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Ticks in North Carolina: Increasing disease and confusion

In 2007 North Carolina reported almost 800 cases of tickborne diseases (TBDs) and close to 1,000 the year before (see Table 1). This indicates that many thousands of citizens may get sick each year from ticks since studies have found that only a minority of reportable cases are usually reported.1 There are also several non-reportable TBDs. On average, a few fatalities also occur.

Four species of NC ticks bite humans and all may carry one or more human pathogens. New "emerging infections" are also being identified. The most common tick is the lone star. Thirty years ago when this aggressive tick appeared in NC many people assumed they were the "deer" ticks that carry the Lyme disease spirochete since the larvae and nymphs are so small. Black-legged ticks, the Lyme disease vector, are also established in a number of counties in NC.2 Ticks, most active from February through October, may also be active during warm spells in the winter, so TBDs need to be considered all year if symptoms are suggestive. The distribution and prevalence of human-biting ticks and TBDs in North Carolina are not well characterized although work is beginning on this for the black-legged tick.2

Ticks have three blood feeding stages: larval, nymph, and adult. They feed and molt between each stage over one to three years. Usually, the only larval ticks (commonly called "seed ticks") that bite humans are lone stars. In North Carolina, nymphs of lone stars (sesame seed size) frequently attack people. Bites by black-legged nymphs (poppy seed size) are much less common. Nymphal bites are highly associated with disease since their small size makes them harder to detect. Infections are transmitted by nymphal and adult ticks. The female lone star, known by the white spot on its back, is the only tick easily identified by the non-professional. Tick populations are growing in our state along with suburbanization and the deer population. Deer serve as hosts to the lone star and black-legged ticks.

Most tick infections may initially cause similar symptoms -- often flu-like with fever, aches, and pains. Most tick-borne infections in North Carolina are not associated with a rash, especially early in the infection. Some rashes, when they occur, may be pathognomonic. Serologic tests are usually negative in the acute phase and sensitivity and specificity are far from ideal.3,4 Co-infections may also occur. A history of tick bite is not necessary for diagnosis.

Lyme disease is emerging in North Carolina. Studies have identified cases, the vector tick Ixodes scapularis, and the bacteria, Borrelia burgdorferi, a spirochete related to Treponema pallidum, the spirochete which causes syphilis. The so-called "bulls-eye" rash, erythema migrans (EM), associated with Lyme disease and Southern Tick Associated Rash Illness (STARI) is a misnomer because many EM rashes may be solid red.5 EM starts at the site of the tick bite, is usually oval, and expands to greater than two inches. (Most patients have a normal small red, itchy, local reaction to tick bites, especially the lone star.) People presenting with an EM rash should be treated for Lyme disease/STARI immediately. Only 60% to 80% of people with Lyme disease (the percentage is unknown for STARI) will get or find an EM rash so recognition of an infection may be difficult. Lyme disease diagnosis, testing, chronicity, and treatment is complex and controversial.6

STARI is associated with the lone star tick. The causative organism is not known in spite of on-going research by the CDC and others.5,7 There are no diagnostic tests for STARI and, at this time, it is not a reportable disease. The lone star tick, widely distributed in the coastal plain and piedmont of North Carolina, is aggressive and all life stages readily bite humans. This suggests that there may be a high potential for transmission of the causal agent of STARI.

Of all the TBDs found in NC, Rocky Mountain Spotted Fever (RMSF) is associated with the highest rate of mortality. The overall case fatality rate is 5%-10% and may approach 20% in those untreated.4 In the last 25 years, NC has had an average of 3.5 deaths per year from RMSF. Deaths are usually due to delayed recognition and treatment. Ehrlichiosis may be quite prevalent in the Piedmont. Studies have suggested that reports underestimate the true burden of disease.4 Less than 2-3% of untreated Ehrlichiosis and Anaplasmosis may be fatal.4

Prevention and removal

Prevention and control methods may be found at www.cdc.gov/Features/StopTicks/. Complete protection is not possible. Environmental tick control methods are not practical or affordable for everyone and no personal prevention method offers infallible protection.8

Physicians should teach patients to save biting ticks because if an illness follows, identification can help sort out which infection(s) may be causing illness. The easiest method is to scotch tape the tick to an index card recording the date and place on the body. Most studies show that ticks need to feed for several hours or even days before infective agents can be transmitted, though the amount of time is controversial and varies with the tick and the pathogen.

North Carolina Public Health Pest Management has initiated tick education, awareness, collection and testing programs thanks to recent funding from the General Assembly, although this funding may be in jeopardy due to economic conditions. Work is also underway to ascertain which counties may become endemic for Lyme disease.2, 9 Ongoing research from the Entomology Department at NC State University and the NC School of Veterinary Medicine is contributing to knowledge about known and emerging TBIs. Prevention of tick-borne diseases requires a comprehensive multi-disciplinary approach.

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