


Arboviral diseases, neuroinvasive and non- neuroinvasive

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Attachments can be accessed through the Adobe Reader's navigation panel for attachments. Throughout this document attachment links are indicated by this symbol ; when the link is activated in Adobe Reader it will open the attachments navigation panel. The link may not work when using PDF readers other than Adobe.

Revision History:

Date	Replaced	Comments
06/2015	09/2011	Updated Case Definition to CDC 2015 version. Updated Laboratory Analysis Section. More details added to Investigators Responsibilities and Data Management. Reformatted Standard Case Investigation section to assist with EpiTrax system data entry. Added Chikungunya recommendations to all sections. Updated fact sheets. Fixed or removed broken web links.
09/2011	09/2008	Updated Case Definition to CDC version 2011, Notification section added, format change to guideline, and update to web-links. Added Rapid Assessment worksheet.
02/2012	-	Removed references to KS-EDSS

Arboviral Disease – Neuroinvasive and Non-Neuroinvasive Disease Management and Investigation Guidelines

CASE DEFINITION (CDC 2015)

Subtype(s):

- California Serogroup Virus Diseases
- Chikungunya Virus Disease (not OMB PRA approved)
- Eastern Equine Encephalitis Virus Disease
- Powassan Virus Disease
- St. Louis Encephalitis Virus Disease
- West Nile Virus Disease
- Western Equine Encephalitis Virus Disease

Clinical Description for Public Health Surveillance:

A clinically compatible case of arboviral disease is defined as follows:

Neuroinvasive disease:

- Meningitis, encephalitis, acute flaccid paralysis, or other acute signs of central or peripheral neurologic dysfunction, as documented by a physician, AND
- Absence of a more likely clinical explanation. Other clinically compatible symptoms of arbovirus disease include: headache, myalgia, rash, arthralgia, vertigo, vomiting, paresis and/ or nuchal rigidity.

Non-neuroinvasive disease:

- Fever (chills) as reported by the patient or a health-care provider, AND
- Absence of neuroinvasive disease, AND
- Absence of a more likely clinical explanation. Other clinically compatible symptoms of arbovirus disease include: headache, myalgia, rash, arthralgia, vertigo, vomiting, paresis and/ or nuchal rigidity.

Laboratory Criteria for Diagnosis

Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, OR

- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, OR
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, OR
- Virus-specific IgM antibodies in CSF or serum.

Case Classification:

Confirmed, Neuroinvasive disease:

A case that meets the above clinical criteria for neuroinvasive disease and one or more of the following laboratory criteria for a confirmed case:

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, OR
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, OR
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen, OR
- Virus-specific IgM antibodies in CSF, with or without a reported pleocytosis, and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred.

Confirmed, Non-neuroinvasive disease:

A case that meets the above clinical criteria for non-neuroinvasive disease and one or more of the following laboratory criteria for a confirmed case:

- Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, or other body fluid, excluding CSF, OR
- Four-fold or greater change in virus-specific quantitative antibody titers in paired sera, OR
- Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen..

Probable, Neuroinvasive disease:

A case that meets the above clinical criteria for neuroinvasive disease and the following laboratory criteria:

- Virus-specific IgM antibodies in CSF or serum but with no other testing.

Probable, Non-neuroinvasive disease:

A case that meets the above clinical criteria for non-neuroinvasive disease and the laboratory criteria for a probable case:

- Virus-specific IgM antibodies in serum but with no other testing..

Suspect (Definition for KDHE Data Management Purposes):

A case requiring further investigation to collect missing clinical or laboratory information:

- Lab confirmed only in absence of ANY clinical information OR
- Clinical information or physician diagnosis but lab information is absent OR
- Virus-specific IgM antibodies demonstrated in serum and absence of ANY clinical information.

Not a Case (Definition for KDHE Data Management Purposes):

- Does not match any of the above criteria for suspect, probable or confirmed cases OR
- Virus-specific IgG antibody demonstrated in serum and absence of ANY clinical information. (Requires no follow-up by LHD, unless further labs are received.)

LABORATORY ANALYSIS:

Commercial reference laboratories offer testing for most arboviral diseases. Specimens are not required to be sent to the State Public Health Laboratory (KHEL), but they are equipped to test for WNV IgM, if requested and approved. Prior to testing, the Bureau of Epidemiology and Public Health Informatics (BEPHI) must be contacted at 1-877-427-7317. Arboviral testing, other than WNV, is referred to CDC.

