



Epizootiological situation of brucellosis of cattle and small ruminants in the Almaty region of the Republic of Kazakhstan

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Abstract. Brucellosis poses a serious threat to livestock production, hindering herd expansion and reducing product quality. Effective control of the epizootic process requires timely diagnostics and early identification of brucella carriers. The aim of this work was epizootiological monitoring and analysis of the epizootiological situation of brucellosis in cattle and small ruminants in the Almaty region. Biological material samples (blood serum, whole blood, parenchymal organs, lymph nodes, aborted fetuses) were examined, and official veterinary reporting data from the Veterinary Control and Surveillance Committee of the Ministry of Agriculture of the Republic of Kazakhstan, the Republican Anti-Epizootic Unit, and the regional branch of the Republican Veterinary Laboratory for 2021-2023 were analysed. A total of 1,989 samples were collected and examined in the Almaty region: 867 cattle serum samples, 1,022 small ruminant serum samples, 30 cattle whole blood samples, 50 small ruminant whole blood samples, and 20 pathological material samples. Serological diagnostics revealed positive results in 16 cattle and 6 small ruminants. Bacterial culture growth from pathological material was not

Suggested Citation: Shakibayev, Ye., Kydyrova, G., Bojko, G., Orynbaeva, B., & Kadyrkulova, M. (2026). Epizootiological situation of brucellosis of cattle and small ruminants in the Almaty region of the Republic of Kazakhstan. *Bulletin of the Kyrgyz National Agrarian University*, 24(2), 19-29. doi: 10.63621/bknau./2.2026.19.

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established by bacteriological methods. Based on statistical data, the epizootiological situation of brucellosis for 2021-2023 was studied, districts with varying degrees of infection were identified, and an epizootiological map of infection distribution was compiled. A decrease in cattle morbidity was established during 2021-2023, despite an increase in livestock numbers from 238,751 to 780,417 animals, indicating the effectiveness of anti-epizootic measures. In small ruminants, morbidity increased from 0.03 to 0.08% during 2021-2022 with a more than 15-fold increase in livestock numbers; however, in 2022-2023, morbidity decreased, demonstrating positive results of the implemented measures

Keywords: monitoring; biological material; serology; bacteriology; incidence rate; contagiousness

Introduction

An important prerequisite for the growth and development of livestock farming, as well as for ensuring the country's population is supplied with food, is the reduction and complete eradication of infectious diseases in farm animals. One such disease, causing significant damage to the meat and dairy production sectors, is brucellosis. The eradication of brucellosis is of paramount importance from an epidemiological and epizootiological perspective, as infected animals serve as a source of infection for humans and other animals. The disease poses a serious problem, requiring substantial expenditure of labour and material resources on a range of veterinary-sanitary and organisational-economic measures. Alongside general preventive measures, specific prevention plays a significant role in the prevention and eradication of brucellosis. Brucellosis remains one of the most pressing zoonotic infections in Kazakhstan, due to the country's historically agrarian economy and extensive private livestock sector. Despite the veterinary and sanitary control measures being implemented, the situation in the country is characterised as consistently tense, according to the findings of A. Askarov *et al.* (2024). The difficulty in eradicating the disease is linked to the unique biological properties of the pathogen. M. Dadar *et al.* (2020) highlight in their work the high environmental adaptability of *Brucella*: its ability to parasitise intracellularly and survive for long periods in the external environment, which creates constant risks of spontaneous outbreaks even in relatively healthy herds.

The severity of the clinical manifestations of the infection and its impact on herd reproduction are analysed in detail in the works of A. Haif *et al.* (2021) and B. Wakjira *et al.* (2022). The authors demonstrated a direct correlation between the circulation of the pathogen and a critical decline in the productivity of the breeding stock due to mass abortions and subsequent infertility, which transforms the veterinary problem into a serious economic threat to the agro-industrial complex. The methodological approach proposed by A. Robaj *et al.* (2021) allows brucellosis to be viewed not as an isolated pathology, but as a systemic problem directly dependent on the accuracy of serological monitoring and the strictness of controls on livestock movement. These findings correlate with the situation in the

Republic of Kazakhstan, where the spatial distribution of the infection is largely determined by migration patterns in livestock farming.

