

## ANNOTATION

**of the doctoral dissertation of Abdullina Elmira  
on the topic: “Epizootological monitoring and veterinary and sanitary  
measures for bovine moraxellosis in the east of Kazakhstan”  
submitted for defense for the degree of Doctor of Philosophy (PhD)  
in the educational program 8D09102 – “Veterinary Sanitation”**

**Relevance of the research topic.** East Kazakhstan occupies a leading position in terms of the rate of development of animal husbandry. In recent years, significant economic damage to dairy and beef cattle breeding has been caused by the bovine moraxellosis infection, which affects the visual organs. The disease is highly contagious and rapidly spreads among all age groups, including both young and adult animals. Clinical symptoms include profuse lacrimation, photophobia, and rapid progressive damage to the eyes, up to the destruction of the eyeball and the development of unilateral or bilateral blindness. With the primary introduction of the pathogen into the herd, the incidence rate can reach from 20% to 90% of the livestock.

Insects, such as zoophilic flies, play a key role in the spread of moraxellosis, facilitating the transmission of pathogens from sick animals to healthy ones. In this regard, the issues of protecting animals from insect vectors of diseases are becoming particularly relevant. This underlines the need for additional research to develop more effective veterinary and sanitary measures for cattle moraxellosis in the conditions of eastern Kazakhstan. In addition, the development of mobile and cost-effective means of protection against insect vectors is essential for the sustainable development of livestock production, especially in conditions of limited access to electricity and difficulties in the delivery of veterinary drugs and protective equipment.

**Purpose of the study.** To analyze the current epizootological situation of cattle moraxellosis in the east of Kazakhstan and present practical proposals on veterinary and sanitary measures for this disease.

**Research objectives:**

1. To develop a method for taking samples from the animal's eye and to identify *Moraxella bovis* and *Moraxella bovoculi* in biomaterial from the eyes of cattle with clinical signs of infectious keratoconjunctivitis in the east of Kazakhstan.

2. Perform a spatial analysis of the results of laboratory tests.

3. To determine the terms of repellent activity of preparations for veterinary disinsection.

4. Develop a device for treating the skin of farm animals from flies carrying pathogens of moraxellosis.

5. Compare the effectiveness of a new device for processing the skin of farm animals with the traditional method of processing used in the pasture conditions of the east of Kazakhstan.

**Research methods.** Sampling by eye scraping of animals with clinical signs of moraxellosis from cattle located in seven districts of the east of Kazakhstan: Zharminsky, Kokpektysky, Borodulikhinsky, Abaysky, Zhana-Semeysky, Beskaragaysky, Ayagozsky in the period from 2019 to 2023, in individuals aged from 1 month.

Biomaterial samples were placed in test tubes with transport medium and lysing solution for bacteriological and molecular genetic studies.

In the course of the work, a number of research methods were applied:

1. Examination, palpation of the eye area of cattle were carried out on the basis of peasant and farm farms, pastures of the east of Kazakhstan, directly at the place of collection of pathological material from the eyes.

2. Bacteriological method: primary seeding and isolation of pure bacterial cultures were carried out, followed by identification according to methodological recommendations for the diagnosis of bovine moraxellosis by generally accepted bacteriological methods.

3. Molecular genetic studies were carried out according to generally accepted research methods: multiplex real-time PCR, sequencing.

4. Treatment of the skin of cattle against flies by spraying. On the place of grazing animals, on pastures and places of summer parking in the territory of the east of Kazakhstan.

5. Statistical analysis, by using IBM SPSS Statistics 20.0 software.

6. Spatial analysis (GIS mapping), by using the ArcMap 10.8 software.

7. Graphic processing of maps was carried out in the CorelDRAW 2020 program.

8. Working with scientific literature, compiling a bibliography in the Mendeley program.

#### **Main provisions submitted for defense**

1. Comprehensive monitoring study on cattle moraxellosis in the east of Kazakhstan.

2. Comparison of two commercial repellent preparations in pasture conditions of the East of Kazakhstan.

3. Development and introduction into production of a mobile "Plant for processing farm animals".

**Description of the main research results.** As a result of monitoring and experimental studies, the data obtained were systematized, analyzed and epizootological foci were reflected on maps. We performed the following tasks:

1. A method for taking samples from an animal's eye was developed and applied, patent for invention No. 37188 was obtained and entered into the State Register of Inventions of the Republic of Kazakhstan. The identification of *Moraxella bovis* and *Moraxella bovoculi* was carried out, and it was noted that there are statistically significant differences between the presence of the pathogen separately and the association of two bacteria *M. bovis* and *M. bovoculi* ( $p=0.001$ ), that is, bacteria are mainly found in association. According to statistical processing of the obtained results, the disease moraxellosis of cattle is clinically manifested in the presence of two pathogens simultaneously. The predominance of the prevalence

of any individual pathogen of interest did not reach significant indicators of *Moraxella bovis* ( $p=0.701$ ), *Moraxella bovoculi* ( $p=0.693$ ). In addition to the identified pathogens of the *Moraxella* genus, another one, *Mycoplasma bovoculi*, was found in the association. It was noted that in 54.7% of the samples, a combination of 3 pathogens was detected – *Mycoplasma bovoculi* + *Moraxella bovis* + *Moraxella bovoculi*. During the molecular genetic study, 6 new serotypes were identified and added to the NCBI GenBank: 3 *Moraxella bovoculi* from two districts of Zharminsky and Borodulikhinsky, and 3 *Moraxella bovis*, also from three districts-Abaysky, Ayagozsky and Zharminsky.