- Specimen: Blood (3-5 ml) in clot separator tubes, the separated serum, or CSF.
- Timing of collection for serology: Acute obtained <30 days after the onset of symptoms; convalescent should be collect 14-21 days (minimum 7 days).
- For additional information and/or questions, call (785) 296-1620 or refer to online guidance at www.kdheks.gov/labs/lab_ref_guide.htm

Interpreting arboviral laboratory results:

- **Serologic cross-reactivity.** In some instances, arboviruses from the same genus produce cross-reactive antibodies. In geographic areas where two or more closely-related arboviruses occur, serologic testing for more than one virus may be needed and results compared to determine the specific causative virus.
- **Rise and fall of IgM antibodies.** For most arboviral infections, IgM antibodies are generally first detectable at 3 to 8 days after onset of illness and persist for 30 to 90 days, but longer persistence has been documented (e.g, up to 500 days for West Nile virus). Serum collected within 8 days of illness onset may not have detectable IgM and testing should be repeated on a convalescent-phase sample to rule out arboviral infection in those with a compatible clinical syndrome.
- **Persistence of IgM antibodies.** Arboviral IgM antibodies may be detected in some patients months or years after their acute infection. Therefore, the presence of these virus-specific IgM antibodies may signify a past infection and be unrelated to the current acute illness. Finding virus-specific IgM antibodies in CSF or a fourfold or greater change in virus-specific antibody titers between acute- and convalescent-phase serum specimens provides additional laboratory evidence that the arbovirus was the likely cause of the patient's recent illness. Clinical and epidemiologic history also should be carefully considered.
- **Persistence of IgG and neutralizing antibodies.** Arboviral IgG and neutralizing antibodies can persist for many years following a symptomatic or asymptomatic infection. Therefore, the presence of these antibodies alone is only evidence of previous infection and clinically compatible cases with the presence of IgG, but not IgM, should be evaluated for other etiologic agents.
- **Arboviral serologic assays.** Assays for the detection of IgM and IgG antibodies commonly include enzyme-linked immunosorbent assay (ELISA), microsphere immunoassay (MIA), or immunofluorescence assay (IFA). These assays provide a presumptive diagnosis and should have confirmatory testing performed. Confirmatory testing involves the detection of arboviral-specific neutralizing antibodies utilizing assays such as plaque reduction neutralization test (PRNT).
- **Other information to consider.** Vaccination history, detailed travel history, date of onset of symptoms, and knowledge of potentially cross-reactive arboviruses known to circulate in the geographic area should be considered when interpreting results.

EPIDEMIOLOGY

Arthropod-borne viruses (arboviruses) are transmitted to humans primarily through the bites of infected mosquitoes, ticks, sand flies, or midges. Mosquito-borne infections generally occur in the late summer and early fall. The vectors must be present for the transmission to occur. Other modes of transmission for some arboviruses include blood transfusion, organ transplantation, perinatal transmission, breast feeding, and laboratory exposures. The incidence and intensity of epidemic transmission of arboviral disease varies with 150 to 3,000 cases / year

More than 130 arboviruses are known to cause human disease. Most arboviruses of public health importance belong to one of three virus genera: Flavivirus, Alphavirus, and Orthobunyavirus.

The United States has seen human cases of mosquito-borne Western Equine Encephalitis (WEE), Eastern Equine Encephalitis (EEE), West Nile Virus (WNV), St. Louis Encephalitis (SLE), and California encephalitis (CE), which were mostly LaCrosse (LAC). While WEE, SLE and WNV are widespread; EEE has been seen only in the Eastern Border, Great Lakes and Gulf Coast states. The CE serogroup have been predominately in states east of Kansas and in Oklahoma, Texas, Colorado and California. Another virus, Powassan, is a minor cause of encephalitis in the northern United States and is transmitted by ticks.

Chikungunya virus (CHIKV), another viral disease spread to people by the bite of infected mosquitoes, has been associated to travel to the Caribbean, South America, or the Pacific Islands. The first locally acquired cases of chikungunya were reported in Florida on July 17, 2014.

