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**EPIDEMIOLOGICAL SURVEILLANCE OVER TICK-BORNE VIRAL ENCEPHALITIS IN ARKHANGELSK REGION**O.V. Sokolova<sup>1</sup>, I.K. Kovrov<sup>2</sup>, R.V. Buzinov<sup>1</sup><sup>1</sup>Rospotrebnadzor's Office for Arkhangelsk Region, Arkhangelsk, Russia; <sup>2</sup>Center for Hygiene and Epidemiology in Arkhangelsk Region, Arkhangelsk, Russia

In the areas with naturally occurring hot spots, the incidence of tick-borne infections (hereinafter, TBIs) represents one of the challenging issues of medical, social and economic nature. An infection among TBI which is most impactful in Arkhangelsk Region is tick-borne viral encephalitis (hereinafter, TBE).

The study sees its purpose as contributing to better epidemiological surveillance over TBE on the regional level, and is designed to analyze the contamination levels among ixodic mites using the PCR method.

The statistical data forms reported to the federal level, as well as of the studies into the contamination levels among ixodic mites were used for the analysis.

The study involved the analysis of TBI incidence in Arkhangelsk Region over the period from 2005 to 2017. It was found that the TBI incidence was exceeding the average score for Russia every year during the period analyzed (2.8-fold in 2017). The minimum level of TBI incidence was registered in 2017 — 3.6 per 100 000 residents, while the maximum one in 2009 — 9.9 per 100 000 residents. In 2017, the incidence rate of ixodic tick borreliosis (hereinafter, ITB) was 2.0 per 100 000 residents, which is 2.3 times lower than in Russia (4.6 per 100 000 residents). The contamination of mites with tick-borne encephalitis virus varied, during the period analyzed, between 3.4 and 16.8%, the average rate being 7.4%.

For the purposes of epidemiological surveillance over TBIs in Arkhangelsk Region, the molecular genetic method (real-time PCR) has been in use since 2012. The PCR-based studies conducted in 2016 to 2018, have found that the TBIs contamination rates among the ticks occurring in natural biotopes and removed from people, were as follows: TBE — 3.8%, ITB — 26.1%, HME — 2.7%, and HGA (not detected).

The application of molecular genetic methods in studying the contamination levels among ticks has enabled an increase in the range of microorganisms detectable in biological material, and has led to better awareness of TBE, ITB, and HME contamination levels among ticks, which, in turn, is essential to quality epidemiological surveillance, TBIs prevalence risk assessment and forecasting, and preventive interventions planning.

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**IMMUNOLOGICAL SCREENING OF LEPTOSPIROSIS IN DOGS IN ST. PETERSBURG**

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Leptospirosis is an acute infectious disease classified with zoonoses. It is a ubiquitous disease with severe clinical course, and with high lethality exceeding 20% for some etiologic forms. In urban areas domestic dogs proved to be one of the main source of this infection. The epidemiological well-being of the urban environment depends largely on epizootic processes taking place in the population of those animals.

The study objective was to conduct immunological screening of leptospirosis in dogs in St. Petersburg in order to identify their epidemiological danger for city residents.

In 2012–2017 we examined sera sampled from 720 domestic dogs in St. Petersburg. A standard technique was applied to detect the antibodies to leptospirae in the microagglutination reaction with a set of reference strains of living leptospira belonging to 12 serological groups.

In 165 samples (22.9%) we detected specific antibodies to leptospirae belonging to 3 serological groups: *Icterohaemorrhagiae* (49.7%), *Canicola* (43.0%), *Grippotyphosa* (7.3%). 60.0% of samples contained antibodies at a titer of 1:200–1:400, while 40.0% of our samples contained antibodies at a titer of 1:800 and higher. The seropositive animals were male (69.7%) and female (30.3%). The dogs got infected in some pet relief areas, often in a city park or square (67.0%), when swimming in urban and suburban water bodies (15.0%), or in unknown places (18.0%). The tendency towards the prevalence of *Icterohaemorrhagiae* serogroup in dogs' leptospirosis etiology, revealed at the turn of the century, is found to persist. The presence of antibodies to leptospira in the sera of domestic animals points to their infection with this pathogen and therefore to the existence of potentially dangerous source of this disease in St. Petersburg.

