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ASSESSING OF VETERINARY AND SANITARY MEASURES AGAINST GLANDERS AND THE RISK OF DISEASE INTRODUCTION INTO REPUBLIC OF KAZAKHSTAN

ANNOTATION

A possible revised sentence could be: "Veterinary and sanitary measures against glanders consist of preventing the introduction of the pathogen into the country, systematically monitoring the welfare of the horse population, preventing the spread of the disease, and implementing timely eradication or control measures in the event of an outbreak.

This article presents the results of an analysis of veterinary and sanitary measures currently implemented against glanders in the Republic of Kazakhstan, as well as the results of epizootological forecasting. Special measures for preventing glanders in horses in the territory of veterinary and sanitary well-being, which is Kazakhstan, include basic requirements such as quarantine, clinical examination, and negative malleinization test results for imported animals. Local veterinary services systematically monitor the well-being of the horse population and conduct annual scheduled allergy testing procedures, such as eye malleinization

Outbreaks of glanders have not been recorded in the Republic since 1939, indicating the effectiveness of annual veterinary and sanitary measures. However, due to the intensive development of horse breeding and close economic ties of Kazakhstan with neighboring regions and countries where glanders is prevalent or endemic, the risk of introducing the pathogen into the Republic remains. Therefore, it is necessary to conduct ongoing epizootological monitoring, including short-term and long-term forecasting of glanders outbreaks, as well as analysis of veterinary and sanitary measures against the disease.

Key words: *glanders, horses, veterinary sanitary measures, prophylaxis, malleinization*

Introduction. Glanders is a highly contagious disease caused by Burkholderia mallei that mainly affects horses, donkeys, mules, and camels, and rarely cats, dogs, and bears. Acutely ill animals serve as the reservoir and primary source of infection for humans. In chronic and subclinical forms, the pathogen is excreted in feces, saliva, and milk, contaminating the external environment. The pathogen can persist in the environment for up to 5 weeks in high humidity and absence of direct sunlight, and up to 3 months in dried secretions and water, posing a risk of infection to animals and people. People are highly susceptible to glanders, and typically contract the disease through contact with infected animals, though transmission through food or air is also possible. The disease is most common among people who work with animals, but can also spread from person to person [3,4].

In countries or farms where glanders is not endemic, affected animals may exhibit a latent form of the disease in which there are no clinical signs and the response to mallein testing may temporarily be reduced. This is especially true for semi-wild animals. However, a sudden change in living conditions,

inadequate nutrition, increased stress, or transport to different natural and climatic conditions (acclimatization) can trigger an exacerbation of the latent glandular process, leading to overt infection in these horses [5].

The development, continuous improvement, and implementation of a system of anti-epizootic measures, including mass malleinization, timely detection of horses positively reacting to mallein, establishment of mallein isolators, provision of operational assistance, and control by local authorities over the implementation of anti-epizootic measures, as well as the provision of veterinary personnel for mass treatments, allowed for the containment and elimination of glanders in horses in developed countries of Europe, North America, and the former USSR by the mid-20th century [6,7,8,9].

Despite progress made in the control of glanders, in the last 15 years there has been a concerning trend of increasing outbreaks among thoroughbred horses, as well as other agricultural and wild animals in multiple regions of Africa, Asia, the Near and Middle East, and Central and South America. This resurgence of glanders has affected 23 countries worldwide, classifying it as a "re-emerging infection [10,11,12,13].

Veterinary and sanitary measures aimed at preventing, monitoring, and controlling glanders, donkeys, and mules involve preventing the introduction of the pathogen into the country, systematic monitoring of livestock, and measures to prevent the spread and elimination of the disease if it occurs. These measures have been effective, as evidenced by the absence of glanders outbreaks in Kazakhstan for many decades [14,15]. However, given the current global changes and increasing international trade and travel, there are still risks of introducing the glanders pathogen into our country.

Materials and research methods.

