The data present the prevalence of leptospirosis in cattle on the territory of Ukraine over the last eight years (2005-2012) and the dynamics of changes of the etiological structure of the agent. Territorial diffusion of leptospirosis outbreak has also been studied.

The outbreaks’ density map was completed based on these data, depending on the number of cases in cattle. All areas of the country were divided into risk of infection four zones: low, medium, high and extra high risk.

Key words: Leptospira, Leptospirosis in cattle, epizootology, etiological structure, micro-agglutination test

Introduction / Uvod

Leptospirosis is a anthropozoonosis natural focal infection, which is characterized by transient fever, symptoms of anemia, jaundice, necrosis of the mucous membranes and skin, bloody urine, atony of the gastrointestinal tract of animals and weight loss, abortion and birth of non-viable offspring. Sustainable livestock development is prevented by many infectious diseases, including leptospirosis, which is still one of the most common anthropozoonosis infection in many coun-
ttries and in Ukraine in particular. Knowledge of serotypes structure of leptospirosis is a theoretical basis to determine the role of individual serotypes of leptospires in infectious diseases and the development of effective tools for diagnosis and prevention of disease, by identifying the sources and reservoirs of pathogenic leptospires.

The maintenance hosts of leptospires of the one serovar can be animals of different species, and vice versa, in animals of one species can parasitize leptospires of different serovars and serogroups. For many of them this animal species is a casual host. In addition, in different zones the reservoir of leptospires of the same serovar can be different species of animals (Musaev, 1959; Nikolaev, 1963; Nakonechna, 2002).

Epizootological studies on leptospirosis in disadvantaged households indicate that the main source of pathogen is sick and recovering animals which can spread leptospires from 1.5 to 2 years. Healthy animals are infected through infected water, forage, pasture, soil, litter, and other factors of transmission.

In cattle the disease has an acute form and often result in mortality. In one part of cattle the disease causes abortion, but in another one it goes in asymptomatic form. The situation is complicated by the fact that in recent years leptospirosis in cattle is asymptomatic and often diagnosed on the basis of positive results of serological tests. Animals with asymptomatic disease remain carriers of leptospires for a long time and spread the disease among susceptible animals and humans (Romanyuk, 2006).

The results of the Ukrainian veterinary laboratory tests on leptospirosis during 2007-2009 showed that on the territory of the country among the cattle the dominant serological groups of Leptospires are Hebdomadis – 15,5% and Sejroe – 12,0%. Positive results on the other serogroups are rare: Tarassovi – 4,2%; Grippotiphora – 3,5%; Icterohaemorrhagiae – 2,9%; Australis – 2,3%; Pomona – 1,5%; Canicola – 1,4%. It is extra high amount of the positive tests with several serogroups of leptospires (cross reactions) at the same time, and that is 56,7% from the total number of the positively responding animals (Ukhovskyi, 2010).

The diversity of Leptospire changes periodically according to the results of serological tests in cattle on leptospirosis on the territory of Zhytomyr region (Zh.V. Romanyuk, 2006). The dominant serogroups in 1998-2000 years were Sejroe, Hebdomadis and Icterohaemorrhagiae; in 2001-2002 – Sejroe and Hebdomadis, Icterohaemorrhagiae and Grippotiphora, but in 2003-2005 – Sejroe, Hebdomadis. Quantity of positively responding animals with two leptospirosis antigens increased periodically in 2001-2002 years was 3,4%; 2003 – 11,5%; 2004 – 17,7% and 2005 – 19,5% of animals (Romanyuk, 2006).

On the territory of the Republic of Dagestan the dominant position in etiology of the disease in cattle refers to serogroups of leptospires Hebdomadis – 35,5%, Sejroe – 21,8% and Grippotiphora – 11,7% (Aydiev, 2003).
In Russia most common serogroups of leptospires in cattle are Sejroe, Hebdomadis, Pomona, Grippotyphosa, Tarassovi (Malakhov, 2000). In rare cases, there are Canicola and Icterohaemorrhagiae. Abroad, other than the above serogroups, there are Australis and Autumnalis – Japan (Nakamura, 2001; Koizumi, 2012; Tsuchimoto, 1983); Batavia – China and Cuba (Lin, 1993; Hernández 2005); Pyrogenes (serovar zanoni) – Australia (Slack, 2006).

