REPUBLIC OF AZERBAIJAN

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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

STUDY OF THE DEVELOPMENT OF CAUSATIVE AGENT OF FRANSAIELLOSIS (*FR. COLCHICA*) IN CATTLE AND TICK (*B. CALCARATUS*) ORGANISM AND IMPROVEMENT OF ITS TREATMENT

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INTRODUCTION

Relevance of the topic and degree of development. In the Republic of Azerbaijan, the development of livestock breeding, along with other branches of state agriculture, in the direction of intensive and ecologically clean agriculture, along with other branches of agriculture, is always at the forefront as an important issue in terms of ensuring the sustainability of the economy.

In order to achieve all the relevant goals set, in recent years, productive breeds of agricultural animals have been brought to the republic from European countries and neighboring countries in order to increase the productivity of livestock breeding.

One of the most important issues is the adaptation of these animals introduced to the republic to local conditions, their resistance to infectious disease agents, and the implementation of appropriate control measures or improvement of treatment methods. In terms of improving effective treatment against blood-parasitic diseases (piroplasmosis and anaplasmosis), the causative agent of which is transmitted to livestock through ticks, the study of the development of the causative agent of francaisella (*Fr. colchica*) in the organism of large horned animals and ticks is considered relevant.

Blood-parasitic diseases, which are widespread in different countries of the world, are among the invasive infectious diseases that cause the most damage to livestock in our republic. The virulent properties of the parasites that cause these diseases are related to their biological properties.

Therefore, in the fight against *fransaiellosis*, one of the blood-parasitic diseases, it is necessary to study it, taking into account that the causative agent develops in the organism of animals and ticks, and appropriate improvements should be made in the field of treatment.

In order to eliminate the invasion, preventive measures against the vectors of blood-parasitic diseases and their carriers, which have been carried out for more than a hundred years, have not yielded significant results.

Considering that the subtropical climate of the southern zone, the humidity of the air, its relief and vegetation create favorable conditions for the spread and reproduction of 12 species of pasture ticks (ixodids) belonging to 6 genera belonging to the Ixodidae family, which are present and widespread in the territory of the republic, allow them to be active for 7-8 months. The causative agents of blood-parasitic diseases transmitted by these ticks are widely distributed throughout the republic (except for the altitudes of mountainous zones above 1500 meters), causing great economic damage to livestock.

It should be noted that in order to study the spread of blood-parasitic diseases among agricultural animals in the republic and organize measures to combat them on a scientific basis, a protozoology laboratory was established under the Azerbaijan Scientific Research Veterinary Institute in 1930, extensive research was conducted, and to this day, a number of studies have been conducted by our scientists by our scholars on the composition and distribution of the causative agents of blood-parasitic diseases and the ixodid ticks that transmit them in the country, etc.[1]. However, at the same time, some issues related to blood-parasitic diseases have not yet been resolved.

Currently, due to the development of livestock breeding in the private sector, the study of the spread of piroplasmidosis in the regions sometimes creates certain difficulties in the timely detection of blood-parasitic diseases in agricultural animals, including large horned animals.

Effective treatment and preventive measures against blood-parasitic diseases, as well as continued research on the epizootological characteristics of the diseases, the development of pathogens in the animal organism, and their study, are crucial issues. However, the morphology of the blood-parasitic disease agents in

[1] Мирзабеков, Д.А. Некоторые данные по биоэкологии клещей в Азербайджанской Республике / Д.А Мирзабеков, В.М. Курчатов, Н.С Абусалимов [и.др.] // Труды Азербайджанской Научно-Исследовательской Опытной Станции, – Баку: – 1949. т.3, - с.123-132.

the peripheral blood of animals has been studied[2]. During the research conducted by scientists, no comprehensive understanding of the morphology and development of the pathogens in the internal organs of infected animals was found[3].

Considering that fransaiellosis is widespread among the large horned animals in all regions of Azerbaijan and that it causes great economic damage to livestock, it becomes clear how important it is to continue scientific research in this area in terms of its role in ensuring food security. Due to the disruption of physiological processes in sick animals, it causes a decrease in milk yield by 20-40% and meat yield by 15-25 kg. After the recovery of an animal that has suffered a disease, the restoration of physiological processes and productivity takes a long time (20-30 days). Considering that it is especially important to carry out treatment with new effective methods or implement improved methods.

In addition, in the last 30-40 years in Azerbaijan, no work has been carried out to study ixodid ticks, which transmit blood-parasitic diseases and pathogens of large horned animals in the southern region of the country.

Therefore, in the fight against the above-mentioned blood-parasitic disease, francaiselleosis, it is important to continue scientific research in the relevant field and improve treatment, taking into account the development of its causative agent in the animal and tick organism.

Object and subject of the study. The object of the study is animals fed in private and farmer livestock farms in the Southern region (Astara, Lankaran, Masalli, Bilasuvar) and in the Masalli outpost operating under the Azerbaijan Veterinary Scientific Research Institute, as well as laboratory animals of the institute (island rabbit). The subject of the study is the study of the development of the causative agent of francaiselleosis (*Fr.colchica*),

[2] Якимов, В.Л., Василевская, В.И. К вопросу о русских пироплазмозах крупного рогатого скота // – Москва: «Ветеринарное дело», – 1924. №12-13, – с.107-120.

[3] Ли, П.Н. Развитие некоторых пироплазмид в организме теплокровных животных // – Саратов: Тр. Саратовской НИВС, – 1967. т.VII, – с.242 - 254.

a blood-parasitic disease of large horned animals in that region, in the animal and tick organism and the improvement of its treatment.

Goals and objectives of the study. The aim is to study the epizootology of piroplasmosis and anaplasmosis in the southern region of the republic and the distribution of species of ixodid ticks that transmit their pathogens, the development of the pathogen (*Fr. colchica*) in the organism of large horned animals and ticks, and to improve the treatment of these diseases. To achieve the aim, the following issues are planned to be solved:

1. Study the epizootological situation of blood-parasitic diseases of large horned animals in the southern region of the republic, the seasonal dynamics of pathogens

2. Study the distribution and seasonal dynamics of ixodid ticks that transmit blood-parasitic diseases in the southern region.

3. Study the development of the pathogen in the organs (salivary gland, ovary, intestines) and eggs of *B. calcaratus* ticks infected with the Fr. colchica species.

4. Study the development, morphology and localization of the pathogen in the peripheral blood and internal organs of large horned animals infected with the *Fr. colchica* species.