It is necessary to implement the predictive modelling tools described in the works of M. Tito *et al.* (2023), which allow not merely to record cases of the disease, but to take preventive action on the most vulnerable links in the epizootic chain, preventing the spread of infection to disease-free farms and wildlife. Of particular significance in the context of brucellosis eradication are the findings of K. Franc *et al.* (2018), who characterise this disease as one of the most "forgotten" zoonotic infections in the developing world. The authors emphasise that the persistence of even a low level of infection in livestock creates a constant and hidden threat to human health, forming persistent foci capable of sudden outbreaks when environmental conditions or livestock density change. The aim of this study was to investigate the epizootic situation regarding cattle and small ruminants brucellosis in the Almaty region using official statistical data and the results of own laboratory studies.

Materials and Methods

Comprehensive research into the epizootic situation and the improvement of brucellosis diagnostics was carried out at the Brucellosis Laboratory of the Kazakh Scientific Research Veterinary Institute LLP between January and December 2024. The study focused on the epizootic situation regarding brucellosis in cattle and small ruminants on farms in the Almaty region of the Republic of Kazakhstan. Field visits were organised across the region in each district; samples were collected from varying numbers of rural districts, averaging between 2 and 4, depending on the epizootic situation regarding brucellosis. Districts were selected based on data from official veterinary reports for previous years, with priority given to areas with elevated incidence rates.

The following biomaterials were used for laboratory testing:

- Blood serum – for in vivo serological diagnosis and assessment of the immune response. The volume of material collected was 5-10 mL in vacuum tubes containing a coagulation activator, taken from the jugular vein or caudal vein. After serum separation, it was

transferred to 2-mL Eppendorf-type tubes, each tube was labelled with the animal's serial number in accordance with the attached inventory, and frozen in a freezer at -20°C.

- Whole blood – for bacteriological examination by culture on erythritol agar. A blood sample of 4-5 mL was collected, each tube was labelled with the animal's serial number in accordance with the attached inventory, and placed in a refrigerator at a temperature of +4...+6°C.

- Parenchymal organs – for direct detection of the pathogen and isolation of pure cultures by inoculation onto erythritol agar. Organs were collected at specialised slaughterhouses from suspect animals in quantities of 50-100 g into 125-mL plastic containers for collecting biomaterial, and were subsequently frozen in a freezer at -20°C. No aborted fetuses were found.

Ethical standards were observed during the collection of whole blood and serum samples (Directive 2010/63/EU, 2010): minimisation of stress in animals, humane treatment, minimal restraint, involvement of qualified specialists to avoid punctures and injuries, use of sterile needles and vacuum tubes, and the blood collection site was treated with 70% alcohol to prevent infection of the animal and contamination of the sample. A total of 1,989 samples were collected across the Almaty region: 867 cattle serum samples, 1,022 small ruminants serum samples, 30 cattle whole blood samples, 50 small ruminants whole blood samples and 20 samples of pathological material from suspected animals. The criteria for selecting animals for testing were clinical signs (abortions, orchitis, bursitis), seropositivity in previous tests, and belonging to farms with a history of brucellosis. All biological samples were placed in thermal cases with frozen refrigerant upon dispatch, sealed, accompanied by the following documents: a cover letter, a certificate of work performed, and a list of animals, and sent to the institute via a specialised parcel delivery service. The samples reached the institute within 1 to 3 hours. Biological samples were collected in strict compliance with biosafety measures, using disposable gloves, masks, protective coveralls and safety goggles. After collection, the gloves, masks, coveralls and gowns were destroyed by incineration at specialised facilities.

To analyse the patterns of infection spread, an epizootiological method was applied, including field surveys of farms. A key feature of the work was the introduction of GIS technologies: the use of geographical coordinates of outbreak sites enabled electronic mapping and the identification of spatial clustering of the infection, which is necessary for forecasting epizootic risks in the region. Mapping was carried out using QGIS software version 3.28.

Serological diagnostic methods. In vivo diagnosis was carried out in accordance with GOST 34105-2017 (2017). The investigations were conducted according to a hierarchical scheme:

- screening: use of the Rose Bengal test (RBT) for rapid identification of positive individuals;

- titration and confirmation: use of the agglutination reaction (AR) and highly specific complement fixation reactions (CFR) and prolonged complement fixation reaction (PCFR).

