

## VDH Arboviral Infections - For Epidemiologists and Healthcare Providers

### NON-ENDEMIC MOSQUITO-BORNE VIRUSES

Characteristics	Chikungunya virus (CHIKV)	Dengue virus (DENV)	Zika virus (ZIKV)	Comments or additional information
<b>Virology</b>	Genus: <i>Alphavirus</i>	Genus: <i>Flavivirus</i>	Genus: <i>Flavivirus</i>	
<b>Vector(s)</b>	<i>Aedes</i> mosquitoes	<i>Aedes</i> mosquitoes	<i>Aedes</i> mosquitoes	<i>Aedes aegypti</i> and <i>Aedes albopictus</i> mosquitoes
<b>Reservoir</b>	Humans and non-human primates	Humans and non-human primates	Humans and non-human primates	
<b>Geographic Distribution</b>	<a href="#">Endemic in subtropics and tropics</a>	<a href="#">Endemic in subtropics and tropics</a>	<a href="#">Area with risk of Zika in subtropics and tropics</a>	<ul style="list-style-type: none"> <li>Local transmission of all 3 occurs in US territories</li> </ul>
<b>Transmission</b>	<ul style="list-style-type: none"> <li>Bite of infected <a href="#">Aedes</a> mosquito</li> <li>Vertical transmission (Rare)</li> <li>Rarely transmitted through infected blood or tissue</li> </ul>	<ul style="list-style-type: none"> <li>Bite of infected <a href="#">Aedes</a> mosquito</li> <li>Vertical transmission (Rare)</li> <li>Rarely transmitted through infected blood or tissue</li> </ul>	<ul style="list-style-type: none"> <li>Bite of infected <a href="#">Aedes</a> mosquito</li> <li>Vertical transmission</li> <li>Sexual transmission</li> <li>Transmitted through infected blood or potentially infected tissue</li> </ul>	<ul style="list-style-type: none"> <li>Mosquitoes in Virginia that become infected by feeding on infected persons (including asymptomatic persons) can locally transmit virus to others.</li> <li>Yellow fever mosquito (<i>Aedes aegypti</i>)                             <ul style="list-style-type: none"> <li>Primary vector of CHIK, DENV, and ZIKV</li> <li>Lives in tropical, subtropical, and sometimes temperate climates.</li> <li><i>Ae. aegypti</i> have been occasionally identified in Washington, DC and northern Virginia.</li> </ul> </li> <li>Asian tiger mosquito (<i>Aedes albopictus</i>)                             <ul style="list-style-type: none"> <li>Widespread in Virginia</li> <li>Persistent, opportunistic daytime biting mosquito that feeds readily on humans and other mammals</li> </ul> </li> </ul>
<b>Incubation Period</b>	3-7 days (range 1-12 days)	4-10 days (range 3-14 days)	Range 3-14 days	
<b>Signs and Symptoms</b>	<ul style="list-style-type: none"> <li>Fever (acute onset, high temp)</li> <li>Joint pain (usually bilateral, symmetric, and associated with extremities)</li> <li>Headache</li> <li>Backache</li> <li>Muscle pain</li> <li>Maculopapular rash</li> <li>Arthritis/tenosynovitis</li> <li>Conjunctivitis</li> <li>Nausea/vomiting</li> <li>Rarely, neurological symptoms, uveitis, retinitis, myocarditis, hepatitis, nephritis, bullous skin lesions or hemorrhage may occur</li> </ul>	<p>Dengue Fever (DF)</p> <ul style="list-style-type: none"> <li>Fever</li> <li>Aches and body pains (headache, retro-orbital pain, abdominal pain, myalgia, arthralgia)</li> <li>Maculopapular rash</li> <li>Mild hemorrhagic manifestation (petechiae, epistaxis, gingival bleeding, etc.)</li> </ul> <p>Dengue Hemorrhagic Fever (DHF) has 3 phases:</p> <ol style="list-style-type: none"> <li>Febrile (similar to DF)</li> <li>Critical (Plasma Leak) Phase: Severe plasma leakage, bleeding, organ involvement, abdominal pain, persistent vomiting, liver enlargement</li> <li>Convalescent (Reabsorption) Phase</li> </ol>	<ul style="list-style-type: none"> <li>Maculopapular rash</li> <li>Mild fever</li> <li>Arthralgia/arthritis in the extremities</li> <li>Conjunctivitis</li> <li>Rarely, neurological symptoms may occur; has been linked to Guillain-Barre Syndrome, other neurological manifestations</li> <li>Pregnancy complications and potential birth defects (e.g., microcephaly, severe fetal brain defects, abnormal eye development or hearing loss)</li> </ul>	<ul style="list-style-type: none"> <li>All 3 infections can be mild or asymptomatic (ZIKV most likely asymptomatic &gt; DENV &gt; CHIKV most likely symptomatic); co-infection is possible</li> <li>Although each infection might have characteristic symptoms, they cannot always be differentiated by signs and symptoms; therefore obtain travel history and pregnancy status information to narrow DDx.</li> <li>CHIKV more likely to cause high fever (&gt;39°C/102°F), severe, focal polyarthralgia, which can be debilitating, arthritis, maculopapular rash, and lymphopenia; DENV more likely to cause diffuse body pain, neutropenia, thrombocytopenia, hemorrhage, shock, and death; ZIKV more likely to cause itchy, maculopapular rash, arthralgia, and conjunctivitis</li> <li>There are 4 DENV serotypes (I-IV), and infection with 1 type does not confer immunity to another serotype; sequential infections increase the risk for DHF</li> </ul>
<b>Duration (if symptomatic)</b>	Acute symptoms typically resolve in 7-10 days; relapse of rheumatologic symptoms for months to years	Febrile phase can last for 2-7 days; if there are severe manifestations, illness can last 2-13 days	Several days-1 week	
<b>Clinical Laboratory Findings</b>	Mild thrombocytopenia, lymphopenia, elevated liver enzymes (ALT, AST), elevated creatinine	Thrombocytopenia, lymphopenia, neutropenia, elevated liver enzymes (ALT, AST)	Thrombocytopenia, lymphopenia and neutropenia	
<b>Reporting to Public Health</b>	All cases must be reported within 3 days to the <a href="#">local health department (LHD)</a>	All cases must be reported within 3 days to the <a href="#">LHD</a> .	All cases must be reported within 3 days to the <a href="#">LHD</a> .	Reports should be made within 3 days of suspicion or confirmation; for reporting regulations and the Virginia Reportable Disease list, see <a href="#">here</a> .

