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ANALYSIS OF THE SEROLOGICAL INVESTIGATION RESULTS OF AUJESZKY'S DISEASE AMONG SWINE IN UKRAINE DURING 2011–2016

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Summary. This study was aimed to analyze the serological diagnostics of Aujeszky's disease among swine in Ukraine. The article presents data on serological studies of blood sera samples from swine for the presence of specific humoral antibodies against the Aujeszky's disease virus during six years (2011–2016).

The visual mapping and statistical analysis were conducted by using GIS technologies through software 'ESRI ArcGIS 10.1'. The research for the presence of specific humoral antibodies against Aujeszky's disease virus in blood sera from domestic swine was performed by enzyme-linked immunosorbent assay (ELISA) using test system IDEXX Herd®PRV gI Antibody Test Kit.

During the period 2011–2016, 9,026 blood sera samples from swine were studied and in 2,277 were received positive reactions against Aujeszky's disease (antibodies were detected in 25.2% animals from the total number of investigated swine). The monitoring investigations have covered all regions of Ukraine. For this period, 331 farms were examined and 103 of them turned disadvantage to Aujeszky's disease, which amounted to 31.1%.

During the analyzed period, the largest number of blood sera samples from swine were investigated in three regions: Dnipropetrovsk (1,789 samples), Kyiv (1,647 samples) and Donetsk (1,215 samples) oblasts. At the results of serological monitoring, it was established that the highest seroprevalence to Aujeszky's disease was registered in four oblasts: Kirovohrad — 57.1%, Kherson — 52.2%, Kharkiv — 49.3% and Sumy — 47.6%. Antibodies to the virus were not detected in this species of animals from Ivano-Frankivsk, Luhansk, Rivne and Khmelnytsk oblasts.

The obtained data of serological research allow us to approve that the causative agent of Aujeszky's disease circulates among the swine herds in Ukraine.

Keywords: Aujeszky's disease, swine, monitoring, mapping, antibody

Introduction. Aujeszky's disease usually called pseudorabies in USA is a highly contagious viral disease in swine that occurs in the form of epizootic and sporadic cases. It is an economically important disease that may cause significant losses for livestock farms, especially in countries with intensive development of swine and fur animals breeding (Pomeranz, Reynolds and Hengartner, 2005; Tong et al., 2015). It is caused by Aujeszky's disease virus (Suid Herpesvirus 1), that belong to the family Herpesviridae, subfamily Alphaherpesvirinae, genus Varicellovirus (Verpoest, Cay and De Regge, 2014; Moreno et al., 2015).

Scientists from different countries pays a great attention to the pathology of pseudorabies from the perspective of a separate disease or associated with other different forms of manifestations in the industrial swine breeding (Maes et al., 2000).

The lethal cases of this disease occur mainly in piglets. In mature swine, Aujeszky's disease is accompanied by establishing a lasting or lifelong virus carrying. With increasing the age of animal, manifestation of clinical signs is decreasing. In fattening and breeding swine, pseudorabies often characterized by respiratory syndrome (cough, dyspnea, fever, upper respiratory tract and lungs lesions). Swine that have recovered, are latently infected and the main reservoir of the virus and the source of infection (Verpoest et al., 2016).

Because of the variety of Aujeszky's disease forms, the laboratory confirmation of the diagnosis is a prerequisite for suspected in all cases (Vrublevskaya et al., 2016).

Nowadays, thanks to numerous scientific research of this disease, become clear issues of the pathogenesis, clinical and pathological-anatomical features, specificity of immunity and common complex of preventive measures. But at the same time in opinion of most leading experts on the study of Aujeszky's disease, to effective control it's need to constantly conduct monitoring investigation farm animals and wild boars, synanthropic rodents and natural foci residents (Sytyuk, 2011; Pannwitz et al., 2012; Elbers et al., 2000; Ruiz-Fons et al., 2007).

At the modern stage, one of the main directions of epizootic monitoring of natural focal infections is to define enzootic territories with pathogens circulation, including Aujeszky's disease. It should be emphasized, that the monitoring research of Aujeszky's disease in swine are an integral part of the strategy to combat and eliminate the causative agent of this disease.

