junior Researcher, PhD Dzhangulova A.N.
ORCID: <https://orcid.org/0000-0002-1215-5021>

Junior Research Fellow, M.Sc. Baibolin Zh.K.
Researcher ID: O-9530-2017
ORCID: <https://orcid.org/0000-0002-6499-664X>

Project Manager, Zhanat Adilbekov,
PhD, Associate Professor
Scopus Author ID:57204945191
Researcher ID: P-1902-2017
ORCID: 0000-0001-7491-3943

Chief Researcher Maikanov Balgabay Sadepovich,
doctor of sciences, professor.
Scopus Author ID: 56414972800
Researcher ID: P-1911-2017
ORCID: 0000-0003-0839-5126

Senior Researcher, Suranshiev Zhambulat Amreevich
Ph.D., Associate Professor.
Scopus Author ID: 57193346147
Researcher ID: O-7678-2017
ORCID: <https://orcid.org/0000-0002-6608-2294>

Senior Researcher Baldzhi Yury Alexandrovich,
Ph.D., Associate Professor.
Scopus Author ID: 57204942823
Researcher ID:C-6504-2017
ORCID: 0000-0002-5006-3224

Researcher Lider Lyudmila Aleksandrovna,
Ph.D., Associate Professor.
Scopus Author ID: 56058488900
Researcher ID: O-8442-2017
ORCID: 0000-0001-5842-0751

Junior researcher Bainiyazov Aslan Abdukhanovich,
Ph.D., Associate Professor.

Scopus Author ID: 57203992654
Researcher ID: AAE-7992-2021

Junior researcher Musagieva Danara Kazybekkyzy,
master of veterinary sciences.
ORCID: 0000-0001-5605-9552

Project Manager Nurgaliev Birzhan Elubayevich, Ph.D., Associate Professor
Scopus Author ID: 55792778700
Researcher ID:
ORCID: 0000-0001-5998-8250

Project Manager, Ph.D., Baltin Kairat Kanatovich
Author ID in Scopus 55437315200
Researcher ID Web of Science AAQ-9372-2020
ORCID ID 0000-0002-6187-7223
Researcher ID in Publons AAQ-9372-2020

Khasenov Bekbolat Baurzhanovich, Ph.D.
Author ID in Scopus 36096620800
Researcher ID in Web of Science AAM-8657-2020
ORCID ID 0000-0003-4572-948X
Researcher ID in Publons AAM-8657-2020

Akischev Zhiger Dastanovich master
Author ID in Scopus 56674741700
Researcher ID Web of Science N-6206-2017
ORCID ID 0000-0001-9943-1625
Researcher ID in Publons N-6206-2017

Kiribaeva Asel Kaliaskarovna Master
Orcid 0000-0002-8293-2340,
Author ID Scopus 57215499873,
ResearcherID Web of Science and Publons: N-6774-2017,

Musakhmetov Arman Sartambayevich master
Author ID Scopus 57203751227
Research ID Web of science
AAQ-9945-2020
ORCID ID 0000-0002-6182-3487
Research ID in Publons
AAQ-9945-2020

Aktaeva Saniya Aidarbekovna Master
Author ID in Scopus 00000000

Researcher ID Web of Science AAR-5133-2020
ORCID ID 0000-0001-6346-5866
Researcher ID in Publons AAR-5133-2020

Sarsen Araylym Konysbayzyzy, master
Researcher ID: AED-8089-2022
ORCID: 0000-0002-6071-430X

Tursunbekova Annelya Ernazarovna, Ph.D.
ResearcherID: GZB-1888-2022,
ORCID: 0000-0002-7536-7451

Silaev Dmitry Vitalievich, Ph.D.
Researcher ID: AAQ-8940-2020
ORCID: 0000-0001-6867-953X,
Scopus Author ID: 57219323485

Project leader: Abeldenov Sailau Kasenovich, PhD
Scopus Author ID: 56674705400
Researcher ID: F-5139-2015
ORCID: 0000-0002-6974-9138

Project leader: Ryshchanova Raushan Miranbaevna, Ph.D., Associate Professor
Scopus Author ID: 57000465400
Researcher ID: ABE-3654-2021
ORCID: 0000-0002-2695-4238

Leading Researcher Mendybayeva Anara Muratovna, PhD
Scopus Author ID: 57200392942
Researcher ID: ABE-4109-2021
ORCID: 0000-0002-2666-4847