For serological testing, antigen, haemolysin and Rose Bengal produced in-house by the Kazakh Scientific Research Veterinary Institute LLP were used, along with complement produced by the Antigen Scientific and Production Enterprise LLP. All diagnostic reagents had valid certificates of conformity and were within their expiry dates. To isolate the "gold standard" for diagnosis – a pure culture of *Brucella* bacteria – a set of methods was used in accordance with GOST 33675-2015 (2016). Biological material (whole blood, parenchymal organs) was inoculated onto specialised culture media: meat peptone broth (MPB), meat peptone agar (MPA) and erythritol agar, with the addition of selective antibiotics (polymyxin, bacitracin). Given the slow growth of the pathogen, cultures were incubated for 30 days at 37°C. When examining material from cattle, it was essential to create microaerophilic conditions with a CO₂ concentration of 5-10%.

For primary identification, the Kozlovsky and Stamp staining methods were used, which allow *Brucella* to be differentiated based on their ability to retain specific dyes (safranin, carbol fuchsin). The species of the isolated strains was determined by a combination of characteristics: the intensity of hydrogen sulphide (H₂S) production, the ability to grow on media containing aniline dyes (thionin and basic fuchsin), and sensitivity to specific bacteriophages (phage "Tb").

In cases involving material with heavy bacterial contamination or a low pathogen concentration, a bioassay was performed on guinea pigs by subcutaneous inoculation with a bacterial suspension taken from the MPB or erythritol agar of the test material. Female guinea pigs weighing 350-400 g were used for the bioassay. The results were evaluated after 15-30 days based on serological data and the results of post-mortem examination, with mandatory re-isolation of the culture from the lymph nodes and parenchymal organs of the animals.

The research also drew on official veterinary reporting data, which reflect serological tests carried out on farm animals for the diagnosis of particularly dangerous diseases during the period 2021-2023: data from the Ministry of Agriculture of the Republic of Kazakhstan, the Republican Anti-Epizootic Unit, and the regional branch of the Republican Veterinary Laboratory, which serves as a national-level surveillance and diagnostic centre. The data were provided in response to an official request from the Committee for Veterinary Control and Supervision. The prevalence of infection was expressed as a percentage and calculated using the formula: $P = (n / N) \times 100$, where P is the prevalence of infection (prevalence) in %; n is the number of animals that tested positive; N is the

total number of animals tested in the herd or region. Statistical analysis of the results was performed using Microsoft Excel 2019 and included the calculation of means, standard deviations and confidence intervals ($p < 0.05$).

Results and Discussion

During the study, a comprehensive assessment of the epizootiological situation regarding brucellosis in the

Almaty region was carried out based on serological and bacteriological diagnostic methods, as well as a retrospective analysis of official statistical data for the period 2021-2023. The results obtained made it possible to identify areas with varying degrees of epizootic risk and to assess the effectiveness of the anti-epizootic measures being implemented. The results of the serological and bacteriological studies are presented in Table 1.

Table 1. Results of serological and bacteriological tests on samples from cattle and small ruminants for brucellosis in the Almaty region for 2024

District	Rural district	Number of blood serum samples		Number of whole blood samples		Positive blood serum reactions detected		Positive whole blood reactions detected	
		Cattle	Small ruminants	Cattle	Small ruminants	Cattle	Small ruminants	Cattle	Small ruminants
Karasai	Shamalgan	50	100	5	10	0	0	0	0
Ili	Mezhdurechensk	50	50	5	5	0	0	0	0
	Ashibulak	50	100	5	10	0	0	0	0
	Zhetigen	50	100	5	10	6	0	0	0
	Karaoy	50	100	5	10	0	0	0	0
Raimbek	Saryzhaz	248	100	0	0	0	0	0	0
	Tekes	163	379	0	0	0	0	0	0
	Kainar	156	43	0	0	0	6	0	0
Almaty	Turksib	0	50	0	5	0	0	0	0
	Naurzbyay	50	0	5	0	10	0	0	0
Total		867	1,022	30	50	16	6	0	0