To assess the effectiveness of veterinary and sanitary measures against glanders in Kazakhstan, an analysis was conducted using official veterinary reporting data from various sources, including the Committee for Veterinary Control and Supervision of the Ministry of Agriculture of the Republic of Kazakhstan, the Republican Veterinary Laboratory, and the National Veterinary Reference Center. In addition, regulatory documents such as the Law of the Republic of Kazakhstan "On Veterinary Medicine", veterinary rules for the implementation of measures to prevent and eliminate glanders (dated 17.01.2012 No. 10-1/18), and sanitary-epidemiological and veterinary-sanitary rules (Approved by order of the Minister of Agriculture of the Republic of Kazakhstan dated June 29, 2015 №. 7-1 / 587) and norms were studied. These documents provide guidance on the organization of epidemiological and epizootological supervision, as well as the implementation of sanitary and anti-epidemic (preventive) and veterinary and preventive (anti-epizootic) measures for glanders in Kazakhstan (Approved by a joint order of the Ministry of Health of the Republic of Kazakhstan and the Ministry of Agriculture of the Republic of Kazakhstan dated August 16, 2007 year, №. 507). The veterinary and sanitary measures have been effective, as there have been no recorded outbreaks of glanders in horses in Kazakhstan for many decades [16].

In order to determine the well-being of farms, scientific expeditions were organized with the selection and study of blood samples from horses. During 2021-2022, 1,713 blood samples were taken from 7 regions. The prepared blood serum samples were examined at the laboratory of LLP Scientific and Production Enterprise "Antigen" by the method of enzyme immunoassay, the AsurDx™ Burkholderia Mallei test system for the detection of antibodies specific to Burkholderia Mallei (B.mallei) in horses (USA) (Figure 1) [17].

To carry out epizootological forecasting of horse glanders, extrapolar forecasting and the factorial method according to Zhigalsky O.S. were used. [18,19]. The method of extrapolar forecasting is based on the principle of time series analysis, taking into account the cyclical nature of zoonotic infections. The factorial method is based on the identification of statistical relationships between the process under study and the factors influencing the incidence.

Research results. According to official sources of the authorized body in the field of veterinary medicine (Committee for Veterinary Control and Supervision of the Ministry of Agriculture of the Republic of Kazakhstan) and the World Organization for Animal Health - the International Epizootic Bureau (OIE), the territory of the Republic of Kazakhstan is safe for horse glanders, outbreaks of the disease have not been recorded since 1939.

Considering the development of horse breeding in the republic, in the conditions of close economic ties of Kazakhstan with neighboring regions, geographical location in the center of the Eurasian continent, acting as a cross-border region, the risk of introduction of the pathogen and the occurrence of outbreaks of glanders in the country remains. According to the Bureau of National Statistics of the

Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, in 2022 there is an increase in the number of horses by 10 % and amounts to 3.8 million (picture 1).