Materials and methods. The goal of the work was to conduct analysis of the serological investigation

results of Aujeszky's disease among swine on the territory of Ukraine for the period 2011–2016.

Laboratory studies of blood sera samples from swine were carried on basis of serological laboratory 'Center of Veterinary Diagnostics' (Kyiv). The analysis of the serological investigation results was conducted during 2011–2016. Blood sera samples were collected from all regions of Ukraine.

The visual mapping and statistical analysis were conducted by using GIS technologies through software 'ESRI ArcGIS 10.1'.

The research for the presence of specific humoral antibodies against Aujeszky's disease virus in blood sera from domestic swine was performed by enzyme-linked immunosorbent assay (ELISA) using test system IDEXX Herd®PRV gI Antibody Test Kit. This test system is discriminatory. It helps to differentiate between infected and latently infected animals from vaccinated livestock after using marked gE-negative vaccine against Aujeszky's disease.

Results and discussions. During the period 2011–2016, 9,026 blood sera samples of swine were studied and in 2,277 were received positive reactions against Aujeszky's disease (antibodies were detected in 25.2% animals from the total number of investigated swine). The obtained results of serological investigation of blood sera samples from swine are summarized and shown in Table 1 and on Fig. 1.

Table 1 — The results of serological investigation of blood sera samples from swine on the presence of specific humoral antibodies against Aujeszky's disease

Indicator	The years of research					
	2011	2012	2013	2014	2015	2016
The number of investigated regions	23	22	17	20	20	15
The number of identified disadvantaged regions	16	12	8	8	7	2
The number of investigated farms	80	77	49	54	46	25
The number of identified disadvantaged farms	35	28	15	11	10	4
The number of investigated animals	2270	2255	1510	1176	1180	635
The number of positively reacting swine	882	782	255	132	154	72
Percentage of positive reactions from investigated swine, %	38.8	34.7	16.9	11.2	13.0	11.3

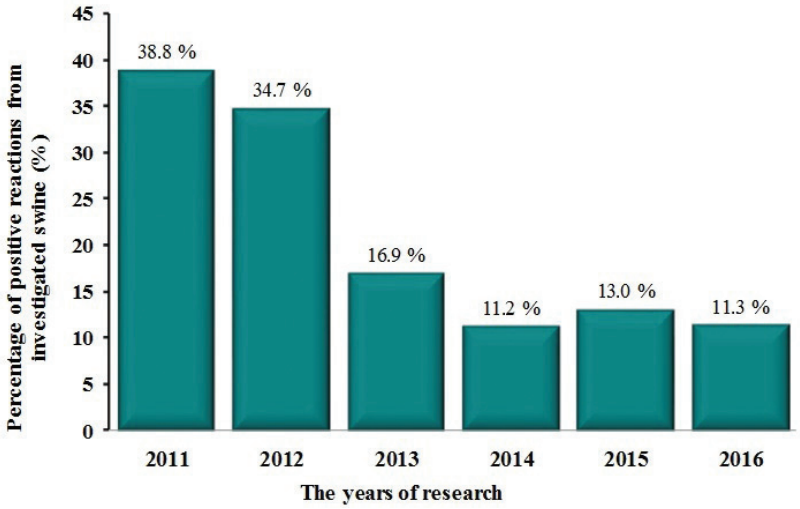

Figure 1. The dynamic of seroprevalence among swine to virus of Aujeszky's disease on the territory of Ukraine during 2011–2016

As shown on Fig. 1, seropositivity in swine herds to this disease for the analyzed period was the highest in 2011 and 2012 — respectively, 38.8% and 34.7% and the lowest in 2014 and 2016 — 11.2% and 11.3%, respectively. In 2013 there was a slight decrease in the number of positively reacting swine. Their number in comparison with the previous year decreased by 17.8%. In general, for the analyzed period from 2011 to 2016, there had observed a steady trend to reduce the incidence of seropositivity in swine to Aujeszky's disease.