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Characteristics	Chikungunya virus (CHIKV)	Dengue virus (DENV)	Zika virus (ZIKV)	Comments or additional information
<b>Testing</b>				
<b>Specimen Type</b>	Serum (≥2ml)	Serum (≥2ml)	<ul style="list-style-type: none"> <li>• Serum (≥2ml)</li> <li>• Urine (paired with serum) 2-5ml</li> <li>• Placental/fetal tissue</li> </ul>	CDC testing of placental/fetal tissue requires pre-approval by VDH and CDC
<b>Test Type, Sensitivity</b>	<ul style="list-style-type: none"> <li>• RT-PCR: Most sensitive if collected ≤8 days of onset.</li> <li>• IgM: IgM response develops 7-10 days after onset; specimens collected in the acute phase may be negative for IgM and a convalescent specimen should be tested</li> </ul>	<ul style="list-style-type: none"> <li>• RT-PCR: Most sensitive if collected ≤5 days of onset</li> <li>• IgM: IgM response develops 5–6 days after onset; specimens collected in the acute phase may be negative for IgM and a convalescent specimen should be tested</li> <li>• IgG: May be used for detection of past DENV or flavivirus infections or for secondary infection determinations.</li> <li>• NS1: NS1 ELISA is highly specific to DENV and may detect DENV ≤1 days of onset</li> <li>• PRNT: Useful when a serological specific diagnostic is needed between cross-reactive flaviviruses.</li> </ul>	<ul style="list-style-type: none"> <li>• RT-PCR/NAT: Performed if specimen collected within 14 days of onset; pregnant women may have prolonged viremia</li> <li>• Serology: IgM response develops 4–7 days after onset; recommended if ≥14 days after onset; IgM response wanes but may persist beyond 12 weeks</li> <li>• PRNT: Necessary for CSTE case definition. Useful for a specific serologic diagnostic between cross-reactive flaviviruses.</li> <li>• Placental/fetal tissue: Pre-approval is required prior to submission</li> </ul>	<ul style="list-style-type: none"> <li>• Recommend testing for all 3 viruses if patient is symptomatic</li> <li>• IgM: IgM antibody capture ELISA (MAC-ELISA) used to detect antibodies. High level of cross-reactivity between DEN and ZIKV.</li> <li>• IgG: IgG ELISA used to detect antibodies. IgG development is slower and lasts longer; more useful to determine past infections than current in absence of positive IgM</li> <li>• PRNT: Used to measure titer of the neutralizing antibodies in the serum of the infected individual and determines level of protective antibodies towards infecting virus.</li> </ul>
<b>Labs and Testing Priority</b>	Testing available through commercial laboratories.	Testing available through commercial laboratories.	<ul style="list-style-type: none"> <li>• Serology: Testing available through commercial laboratories.</li> <li>• PRNT: CDC performs PRNT for confirmatory testing; results take ~1 month</li> </ul>	<ul style="list-style-type: none"> <li>• Refer to <a href="#">Zika Testing Algorithm</a> for Providers to determine if Zika testing is recommended.</li> <li>• For public health testing at DCLS, refer to <a href="#">DCLS instructions</a> on collection, shipment and paperwork; complete the <b>entire</b> form, including onset date (mandatory), detailed travel history, clinical details, pregnancy status, etc.</li> </ul>
<b>Treatment</b>	No vaccine or medicine to treat; supportive treatment by rest, fluids, pain relievers (avoid NSAIDs), rehab; consult a physician	No vaccine or medicine to treat; supportive treatment by rest, fluids, pain relievers (avoid NSAIDs), rehab; consult a physician	No vaccine or medicine to treat; supportive treatment by rest, fluids, pain relievers (avoid NSAIDs), rehab; consult a physician	<ul style="list-style-type: none"> <li>• Suspected CHIKV and Zika cases should be managed as DENV (<b>i.e., avoid NSAIDs</b>) until DENV has been ruled out.</li> <li>• Refer to prescribing provider to discuss potential risk of anti-coagulation medication use until dengue is ruled out.</li> </ul>
<b>Prevention and Control</b>	<ul style="list-style-type: none"> <li>• <a href="#">Avoid further mosquito exposure</a> for 3 weeks after returning from travel to CHIKV-endemic country</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Avoid further mosquito exposure</a> for 3 weeks after returning from travel to DENV-endemic country</li> </ul>	<ul style="list-style-type: none"> <li>• Pregnant women and couples planning to become pregnant within 3 months should work with their healthcare providers and carefully consider the risks and possible consequences of travel to <a href="#">areas with risk of Zika</a>.</li> <li>• All travelers to <a href="#">areas with Zika risk</a> should take steps to <a href="#">avoid mosquito bites</a> during travel and for 3 weeks after return.</li> </ul>	<p>To <a href="#">avoid mosquito bites</a>:</p> <ul style="list-style-type: none"> <li>• Wear protective clothing (e.g., long sleeves, pants, shoes and socks)</li> <li>• Use repellent (e.g., Picaridin or DEET based repellants) on exposed skin when outdoors</li> <li>• Maintain residence door and window screens to prevent mosquito entry into home</li> <li>• Eliminate container breeding areas around home as <i>Aedes</i> species larval habitat is primarily natural and artificial containers (e.g., discarded tires, buckets, plastic containers, tree holes)</li> </ul>
<b>More Information</b>	<a href="#">CDC Chikungunya</a>	<a href="#">CDC Dengue</a> ; <a href="#">WHO Dengue</a>	<a href="#">CDC Zika Virus</a>	<a href="#">CDC Traveler's Health</a>