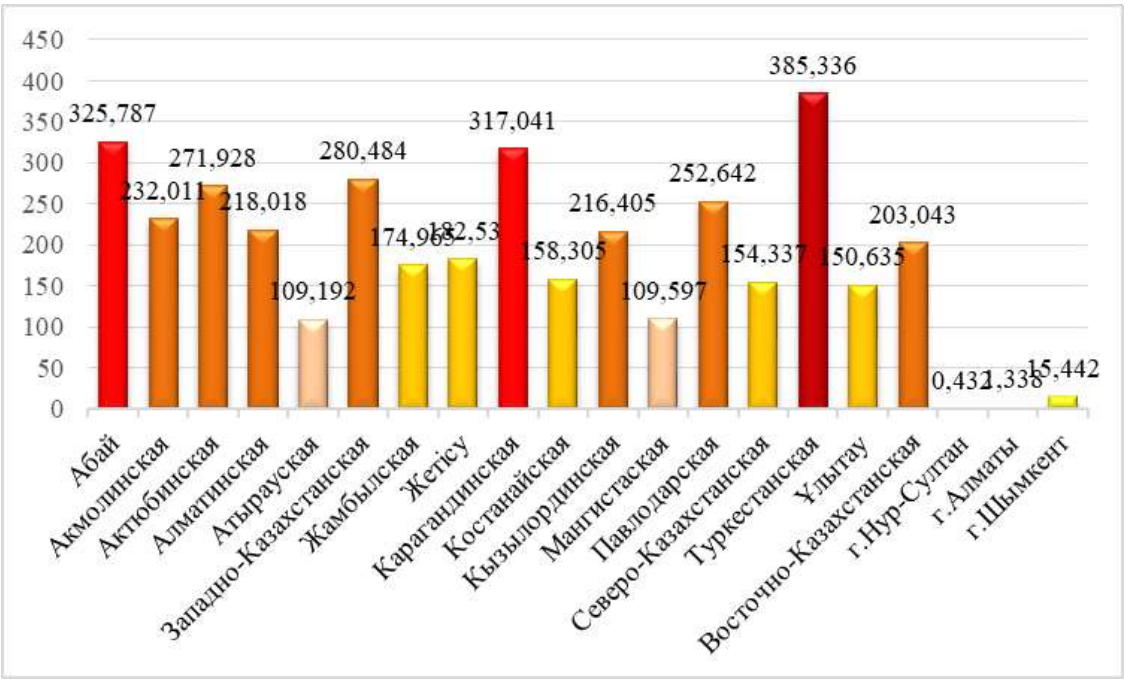

Figure 1 – The number of horses in the Republic of Kazakhstan in 2022

Among the regions, the Turkestan region is the leader in livestock – 385.3 thousand horses. Abai region is in second place - 325.8 thousand horses.

To study the current epizootic situation of horse breeding in the Republic of Kazakhstan, during 2021-2022, expedition trips were organized by university staff to the districts of Almaty, Zhambyl, Kargandy, West Kazakhstan, Kostanay, East Kazakhstan, Abai regions, during which the characteristics of farms where horses were kept and blood samples were taken. A total of 1,848 blood serum samples from 7 regions were examined (picture 2,3).

Table 1 – ELISA results for glanders among local, imported and breeding horses

Region name	Number of samples	Research results
Almaty	598	negative
Zhambyl	483	negative
Karaganda	285	negative
West Kazakhstan	100	negative
Kostanay	100	negative
East Kazakhstan	157	negative
Abai	125	negative
Total	1848	

As shown in Table 1, out of 1848 blood serum samples studied in the period 2021-2022 not a single positive sample was found, which confirms the status of the republic as safe from glanders.

Picture 2, 3 – Selection and study of blood serum of horses

Compliance with general and special veterinary and sanitary measures, including: livestock management technologies that contribute to breaking the epizootic chain, well-established identification of horses, compliance with the rules for keeping and feeding, with the exception of stress factors, compliance with quarantine measures, dividing the territory of a livestock farm into zones, building the necessary livestock , veterinary and sanitary facilities, the availability of veterinary documents for incoming animals, veterinary and sanitary control and supervision of animal congestion places (internal trade facilities selling live animals, exhibitions, facilities for slaughtering animals and processing raw materials from them), when transporting animals in compliance with of these rules and the organization of preventive measures, providing workers of livestock economic entities with the necessary equipment and special clothing, organizing educational work among the population, disinfection, disinsection and rodent control using drugs registered in the Republic of Kazakhstan and the member states of the Eurasian Economic Union, ensured the well-being of horses in the republic with regard to glanders.

Measures of veterinary and sanitary prophylaxis include annual scheduled allergic tests with a diagnostic test with mallein - ocular malleinization [16]. The results of malleinization from 2012 to 2022 are shown in Table 2.

