

ENCEPHALITIS or MENINGITIS, ARBOVIRAL: Notes about the Disease

To begin with, one should understand that most viruses (including arboviruses) that sometimes affect the central nervous system produce asymptomatic or mild infections in the majority of infected individuals. Also, one should not become confused by the somewhat arbitrary distinction between the clinical entities “encephalitis” and “meningitis,” for the difference can be subtle in the individual patient. Many viruses can cause both “aseptic” meningitis and encephalitis (or a clinical state in between the two conveniently termed “meningoencephalitis”). Although not an “official” taxonomic term, “arboviral”—meaning transmitted by an arthropod—has become a standard and useful adjective in describing mosquito or tick-borne viral diseases. North Carolina has been plagued with several different forms of viral encephalitis transmitted by mosquitoes over the years, and some forms tend to concentrate in specific regions of the state from year to year.

Eastern equine encephalitis (EEE) is fortunately only an occasional cause of human illness in coastal NC, but unimmunized horses in the coastal and, to a lesser extent, piedmont counties of our state suffer almost annually a number of cases, a high proportion being fatal. About a third of clinically apparent human cases—usually in adults—are fatal. Maintained in nature in a complex bird-mosquito (primarily *Culiseta melanura*)-bird cycle, equine and human cases occur when EEE virus from this freshwater swamp cycle spills over into mosquitoes that transmit more readily to mammals (e.g., *Aedes spp.*, *Culex spp.*). Non-avian species are dead-end hosts for this virus.

By contrast, **LaCrosse encephalitis (LAC)** seems to be a geographically expanding problem in western NC. Named for the community in Wisconsin where LAC was first documented, it was first noted in NC in the counties surrounding the Great Smoky Mountains National Park in the early 1960s. LAC has gradually expanded eastward and, in 2005, NC’s 32 cases accounted for 46% of the 70 total cases reported for the entire US.¹ It primarily affects children, and although fatalities are rare, serious neurologic sequelae can follow recovery from the acute disease.² Equines are not involved with this virus, and the cycle in nature is maintained between the tree hole-breeding mosquito, *Aedes triseriatus*, and small mammals.

West Nile fever, caused by the West Nile virus (WNV), is a fairly recent US immigrant and, as such, has been more newsworthy than other arboviral encephalitides. It was first recognized in this country (in New York City) in 1999. By 2000 it had reached NC via infected migratory birds, and the first human case was documented here in 2002. Unlike EEE and LAC, WNV infections are not limited to any particular geographic area of the state. Only a small proportion of human WNV infections result in encephalitis; older adults are more likely to experience such serious manifestations. Several mosquito species are at least potential competent vectors for WNV. Like EEE, equines can also be affected by WNV, as can dogs and cats. Also, as with EEE, there is a vaccine for equines. Because of the complexity of these viruses’ cycles in nature, arboviral activity can be quite variable in its severity in any locale from year to year. From time to time, other types of arboviral encephalitis have been found in NC. For example, in the 1970s, single cases of **Saint Louis encephalitis** occurred in the same Durham neighborhood during two separate years. Also, the first documented human case of **Cache Valley encephalitis** anywhere fatally affected a Lee County man in 1995; he was most likely infected while deer hunting in Anson County.³

On an individual level, prevention of arboviral disease is multifactorial. The use of repellents, avoidance of mosquito habitats, and elimination of mosquito breeding sites are all-important steps. Although controversial, aerial spraying of mosquitoes is sometimes used when justifiable by the level of viral activity at the community level.

1. J. Johnson, “LaCrosse Encephalitis in Western North Carolina, 2006,” *Epi Notes* 1 (2006): 1-2.
2. JT Utz, et al., “Economic and Social Impacts of LaCrosse Encephalitis in Western North Carolina,” *Am J Trop Med Hyg* 69 (2003): 509-18, www.ajtmh.org/cgi/content/full/69/5/509.
3. DJ Sexton, PE Rollin, and ED Breitschwerdt, “Life-threatening Cache Valley Virus Infection,” *New Eng J Med* 336 (1997): 547-9, content.nejm.org/cgi/reprint/336/8/547.pdf.