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ECOLOGICAL CONDITIONS ON THE TERRITORY OF MYKOLAIV REGION AS AN ARENA OF LEPTOSPIRA ENZOOTIC CIRCULATION

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Abstract. *The article presents the results of the analysis of long-term (1961-2022) situation with leptospirosis in Mykolaiv Region in its epizootic manifestation, which was considered from the standpoint of the general ecological role of pathogenic leptospira in natural and disturbed ecosystems. Taking into account the climatic, landscape and soil specifics of the Lower Pobuzhzhia Region, an attempt was made to assess the dependence of the location and functioning of different types of infection sources in the region, which has been transformed into an almost continuous agricultural landscape. The stability of pathogenic leptospira circulation in the northwestern part of the region, located on the spurs of the Podilska Upland, with sufficient precipitation (450-480 mm/year) and the presence of powerful full-profile chernozems with a high humus content and neutral or slightly alkaline pH, was confirmed. The epizootic analysis of the situation with leptospirosis in livestock production in Mykolaiv Region shows that there is a direct correlation between the total number of farm animals and the frequency of seropositive individuals among them. Against the background of climatic instability in 2010-2022, significant changes in the serogroup structure of pathogens from natural sources of leptospirosis were detected, due to a sharp decrease in the activity of field foci of the "watering type" (associated with Grippotyphosa strains), partial elimination of circulation circles of Icterohaemorrhagiae strains (supported by water-borne rodents) and the absence of migration of strains of the serogroups Hebdomadis, Sejroe, Bataviae, Australis with the simultaneous elimination of farm enzootic foci of Pomona and Tarassovi.*

Keywords: zoonotic leptospirosis, natural hosts of leptospira, foci of leptospirosis of steppe-field type, serogroup structure of antibodies to leptospira.

Introduction. The Lower Pobuzhzhia, located in the central part of the North-Western Black Sea region, is now entirely part of the administrative territory of Mykolaiv Oblast, which, with its predominance of flat steppe landscapes, also contains various types of azonal complexes (estuaries, rivers, floodplains, forest-shrub and gully-forest areas, salt marshes, etc.), expanded by field, artificial forest and urban facilities of the recent past [1-4]. All of this has its reflection in the diversity of biotic complexes and the associated nosological

structure of natural and community infections, with a high level of epidemic and epizootic tension for leptospirosis. The steppe rivers, the valleys of the Southern Bug and its tributaries, as well as irrigated farming areas have a particularly high potential as an arena for its manifestation [5,6].

Material and methods. The results of long-term (1961-2023) laboratory studies of leptospirosis in the Mykolaiv Region, reflected in the state institutions and organisations reports for this period were used as the main materials.

Research results and discussion. Based on the reporting materials of the Main Directorate of the State Service of Ukraine for Food Safety and Consumer Protection in Mykolaiv Oblast in recent years, a detailed analysis of the long-term situation with leptospirosis in livestock production was carried out. The results of the analysis indicate that there is a direct correlation between the total number of farm animals and the frequency of seropositive individuals among them. At the same time, the indices of seropositive individuals during the period of high livestock numbers (1971-1993) and during its rapid decline (1994-2008) show a clear dynamics that clearly depends on the culture of livestock husbandry and veterinary care of animals (Fig. 1).

Thus, in 1971-1979, the livestock industry in the region was undergoing a transition from primitive farms to large farm complexes with a corresponding increase in livestock, which was accompanied by an increase in the circulation of adapted leptospira strains. Strengthening of sanitation and laboratory control of animals in the 1980s (almost at the peak of their number) allowed bringing the situation under control and reducing the proportion of seropositive individuals to a minimum (less than 10%). However, in the 1990s, as the population declined, there was a primitivisation of keeping technologies due to the loss of veterinary control. This was accompanied by a rapid increase in the number of infected animals, especially among cattle on pasture. Furthermore, in 2001-2007, the rapid decline in livestock numbers virtually eliminated enzootic on-farm foci of leptospirosis, which are still sporadically present only in pig production. Seropositive individuals in cattle and horses have so far been associated exclusively with pasture-based transmission from natural sources of infection.