Table 2 – Malleinization of horses in Kazakhstan from 2012 to 2021

№	Name of regions	Years									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Akmola	35500	38000	41200	44000	44000	40000	20000	20000	22200	25600
2	Aktobe	16000	16660	18650	31500	33670	33 670	17000	17000	21600	24400
3	Almaty	17230	22450	80300	87350	89500	77570	18800	20000	25850	19670
4	Atyrau	15203	16000	16100	17200	17300	14400	7500	8000	8000	4000
5	East Kazakhstan	14750	16800	18000	180352	200000	200000	81680	45600	40000	47080
6	Zhambyl	50460	52000	52400	53400	54300	101100	29900	30000	16110	18520
7	West Kazakhstan	30440	32400	33460	33460	34670	37450	20	15000	10000	20000
8	Karaganda	42320	45800	50200	50580	51670	100200	5100	5000	5000	5000
9	Kyzylorda	30230	32230	33250	33300	33500	34800	16800	16000	10000	10900
10	Kostanay	19500	24200	25000	25650	25500	26030	10420	10420	16860	16760
11	Mangistau	16400	17500	18000	19600	20000	19550	-	500	500	700

12	Pavlodar	89350	96650	97300	101600	101000	102000	10000	10000	10	10300
13	North Kazakhstan	17520	16400	17560	18220	18385	15367	12225	14250	6500	7550
14	Turkestan	65000	110423	105300	112200	111996	116227	55232	60000	68000	73300
15	Astana city	350	400	420	450	410	440	410	410	500	460
16	Almaty city	450	450	500	600	700	500	700	700	700	700
17	Shymkent city	-	-	-	-	-	-	-	1000	1000	1000
TOTAL		672880	713600	717200	828200	836448	919304	305767	273880	285480	285940

According to the fifth point of veterinary and sanitary measures in economic entities, annually, once a year, a planned allergic test of animals for glanders is carried out. As can be seen from Table 2, a total of 5,838,699 horses were malleated from 2012 to 2021. In 2022, 260,285 horses were malleated. At the end of 2021, up to ±10% of horse heads were malleated in Kazakhstan, with the largest coverage of the Turkestan (73,300) and East Kazakhstan (47,080) regions.

The result of the epizootological analysis showed that the territory of the East Kazakhstan region is at risk for glanders. In this regard, it is recommended to conduct routine examinations of horses in the East Kazakhstan region, by malleinization and clinical examination twice a year in autumn and spring, with serological diagnostics, in accordance with the OIE recommendation, with a positive reaction to mallein and clinical signs of the disease.

In farms (countries) that are permanently unfavorable for glanders, among the affected animals, a latent course of the disease prevails, in which not only are there no clinical signs, but sometimes the reaction to mallein also temporarily drops out. In this regard, there is a need to develop an advanced forecast for the occurrence of glanders, since the prediction of the next increase in the incidence will allow timely implementation of preventive measures, which is much more effective and cheaper than the use of emergency measures to eliminate sudden outbreaks at the top of the outbreak activity wave.

Epizootological prognosis was carried out using the methods of extrapolar and factorial forecasting according to Zhigalsky O.S. The method of extrapolar forecasting is based on the principle of time series analysis, taking into account the cyclical nature of zoonotic infections. The factorial method is based on the identification of statistical relationships between the process under study and the factors influencing the incidence. Taking into account the available data, a short-term, medium-term and long-term analysis was given (Table 3).

Table 3 – Results of epizootological forecasting of horse glanders in Kazakhstan

short-dated prediction	- favorable, taking into account the observance of veterinary and sanitary measures, the conditions for quarantine of horses.
mid-term prediction	- favorable, with no disease registration. It is recommended to conduct monitoring studies in the border areas of southeastern and eastern Kazakhstan.
long-term prediction	- for 5 or more years: in the context of an increase in the number of horses in our country [20], the development of equestrian sports, the presence of outbreaks of glanders in neighboring countries – Russia, China, Mongolia, and in importing countries such as Turkey and others (Figure 4) [21,22] , intensive growth of imports of horses from abroad, there is a risk of bringing glanders into the territory of the Republic of Kazakhstan, especially in the East Kazakhstan, Almaty, Zhambyl, Turkestan regions. The East Kazakhstan region is at risk, noting factors such as: - border zone with China, proximity to Mongolia; - first place in the number of horses - 545,012 thousand heads. - first place in the import of horses from abroad (Russia).