DISEASE OVERVIEW

A. Agent:

A specific virus in one of four groups: 1) Alphaviruses including: Western Equine Encephalitis (WEE), Eastern Equine Encephalitis (EEE) and Venezuelan Equine Encephalitis (VEE); 2) Flaviviruses; including: Japanese Encephalitis (JE), West Nile Virus (WNV), St. Louis Encephalitis (SLE) and tick-borne Powassan (POW); 3) Bunyaviruses including: the LaCrosse (LAC) and California encephalitis (CE) in the California serogroup; and 4) chikungunya virus (CHIKV).

B. Clinical Description:

Arboviral infections are a group of acute inflammatory viral diseases of usually short duration that may involve parts of the brain, spinal cord and meninges. Signs and symptoms of these diseases are similar but vary in severity and rate of progress. Symptoms associated with mild cases often include febrile headache and/or aseptic meningitis. Acute onset, headache, high fever, meningeal signs, stupor, disorientation, coma, tremors, convulsions and spastic paralysis mark severe infections.

C. Reservoirs:

Dependent on specific virus, but includes: amphibians, bats, birds, reptiles, rodents, and others. Birds are the primary reservoir for SLE, WEE and WNV.

D. Mode(s) of Transmission:

Bite of infective arthropod, usually a mosquito. Common vectors in U.S.:

- WEE - *Culex tarsalis*;
- EEE - Probably *Culiseta melanura* from bird to bird, and *Aedes* and *Coquillettidia spp.* from birds or other animals to humans;
- SLE - *C. tarsalis*, *C. pipiens-quinquefasciatus* and *C. nigripalpus*;
- WNV – *Culex spp.*
- CHIKV – *Aedes aegypti* and *Ae. albopictus*

E. Incubation Period:

Varies depending on the specific virus type but usually between 1-15 days:

- WEE 5-10 days;
- SLE 4-21 days;
- WNV 3-15 days;
- CE 5-15 days;
- CHIKV 3-7 days

F. Period of Communicability:

Not transmittable person-to-person except under rare circumstances such as transplants or transfusions from viremic individuals.

G. Susceptibility and Resistance:

Susceptibility varies by virus type and infection results in lifelong immunity to the specific virus.

H. Treatment:

No specific treatment, supportive care only.

NOTIFICATION TO PUBLIC HEALTH AUTHORITIES

Arboviral Disease shall be designated as infectious or contagious in nature, and cases or suspect cases shall be reported within seven days*:

1. Health care providers and hospitals: report to the local public health jurisdiction
2. Local public health jurisdiction: report to KDHE-BEPHI (see below)
3. Laboratories: report to KDHE-BEPHI (see below)

**Kansas Department of Health and Environment (KDHE)
Bureau of Epidemiology and Public Health Informatics (BEPHI)
Phone: 1-877-427-7317
Fax: 1-877-427-7318**

* **Immediately** contact the KDHE-BEPHI at (1-877-427-7317) for the following situations:

1. A bioterrorism situation is suspected.
2. A patient provides a history of donating or receiving blood or an organ.



Further responsibilities of state and local health departments to the CDC:

As a nationally notifiable condition, confirmed and probable arboviral neuroinvasive and non-neuroinvasive disease cases require a STANDARD report to the Center of Disease Control and Prevention (CDC) through the ArboNet Surveillance System.

1. STANDARD reporting requires KDHE-BEPHI to file an electronic report for cases within the next reporting cycle.
 - KDHE-BEPHI will file electronic reports weekly with CDC.
2. **Local public health jurisdiction** will report information requested on the supplemental form as soon as possible, ensuring that the electronic form is completed within 7 days of receiving a notification of an arboviral report.

INVESTIGATOR RESPONSIBILITIES

Note: Prompt investigation of every suspect and probable case is required to accurately classify or confirm all cases occurring in Kansas.

