

## Phylogenetic diversity of *flaB* gene among *Borrelia* spp. in *Ixodes ricinus* ticks from urban and semi-natural habitats

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*Ixodes ricinus* ticks play a key role in the circulation of *Borrelia* spp. spirochaetes in the environment, both in semi-natural and wooded urban areas highly transformed by humans. Among other pathogens, *Borrelia burgdorferi* sensu lato group (Bbsl) and *B. miyamotoi* of Relapsing Fever Group (RFG) are often transmitted. The aim of the study was to determine and compare the diversity of the *flaB* gene marker of *Borrelia* spirochaetes detected in ticks from two kinds of habitats.

Spirochaetal DNA presence was tested in DNA isolates from *I. ricinus* ticks collected during the years 2013–2014 from three urban parks and forests in Warsaw, i.e., the Royal Łazienki (n=384), Bielański (n=952) and Kabacki Forests (n=468), as well as in the Białowieża Primeval Forest (n=549). *Borrelia* spp. detection was performed with PCR of 16S rDNA (~350 bp). Further phylogenetic analyses were conducted with use of partial sequences of the flagellin gene marker (*flaB*) (~600 bp).

The overall prevalence of *Borrelia* spp. in ticks was 16.7% in Royal Łazienki; 7.8% in Bielański Forest; 8.8% in Kabacki Forest and 13.1% in the Białowieża Primeval Forest.

BLAST and phylogenetic analyses revealed the presence of six *Borrelia* species in the study: *B. afzelii*, *B. burgdorferi* sensu stricto (*Bbss*), *B. garinii* and *B. lusitaniae* (exclusively in Kabacki Forest), as well as *B. valaisiana* from Bbsl group and *B. miyamotoi* from RFG. Some inter-species molecular diversity was detected in *Bbss* and *B. garinii*. *B. miyamotoi* were detected in four ticks from Białowieża, but only in one tick from the Kabacki Forest. In the Royal Łazienki forest, only *Bbss* and *B. afzelii* were detected.

These findings suggest that not only semi-natural, but also urban parks and forests are inhabited by a wide range of *Borrelia* spp. host species: either a vertebrate reservoir and ticks. Our results indicate a comparable risk of acquiring tick-borne spirochaetosis in the two kinds of habitat.

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