5. Determination of the optimal treatment dose of the diminazin-aceturate preparation, which is the active ingredient of Trypa-ject, Tryponil, Piroplasmin, Diminaze preparations used in the treatment of large horned animals infected with the causative agent of *fransaiellosis*, in order to increase the treatment effectiveness, and calculation of economic efficiency.

6. Examination of the blood of large horned animals infected with the causative agent of franchiellosis, determination of changes in the morphological indicators of the blood.

The tasks to achieve the set goals are as follows:

– To study the physical and geographical characteristics of the study areas and the distribution of piroplasmidosis and transmitting ticks in those areas;

–To determine the degree of study of the development of the causative agent of blood-parasitic disease francaiellosis *(Fr. colchica*) in the peripheral blood and internal organs of large horned

animals in Azerbaijan and different countries;

–To determine the degree of study of the development of the species *Fr. colchica* in the internal organs

(salivary gland, ovary, intestines) and eggs of the *B. calcaratus* tick in Azerbaijan and different countries;

–To calculate and carry out a comparative analysis of the amount of hemoglobin, ESR, erythrocytes and leukocytes in the blood taken from animals infected with francaiellosis and healthy animals;

–To determine the therapeutic dose of the active substance of parasitocyte preparations (diminazine-aceturate) in laboratory and farm conditions and calculate the economic efficiency in order to increase the effectiveness of the treatment of francaiellosis and piroplasmosis in the republic.

Research methods. In the southern region of the country, in 2011-2018, smears prepared from peripheral blood of sick animals of citizens, internal organs of dead and forcibly slaughtered animals and ticks, as well as tick eggs, were examined in livestock farms and backyards of legal entities and individuals.

In addition, morphological indicators of blood of healthy and francois infected animals were studied.

The economic benefit obtained from improving the treatment of cattle infected with francois was calculated using appropriate formulas.

Main provisions presented to the defense:

1. Parasitological studies conducted in the southern region of the Republic revealed that the distribution of ixodid ticks, depending on their genus and species, was higher in plain (30.5%) and foothill (55.8%) zones, while it was recorded at a lower rate (1.1%) in mountainous zones.

2. While studying the epizootic situation and seasonal dynamics of piroplasmidoses (theileriosis, francaiellosis, piroplasmosis, anaplasmosis) in large ruminants, it was observed that the infection rate of blood-parasitic diseases was higher in spring – 55%, in summer – 35%, and in autumn – 10%, whereas no

cases were observed in winter. Therefore, the incidence of disease in animals is higher in spring and summer.

3. Although the reproduction of *Fr. colchica* species in three forms (simple, budding, and schizont) was clearly observed in the adult stage and eggs of *B. calcaratus*, it was not recorded in milk and immune samples. It should be noted that without being detected in milk and immune fluids, the invasive forms of the parasite are taken in during blood feeding.

4. In large ruminants infected with the causative agent of francaiellosis, the *Fr. colchica* species develops in the internal organs (lungs, liver, kidneys, heart, spleen, brain) and enters the peripheral blood, hicr leads to the severe progression of blood-parasitic diseases.

5. In the treatment of piroplasmosis and francaiellosis, improving the 4-day treatment course and reducing it to a 1-day treatment was found to yield an economic benefit of 105.60 AZN per calf, depending on the determination of the effective dose of parasitotropic preparations.

Scientific novelty of the study. For the first time in Azerbaijan, the development and improvement of the treatment of the causative agent of francaisella in the animal and tick organism have been studied on scientific grounds.

For the first time in Azerbaijan, the morphological characteristics and development of the causative agent of francaisella *(Fr.colchica*) in the internal organs and eggs of the *B.calcaratus* tick have been studied.

For the first time in Azerbaijan, in order to fully clarify the epizootological situation of blood-parasitic diseases in the southern region of Azerbaijan, we have examined ixodid ticks - *B.calcaratus*, *I.risinus, H.anatolicum* - along with animals.

Based on the research conducted, for the first time in Azerbaijan, forms belonging to the *Babesia* genus were discovered, which differ from other species *(P.bigeminum* and *Fr.colchica*) transmitted by the *B.calcaratus* tick in terms of their morphological structure and reproduction, and were determined as *Babesia sp*.

For the first time in Azerbaijan, the morphological

characteristics and development of the *Fr. colchica* species in the larvae and nymphs of the *B.calcaratus* tick have been studied.

For the first time in Azerbaijan, the localization and development of *P. bigeminum* and *Fr. colchica* species in the peripheral blood and internal organs of large horned animals have been studied, and their morphological structure has been presented in a comparative manner.

For the first time, in order to increase the effectiveness of the treatment of francaiellosis in the southern region, the optimal effective treatment dose of the active substance (diminazine-aceturate) of the drugs Piroplasmin, Trypaa-ject, Tryponil, Diminaze, etc. was determined, reducing the treatment period from 3-4 days to one day. The economic efficiency was determined to be 105.6 man. per head of cattle.

Theoretical and practical significance of the study. The results of the conducted studies are new not only for the southern region where the study was conducted, but also for Azerbaijan. Improving the treatment of large horned animals infected with francaiellosis, preventing the disease in the body in a short time played an important role in improving its quality, leading to an increase in productivity. Determining the optimal treatment dose of the parasitocyte preparations used, studying the biological characteristics of the *Fr.colchica* species in the body of large horned animals and ticks, detecting the seasonal distribution of piroplasmidosis in the plains, foothills and mountainous zones of that region, and determining the species composition of the causative agents and vectors will be of great importance.

During the studies, it was determined that in addition to examining and detecting the causative agents of blood-parasitic diseases in the body of large horned animals, it is also important to examine and detect ixodid ticks, which are the carriers of these agents. The optimal treatment dose of parasitocyte preparations used in the treatment of sick animals against blood-parasitic diseases of large horned animals has been determined on scientific grounds. As a result of the studies conducted, a recommendation entitled “Study of the development of the causative agent of francaisellosis

(Fr.colchica) in the body of large horned animals and ticks and improvement of its treatment" (2017) was developed.

Based on the results of the research conducted to solve the problems set, the causative agents of piroplasmosis in cattle and ticks will be destroyed in livestock farms. Also, the scientific results we have obtained can be used in teaching parasitological subjects in higher education institutions and in work related to the protozoological study of cattle.

Approbation and application. The main provisions of the research work were reported and widely discussed in the annual reports of the Department of Parasitology of the State Veterinary Institute, as well as at the following Republican and International (domestic and foreign) scientific conferences:

"Actual problems of food security (Ecological, chemical and biological safety, quality and safety of agricultural products)" dedicated to the 100th anniversary of Academician Gladenko I. (Kharkov, 2015).