VDH Arboviral Infections - For Epidemiologists and Healthcare Providers

LOCALLY TRANSMITTED MOSQUITO-BORNE VIRUSES

Characteristics	West Nile virus (WNV)	La Crosse virus (LAC)	St Louis virus (SLE)	Jamestown Canyon (JC)	Eastern Equine Encephalitis (EEE)
<b>Virology</b>	Genus: <i>Flavivirus</i>	Genus: <i>Bunyavirus</i> Member of California Serogroup	Genus: <i>Flavivirus</i>	Genus: <i>Bunyavirus</i> Member of California Serogroup	Genus: <i>Alphavirus</i>
<b>Primary Vector(s)</b>	Primarily <i>Culex</i> mosquitoes	<i>Aedes triseriatus</i> , <i>Ae. albopictus</i> , <i>Ae. japonicus</i> , <i>Ae. vexans</i> mosquitoes	<i>Culex</i> mosquitoes	<i>Aedes</i> , <i>Coquillettidia</i> , <i>Culex</i> , and <i>Culiseta</i> mosquitoes	<i>Aedes</i> , <i>Coquillettidia</i> , and <i>Culex</i> mosquitoes
<b>Reservoir</b>	Songbirds, <i>Culex pipiens</i> mosquitoes	Chipmunks/squirrels	Birds (e.g., sparrow, robin), <i>Culex pipiens</i> mosquitoes	Deer and other ruminants	Birds and <i>Culiseta melanura</i> mosquitoes
<b>Geographic Distribution</b>	Extensive distribution in US	Primarily upper Midwest, mid-Atlantic, southeastern states	Primarily Southwest and Central states	Primarily Northeast and Midwest states	Primarily Great Lakes and Gulf Coast states
<b>Transmission</b>	<ul style="list-style-type: none"> <li>• Bite of infected mosquito, humans are dead-end hosts</li> <li>• Rarely transmitted through infected blood or tissue</li> <li>• Rarely transmitted from infected mother to newborn around the time of birth</li> </ul>	Bite of infected Eastern Treehole mosquito ( <i>A. triseriatus</i> ) and other container-breeding <i>Aedes</i> mosquitoes; humans are dead-end hosts	Bite of infected mosquito; humans are dead-end hosts	Bite of infected mosquito; humans are dead-end hosts	Bite of infected bridge mosquito, humans are dead-end hosts- primary cycle occurs in and around swampy areas
<b>Incubation Period</b>	2-6 days (range 2-14 days)	5-15 days	5-15 days	2-14 days	4-10 days
<b>Signs and Symptoms</b>	<p>~80%- Asymptomatic</p> <p>~19%- Non-Neuroinvasive:</p> <ul style="list-style-type: none"> <li>• Fever</li> <li>• Headache</li> <li>• Myalgia/Arthralgia</li> <li>• Vomiting/Diarrhea</li> <li>• Maculopapular rash</li> </ul> <p>~&gt;1%- Neuroinvasive:</p> <ul style="list-style-type: none"> <li>• Meningitis (fever/headache/nuchal rigidity)</li> <li>• Encephalitis (altered mental status, seizures, focal neurologic deficits, parkinsonism)</li> <li>• Acute flaccid paralysis</li> </ul>	<ul style="list-style-type: none"> <li>• Fever</li> <li>• Headache</li> <li>• Nausea/Vomiting</li> <li>• Fatigue/Lethargy</li> </ul> <p>Neuroinvasive (most common in children aged &lt;16 years):</p> <ul style="list-style-type: none"> <li>• Seizures</li> <li>• Partial paralysis of 1 side</li> <li>• Cognitive or neurobehavioral abnormalities</li> <li>• Coma</li> </ul>	<ul style="list-style-type: none"> <li>• Fever</li> <li>• Headache</li> <li>• Dizziness</li> <li>• Meningitis (stiff neck, confusion, disorientation)</li> <li>• Encephalitis (common in older adults)</li> <li>• Coma</li> </ul>	<ul style="list-style-type: none"> <li>• Cold-like symptoms</li> <li>• Fever</li> <li>• Headache</li> <li>• Nausea/Vomiting</li> <li>• Fatigue/Lethargy</li> <li>• Meningitis (severe headache/nuchal rigidity)</li> <li>• Encephalitis (altered mental status, weakness, coma)</li> </ul>	<ul style="list-style-type: none"> <li>• Fever/Chills</li> <li>• Malaise</li> <li>• Arthralgia/Myalgia</li> <li>• Encephalitis (fever, headache, irritability, anorexia, drowsiness, vomiting, diarrhea, cyanosis, convulsions, coma)</li> </ul>
<b>Duration (if symptomatic)</b>	Fatigue/weakness associated with non-neuro cases last weeks-months. Neuro case fatality rate ~10%; those that recover risk residual neurologic deficits.	Febrile illness may last 2-3 days. Neurologic sequelae may cause deficits and disabilities for years. Less than 1% of LAC encephalitis cases are fatal.	Febrile illness is acute and may last 2-3 days. Overall case fatality ratio is 5-30% and increases with age.	Likely febrile stage is acute with lasting neurologic effects. No reported fatalities.	Illness lasts 1-2 weeks. Neurologic manifestation can cause permanent mental and physical dysfunction. Case fatality rate is ~33%.
<b>Clinical Laboratory Findings</b>	Lymphocytic pleocytosis in CSF	Mildly elevated lymphocytic pleocytosis in CSF and elevated CSF protein, elevated peripheral WBC	Moderate lymphocytic pleocytosis in CSF and elevated CSF protein	Poorly understood	Neutrophil pleocytosis and elevated protein levels in CSF
<b>Reporting to Public Health</b>	All cases must be reported within 3 days to the <a href="#">LHD</a> .	All cases must be reported within 3 days to the <a href="#">LHD</a> .	All cases must be reported within 3 days to the <a href="#">LHD</a> .	All cases must be reported within 3 days to the <a href="#">LHD</a> .	All cases must be reported within 3 days to the <a href="#">LHD</a> .