- 1) [Report](#) all confirmed and suspected cases to the KDHE-BEPHI.
- 2) Contact medical provider to collect additional information and confirm diagnosis using current [case definition](#).
 - Collect all information requested in [Step 1](#) of case investigation.
 - Ensure that case/proxy is aware of the diagnosis.
- 3) Conduct a [case investigation](#) to determine the individual's at-risk activities and potential site of exposure; evaluate the possibility of additional cases.
- 4) Conduct [contact investigation](#) to identify additional cases.
- 5) Identify whether the source of infection is major public health concern.
 - *Patient provides history of donating or receiving blood or organ.*
 - *Patient has had no travel to an area where the disease is endemic.*
 - *A larger than expected incidence of cases or the first incidence of the disease in Kansas has occurred.*
 - *There has been a death associated to the disease.*
- 6) Conduct [Case](#) or [Contact Management](#) as needed.
- 7) Increase surveillance for cases if an outbreak is suspected or anticipated.
- 8) Initiate [control and prevention measures](#) to prevent further spread of disease by the arthropod (if necessary).
- 9) [Record](#) data, collected during the investigation, in the KS EpiTrax system under the data's associated [\[tab\]](#) in the case morbidity report (CMR).
- 10) As appropriate, use the [notification letter\(s\)](#)  and the disease [fact sheet](#)  to notify the case, contacts and other individuals or groups.

STANDARD CASE INVESTIGATION AND CONTROL METHODS

Case Investigation

- 1) Contact the medical provider who ordered testing of the case and obtain the following information. (This includes medical records for hospitalized patients.)
 - Collect patient's demographics (address, birth date, gender, race/ethnicity, primary language, and phone number(s)). [Demographic]
 - Record onset date (approximate if exact date is not known) [Clinical]
 - Obtain clinical information on symptoms, including fever, chills/rigors, headache, fatigue/malaise, rash, nausea, vomiting, diarrhea, muscle weakness/pain, joint pains, arthritis, paresis/paralysis, stiff neck, ataxia, Parkinson/Cogwheel Rigidity, seizures, or any other symptoms [Investigation – Symptoms].
 - Record clinical complications from the recent attack: meningitis, encephalitis, acute flaccid paralysis. [Investigation – Symptoms]
 - Record hospitalizations: location and duration of stay [Clinical]
 - Record outcomes: survived or date of death [Clinical]
 - Record pregnancy status for women. [Clinical]
 - Travel history in 15 days prior to illness onset? [Investigation – Exposure]
 - Obtain information on any laboratory tests performed and results. If needed, obtain copies of laboratory reports that are needed to confirm the case. [Laboratory]
 - Attach copies to the EpiTrax record as needed. [Add Attachment]
- 2) Establish if the patient's illness is clinically compatible to the suspected agent.
 - Clinically compatible: Continue investigation for possible arboviral infection.
 - Not clinically compatible: Determine if there are other reasons to continue the investigation. (Consultation can occur through KDHE-BEPHI.)
- 3) If a continued investigation is needed and the patient charts do not provide information on the following risk factors or travel, interview the case to determine risk factors and transmission settings within the incubation period of the specific infectious agent and after onset of symptoms. [Investigation – Exposure]
 - 1) Verify/obtain travel history during the 15 days prior to illness onset.
 - Travel to other Kansas counties? (If yes, City/County and dates)
 - Was there travel outside of Kansas?
 - o Travel in the U.S.? (If yes, City/State and dates)
 - o Travel internationally? (If yes, City/Country and dates)
 - 2) Exposure to mosquitoes or other arthropod vectors, describe.
 - 3) Occupation or hobbies, including any laboratory work.
 - 4) Organ, tissue, blood donor or recipient.
 - 5) Breast feeding or potential in utero infection
- 4) Examining the epidemiological information, record where the infection was most likely imported from. (Indigenous or out-of-county, state, or U.S.) [Epidemiologic]
- 5) Collect information from case for the [Contact Investigation](#). (See below).
- 6) Investigate epi-links among cases (clusters, household, co-workers, etc).

Contact Investigation

Not usually required, these diseases cannot be transmitted from person-to-person, but an individual living in the same household, travel companions, co-workers, and anyone else who might be exposed to infected mosquitoes is potentially at risk.

- 1) Identify other individuals who may have had contact with the potential source in the two weeks prior to the case becoming ill to find unreported or undiagnosed cases.
- 2) Report possible transfusion associated transmission (TAT) or organ transplantation transmission to KDHE-BEPHI immediately.
 - Possible transfusion or organ transplant transmission will be evaluated by the state to determine if a potential contact investigation is necessary. If a blood transfusion or organ transplant is suspected, coordinate with BEPHI.
- 3) Pregnancy and newborns:
 - Transmission of WNV transplacentally has been documented but the risk is low. The risk of WNV transmission through breastfeeding is unknown.
 - Transmission of CHIKV is rare from mother to newborn around the time of birth and to-date no infants have been found to be infected through breast feeding.
 - Please note, there are no recommendations to stop breastfeeding because of WNV or CHIKV.
- 4) ONLY if a risk of transmission exists, create a line listing of contacts at-risk of developing disease. [\[Contact\]](#)

Isolation, Work and Daycare Restrictions

Humans are incidental or dead-end host for most of the arboviral agents covered by this guideline. Standard blood and body substance precautions are sufficient.

