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**THE CURRENT SITUATION OF BOVINE TUBERCULOSIS IN THE REGIONS OF
THE REPUBLIC OF KAZAKHSTAN**

Abstract. According to the World Organisation for Animal Health, tuberculosis remains a significant zoonanthropotic challenge globally, including within the Republic of Kazakhstan. Despite systematic preventive and eradication measures, the causative agent is periodically detected in cattle. The infection frequently manifests in a latent form without characteristic clinical signs, which substantially complicates timely diagnostic detection. Current statistical data indicates that the intradermal tuberculin test identifies approximately 79.3% of infected animals; however, a probability remains that up to 20.7% of infected individuals may persist within a herd. These inherent diagnostic limitations hinder an objective assessment of the epizootic situation at the level of regions, districts, and rural settlements. Consequently, a comprehensive study was conducted to analyze the epizootic and epidemiological dynamics of tuberculosis across the various regions of Kazakhstan.

An analysis of official veterinary statistics from the Committee for Veterinary Control and Supervision for the 2021–2023 period revealed that bovine tuberculosis was officially registered in two specific regions: Akmola and Karaganda. Conversely, data from the National Center for Public Health indicates that human tuberculosis is reported in all regions of the country. A notable increase in human incidence was recorded in North Kazakhstan (16.1%), Almaty (10.8%), Zhetysu (9.6%), and the city of Astana (2.4%). Thus, the epidemiological

situation remains relatively tense, even though many regions are officially considered free from bovine tuberculosis. Occasional control slaughter of tuberculin-positive animals does not fully guarantee the elimination of the pathogen from a herd. It is probable that the causative agent persists in certain territories. Under such circumstances, ensuring the complete detection of infected animals requires considering the state of anergy and conducting additional diagnostic investigations to clarify the nature of these reactions.

Keywords. Epizootiology, monitoring, tuberculosis, diagnostics, bacteriology, mycobacteria.

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**ҚАЗАҚСТАН РЕСПУБЛИКАСЫНЫҢ ОБЛЫСТАРЫНДАҒЫ ІРІ ҚАРА МАЛ
ТУБЕРКУЛЕЗІ БОЙЫНША АҒЫМДАҒЫ ЖАҒДАЙ**

Аңдатпа. Дүниежүзілік жануарлар денсаулығын сақтау ұйымының деректері бойынша туберкулез зооантропоноздық ауру ретінде әлемнің көптеген елдері үшін, оның ішінде Қазақстан Республикасы үшін де өзекті мәселе болып табылады. Туберкулездің қоздырғышы профилактикалық және сауықтыру шараларын жүргізуге қарамастан, ірі қара мал организмнен анда-санда бөлінеді. Ауру көбінесе жасырын түрде жүреді, көп жағдайда аурудың тән клиникалық белгілері болмайды, бұл оны уақтылы анықтауды қиындатады. Тері ішілік туберкулин сынамасы ауру жануарлардың 79,3% - ы анықтайды, ал туберкулезбен ауыратын жануарлардың 20,7% - ы (дейін) табында қалуы мүмкін. Ауруды диагностикалаудағы барлық осы қиындықтар

туберкулез бойынша облыстың, ауданның, ауылдық округтің эпизоотиялық жай-күйін объективті бағалауға мүмкіндік бермейді. Осыған байланысты біз Қазақстан Республикасының өңірлерінде туберкулез бойынша эпизоотиялық және эпидемиологиялық жағдайды зерделедік.

