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## EPIZOOTOLOGICAL MONITORING OF EQUINE HERPESVIRUS IN KAZAKHSTAN

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### Abstract

Equine herpesvirus is one of the most common infectious diseases of horses, causing huge economic losses associated with fetal abortion and subsequent chronic course. At the same time, a difficult epizootological situation regarding herpesvirus infections remains in the republic. Therefore, epizootological surveillance and planned monitoring studies of the epidemiological process in a certain territory are one of the effective tools for preventing the spread of equine herpesvirus in horse breeding farms. This article presents the results of an analysis of epizootological monitoring and ongoing diagnostic measures regarding equine herpesvirus on the territory of the Republic of Kazakhstan. According to epizootological data, over the past 10 years, 35 outbreaks of equine herpesvirus have been registered in Kazakhstan. Serological monitoring confirmed the circulation of the causative agent of equine herpesvirus in the country's horse breeding farms. In a study of 1391 blood serum samples, antibodies to equine herpesvirus were detected in 93 cases (6.7%). The data obtained give reason to believe that in disadvantaged areas it is necessary to take a full range of measures for timely diagnosis, prevention and elimination of foci of infection.

**Key words:** diagnostics; equine herpesvirus; epizootological monitoring; herpesvirus; horses; prevention.

### Introduction

In the Republic of Kazakhstan, horse breeding is a traditional and profitable branch of animal husbandry: according to the State Statistics Service of the Agency for Strategic Planning and Reform of the Republic of Kazakhstan, in 2023 there were more than 4 million horses in the country [1]. Along with meat and dairy horse breeding, the breeding of stallions and mares of the purebred horse breed is promising. Currently, in all regions of the republic, various types of personal, subsidiary, farm and state horse breeding farms are organized, the number of local and imported horses purchased in Russia, the CIS countries and many other foreign countries is gradually increasing [2].

At the same time, despite the intensive development of horse breeding in Kazakhstan, one of the hindering factors for its development in the country is diseases of contagious etiology. In this regard, equine herpesvirus (equine herpesvirus infection, equine viral abortion) poses a constant threat to horse breeding.

Equine herpesvirus (EHV) is a highly contagious viral infection that causes upper respiratory tract disease, neurological impairment, abortion and neonatal death. EHV is the historical common name of a disease caused by two DNA viruses of the herpesviridae family – equine herpesvirus-1 and equine herpesvirus-4 (EHV-1 and EHV-4) [3,4]. Both viruses belong to the alpha herpesvirus genus; their genomes are 55-84% identical in nucleotide composition and up to 96% similar in amino acid composition. Today, EHV-1 and EHV-4 belong to the sub-family of alphaherpesviruses of the Varicellovirus genus [5,6,7].

EHV causes significant economic damage to horse breeding, which consists of the loss of reproductive ability of mares, lack of offspring, culling of horses that are valuable for breeding, and the implementation of veterinary and sanitary measures [8, 9]. In addition to direct damage, this infection creates barriers to international trade and transportation of both horses and a large arsenal of goods under the control of the veterinary service [10].

The epizootic situation regarding EHV in many countries of the world remains tense and ambiguous. The disease is registered on almost all continents and annually results in large economic losses for horse breeding farms. In recent years, a significant increase in the incidence of equine herpesvirus infection has been observed in countries with developed horse breeding (USA, Canada and the EU) [11,12]. EHV outbreaks, in addition to causing direct economic losses to horse farms, can also disrupt important economic sectors such as horse racing. The occurrence of EHV-1 infection in different countries varies from isolated sporadic cases to infection of 90% of the herd. Mortality also varies during outbreaks and can reach 40–50% [13,14].

At the same time, in Kazakhstan there is very little research in the field of epizootology of EHV, there is no new data on the dynamics of the epizootic process of the disease, depending on the impact of natural, climatic and economic factors.

According to epizootological data, equine herpesvirus is often recorded on farms where special preventive measures are not taken. According to literature data and official veterinary statistics, equine herpesvirus began to occur in Kazakhstan in 2011. The first time equine herpesvirus was recorded in the Almaty region. Further, in 2012, serotypes EHV-1 and EHV-4 were detected in two districts of Zhambyl region [15]. In subsequent years, foci of equine herpesvirus were registered in other regions of the country.