The exception is CHIKV. If there is evidence or the risk of chikungunya viremia, the risk of local transmission should be mitigated by recommending that the case-patient stay in air conditioned or screened accommodations during the first week of illness and that mosquito breeding sites in and around the patient's home be reduced.

Case Management

- 1) For CHIKV:
 - Assess evidence or risk of the case-patient being viremic while in the United States:
 - Positive RT-PCR or viral culture.
 - Onset of symptoms within the 7 days.
 - If there is evidence of viremia, mitigate the risk of local transmission using the recommendations listed in [Isolation, Work, and Daycare Restrictions](#).
 - [Educate](#) the case-patient on how to prevent spread of CHIKV.
- 2) Other arboviral diseases: Case management is generally not required.

Contact Management

- 1) If a contact listing was created because of the high possibility of disease, follow-up with the listed contacts to determine if illness occurred [\[Contact\]](#).
 - Collect information on each contact's health status, noting any symptoms
 - Inform contact of possible exposure to facilitate proper diagnosis and therapy.
 - [Educate](#) the contacts as needed.

- 2) A symptomatic contact is considered a suspect case requiring investigation and [reporting](#) to KDHE-BEPHI [\[Contact\]](#)
 - On the [\[Contact\]](#) Tab of the CMR, click 'Show' beside the symptomatic contact on the listing. When [View Contact Event](#) opens in show mode, select 'Promote to CMR'
- 3) For transfusion associated transmission (TAT) or organ transplantation transmission, KDHE-BEPHI will work with the LHD to:
 - Determine dates, places, and lot numbers. [\[Investigation –Exposure\]](#)
 - Notify blood or tissue banks to quarantine remaining co-component blood or tissues and identify other possible exposed patients.
 - Notify the CDC Arboviral Diseases Branch.
- 4) For CHIKV:
 - Assess the risk of local transmission:
 - Patient was viremic while exposed to mosquitoes locally.
 - Case patient had no travel outside of the United States.
 - Case-patient returned to the U.S. < 7days after illness onset.
 - If there is the risk of local transmission:
 - Notify KDHE-BEPHI.
 - KDHE-BEPHI will consult with the CDC Arboviral Disease branch to determine if vector control and mosquito trapping/ testing should be considered.
 - Make healthcare providers aware of the situation and perform enhanced surveillance to identify additional cases.

Environmental Measures

- 1) The most effective method for reducing mosquito populations is to eliminate stagnant water, where the female mosquito lays her eggs, and to target the larval stages. The control of adult mosquitoes is difficult and expensive.
- 2) To control mosquito breeding involve the community in the following:
 - Eliminate standing water: Check for water trapped in plastic covers on boats and swimming pools. Make sure rain gutters are clean and do not hold water. Fill or drain tree holes, stumps and puddles. Irrigate gardens and lawns carefully to prevent water standing for more than a few days.
 - If that is not possible to eliminate a standing water source:
 - Empty buckets, bowls, cans, bottles, used tires, bird baths and other containers preferably every 3 days but at least once a week.
 - Stock garden ponds with mosquito-eating fish, such as minnows and goldfish and/ or aerate ponds and pools. Remove aquatic vegetation around the edges of garden ponds, to allow predatory fish and beneficial predatory insects to reach the mosquito larvae. When feasible, raise and lower the water level to allow predatory fish to reach the mosquito larvae.
 - Selectively use of larvicides, such as Bti, in standing water sources.
 - Additional information at: <http://entomology.k-state.edu/department-info/associated-websites/west-nile-virus/mosquito-control.html>
- 3) Other mosquito control activities (public removal of mosquito breeding areas, larviciding, or adulticiding) are usually carried out by local governmental agencies. Actions are taken based upon an assessment of human risk and the appropriateness and feasibility of control measures.

