Assessing the Behavior of Ticks Harboring Human Pathogens

Brittney Jabot | Advisors: Dr. Carl N. Keiser & Elise Richardson

Introduction

- *Amblyomma Americanum,* the lone star tick, is a vector of many known human pathogens, and as its range expands, it poses an increased risk to human and animal health.[1]
- *Rickettsia amblyommatis,* a member of the *Rickettsia* spotted fever group was found in lone star ticks and may be responsible for some cases of diagnosed Rocky Mountain spotted fever.[2]
- Ticks seek out hosts by "questing" on vegetation, which may be altered by physiological and environmental factors
- This study aimed to assess the interaction between habitat type and pathogen infection on tick host-seeking behavior, to better understand disease risk across habitat types.

Figure 1. Habitat types associated where ticks were collected. (a) Successional hardwood, (b) Xeric hammock. Photo credits: Ordway-Swisher Biological Station.

Methods

- 176 ticks collected at Ordway-Swisher Biological Preserve in Hawthorne, FL using a tick drag.
  - Two habitat types: Xeric Hammock (XH) (Fig.1b) & Successional Hardwood forest (SHF) (Fig. 1a)
- 10 minute questing assays completed for each tick
- Recording of questing height and duration
- All ticks were tested for *Rickettsia* using Qiagen DNeasy Tissue and Blood extraction kits and traditional PCR
- Positive samples were sent to Genewiz for Sanger sequencing and then were NCBI blasted using Geneious software.

Results

- No evidence was found that habitat type, burn history, infection status, or life stage altered the propensity for ticks to quest during the experimental assay.
- No independent variables appeared to have an effect on the average height at which ticks quested.
- Ticks collected in XH spent over twice as long engaging in questing behavior compared to ticks collected in SHF ($df = 1, \chi2 = 6.99, p = 0.008$; Fig. 2).
- Ticks that tested positive for *R. amblyommatis* infection spent less time questing compared to uninfected ticks ($df = 1, \chi2 = 3.85, p = 0.05$; Fig. 2).

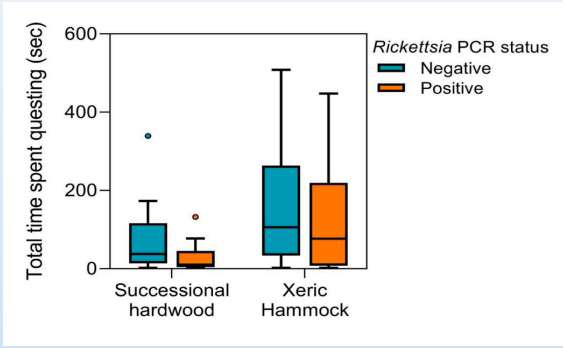

Figure 2. Total time ticks spent questing based on infection status and habitat type.

Conclusions

- The XH habitat has more leaf litter and has more open spaces than the SHF habitat. Ticks quested longer in the XH habitat; this has public health implications.
- We found that ticks infected with *R. amblyommatis* spent less time questing when compared to uninfected ticks
- In terms of importance to public health, this study highlighted the importance of understanding tick behavior in different habitats .

1. Raghavan, R. K., Peterson, A. T., Cobos, M. E., Ganta, R., & Foley, D. (2019). Current and future distribution of the lone star tick, Amblyomma americanum (L.)(Acari: Ixodidae) in North America. *PloS one*, *14*(1), e0209082. https://doi.org/10.1371/journal.pone.0209082
2. Whitman, T. J., Richards, A. L., Paddock, C. D., Tamminga, C. L., Sniezek, P. J., Jiang, J., Byers, D. K., & Sanders, J. W. (2007). Rickettsia parkeri infection after tick bite, Virginia. *Emerging infectious diseases*, *13*(2), 334–336. https://doi.org/10.3201/eid1302.061295