

LA CROSSE ENCEPHALITIS SURVEILLANCE PROTOCOL

Public Health Action

1. Educate the public about La Crosse infection, especially removal of containers and elimination of other mosquito breeding sites, and use of mosquito repellent and other personal protective measures.
2. Educate physicians and infection control practitioners about diagnosis and reporting of La Crosse encephalitis by sending out a provider alert in May-June annually. Providers should be alert for patients with summertime encephalitis and they should test patients with summertime encephalitis for La Crosse (LAC), eastern equine encephalitis (EEE), western equine encephalitis (WEE), St. Louis encephalitis (SLE), and West Nile virus (WNV).
3. Educate government officials at all levels about mosquito surveillance and integrated pest management as a means of preventing cases of La Crosse.
4. Perform a visit to the homes of all confirmed La Crosse cases to visualize the outdoor environment, educate the family about removal of containers, mosquito habitat abatement, and use of personal protective measures, including use of mosquito repellent. Obtain latitude and longitude of the home of the case, and interview the case (or parents) to obtain information on the location of other potential exposures, including time spent out of doors during the incubation period. Include a travel history during the incubation period. Document using the Arbovirus Supplemental Investigation Form. Attach the supplemental form and all appropriate laboratory studies to the yellow card and send to the West Virginia Infectious Disease Epidemiology Program.
5. If a case of La Crosse is reported, issue an alert to physicians and infection control practitioners asking for prompt reporting of additional cases.

Prevention Objectives

1. Reduce disease risk through public education to encourage:
 - a. use of personal protective measures, and
 - b. elimination of mosquito breeding sites, especially containers.
2. *If additional resources become available:* reduce disease risk through development of local or regional mosquito control capacity.

Disease Control Objectives

1. *Given existing resources, if a case is confirmed:* Reduce the risk of additional cases by encouraging parents and/or the public to identify and eradicate possible sites for container-breeding mosquitoes in the area where the case of La Crosse was reported.
2. *If additional resources become available:* Prevent additional cases through appropriate mosquito surveillance and control activities.

Surveillance Objectives

1. To understand the demographic characteristics of persons with La Crosse infection.
2. To identify geographic clustering of La Crosse encephalitis.
3. To identify risk factors for infection with La Crosse.

Public Health Significance

Prior to the 2002 West Nile epidemic La Crosse encephalitis was the most common form of arboviral encephalitis reported in the United States. According to the CDC, an average of 75 La Crosse encephalitis cases were reported per year from 27 states between 1964 - 2000 (<http://www.cdc.gov/ncidod/dvbid/arbor/arbocase.htm>). West Virginia reported an average of 37 cases per year during 1998 - 2002; cases occurred in 17 counties (see http://www.wvdhhr.org/bph/oehp/sdc/PDFs/IDEP/lacrosse_1998_2002.pdf). In a study published in 2001 in the New England Journal of Medicine, Dr. James McJunkin and colleagues at Charleston Area Medical Center documented long-term neurological and cognitive sequelae in children after infection with La Crosse.

A case-control study performed by the Centers for Disease Control and Prevention demonstrated that children with La Crosse infection were more likely to live in homes surrounded by containers that filled with water periodically. Examples of containers include tires, flower pots, toys, or any item that can collect rainwater and serve as a mosquito breeding site.

In summary, the disease is serious problem in West Virginia with potential for life-long effects in previously healthy children, and it is probably preventable. These elements combine to make La Crosse encephalitis a high priority for the public health community of West Virginia.

Clinical Description

Predominantly a disease of children, 75% of La Crosse cases occur in children under 10 years of age, and only 3% occur in persons over the age of 20. Most cases are in boys, with an estimated male:female incidence of 1.8:1. As with other arboviral illness, subclinical infections are common (>95% of infections), and seroprevalence in endemic areas rises with age. Based on a large clinical series of hospitalized patients, symptoms are as follows:

Symptom	Percent with the symptom	Occurrence in days prior to admission
headache and fever	80-85%	3-4 days prior to admission
vomiting	70-75%	1-2 days prior to admission
seizures or disorientation	40-45%	day of admission
focal neurological findings	16-25%	--
focal and generalized seizures	42-62%	--
status epilepticus	10-15%	--

There is evidence that long-term neurological damage may result from La Crosse infection.

Even children who are very ill may respond dramatically to intensive medical therapy; children with seizures or disorientation should be managed in consultation with an expert.

Etiologic Agent

LaCrosse virus (family *Bunyaviridae*) is a member of the California serogroup viruses.

Reservoir

La Crosse virus overwinters in the eggs of *Ochlerotatus (Aedes) triseriatus* or the “treehole” mosquito. The eggs are usually deposited in treeholes or artificial containers holding rainwater. Horizontal transmission by viral amplification occurs in small vertebrates, such as squirrels and chipmunks. Venereal transmission also occurs among mosquitoes. Humans are incidental or “dead-end” hosts.

Ochlerotatus triseriatus breeds by depositing eggs in treeholes or containers holding rainwater. In a case-control study conducted in West Virginia, the presence of containers in the yard was a risk factor for infection with La Crosse.