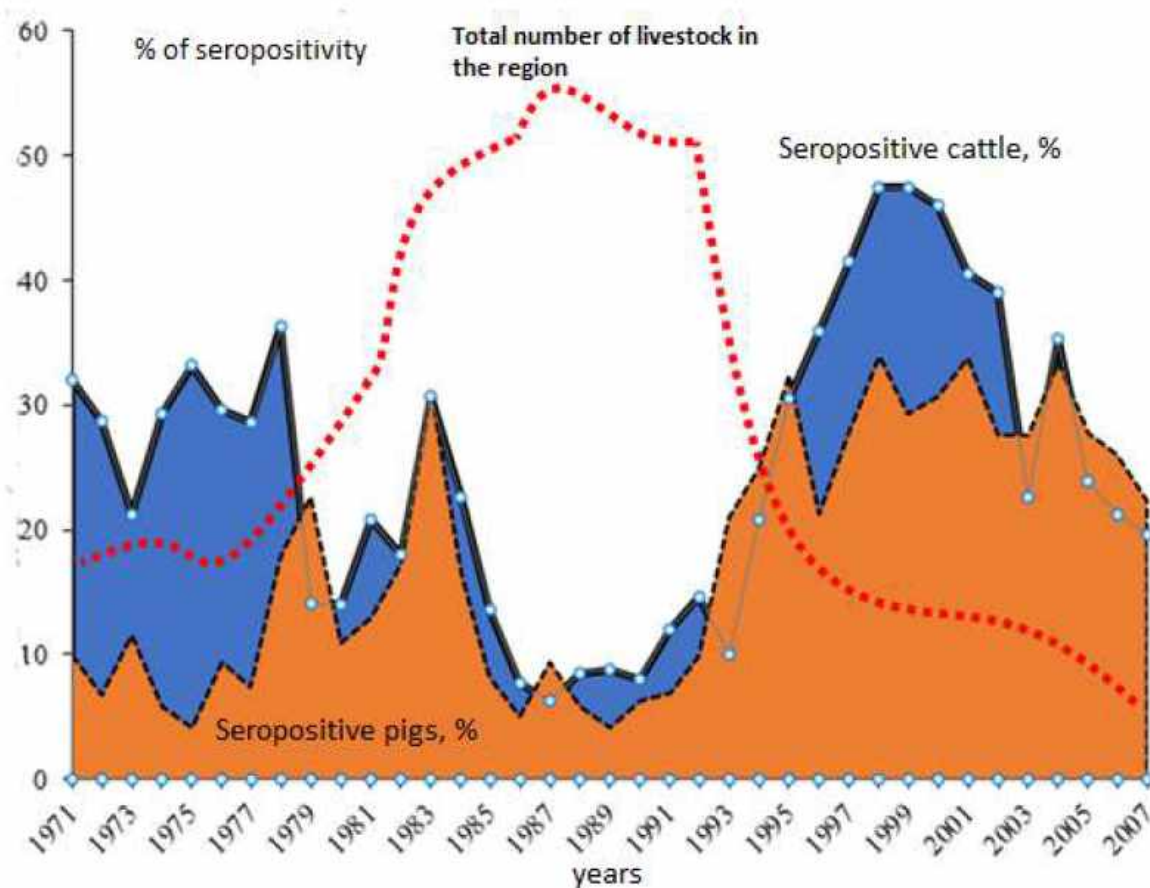


Fig. 1. Long-term dynamics of seropositive animals at the peaks of livestock numbers in the Mykolaiv region in 1971-2008.

The volume of livestock in 2008-2023 in Mykolaiv Region is no more than 10% of the 1991 level, and their coverage by laboratory control does not allow to obtain a statistically reliable sample for assessing the situation. Thus, the results of the analysis of the current situation with leptospirosis in livestock in the Mykolaiv Region (2019-2022) seem to allow it to be assessed as controlled. At the same time, the relatively small volumes of research are not representative, with the total number of cattle in the range of 130 thousand heads, the study of 1.1-2.2 thousand heads is less than 2%. This is much less than the critical mass (10%) of the required coverage. Therefore, given the actual (according to the results of laboratory control) satisfactory situation, the actual local epizootic situation with regard to leptospirosis in the livestock sector of the region may have significant differences. In particular, the influence of natural sources of the pathogen can be traced in the northern and central regions, which are located in the Southern Bug Valley. In the purely steppe arid regions, the proportion of seropositive animals is minimal and essentially random, more likely to be associated with synanthropic sources of leptospores. The general well-being of the southern plains in terms of leptospirosis is confirmed by the negative results of studies of horses and cattle (sheep) grazing in purely steppe landscapes.