Source: compiled by the authors

During diagnostic testing in 2024, 867 cattle serum samples and 1,022 small ruminant serum samples, 30 cattle whole blood samples, 50 samples of small ruminant blood serum and 20 samples of pathological material from cattle from suspected animals, which made a total of 1,989 samples. Positive results of serological diagnosis of blood serum were detected in 16 animals of cattle and 6 animals of small ruminants. During bacteriological examinations of pathological material, no growth of cultures was observed. An analysis of the distribution of animals testing positive across the region's districts showed that the highest number of seropositive cattle was recorded in the Ili district (Zhetigen rural district) – 6 cases, accounting for 12% of the total number of samples taken in that settlement, and in the Naurzbyay district of Almaty – 10 cases (20% prevalence). Positive results for brucellosis were detected in the Raimbek district (Kainar rural district) – 6 cases, corresponding to a 13.9% prevalence rate. Based on the data obtained, these districts and their rural districts can be classified as areas with a high prevalence rate.

The phenomenon of “seropositivity with culture negativity” observed in this study warrants separate discussion. J. Papaparaskevas *et al.* (2023) emphasise that circulating strains in specific regions may have unique metabolic requirements that are not accounted for by standard culture media, leading to false-negative results in bacterial culture despite the presence of antibodies in the blood serum. J. Aliyev *et al.* (2022)

attribute this in their studies to the adaptation of microorganisms to the environment and antibiotic therapy, which renders them uncultivable. In the context of high antibody titres detected in the Ili and Naurzbyay districts (12-20%), K. Tursunov *et al.* (2017) highlight the critical importance of verification via PCR and sequencing for areas with high incidence rates. Molecular methods allow not only the detection of pathogen DNA fragments when the live cell is not growing, but also the typing of strains to determine their origin, as well as the development of more accurate test systems specific to a particular region.

The results of serological studies for brucellosis of cattle and small ruminant serum samples, provided by the Committee for Veterinary Control and Supervision based on veterinary reports from the Almaty branch of the Republican Veterinary Laboratory for 2021-2023, are presented in Table 2. The data presented show that the highest incidence rate for cattle was recorded in the Ili district, whilst the infection rate for small ruminants remains low and is showing a downward trend. Overall, there has been a decline in the incidence rate among both cattle and small ruminant populations; however, the risk of infection remains, which allows the Ili district to be classified as an area with a high incidence of brucellosis. In the Enbekshikazakh district, the infection rate among cattle reached a record 0.44% in 2021, falling to 0.08% in 2022 despite an eightfold increase in the livestock population, which is an indicator of the

veterinary service's effective work. However, in 2023, the rate rose again to 0.13%, which means this district can be classified as an area with a high incidence of livestock disease, as the infection rate exceeds the regional average.

Table 2. Trends in the incidence of brucellosis in cattle and small ruminants in the districts of Almaty region between 2021 and 2023

District	Cattle blood serum samples	Positive results	Infection rate	Small ruminants serum samples	Positive results	Percentage of infection
2021						
Ili	31,354	145	0.46	97,887	25	0.03
Balkhash	10,000	0	0	12,700	0	0
Enbekshikazakh	16,930	75	0.44	11,214	8	0.07
Zhambyl	19,190	6	0.03	25,076	0	0
Karasai	3,569	0	0	5,055	0	0
Kegen	7,776	5	0.06	2,125	0	0
Raimbek	150,000	26	0.02	0	0	0
Talgar	4,962	2	0.04	3,579	0	0
Uyghur	8,800	3	0.03	0	0	0
Almaty	3,100	4	0.13	1,935	4	0.2
Total	238,751	191	Mean 0.12	148,357	29	Mean 0.03
2022						
Ili	29,300	120	0.41	105,000	8	0.01
Balkhash	122,000	6	0.005	147,500	39	0.03
Enbekshikazakh	131,116	100	0.08	284,073	253	0.09
Zhambyl	163,366	11	0.007	925,907	3	0.0003
Karasai	33,177	0	0	55,745	0	0
Kegen	61,000	22	0.04	174,500	14	0.01
Raimbek	70,000	39	0.06	245,000	0	0
Talgar	37,632	23	0.06	70,165	62	0.09
Uyghur	105,200	3	0.003	260,600	9	0.003
Almaty	7,015	11	0.16	64,012	388	0.61
Total	759,806	335	Mean 0.08	2,332,502	766	Mean 0.08
2023						
Ili	26,995	38	0.14	106,110	1	0.001
Balkhash	120,225	10	0.01	145,014	28	0.02
Enbekshikazakh	128,902	162	0.13	297,321	79	0.03
Zhambyl	183,433	26	0.01	151,020	10	0.01
Karasai	32,500	3	0.01	58,601	4	0.01
Kegen	60,618	7	0.01	165,100	7	0.004
Raimbek	75,000	23	0.03	350,000	6	0.002
Talgar	35,608	16	0.04	74,081	6	0.01
Uyghur	106,000	1	0.001	260,000	14	0.01
Almaty	11,136	10	0.09	51,700	14	0.03
Total	780,417	296	Mean 0.05	1,658,947	169	Mean 0.01