Based on Table 3, we can conclude that there is a favorable short-term and medium-term prognosis in the context of compliance with preventive veterinary and sanitary measures and monitoring

studies of the border zones of southeastern and eastern Kazakhstan. With a long-term forecast, we observe the presence of risks of the introduction of the pathogen from the border regions.

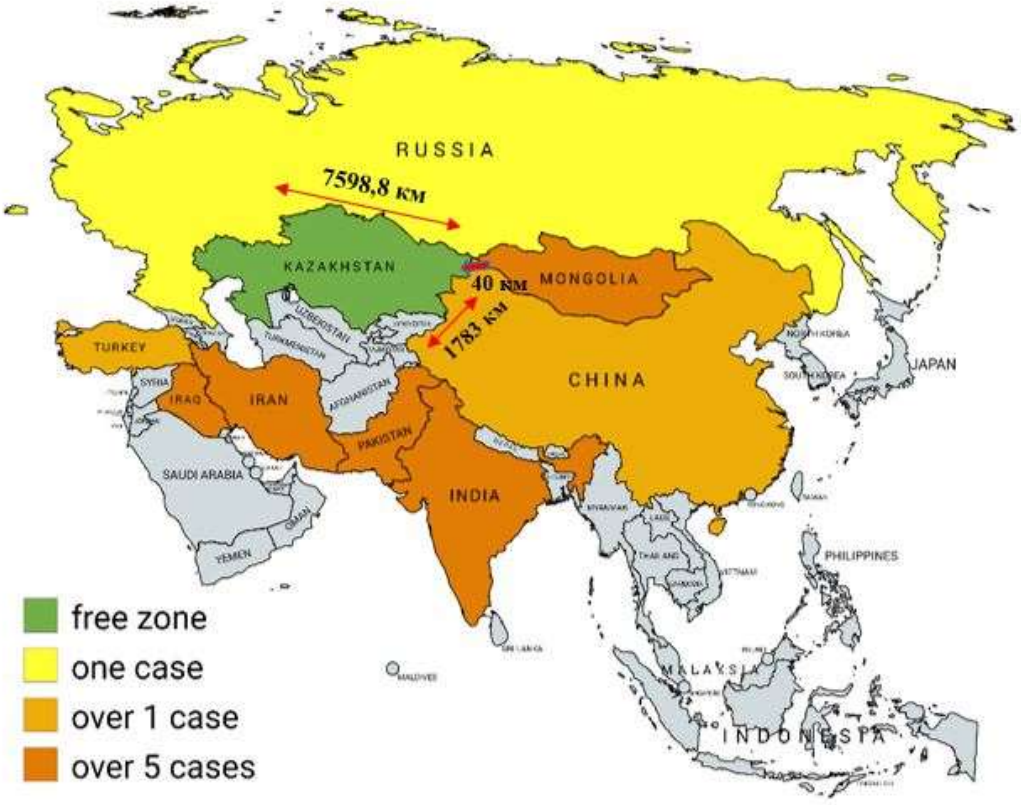

Figure 4 – Countries at risk of introducing Glanders to the Republic of Kazakhstan

Our republic has close trade and economic ties with China, which has experienced glanders outbreaks for the past four years. With a total border length of 1,783 km and the possibility of uncontrolled horse movement, there is a risk of glanders introduction into our country. In Mongolia, the last glanders outbreaks were recorded in 2018, including the Bayan-Ulga district located 40 km from the Kazakhstan border, which also poses a risk. Recently, the OIE reported a glanders outbreak in Russia, and given our close foreign economic ties and a shared border of 7598.8 km, particularly with the highest import of horses, there is a potential threat of desease introduction from the border zones [23].

All animals imported from known or potentially endemic regions should be regularly checked for the presence of glanders before importation. Repeated testing during quarantine is also recommended, as infected animals may be asymptomatic and serologically negative.

