МРНТИ 68.41.53. **DOI: 10.58318/2957-5702-2024-18-44-50**

IMMUNE STATUS OF POULTRY TO NEWCASTLE DISEASE VIRUS IN KAZAKHSTAN

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Abstract. The causative agents of viral diseases among birds are widespread in nature. The spread of Newcastle among wild and domestic bird populations requires veterinary services to take effective control measures based on molecular epidemiological data.

The article presents data from monitoring studies on Newcastle disease in various regions of Kazakhstan. Collection of samples from poultry and wild birds was carried out in private farmsteads in different regions of Kazakhstan.

In order to determine the immune status of birds in individual farms and poultry farms, we conducted studies on the presence of antibodies to the Newcastle disease virus in the blood of birds.

It has been established that 82.3% of birds from private farms and poultry farms have antibodies to the Newcastle disease virus in the blood sera. In Kostanay, Akmola, Turkestan and North Kazakhstan regions, the percentage of immune birds is above 80%, in Zhambyl, Kyzylorda, West Kazakhstan, Almaty and Abay the percentage of immune birds is within 55-72.1%.

In Aktobe and Atyrau regions, 1-32% of birds have antibodies to the ND virus. It is likely that in these areas birds are not vaccinated across the entire population. The risk of developing ND is average.

Key words: virus; Newcastle disease; linked immunosorbent assay; monitoring.

Introduction

Newcastle disease (ND) is a highly contagious viral infection of birds, characterized by pneumonia, encephalitis, multiple petechial hemorrhages and damage to internal organs [1].

Epizootic welfare in poultry farms of the Republic of Kazakhstan is maintained through intensive vaccination of birds, starting from the first days of life [2]. Many farms have developed vaccination schemes to maintain a high number of post-vaccination antibodies, which is required to ensure immunity of birds to ND. However, despite all the measures taken, epizootic outbreaks of ND cause damage to poultry farming in Kazakhstan [3, 4].

Outbreaks of ND are registered annually in private farmsteads where bird vaccination is not carried out. Thus, in 2019, an outbreak of ND was registered in private farmsteads in the village of Karasu, Rodnikovsky rural district, Osakarovsky district, Karaganda region. In 2022, the disease and death of birds as a result of an outbreak of Newcastle disease were noted in a private farmstead in the Baizak district of the Zhambyl region. Many cases of bird death remain unnoticed and are not officially registered [5].

The research was carried out by employees of the RSE at the Scientific Research Institute for Biological Safety Problems of the Ministry of Health of the Republic of Kazakhstan within the framework of the scientific and technical program “Biological Safety of the Republic of Kazakhstan: Threat Assessment, Scientific and Technical Foundations for Their Prevention and Elimination” for the period 2021-2023.

It should also be noted that the laboratory "Monitoring of infectious diseases" of the Research Institute for Biological Safety Problems of the Ministry of Health of the Republic of Kazakhstan currently continues to conduct monitoring visits to different regions of the country according to the calendar plan of the current year and the results of the diagnostic studies will be summarized by the end of the calendar year.

These studies are important because such diagnostic studies are necessary for the fight against ND in the territory of the Republic of Kazakhstan for timely forecasting and planning of anti-epizootic measures by the country’s veterinary service, and these studies are also needed for the future veterinary well-being of our state.

The purpose of the study is to determine the immune status of poultry to the ND virus in Kazakhstan.

Materials and methods

In order to determine the immune status for ND, 100-500 samples of bird blood serum were collected and delivered to the laboratory "Monitoring of Infectious Diseases" of the RSE "RIBSP" from different regions of the Republic of Kazakhstan. To determine the seroprevalence for ND, the ELISA kit, Newcastle Disease Virus Antibody Test Kit – IDEXX, was used.

Determination of the presence of antibodies to the Newcastle disease virus in the blood serum of birds was carried out by enzyme-linked immunosorbent assay (ELISA) using the Newcastle Disease Virus Antibody Test Kit test system, according to the method described by SOP- QMS-RIBSP-NR-492-2020 [6].

Research results

In order to determine the immune status of poultry in private farmsteads and poultry farms, we conducted studies of bird blood serum for the presence of antibodies to the ND virus.

The results of the study are presented in Figure 1.