The blood sera samples from swine for serological investigation were collected from all regions of Ukraine. For the analyzed period during 2011–2016, the largest number of regions were surveyed in 2011, 2012, 2014, and 2015 — 23, 22, 20, and 20 regions, respectively.

The obtained data volumes of swine serological diagnostic, in detecting specific humoral antibodies against Aujeszky's disease in the context of Ukraine regions, are shown on Fig. 2.

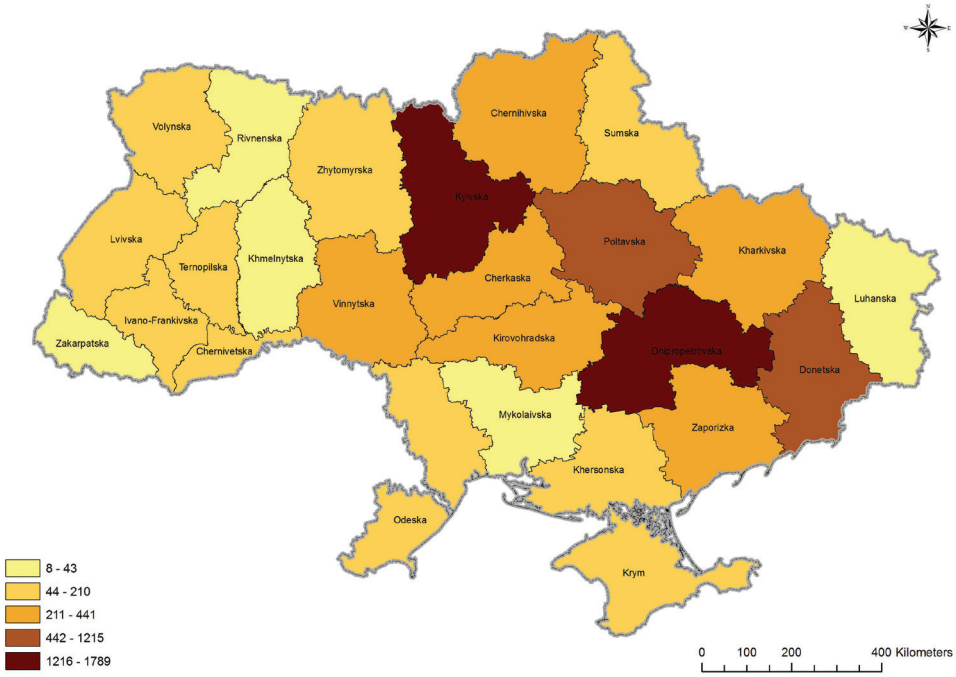

Figure 2. The number of investigated blood sera samples from swine on antibodies presence against Aujeszky's disease virus during 2011–2016

Analysis of obtained data on Fig. 2 shows, that monitoring investigations have covered all regions of Ukraine. For the period 2011–2016, the largest number of blood sera samples from swine were investigated in three oblasts: Dnipropetrovsk (1,789 samples), Kyiv (1,647 samples) and Donetsk (1,215 samples). The smallest amount of samples were investigated from the following oblasts: Volynsk (91 samples), Ternopil (88 samples), Ivano-Frankivsk (78 samples), Mykolaiv (43 samples), Luhansk (30 samples), Zakarpattia (24 samples), Khmelnytsk (22 samples) and Rivne (8 samples).

During the analyzed period the volumes of serological research were constantly decreasing: 2011 — 2,270 blood sera samples from swine, 2012 — 2,255 samples, 2013 — 1,510 samples, 2014 — 1,176 samples, 2015 — 1,180 samples, 2016 — 635 samples. For these years, 331 farms were examined and 103 of them turned disadvantage to Aujeszky's disease, which amounted to 31.1%. The percentage of identified disadvantaged farms for analyzed period was varied within the limits from 16.0% in 2016 to 43.7% in 2011.

The results of serological monitoring during 2011–2016 for the presence of specific humoral antibodies against Aujeszky's disease virus in blood sera from domestic swine in the context of Ukraine regions, are shown in absolute indicators (number of seropositive swine) on Fig. 3.