Application of innovations in the direction of the development of veterinary science. International Scientific and Practical Conference (Baku, 2019).

Based on the research materials, 7 articles (3 of which are included in international indexed databases and the list of publications of the Russian Academy of Sciences), 2 conference materials (1 abroad) and 1 recommendation were published, reflecting the main content of the dissertation work.

The name of the organization where the dissertation work was carried out. The dissertation work was carried out in the Parasitology Laboratory of the Veterinary Research Institute (VETI) of the Ministry of Agriculture and the Masalli outpost, which is a structural unit of the VETI.

Structure and volume of the dissertation work. The dissertation work consists of an introduction (13847 characters), 8 chapters (115763 characters), discussion of the results of the research (48127 characters), conclusion (1590 characters), practical proposals (975 characters), a list of 149 references in Azerbaijani, Russian and other languages. The dissertation work contains 18

figures, 17 tables and 4 graphs. The total volume of the dissertation (180302 marks) is a conditional mark.

CHAPTER I. LITERATURE REVIEW

This chapter provides information on the epizootic situation, treatment and prevention of blood-parasitic diseases of large horned animals in Azerbaijan and foreign countries, the species composition of the causative agents of the diseases, the distribution of their vectors (ixodid ticks) in the organism of large horned animals and ticks, based on literature data. The geographical location of the Lankaran-Astara and Shirvan-Salyan economic regions, plant grouping, forest zone, animal world, soil cover, climate indicators and other features of the plain, foothill, and mountainous zones are described [4].

CHAPTER II. MATERIAL AND METHODS

In 2011-2018, studies were conducted in the parasitology laboratory of the Azerbaijan Scientific Research Veterinary Institute (BRI), in the Masalli outpost, a structural unit of BRI, and in livestock farms of the Jabrayil region located in the territories of Lankaran, Astara, Masalli and Bilasuvar districts. Clinical or parasitological diagnostic examinations were conducted on 478 large horned animals and ixodid ticks in 67 individual and 9 farm farms belonging to residents engaged in livestock breeding in these regions. Clinical and parasitological diagnostic examinations were carried out by measuring the animal's temperature, recording signs of the disease, examining the animal's peripheral blood in an appropriate manner, and examining the collected ixodid ticks. During the examination, 3581 individual ixodid ticks collected from large horned animals infected with piroplasmosis were

[4] Azərbaycan Respublikasının coğrafiyası.Regional coğrafiya / AMEA, akad. H.Ə. Əliyev adına Coğrafiya İnstitutu – Bakı: "Avropa" nəşriyyatı, –2015. c.3, –400s.

differentiated[5]. Of these, 783 smears were prepared from 92 eggs of 221 B. calcaratus female adults, 394 from 129 internal organs (salivary gland, ovary, intestine) and 107 from 184 larvae and nymphs by the splitting method[6].

In addition, 187 smears were prepared from 28 dead and forcibly slaughtered large horned animals (kidney, heart, spleen, liver, lung, brain) by the pressing method, and 286 peripheral blood smears were prepared from 134 large horned animals infected with francaiselliosis. The fixation and staining of the smears were carried out according to the general methods accepted in protozoology. The parasites were determined according to the atlas given by Kapustin[7]. Determination of the optimal treatment dose in the treatment of piroplasmosis and francaiellosis was also carried out at the base station of BETI located in Masalli district.

Based on the results of our experiments, treatment was carried out at the rate of 7.5-10.0 ml per 100 kg of live weight by increasing the therapeutic dose of diminazine-aceturate-containing parasitotropic preparations (Trypa-ject, Tryponil, Piroplasmin Diminaze) in large horned animals in livestock farms according to the instructions (instead of 5 ml per 100 kg of live weight). Also, blood morphology (ECS, hemoglobin, erythrocytes, leukocytes) and clinical indicators of the animal (temperature, pulse, respiration) were measured using appropriate methods.

Biometric calculations of the size and morphological indicators of parasites were carried out based on Student assessment criteria.[8]

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[5] Померанцев, Б.И. Морфологический очерк. Паукообразные. // – Ленинград: НА СССР, – 1950. Т.4, №2, с.34-59.

[6] Павловский, Е.Н. Наставление к собранию и исследованию клещей в природе как обоснование мер борьбы с ними / Е.Н.Павловский – Москва; – Ленинград:Сборник «Вредители животноводства», –1935. –359с

[7] Капустин, В.Ф. Атлас паразитов кров сельскохозяйственных животных / В.Ф. Капустин – Москва: Огиз-сельхозгиз, –1949. –79 с.

[8] Hesablama texnikasının və eksperimentin riyazi nəzəriyyəsinin elmi tədqiqatlarda tətbiqi T.Ə.Babayev, A.R. Bünyatov, Q.C.Əfəndiyev[və b.] / Elm, – Bakı: – 1999. - 102 s.

CHAPTER III. SPECIES, DISTRIBUTION AND SEASONAL DYNAMICS OF IXODID TICKETS IN NATURAL CLIMATE ZONES OF LANKARAN-ASTARA AND SHIRVAN-SALYAN ECONOMIC REGIONS

The seasonal dynamics, species composition and distribution of ixodid ticks in the livestock farms of the Jabrayil region, located in the natural climatic zone of the republic (inhabited in the territories of Lankaran, Astara, Masalli and Bilasuvar), were determined as a result of our research.Thus, in the Bilasuvar region, the species *H.anatolicum*, *H.plumbeum* and *H.detritum* of the genus *Hyalomma*, which are the carriers of theileriosis, are widely distributed in deserts, mainly in areas with drought and poor vegetation. The widespread distribution of species belonging to the genus *Hyalomma* in most areas of the Bilasuvar region has led to the infection of theileriosis in large horned animals. The species *B.calcaratus* is more common around water bodies with rich vegetation and high humidity in the region. This has led to the widespread spread of piroplasmosis and francaisellosis diseases among animals. Unlike the Adygea region, the *Boophilu*s tick has been observed to spread among large horned animals in the plains, foothills, and mountainous zones of Masalli, Lankaran, and Astara regions, covering large areas and causing francaieilosis, piroplasmosis, and, to a lesser extent, anaplasmosis. During the examination of ticks, the causative agents of the above-mentioned diseases were detected in *Hyalomma, Boophilus Ixodes* ticks. During the examination of H*yalomma* and *Boophilus* ticks collected from sick animals, mixed infestation was not observed, and it was determined that the ticks were infected with only one type of parasite. We observed ixodid ticks of 6 genera in the territories of the indicated regions, of which 4 genera (*Hyalommo, Boophilus, Ixodes* and Haemaphysalis) were found to be carriers of piroplasmosis, francaisellosis, anaplasmosis and theileriosis in large horned animals. In plain and arid areas, the Hyalomma genus was found to be prevalent, while in foothills and mountainous areas with high humidity and vegetation, Boophilus, Ixodes, *Haemaphysalis, Rhipicephalus, Dermacentor* ticks were found to be prevalent.(Table 1).