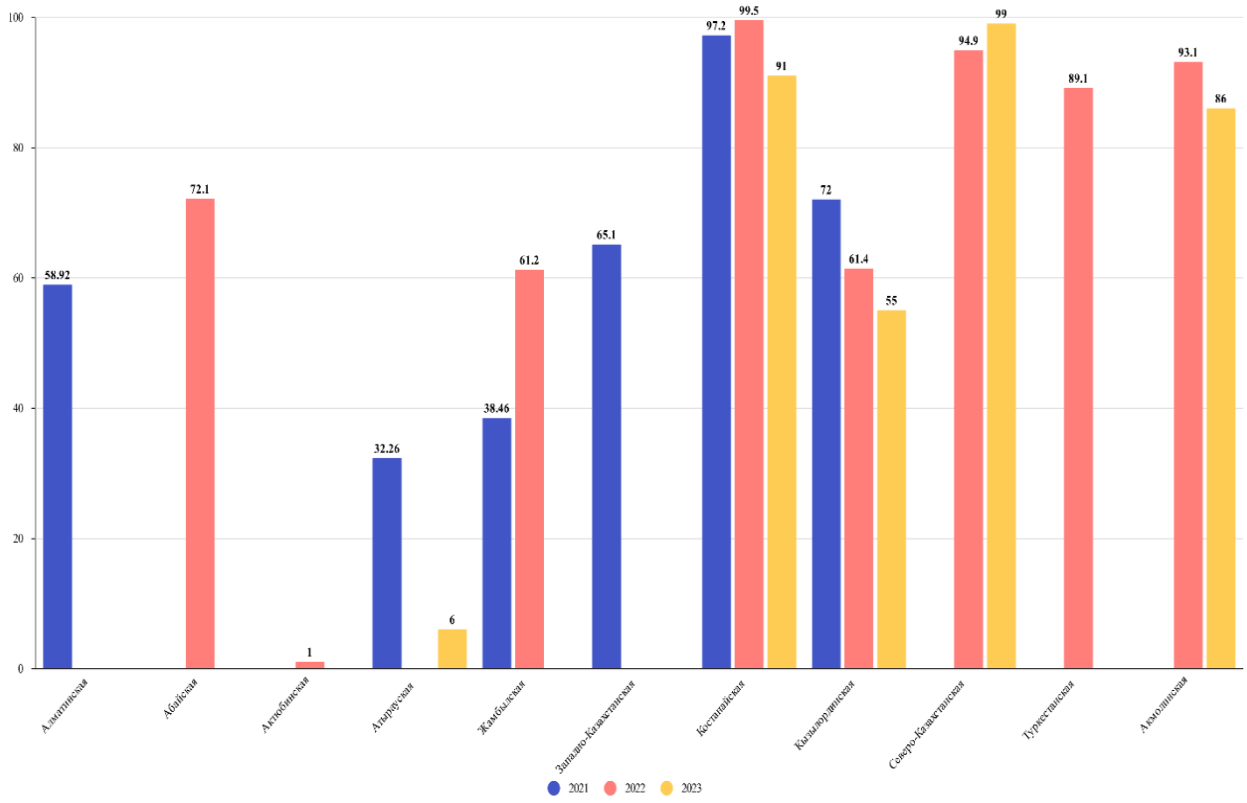

Figure 1 – Immune status of poultry to ND virus in Kazakhstan

As a result of the studies, it was found that 82.3% of birds from private farmsteads and poultry farms have antibodies to the ND virus in the blood serum. In Kostanay, Akmola, Turkestan and North Kazakhstan regions, the percentage of immune birds is above 80%, in Zhambyl, Kyzylorda, West Kazakhstan, Almaty and Abay regions, the percentage of immune birds is within 55-72.1%.

In the Aktobe and Atyrau regions, 1-32% of birds have antibodies to the ND virus. Probably, in these regions, birds are vaccinated without covering the entire population. The risk of developing ND is medium.

Previously, we have shown that Newcastle disease viruses belonging to genotypes VI and VII constantly circulate among wild and domestic birds (Figure 2). Genotype VII viruses are of particular importance, as they cause the majority of epizootic outbreaks among domestic birds in Asia, Europe and Africa. It was found that genotype VIIb Newcastle disease virus circulates among wild birds in Kazakhstan.