According to data on Fig. 3, the largest number of positive blood sera samples from swine to Aujeszky's disease in Ukraine were detected in Dnipropetrovsk oblast — 643. The significant number of positive samples were registered in five oblasts: Donetsk — 270 samples, Kirovohrad — 252, Kyiv — 231, Kharkiv — 178, Zaporizhia — 130. In oblasts such as the following: Sumy, Chernihiv, Cherkasy, Kherson, Lviv, AR Crimea, Vinnytsia, Poltava, Ternopil, Volyn, Mykolaiv, and Odesa the number of identified positive blood sera samples from swine were 100, 90, 78, 59, 49, 47 37, 31, 30, 24, 16, and 9, respectively. In Zhytomyr, Zakarpattia

and Chernivtsi oblasts were detected only one positive sample in each. Antibodies against the disease were not detected in Ivano-Frankivsk, Luhansk, Rivne, and Khmelnytskyi oblasts.

The indicators of swine seroprevalence to Aujeszky's disease virus in the context of Ukraine regions for the period 2011–2016 are presented as map (Fig. 4).

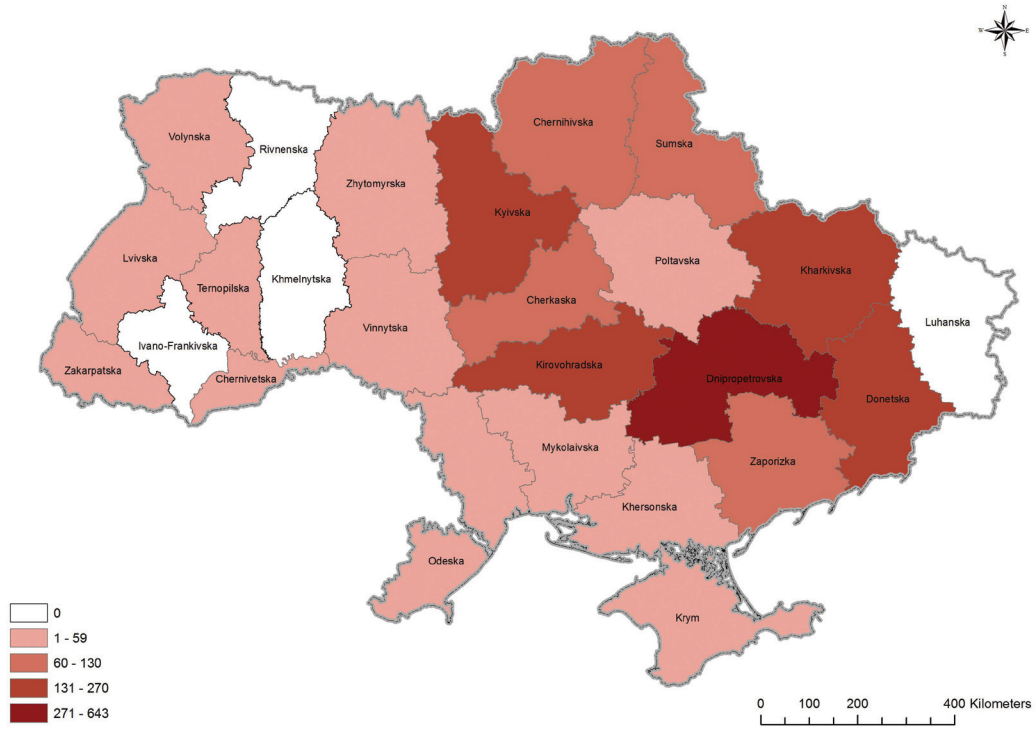

Figure 3. Map of density the number of seropositive swine to Aujeszky's disease virus on the territory of Ukraine during 2011–2016