- The county or joint boards of health have the power and authority to examine and order, in writing, the removal of all nuisances and causes of sickness that in their opinion may be injurious to the health of the inhabitants in their jurisdiction (K.S.A. 65-159).
- 4) Additional measures that can assist with determining risk include:
- Entomologic surveys: Inventory and mapping of mosquito populations with monitoring of larval and adult mosquito density provides measurements of vector population overtime to facilitate appropriate and timely responses to mosquito control. Differentiation between nuisance (non-vector) and vector mosquitoes may not always be done, but is important to note when evaluating the risk of human disease.
 - Testing of mosquito pools: Testing of mosquito pools is contracted through the Kansas University. Information on positive pools is posted at www.kdheks.gov/epi/arboviral_disease.htm.
 - Reports of increased mortality in animals in the area: Reports of increased mortality in wildlife should be reported to the Kansas Wildlife, Parks and Tourism at 620-672-5911.
 - Increased mortality of horses may indicate the presence of WEE.
 - Increased mortality of crows or other corvid species may indicate WNV
 - Testing of dead birds and other vertebrates: Offered as a fee-for-service through the Kansas State University (KSU).

Education

- 1) Key messages on personal protection measures against mosquitoes:
- Use an insect repellent on the skin. Products that contain DEET, Picaridin or oil of lemon eucalyptus are effective in repelling mosquitoes. Follow the label directions for all repellants closely.
 - Wear protective clothing when practical.
 - Limit outdoor activities at dawn and dusk when mosquitoes are most active.
 - Source reduction: Remove standing water – where mosquitoes breed (e.g., clogged gutters, containers, unused tires).
 - Use larvicide with Bti in water that cannot be drained or removed.
 - Change water preferably every 3 days but at least once a week in birdbaths, pet bowl, and wading pools.
 - Mosquito proof your home by repairing screens on windows and doors.
- 2) Public Information campaigns are a key component in the response to a possible arbovirus outbreak (See [Managing Special Situations](#)):
- Remote / probable chance: Educate public risk potential and personal protection which emphasizes residential vector source reduction.
 - Probable risk: Expand public information campaign to emphasize use of repellents, personal protection and avoidance of high vector areas and times.
 - Moderate risk: Initiate visible activities to increase attention to risks (speakers, social marketing, and community mobilization for source reduction).
 - High risk: Increase visibility of message; include mass media sources and engage key local partners to speak about the risk of arboviral disease.
 - Outbreak: Hold regular public information briefings on status of epidemic and continue emphasis on personal protection measures.

MANAGING SPECIAL SITUATIONS

A. Outbreak Investigation:

- Notify KDHE immediately, 1-877-427-7317, of any outbreaks
- The probability of a human outbreak of arboviral disease is defined by:
 - None or negligible: Off-season; adult vectors inactive or not present; climate unsuitable.
 - Remote: Spring, summer, or fall; areas anticipating epizootic activity based on previous arboviral activity in the region, but no current surveillance findings indicating epizootic activity in the area.
 - Probable: Summer or fall; areas with limited or sporadic epizootic activity in birds and/or mosquitoes, but no positives prior to August.
 - Moderate: Spring, summer, or fall; areas with initial confirmation of epizootic arboviruses in birds before August; a horse and/or a human case occurring, or sustained arboviral activity in birds or mosquitoes.
 - High: Spring, summer, or fall; areas with an early season positive or epizootic activity measured quantitatively at a level suggesting high risk of human infection (e.g., high dead bird densities in early summer, sustained high mosquito infection rates, multiple positive mosquito species, mammal cases indicating escalating epizootic transmission, or a human case and high levels of epizootic activity)
 - Outbreak in progress: Multiple confirmed cases in humans.
- Surveillance activities for human cases based on outbreak probability:
 - None / Remote: **Maintain passive surveillance which includes the prompt investigation of every suspect / probable case to collect information needed to classify or confirm**; encourage confirmatory testing of any probable or suspect cases.
 - Probable: Maintain passive surveillance. Contact medical providers about the need to consider arbovirus testing and to report all suspected cases. (i.e., mailings, participating in hospital meetings and grand rounds or seminars)
 - Moderate: Initiate hospital surveillance for human cases. (i.e., active surveillance for encephalitis or meningoencephalitis admissions)
 - High: Intensify and expand active surveillance for human cases.
 - Outbreak: Coordinate with the state on the process for updating and maintaining case counts (i.e., updates to official case counts on public websites; what information is needed for a case to be officially counted.) Communicate with state when discrepancies occur (i.e., case location).