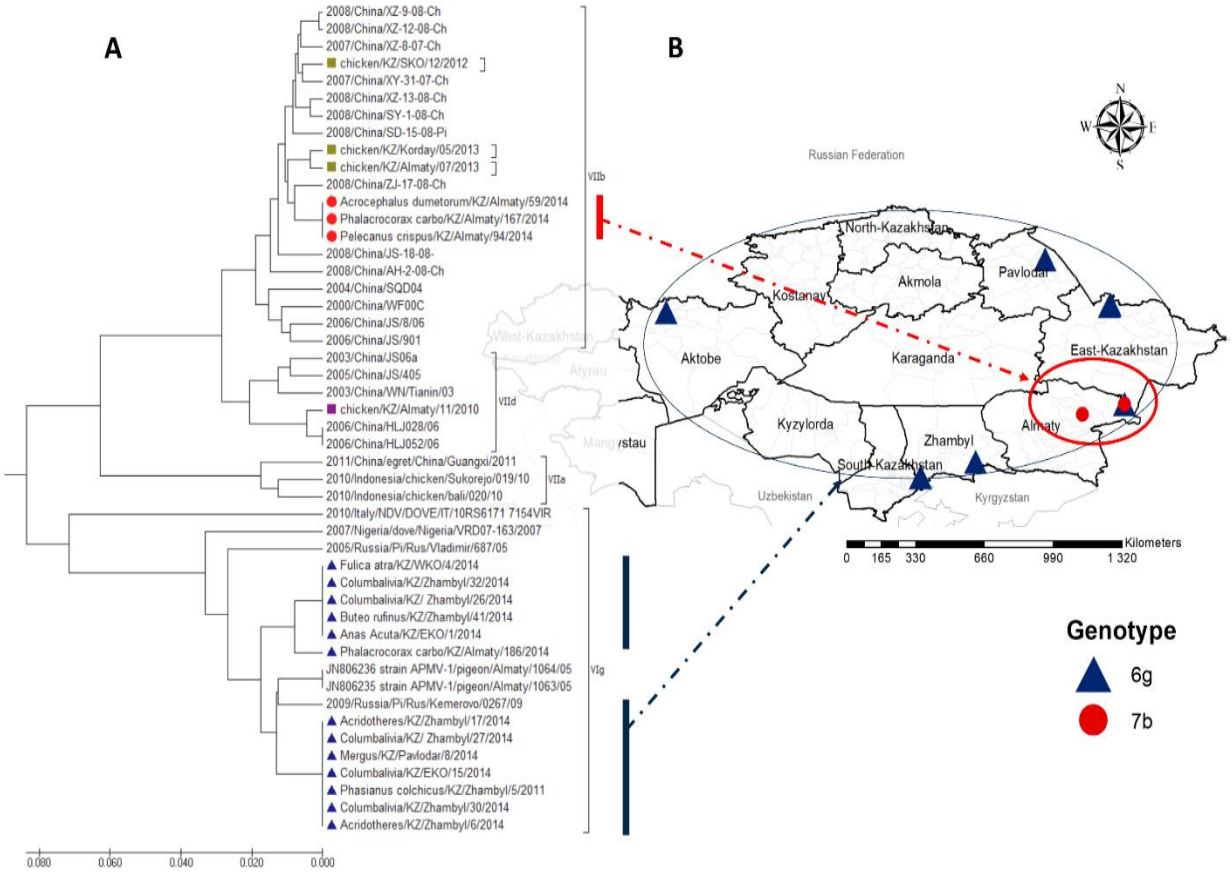

Figure 2 – Genetic diversity of Newcastle disease viruses isolated from wild birds in Kazakhstan

It has also been shown that ND viruses isolated from dead vaccinated poultry farm birds belong to genotype VIId. Virus isolates isolated from unvaccinated birds in private farmsteads in Almaty, Zhambyl and North Kazakhstan regions were classified as genotype VIIb.

Our data show that, despite the geographical remoteness of the outbreaks, the same genotypes circulate in northern Kazakhstan as in the southern regions of the country. These data confirm that each genetic group has its own geographical range, and its distribution is possibly related to the migration routes of wild birds.

Discussions

The results of studies to determine the immune status to the ND virus show that on average 50% and more than 80% of birds from private farmsteads and poultry farms in the Kostanay, Akmola, Turkestan and North Kazakhstan regions (80%) have antibodies to the BN virus in their blood serum, and in the Zhambyl, Kyzylorda, West Kazakhstan, Almaty and Abay regions the percentage of immune birds is within 55-72.1%, and in the Aktobe and Atyrau regions 1-32% of birds have antibodies to the ND virus. It is likely that in these regions the poultry population is not being fully vaccinated.

Previous isolation studies have been conducted to determine ND virus subtypes. It was established that the virus isolates isolated from unvaccinated birds in private farmsteads in the Almaty, Zhambyl and North Kazakhstan regions were classified as genotype VIIb.

Such monitoring and diagnostic studies will be continued annually and based on the results, recommendations will be made for the country's veterinary service in the fight and planning of IEM in ND.

Conclusions

Therefore, the spread of ND in Kazakhstan requires veterinary services to develop effective disease control measures, taking into account data from serological analysis and molecular epidemiology.

