

## ANNOTATION

**dissertation work of Ichshanova Aiman Salimzhanovna on the topic “Identification of pasteurellosis by modern research methods” submitted for the degree of Doctor of Philosophy (PhD) on the specialty 6D120100- “Veterinary Medicine”.**

**Relevance of the research topic.** In recent years, the intensive growth of saiga populations in our region has been very detrimental to the development of animal husbandry in the region. In addition, there is also an increased risk of disease spread due to this trend. Excessive growth in wildlife populations contributes to epizootics, as well as to an increase in the spread of disease among saigas and domestic animals. As research has shown, it is known that an excessive saiga population exceeding the established norm leads to an increased likelihood of disease transmission to domestic animals and even humans.

There are still many infectious diseases that harm the development of animal husbandry and contribute to the reduction of the economic efficiency of this industry. These include various pathologies caused by representatives of the *Pasteurellaceae* family. These pathogens are Gram-negative, facultatively anaerobic, bacilliform bacteria, commensal inhabitants of the surface layer of the mucous membranes of the upper respiratory tract of animals, capable of causing primary as well as secondary infectious diseases.

It should be noted that *Pasteurella multocida* and *Pasteurella haemolytica* are the causative agents of various pathological forms of pasteurellosis, which have a major economic impact on livestock production worldwide and also pose a high risk of animal-to-animal and animal-to-human transmission.

At present, the results obtained based on the organization of measures aimed at the detection and identification of wild and domestic animals pasteurellosis on the territory of Western Kazakhstan, firstly, have a scientific basis for the prevention of this disease, and secondly, contribute to the protection from zoonothroponosis infection not only domestic animals, but also humans.

At the same time, the results of the study will be of interest not only to our veterinary science and practice but also to neighboring countries where saigas live, as this infection is one of the most important problems that has not been fully solved in Uzbekistan, Mongolia, Turkmenistan, and Russia.

Therefore, one of the urgent problems of veterinary science and practice is the detection and identification of pathogens with determination of their properties to study the prevalence and frequency of manifestation of this pathology, as well as the organization of anti-epizootic measures.

**Purpose of the thesis study.** To determine the priority of representatives of the family Pasteurellaceae in the occurrence of pasteurellosis of cattle and saigas in the conditions of West Kazakhstan region, and identification of Pasteurellaceae belonging to this species using modern research methods.

### **Objectives of the study.**

- Identification of peculiarities of distribution, course, and pathological and anatomical changes of pasteurellosis caused by *Pasteurella multocida* and *Pasteurella haemolytica* in cattle and saigas in the West Kazakhstan region;

- Determination of pasteurellosis by serologic method in conditions of the West Kazakhstan region;

- Diagnosis of pasteurellosis and pasteurellosis carriers by bacteriological methods in conditions of the West Kazakhstan region;

- Identification of *Pasteurella* by molecular-genetic methods in conditions of the West Kazakhstan region.

**Research Methods.** Research work from 2015 to 2024 was conducted in the laboratory “Microbiology” of the Institute of Veterinary Medicine and Livestock Non-profit JSC “West

Kazakhstan Agrarian-Technical University named after Zhangir Khan”, experimental studies of research work were conducted in peasant farms of districts of West Kazakhstan region, based on the research and innovation center (Research Institute) at Non-profit JSC “Kostanay regional named after A.Baitursynuly”, laboratory “Biotechnology against bacteriosis” of the Kazakh State University of Agriculture and Livestock. Within the framework of the project AR15473404 “Intensity of pasteurellosis manifestation during the seasonal migration of saigas and the relationship of disease occurrence in farm animals”.

Bio- and pathological materials obtained from cattle (159 heads) and saigas (65 heads), as well as laboratory animals (white mice), were used as experimental research objects.

To study the epizootic situation associated with animal pasteurellosis, we used the results identified from the study of bio- and pathological material isolated from cattle and saigas using traditional and modern methods.

For the bacteriological study, samples of parenchymatous organs were taken by the order of the Minister of Agriculture of the Republic of Kazakhstan from April 30, 2015, № 7-1/393 “rules of sampling of transported (transported) objects and biological material”, according to the stipulated rules and volumes.

An integrated method was applied for the study of animal cadavers, i.e., inspection of cadavers, preparation of pathology anatomical autopsy reports with organ evisceration by the generally accepted Shore method, and sampling for bacteriological examination.

Samples of material taken for bacteriological examination were placed in polyethylene bags or moisture-proof containers and examined on the same day. However, samples from remote areas (animal parenchymatous organs and tissues, etc.) were preserved with a 30% aqueous solution of chemically pure glycerol if they could not be brought to the laboratory within 3-4 hours, especially during the warm season.

Pasteurella isolation and identification were performed according to “laboratory diagnosis of pasteurellosis by bacteriological method” following standard operating instructions.