ҚР АШМ Ветеринариялық бақылау және қадағалау комитетінің 2021-2023 жылдары туберкулезбен сырқаттанушылық жөніндегі ресми ветеринариялық Статистика материалына жүргізілген талдау ірі қара мал арасында бұл инфекция республиканың екі облысында: Ақмола және Қарағанды облыстарында тіркелгенін көрсетті. Осыған қарамастан, ҚР ДСМ Ұлттық Қоғамдық денсаулық сақтау орталығының мәліметтері бойынша адамдардың туберкулезбен ауыруы еліміздің барлық облыстарында байқалады. Әсіресе, адамдар арасында туберкулезбен сырқаттанушылықтың артуы Солтүстік Қазақстан облысында – 16,1%-ға, Алматы облысында – 10,8%-ға, Жетісу облысында – 9,6%-ға және Астана қаласында – 2,4%-ға байқалады. Көріп отырғанымыздай, республикадағы эпидемиологиялық жағдай әлі де шиеленісті болып тұр, дегенменмен ресми түрде көптеген өңірлер ірі қара мал туберкулезі бойынша қолайлы болып табылады. Шаруа қожалықтарында жүзеге асырылатын туберкулинге оң жауап беретін жануарларды союдың жекелеген бақылаулары мал туберкулезімен ауыратындардың кейбірінің табында қалуына әрдайым кепілдік бермейді. Сірә, қоздырғыш кейбір аумақтарда әлі де сақталады. Мұндай жағдайда ауру жануарларды толық анықтау үшін анергия күйін ескеру керек және бұл реакциялардың табиғатын нақтылау үшін қосымша зерттеулер жүргізу өте маңызды.

Кілт сөздер. Эпизоотология, мониторинг, туберкулез, диагностика, бактериология, микобактериялар.

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ТЕКУЩАЯ СИТУАЦИЯ ПО ТУБЕРКУЛЕЗУ КРУПНОГО РОГАТОГО СКОТА В ОБЛАСТЯХ РЕСПУБЛИКИ КАЗАХСТАН

Аннотация. По данным Всемирной организации охраны здоровья животных туберкулез как зооантропонозное заболевание является проблемой для многих стран мира, в том числе и для Республики Казахстан. Возбудитель туберкулеза спорадически выделяется у крупного рогатого скота, несмотря на проведение профилактических и оздоровительных мероприятий. Болезнь протекает нередко в латентной форме с отсутствием в большинстве случаев характерных клинических признаков болезни, что затрудняет его своевременное выявление. Внутрикожная туберкулиновая проба выявляет 79,3% больных животных, при этом есть вероятность, что до 20,7% больных туберкулезом животных могут оставаться в стаде. Все эти сложности с диагностикой болезни не дают объективно оценивать эпизоотическое состояние области, района, сельского округа по туберкулезу. В этой связи нами проведено изучение эпизоотической и эпидемиологической ситуации по туберкулезу в регионах Республики Казахстан.

Проведенный анализ материала официальной ветеринарной статистики Комитета ветеринарного контроля и надзора МСХ РК по заболеваемости туберкулезом за 2021-2023 годы показал, что данная инфекция среди крупного рогатого скота зарегистрирована в двух областях республики: Акмолинской и Карагандинской. Тем не менее, по данным Национального центра общественного здравоохранения МЗ РК заболевание людей туберкулезом наблюдается во всех областях страны. Особенно увеличение заболеваемости туберкулезом среди людей отмечается в Северо-Казахстанской области на 16,1%, Алматинской области – на 10,8%, Жетысуской области – на 9,6% и г. Астана – на 2,4%. Как видим, эпидемиологическая ситуация в республике по-прежнему остается еще довольно напряженной, хотя официально многие регионы являются на сегодняшний день благополучными по туберкулезу крупного рогатого скота. Осуществляемые в хозяйствах единичные контрольные убой положительно реагирующих на туберкулин животных не всегда гарантирует того, что некоторое количество больных туберкулезом скота могут оставаться в стаде. Вероятнее всего возбудитель еще сохраняется на некоторых территориях. В такой ситуации для полноты выявления больных животных крайне важно учитывать состояние анергии и проводить дополнительные исследования для уточнения природы таких реакций.

Ключевые слова. Эпизоотология, мониторинг, туберкулез, диагностика, бактериология, микобактерии.

Introduction. Currently, the study of the epizootic situation of particularly dangerous infectious diseases affecting humans and animals has become an important issue for many countries worldwide, including the Republic of Kazakhstan. The most dangerous diseases periodically occur in different countries, and their pathogens are capable of being transmitted from infected animals to healthy animals and, in many cases, to humans. One such zoonanthropotic disease is tuberculosis, which occupies a special place due to its significant social and economic impact [1,2,3,4,5,6].