There are many reports on the study of aspects of regional epizootiology, the etiologic structure of leptospirosis of animals on the territory of Community of Independent States and based on these data general stages of development, progress, the structure of leptospirosis of this genus of animals are established.

Nevertheless, because of steady increasing of the number of serovars and serogroups of leptospires, isolation and identification of new strains that are extracted from animals, human and environment, there is a need to monitor changes of epizootic features of this infection constantly.

Purpose of this research is to provide analysis on the epizootic situation of leptospirosis in cattle in Ukraine and to study the dynamics of changes of etiologic structure of pathogen. To identify the most common serogroups of leptospires circulating in the country during 2005-2012 and to explore the territorial diffusion of leptospirosis outbreak among the cattle of the country for current period.

Material and methods / Materijal i metode rada

Etiological structure of leptospirosis of cattle was analyzed according to reports of the State Scientific-Research Institute of Laboratory Diagnostics and Veterinary Sanitary Expertise during 2005-2012 years.

Eight diagnostic strains of leptospires are used in serological studies on leptospirosis in cattle that are made by veterinary laboratories in Ukraine. These diagnostic strains are the most widespread on the territory of the country and belong to eight serological groups of leptospires. These strains are Canicola, Grippotyphosa, Hebdomadis, Icterohaemorrhagiae, Pomona, Sejroe, Tarassovi and Australis.

Results and Discussion / Rezultati i diskusija

During 2005-2012, 1834316 samples of sera of cattle were investigated by veterinary laboratories of Ukraine and 109567 positive samples of leptospirosis in cattle were received. These summarized results of sera of cattle studied by the micro-agglutination test (MAT) are presented in Fig. 1 and Fig. 2. Analysis of the results of research indicates extensive circulation of leptospirosis among cattle herds in Ukraine as evidenced by the percentage of positively responding to MAT cattle is 6.0% of the studied samples.
Figure 1. Dynamics of leptospirosis infection in cattle in Ukraine (2005-2012) / Slika 1. Dinamika infekcije leptosipiroze kod goveda u Ukrajini (2005-2012)

Figure 2. Dynamics of the etiological structure of leptospirosis in cattle on the territory of Ukraine in the period 2005 – 2012. / Slika 2. Dinamika etiološke strukture leptosipiroze kod goveda na teritoriji Ukrajine u periodu 2005-2012.
As shown in Fig. 1 leptospirosis infection in cattle for the analyzed period was the highest in 2005 – 8.6%, the lowest in 2012 – 3.6%. During the period from 2005 to 2012, there has been a tendency to reduce cases of leptospirosis infection in cattle with an average of 0.6% per year.

During the research period we have seen a steady increase in the incidence of infection of cattle by serogroup of leptospires Australis – from 0.1% in 2007 year (this year serogroups Australis was included to the panel of the diagnostic strains of Leptospires in Ukraine) up to 7.6% in 2012 year, and a gradual decrease of infection in serogroup Icterohaemorrhagiae – Fig. 2.

Generally in Ukraine among the cattle dominant serological groups of leptospires are: Hebdomadis – 12.4% and Sejroe – 10.9%. Positive tests with other serogroups of leptospires are observed less frequently: Tarassovi – 4.8%; Icterohaemorrhagiae – 3.4%; Grippotyphosa – 2.2%; Australis – 1.9%; Pomona – 1.2%; Canicola – 0.9%. A high number of positive tests at once were with several serogroups of leptospires for the observed period (cross tests), it is 62.5% from the total number of the positively responding animals (Fig. 3).

![Figure 3. Etiological structure of leptospirosis in cattle in Ukraine (2005-2012)](image)


Based on analyses, data map of leptospirosis density outbreaks in cattle was compiled in Ukraine over the last eight years (2005-2012). It is on Figure 4. On this map all regions of the country were divided into four zones of risk of infection: low, medium, high and extra high.