Active anthroponotic foci of leptospirosis exist within the limits of St. Petersburg city in the immediate environment of citizens, and domestic dogs are one of the sources of this infection. What gives rise to concerns is the fact that dogs are infected with *Icterohaemorrhagiae* and *Canicola* leptospira serogroups, that cause the most serious diseases in humans.

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**A SURVEY ON CASES OF TICK BORNE ENCEPHALITIS IN ST. PETERSBURG**E.A. Suzumova<sup>1</sup>, N.K. Tokarevich<sup>1</sup>, N.A. Stoyanova<sup>1</sup>, O.V. Blinova<sup>1</sup>, N.V. Telnova<sup>2</sup>, A.O. Shapar<sup>3</sup>, B.I. Aslanov<sup>4</sup><sup>1</sup>St. Petersburg Pasteur Institute, St. Petersburg, Russia; <sup>2</sup>Directorate of Rospotrebnadzor in St. Petersburg; <sup>3</sup>Centre of Hygiene and Epidemiology in St. Petersburg; <sup>4</sup>North-Western State Medical University named after I.I. Mechnikov, St. Petersburg, Russia

The study objective was to bring to light the current environmental and epidemiological specificity of tick borne encephalitis (TBE) in St. Petersburg.

We analyzed the data on TBE incidence in St Petersburg published in “Data on infectious and parasitic diseases” (State Statistical Reporting, Form #2), FGBUZ “Federal Centre of Hygiene and Epidemiology of the Rospotrebnadzor”, and those reported by Parasitology Department of FBUZ “Centre of hygiene and epidemiology in St. Petersburg” in 1996–2016.

It is found that people in St. Petersburg are at risk of exposure to tick bites, and of TBE infection acquire not only outside of the city, but also in the territory of their megapolis. Every year about 1000 humans are bitten by ticks in St. Petersburg.

*I. persulcatus* and *I. ricinus* are two main vectors of TBE virus, and the former dominates. The average TBE virus prevalence in flagged ticks is 0.61%.

There is a rise in number of medical care encounters related to tick bites in St. Petersburg. Thus, the tick-bite incidence rate (number of cases per 100 000 of inhabitants) increased from 141.9 in 1996–2002 to 288.9 in 2010–2016. Meanwhile, TBE incidence rate tends to go down both in St. Petersburg and countrywide. For instance, in St. Petersburg the average TBE incidence rate (number of cases per 100 000 of inhabitants) was 1.66 in 1996–2002, but dropped to 1.17 in 2010–2016. The maximal TBE incidence rate in St. Petersburg is reported in children (3–6 and 7–14 year old).

The absence of reported TBE cases in professionally-menaced groups of population testifies to the efficiency of preventive services among these contingents.

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**COOPERATION OF ZOOLOGICAL GROUP AND THE PCR LABORATORY FOR EVALUATION OF EPIZOOTICS IN REPUBLIC OF BASHKORTOSTAN**

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The aim of the study was to evaluate the work done to study the natural foci of tularemia in the Republic of Bashkortostan (RB).

The objectives of the study were to estimate the number of study district, the number of studies conducted, the nature of the samples studied, and the methods used.

Tularemia is a zoonanthroponosis infection, characterized by the flood-marsh type of natural foci.

From 2014 to July 2018, 242 small mammals caught in the RB were examined for tularemia, of which two were infected. The first specimen was caught in the Krasnokamsky district in 2014, the second in the Gafuriysky district in 2018. These areas adjoin the natural focal point of tularemia in the city of Agidel, where in 2013, 5 cases of tularemia were reported.

Through the territory of the RB the Belaya River and its tributaries flows, therefore, in the years of active reproduction of small mammals, the dispersal of *F. tularensis* carriers along this watercourse is possible. In connection with this, the number of areas studied is also growing. In 2014 — 1 district, in 2015 — 5 districts, in 2016 — 14 districts, in 2017 — 5 districts.

