

Host blood meal identity modifies vector gene expression and competency

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Abstract

A vector's susceptibility and ability to transmit a pathogen—termed vector competency—determines disease outcomes, yet the ecological factors influencing tick vector competency remain largely unknown. *Ixodes pacificus*, the tick vector of *Borrelia burgdorferi* (Bb) in the western U.S., feeds on rodents, birds, and lizards. Unlike rodents and birds which are reservoirs for Bb and infect juvenile ticks, lizards are refractory to Bb and cannot infect feeding ticks. Additionally, the lizard bloodmeal contains borreliacidal properties, clearing previously infected feeding ticks of their Bb infection. Despite *I. pacificus* feeding on a range of hosts, it is undetermined how the host identity of the larval bloodmeal affects future nymphal vector competency. We experimentally evaluate the influence of larval host bloodmeal on Bb acquisition by nymphal *I. pacificus*. Larval *I. pacificus* were fed on either lizards or mice and after molting, nymphs were fed on Bb-infected mice. We found that lizard-fed larvae were significantly more likely to become infected with Bb during their next bloodmeal than mouse-fed larvae. We also conducted the first RNA-seq analysis on whole-bodied *I. pacificus* and found significant upregulation of tick antioxidants and antimicrobial peptides in the lizard-fed group. Our results indicate that the lizard bloodmeal significantly alters vector competency and gene regulation in ticks, highlighting the importance of host bloodmeal identity in vector-borne disease transmission and upends prior notions about the role of lizards in Lyme disease community ecology.

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