Tuberculosis is a chronic infectious disease characterized by the formation of nodular lesions (“tubercles”) in affected organs. The causative agents of tuberculosis, *Mycobacterium tuberculosis* and *Mycobacterium bovis*, are pathogenic for both humans and animals. The

disease often occurs in a latent form and, in most cases, without typical clinical signs, which complicates its timely detection.

Tuberculosis is registered in almost all countries engaged in cattle breeding [7,8,9,10,11]. Globally, between three and six million cattle with positive reactions to tuberculin are detected annually, which corresponds to approximately 2,500–5,000 cases of infection per 100,000 animals [5,12].

According to the World Organisation for Animal Health (WOAH), the highest prevalence of bovine tuberculosis during 2021–2022 was recorded in Ireland, the United Kingdom, and Spain. In several Asian countries, including India and China, cases of tuberculosis in animals are also reported. In the Russian Federation, three outbreaks were registered in 2023: two in the Republic of Tatarstan and one in the Republic of Mordovia.

In Kazakhstan, one person becomes infected with tuberculosis approximately every 38 minutes, while the mortality rate is 3.2 per 100,000 population. A difficult epidemiological situation regarding tuberculosis among the population is also observed in Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Uzbekistan, and Ukraine [12]. Furthermore, specific forms of tuberculosis resistant to existing drugs have emerged.

According to official data from the Committee for Veterinary Control and Supervision of the Ministry of Agriculture of the Republic of Kazakhstan, the country is considered officially free from animal tuberculosis. Nevertheless, the problem of tuberculosis in the country has not yet been fully resolved. In livestock farms, infected animals may remain in a latent form, and despite preventive and eradication measures, the disease is sporadically detected in cattle, causing significant economic losses to farms [13,14].

During routine annual diagnostic testing of cattle using the intradermal tuberculin test, up to 79.3% of infected animals can be detected. Currently, this method remains one of the most widely used and accessible diagnostic tools in veterinary practice. However, not all livestock in the country is covered by tuberculosis testing. For example, in 2021, 7,227,230 cattle were examined using the allergic method out of 8,185,100 animals present at the end of the year, which accounted for 88.29% of the total population. In addition, since 2021, by decision of the Committee for Veterinary Control and Supervision, a single allergic test for tuberculosis has been conducted in animals across the republic.

Allergic reactions in animals may manifest differently. They may appear in some animals, disappear after a certain period, and then reappear in others. In animals with poor body condition, in aged animals, in late pregnancy, and in cases of generalized tuberculosis infection, the reaction to tuberculin may be weakly expressed and remain hidden (anergy). Conversely, cases of mass detection of tuberculin-reactive animals may occur, especially in farms considered free from tuberculosis. However, during clinical examination, pathological autopsy, and bacteriological studies, the diagnosis of tuberculosis in such animals is often not confirmed. As a result, such farms may show 5.3 times more tuberculin-reactive animals than farms officially considered infected [15,16].

According to A.Kh. Naimanov, the frequency of nonspecific reactions may range from 10% to 74% [17,18,19,20]. Nonspecific (para- and pseudo-allergic) reactions to tuberculin in mammals are mainly caused by sensitization of the organism by avian mycobacteria, the causative agent of paratuberculosis, atypical mycobacteria, and other factors [21].

All these diagnostic challenges make it difficult to objectively assess the epizootic status of tuberculosis at the regional, district, and rural administrative levels.

Aim of the study. The aim of this study was to assess the epizootic and epidemiological situation of bovine tuberculosis in the regions of the Republic of Kazakhstan in order to characterize the true status of this infection.

Materials and Methods. The epizootic and epidemiological situation of tuberculosis in the Republic of Kazakhstan was analyzed using official veterinary statistical data from the Committee for Veterinary Control and Supervision of the Ministry of Agriculture of the Republic of Kazakhstan, the Republican Veterinary Laboratory, the Republican Anti-Epizootic Detachment, the World Organisation for Animal Health (WOAH), the World Health Organization (WHO), and the National Center for Public Health of the Ministry of Health of the Republic of Kazakhstan.

