

**MICHIGAN MOSQUITO CONTROL ASSOCIATION
WILLIAM J. LECHER, II MEMORIAL SCHOLARSHIP
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Name: Isis M. Kuczaj

Title: Genetic and Phenotypic Variation in Host-Seeking Behavior of Nymphal *Ixodes Scapularis* Ticks: Implications for Lyme Disease Risk in Eastern United States

Biography:

Isis has completed an undergraduate degree at Edinboro University of Pennsylvania, and came to Michigan State University in the fall of 2009. He is interested in how vector behavior can influence disease dynamics.

Abstract:

Genetic and environmental influences contribute to host-seeking variation of *Ixodes scapularis* nymphs at four sites in the eastern United States.

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The blacklegged tick (*Ixodes scapularis*) -- which vectors the causal agents of Lyme disease, human anaplasmosis, human babesiosis, and Powassan virus -- exhibits variation in host-seeking behavior across its geographic range. This variation appears to coincide with pronounced geographic variation in the incidence of human Lyme cases, which suggests a link between human disease and vector behavior. However, the strength of this relationship and its proximal causes (genetics, environment, or an interaction of the two) are unknown. A transplant experiment was therefore conducted to determine whether juvenile blacklegged ticks derived from Lyme disease endemic vs. non-endemic regions differ in host-seeking behavior and, if so, whether the observed variation is the result of genetic differentiation, environmental influences, or an interaction of the two.

Questing behavior of nymphal ticks originating from northern (Lyme endemic) and southern (non-endemic) U.S. regions were observed in replicated field arenas monitored simultaneously at field sites in the North (Wisconsin and Rhode Island) and South (Tennessee and Florida). In May 2012, laboratory-raised uninfected nymphs were released at each site into circular 0.5 m² experimental arenas containing wooden dowel rods emerging from leaf litter. The experimental design consisted of four blocks of four arenas, each arena containing 50 nymphal ticks of the same origin (n=5 from Wisconsin, n=3 from North Carolina, n=8 from South Carolina). This design was replicated at each of the four geographic locations, with tick activity on rods recorded weekly or biweekly from May – September 2012.

Results revealed that tick activity differed between nymphal ticks from northern and southern regions such that nymphs were observed elevated on dowels more often than were southern nymphs ($F=21.6$, $df=1$, $p=.0002$), regardless of which environment (site) they were placed. Variation was observed within groups among each site, indicating environmental influences contribute to observed behavior. These results are important for understanding observed low Lyme disease incidence in southern states if southern ticks rarely ascend emergent vegetation and consequently are less likely to contact human hosts.