2. A spatial analysis of the results of laboratory diagnostics was carried out. So, as of 2023, a map of unfavorable points for cattle moraxellosis was compiled, 11 peasant farms with the presence of causative agents of cattle moraxellosis were identified in 7 districts: Abay, Ayagoz, Beskaragay, Borodulikhinsky, Zharminsky, Zhana -Semeysky, Kokpektinsky districts, of which foci with the presence of new serotypes of *Moraxella spp* were detected in 4 districts.

3. It was revealed that there are differences between the terms of repellent action indicated in the instructions for the drugs and the actual duration of action in the conditions of pastures of East Kazakhstan: Tsipek 25% has a high protective effectiveness against zoophilic flies for 168 hours (the coefficient of repellent effect = 84%) and Flyblock persists for 144 hours (the coefficient of repellent effect = 81%). This is much less than the specified period of validity of drugs, according to the instructions.

4. A "Farm animal processing equipment" (FAPE) has been developed, the facility is equipped with a toggle switch that is used to turn on and off the pump operation. "Farm animal processing equipment" (FAPE) (patent No. 6510) consists of several key components: a tank containing a diluted working solution, a pump, a pipeline system for feeding the solution, and injectors that are installed on a frame. The pump is switched on by means of a toggle switch and receives power from the car battery.

5. The "Farm animal processing equipment" (FAPE) has shown the greatest efficiency both economically and in operation. It can be applied to farm animals regardless of age and body weight, it works almost silently, which reduces the level of stress of animals during processing. It is mobile, as the design details of the installation can be easily disassembled and folded for transportation to the desired object. Operation from a car battery allows you to use it in places where there is no electric power supply. And the launch of the device and its direct operation takes place by the means of involving only one person. The consumption of the working solution for small-drop irrigation of the skin is not only cost-effective, but also reduces the amount of chemical that affects the animal. Ease of use allows you to systematize the treatment of animals during the mass summer season of flies and other insects that carry pathogenic agents of infectious and invasive diseases, including cattle moraxellosis. "Farm animal processing equipment" (FAPE) is implemented in 6 farms of East Kazakhstan.

**Justification of the novelty and importance of the results obtained.**

Within the framework of the study, unique and innovative results were obtained that contribute to the development of veterinary medicine, in the field of combating infectious diseases of cattle, as well as in the development of new technologies and approaches for veterinary and sanitary measures.

1. *Development of a new method for taking samples from the animal's eye.* In the course of the study, an innovative method of sampling animal eyes was developed and applied. This method was patented and entered in the State Register of Inventions of the Republic of Kazakhstan (Patent No. 37188). The development of a sampling method opens up new opportunities for diagnosing infectious diseases with high accuracy, which increases the efficiency and reliability of epizootological studies. Identifying statistically significant differences in the association of *Moraxella bovis* and *Moraxella bovoculi* bacteria from the point of view of disease pathogenesis is also an important scientific contribution, since it allows us to accurately determine that the most clinically dangerous disease is caused by their joint presence, and not by individual species.

2. *Identification of new pathogen serotypes.* In the course of molecular genetic studies, six new serotypes of *Moraxella bovis* and *Moraxella bovoculi* pathogens were identified and added to the NCBI GenBank *Moraxella bovis* и *Moraxella bovoculi*, which expands scientific knowledge about the causative agents of bovine moraxellosis in Eastern Kazakhstan. This discovery helps to better determine the spread and genetic variability of pathogens, which is of great importance for the development of effective diagnostic tests and treatments. The addition of new serotypes to the international database contributes to the globalization of scientific data and the exchange of experience in the field of veterinary microbiology.

3. *Development of a plant for processing farm animals.* Another significant novelty is the creation of a "Farm animal processing equipment" (FAPE) (patent No. 6510), which allows you to effectively and economically treat animals against insect vectors of diseases, including moraxellosis. "Farm animal processing equipment" (FAPE) is mobile, cost-effective, and low-energy-consuming, which makes it available for use in agriculture. The advantage of this unit is its high efficiency, easy operation and the ability to operate in remote areas without electricity. The device also helps reduce stress in animals.

4. *Implementation of developments in practice.* The developed method of sampling has been successfully applied in the research process, and "Farm animal processing equipment" (FAPE) has been implemented in six farms in East Kazakhstan, which confirms their high efficiency and practical significance. It also highlights the willingness of local agricultural enterprises to innovate in their daily practices.

**Compliance with the directions of scientific development or state programs.** According to the assignment "Identification and assessment of biological threats of exotic and endemic origin with prediction of their possible impacts" subprogram 1. "Ensuring the biological safety of the population and animals for especially dangerous diseases" within the framework of the scientific and technical program "Biological safety of the Republic of Kazakhstan: threat

assessment, scientific and technical basis for their prevention and elimination" for 2021-2023.

**Description of the doctoral student's contribution to the preparation of each publication.** The doctoral student took an active part in the formulation of scientific conclusions, discussion of results and writing the main sections of articles. In addition, she ensured the correct design of publications in accordance with the requirements of scientific journals, participated in correspondence with editorial offices, and developed patents.

The research results are published in 11 publications: 3 articles in the publication recommended by the Committee Ministry of Science and Higher Education of the Republic of Kazakhstan; 1 article in the journal with a non-zero impact factor included in the Web of Science, Scopus, PubMed database PubMed: "Veterinary World"(Q1, percentile-87); 1 patent for invention, 1 utility model patent, 4 theses in international scientific and practical conferences, 1 article in a scientific publication of the Near Abroad.

**Scope and structure of the dissertation.** The dissertation is presented on 143 pages of computer text, contains 10 tables, 24 figures. The dissertation consists of the following sections: introduction, review of literature, materials and methods, results of own research and conclusions. 175 sources of literature were used in the study.