Table 1

Ixodid indicators of distribution of ticks in cattle in the southern zone

District	Prevalence indicators of ixodid ticks (number, %)												
	Total ticks (individual)	*Ixodes*		*Haemaphysalis*		*Boophilus*		*Dermacentor*		*Rhipicephalus*		*Hyaloma*	
		Individual	%	Individual	%	Individual	%	Individual	%	Individual	%	Individual	%
Lankaran	1394	97	7.0	38	2.7	864	62.8	1 9	1.3	122	8.8	254	18.4
Primer	556	42	7.7	6	1.0	381	70,1	13	2,3	22	4.0	95	17.4
Fairy tale	596	32	5.3	7	1.1	321	53.8	9	1,5	57	9.5	170	28.5
Bilasuvar	1035	-	-	22	2.1	10435	42.0	-	-	13	1,2	565	54.5
Total	3581	171	4.7	73	2.0	2001	55.8	41	1.1	214	5.9	1081	30.5

CHAPTER IV. DISTRIBUTION AND SEASONAL DYNAMICS OF BLOOD-PARASITE DISEASES OF LARGE-HORNED ANIMALS IN THE NATURAL CLIMATE ZONES OF THE LANKARAN-ASTARA AND SHIRVAN-SALYAN ECONOMIC REGIONS

In order to determine the spread of blood parasites in the southern region of the republic, studies were conducted in the territories of Lankaran, Astara, Masalli and Bilasuvar districts. During the studies, it was determined that the intensity of infection of animals with blood-parasitic diseases and the spread of invasion depend on the natural climatic conditions of the regions where livestock farms are located. The spread of piroplasmosis and their seasonal dynamics corresponded to the development period of the transmitting ticks. Studies conducted in Bilasuvar district show that theileriosis is observed massively in large horned animals throughout the region.

Considering that in the hot and arid areas of that zone, the theileriosis was mainly caused by the spread of tick species belonging to the genus *Hyalomma*. Unlike *Hyalomma*, due to the vegetation cover and high humidity around water bodies in that zone, Boophilus ticks caused the widespread spread of piroplasmosis, francaelosis and anaplasmosis among animals. Unlike Bilasuvar district, francaieilosis, piroplasmosis and anaplasmosis are widespread among animals in the plain, foothill and mountainous zones of Masalli, Lankaran and Astara districts (Table 2).

A group of pathogens of infectious diseases of agricultural animals are blood-parasitic diseases (piroplasmosis and anaplasmosis) transmitted by ticks.

These diseases are also widespread among large horned animals in the southern region of the republic (except for the mountainous zones at an altitude of 1500 meters above sea level) and have caused great damage to the economy. The difficulties in combating blood-parasitic diseases are associated with the migration and spread of animals and ticks, which are carriers of invasive pathogens.

Table 2

Prevalence indicators of blood parasites among cattle in the southern zone

District	Distribution of blood parasites among animals (number of heads, %)													
	the number of animals in thedistrict	*Th. annulata*		*Th. mutans*		*Fr. colchica*		*Fr. caucasica*		*A. marginale*		*P. bigeminum*		total
		quantity	%	quantity	%	quantity	%	quantity	%	quantity	%	quantity	%	%
Lankarn	167	33	19,7	_	_	64	38,3	13	7,7	21	12,5	36	21,5	34,4
Astara	102	21	20,5	–	_	43	42,1	_	_	11	10,7	27	26,4	20,9
Masallı	112	20	17,8	14	12,5	39	34,8	–	–	13	11,6	26	23,2	22,9
Bilasuvar	106	45	42,4	_	_	31	29,2	_	_	11	10,3	19	17,9	21,8
total	487	119	24,4	14	2,8	17	36,3	13	2,6	56	11,4	108	22,1	

CHAPTER V. STUDY OF THE LOCATION, MORPHOLOGY AND DEVELOPMENT OF *FR. COLCHICA* SPECIES IN THE ORGANISM OF LARGE-HORNED ANIMALS

Studies on the localization, morphology and development of the causative agent of *Fr. colchica* in smears prepared from the peripheral blood of sick animals and from the internal organs (kidney, heart, lung, liver, spleen and brain) of dead and forcibly slaughtered large-horned animals of different ages in the livestock farms of Lankaran, Masalli, Astara and Bilasuvar regions were included[9].

Table 3

Indicators of infection of erythrocytes with parasites in the organs of large horned animals with fransaiellosis and piroplasmosis

Organs	*Piroplasma* found in erythrocytes in one field of view of the microscope (%)	*Fransisella* (%) detected in erythrocytes in one field of view of the microscope	Additional note
kidney	1-1,5	70-80	Infection of erythrocytes with *Piroplasma* in the field of vision of the microscope in the brain was 100% in some cases.
liver	5	55 - 60	
heart	50-60	45-50	
Spleen	1-3	3-5	
lungs	12-16	7-8	
brain	55-60	1	

[9] Mirzəbəyov, K.D, Mehralıyeva, Ü.M, İbrahimova, K.A. İri buynuzlu heyvanların daxili orqanlarında piroplazmaların və fransaiellaların lokalizasiyası və onların təfriqi diaqnozu. Azərbaycan Zooloqlar Cəmiyyətinin əsərləri. – 2011, Cild 3, – s. 211-216

Morphological signs of the relevant pathogens of large horned animals (shapes, sizes of parasites, location inside erythrocytes, etc.) were detected in slightly different forms. Also, epizootological data, clinic of the disease, pathological-anatomical analysis and laboratory (microscopic) examinations were used in the diagnosis of blood-parasitic diseases of animals. The detection of a specific causative blood-parasite in the blood of a sick animal is a decisive and objective indicator of the disease.

Since two or more types of parasites were detected in the body of a sick animal, in order to implement the correct treatment measures, peripheral blood smears of the sick animal prepared before specific (parasitotropic) treatment were carefully examined. Peripheral blood was collected from sick animals, smear preparation and microscopic examination were carried out in accordance with the relevant rules.