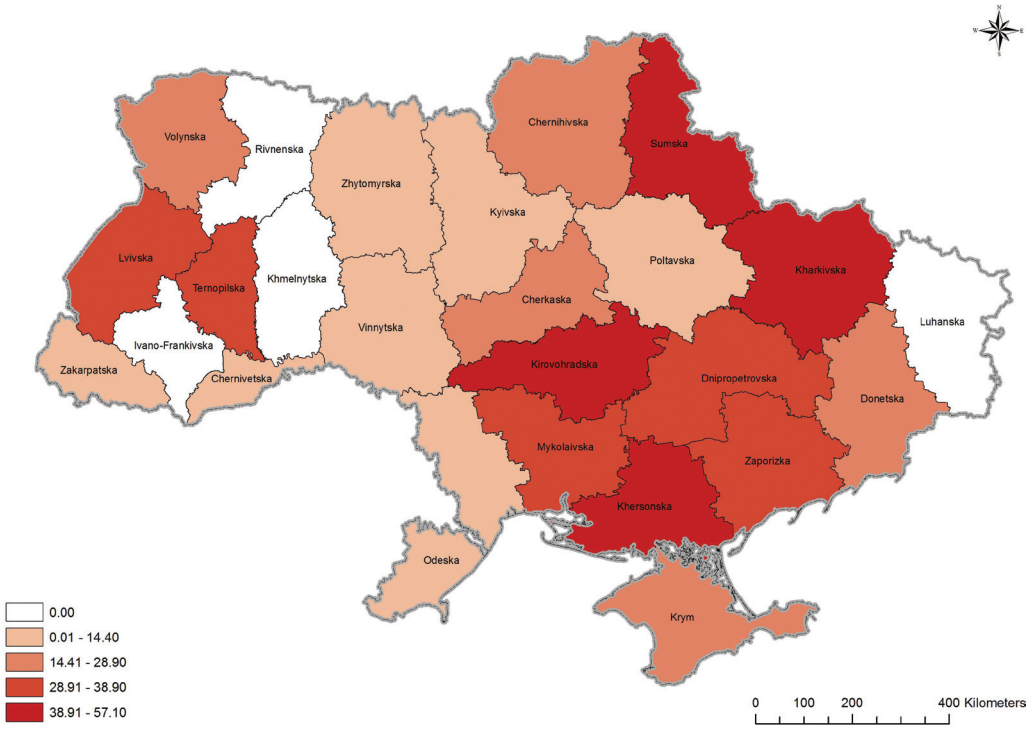

Figure 4. The cartographic analysis of swine seroprevalence to Aujeszky's disease virus on the territory of Ukraine by results of serological monitoring during 2011–2016

As shown on Figure 4, the highest indicators of swine seroprevalence to Aujeszky's disease were registered in four oblasts: Kirovohrad — 57.1%, Kherson — 52.2%, Kharkiv — 49.3% and Sumy — 47.6%. In Lviv, Mykolaiv, Dnipropetrovsk, Ternopil, Zaporizhia, Chernihiv, Volyn, Cherkasy, Donetsk, Vinnytsia, Kyiv oblasts and AR Crimea the percentages of positive blood sera from the total number of investigated swine were 38.9, 37.2, 35.9, 34.1, 34.0, 28.9, 26.4, 25.5, 25.0, 22.2, 14.4 and 14.0%, respectively. Insignificant percentages of the positively reacting swine were detected in Odesa (7.2%), Zakarpattia (4.2%), Poltava (3.5%), Chernivtsi (1.0%), and Zhytomyr (0.6%) oblasts. Specific antibodies to Aujeszky's disease were not diagnosed in animals from Ivano-Frankivsk, Luhansk, Rivne, and Khmelnytsk oblasts.

Conclusions. According to the results of serological monitoring of Aujeszky's disease among swine in Ukraine during six years, it was established that the overall rate of seroprevalence — 25.2% from the total number of investigated animals. In the context of years it was 38.8% in 2011, in 2012 — 34.7% in 2013 — 16.9%, in 2014 — 11.2%, in 2015 — 13.0% and in 2016 — 11.3%.

The obtained data of serological research allowus to approve that the causative agent of Aujeszky's disease circulates among the swine herds in Ukraine.

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