Taking into account the main role of strains of the *Icterohaemorrhagiae* serogroup in the epidemic manifestation of leptospirosis

and partially based on the prevalence of pasture sources of infection in cattle and horses in ecologically favourable areas for leptospira circulation in Mykolaiv region, the problem of ecological and epidemiological identification of foci and their type remains open. The summary data on the results of serological control of domestic and wild animals in 2019-2022 demonstrate several important patterns. The first pattern - marked change in the serovar spectrum of leptospira circulating in livestock in 2010-2022. . The period of 2000-2010 was characterised by antibodies to leptospirae *Icterohaemorrhagiae* (the main host is the grey rat) and *Grippityphosa* (the main host is the grey vole) in cattle and horses, and *Pomona* and *Tarassovi* in pigs, the serovar landscape has changed dramatically in recent years. Strains of *Bratislava*, a new serovar for the region and for Ukraine in general, have emerged that were almost absent before.

These changes in strains and serogroups are due to profound changes in the ecological state of the environment, which led to the suppression of some natural foci and the restriction of contact of domestic animals with these infectious sources. No less expressed the variability of the etiological structure of farm foci supported by adapted strains of *Pomona* and *Tarassovi*, which were almost equally widespread among cattle and pigs in the absence of natural sources. Today, they are almost absent, and along with them, serological responses to leptospore strains of the *Hebdomadis*, *Sejroe*, *Bataviae*, *Australis* serogroups have completely disappeared in farm animals. The exact reasons for their disappearance in the serological response are not yet clear; most likely, it was not the leptospira strains themselves that disappeared, but the contact of domestic animals with carriers (house mice, forest mice, voles) of these pathogens that was sharply limited. It is likely that the key role in this phenomenon is played by the normalisation of farming technology, which is accompanied by timely ploughing of fields under crop residues, virtually eliminating the static space for the existence of mouse-like rodents in the fields. Their all-season stations remain forest strips, remnant steppe habitats, gullies, etc., the areas of which are significantly limited in the agricultural landscape. In addition, purely natural steppe-type habitats, lacking sufficient food reserves, cannot maintain the long-term breeding potential of field rodents. The latter, concentrating in natural habitats after ploughing fields, are subjected to strong pressure from terrestrial and aerial predators. Accordingly, migrant rodents moving from ploughing to the surrounding natural habitats, where they graze livestock, are unable to maintain high numbers and active circulation of leptospores in these grain-poor stations. This manifests itself in the blocking of the activity of steppe-field leptospirosis foci and other natural infections.

Conclusions:

1. The current epizootic situation with leptospirosis in livestock production in the region is characterised by a generally controlled state, while maintaining a direct dependence on the ecological and landscape characteristics of the area, the

availability of pastures in hydromorphic habitats, the density and level of concentration of domestic animals.

2. In terms of etiology for the period 2010-2022, significant changes have been identified in the etiology of the disease due to a sharp decrease in the activity of field foci, partial elimination of circulation circles of *Icterohaemorrhagiae* strains in the natural environment, supported by aquatic rodents and the absence of migration of strains of the serogroups *Hebdomadis*, *Sejroe*, *Bataviae*, *Australis* with the simultaneous elimination of farm enzootic foci of *Pomona* and *Tarassovi*.

Prospects for further research are associated with a deeper study of the possible dependencies between the local-spatial dynamics of leptospirosis and the ecological and landscape characteristics of individual areas.

References:

1. I.V. Nakonechnyi, Biotopic features of the ways of leptospira spreading among rodents in the zone of arid steppes of the Northern Black Sea region. 2008. № 2. P. 147-152.
2. Z.M.Nekhoroshyh, H.M.Dzhurtubaeva, N.V.Pylypenko et al. Ecological, epidemiological and socio-economic aspects of zoonotic natural-focal infections in the South of Ukraine. Veterinary medicine. 2015. Issue 101. P.16-20. http://www.jvm.kharkov.ua/sbornik/101/1_4.pdf.
3. O.A. Melnyk et al. The results of studying the components of the lyme potential of naturally occurring focal infections in the Ukrainian Black Sea region. Bulletin of Biology and Medicine. 2019. Issue 2. T.2(151). P. 77-81.
4. V.V Stetsiuk. Ecological geomorphology of Ukraine. K.: Slovo Publishing House, 2010. 367 c.
5. V.V.Nedosekov, V.V. Ukhovsky, O.O. Kucheryavenko. Leptospirosis of farm animals. Kyiv: NuBR, 2011. 139 p.
6. I.V.Nakonechnyi, V.V. Serebriakov. Pathogens of naturally occurring focal infections in ecosystems of the South of Ukraine. Kyiv: Taras Shevchenko National University of Kyiv. 2013. 227 p.

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THE ROLE OF REPRESENTATIVES OF THE GENUS KLEBSIELLA IN THE PATHOLOGY OF UNIFIED HEALTH

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