Researcher Alieva Gulnur Kozyevna, MD
Scopus Author ID: 57222984016
Researcher ID: GOC-2032-2022
ORCID: -

Junior researcher Zhanaidar Zhagparovich Bermukhametov, Ph.D.
Scopus Author ID: 57192084641
Researcher ID: DVH-7662-2022
ORCID: 0000-0002-8767-3624

Junior Researcher Shevchenko Pavel Viktorovich, M.Sc.
Scopus Author ID: 57192087543
Resercher ID: DZJ-3447-2022

ORCID: 0000-0003-4235-992X

Project Manager, Ph.D., Associate Professor, Chuzhebaeva Gulzhagan
Dzhambulovna

Scopus Author ID: 57350331300, 55933058000

ORCID: <https://orcid.org/0000-0002-0091-8888>

Senior researcher, responsible project executor, MD, Baimenov Bakhit Muratovich

Scopus Author ID: 57222980025

<https://orcid.org/0000-0001-9063-7651>

Researcher, MD, Alieva Gulnur Kozyevna

Scopus Author ID: 57222984016

ORCID: <https://orcid.org/0000-0002-0550-6639>

Researcher, bachelor, master student, Mukanov Tamerlan Maratovich

ORCID: <https://orcid.org/0000-0002-0015-1322>

Junior researcher, bachelor, master student, Malikzada Kalamkas Malikzadakyzy

ORCID: <https://orcid.org/0000-0002-8689-3342>

Junior Researcher Ph.D., Kokanov Sabit Kabdyshevich

Scopus Author ID: 55971272400

Junior researcher, MD, doctoral candidate, Aleshina Yulia Evgenievna

ORCID: <https://orcid.org/0000-0001-7072-7676>

List of publications published as part of the program in 2021:

in national publications:

1 Bulashev A.K. Immunobiotechnological methods for the determination of antibiotics in food. // Bulletin of ENU named after L.N. Gumilyov. – 2021. - №3(136). – P. 35-50. DOI: 10.32523/2616-7034-2021-136-3-35-50

2 Nurgaliev B.E., Kadralieva B.T., Usenov Zh.T., Zhumabaev A.K., Safety and quality of fish affected by invasion in the West Kazakhstan region // Journal of Science and Education. - V.1, Issue 65. – P. 42–49.

DOI: 10.52578/2305-9397-2021-1-4-42-49.

in foreign publications:

1. Bulashev AK, Ingirbay BK, Mukantayev KN, Syzdykova AS (2021) Evaluation of chimeric proteins for serological diagnosis of brucellosis in cattle, Veterinary World, 14(8): 2187-2196. DOI: www.doi.org/10.14202/vetworld.2021.2187-2196;

2. Bulashev A.K., Kuibagarov M.A., Akanova Zh.Zh., Zhagipar F.S. Immunoassay of food for antibiotics // Integration of Education, Science and Business in Modern Environment: Summer Debates: abstracts of the 3rd International Scientific and Practical Internet Conference, August 11-12, 2021. –

Dnipro, Ukraine, 2021. – P.48-50;

3. Tuleuov A.M., Kadralieva B.T., Nurgaliev B.E., Usenov Zh.T. The level of fish infection with opisthorchiasis and anisakidosis on the ural river in the West Kazakhstan region. Integration of Education, Science and Business in Modern Environment: Summer Debates: abstracts of the 3rd International Scientific and Practical Internet Conference, August 11-12, 2021. – Dnipro, Ukraine, 2021. – P.188-190.

4. Tuleuov A.M., Kadralieva B.T., Nurgaliev B.E., Usenov Zh.T. The study of healthy and infected fish // Proceedings of the International Scientific Internet Conference "Trends and Prospects for the Development of Science and Education in the Context of Globalization". - Pereyaslav, 2021. - Issue. 74. - P.160-164.