## VDH Arboviral Infections - For Epidemiologists and Healthcare Providers

Characteristics	West Nile virus (WNV)	La Crosse virus (LAC)	St Louis virus (SLE)	Jamestown Canyon (JC)	Eastern Equine Encephalitis (EEE)
<b>Testing</b>					
<b>Specimen Type</b>	<ul style="list-style-type: none"> <li>• Serum (≥2ml)</li> <li>• CSF (1-2ml)</li> </ul>	<ul style="list-style-type: none"> <li>• Serum (≥2ml)</li> <li>• CSF (1-2 ml)</li> </ul>	<ul style="list-style-type: none"> <li>• Serum (≥2ml)</li> <li>• CSF (1-2 ml)</li> </ul>	<ul style="list-style-type: none"> <li>• Serum (≥2ml)</li> <li>• CSF (1-2ml)</li> </ul>	<ul style="list-style-type: none"> <li>• Serum (≥2ml)</li> <li>• CSF (1-2ml)</li> </ul>
<b>Test Type, Sensitivity</b>	<ul style="list-style-type: none"> <li>• RT-PCR/NAT: Most sensitive when performed on CSF &lt;5 days after mosquito bite</li> <li>• IgM: IgM response develops 3-8 days after onset and may persist &gt;1 year; specimens collected in the acute phase may be negative for IgM and a convalescent specimen should be tested</li> <li>• IgG: IgG response develops 1-2 days after IgM and may persist for many years</li> <li>• PRNT: Useful when a specific serologic diagnostic is needed between cross-reactive flaviviruses</li> </ul>	<ul style="list-style-type: none"> <li>• IgM: IgM response detected within 1-3 weeks of onset</li> <li>• PRNT: Useful to confirm a positive LACV disease case and distinguish between other members of California serogroup viruses (e.g., JCV)</li> </ul>	<ul style="list-style-type: none"> <li>• IgM: SLEV IgM testing in serum and CSF can indicate recent flavivirus infection</li> <li>• PRNT: Useful when a specific serologic diagnostic is needed between cross-reactive flaviviruses</li> </ul>	<ul style="list-style-type: none"> <li>• IgM: IgM response detected &gt;7 days post onset. JACV IgM testing in serum and CSF can indicate an acute neuroinvasive JACV infection</li> <li>• PRNT: Useful to confirm a positive JACV disease case and distinguish between other members of California serogroup viruses (e.g., LAC)</li> </ul>	<ul style="list-style-type: none"> <li>• IgM: EEE IgM testing in serum and CSF can indicate an acute neuroinvasive EEEV infection</li> <li>• PRNT: Useful to confirm a positive EEEV disease case</li> </ul>
<b>Labs and Testing Priority</b>	<ul style="list-style-type: none"> <li>• Testing is available at commercial laboratories.</li> <li>• PRNT: CDC performs PRNT for confirmatory testing; results take ~1 month</li> </ul>	<ul style="list-style-type: none"> <li>• Testing is available at commercial laboratories; often referred to as “California Virus”.</li> <li>• PRNT: CDC performs PRNT for confirmatory testing; results take ~1 month</li> </ul>	<ul style="list-style-type: none"> <li>• Testing is available at commercial laboratories.</li> <li>• PRNT: CDC performs PRNT for confirmatory testing; results take ~1 month</li> </ul>	<ul style="list-style-type: none"> <li>• Testing is available at commercial laboratories; often referred to as “California Virus”.</li> <li>• PRNT: CDC performs PRNT for confirmatory testing; results take ~1 month</li> </ul>	<ul style="list-style-type: none"> <li>• Testing is available at commercial laboratories.</li> <li>• PRNT: CDC performs PRNT for confirmatory testing; results take ~1 month</li> </ul>