Results and Discussion. In Kazakhstan, bovine tuberculosis is unevenly distributed across different regions. In various years, the disease has been registered mainly in the central and northern regions of the country. For example, epizootic foci of tuberculosis were previously reported in the Almaty, Kostanay, and Karaganda regions.

However, among all regions of the republic, cases of bovine tuberculosis have been consistently detected in the Karaganda region in recent years. According to official veterinary statistical data from the Committee for Veterinary Control and Supervision of the Ministry of Agriculture of the Republic of Kazakhstan, infected animals were detected in the Karaganda region in 2014 in the Abay district (Ata farm, Mayburnak winter pasture); in 2015 in the Bukhar-Zhyrau district (Dubovka rural district, the village of Alabas); in 2015–2016 in the Oktyabrsky district of Karaganda city; in 2017 in the city of Zhezkazgan; and in 2018–2019 in the Osakarov district (Nikolaevsky rural district, “Soyuz Alem KZ”).

In the above-mentioned regions, quarantine restrictions were imposed and disease control measures were implemented by the Republican Anti-Epizootic Detachment. Tuberculin-positive animals were removed from the herd and sent for sanitary slaughter. As a result, the number of infected settlements decreased by 3.7 times over the last three years, while the number of infected animals decreased by 1.25 times. Consequently, the epizootic situation regarding animal tuberculosis has improved significantly compared with previous years.

In the republic, more than 8 million cattle are vaccinated annually. In 2021, 7,564,666 cattle were immunized, in 2022 – 6,875,360 animals, and in 2023 – 4,167,313 animals.

According to data from the Republican Anti-Epizootic Detachment, in 2021 three epizootic foci of bovine tuberculosis were identified in the village of Akkol in the Akkol rural district of the Zerenda district, Akmola region. In the Karaganda region, three epizootic foci of bovine tuberculosis were also detected: two in the Nura district (Karoy rural district, Karoy LLP, and Zharaspay rural district, Bereke farm) and one in the Abay district (Dubovka rural district, Erzhanova K.R. farm). A total of 1,347 cattle were examined in these epizootic foci, and one animal with a positive tuberculin reaction was culled and sent for slaughter [22].

In 2022, two epizootic foci of tuberculosis were identified in the Karaganda region: in the Aktogay district (Shabanbai Bi rural district, K-Madiyar farm) and in the Bukhar-Zhyrau district (Zhake farm, Ushtobe rural district). A total of 852 cattle were examined in these epizootic foci, of which 126 animals showed positive reactions and were subsequently sent for slaughter.

In 2023, two infected locations were also recorded in the Karaganda region. One case was detected among cattle in a private household in the Bukhar-Zhyrau rural district in the village of Staraya Tuzda, and the second case was identified at the Maksat farm in the Batyk rural district of the Shet district. A total of 298 cattle were examined in these epizootic foci, of which nine animals reacted positively and were culled and sent for slaughter.

In 2024, epizootic foci of bovine tuberculosis were again registered in the Karaganda region, specifically in the Janat LLP in the Kokpekty rural district of the Bukhar-Zhyrau district and in the Kugabayev N. farm in the Akhmetauly rural district of the Nura district [14]. Thus, as mentioned above, bovine tuberculosis cases have been increasingly detected in recent years in the Karaganda region, which requires additional control and preventive measures.

It should be noted that the absence of pathological lesions typical of tuberculosis in animals slaughtered for diagnostic purposes does not exclude the disease, since a definitive diagnosis requires laboratory confirmation. Therefore, laboratory examination of biological material obtained from animals reacting positively to tuberculin is mandatory.

Table 1 presents the results of bacteriological examination of biological material collected from tuberculin-positive animals, performed by the Republican Veterinary Laboratory [23].

Table 1 – Detected cases of bovine tuberculosis in the Republic of Kazakhstan during 2021–2023.