There are five regions of the extra high risk of infection: Donetsk, Sumy, Mykolaiv, Cherkasy, Kharkiv. The total number of outbreaks in cattle is 61.8% in that zone. Limit values for this zone are Donetsk – 15.6% and Kharkiv – 8.8% of outbreaks of leptospirosis in cattle. A very high probability of leptospirosis in cattle herds is for areas that are in this zone.
There are five regions of high risk of infection: Odesa, Vinnytsia, Volyn, Chernihiv and Dnipropetrovsk. The total number of outbreaks in cattle is 23.6% in that zone. Limit values for this zone are Mykolaiv – 5.7% and Dnipropetrovsk – 4.1% outbreaks.

There are eight regions of medium risk of infection: Kherson, Zhytomyr, Poltava, Zaporizhzhia, Kyiv, Rivne, Ternopil and Luhansk. The total number of outbreaks in cattle is 12.0% in that zone. In this zone the highest number of outbreaks is in Kherson – 1.9%, and the lowest are in Luhansk – 1.1%.

In such regions like Ivano-Frankivsk, Chernivtsi, Kirovohrad, AR Crimea, Khmelnytskyi, Lviv and Zakarpattia there were the lowest number of outbreaks with positively responding animals of leptospirosis in cattle for the last eight years. That is why these regions are in the low zone of risk of infection. The total number of outbreaks is 2.6% in this zone. Within the data for this zone, the highest number of outbreaks is in the Ivano–Frankivsk region – 0.7%, and the lowest is (in that region and in general in Ukraine) in Lviv 0.1% of outbreaks of the total number of the positively responding cattle in 2005–2012 years. In Zakarpattia there were not positive tests of leptospirosis in cattle during the analyzed period.
Conclusion / Zaklučak

Leptospirosis in cattle is widespread on the territory of Ukraine. Average rate of leptospirosis infection in cattle is 6.0% of the studied samples in eight years (2005-2012). Dominant serological groups of leptospires are Hebdomadis – 12.4% and Sejroe – 10.9% that are circulating among the cattle herds on the territory of Ukraine. Such serogroups of leptospires as Tarassovi and Icterohaemorrhagiae have a minor role in etiology of leptospirosis in cattle and the rates are 4.6% and 3.4% respectively. Other serogroups of leptospires do not play a great role in etiology of the disease in cattle. We found a constant increased number of cases of infection in cattle with leptospires serogroup Australis. The map of density cases of infection in cattle was made of all regions of the country, in which there are shown the zones of risk infection with low, medium, high and extra high risks. Analysis of etiological structure of leptospirosis in cattle is needed for further improvement of the methods of leptospirosis diagnostics, development and improvement of vaccines against leptospirosis for this species.

Literatura / References

PREVALENCIJA I RASPROSTRANJENOST SEROTIPOVA LEPTOSPIRA KOD GOVEDA U UKRAJINI

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Epidemiološka karta izrađena je na bazi ovih podataka, u zavisnosti od broja slučajeva kod goveda. Cela teritorija države podeljena je na četiri zone rizika od infekcije: nizak, srednji, visok i veoma visok rizik.

Ključne reči: Leptospira, leptospiroza goveda, epizootiologija, etiološka struktura, mikroaglutinacioni test

ПРЕВАЛЕНТНОСТЬ И РАСПРОСТРАНЁННОСТЬ СЕРОТИПОВ ЛЕПТОСПИРОВ У КРУПНОГО РОГАТОГО СКОТА В УКРАИНЕ

Ukhovskyi V. V., Kucheryavenko O. O., Куликова В. В., Алексеева Г. Б., Gerilovych A. P., Недосеков В. В., Потконяк А.

Результаты показывают превалентность лептоспироза у крупного рогатого скота в Украине, для периода последних восьми лет (2005-2012) и динамику изменения серотипов возбудителя. Испытана и географическая распространённость появления лептоспироза.

Эпидемиологическая карта сделана на базе этих данных, в зависимости от числа случаев у крупного рогатого скота. Целая территория государства разделена на четыре зоны риска от инфекции: низкий, средний, высокий и очень высокий риск.

Ключевые слова: Лептоспира, лептоспироз крупного рогатого скота, эпизоотология, этиологическая структура, микроаглютинационный тест