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MILIEU Research Module: Ticks and the city

Vector-borne diseases in an urban environment

Particular infections posing a threat to public health are strongly influenced by environmental parameters. Ticks transmitting the agent of Lyme borreliosis from wildlife to people depend on various biotic and climatic factors. In urban environments, these factors differ substantially from those in peri-urban areas and are subject to anthropogenic impact and frequent changes. Understanding the characteristics of the urban transmission cycle of tick-borne pathogens is essential to evaluate the risk for public health and develop prevention strategies. Understand to prevent!

We aim to determine biotic, climatic and anthropogenic parameters that support ticks in the city of Berlin in order to estimate the risk of infection for people and devise measures of prevention. Wood ticks serving as vectors for various zoonotic pathogens, such as Lyme borreliosis, seem able to exploit particular urban conditions. The complex relationships between ticks, their hosts, habitat structure and microclimate exemplify how pathogens of public health importance are influenced by an urban environment.

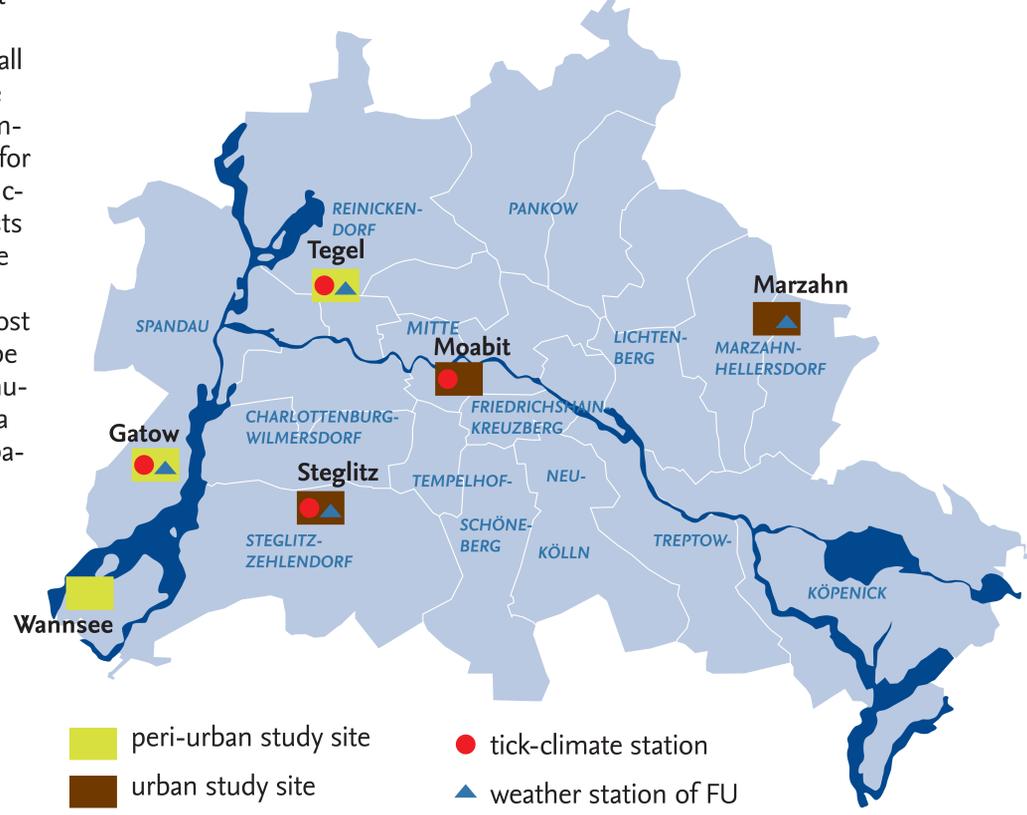
In urban and peri-urban sites in Berlin, our interdisciplinary project examines these relationships by collecting ticks, capturing rodent hosts, measuring meteorological parameters and describing habitat structure. To estimate risk of infection, we determine the spatiotemporal activity of host-seeking ticks and the prevalence of Lyme borreliosis. Surprisingly, a person may encounter infected ticks in two of the urban sites as frequently as in the peri-urban sites, amounting to an exposure risk of two to three infected ticks per 10 m². To deduce the microclimate relevant to ticks, "tick-climate stations" record various meteorological parameters in the sites. Low levels of saturation deficit support ticks. To determine the diversity and abundance of hosts, small rodents are live-captured. Each site varies profoundly in the species composition of rodents serving as host for ticks and borreliosis. The habitat structures supporting ticks and their hosts as well as affecting the microclimate are characterized. Site-specific data on microclimate, tick abundance, host diversity and habitat structure will be integrated in models serving to simulate these complex tick habitats on a small scale and extrapolate them spatiotemporally.

Exposure risk to ticks infected with Lyme borreliosis in urban and peri-urban study sites in Berlin

	Study site located in	Mean no. of ticks flagged per 10 m ²	No. of ticks examined	% ticks infected by pathogenic borreliosis	Theoretic risk of exposure per 10 m ²
URBAN	Steglitz	7,2	129	12,4	0,89
	Moabit	18,3	343	12,5	2,29
	Marzahn	9,2	210	39,0	3,59
PERI-URBAN	Tegel	18,4	208	10,6	1,95
	Gatow	14,6	224	22,3	3,26
	Wannsee	11,7	201	38,8	4,54



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