Region	2021		2022		2023	
	Tested	Examined	Tested	Examined	Tested	Examined
Akmola Region	9	1	8	0	1	0
Aktobe Region	13	0	21	0	10	0
Almaty Region	35	0	0	0	0	0
Atyrau Region	0	0	0	0	0	0
East Kazakhstan Region	0	0	0	0	0	0
Abai Region	0	0	0	0	0	0
Zhambyl Region	9	0	9	0	7	0
West Kazakhstan Region	0	0	0	0	0	0
Karaganda Region	6	3	3	2	3	2
Kostanay Region	13	0	39	0	15	0
Kyzylorda Region	0	0	39	0	21	0
Mangystau Region	0	0	0	0	0	0
Pavlodar Region	28	0	0	0	0	0
North Kazakhstan Region	0	0	0	0	0	0
Zhetysu Region	40	0	0	0	0	0
Turkistan Region	52	0	0	0	0	0
Total in the Republic of Kazakhstan	205	4	119	2	57	2

As shown in Table 1, confirmed cases of tuberculosis were also recorded in the republic during 2021–2023. In 2021, 205 animals showed positive reactions to the tuberculin skin test; laboratory examinations confirmed the presence of tuberculosis in four samples (Akmola Region – 1, Karaganda Region – 3). In 2022, out of 119 animals that reacted positively to the allergic test, tuberculosis bacteria were detected in two samples (Karaganda Region – 2). In 2023, among 57 animals that tested positive, *Mycobacterium tuberculosis* complex pathogens were isolated in two samples (Karaganda Region – 2).

In several regions of the republic (Aktobe, Almaty, Zhambyl, Kostanay, Pavlodar, Zhetysu, and Turkistan regions), animals also reacted to tuberculin; however, bacteriological examination of biological material collected from these animals did not reveal the presence of tuberculosis bacteria. It is possible that, for a more objective assessment of the epizootic status of the herd and more complete detection of infected animals, additional diagnostic studies should be conducted to clarify the diagnosis. Control slaughter of only one or two tuberculin-reactive animals among those examined using the allergic method does not guarantee that some

infected animals remain in the herd. There have been cases when specific lesions characteristic of tuberculosis was detected in 3.0–12.6% of apparently healthy cattle sent to slaughterhouses [15,16].

According to data from the National Center for Public Health of the Ministry of Health of the Republic of Kazakhstan, the epidemiological situation regarding tuberculosis in the republic remains rather tense (www.gov.kz). Human tuberculosis cases are recorded annually and occur across all age groups of the population. The incidence rate in 2021 was 36.5 per 100,000 populations, in 2022 – 36.5, in 2023 – 34.8, and during the first five months of 2024 – 16.1 per 100,000 population compared with 15.7 during the same period in 2023. The tuberculosis incidence rate among children in 2023 was 4.3 per 100,000 children compared with 4.1 in 2022.

In 2023, an increase in human tuberculosis incidence was recorded in the North Kazakhstan Region by 16.1%, in the Almaty Region by 10.8%, in the Zhetysay Region by 9.6%, and in the city of Astana by 2.4%. In the Karaganda Region, 22 people died from tuberculosis in 2023, with a mortality rate of 1.8 per 100,000 populations.

Thus, the epidemiological situation regarding tuberculosis remains complex, which indicates the limitations of the intradermal allergic diagnostic method for tuberculosis as well as shortcomings in the current system for recording infected animals.

Conclusion. To minimize the spread of tuberculosis and prevent its further transmission, it is necessary to significantly strengthen control and preventive measures. Particular attention should be paid to breaking the chains of infection. Strict supervision over the transportation of cattle between regions with different levels of tuberculosis risk should be established.

Careful diagnostic examination of imported livestock for the presence of *Mycobacterium* spp. should be carried out, and infected animals must be promptly removed as the main source of infection.

For more complete detection of infected animals, allergic testing should be carried out in two stages: in spring, after winter housing conditions, and in autumn, before animals are transferred to stall housing. At the same time, all established veterinary-sanitary and organizational measures for tuberculosis control must be strictly observed.

In addition, it is important to differentiate specific reactions from nonspecific ones, considering that about 90% of cattle are kept in private households in rural areas. Unjustified culling of animals may lead to significant economic losses. Therefore, comprehensive measures should be aimed at interrupting the transmission routes of infection and maintaining the health of both individual animals and the entire livestock population.

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