List of publications published as part of the program in 2022:

1 Bulashev A.K., Kuibagarov M.A., Akanova Zh.Zh., Zhagipar F.S., Dzhangulova A.N. Immunoassay of antibiotics in animal products // Bulletin of Science, S. Seifullin Kazakh Agrotechnical University. - 2022. – Vol. 1 (112). - P. 289-300 (in Russian, CQASHE)

2 Bulashev A.K., Ingirbay B.K., Mukantayev K.N., Syzdykova A.S. Evaluation of chimeric proteins for serological diagnosis of brucellosis in cattle //Veterinary World – 2021. – Vol.14(8). – P.2187-2196 (Quartile Q2, Web of Science), percentile 79 (Scopus))

3 Mukantayev K.N., Borovikov S.N., Syzdykova A.S., Zhakhina A.A. The use of recombinant antigens of *Campilobacter jejuni* to obtain specific polyclonal antibodies // Bulletin of Science, S. Seifullin Kazakh Agro Technical University. - 2022. – Vol.2 (113). - P. 146-155. (in Russian, CQASHE)

4 Aktayeva S., Kiribayeva A., Makasheva D., Astrakhanov M., Tursunbekova A., Baltin K., Khassenov B. Isolation, identification and usage of *Bacillus* strains in microbial inhibition test in milk // Eurasian Journal of Applied Biotechnology. – 2022. – № 4. – P.49–57. DOI: 10.11134/btp.4.2022.6 (CQASHE)

5 Maikanov B.S., Adilbekov Zh.Sh., Lider L.A., Aubakirova G.A., Auteleeva L.T. Monitoring of fish safety in water bodies of Akmola region // Bulletin of Science, S. Seifullin Kazakh Agrotechnical University.- 2022. – Vol.1 (112). - P. 311-323 (in Russian, CQASHE)

6 Adilbekov Zh.Sh., Lider L.A., Bainiyazov A.A., Mussagieva D.K. Veterinary and sanitary examination of commercial fish in reservoirs of the Karaganda region //J. Science and Education.- 2022. – Vol. 2–1 (67). – P. 96-104 (in Russian, CQASHE)

7 Nurgaliev B.E., Kadralieva B.T., Usenov Zh.T., Zhumabaev A.K., Tuleuov A.M. Results of the parasitological study of fish of «Bol'shikh» and «Maly`kh» rivers in West Kazakhstan region // J. Science and Education.-2022- Vol.3-1 (68) - P. 3-12 (in Russian, CQASHE)

8 Mendybayeva A.M., Modestas Ruzauskas, Aleshina Yu.E., Alieva G.K., Mukanov G.B., Ryshchanova R.M.. Assessment of the risk of emergence of resistance to antibiotics of opportunistic and pathogenic microflora isolated from

animal products // Bulletin of the Krasnoyarsk State Agrarian University.–2022.– №2–P.147–156.–URL: <https://doi.org/10.36718/1819-4036-2022-2-147-156> (in Russian, Russian Science Citation Index)

9 Mendybayeva A.M., Ryshchanova R.M. Antibiotic resistance of *Salmonella spp.* strains isolated from animals and birds in the territory of Northern Kazakhstan // Bulletin of Science, S. Seifullin Kazakh Agrotechnical University.–2022.–Vol.1(112).–P.324-334.–URL: [https://doi.org/10.51452/kazatu.2022.1\(112\).937](https://doi.org/10.51452/kazatu.2022.1(112).937) (in Russian, CQASHE)

10 Kuzeubaeva A.S., Usenbaev A.E., Ryshchanova R.M., Akanova Zh.Zh. Antibiotic resistance of *Escherichia coli* isolates contaminating cheese // Bulletin of Science, S.Seifullin Kazakh Agrotechnical University.–2022.–Vol.2(113).–P.123-132.–URL: [https://doi.org/10.51452/kazatu.2022.2\(113\).1028](https://doi.org/10.51452/kazatu.2022.2(113).1028) (in Kazakh, CQASHE).

11 Chuzhebaeva G., Alieva G., Baimenov B. and Malikzada K. Basic biological properties and resistance to antibiotics of *Staphylococcus aureus* and *Streptococcus agalactiae* isolates isolated from milk of cows of the Kostanay region of Kazakhstan // J. Education and Science.–2022.–Vol.1(66).–P.3–11. DOI: <https://doi.org/10.52578/2305-9397-2022-1-1-3-12>: [in Russian, CQASHE].

12 Chuzhebaeva G.D., Baimenov B.M., Alieva G.K., Mukanov T.M. Evaluation of primers and fluorescently labeled probes for the identification of *Staphylococcus aureus* and *Streptococcus agalactiae* and their antibacterial drug resistance genes // J. Education and Science. – 2022.- Vol.3-1 (68).-P.105-114. DOI 10.56339/2305-9397-2022-3-1-105-114. [in Russian, CQASHE].