Monitoring paramyxoviruses in wild and domestic birds in their natural habitats will increase our knowledge of the epidemiology, ecology and genetic relationships of these viruses and will enable us to assess the risk of virus transmission between domestic and wild birds. This knowledge will facilitate the assessment of risks to poultry and wild bird populations, as well as provide information about currently circulating viruses. Therefore, continued surveillance of paramyxoviruses among wild and poultry populations in Central Asia and Kazakhstan is strongly recommended.

**The article is written based on the results of research obtained within the framework of the scientific and technical program "Biological safety of the Republic of Kazakhstan: threat assessment, scientific and technical foundations for their prevention and elimination" for 2021-2023.*

Acknowledgment: The authors express their gratitude to the head and all the executors of the scientific and technical program "Biological safety of the Republic of Kazakhstan: threat assessment, scientific and technical foundations for their prevention and elimination" for 2021-2023 for their support in obtaining research results for the preparation of this article.

Conflict of interest: The authors have no conflict of interest in publishing materials in the article.

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ИММУННЫЙ СТАТУС ДОМАШНЕЙ ПТИЦЫ К ВИРУСУ БОЛЕЗНИ НЬЮКАСЛА В КАЗАХСТАНЕ

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Аннотация. Возбудители вирусных заболеваний птиц широко распространены в природе. Распространение болезни Ньюкасла среди диких и домашних популяций птиц требует от ветеринарных служб принятия мер по разработке эффективных мер борьбы на основе молекулярно-эпидемиологических данных.

В статье представлены данные мониторинговых исследований по БН в различных регионах Казахстана. Сбор образцов от домашней и дикой птицы проводился в частных подворьях разных областей Казахстана.

С целью определения иммунного статуса птиц в индивидуальных хозяйствах и птицефабриках нами были проведены исследования на наличие антител к вирусу болезни Ньюкасла среди птиц.

Установлено, что что в сыворотках крови у 82,3 % птиц частных подворий и птицеводческих хозяйств имеются антитела к вирусу БН. В Костанайской, Акмолинской, Туркестанской и Северо-Казахстанской областях процент иммунных птиц выше 80 %, Жамбылской, Кызылординской, Западно-Казахстанской, Алматинской и Абайской процент иммунных птиц в пределах 55-72,1 %.

В Актюбинской и Атырауской областях 1-32 % птиц имеют антитела к вирусу БН. Вероятно в данных областях птиц вакцинируют не охватывая все поголовье. Риск возникновения БН средний.

Ключевые слова: вирус; болезнь Ньюкасла; подтип; иммуноферментный анализ; мониторинг.

ҚАЗАҚСТАНДАҒЫ ҮЙ ҚҰСТАРЫНЫҢ НЬЮКАСЛ АУРУЫНА ИММУНДЫҚ МӘРТЕБЕСІ

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Аннотация. Құстардың вирустық ауруларының қоздырғыштары табиғатта кең таралған. Ньюкасл ауруының жабайы және үй құстары популяциясы арасында таралуы ветеринариялық қызметтерден молекулярлық эпидемиологиялық деректер негізінде тиімді күрес шараларын әзірлеу үшін шаралар қабылдауды талап етеді.

Мақалада Қазақстанның әртүрлі аймақтарындағы Ньюкасл ауруы бойынша мониторингтік зерттеулердің деректері берілген. Үй құстары және жабайы құстардан сынамаларды алу Қазақстанның әртүрлі аймақтарындағы жүргізілді.

Жеке шаруашылықтар мен құс фабрикаларындағы құстардың иммундық жағдайын анықтау мақсатында құстардың қанында Ньюкасл ауруы вирусына қарсы антиденелердің болуына зерттеулер жүргіздік.

Жеке шаруашылықтар мен құс фабрикаларының құстарының 82,3% қан сарысуында BN вирусына қарсы антиденелер бар екені анықталды. Қостанай, Ақмола, Түркістан және Солтүстік Қазақстан облыстарында иммундық құстардың үлесі 80%-дан жоғары болса, Жамбыл, Қызылорда, Батыс Қазақстан, Алматы және Абай қалаларында иммундық құстардың үлесі 55-72,1%-ды құрайды.

Ақтөбе және Атырау облыстарында құстардың 1-32 пайызында Ньюкасл ауруы вирусына қарсы антиденелер бар. Бұл аймақтарда құстарға бүкіл популяцияға вакцина салынбаған болуы мүмкін. Ньюкасл ауруы даму қаупі орташа.

Негізгі сөздер: вирус; Ньюкасл ауруы; иммуноферменттік талдау; бақылау.