The pathogens of blood-parasitic diseases were detected microscopically in smears prepared from the peripheral blood of the sick animal, internal organs (heart, lungs, spleen, liver, kidneys, brain) of dead and forcibly slaughtered animals. The results of the studies show that the blood parasites inside the erythrocytes were round, oval, single or double pear-shaped. The *Fr.colchica* parasite was not found outside the erythrocytes. In addition, in smears prepared from the peripheral blood of the animal, the parasites inside the erythrocytes had one or two small nuclei. The process of nuclear division was not recorded by us.

Also, during the disease of francoisellosis, erythrocytes in the peripheral blood were less infected with the parasite than in the internal organs. When studies were conducted on the development of the *Fr.colchica* parasite in the peripheral blood of sick animals, a small amount was found in the peripheral blood, 30-40 per 100 visual fields. In the peripheral blood, *Fr.colchica* was located in the center of the erythrocytes, and the amount was 1-2, and in some cases up to 3-4.

Tables 3 and 4 show the parasite infection of erythrocytes in the internal organs of animals infected with Frenchiellosis and piroplasmosis, as well as the morphological structure of *P.bigeminum*

and *Fr.colchica* in the peripheral blood and internal organs of sick animals.

In the peripheral blood of animals infected with piroplasmosis and francaisella, the nuclei of arachids were one, rarely two. When *Fr.colchica* was located in pairs inside the erythrocyte, its specific shape resembled a goblet, united at the blunt end.

During the severe period of the disease, mainly round and oval shapes characteristic of *Francaiella* were observed in the blood, while pear-shaped (single and double) shapes were rarely found. Single pear-shaped ones – 1.8-3.6x0.7-2.1 μm; double pear-shaped ones – 1.6-3.2x0.5-1.8 μm; round ones – 0.9-2.7 μm; oval ones – 1.8-3.6x0.9-2.0 μm in size.

When examining the internal organs of sick animals (lungs, heart, kidneys, liver, spleen and brain), infection of erythrocytes with *Fr.colchica* was observed in 70-80% of the kidneys, 40-45% of the heart, 55-60% of the liver, 8-10% of the lungs, 1% of the brain, and up to 3-5% of the spleen, and with *P.bigeminum* in 50-60% of the heart, 55-60% of the brain, 12-16% of the lungs, 5% of the liver, 1-1.5% of the kidneys, and 1-3% of the spleen. The observed pear-shaped, oval and round parasites were found inside the erythrocytes, as well as outside the erythrocytes, while in peripheral blood smears, the parasites were found only inside the erythrocytes.

The localization of *Piroplasma* and *Francaiella* in the internal organs during blood-parasitic disease was different. The highest infection with *Piroplasma* was in the heart, brain and lungs, while infection with Fransaiella was predominant in the liver, kidneys and spleen.

The results of the examinations conducted show that the parasitemia in the internal organs of sick animals is not the same. It is higher in the kidneys, liver and heart than in other organs. The development of the parasite occurs mainly in the blood plasma, inside and outside the erythrocyte. In addition, the sizes of *Fr. colchica* in the internal organs of the animal are small when compared to the sizes in the peripheral blood of patients.

During our research, the morphological structure of parasites detected through the microscopy of smears prepared from the internal

organs of sick large cattle differed from the morphological structure of parasites found in peripheral blood. Thus, in the smears prepared from the internal organs, the parasites were smaller in size and mostly had round or oval shapes. It was found that most of the parasites were surrounded by a nucleus, while a smaller part was surrounded by protoplasm. In the blood of sick and recovered large cattle, most of the parasites had a single nucleus within the protoplasm, and parasites with two small nuclei were rarely observed.

In addition, the size of the *Fr. colchica* parasite in the internal organs of the animals was found to be smaller compared to its size in the peripheral blood of sick animals. It was determined that the division of the parasite took place in the internal organs, based on the examination of the internal organs of deceased animals. When examining smears prepared from the internal organs of large cattle of different ages that had died from or were forcibly slaughtered due to francaiellosis, the *Francaiella* parasites were observed in pear-shaped, oval, and round forms. In most cases, the *Francaiella* parasites, like *piroplasm*s, were found in the internal organs in oval or round shapes, while pear-shaped forms were detected only rarely.

The results of our studies show that the division of the parasite occurs in the internal organs of the animal. The division of the parasite was not detected in the peripheral blood, and only simple division of the parasites was observed in the animal body.

Table 4

Piroplasmids in peripheral blood and internal organs morphological differences

The originator development forms	Sizes of parasites in the peripheral blood of the animal (μm)		Size of the parasite in the internal organs of the animal (μm)	
	P. bigeminum	*Fr.colchica*	*P.bigeminum*	*Fr.colchica*
pear-shaped	4,6-6,2 x2,1-3,7	1,2-3,5x0,7-2,1	2,2-3,5x1,1-2,0	1,1-2,7x0,5-1,6
amoeboid	_____	_____	2,5-3,7x2,0-2,3	1,1-2,5x0,8-1,25
rounded	1,4-1,7 x3,8-4,1	0,7-0,8x2,5-2,8	1,3-1,5x3,2-3,6	0,74-1,2x1,2-1,3
Oval	_____	_____	1,1-4,5x1,5-2,1	0,8-2,3x0,5-1,1

CHAPTER VI. STUDY OF THE MORPHOLOGY AND DEVELOPMENT OF THE *FR. COLCHICA* PARASITE IN THE ORGANISM OF THE *B. CALCARATUS* TICKET

During the studies conducted on the morphology and development of the *Fr.colchica* pathogen in the eggs of the *B.calcaratus* tick, various forms of *Fransaiella* (pear-shaped, cigar-shaped, oval, schizont, amoeba-shaped, etc.) were determined in smears prepared from the eggs from the first day of the tick's egg laying until the larvae hatched. The forms of the identified parasites varied depending on the days of egg laying. In the first 3 days of egg laying and 6-7 days before the larvae hatched, the infection with *Fr.colchica* was 20-25%, and in the remaining days of incubation, 60-65%.

In the first days of egg laying, it was possible to observe 1-4 parasites in 150-200 fields of view of the microscope. However, on the 7th-15th day of the incubation period, 3-4 parasites were observed in each field of view of the microscope.The parasite was mainly cigar-shaped, and in some cases, oval and pear-shaped. Cigar-shaped forms were observed with a length of 2.1-4.6 μm and a width of 0.9-2.4 μm. In addition, the observation of the process of fragmentation (division) of the large nucleus located in the middle of the parasite in cigar-shaped forms indicated simple division of the parasite.On the 4th-5th day of egg laying, oval forms with a size of 2.7-2.9 μm were observed. As a result of the division process of the oval form, pear-shaped *Fransaiellas* with a size of 1.3-3.4x0.9-2.8 μm were observed.