Source: compiled by the authors

The incidence rate of cattle brucellosis in Almaty over the three-year observation period exceeds the average incidence rate and stands at 0.12%. In 2022, the percentage of infected livestock increased slightly compared to 2021; however, a significant decrease in infection rates was observed in 2023. Thus, Almaty can be classified as an area with a high incidence of brucellosis, as the annual figures exceed the regional average incidence rate. For small ruminants, the incidence rate for 2022-2023 also exceeded the average, allowing this region to be classified as an area with a high incidence of the disease. In the Raimbek district, during the authors' own research in 2024, six animals of small ruminants were identified as testing positive for

brucellosis. According to statistical data, the incidence rate for 2021-2023 remains low, which is likely due to sporadic cases of the disease in livestock.

A. Dahmani *et al.* (2022) emphasise in their research that traditional control measures are often insufficiently effective without taking into account the spatio-temporal dynamics and density of contact between different animal species sharing common water and feed resources. The status of the Ili and Enbekshikazakh districts as high-risk areas may be due to several factors. Firstly, cross-border and migratory flows associated with high livestock movement density near the Almaty metropolitan area. Secondly, the natural and climatic conditions, the specific characteristics

of the pastures, and the presence of natural reservoirs of infection in these districts. Y. Hegazy *et al.* (2022) identify the uncontrolled movement of animals as a key factor in the instability of the epizootic situation in developing agricultural regions. Cross-border transmission is due to the fact that the Almaty region borders Kyrgyzstan and China, creating corridors for the circulation of strains different from local ones. The migration of small ruminant herds under traditional transhumance practices contributes to the “mixing” of the infectious background of different farms at watering points and along migration routes. H. Brangsch *et al.* (2023) highlight the problem of “reservoir species”. On farms where small and large ruminants are kept together or use shared pastures, an interspecies transmission effect occurs, during which the pathogen adapts. Some infections can circulate between species, with one species acting as an asymptomatic carrier,

constantly fuelling the infection focus in the other. Mixed farms are statistically more difficult to completely sanitise, as they require simultaneous and strict control of all links in the biological chain.

The results of tests on livestock for cattle and small ruminants’ brucellosis in the Almaty region for the period 2021-2023 are presented in Table 3. For cattle, the Ili district is by far the worst-affected, where the infection rate (1.01%) is four times higher than the regional average. An alarming situation is also observed in the Enbekshikazakh district (0.65%). These areas require enhanced veterinary surveillance. For small ruminants, a sudden surge has been recorded in the city of Almaty, where, despite a relatively small herd size, 406 positive cases (0.83%) were detected, which is six times higher than the regional average. This may indicate specific husbandry conditions or control issues regarding the import of livestock into the city limits.

Table 3. Summary data on the total number of animals tested and confirmed cases of brucellosis among cattle and small ruminants in the Almaty region for the period 2021-2023

District	Cattle	Positive	Infection rate	Small ruminants	Positive	Infection rate
Ili	87,649	303	1.01	308,997	34	0.04
Balkhash	252,225	16	0.013	305,214	67	0.05
Enbekshikazakh	276,948	337	0.65	592,608	340	0.19
Zhambyl	365,989	43	0.047	1,102,003	13	0.010
Karasai	69,246	3	0.01	119,401	4	0.01
Kegen	129,394	34	0.11	341,725	21	0.01
Raimbek	295,000	88	0.1	595,000	6	0.002
Talgar	78,202	41	0.14	147,825	68	0.1
Uyghur	220,000	7	0.034	520,600	23	0.013
Almaty	21,251	25	0.37	117,647	406	0.83
Total	1,795,904	897	Mean 0.25	4,151,020	982	Mean 0.13