13 Amanzholova M.Zh., Shayzadinova A.M., Abeldenov S.K. Expression and purification of recombinant DNA endonuclease CRISPR/Cas system // Bulletin of Karaganda University, Series “Biology. Medicine. Geography”. - 2022. – Vol. 4 (107). – P. 1-7. (in Russian, CQASHE).

**List of publications published as part of the program in 2023:
in national publications:**

1 Zeinulin M., Amanzholova M., Shaizadinova A., Abeldenov S. Advancement in *Staphylococcus aureus* Detection Using a RPA-CRISPR-Cas12a Fluorescent Assay Technology // Eurasian Journal of Applied Biotechnology. – 2023. – № 3. – C. 1-13. <https://doi.org/10.11134/btp.3.2023.3> C.

2 Borovikov S.N., Syzdykova A.S., Museipova Z. A., Bakishev T.G. Studying the diagnostic value of recombinant *Campylobacter jejuni* antigens //Herald of Science of S.Seifullin Kazakh Agrotechnical Research university: Veterinary Science. – 2023. – Vol.2. – P.20-26. [https://doi.org/10.51452/kazatuvc.2023.2\(002\).1408](https://doi.org/10.51452/kazatuvc.2023.2(002).1408). CQAES.

3 Jangulova A.N., Temirgazyev B.S., Bulashev A.K., Akanova Zh.Zh., Serikova Sh. Obtaining oxytetracycline conjugates with protein carriers // Herald of Science of S.Seifullin Kazakh Agrotechnical Research University: Veterinary Sciences. – 2023. – №1 (001). – P. 17-26. DOI: [https://doi.org/10.51452/kazatuvc.2023.1\(001\).1335](https://doi.org/10.51452/kazatuvc.2023.1(001).1335). CQAES.

4 Aktayeva S., Sarsen A., Mussakhmetov A., Kiribayeva A., Tursunbekova A., Khassenov B. Development of microbiological diffusion inhibition test for the determination of antibiotic residues in the milk // Eurasian Journal of Applied Biotechnology 2023. - №2. - С.44-51. doi: 10.11134/btp.2.2023.6 (RSCI-0.117) **CQAES**.

5 Байменов Б.М., Чужебаева Г.Д., Алиева Г.К. и Серикбайов О.Н. Разработка рекомбинантных положительных контролей ПЦР для выявления *Staphylococcus aureus* и *Streptococcus agalactiae* в молочной продукции и определения их локусов антибиотикорезистентности // Gulum žāne bilim. – 2023. - N 2-2(71). - С. 144–153. DOI:<https://doi.org/10.52578/2305-9397-2023-2-2-144-153>. **CQAES**.

6 Лидер Л.А., Адильбеков Ж.Ш., Майканов Б.С., Жужжасарова Г.Е. Солтүстік және орталық Қазақстанның су қоймаларындағы балықтың гельминтоздары // 3i: intellect, idea, innovation - интеллект, идея, инновация”. – 2023. – № 1. – С. 23-31. DOI: 10.5269/22266070_2023_1_3 **КОКСНВО**.

7 Адильбеков Ж.Ш., Мустафина Р.Х., Балджи Ю.А., Сураншиев Ж.А., Жужжасарова А.Е. Контаминация рыбы и рыбной продукции антибиотиками // Наука и образование. – 2023. – №3-1(72). – С. 12-19. DOI: 10.52578/2305-9397-2023-3-1-3-12 **CQAES**.

8 Жумабаев А.К., Кушмуханов Ж.С., Нурғалиев Б.Е., Кадралиева Б.Т., Усенов Ж.Т., Абилова И.М., Симғалиев С.Ф., Қырықбаева А.А. Распространение описторхоза в Западно-Казахстанской области // Наука и образование. – 2023. – №3(72). – С.207–214. DOI: 10.52578/2305-9397-2023-3-1-209-21 **CQAES**.

9 Nurgaliyev B., Zhumabayev A., Kushmukhanov Zh., Kadralieva B., Ussenov Zh., Inirbayev A. Studies of fish and fish products for the presence of heavy metal salt and radionuclides in water bodies of the west kazakhstan region //Herald of science of S.Seifullin Kazakh Agrotechnical Research University: Veterinary sciences. – 2023. – №. 1 (001). – С. 27-34. DOI: 10.51452/kazatuvc.2023.1(001).1348 **CQAES**.

