

Project name: AR19679420 "Study the genetic diversity of zoonotic parasites of cats circulating in Kazakhstan".

Relevance: Free-walking cats pose a serious danger to public health and are considered a source of such protozoa zoonoses, as toxoplasmosis, giardiasis and cryptosporidiosis. These diseases cause health problems, including abortions, stillbirths, diarrhea and other clinical signs. It is not always possible an accurate diagnosis the protozoa using classical diagnostic methods. In this regard, making a diagnosis using the method of isolating the genomic DNA of parasites, selecting specific primers for PCR analysis and optimizing the parameters of its formulation, sequencing will help determine species of cats' zoonotic protozoa circulating in Kazakhstan.

Protozooses are infections caused by parasitic protozoa that cause severe diseases of humans, domestic and commercial animals. Parasitizing in various organs and tissues including the blood, intestines, central nervous system, liver, lungs, etc. protozoa cause significant social and economic damage. Cats, being in close proximity to a human creature, can pose a threat to public health. Pathogens of toxoplasmosis, giardiasis, cryptosporidiosis entering the external environment are able to persist in the soil for a long time while remaining invasive. Oocysts could be entered the human body through the soil, most often children are at the risk area. There is no data on study the prevalence and species genetic diversity of zoonotic protozoa pathogens in cats in Kazakhstan, which complicates the diagnosis and comparative analysis the epidemiological situation in the country and by the regions.

The implementation of this project will have a positive impact on the problem of zoonotic protozoa in Kazakhstan, help to develop a protocol for genetic identification and clear the missing gaps in various species' genomes. This will serve as a powerful impetus for development the molecular protozoology in Kazakhstan and contribute to domestic science's competition at the international level.

Objective: To study the genetic diversity of zoonotic parasites of cats circulating in Kazakhstan.

Expected results: highly qualified specialists in the field of molecular parasitology and epidemiology will be trained, two graduate works and two dissertations for the Master of Sciences' academic degree will be prepared.

The research results will be published:

- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications indexed in the Science Citation Index Expanded of the Web of Science database and (or) in the Scopus database having a CiteScore percentile at least 35 (thirty-five) ;

- as well as at least 1 (one) article or review in a peer-reviewed foreign or domestic publication recommended by Committee for Quality Assurance in the Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan;

- the results will be presented at national, international and scientific conferences organized by scientific state or international organizations.

The results of the project will be distributed to potential consumers, the community of scientists and the general public by creating a web page on the website of the implementing organization or laboratory, which will contain basic information about the project, as well as through publications in leading ranking journals, reports at national and international conferences, as well as through Internet scientific and public social networks.

The results obtained for 2023:

The degree of infection of cats with protozoa in Astana is 24.7%, while *Giardia duodenalis* accounts for 12.2% and *Cryptosporidium* spp. 7.6%, *Toxoplasma gondii* 2.2%, *Isospora* 18.48%. In addition to zoonotic protozoa of cats, eggs of helminths *Toxocara cati* – 4.2%, *Strongyloides* – 0.84%, *Spirura rytipleurites* – 0.84% were found. The nematode *Toxocara cati* is zoonotic. The dynamics of the degree of infection among cats has age-specific characteristics. Cats aged from 1 to 3 years are most susceptible to infection. The prevalence of invasion in this age group is 21.2% (*Giardia duodenalis* – 29.4%, *Cryptosporidium* spp. – 11.8%, *Toxoplasma gondii* 2.2%). Cats living at home are infected by 23.6%, cats from shelters and kennels by 41.2%. The degree of infection of cats with protozoa in Shymkent is 18.5%, while *Giardia duodenalis* accounts for 9.2% and *Cryptosporidium* spp. 6.9%, *Toxoplasma gondii* 3.3%, *Isospora* 18.2%. In addition to zoonotic protozoa of cats, eggs of helminths *Toxocara cati* were found – 4.76% (zoonotic invasion), *Taenia* spp. – 1.9%. The dynamics of the degree of infection among cats has age-specific characteristics. Cats aged from 1 to 3 years are most susceptible to infection. The prevalence of invasion in this age group is 11.5% (*Giardia duodenalis* – 5.2%, *Cryptosporidium* spp. – 4.4% *Toxoplasma gondii* 3.3%). Cats living at home are infected by 19.5%, cats from shelters and kennels by 31.4%. The degree of infection of cats with protozoa in Almaty is 19.9%, while *Giardia duodenalis* accounts for 7.1% and *Cryptosporidium* spp. 8.2%, *Toxoplasma gondii* 4.5%, *Isospora* 5.6%. In addition to zoonotic protozoa of cats, eggs of *Toxocara cati* helminths were found – 13.8% (zoonotic invasion), *Capillaridae* – 1.8%. The dynamics of the degree of infection among cats has age-specific characteristics. Cats aged from 1 to 3 years are most susceptible to infection. The prevalence of invasion in this age group is 10.1% (*Giardia duodenalis* – 6.2%, *Cryptosporidium* spp. – 7.1%). Cats living at home are infected by 17.5%, cats from shelters and kennels by 23.5%. The degree of infection of cats with protozoa in Kostanay is 15.6%, while *Giardia duodenalis* accounts for 2.1% and *Cryptosporidium* spp. 2.2%, *Toxoplasma gondii* 3.1%, *Isospora* 19.4%. In addition to zoonotic protozoa of cats, eggs of *Toxocara cati* helminths were found – 8.06% (zoonotic invasion), *Capillaridae* – 3.2%, *Taenia* spp – 3.2%. The dynamics of the degree of infection among cats has age-specific characteristics. Cats aged from 1 to 3 years are most susceptible to infection. The prevalence of invasion in this age group is 22.2% (*Giardia duodenalis* – 3.3%, *Cryptosporidium* spp. – 6,2%). Cats living at home are infected by 14.3%, cats from shelters and kennels by 19.4%. The degree of infection of cats with protozoa in the city of Uralsk is 16.6%, while *Giardia duodenalis* accounts for 4.7% and *Cryptosporidium* spp. 4.7%, *Toxoplasma gondii* 2.3%, *Isospora* 9.5%. In addition to zoonotic