Source: compiled by the authors

The trend in the incidence rate for cattle and small ruminants is shown in Figure 1. During the period 2021-2023, a steady decline in the incidence rate of brucellosis was observed in cattle, particularly given that the livestock population tripled between 2021 and 2022, which demonstrates the effectiveness of the anti-epizootic measures implemented. For small ruminants, an increase in the incidence rate from 0.03% to

0.08% was observed between 2021 and 2022, alongside a simultaneous increase in the livestock population from 148,357 to 2,332,502 animals. However, between 2022 and 2023, the livestock population decreased to 1,658,947 animals, and the incidence rate fell from 0.08% to 0.01%, indicating a decline in animal disease incidence and the positive impact of anti-epizootic safety measures.

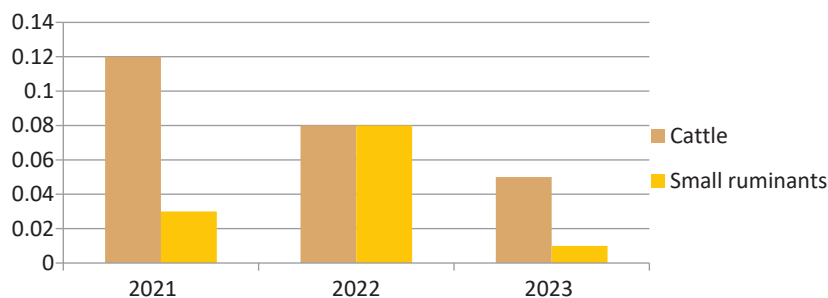


Figure 1. Incidence rate of brucellosis in cattle and small ruminants in the Almaty region between 2021 and 2023

Source: compiled by the authors

A. Taipova *et al.* (2023) note the high effectiveness of current veterinary measures in Kazakhstan, despite the country's overall status as an endemic zone for brucellosis. An analysis of the epizootic situation in the Almaty region for 2021-2023 revealed a steady downward trend in the incidence of brucellosis among cattle, which correlates with the data from these researchers. The achieved level of cattle infection (0.05%) places the region in a more favourable position compared to neighbouring territories. W. Liu *et al.* (2025) indicate that in the border regions of Russia and Kyrgyzstan, rates vary from 0.5 to 1.0%. Such a low prevalence in the Almaty region (below the 1% threshold) allows, in accordance with the recommendations of the WOA (2023), a shift from a containment strategy to the strict "test-and-cull" approach, which has proven effective in eradicating the infection in EU countries and Australia. However, the presence of high-risk zones (Ili district) and areas with a medium risk level (Enbekshikazakh district, Almaty city) indicates the persistence of natural foci. B. Ntirandekura *et al.* (2021), as well as A. Abutalip *et al.* (2024), note that environmental factors – in particular, the use of leased pastures and the presence of wetlands – significantly increase the survival of *Brucella abortus*. Cross-border migration and the illegal movement of livestock remain critical risk factors, bringing the situation in Central Asia into line with the problems faced in the Middle East and Africa, as indicated by W. Oyetola *et al.* (2021).

Based on a retrospective analysis of statistical data, this study notes a sustained positive trend in the control of brucellosis among cattle. From 2021 to 2023, the incidence rate in cattle has shown a steady decline, indicating the effectiveness of the veterinary and preventive measures being implemented and the high-quality coverage of the herd by serological testing. In the small ruminant sector, the situation is characterised by volatility: slight fluctuations in incidence are observed, driven by sharp changes in herd numbers (increases and decreases by a factor of ten in different periods). Nevertheless, when calculating relative indicators, the infection rate in recent years has shown a downward trend, which confirms the effectiveness of the region's veterinary service. Based on the results of diagnostic studies for 2024, the districts of the region were categorised according to their level of epizootic safety. The Ili district has been classified as the most high-risk and requires enhanced monitoring and updated quarantine measures. The Enbekshikazakh district and the city of Almaty are classified as medium-risk areas, where a moderate level of detection of animals testing positive persists. The Balkhash, Zhambyl, Karasai, Kegen, Talgar and Uyghur districts are classified as conditionally safe areas, where the infection rate varies within minimal limits (0.001-0.02%), allowing these administrative units to be considered areas with a low epidemiological threshold. Based on

a comprehensive analysis of the epizootic chain (wild animals – livestock – external environment) and an assessment of the current situation in the Almaty region, it has been established that the process is characterised by a marked decline. The decrease in cattle disease incidence against a backdrop of growing livestock numbers confirms the effectiveness of current veterinary control measures. However, fluctuations in brucellosis cases require enhanced surveillance of animal movements. A. Daugalieva & S. Daugalieva (2025) note that the genetic stability of the isolates detected indicates the presence of persistent foci, making the control of animal movement routes a priority.

