

Department of Biological Sciences Seminar Blog

Seminar Date: 1/27/17

Speaker: Dr. Sarah States, Research Manager at Phipps Conservatory

Title: “*Effects of host and pathogen diversity on tick-borne disease emergence*”

Stepping into the *Lymelight* of scientific outreach

By: Brandon Hoenig

For many people interested in scientific research, the most travelled path to success is to first obtain your undergraduate degree, conduct doctoral research for those lovely three letters (PhD), and then publish as many papers as possible at a post-doctoral research position. For the few people that make it through what seems to be an eternity of writing, reading, and researching, there comes a seemingly small set of options for gainful employment. The two options most discussed are to teach at a university or work in industry. However, the path less travelled is one of scientific outreach and relationship building between research scientists and the non-scientific community. Dr. Sarah States chose to take this path which led her from behind the curtain of scientific research and into the “lymelight” of scientific community outreach as Research Manager at Phipps Botanical Gardens in Pittsburgh.

In her seminar presentation, Dr. States began discussing her post-doctoral research which investigated the prevalence of Lyme disease in communities with varying degrees of host biodiversity (States et al., 2014, *Infection, Genetics and Evolution*). These hosts,

such as deer and mice, can serve as reservoirs for ticks to transmit Lyme disease, a disease caused by the bacteria *Borrelia burgdorferi*. By studying this system, Dr. States attempted to investigate the 'host dilution hypothesis' which is an idea that states that increased biodiversity in a host community could aid in decreasing a particular disease in that community. The reasoning proposed for this hypothesis is that an ecosystem with more diverse host species will have more organisms that are inefficient reservoirs that cannot pass on *B. burgdorferi*. While there has been evidence of this hypothesis in other ecosystems, Dr. States found no evidence to support the dilution effect hypothesis in ticks that carry *B. burgdorferi*. However, she did find that areas of higher host biodiversity tended to have more diverse strains of *B. burgdorferi*, a result that fits another idea her study focused on, known as the multiple niche polymorphism hypothesis. This hypothesis states that as host diversity increases, so does the ability for new strains to evolve to fill the new niche created by new host species.

Dr. States included a second project that she had completed more recently to understand the different mechanisms by which *B. burgdorferi* could be passed between ticks (States et al., 2016, *Epidemics*). In this project, she studied how a short-lived strain of *B. burgdorferi* could be transmitted between ticks without the need to first fully infect the host species through local transmission of the pathogen. To this point, it was not accepted that *B. burgdorferi* could be transmitted between two ticks feeding in close proximity to one another through a behavior known as co-feeding. While this idea has been accepted as a method of transmission for other pathogens, as in those pathogens found in Eurasian ticks, Dr. States' research was

the first to point out co-feeding as a viable transmission method in American ticks that carry the Lyme disease pathogen.

At this point in her discussion, it seemed apparent that she followed the path set by many research scientists prior, but it was her decision to spend the concluding period of her seminar to discuss public outreach that separated her presentation from many other seminars. Other speakers may use this as the time to sew up any loose ends of their research and explain the subtleties that may have been missed by the audience. Instead of reiterating what she had already said, Dr. States delved into her current endeavors in scientific outreach as well as the idea of “biophilia”, or the unending love for the many pieces of the living world.

As the Research Manager at Phipps Conservatory, a portion of her occupation is to aid in scientist/community interactions, and to inform the public about the importance of science-literacy as well as the incredible fun that science can supply. She also works extensively with graduate students and post-doctoral researchers who receive research fellowships from the Phipps. Dr. States helps these young researchers improve their ability to present their research in a manner that allows an audience of non-scientists to understand the importance of their scientific work while also being interesting enough to keep the attention of young ‘biophiliacs’.

Near the conclusion of her talk, Dr. States introduced a statistic which showed that a large percentage of people do not believe that climate change is a particularly alarming issue. While it is very important that the non-scientific population be interested in science for their own benefit, it is just as important that we as scientists learn to convey our message to the public in a way that all people

can understand. It is all too often where we find ourselves using jargon to explain how “single nucleotide polymorphisms of the *OspC* gene can influence nymph infection prevalence and pathogenic transmission rates”, when all that needs to be said is how “genetic differences in a pathogen can change the frequency of tick bites that lead to Lyme disease”. Dr. States’ post-doctoral research led to great discussion among scientists at our seminar social event after her talk. However, it was her conclusion which stated the importance of communicating science to non-scientists that will stick in my mind the next time I attempt to explain to the importance of my ecological research to my grandmother.