protozoa of cats, eggs of helminths *Toxocara cati* were found – 4.72% (zoonotic invasion), Capillaridae – 2.3%, *Taenia* spp – 4.76% (zoonotic invasion). The dynamics of the degree of infection among cats has age-specific characteristics. Cats aged from 1 to 3 years are most susceptible to infection. The prevalence of invasion in this age group is 9.5% (*Giardia duodenalis* – 3.3%, *Cryptosporidium* spp. – 6.2%). Cats living at home are infected by 8.4%, cats from shelters and kennels by 12.6%.

Research Team

Project Leader: Lyudmila Lider, Candidate of Veterinary Sciences, Associate Professor, specialist in the field of parasitology, helminthology and protozoology, research experience more than 20 years, H-index-2 (Researcher ID: [O-8442-2017](https://orcid.org/0000-0001-5842-0751), ORCID: [0000-0001-5842-0751](https://orcid.org/0000-0001-5842-0751), Scopus Author ID: 5605848900). <https://www.scopus.com/authid/detail.uri?authorId=56058488900>

Members of the Research Group:

Vladimir Kiyani, Chief Researcher, PhD, Associate Professor, specialist in the field of molecular and cellular biotechnology, 16 years of research experience, H-index-4 (Researcher ID: [O-7403-2017](https://orcid.org/0000-0001-9787-9151), ORCID: [0000-0001-9787-9151](https://orcid.org/0000-0001-9787-9151), Scopus Author ID: 6701646393).

<https://www.scopus.com/authid/detail.uri?authorId=6701646393>

Igor Sytnik, Leading Researcher, Candidate of Veterinary Sciences, research experience more than 12 years. Specialist in the field of molecular biology of bacteria and viruses, owns professional GIS programs (MapInfo, MapEdit, ArcGis, ArcView, AutoCAD, dBASE и др.). H-index-4 (ORCID: [0000-0002-3439-7021](https://orcid.org/0000-0002-3439-7021), Scopus Author ID: 56736251700).

<https://www.scopus.com/authid/detail.uri?authorId=56736251700>

Altay Ussenbayev, Researcher, Candidate of Veterinary Sciences, research experience more than 30 years. Specialist in the field of parasitology, helminthology and protozoology, H-index-6 (ORCID: [0000-0002-1508-7335](https://orcid.org/0000-0002-1508-7335), Scopus Author ID: 6507508795).

<https://www.scopus.com/authid/detail.uri?authorId=6507508795>

Dinara Seitkamzina, Leading Researcher, Candidate of Veterinary Sciences, 19 years of research experience. Specialist in the field of parasitology, helminthology and protozoology, H-index-1 (ORCID: [0000-0003-2245-9317](https://orcid.org/0000-0003-2245-9317), Scopus Author ID: 57918328300).

<https://www.scopus.com/authid/detail.uri?authorId=6507508795>

Ainura Smagulova, Researcher, Master of Technical Sciences. Specialist in the field of cell engineering, immunology and molecular genetics. She is proficient in PCR analysis, DNA sequencing and genetic identification of species, H-index-2 (Scopus Author ID: 57213811809, orcid.org/0000-0002-3067-3666).

<https://www.scopus.com/authid/detail.uri?authorId=57213811809>

Rabiga Uahit, Researcher, PhD-student, Master of Biological Sciences. Specialist in the field of cell engineering, immunology and molecular genetics. She is proficient in PCR analysis, DNA sequencing and genetic identification of species, H-index-1 (Scopus Author Id: 57226673682, orcid.org/0000-0001-7737-7162).

<https://www.scopus.com/authid/detail.uri?authorId=57226673682>

List of publications and patents published within the framework of this project (with links to them):

-

Information for potential consumers:

Diagnostics of *Toxoplasma gondii*, *Giardia* spp. and *Cryptosporidium* spp. is crucial for prevention and control of these pathogens in both humans and animals.

For cat owners we can offer a range of modern methods for diagnostics of *Toxoplasma gondii*, *Giardia* spp. and *Cryptosporidium* spp.

Information could be obtained by phone: 87015270040

Additional information:

For consultations during the research, a partnership is envisaged with scientists and specialists the Institute of Parasitology the Justus Liebig University Giessen (Germany):

Christian Bauer, Prof. h.c. (KazATU), Dr.med.vet., DVM, DipEVPC (retd.), Visiting Prof. (UNUD Bali);

Anja Taubert, Prof. Dr. med. vet., Managing Director of the Parasitology Institute;

Carlos Hermosilla, Prof. Dr. Dr. habil., DipEVPC, EBVS Veterinary Specialist in Parasitology, Visiting Professor of the University Austral of Chile