Conclusion. Currently, there are no specific funds for the prevention of glanders, and improvements to existing veterinary and sanitary measures must be based on a thorough study of the disease's global status, horse import-export trends, and changes in the epizootic process of glanders. Diagnostic methods should also be improved, and the glanders situation in neighboring countries, border areas, and countries with strong trade relations should be monitored. While the territory of the Republic of Kazakhstan is currently safe from glanders due to effective preventive measures, there are still risk factors that require ongoing epizootic monitoring and prediction.

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ТҮЙІН

Маңқаға қарсы ветеринариялық-санитариялық іс-шаралар патогенді елге әкелудің алдын алудан, жылқы басының әл-ауқатын жүйелі бақылаудан, аурудың таралуына жол бермеуден және кенеттен туындаған жағдайда уақтылы жою шараларынан тұрады.

Мақалада Қазақстан Республикасында жылқылардың маңқасына қарсы қолданыстағы ветеринариялық-санитариялық іс-шараларды талдау нәтижелері және індеттанулық болжау нәтижелері келтірілген. Қазақстан ветеринариялық-санитариялық қолайлы аумақта жүзеге асырылатын жылқы маңқасы алдын алу жөніндегі іс-шаралар болып табылады және патогенді елге әкелудің алдын алу үшін әкелінетін жануарларды шектеу, клиникалық тексеру және маллеинизациялаудың теріс нәтижелері сияқты негізгі талаптарды қамтиды. Жергілікті ветеринариялық қызметтер жылқы басының әл - ауқатына жүйелі бақылау жүргізеді және жыл сайынғы жоспарлы аллергиялық зерттеулер-көз маллеинизациясы жүргізіледі.

1939 жылдан бері Республикада жылқы маңқасының өршуі тіркелмеген, осылайша жыл сайын өткізілетін ветеринариялық-санитариялық іс-шаралар өзінің тиімділігін көрсетеді. Бірақ жылқы шаруашылығының қарқынды дамуы және Қазақстанның көршілес өңірлермен және елдермен, оның ішінде жылқының маңқасы бойынша қолайсыз елдермен тығыз экономикалық байланыстары жағдайында қоздырғышты республика аумағына әкелу қаупі сақталады. Осы жағдайларда қысқа мерзімді және ұзақ мерзімді болжаммен індеттік сараптама жүргізу және жылқы маңқасына қарсы ветеринариялық-санитариялық іс-шараларды талдау қажет.

РЕЗЮМЕ

Ветеринарно-санитарные мероприятия против сапа заключаются в предупреждении заноса возбудителя в страну, систематическом контроле за благополучием поголовья лошадей, недопущении распространения болезни и своевременных мерах ликвидации в случае вспышки.

В статье приведены результаты анализа действующих в Республике Казахстан ветеринарно-санитарных мероприятий против сапа лошадей и результаты эпизоотологического прогнозирования. Специальные мероприятия по профилактике сапа лошадей, осуществляемые на территории ветеринарно-санитарного благополучия, каким и является Казахстан, включают основные требования для предупреждения заноса возбудителя в страну такие, как карантинирование, клинический осмотр и отрицательные результаты маллеинизации ввозимых животных. Местными ветеринарными службами осуществляется систематический контроль за благополучием поголовья лошадей и проводятся ежегодные плановые аллергические исследования - глазная маллеинизация.

Вспышки сапа лошадей не регистрировались в республике с 1939 года, таким образом проводимые ежегодно ветеринарно-санитарные мероприятия показывают свою эффективность. Но в условиях интенсивного развития коневодства и тесных экономических связей Казахстана с соседними регионами и странами, в том числе неблагополучными по сапу лошадей, сохраняется риск заноса возбудителя на территорию республики. В данных условиях необходимо проводить эпизоотологический мониторинг с краткосрочным и долгосрочным прогнозированием и анализ ветеринарно-санитарных мероприятий против сапа лошадей.