

***IXODES RICINUS* AS VECTOR AND RESERVOIR OF *BORRELIA BURGDORFERI* IN AN URBAN ENVIRONMENT. Dragana V. Rajković and A. D. Jurišić. Department of Environmental and Plant Protection, Faculty of Agriculture, 21000 Novi Sad, Serbia and Montenegro.**

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As specific arthropods, ticks in urban environments transmit the agents of dangerous contagious diseases endangering human and animal health. They are vectors of numerous infective agents that cause serious diseases of animals such as babesiosis and ehrlichiosis. Tick populations maintain and transmit an increasing number of different infective agents. In regard to the human population, they transmit the agents of tick encephalitis, Omsk hemorrhagic disease, Crim-Congo hemorrhagic disease, Kyasanur forest fever, ixodid fever, Q fever, Rocky Mountain spotted fever, tularemia, Siberian tick typhus and Lyme disease the last of which according to acarological references has become the dominant zoonosis in over 140 of the world's countries. In urban environments ticks represent problem both for their epidemiological significance and as organisms whose presence disturbs people during their work and rest. In Europe, the two most frequent species and *Ixodes ricinus* and *Ixodes persulcatus*. Both species have a wide spectrum of hosts.

During their development cycles, ticks make contact with various animal species and take over, maintain, and transmit numerous infective agents such as bacteria, viruses, and protozoa directly to a new host. However, they more frequently circulate and maintain the given agents in the tick population through trans-stadial and trans-ovarial passage, and their role as vectors broadens into that of infection reservoirs and sources (Pavlović *et al.* 1999).

In the last few years, the city of Novi Sad has acquired all of the ecological factors needed for tick development. Increase in tick numbers is caused by increased numbers of homeless dogs, pets, rodents and birds, as well as by the lack of human efforts directed toward better organization of parks, picnic grounds, and areas under horticultural plants in and around the city.

During 2004, a systematic survey was performed of areas in which the presence of the species *Ixodes ricinus* (the confirmed vector of the agent of Lyme disease in humans and animals) was registered in previous years. The survey was carried out by the Department of Environmental and Plant Protection of the Faculty of Agriculture in cooperation with the Veterinary Institute of Novi Sad. The greatest attention was paid to the locality of the Poplar Institute, which is situated on the left side of the Novi Sad – Belgrade highway and represents a test pilot and nursery for production of planting material. Ticks were collected from March until the second half of October of 2004. Altogether, 222 individuals of the species *Ixodes ricinus* were examined.

The presence of ticks and population dynamics were monitored by the “Flag-hour” method according to Maupin *et al.* (1991). In order to increase the success of catching ticks, traps with dry ice were also used in several instances. Individual ticks were collected from 10 PM until 8 AM. Determination was performed up to the level of species using the key of Pomerancev (1957), and standard laboratory procedures were car-

ried out at the Acarological Laboratory of the Department of Environmental and Plant Protection of the Faculty of Agriculture in Novi Sad.

Examination of ticks in all stages of development for the presence of the bacterium *Borrelia burgdorferi* was performed microscopically, samples prepared by specialists of the Veterinary Institute of Novi Sad according to the method of Kovalevski *et al.* (1988).

The study's objective was to determine the percentage of infectivity of the species *Ixodes ricinus* by the bacterium *Borrelia burgdorferi*, (the agents of Lyme disease in humans) at a locality chosen for ecological and epidemiological reasons (the Poplar Institute's test pilot).

The species *Ixodes ricinus* is a cosmopolitan one with a wide ecological valence. It is rather aggressive and not so choosy in regard to the selection of hosts. This makes it more significant and increasingly dangerous to the human population as a vector and reservoir of the bacterium *B. burgdorferi*.

During the seasons, most ticks show two peaks, the first one in spring and the second in autumn (Milutinović, 2002). The year 2004 was extremely rainy. In that year, *Ixodes ricinus* was registered in greater numbers at the beginning of May and in the middle of September, which is in agreement with the results of Milutinović *et al.* (2002). In the period from May to September, all three stages (larvae, nymphs, and adults) of the species *Ixodes ricinus* were registered. In regard to stages of development, of the total of 222 individuals captured at this locality, 148 were in the larval stage, 53 were females, and 21 were males (Table 1).

The highest percentage of infectivity by the bacterium *Borrelia burgdorferi* was registered in the larval stage (31.75%), the lowest in males (14.28%).

Table 1. Infectivity of *Ixodes ricinus* with *B. burgdorferi* at the Poplar Institute locality during 2004.

Development stage	No. examined	No. infected	% infected
males	21	3	14.28
females	53	15	28.30
larvae	148	47	31.75
<b>Total</b>	<b>222</b>	<b>65</b>	<b>29.27</b>

*Ixodes ricinus* infectivity is lower in other European countries such as Switzerland (29.00%), Austria (4.0), Germany (16%), and Sweden (14%) (Staneč, 1985). By way of comparison average infectivity at the Poplar Institute locality was

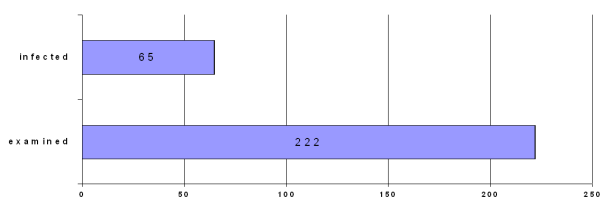


Fig. 1. Total infectivity of ticks by *B. burgdorferi* at the Poplar Institute locality.

about 29.27% (Fig. 1.), suggesting that this locality represents place of great potential risk of human contact with the agent of Lyme disease causer.

At the Poplar Institute locality (Novi Sad), the presence of the bacterium *Borrelia burgdorferi* was detected in all stages of the species *Ixodes ricinus*. As this locality is situated quite near the city of Novi Sad and tick infectivity was 29.27%, these

results suggest that use of additional preventive measures for control of the tick population should be implemented in order to reduce the risk of bites from ticks infected by the bacterium *Borrelia burgdorferi*.

*References:* - Kovalevski, V., Krjučernikov, V. N., Korenberg, E. I. (1988). *Med. Parasitol.* **5**: 75-77. - Maupin, O. G., Fish, D., Zultowsky, J., Campos, G. E., Piesman, J. (1991). *Am J Epidemiol* **133**, 11, 1105-1113. - Milutinović, M., Petrović, Z., Radulović, Ž. (2002). Bionomija i specijski diverzitet krpelja, Beograd. Kontrola štetnih organizama u urbanoj sredini. V Beogradska konferencija sa međunarodnim učešćem, Zbornik radova. 63-69. Beograd. - Померанцев, Б. (1957). Фауна СССР. Иксодовие клещи, Колос, Москва-Ленинград. - Pavlović I., Milutinović M., Kulišić Z., Dimitrić A., Pavlović B. (1999). Prisustvo artropoda od biomedicinskog značaja na zelenim površinama grada Beograda. Druga Beogradska konferencija o suzbijanju štetnih artropoda i glodara. Zbornik radova, 81-87. - Stanek, G. (1985). *Microbiol Sci.* **1:8**, 231-232.