<b>Treatment</b>	No vaccine or medicine to treat; supportive treatment by rest, fluids, pain relievers, rehab; consult a physician	No vaccine or medicine to treat; supportive treatment by rest, fluids, pain relievers, rehab; consult a physician	No vaccine or medicine to treat; supportive treatment by rest, fluids, pain relievers, rehab; consult a physician	No vaccine or medicine to treat; supportive treatment by rest, fluids, pain relievers, rehab; consult a physician	No vaccine or medicine to treat; supportive treatment by rest, fluids, pain relievers, rehab; consult a physician
<b>Prevention and Control</b>	<p>To <u>avoid mosquito bites</u>:</p> <ul style="list-style-type: none"> <li>• Wear protective clothing (e.g., long sleeves, pants, shoes and socks)</li> <li>• Use repellent (e.g., Picaridin or DEET based repellants) on exposed skin when outdoors</li> <li>• Avoid or treat ditches, resting stagnant waters with high organic material and eliminate artificial container breeding areas near home</li> </ul>	<p>To <u>avoid mosquito bites</u>:</p> <ul style="list-style-type: none"> <li>• Wear protective clothing (e.g., long sleeves, pants, shoes and socks)</li> <li>• Use repellent (e.g., Picaridin or DEET based repellants) on exposed skin when outdoors</li> <li>• Fill treeholes in or around yard with sand</li> <li>• Eliminate artificial container breeding areas near home</li> </ul>	<p>To <u>avoid mosquito bites</u>:</p> <ul style="list-style-type: none"> <li>• Wear protective clothing (e.g., long sleeves, pants, shoes and socks)</li> <li>• Use repellent (e.g., Picaridin or DEET based repellants) on exposed skin when outdoors</li> <li>• Avoid or treat ditches, resting stagnant waters with high organic material and eliminate artificial container breeding areas near home</li> </ul>	<p>To <u>avoid mosquito bites</u>:</p> <ul style="list-style-type: none"> <li>• Wear protective clothing (e.g., long sleeves, pants, shoes and socks)</li> <li>• Use repellent (e.g., Picaridin or DEET based repellants) on exposed skin when outdoors</li> <li>• Avoid or treat ditches, resting stagnant waters with high organic material and eliminate artificial container breeding areas near home</li> </ul>	<p>To <u>avoid mosquito bites</u>:</p> <ul style="list-style-type: none"> <li>• Wear protective clothing (e.g., long sleeves, pants, shoes and socks)</li> <li>• Use repellent (e.g., Picaridin or DEET based repellants) on exposed skin when outdoors</li> <li>• Use extra precaution in woodland habitats, in and around swampy areas during late spring and early fall</li> </ul>
<b>More Information</b>	<a href="#">CDC West Nile Virus</a>	<a href="#">CDC La Crosse Encephalitis</a>	<a href="#">CDC Saint Louis Encephalitis</a>	<a href="#">Pastula DM, et al. 2015. Jamestown Canyon Virus Disease in the United States---2000-2013</a>	<a href="#">CDC Eastern Equine Encephalitis</a>