Every year, the volume of conducted research, the types of investigated samples increased. Since 2016, were studied samples of water from open reservoirs, since 2017 — samples blood-sucking arthropods, and since 2018 samples of hydro fauna for research on tularemia. The total number of samples of environmental objects in 2014 was 45, in 2015 — 50, 2016 — 84, 2017 — 96, in 2018, 89 are planned.

Serologic methods (microreaction of agglutination, indirect haemagglutination reaction, inhibition of indirect haemagglutination) and PCR were used. It is planned to use the ELISA.

As the result of the study there was issued the order in the FBUZ “Center for Hygiene and Epidemiology in the Republic of Bashkortostan” about the ongoing monitoring of the epizootic condition of foci of tularemia in the area of Agidel city and the Krasnokamsky district.

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**THE IMPACT OF GLOBAL CLIMATE CHANGE ON THE INCIDENCE OF TICK-BORNE ENCEPHALITIS IN THE EUROPEAN PART OF THE RUSSIAN ARCTIC**

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The study objective was to estimate the impact of air temperature change on the incidence of tick-borne encephalitis (TBE) in the Arkhangelsk Region (AR) and in the Komi Republic (RK).

We analyzed TBE incidence rate (TBEIR) in RK in 1970–2017, and in AR in 1980–2017, its dependence both on the average annual air temperature and the local air tem-

perature during the ixodid tick activity season, and satellite data on vegetation changes within the area under study.

In RK in 1970–1979, the average number of TBE cases per year was 1.4 (TBEIR was 0.1 per 100 000), while in 2008–2017 it was 15.2 (TBEIR was 1.8 per 100 000, i.e., 18 times higher than in 1970–1979). An even sharper rise in TBEIR was registered in AR. In 1980–1989 the average number of TBE cases per year was 1.6 (TBEIR was 0.1 per 100 000), while in 2008–2017 it was 64.4 (TBEIR was 5.4 per 100 000, i.e. 54 times higher than in 1980–1989). A sharp rise in TBEIR in the Northern Europe is due both to the significant northward shift of TBE geographical distribution limits and to TBEIR significant growth in the southern districts. During the analyzed period both average annual temperature and the air temperature during the period of tick activity increased substantially. A strong correlation was revealed between the increase in the TBEIR and the rise in the air temperature. With the help of satellite technologies a pronounced growth of the vegetation index was detected.

The increase in TBEIR within the area under study was mostly due to the air temperature increment, especially during the period of tick activity. The increase in the local vegetation index bears witness to significant changes in the entire ecosystem under the influence of climate changes that provide more favorable conditions for increase in number of animal hosts of ixodid ticks, those being the main vectors of TBE virus.

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**PATHOGENETIC TREATMENT OF SEVERE P. FALCIPARUM MALARIA: APPROACHES TO OPTIMIZATION**

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Pathogenesis of malaria is associated with massive destruction of erythrocytes infected with plasmodium and a development of pathological reactions. One of the most severe clinical forms of malaria is the cerebral form, which is registered in almost 10% of all *P. falciparum* malaria cases. This is also the leading cause of death. The aim of this study was to optimize the pathogenetic treatment of severe *P. falciparum* malaria to prevent fatal outcomes.

During the years 2007–2016 44 patients (36 men and 8 women) with severe *P. falciparum* malaria aged 16 to 69 years old were treated in the intensive care unit of Moscow state Clinical Hospital No. 2. The verification of the diagnosis was based on clinical, epidemiological history and the results of blood smears. The severity of malaria in patients was mainly due to late hospitalization: between 5 to 10 days from the onset of the disease. On admission the level of blood parasites in patients was in the range from 2500 to 2 701 800 p/μl. The patients were treated in accordance with WHO recommendations (2006, 2010).

Ischemic damage of organs and hemorrhagic complications were prevented. In addition, a protocol of intensive care in patients with severe *P. falciparum* malaria was implemented: preventive extracorporeal hemocorrection methods were added without waiting for signs of uremia. This was carried out by a prolonged veno-venous hemodiafiltration procedure (“Prisma”), which resulted in the removal of a wide range of toxic and biologically active substances. This plasmapheresis procedure clears the plasma from fragments of dead parasites, toxic substances, and excessive amount of hemoglobin accumulated during hemolysis, thus reduces or prevents severe damage of the