OCCURRENCE OF IXODID TICKS — THE MAIN VECTORS OF TICK-BORNE ENCEPHALITIS VIRUS IN URBANIZED TERRITORY

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Abstract. The influence of urbanization on ticks I. ricinus and I. persulcatus — the main vectors of tick-borne encephalitis virus is discussed on the basis of concrete examples. It has been revealed that under favourable conditions the populations of these tick species can exist for a long time not only in towns and new housing estates, but in the old residential districts as well. The necessity of studying the ecology of urban populations of ixodid ticks is pointed out.

The urbanization, generally understood (Ozerova and Pokshishevsky 1981) as a process of a higher role of towns in the development of society, accompanied by the growing number of towns and of their inhabitants, as well as the absorption of larger and larger portions of agricultural area by them, is one of the most important tendencies in the human influence on nature*. The historical process of landscape cultivation (Rosický and Hejny 1959) with its final stage of urbanization (Rosický 1977) is accompanied by changes of tick occurrence in various biotopes (Černý 1965). It is common knowledge that on the whole, the urbanization leads to the deterioration of ecological conditions. It poses a number of epidemiological problems, among which the existence of vectors and natural foci of human diseases in urbanized territory is of great importance, (Rosický 1978a, b, Kovaleva et al. 1982, Korenberg 1983).

It has been found that within the precincts of big towns situated in the forest zone of Eurasia scores of ixodid tick species may live (Karpov 1956, Dyk 1957, Vlasenko and Filippova 1961, Gilot et al. 1973, 1977, Troger et al. 1976, Rosický and Daniel 1978, Gilot and Pautou 1982, Nosák 1982). Among them are the main vectors of tick-borne encephalitis (TBE) — the ticks Ixodes ricinus (L.) and Ixodes persulcatus P. Sch., whose importance in different parts of the distribution area of the causative agent is discussed in detail in a special publication (Korenberg and Kovalevsky 1981). The present paper is devoted to an analysis of the existing data on the possible occurrence of the two species in urbanized territory, as this phenomenon of great epidemiological importance seems to have been scantily studied.

