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Health Update: Domestic Arbovirus Diseases June 18, 2007

Arboviral (arthropod-borne viral) diseases are caused by viruses that are transmitted by arthropods such as ticks, sandflies, and mosquitoes. The 2007 mosquito season has begun in the United States. Philadelphia's mosquito season generally begins in May and extends into October depending upon ambient temperatures. This bulletin provides a summary of selected mosquito-borne arbovirus infections that may be transmitted in the United States, with an emphasis on viruses that are present in this region.

Selected Arboviruses - Epidemiology and Clinical Manifestations

West Nile Virus

West Nile Virus (WNV) infection is now the most common mosquito-borne infection in the United States. The virus was first recognized in the western hemisphere in 1999 in New York City. Since then, the virus has spread throughout the continental United States. In the last few years, the Gulf coast and western states have experienced the most transmission. Birds, particularly the crow, are susceptible to WNV infection. Detection of disease in mosquitoes and/or birds indicates that the virus is present in the local environment.

The majority of infections due to West Nile Virus are asymptomatic. Approximately 20% of individuals will develop a self-limited febrile illness called West Nile Fever, characterized by fever, headache, myalgia, and gastrointestinal symptoms. A transient maculopapular rash may also be present. Fewer than 1% of infected individuals will develop neuroinvasive disease - aseptic meningitis, encephalitis, or flaccid paralysis. The risk of neuroinvasive disease increases with age, and is highest among adults > 60 years old and among organ transplant patients. Residual neurological deficits are not uncommon among cases of encephalitis and flaccid paralysis.

Eastern Equine Encephalitis

Eastern Equine Encephalitis (EEE) is the most severe of the arboviral infections that occur in the US; its presentation is typically as a fulminant neurological illness. Coma and death occur in 40 – 70% of cases. Serious neurological sequelae remain in one-third of the survivors. The highest mortality rates are in infants and children. Transmission occurs in the Gulf region and along the eastern seaboard. During the 2005 mosquito season, 11 human cases were reported in Massachusetts and New Hampshire. Viral transmission also occurs locally. In 2005, EEE was identified in a mosquito sample from Monroe County in Northeastern Pennsylvania. In 2003, New Jersey reported a human case of EEE, and identified a horse with EEE as recently as September 2006.

Saint Louis Encephalitis (SLE)

Saint Louis Encephalitis virus (SLEV) is widespread in the US, and has been reported in the country's central, southern, northeastern and western regions. Outbreaks have been reported in Florida and the central US, and occur at unpredictable intervals. Fewer than 1% of infections are clinically apparent, and symptoms range from a non-specific febrile illness to aseptic meningitis and encephalitis. The case fatality ratio for symptomatic cases is 7%. Before WNV emerged in the western hemisphere, SLE was the leading cause of viral encephalitis in this country.

Western Equine Encephalitis

Western Equine Encephalitis (WEE) is associated with a case-fatality rate of 5%. Neurological impairment is common in infants, and congenital infection has also been described. Infections occur in central and western US, as well as Canada and South America.

La Crosse Encephalitis

La Crosse Encephalitis belongs to the California serogroup encephalitis viruses. La Crosse virus produces aseptic meningitis or encephalitis with acute seizures or focal encephalitis in more than 25% of cases, stupor or coma in 50% of cases, and death in less than 1%. The geographic distribution is widespread in the US and Canada. It is most prevalent in the upper Midwest, but also occurs in the Yukon and Northwest territories.

Laboratory Diagnosis of Arbovirus Infections

The incubation period of WNV infection ranges from 2-14 days (up to 21 days in immunocompromised persons). Serum and cerebrospinal fluid (CSF) may be tested for specific IgM antibody to WNV; however serum collected within the first 8 days of illness may not have detectable IgM and repeat testing may be necessary. A four-fold rise in WNV-specific IgG in acute and convalescent serum is also diagnostic. Viral culture and nucleic acid amplification tests can also be performed on serum collected early in the illness, and on CSF.

Diagnostic testing for non-WNV arboviruses is similar to that for WNV infection, relying on detection of virus-specific IgM in either serum or CSF, or demonstration of a four-fold increase in IgG titers in acute and convalescent (2-3 weeks later) serum specimens. Detection of virus in CSF, either through PCR or viral isolation may be possible for cases of encephalitis. Serologic diagnosis is generally required for non-encephalitis cases.

Testing performed in commercial laboratories may not be reliable. Testing should be performed by the Pennsylvania Department of Health Bureau of Laboratories, which participates in the Centers for Disease Control Laboratory Response Network. The Philadelphia Department of Public Health Division of Disease Control (DDC) can facilitate specimen submission.

Arbovirus Infection Treatment and Prevention

Treatment for the arboviral diseases described in this update is supportive; there is no specific antiviral therapy for these infections. Prevention remains the best way to decrease the risk of acquiring mosquito-borne diseases. Mosquito repellent containing no more than 30% DEET should be applied whenever one is outdoors during mosquito season. Products that contain 10% DEET can safely be used on children > 2 months old. In addition, non-DEET products such as picaridin and oil of lemon eucalyptus are effective. Eliminating standing water on personal property will decrease mosquito-breeding sites.

The Philadelphia Department of Public Health has an active mosquito control and dead bird surveillance program. Mosquito complaints and dead bird sightings can be reported to the Vector Control Program at 215-685-9027. Clinicians should consider arboviruses in the differential diagnosis of encephalitis and aseptic meningitis during summer and early fall months; obtain serum and CSF on all suspected cases for diagnostic testing.

To report suspected human mosquito-borne diseases and to request testing of human specimens, please call the Division of Disease Control at 215-685-6741 during regular business hours or 215-686-1776 after-hours.