

# Indirect Evidence of Bourbon Virus (*Thogotovirus, Orthomyxoviridae*) Infection in North Carolina

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**To the Editor**—Bourbon virus (*Thogotovirus, Orthomyxoviridae*) was discovered in 2014 when a patient with history of multiple tick bites in Kansas died from an unknown infection [1]. Human infections from Bourbon virus have now been recognized in several states (i.e., Kansas, Oklahoma, Missouri). The virus was detected in collections of the lone star tick (*Amblyomma americanum*) in Missouri [2]. A serosurvey of domestic and wild mammals in Missouri noted the presence of Bourbon virus-neutralizing antibodies in serum samples collected from a variety of species, but most frequently in white-tailed deer (*Odocoileus virginianus*) and raccoon (*Procyon lotor*) [3]. We report here that neutralizing antibodies against Bourbon virus were detected in white-tailed deer in North Carolina, suggesting that the virus is present in the state. We screened 32 white-tailed deer for the presence of Bourbon virus-specific neutralizing antibodies. Of 20 plasma samples that reacted with the virus, 18 were confirmed with neutralizing antibody titers ranging from 10 to  $\geq 320$  for a seroprevalence rate of 56% (95% confidence interval 39%–72%). The seropositive samples were from deer killed during the 2014 hunting season from Stanly and New Hanover counties.

The incidence of Bourbon virus infection in humans in North Carolina is unknown. However, given the abundance of the lone star tick in the state, and the notable proportion of deer with evidence of infection, human infections have likely gone unnoticed or possibly misdiagnosed. Human infection with Bourbon virus results in a nonspecific viral syndrome that includes fever, nausea, diarrhea, myalgia (muscle pain), arthralgia (joint pain), leucopenia (low white blood cell count), and thrombocytopenia (low blood platelet count) [1]. The illness resembles that caused by tick-borne bacterial infections such as rickettsioses, ehrlichiosis, and anaplasmosis, but is nonresponsive to antibiotic therapy. It is also similar to the disease syndrome caused by Heartland virus, which was detected indirectly in a serosurvey of these same white-tailed deer and directly from an ill patient in North Carolina [4, 5]. Health care providers should consider Bourbon and Heartland virus testing in patients presenting with an acute febrile illness with either leukopenia or thrombocytopenia not explained by another condition, or who were suspected to have a tick-borne bacterial disease but did not

improve following appropriate treatment (e.g., doxycycline). Testing can be obtained by sending acute and convalescent serum samples to the state public health laboratory, which can arrange for testing at the Centers for Disease Control and Prevention Arbovirus Diagnostic Laboratory in Fort Collins, Colorado.

The natural history of Bourbon virus is not fully understood. However, the pattern of human cases occurring in May and June suggests that risk to humans is largely based on transmission from the adult stages of the lone star tick [6]. Adult lone star ticks typically feed on larger animals during spring and early summer, and use vertebrate blood to nourish several thousand eggs. These eggs are laid on vegetation and when heat and humidity reach acceptable levels in July and August, they hatch into minuscule six-legged larvae. The almost invisible larvae feed on small and large mammals in late summer before transforming into eight-legged nymphs the size of a pinhead, just a few millimeters in diameter. Host-seeking nymphs are found throughout the year (except for the coldest months of winter, when they are inactive). Nymphs morph into adults shortly after feeding on mammalian blood. Tick-borne viruses are typically transmitted transstadially within the tick, but not transovarially (from the tick to its offspring). Therefore, it is expected that a larva feeding on an infectious host may become infected and subsequently remain infected as a nymph and an adult, but fail to infect its offspring.

Because the virus is likely transmitted by infected ticks, prevention depends on using insect repellents, wearing long sleeves and pants, avoiding bushy and wooded areas, and performing tick checks after spending time outdoors. Future research is needed to assess geographic distribution of Bourbon virus infection risk and to understand the clinical spectrum of disease, including determination of whether asymptomatic infections can occur. NCMJ

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