Based on the above, the purpose of this research is to assess the current epizootological situation of EHV in Kazakhstan, by conducting epizootological monitoring and diagnostic studies in various regions of the country.

### **Materials and methods**

The research was carried out at the Department of Veterinary Sanitation of the S. Seifullin Kazakh Agrotechnical Research University and on the basis of the RSE on the REM «National Reference Center for Veterinary Medicine» (NRCVM), Committee for Veterinary Control and Supervision, Ministry of Agriculture, Republic of Kazakhstan.

For epizootological analysis, veterinary reporting forms, data of own studies were used, as well as analysis of statistical data and epizootological surveys of a number of affected farm horse farms in the Republic of Kazakhstan, based on data on the geography of the regions included in the zones of well-being from equine herpesvirus of horses with vaccination, and other necessary information. Also, in epizootological studies, the materials of periodic bulletins of the International Epizootic Bureau on cases of registration of horse EHV in various countries of the world were used.

«Diagnostics of Infectious Diseases Laboratory, NRCVM, conducts monitoring studies for equine herpesvirus of horses every year. Serological supervision of equine herpesvirus is based on the detection of antibodies by enzyme-linked immunoassay (ELISA) (Indezim Rhinopneumonitis test system, Spain) in monitoring studies. Molecular genetic studies were performed by real-time polymerase chain reaction (PCR) using a Equid herpesvirus 1 qPCR Kit is designed for the in vitro detection of EHV-1 genomes (NZYTech, Lisboa, Portugal).

The 2023 plan included laboratory diagnostic studies for serological monitoring of rhinopneumonia-susceptible animals (horses), regardless of age, sex and breed. The sampling locations were determined by using data from the Farm Animal Identification Program used in the Republic of Kazakhstan. The method includes a randomized method of sampling blood sera in each settlement where horse breeding is available. The flocks themselves for sampling are determined by local veterinary services under the supervision and supervision of the veterinary inspection.

Materials for serological and molecular genetic studies were 1391 samples of equine blood sera collected in all 14 regions of the country.

## Results

A retrospective analysis of epizootological data on EHV confirms the country's poor situation with regard to this infection. Information on the registration of EHV in Kazakhstan over the past 10 years is presented in Table 1.

Table 1 – Cases of registration of EHV in the Republic of Kazakhstan (2014-2023)

Name of the regions	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
North Kazakhstan Region	-	1	2	-	-	2	-	2	8	1
Akmola	1	-	-	-	-	-	-	-	1	-
Atyrau	-	-	-	-	1	-	-	-	1	-
Aktobe	-	-	-	-	-	-	-	1	-	-
West Kazakstan Region	-	-	1	-	-	-	-	1	-	-
Karaganda	-	1	-	1	1	-	2	1	-	-
Pavlodar	-	2	1	-	1	-	-	-	2	-
Total	1	4	4	1	3	2	2	5	12	1

As can be seen from the table, in the period 2014-2023, EHV was registered in 7 regions out of 14. Moreover, in contrast to the early periods (2011-2012), foci of infection were detected in all regions except the southern regions. A total of 35 outbreaks of equine herpesvirus were recorded during the observation period in Kazakhstan. And if in certain regions (Akmola, Atyrau, Aktobe, West Kazakhstan) only isolated cases of horse disease with EHV were recorded for 10 years, then in the North Kazakhstan region 16 outbreaks or 45.7% of all were recorded during this period cases of disease. In addition, in the Akkayin and Kyzylzhar districts in the North Kazakhstan region and the Karkaraly district of the Karaganda region, a certain stationarity of the disease is observed.

Taking into account the area of registration of EHV in the country, we collected blood serum samples for monitoring diagnostic studies. Sampling in areas for serological studies was carried out taking into account the current epidemiological situation and the number of susceptible livestock in a particular area (Figure).



Figure 1– Visualization of sampling sites for monitoring studies of equine herpesvirus in 2023

As a result, 1391 blood serum samples were taken from farms of various forms of ownership in 14 regions of the republic and Almaty. Taking into account the presence of various risk factors (the number and density of susceptible livestock, retrospective analysis of the epizootic situation, economic ties, the risk of introducing the pathogen from outside, etc.), the largest number of samples were taken in West Kazakhstan (198), Almaty (147), Turkestan (136), Kyzylorda (114), East Kazakhstan (105), Kostanay (103) and Karaganda (102) regions.