In addition, on the 5th-7th day of egg laying, amoeba-shaped parasites with 3 or 4 nuclei were found. Amoeba-shaped forms were observed with a size of 5.2-5.6 μm. This also indicates that the parasite reproduces by budding.

In addition to the above-mentioned simple and budding, the development of *Fransaiella* by multiple division (schizont) was observed on the 7th-11th day of egg laying. Schizonts were found with 8-15 small nuclei, 7.8-8.6 μm in size. As a result of the division of schizonts, the formation of pear-shaped *Fransaiella*

was observed according to the number of nuclei. During the examination of the internal organs (salivary gland, ovary, intestine) of the *B. calcaratus* tick, the highest parasitemia was found in the salivary glands. During the examination of the salivary glands of the *B. calcaratus* tick, 204-243 parasites were found in every 100 fields of view of the microscope. 1-2, and in some cases 5-7 parasites were found in one field of view. In the salivary glands of the species *Fr.colchica*, 5-6-nucleated cigar-shaped, oval, pear-shaped forms and 9-16 small-nucleated schizonts were observed. Low parasitemia was detected in the ovary. In the intestines, the development of the species *Fr.colchica* was not detected by us.

Thus, while in eggs and imagoes the parasites were determined in cigar-shaped, pear-shaped, oval, amoebic, schizont forms, in larvae and nymphs the parasites were observed in only three forms (oval, cigar-shaped and pear-shaped) with 1 or 2 nuclei. During the studies, we did not observe the reproduction (division) of *Fr.colchica* in larvae and nymphs. The morphological characteristics and development form of *Fransaiella* studie by us in the organs of the *B.calcaratus* tick are shown in detail in Tables 5, 6, 7

Table 5
In larvae and nymphs of the tick *B.calcaratus* Morphological structure of *Fr.colchica* species

The larva nymph	Dimensions of *Fr.colchica* species (μm)				The amount of parasites in the field of view of 100 microns
	cigar-shaped	oval	pear-shaped	schizont	
The larva	1,6x2,8	1,2x1,6	0,7x1,2	_____	7-8
nymph	2,9x3,1	2,4x2,9	_____	_____	10-12

Table 6

Of *Fr.colchica* species in eggs of *B.calcaratus* tick morphology and infection rate

Dayswhenticklayeggs	Forms and dimensions of *Fr.colchica* species (μm) M+m, n=5					The num of parasites in100 fiew of micr
	pear-shaped	oval	cigar-shaped	schizont	amoeboid	
Day 1-3	2,32,8x1,4-2,1	1,6-2,1	2,1-3,2x0,9-1,3	____	____	1-4
Day 4-5	2,7-3,2x1,7-2,3	1,8-2,4	2,4-4,5x1,4-2,4	____	____	40-45
Day 6-7	2,5-3,4x1,8-2,6	2,1-2,9	2,2-4,6x1,8-2,1	7,8	5,2-5,3	60-65
Day 8-10	2,4-3,4x2-2,8	1,9-2,8	2,3-4,6x2,1-2,3	8,6	5,3-5,6	65-70
Day 11-15	1,3-1,5x0,9-1,2	1,6-2,2	2,4-4,7x2-2,4	____	5,3-5,4	5-7
Medium size	2,86 ± 0,13	2,18±0,05	4,32 ± 0,15	8,45±0,06	5,3 ± 0,003	__

Table 7

Morphological indicators of the pathogen *Fr. colchica* in the internal organs of the *B. calcaratus* tick

of the imago internal organs	Shape and dimensions of *Fr.colchica* species (μm)			
	pear-shaped	cigar-shaped	oval	amoeboid
	size	size	size	size
salivary gland	2,8-3,6x1,8-2,6	2,3-4,2x0,8-2,3	2,4-3,7	5,3x5,4
ovaries	_____	1,7-2,8x0,7-1,6	1,6-2,7	_____
intestines	2,3-2,8x1,4-2,1	2,2-3,1x1,2-1,7	_____	____

CHAPTER VII. DETERMINATION OF THE OPTIMAL DOSE OF THE ACTIVE SUBSTANCE (DIMINAZINE-ACETURATE) OF THE PREPARATIONS USED IN THE TREATMENT OF PIROPLASMOSIS AND FRANCIELLOSIS

The sections of the dissertation entitled 7.1. Therapeutic effect of the dosage of the preparations according to the instructions; 7.2. Optimal treatment determination of these preparations discuss the use of the preparations (Trypa-ject, Tryponil, Piroplasmin, Diminaze) used in the treatment of piroplasmosis and francaiellosis of large horned animals in the livestock farms of the researched regions in the southern region of Azerbaijan in the dosage according to the instructions (5 ml per 100 kg of live weight) and increased (7.5-10 ml per 100 kg of live weight) and the determination of the effective optimal treatment dose to increase the effectiveness of the treatment.

In order to increase the effectiveness of the treatment of francoisellosis and piroplasmosis, a number of research studies have been conducted in different countries. Individual researchers have proposed the use of diminazin-aceturate-imidocarb, diminazin-aceturate + phinazone, azidine + diminazin preparations in the indicated mixture for the treatment of francoisellosis and piroplasmosis.

Based on the results of studies conducted to improve the treatment of francoisellosis, M.T. Tursunov noted that increasing the dose of diminazine-aceturate-containing preparations up to three times does not cause complications among animals[10].

This result also allows us to continue research in the direction of determining a more effective effective dose against the parasite by increasing the existing treatment dose of the aforementioned preparation.

For this purpose, taking into account the weak effect of

[10] Турсунов, М.Т. Изыскание новых пироплазмоцидных препаратов // – Самарканд: Тр. Узбекского НИВИ – 1982. т.32, ч.1, - с.123 – 127.

the recommended dose of diminazin-aceturate in the treatment of diseases, 147 large horned animals were clinically examined in farms and private farms of the study regions in April-August 2012-2014, and high fever was detected in 81 of them. When blood smears prepared from these animals were microscopically examined, piroplasmosis was detected in 22 animals and francaiellosis in 59 animals.