In recent years an increased morbidity has been noted among urban human population in the greater part of the TBE nosophore. E.g. in the Russian Soviet Federative Socialist Republic at the end of 70-ies the proportion of urban inhabitants among all TBE sick persons reached 70 %, while the values of morbidity per 100 thousand of urban and rural inhabitants remained almost the same. This phenomenon was prima-
rily due to large cities with population over 400 thousand inhabitants (Ivanova 1982) and is connected with the increasing leisure of people who use various ways of spending free time in nature. The town-dwellers often become infected tens or hundreds of kilometers away from their present place of residence, during walking tours or recreation in the forest etc. However, they may also become infected during their contact with ticks directly within the precincts of the town or the boundaries of urban agglomerations (Karpov 1956, Vlaseenko and Filipova 1961, Vlaseenko et al. 1961, Lykov et al. 1971, Chudinov et al. 1971, Černý and Daniel 1980). The TBE virus was repeatedly isolated from the tick *I. ricinus* and *I. persulcatus* collected in the urbanized territory (Vlaseenko et al. 1959b, 1961, Vlaseenko and Filipova 1961, Kuzn and Hofmann 1974, Danielová and Málková 1980, Málková et al. 1981, Rehace-Küpper et al. 1981). Therefore, we consider it expedient to discuss and systematize possible variants of the fate of the tick populations in the urbanized territory (Table 1). The urbanization is a historical process which has been under way in a number of regions for many centuries. Unfortunately, there are practically no available data on the presence or absence of ticks in the territory where towns have sprung up later or in the territory at the first stages of human settlement. In this respect and in conformity with our study under the initial period of urbanization we understand the rise of new towns or a sudden expansion of their area during the last decades. Under the conditions favourable to ticks is implied a complex of biotic factors (presence of animal hosts of all developmental stages) and abiotic factors (presence of conditions suitable for the metamorphosis of all stages of engorged ticks and for the completion of normal life cycle) promoting the tick population. One of the most widespread and well-known variants of the influence of urbanization on the state of tick populations occurs in cases when the urbanization encompasses those biocenoses (territory) in which these arthropods are incased. This happens when new cities and urban agglomerations come into being, and also when large housing estates are erected in the town periphery in the immediate neighbourhood of large forest tracts which are often partly or entirely incorporated within the town boundaries and transformed into park-forests. At the initial stage of urbanization in such cases all factors necessary for the existence of tick populations are preserved. However, abiotic conditions for the existence of arthropods also deteriorate with a certain speed: the surface soil layer becomes solid, soil particles cover less dense and the composition of flora changes etc., and also due to the lesser number of hosts, primarily the hosts of images. Therefore, the numbers of ticks in the territory of such park-forests is, as a rule, lower than they have been before its urbanization or in the adjoining less urbanized forests. Similar circumstances were described for *I. ricinus* in Prague (Černy and Daniel 1980, Málková et al. 1981) and for *I. persulcatus* in Perm (Lykov et al. 1971), Novosibirsk (Vlaseenko et al. 1959b, 1961, Chudinov et al. 1971), Vladivostok (Leonova et al. 1978) and other cities. In the Prague park-forest Šárka, for instance, whose slopes are covered with oak-hornbeam forest with the admixture of maple, rowan and birch tree, as many as 92 nymphs and 14 images of *I. ricinus* could be collected on an area of 100 m² (Černy and Daniel 1980). In the city park of Kazan in Tatarstan at Perm at the end of the sixties and at the beginning of the seventies between 3 to 34 images of *I. persulcatus* were flagged per 1 km of transect (Lykov et al. 1971). The well-known centre of the Siberian Branch of the USSR Academy of Sciences, the Akademgorodok was created at the end of the fifties in the vicinity of Novosibirsk, in the area of birch-pine-aspen tree forests and clearings. The numbers of *I. persulcatus* in the Akademgorodok amounted to 4-8 adult ticks per 1 km of transect (Lykov et al. 1959b). Thereafter the numbers of ticks decreased, but they did not disappear. In the pine forests within the boundaries of Novosibirsk the numbers of *I. persulcatus* were about 20 times lower than in the forests of the analogous type beyond the town boundaries (Vlaseenko et al. 1961). Sometimes the tick numbers in the peripheral park-forests may rise temporarily. This happened, for instance, in the parks of the Sestroretsky town district of Leningrad due to miliarization works (Kovalenko et al. 1982). However, the increasing influence of man more often causes unfavourable conditions for ticks and they disappear. Such circumstances are quite common and therefore they are rarely described. In the French Alps, for instance, the urbanization has such unfavourable effects that *I. ricinus* ticks are absent not only in the superurbanized part of Grenoble, but also in the waste grounds and forest biotopes surrounding this town (Gilot and Pautou 1982).

Table 1. Possible variants of the influence of urbanization on the populations of *I. ricinus* and *I. persulcatus*

<table>
<thead>
<tr>
<th>Urbanized biocenoses</th>
<th>Stages of urbanization</th>
<th>State of populations of ixodid ticks</th>
</tr>
</thead>
<tbody>
<tr>
<td>with initial presence of ticks</td>
<td>initial period</td>
<td>population persists</td>
</tr>
<tr>
<td></td>
<td>final period (situation within the developed town)</td>
<td>population persists</td>
</tr>
<tr>
<td>with initial absence of ticks</td>
<td>initial period</td>
<td>a) brought-in ticks are present for a long time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) autonomous tick population is formed</td>
</tr>
</tbody>
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(continued)
Обитание ископовых клещей — основных переносчиков вируса клещевого энцефалита на урбанизированной территории

Э. И. Коренберг, В. Черны и М. Данилев

Резюме. На конкретных примерах рассмотрено влияние урбанизации на клещей *I. ricinus* и *I. persulcatus*, ведущих переносчиков вируса клещевого энцефалита. При благоприятных условиях популяции этих видов могут длительное существовать в городах и курортах — вновь появляясь и вновь исчезая. Обращает на себя внимание необходимость изучения экологии урбанизированных популяций ископовых клещей.

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Received 16 March 1984.
Translated by: E. Bělyjopová