10 Alieva G.K., Rychshanova R.M., Murzakayeva G.K., Mendybayeva A.M. Antibiotic resistance of *Staphylococcus aureus* strains isolated from animals and birds in the territory of Kostanay region // Herald of Science of S.Seifullin Kazakh Agrotechnical Research University: Veterinary Sciences. - Astana. - 2023. - N3 (003). - P.61-67. doi.org/10.51452/kazatuvc.2023.3 (003).1508. **CQAES**.

**List of publications published as part of the program in 2023:
in foreign publications:**

1 Amanzholova M., Shaizadinova A., Bulashev A., Abeldenov S. Genetic identification of *Staphylococcus aureus* isolates from cultured milk samples of bovine mastitis using isothermal amplification with CRISPR/Cas12a-based molecular assay // Vet Res Commun. – 2023. DOI: 10.1007/s11259-023-10212-z, **Q2/ percentile 72**.

2 Shaizadinova A., Amanzholova M., Kirillov S., Bulashev A., Abeldenov S. Rapid and highly sensitive LAMP-CRISPR/Cas12a-based identification of

bovine mastitis milk samples contaminated by *Escherichia coli* // Journal of Agriculture and Food Research. – 2023. – № 14. – C. 100721. DOI: 10.1016/j.jafr.2023.100721, **Q1- percentile 78**

3 Borovikov S., Tursunov K., Syzdykova A., Begenova A., Zhakhina A. Expression of recombinant Omp18 and MOMP of *Campylobacter jejuni* and the determination of their suitability as antigens for serological diagnosis of campylobacteriosis in animals // Veterinary World. - 2023. - Vol.16. - P. 222-228. www.doi.org/10.14202/vetworld.2023.222-228. **Q1- percentile 80.**

4 Baymenov B.M., Bulashev A.K., Chuzhebayeva G.D., Aliyeva G.K., Beishova I.S., Kokanov S.K., and Raketsky V.A. (2023) Phenotypic and genotypic resistance to antibiotics in *Staphylococcus aureus* strains isolated from cattle milk in Northern Kazakhstan // Veterinary World. – 2023. - Vol. 16(9). - P. 1815-1820. DOI: 10.14202/vetworld.2023.1815-1820. CiteScore 2022 - 3.2, **Q1- percentile 80.**

5 Mendybayeva A., Abilova Z., Bulashev A., Rychshanova R. Prevalence and resistance to antibacterial agents in *Salmonella enterica* strains isolated from poultry products in Northern Kazakhstan // Veterinary World. - 2023. - Vol. 16(3). - P.657-667. DOI: 10.14202/vetworld.2023.657-667. Scopus - 80% (General Veterinary); **Q1- percentile 80.**

List of articles accepted for publication:

1 Nurgaliyev B., Kadrallyeva B., Kushmukhanov Zh., Taubaev U., Tuleuov A., Zhumabayev A. Results of Parasitological Research on Hydrobionts from Water Bodies in West Kazakhstan Region // International Journal of Veterinary Science. – 2023. – Vol.13(1). – P.85-93 <http://www.ijvets.com/volume-13-no-1-2024/> **Q2- percentile 58**

2 Akhmetova V., Balji Yu., Kandalina Ye., Iskineyeva A., Mukhamejanova A., Baspakova A., Uzakov Ya., Issayeva K., Zamaratskaia G. a. Self-reported consumption frequency of meat and fish products among young adults in Kazakhstan. Nutrition and Health. –2022. DOI: 10.1177/02601060221114230. **Q3- percentile 40.**

3 Mussakhmetov A., Kiribayeva A., Daniyarov A., Bulashev A., Kairov U., Khassenov B. Genome sequence and assembly of the amyolytic *Bacillus licheniformis* T5 strain isolated from Kazakhstan soil. // BMC genomic data (preprint). 2023. DOI: 10.21203/rs.3.rs-3295653/v1. Cite Score 5.2, Procentile 55, **Q4.**

4 Amanzholova M.Zh., Shaizadinova A.M., Abeldenov S.K. Enhancing Pathogen Detection Methods through a Novel Molecular Diagnostic Approach with CRISPR/Cas Technology // Вестник Карагандинского университета. Серия «Биология, медицина, география». – 2023. – № 4. **CQAES.**