#### **Main provisions for defense.**

- Seasonal incidence and prevalence of pasteurellosis in wild and domestic animals in West Kazakhstan Oblast;

- The importance of *Pasteurella multocida* in the spread of disease in cattle and saiga populations;

- Features of biological and pathogenic properties of *Pasteurella multocida* and *Pasteurella haemolytica*;

- Results of bacteriological, serological, molecular genetic studies of cattle and saiga biomaterial samples.

#### **Description of the main results of the study.**

1. The peculiarities of distribution, course and pathological and anatomical changes of pasteurellosis caused by *Pasteurella multocida* and *Pasteurella haemolytica* in cattle and saigas in the conditions of West Kazakhstan region have been revealed. Dynamics of seasonality of pasteurellosis under rapid and frequent fluctuations of meteorological phenomena combination of relatively high air humidity and normal temperature is the cause of pasteurellosis. Relative air humidity 77-85% and temperature above 26-28°C contribute to the development of pasteurellosis disease.

2. According to statistical data from the WKO Department of Agriculture for 2015-2023, the total number of animals with pasteurellosis among cattle and saigas in Western Kazakhstan is 194, of which cattle 82% (159 animals) and saigas 18% (35 animals). The total number of animals killed due to disease is 182, of which: cattle - 80.8% (147 animals) and saigas - 19.2% (35 animals).

3. According to the results of serologic studies conducted between 2019 and 2023, among animals with clinical form of pasteurellosis, out of 157 samples, 18.9% (24 head) were positive and 81.1% were negative. In pasteurellosis carrier animals, 3.3% were positive and 96.7% were negative.

4. In conditions of West Kazakhstan region by results of diagnostics of pasteurellosis and pasteurellosis carrier by bacteriological method 150 samples were received for research. At study of biological properties 83,3% of *Pasteurella multocida*, isolated from pathological material, had high pathogenicity and 16,7% - weak pathogenicity. *Pasteurella haemolytica* was found to be completely non-pathogenic.

5. A total of 126 samples were collected for the study of nostril flushes for the determination of *Pasteurella haemolytica* carriage in cattle. Of these, 65.3% of *Pasteurella* cultures isolated from cattle nostrils were highly pathogenic, while *Pasteurella multocida* flushes isolated from saigas (28.6%) showed weak pathogenicity.

*Pasteurella haemolytica* isolates isolated from the nostrils of healthy animals were found to be 100% non-pathogenic. 10.5% of isolates from nostrils of sick animals were weakly pathogenic and 89.5% were non-pathogenic, while isolates isolated from organs of fallen animals were 100% non-pathogenic. According to these studies, pasteurellosis occurs in saigas of all ages.

6. A study of the species composition of *Pasteurella* isolated from cattle and saigas showed that they are similar in biological characteristics.

7. A molecular genetic study of *Pasteurella multocida* strains isolated in the clinical form of pasteurellosis in cattle and saigas showed that the type *Pasteurella multocida* occurs. The strain isolated from cattle has a degree of homology of 99% with strain NR 041809.1 *Pasteurella multocida* strain CUG 17976. Saiga strain NR 041811.1: 41-778 *Pasteurella multocida* subsp. strain *gallicida* had a degree of homology of 99.86% with the closest strain CCUG 17978.

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

Virulent strains of *Pasteurella* cause frequent outbreaks among animals. In this context, on the basis of analysis by traditional and modern methods with clarification of the rates of territorial spread of the pathogen of *Pasteurella* among animals, the results of detection and identification of specific species of pathogens of pasteurellosis among cattle and saigas were given for the first time in the conditions of West Kazakhstan region.

The research results of our dissertation work are used in lectures, practicals, and laboratory classes in the disciplines of Microbiology and Virology, "Laboratory science," and "Epizootiology and Infectious diseases" for students of veterinary specialties, as well as in the writing of term papers and dissertations. Also, the obtained results can be used by students of advanced training courses for veterinarians, state veterinary institutions (republican, regional, and district), peasant farms engaged in animal husbandry, veterinary specialists of enterprises, and research scientists.

The materials of the proposed dissertation are implemented in the educational process of higher educational institutions training personnel in veterinary specialties.

#### **Correspondence to the directions of science development or state programs.**

Research sections of the thesis according to the contract № 335/ЖФ-3-22-24 were realized in the period from 2022-2024 within the framework of the scientific project AR15473404, "Intensity of pasteurellosis manifestation during the seasonal migration of saigas and the relationship of disease occurrence in farm animals", financed by the Ministry of Science and Higher Education of the Republic of Kazakhstan.

#### **Description of the doctoral student's contribution to the preparation of each publication.**

According to the materials of the proposed dissertation work, the co-authors have carried out 12 scientific works, including 1 article in the Scopus database with a percentile on CiteScore 61, in the collections of international scientific conferences, 3 articles, in the proceedings of foreign conferences, 1 article, and in the journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan, which published 6 articles and 1 recommendation.

**The scope and structure of the thesis.** The thesis is 100 pages in electronic format and consists of a review of scientific literature, research materials and methods, independent

research, analysis of research results, conclusion, list of used literature, and appendices. In our research paper, 13 tables and 56 figures are nested and designed. The list of used literature contains 156 scientific works.