Two species of Asian mosquitos, *Aedes albopictus* and *Ochlerotatus japonicus* have recently been identified in the state. Both species are known to be capable of vectoring viral pathogens, including the La Cross virus. A recent study (2001) has found the first isolation of La Crosse in wild populations of *Aedes albopictus* in Tennessee. West Virginia now has three container breeding mosquitoes that can potentially vector La Crosse encephalitis.

Mode of Transmission

La Crosse encephalitis is transmitted by the bite of the infected *Ochlerotatus triseriatus* or “treehole” mosquito. There is no person-to-person transmission.

Incubation Period

Incubation period is usually 5 to 15 days.

Infectious Period

La Crosse is not transmitted from one person to another.

Outbreak Recognition

In endemic regions, La Crosse encephalitis occurs from June through the first frost. Public health professionals engaged in surveillance should be watchful for unusual clusters of disease, including two or more children who have been exposed to the same environment.

Case Definition

Encephalitis or Meningitis, Arboviral

Clinical Description

Arboviral infections may be asymptomatic or may result in illnesses of variable severity sometimes associated with central nervous system (CNS) involvement. When the CNS is affected, clinical syndromes ranging from febrile headache to aseptic meningitis to encephalitis may occur, and these are usually indistinguishable from similar syndromes caused by other viruses. Arboviral meningitis is characterized by fever, headache, stiff neck, and pleocytosis (> 5 white blood cells in CSF). Arboviral encephalitis is characterized by fever, headache, and altered mental status ranging from confusion to coma with or without additional signs of brain dysfunction (e.g. paresis or paralysis, cranial nerve palsies, sensory deficits, abnormal reflexes, generalized convulsions, and abnormal movements).

Laboratory Criteria for Diagnosis

1. Fourfold or greater change in virus-specific serum antibody titer, or
2. Isolation of virus from or demonstration of specific viral antigen or genomic sequences in tissue, blood, cerebrospinal fluid (CSF), or other body fluid, or
3. Virus-specific immunoglobulin M (IgM) antibodies demonstrated in CSF by antibody-capture enzyme immunoassay (EIA), or
4. Virus-specific IgM antibodies demonstrated in serum by antibody-capture EIA and confirmed by demonstration of virus-specific serum immunoglobulin G (IgG) antibodies in the same or a later specimen by another serologic assay (e.g. neutralization or hemagglutination inhibition).

Case Classification

Probable: an encephalitis or meningitis case occurring during a period when arboviral transmission is likely, and with the following supportive serology:

- a. a single or stable (less than or equal to twofold change) but elevated titer of virus-specific serum antibodies; or
- b. serum IgM antibodies detected by antibody-capture EIA but with no available results of a confirmatory test for virus-specific serum IgG antibodies in the same or a later specimen.

Confirmed: an encephalitis or meningitis case that is laboratory confirmed.

Laboratory Diagnosis

Human Serological Testing

It is impossible to clinically distinguish one type of encephalitis from another. Any individual in West Virginia who presents with encephalitis/meningitis during mosquito season (May 1 through November 30 in most areas of the state) should be tested for La Crosse encephalitis (LAC), eastern equine encephalitis (EEE), St. Louis encephalitis (SLE), and West Nile virus (WNV).

Serum and/or CSF should be sent to the West Virginia Office of Laboratory Services (OLS), 167 11th Ave, South Charleston, WV 25303 for testing or confirmation. Sherry Nestor (304-558-3530) should be contacted to arrange testing. The specimen should be accompanied by a completed Arbovirus Test Submission Form when sent to the OLS.

Preventive Interventions

While containers that fill with rainwater are known to be a risk factor for disease, it is not known whether “clean-up” leads to a reduced infection rates. Nonetheless, this intervention is recommended to reduce potential for La Crosse transmission.

Communities should be advised to remove or regularly clean and empty any container that fills with stagnant rainwater, including, tires, pots, toys, swimming pools, bird baths, clogged gutters, buckets, barrels, feeding troughs, etc.

In addition, insect repellents containing DEET are very effective in preventing insect bites. DEET has been associated with encephalopathy in a small number of cases after excessive and repeated application; however, DEET has been in use for 40 years in the United States, and is an *extremely safe product* when used according to the package directions. Parents should apply sparingly only to exposed skin, and avoid application to the hands and face of young children (because DEET is painful if rubbed into the eyes). After coming inside, the child should be rinsed off with soap and water.

Other personal protective measures include use of long sleeves and long pants or “head nets” when venturing into mosquito-infested areas. In addition, assure that window and door screens are “bug tight,” and that yellow bug lights are used outside.

Surveillance Indicators

- Proportion of humans with a diagnosis of encephalitis that are tested for EEE, SLE, LAC, and WNV May to November.
- Proportion of cases with complete clinical investigation: Patient demographics, involvement in outdoor activities, travel history and clinical symptoms (Part 1. of Arbovirus Investigation Form completed).
- Proportion of cases with home visit completed for environmental evaluation, including GIS coordinates of location, patient and family education (Part 2. of Arbovirus Investigation Form completed).
- Proportion of cases investigations that are totally complete: complete WV BPH Confidential Reportable Disease Case report (yellow card), complete Arbovirus Investigation form and copies of supporting laboratory results i.e. confirmatory WNV serologic or antigen results and CSF test results.