B. Natural disasters and encephalitis outbreaks:

- Floods can create the potential for outbreaks. During a disaster declaration, the Federal Emergency Management Agency relies on CDC to evaluate the risk of vector-borne disease. To be reimbursed for vector control measures, a clear risk of vector-borne disease related to the disaster must be present.
- The types of information needed to estimate the risk are a) mosquito population indices, b) virus infection rates in mosquitoes, c) evidence of increased virus transmission in vertebrate amplifying hosts, d) evidence of disease in equines, e) rainfall and temperature data, f) time of year and g) risk to human population.
- A rapid risk assessment is necessary when there is not sufficient information:

- In 2007, an Emergency Management Assistance Compact (EMAC) for rapid mosquito surveillance allowed a team of entomologists to identify a significant number of nuisance mosquitoes with low WNV vector density in the flooded areas. There was no clear risk of vector-borne disease related to the flooding.
- Following flooding in Northeast Kansas in 2011, Atchison and Doniphan Local Health Departments worked with KDHE and volunteers to set weekly, CDC light traps for mosquito surveillance. Surveillance was also performed by Fort Leavenworth Army Preventive Medicine staff to assist with risk assessments.
- Key messages are flooding is unlikely to increase risk of vectorborne diseases:
 - Although mosquito populations are likely to increase in the aftermath of flooding, these are primarily nuisance mosquitoes that do not pose a public health threat. Floodwater mosquitoes lay eggs that remain viable for several years in ground depressions. With flooding and the right conditions, the eggs hatch with adult floodwater mosquitoes emerging in as little as 7-10 days.
 - The mosquitoes that carry WNV and other vectorborne diseases breed in stagnant water with high organic content, such as found in flower pots, tires, bird baths, and other containers, as well as in drainage ditches. The heavy rains that cause flooding are likely to flush out the eggs and larvae of these mosquitoes from such environments.
 - Studies of vectorborne disease following major ecologic disasters over the past 30 years have shown that epidemics of viral encephalitis have rarely, if ever, occurred in the aftermath of such disasters. Although experience with WNV is more limited, flooding does not appear to increase the risk for transmission.
- Guidelines for the vector control are available at www.cdc.gov/westnile/vectorcontrol/index.html.

C. *Intentional Contamination*

The alphaviruses are considered highly infectious by aerosol, are stable during storage and can be produced in large amounts. Agents are readily available, can be mass produced, widely distributed and are potentially lethal on a large scale. A single diagnosed or suspected case of non-indigenous mosquito-borne encephalitis with no travel history should be reported and investigated immediately. If a natural etiology cannot be established by a prompt and vigorous investigation, the situation is considered a bioterrorist act until proven otherwise.

If suspected:

- Notify local law enforcement and state public health officials.
- Implement “Chain of Custody” procedures for all samples collected, as they will be considered evidence in a criminal investigation.
- Work to define population at risk which is essential to guide response activities. Public health authorities will play the lead role in this effort, but must consult with law enforcement, emergency response and other professionals in the process. The definition may have to be re-evaluated and redefined at various steps in the investigation and response.
- Once the mechanism and scope of delivery has been defined, the identification of the symptomatic and asymptomatic exposed individuals can

be completed and recommendations for the treatment and/or chemoprophylaxis made.

- Establish and maintain a detailed line listing of all cases and contacts with accurate identifying and locating information.

Safety Considerations:

- By the time the first cases are identified the risk of exposure is dependent on the number of infected mosquitoes remaining at the exposure site. Appropriate protective clothing and repellents should be used.

Vaccination:

- An investigational, live attenuated vaccine is available for VEE but has a high incidence of side effects such as fever, headache and malaise.
- Investigational, inactivated vaccines are available for EEE, WEE and VEE. None is in widespread use because of problems with poor immunogenicity and need for multiple doses.

Treatment:

- No specific therapy. Patients who develop severe illness may require anticonvulsant and supportive care to maintain fluid and electrolyte balance, for ventilation, and to prevent secondary bacterial infections.

Postexposure prophylaxis (PEP):

- No post-exposure prophylaxis is associated with this group of diseases; however, vaccination may be an option for some of the arboviruses.

