

## ScienceWatch - The Lizard That Licked Lyme

As birders we are greatly affected by the prevalence of Lyme disease in our area. Each time we enter the forest we must alter our behavior to avoid tick bites and when we leave we must perform thorough tick checks. We also may avoid wooded areas known to be heavily tick infested. Others can be so fearful of contracting the disease that they avoid the woods altogether and are even afraid to walk on their lawns. The fear is understandable.

Although it was first described in Europe 80 years earlier where it was linked to tick bites, the disease gained notoriety in the northeast in the 1970's when a high incidence of childhood arthritis was observed in Lyme, Connecticut. These cases were similar to the European ones (e.g., a bull's-eye-shaped rash was often the first sign of the disease), leading health workers to search for and find an abundant tick population in the region. The ticks turned out to be the vector of a potentially debilitating disease caused by a spirochete bacterium first described by Willy Burgdorfer at the Rocky Mountain Labs and now called *Borrelia burgdorferi*. Since 1990, between 9,000 and 14,000 Lyme disease cases have been reported annually. Most cases occur in the northeast, with relatively few people in the west developing the disease. (The life cycle of the black-legged or deer tick, *Ixodides scapularis*, including its hosts and their relationship to periodic bumper acorn crops was described in the March issue of *Chickadee Chatter*).

In the western U. S. in the late 1980's and early 1990's scientists discovered that the western black-legged tick, *I. pacificus*, harbored the bacteria and could serve as a competent vector. A primary host of *I. pacificus* nymphs is the western fence lizard, *Sceloporus occidentalis*. The nymphs also feed on several species of wood rats. However, only a tiny fraction of western adult ticks was infected compared to its eastern cousin where half are routinely found to harbor the bacteria. Moreover, these studies revealed that transmission of *B. burgdorferi* to humans was reduced when ticks fed on lizards rather than rats. Now evidence indicates the fence lizards contain a blood factor that destroys the bacteria in the tick's gut rendering them incapable of infecting other hosts.

Writing in a recent issue of the Journal of Parasitology, Robert Lane and G. B. Quistad, demonstrated the existence of the borreliacidal factor by incubating spirochetes in either blood plasma or serum taken from fence lizards and finding that within one hour all the bacteria were dead. Boiling for ten minutes destroyed any activity, indicating the factor is heat sensitive and therefore a protein. Interestingly, it appears that the factor is not an antibody generated by the lizard's immune system in response to tick feeding, but rather an innate blood factor present whether or not lizards are bitten by ticks. Ten tick-free lizards were captured and kept in the laboratory for 4 years before being used. Five of the lizards were then immunized against the spirochetes by injecting them with dead *B. burgdorferi*. Nonimmunized lizards were presumed to carry no anti-spirochete antibodies. Infected nymphal ticks were allowed to feed on all ten lizards and checked for spirochetes once they molted into adults. All the adult ticks were spirochete-free whether they had fed on immunized lizards or not, indicating that exposure to the

bacteria was not required to produce the borreliacidal factor in the reptile's blood. To prove that molting to adulthood was not killing the spirochetes, other infected nymphs fed on rabbits instead of lizards were shown to remain infected as adults. Other animals such as the European blackbird (*Turdus merula*) have been found to block transmission of spirochetes and it is likely more hosts capable of eliminating the spirochete in ticks will be discovered.

Should we bring the lizard east or perhaps move out west? Neither. The fence lizard is unlikely to survive here and many of us would fare no better in California. Instead our hope resides in the vaccine recently tested in adults and found to be 80% effective. It is currently being tested in children at the Westchester Medical Center. Enrollment is going on now.

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