The analysis conducted allowed for the differentiation of districts according to their level of epizootic risk. Whilst most of the region has achieved the status of conditionally safe areas with a minimal level of infection, the Ili district remains a zone of priority veterinary surveillance. This area requires targeted health improvement measures and enhanced laboratory screening. The region is in the final stage of brucellosis eradication. The main barrier to achieving infection-free status remains the cross-border movement of animals and contact between livestock and wildlife on cross-border pastures. In this regard, the introduction of digital traceability systems and the tightening of administrative controls over all livestock movements within and beyond the region appear to be of critical importance.

Conclusions

An analysis of the epizootic situation regarding brucellosis in the Almaty region for the period 2021-2024 indicates that there is a steady downward trend in the incidence rate among cattle in the region, which had reached 0.05% by 2024. Despite a significant increase in livestock numbers and minor fluctuations in the incidence rate among small ruminants, the overall trend is assessed as positive. The figures achieved demonstrate the high effectiveness of the veterinary and preventive measures being implemented and bring the region closer to the international threshold for the complete eradication of the infection (below 0.1% according to WOA criteria). Variations in the epizootic status of districts have been identified. The Ili district has been identified as the most high-risk area, requiring enhanced veterinary surveillance. The Enbekshikazakh district and the city of Almaty have been classified as medium-risk zones. At the same time, the Balkhash, Zhambyl, Karasai, Kegen, Talgar and Uyghur districts demonstrate a minimal level of infection (0.001-0.02%), which allows them to be classified as conditionally favourable territories. Brucellosis in the region remains a naturally occurring focal infection, with domestic, wild and carnivorous animals involved in the epizootic chain. The key factors contributing to the persistence of *Brucella abortus* in the environment are the presence

of wetlands, the use of communal pastures and uncontrolled migration flows.

To definitively control the infection, it is necessary to shift from a passive control strategy to comprehensive epizootic monitoring, employing a strict “test-and-cull” strategy in areas with low prevalence, timely diagnosis in cases of mass disease (abortions, mastitis) and the elimination of all links in the chain of transmission by breaking contact between livestock and wildlife. The implementation of these measures will minimise economic damage to the agricultural sector and significantly reduce epidemiological pressure among the region’s population. Prospects for further research include the introduction of molecular genetic diagnostic methods (PCR, sequencing) to identify circulating *Brucella* strains and establish their phylogeographic origin, which will enable the development of region-specific test systems with increased sensitivity. In-depth epizootiological studies are required to investigate the role of wild animals as potential reservoirs of infection in natural foci in the Almaty region. A key priority is the development

and validation of mathematical models for predicting epizootic risks using GIS technologies and big data analysis, which will facilitate a shift towards a preventive strategy for brucellosis control. Furthermore, an assessment of the cost-effectiveness of various strategies for the rehabilitation of affected areas is required in order to optimise the allocation of the region’s veterinary service resources.

Acknowledgements

The authors would like to express their gratitude to the management of the Limited Liability Company “Kazakh Scientific Research Veterinary Institute” for providing the opportunity to carry out this research, as well as to the staff of the Brucellosis Laboratory for their assistance in conducting the studies.

Funding

None.

Conflict of Interest

None.