Environmental decontamination:

- The viruses do not persist in the environment for long periods of time. No environmental decontamination necessary.
- A release in areas populated with appropriate animal host (i.e. horses, birds) and/or appropriate arthropod vectors could initiate both an epizootic and epidemic trends.
- Integrated pest management at the presumed infected site, including insecticide fogging, may be a reasonable approach.

DATA MANAGEMENT AND REPORTING TO THE KDHE

- A. Accept the case assigned to the LHD and record the date the LHD investigation was started on the [\[Administrative\]](#) tab.
- B. Organize and collect data, using appropriate data collection tools including:
 - The [Arboviral Form](#) can be used to collect information.
 - Alternatively, investigators can collect and enter all required information directly into EpiTrax [\[Investigation\]](#), [\[Clinical\]](#), [\[Demographics\]](#), [\[Epidemiological\]](#) tabs.
 - During outbreak investigations, refer to guidance from a KDHE epidemiologist for appropriate collection tools.
- C. Report data collected during the course of the investigation via EpiTrax.
 - Verify that all data requested on the [Arboviral Form](#) has been recorded on an appropriate EpiTrax [\[tab\]](#), or that actions are completed for a case lost to follow-up as outlined below.
 - Some data that cannot be reported on an EpiTrax [\[tab\]](#) may need to be recorded in [\[Notes\]](#) or scanned and attached to the record.
 - Paper report forms do not need to be sent to KDHE after the information is recorded and/or attached in EpiTrax. The forms should be handled as directed by local administrative practices.
- D. If a case is lost to follow-up, after the appropriate attempts to contact the case have been made:
 - Indicate 'lost to follow-up' on the [\[Investigation\]](#) tab with the number of attempts to contact the case recorded.
 - Record at least the information that was collected from the initial reporter.
 - Record a reason for 'lost to follow-up' in [\[Notes\]](#).
- E. Once the investigation is completed, the LHD investigator will record the date the investigation was completed on the [\[Administrative\]](#) tab and click the "Complete" button. This will trigger an alert to the LHD Administrator so they can review the case before sending to the state.
 - The LHD Administrator will then "Approve" or "Reject" the CMR.
 - Once a case is "Approved" by the LHD Administrator, BEPHI staff will review and close the case after ensuring it is complete and that the case is assigned to the correct event, based on the reported symptoms reported. (Review the [EpiTrax User Guide, Case Routing](#) for further guidance.)

Note:

Report California arbovirus, eastern equine arbovirus, Powassan arbovirus, St. Louis arbovirus, and West Nile arbovirus based on specific disease name.

Further describe cases as "neuroinvasive" / "encephalitis/meningitis" or "non-neuroinvasive" based on clinical signs and symptoms. (Be certain to report symptoms.)

West Nile neuroinvasive cases exhibiting paralysis report as "WNV, Acute Flaccid paralysis."

Laboratory reports not supporting neuroinvasive infection (i.e. no CSF findings) are initially reported in the KS-EDSS as "Non-neuroinvasive." Clinical information collected from the local investigation may result in the changing or the disease event to "neuroinvasive" or "encephalitis/meningitis".

ADDITIONAL INFORMATION / REFERENCES

- A. Treatment / Differential Diagnosis:** American Academy of Pediatrics. 2009 Red Book: Report of the Committee on Infectious Disease, 29th Edition. Illinois, Academy of Pediatrics, 2014.
- B. Epidemiology, Investigation and Control:** Heymann. D., ed., Control of Communicable Diseases Manual, 19th Edition. Washington, DC, American Public Health Association, 2010.
- C. Case Definitions:** CDC Division of Public Health Surveillance and Informatics, Available at: wwwn.cdc.gov/nndss/
- D. Kansas Regulations/Statutes Related to Infectious Disease:** www.kdheks.gov/epi/regulations.htm
- E. Kansas Arboviral Disease Surveillance:** www.kdheks.gov/epi/arboviral_disease.htm
- F. Kansas State Veterinary Diagnostic Laboratory:** www.ksvdl.org/
- G. Vector Control:** www.cdc.gov/westnile/vectorcontrol/index.html
- H. Additional Information (CDC):**
- www.cdc.gov/ncezid/dvbd/
 - www.cdc.gov/westnile/index.html
 - www.cdc.gov/chikungunya/index.html