In order to increase the effectiveness of the treatment, the dosage of the diminazin-aceturate-containing Tryponil and Piroplasmin preparations, which are widely used in the treatment of diseases, was increased by 1.5-2 times to 5.0-7.0 mg/kg, i.e. 7.5-10.0 ml per 100 kg. live weight, and the treatment gave high effectiveness. The condition of the sick animals improved within 24 hours after a single injection.

Since the causative agent of piroplasmosis is decomposed more quickly than the causative agent of fransaiellose, it is sufficient to increase the treatment dose of the active substance by 1.5 times.

In fransaiellose, while in the first 2 days of the disease it is sufficient to increase the dose of the drug by 1.5 times, in the acute period of the disease, increasing the dose of the drug by two times gave a positive result.

The procedure and results of studying the effectiveness of diminazine-aceturate, the active substance of the Piroplasmin, Trypa-ject, Tryponil, Diminaze preparations used in the treatment of franchiellose and piroplasmosis, at different doses (5 ml per 100 kg. live weight, 7.5 ml per 100 kg. live weight, 10 ml per 100 kg. live weight) are given in Table 8.

Examination of blood (ECS, hemoglobin, erythrocyte, leukocyte) and clinical examination of the animal (temperature, pulse, respiration) obtained from sick animals before treatment and after the recovery of physiological processes (within 20-30 days) are shown in tables 9, 10 and 11 It is given[11].

[11] Hacıyev, H. Klinik diaqnostika / H. Hacıyev. – Bakı: Maarif, – 1985. – 356 s.

Table 8

Treatment effectiveness of the active ingredient diminazine aceturate and farm application indicators

Type of diseases	Studying the effectiveness of Diminazine Aceturate, an active ingredient of Piroplasmin, Trypa-ject, Tryponil, Diminaze drugs, in different doses					
	To the instruction suitable dose	Treatment duration (day)	Sick Animals quantity (head)	Increased dose	Treatment duration (day)	Sick of animals quantity (head)
Piroplasmosis	5 ml (per 100 kg of live weight)	2 - 3 days	6	7.5 ml (per 100 kg of live weight)	1 day	22
Franciellosis	5 ml (per 100 kg live weight)	3 - 4 days	17	10 ml (per 100 kg of live weight)	1 day	59

Table 9

Large horn infected with blood parasites morphological indicators of animal blood

Blood morphological indicators (M+m, n=4)					
Before treatment in sick animals			After treatment (20-30 days during recovery of physiological processes)		
Erythrocyte number(x106)	Leukocyte number (x103)	Hemoglobin q/l	Erythrocyte number(x106)	Leukocyte number (x103)	Hemoglobin q/l
4.7	11.7	7.0	6.2	7.6	11.2
4.8	10.4	8.0	6,8	7.3	12.0
4.3	11.2	7.2	6,7	7.2	11.0
4.6	11.4	7.1	7.1	7.4	11.2
4.6 ± 0.01	11.175 ± 0.077	7.325 ± 0.052	6.7 ± 0.035	7.375 ± 0.007	11.125 ± 0.002

As shown in Table 9, morphological indicators of the blood of sick animals before treatment and after recovery (20-30 days of restoration of physiological processes) from four cattle infected with blood-parasitic disease were determined. The amount of hemoglobin

in the blood of sick animals decreased to 7.0 g/l, and in the blood of recovered animals it increased to 12.0 g/l, the amount of erythrocytes in sick animals was 4.3-4.8 million, and after the disease it increased to 6.8-7, 1 mln., the number of leukocytes in a sick animal was 10.4-11.7 thousand, after the disease it decreased to 7.2-7.6 thousand.

Table 10

Clinical features of cattle infected with blood parasites

Clinical indicators of animals					
Before treating sick animals			From the customer later (in 20-30 days)		
Temperature	Pulse count	The number of breaths	Temperature	Pulse count	The number of breaths
41.3	37	43	38.7	76	27
40.7	39	48	38.9	68	24
40.3	34	37	38.4	71	28
41.2	36	39	38.6	69	23
40.875 ± 0.0539	36.5 ± 1,975	41.75 ± 5.89	38.675 ± 0.007	71 ± 3.15	25.5 ± 1.4

Table 11

Amount of ECS in the blood of cattle infected with blood parasites (in mm) (M±m, n=4)

Before treating sick animals				From the customer then (physiological process recovery time 20-30 days)			
15 min.	30 min.	45 min.	60 min.	15 min.	30 min.	45 min.	60 min.
0.6	0.8	1,2	1.6	0.1	0.25	0.6	0.58
0.3	0.7	1,2	1.6	0.2	0.35	0.6	0.48
0.5	0.9	1.1	1.4	0.1	0.25	0.7	0.48
0.7	1.0	1,2	1.5	0.1	0.25	0.5	0.68
0.5±0.007	0.8±0.005	1.17±0.0006	1.5±0.0025	0.125 ± 0.0005	0.275 ± 0.0006	0.6±0.0015	0.55 = 0.0023

As can be seen from Table 10, the temperature of sick animals with Frenchiellosis and piroplasmosis rises to 40.7-41.30C, and in recovered animals, the temperature is normally 38.4-38.90C, the pulse in sick animals decreases to 34-38, and in healthy animals it increases to 68- 76, in sick animals breathing increases 37-48, and in healthy animals it is normal 23-28 has bee.

As can be seen from Table 11 with blood-parasite in the blood of infected cattle, the ECS increased to 1.4-1.6 mm in 60 minutes, and in the blood of animals recovered from the disease, the ECS was 0.48-0.68 mm in 60 minutes.

CHAPTER VIII. DISCUSSION OF THE ECONOMIC EFFICIENCY OF THE IMPROVED TREATMENT METHOD

Fransaiellosis is widespread among large horned animals in all regions of Azerbaijan and causes great economic damage to livestock. It causes disruption of physiological processes in sick animals, a 20-40% decrease in milk and a 15-25 kg. decrease in live weight of the animal. Studies have shown that the live weight of a head of cattle infected with francaiellosis decreases by an average of 16.5 kg (if the live weight of the cattle is 350 kg. on average) and the daily milk yield of the dairy animal decreases by 30%. Currently, only diminazine-aceturate-containing preparations are used in the treatment of francaiellosis in large horned animals, and previously these preparations were used once or twice in the corresponding sick animals. Now, despite being used 3-4 times, in some cases they do not give a positive result in animals. Considering this fact, in order to increase the effectiveness of the treatment, we have determined the optimal effective dose of diminazin-aceturate and reduced the treatment period. Thus, as a result of the 4-day treatment we proposed for fransaiellosis of large horned animals, the economic efficiency per head was 80.4 manat. Improving the 4-day treatment period for fransaiellosis of large horned animals and reducing it to 1 day resulted in an economic efficiency of 105.6 manat[12]. This is

[12] Hacıyev, Y.H. Helmintozlarda tətbiq işlərinin iqtisadi səmərəsinin hesablanması // – Bakı: Azərbaycan Aqrar Elm Jurnalı, – 2000. №1-2, s. 152-161

25.20 manat more than the economic efficiency we obtained during the 4-day treatment period.