The obtained horse blood serum samples were examined by ELISA using the Indezim Rhinopneumonitis test system (Spain). Next, in order to detect the DNA of the pathogen, serum samples that reacted positively to equine herpesvirus in ELISA were examined by PCR. The research results are presented in Table 2.

Table 2 – Results of diagnostic studies for equine herpesvirus by region in 2023

No	Regions	Number of explored regions	Number of settlements studied	Number of samples studied	Positive results by ELISA (antibodies)	Positive results by PCR
1	Akmola	3	14	35	3	0
2	Aktobe	6	30	94	9	0
3	Atyrau	2	7	31	9	0
4	West Kazakstan Region	10	67	198	29	0
5	Karaganda	6	21	102	0	-
6	Kostanay	5	37	103	15	0
7	Mangystau	5	25	70	6	0
8	Pavlodar	6	28	75	7	0
9	North Kazakhstan Region	5	30	83	15	0
10	East Kazakhstan Region	6	29	105	0	-
11	Almaty	11	58	147	0	-
12	Zhambyl	5	35	89	0	-
13	Kyzylorda	6	41	114	0	-
14	Turkestan	5	51	136	0	-
15	Almaty city	-	-	9	0	-
	TOTAL:	44	277	1391	93	0

Based on the results of serological monitoring of 1391 blood serum samples, antibodies to equine herpesvirus were detected in 93 cases (6.7%). At the same time, out of 15 regions of the country, positive samples were found in 8 regions. In quantitative terms, the largest number of positive samples were found in West Kazakhstan (29), Kostanay (15) and North Kazakhstan (15) regions. The highest proportion of positive samples from the total number of samples examined was also observed in the above regions: West Kazakhstan (14.6%), Kostanay (15.5%) and North Kazakhstan (18.1%).

At the same time, samples that showed a positive result by ELISA were further examined using the PCR method in order to detect the causative agent of EHV. A total of 93 molecular genetic studies were carried out, but in all cases a negative result was obtained.

### Discussion

EHV is one of the most common infectious diseases of horses, causing huge economic losses associated with abortion of the fetus and the subsequent chronic course of the disease. Therefore, systematic monitoring and study of the dynamics of the development of the epizootological process in a certain territory is one of the effective tools for monitoring the situation, which allows timely organization and implementation of the necessary preventive and anti-epizootic measures [2].

In order to maintain a favorable epizootic situation in the republic, veterinary measures are planned annually for the prevention and diagnosis of EHV. The policy of the state veterinary service is aimed at



continuous monitoring and timely diagnosis of the disease. Every year, at the expense of the republican budget, more than 1000 heads of horses are subjected to diagnostic tests in the republic, which is no more than 0.025% of the coverage of the entire livestock. Preventive vaccination is carried out on no more than 70.0 thousand animals in regions where there are outbreaks of infection, which is 2.1% of the total horse population in the republic. However, despite the measures taken, against the backdrop of a difficult epizootic situation in the world and neighboring countries, a difficult situation is developing in the republic, which requires not only a practical approach but also a scientific approach in the study of the epizootic process of the disease.

The data obtained confirm that strains of the pathogen of EHV circulate in the republic and their distribution area covers almost all regions of the country. At the moment, EHV is registered both in organized horse breeding farms and among horse owners in a private farmstead. In addition, taking into account the trend of gradual growth of local and imported horses, the development of various types of equestrian sports, the threat of infection from disadvantaged countries increases.

In this regard, the most important thing for the country's veterinary service is systematic and targeted work on timely diagnosis of infection, the formation of a sufficient number of animals with an immune response and the prevention of the introduction of infection from outside.

### Conclusion

Systematic epizootological monitoring measures are the most effective way to prevent the occurrence and spread of EHV in the territory. At the same time, the results obtained confirm the epizootological problems of the country with re-gard to EHV. Analysis of serological studies of blood serum samples collected in various areas of the country showed that the EHV circulates among various horse populations in at least 8 regions of Kazakhstan. And although molecular genetic studies did not confirm the results of serological studies, due to the specifics of these tests, they do not exclude the presence of pathogenic field strains in the body of the studied animals. Therefore, in affected areas it is necessary to take a full range of measures for timely diagnosis, prevention and elimination of foci of infection.

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