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Казакстан республикасынын Алматы облусундагы ИММ жана МММ бруцеллезу боюнча эпизоотологиялык кырдаал

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Аннотация. Бруцеллез инфекциясы мал чарбасы үчүн олуттуу коркунуч түзүп, малдын санын көбөйтүүгө тоскоолдук жаратат жана продукциянын сапатын төмөндөтөт. Эпизоотиялык процессти эффективдүү көзөмөлдөө өз убагында диагностиканы жана бруцелла ташуучуларын эрте аныктоону талап кылат. Иштин максаты Алматы облусундагы ири мүйүздүү малдын (ИММ) жана майда мүйүздүү малдын (МММ) бруцеллезине байланыштуу эпизоотиялык мониторинг жана анализ болуп саналган. Биологиялык материалдын сынамыктары (кандын сары суусу, бүт кан, паренхиматоздук органдар, лимфа түйүндөрү, бойдон алдырылган жемиштер) изилденген, ошондой эле ҚР АЧМ-нын ветеринардык контролдоо жана көзөмөлдөө комитетинин, Республикалык анти-эпизоотикалык отряддын жана Республикалык ветеринардык лабораториянын облустук филиалынын 2021-2023-жылдар боюнча расмий ветеринардык отчеттук маалыматтары талданган. Алматы облусунда 1989 үлгү алынып изилденген: 867 ИММ сары суусу, 1022 МММ сары суусу, 30 ИММ бүт каны, 50 МММ бүт каны жана 20 патологиялык материал үлгүлөрү. Серологиялык диагностика 16 баш ИММ жана 6 баш МММ боюнча оң жыйынтыктарды аныктаган. Бактериологиялык ыкма менен патологиялык материалдан өсүү аныкталган жок. Статистикалык маалыматтардын негизинде 2021-2023-жылдар аралыгында бруцеллез боюнча эпизоотиялык абал изилденип, ар кандай жуккан деңгээлдеги аймактар аныкталып, инфекциянын жайылуусунун эпизоотиялык картасы түзүлгөн. 2021-2023-жылдар аралыгында ИММ боюнча оорулуулук деңгээлинин төмөндөгөнү аныкталды, малдын саны 238 751 баштан 780 417 башка көбөйгөнүнө карабастан, бул эпизоотияга каршы иш-чаралардын натыйжалуулугун көрсөткөн. МММ боюнча 2021-2022-жылдары оорулуулук 0,03төн 0,08 %га чейин жогорулаган, малдын саны 15 эсеге көбөйгөн, бирок 2022-2023-жылдары оорулуулук төмөндөп, жүргүзүлгөн чаралардын оң жыйынтыктарын көрсөткөн

Негизги сөздөр: мониторинг; биологиялык материал; серология; бактериология; оорунун пайызы; контагиозность

Эпизоотологическая ситуация по бруцеллезу КРС и МРС в Алматинской области Республики Казахстан

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Аннотация. Бруцеллез представляет серьезную угрозу для животноводства, препятствуя увеличению поголовья скота и снижая качество продукции. Эффективный контроль эпизоотического процесса требует своевременной диагностики и раннего выявления бруцеллоносителей. Целью работы являлись эпизоотологический мониторинг и анализ эпизоотологической ситуации по бруцеллезу крупного рогатого скота (КРС) и мелкого рогатого скота (МРС) на территории Алматинской области. Исследовались пробы биологического материала (сыворотка крови, цельная кровь, паренхиматозные органы, лимфатические узлы, абортрованные плоды), а также анализировались официальные данные ветеринарной отчетности Комитета ветеринарного контроля и надзора Министерства сельского хозяйства Республики Казахстан, Республиканского противоэпизоотического отряда и областного филиала Республиканской ветеринарной лаборатории за 2021-2023 годы. В Алматинской области было отобрано и исследовано 1989 проб: 867 проб сыворотки крови КРС, 1022 пробы сыворотки МРС, 30 проб цельной крови КРС, 50 проб цельной крови МРС и 20 проб патологического материала. Серологическая диагностика выявила положительные результаты у 16 голов КРС и 6 голов МРС. Бактериологическим методом рост культур из патологического материала не был установлен. На основе статистических данных была изучена эпизоотологическая ситуация по бруцеллезу за период 2021-2023 годов, определены районы с различной степенью зараженности и составлена эпизоотологическая карта распространения инфекции. Установлено снижение заболеваемости КРС в период 2021-2023 годов, несмотря на увеличение поголовья с 238 751 до 780 417 голов, что свидетельствует об эффективности противоэпизоотических мероприятий. По МРС отмечено повышение заболеваемости с 0,03 до 0,08 % в период 2021-2022 годов при росте поголовья более чем в 15 раз, однако в 2022-2023 годах заболеваемость снизилась, демонстрируя положительные результаты проводимых мер

Ключевые слова: мониторинг; биологический материал; серология; бактериология; заболеваемость; контагиозность