Thus, the effectiveness of the treatment method proposed by us with parasitotropic preparations containing diminazin-aceturate (Trypa-ject, Tryponil, Piroplasmin, Diminaze) has been confirmed once again.

RESULTS

1.During parasitological studies conducted in the southern region of the republic, the epizootological situation of piroplasmosis (blood-parasitic diseases) of large horned animals, the spread and seasonal dynamics of ixodid ticks, which are the carriers of the pathogens, were studied [2, 10].

2. In the plain, foothill and mountainous zones of the southern region, in arid areas, theileriosis, and in humid and vegetated areas, fransaiellosis, piroplasmosis and anaplasmosis were detected among large horned animals [3, 8].

3. We determined that the infection of *B. calcaratus* ticks with *Fr. colchica* was low in the first 3-4 days of the egg-laying period (14-16 days) and higher in the 4-11th days [7].

4. We have detected three forms of reproduction of *Fr.colchica* in the adult stage and eggs of *B. calcaratus* (simple, budding and schizont), but not in larvae and nymphs [7, 10].

5. We have detected simple division (bifurcation) of the causative agent of *Fr.colchica* in the internal organs and peripheral blood of animals infected with frankiellosis. However, division of parasites was not found in the peripheral blood. [1, 4].

6. In the treatment of frankiellosis of large horned animals, a 4-day treatment with parasitotropic drugs at the recommended dose gave an economic benefit of 80.4 manat per head. [5].

7. In the treatment of piroplasmosis and fransaiellosis, the dose of diminazine-aceturate, which is the active ingredient of Trypa-ject, Tryponil, Piroplasmin, Diminaze preparations, was increased, ensuring complete recovery of the animal. Our improvement of the 4-day treatment period to 1 day resulted in an

economic benefit of 105.60 manat per head of cattle, which was 25.20 manat more than the benefit of the 4-day treatment perid [5].

PRACTICAL RECOMMENDATIONS

1. Taking into account the more intensive infection of animals with blood-parasitic diseases in the spring, it is recommended to periodically carry out measures to combat ixodid ticks in the spring.

2. In order to study the epizootological situation and ecological-epizootological characteristics of piroplasmidosis, it is recommended to conduct diagnostic examinations in ixodid ticks, along with large horned animals.

3. It is recommended to apply a new, improved, effective treatment method in the treatment of francoisellosis.

4. It is recommended to use an improved treatment method obtained by increasing the dose of the parasitotropically active diminazine-aceturate substance of the Trypa-ject, Tryponil, Piroplasmin preparations used in the treatment of fransaiellosis by 1.5-2 times.

5. In order to increase the treatment effectiveness of Trypa-ject, Tryponil, and Piroplasmin veterinary drugs against fransaiellosis, it is recommended to support the industrial-scale production of the parasitotropic active ingredient diminazine-aceturate by increasing it by 1.5-2 times.

List of scientific works published on the subject of the dissertation

1. Mirzəbəyov, K.D. İri buynuzlu heyvanların daxili orqanlarında piroplazmaların və fransaiellaların lokalizasiyası və onların təfriq idiaqnozu ./ K.D. Mirzəbəyov,Ü.M. Mehralıyeva, K.A.İbrahimova // – Bakı: Azərbaycan Zooloqlar Cəmiyyətinin əsərləri. – 2011. c. 3, –

s. 211-216.
2. Mehralıyeva, Ü.M. Azərbaycanın cənub zonasında *B.calcaratus*-un yayılması və onun keçirdiyi parazitlərin təfriqi // – Bakı: Aqrar Elm jurnalı, – 2013. №3,– s.129-131.
3. Мирзабеков, К.Д., Мехралиева, У.М. "Пироплазмидозная ситуация крупного рогатого скота в Азербайджане"// «Актуальные проблемы продовольственной безопасности (Экологическая, химическая и биологическая безопасность, качество и безопасность продукции АПК)», посвященную 100-летнему юбилею со дня рождения академика Гладенко И., НАНУ, «СТ-друк» – Харков: – 08 апрел, – 2015. №4 – с.172-174.
4. Mehralıyeva, Ü.M. İri buynuzlu heyvanların ölümündən sonra daxili orqanlarda *P.bigeminum* və *Fr.colchica*-nin təfriqi // – Bakı: Aqrar Elm jurnalı. – 2016. №1, – s. 107-109.
5. Mehralıyeva, Ü.M. İri buynuzlu heyvanların piroplazmoz və fransaiellozunun müalicəsinin təkmilləşdirilməsi //– Naxçıvan: AMEA Naxçıvan bölməsi Xəbərlər, Təbiət və texniki elmlər seriyası "Tusi" – 2017. c.13, № 4. – s. 209-212.
6. Mehralıyeva, Ü.M. Piroplazmoz vəfransaielloun müalicəsinin təkmilləşdirilməsi // – Bakı: Tövsiyə, Füyuzat, – 2017. – 7s.
7. Мехралыева, У.М. Изучение развития *Fr.colchica* в яйцах клещей *B.calcaratus* в природно климатических условиях Азербайджана // – Минск: Экология и животный мир. – 2018. №1, – с.32-35.
8. Mehralıyeva, Ü.M. "Respublikanın subtropik zonasında iri buynuzlu heyvanların qan-parazitar xəstəlikləri və onları keçirən gənələrin yayılması".// Baytarlıq Elminin inkişaf istiqamətində innovasiyaların tətbiqi, Beynəlxalq Elmi-Praktiki Konfrans Materialları – Bakı: "Müəllim"25-26 noyabr, – 2019. – s.244-248.
9. Мехралыева, У.М. Изучение биологических особенностей *Fransaiella colchica* в личинках, нимфах и

имаго *Boophylus calcaratus* в Азербайджане // – Нижневартовск: Бюллетень науки и практики. – 2022. т.8, №2 – с.81-85.

10. Мехралыева, У.М. Значение исследований иксодовых клещей в эпизоотологии крове паразитарных болезней// – Нижневартовск: Бюллетень науки и практики. – 2022. т.8, №3, – с.107-114.

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