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Undergraduate Research in Biology: Ticks

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11:30 AM – 12:30 PM (Room 1310)
Undergraduate Research in Biology: Ticks
Chair: Dr. Holly Gaff, Department of Biological Sciences

Phylogeography of *Ixodes affinis* ticks

By Mindy Marshall (Mentors: Drs. Holly Gaff and David Gauthier)

Ticks transmit the greatest variety of pathogens of any known arthropod vector of disease. Several ticks are of particular interest because they carry pathogens that cause human disease, including *Ixodes affinis* Neuman. *I. affinis* is a hard-bodied (ixodid) tick known to be a competent vector for *Borrelia burgdorferi*, the agent of Lyme disease, and agents of other human diseases, such as *Borrelia bissettii*. This study was completed to discover phylogeographic patterns of *I. affinis* distribution. A phylogeographic study was performed on 77 the individual *Ixodes affinis* from 5 different populations. Populations were sampled from Cheatham Annex, VA, Damn Neck, VA, Beaufort County, NC, and Bulloch County, GA. Three distinct haplotypes were found. One haplotype from Beaufort County, NC was completely unique. In order to generate a clear geographic pattern of *I. affinis*, more samples are to be sequenced and analyzed.

Differentiation of *Ixodes scapularis* and *Ixodes affinis* from Virginia tick collections

By Breanna White and Chelsea Wright (Mentors: Drs. Holly Gaff and David Gauthier)

Ixodes scapularis and *Ixodes affinis* are two common ixodid ticks found in Virginia and surrounding areas. Differentiation between these two morphologically similar species is vital to understanding tick-human interactions, as well as further expansion in the ranges of these vectors. This study will utilize a quantitative PCR assay to differentiate *I. affinis* from *I. scapularis*, and compare these identifications to those made on morphological grounds.

Exploring the innate immune system in *Amblyomma maculatum*: identification of the hemocyte defensin gene

By Nicole Cox (Mentors: Drs. Daniel Sonenshine and Wayne Hynes)

Defensins are a group of immunopeptides common to arthropods, as well as other eukaryotic organisms (plants to humans). The function of these immunoproteins is to lyse microbial cells, by forming channels in cell membranes (Hynes et al 2008). In light of the risks tick-borne pathogens present to humans, understanding the role of ticks' innate immune system is important to eventually controlling the spread of these disease-causing agents. The purpose of this study is to identify the sequence for the major defensin found in the hemocytes of *Amblyomma maculatum* (Gulf Coast Tick).

Enhancing tick field collection methods to attract *Ixodes scapularis*, *Ixodes affinis*, and *Amblyomma maculatum*

By Amy Johnson and Joseph Brown (Mentors: Drs. Daniel Sonenshine and Holly Gaff)

Tick surveillance was conducted in the Hampton Roads areas to study the spread of tick-borne diseases and the movement of tick species throughout the state. The previous methods used for tick collection, flagging and collection from hosts, are very time and labor intensive, and may be biased to the more aggressive tick species. This study aimed to devise a more efficient method of collecting all tick species. Our field sites are dominated by *Amblyomma americanum*, Lone star ticks, but this may be due to their behavioral differences with other species of ticks as Lone stars are known to be exceptionally aggressive in pursuing their hosts. Experimental collection techniques were tested at two different sites adjacent to sites of the surveillance project. We modified standard techniques in order to simulate the host animal of choice of the target species. At the first site, a rural area adjacent to the Great Dismal Swamp, our survey found the greatest diversity in tick species. Using a combination of different attractants on the flags, pheromones and CO₂ traps, and a CO₂ flag system, we hoped to improve the probability of collecting other species such as *Ixodes scapularis*, *Ixodes affinis*, and *Amblyomma maculatum*. At the second site, a urban park located in Portsmouth, we used a variety of semiochemicals to attract *Ixodes scapularis* and *Ixodes affinis*.