## VDH Arboviral Infections - For Epidemiologists and Healthcare Providers

### LOCALLY TRANSMITTED TICK-BORNE VIRUSES

Characteristics	Powassan virus	Heartland virus	Bourbon virus
<b>Virology</b>	Genus: <i>Flavivirus</i>	Genus: <i>Phlebovirus</i>	Genus: <i>Thogotovirus</i>
<b>Vector(s)</b>	Black-legged tick ( <i>Ixodes scapularis</i> )	Lone Star tick ( <i>Amblyomma americanum</i> )	Lone Star tick ( <i>Amblyomma americanum</i> )
<b>Reservoir</b>	Woodchucks, squirrels, white-footed mice	Unknown	Unknown
<b>Geographic Distribution</b>	<ul style="list-style-type: none"> <li>Primarily Northeastern and Great Lakes regions</li> <li>In VA, Black-legged ticks are dominant in higher elevations (Southwest and Northwest regions of VA)</li> </ul>	<ul style="list-style-type: none"> <li>Primarily Midwestern and Southeastern US</li> <li>In VA, Lone Star ticks are dominant in lower elevations (Eastern Piedmont and Central Plains regions)</li> </ul>	<ul style="list-style-type: none"> <li>Primarily Midwestern and Southeastern US</li> <li>In VA, Lone Star ticks are dominant in lower elevations (Eastern Piedmont and Central Plains regions)</li> </ul>
<b>Transmission</b>	Bite of infected Black-legged tick	Bite of infected Lone Star tick	Bite of infected Lone Star tick
<b>Incubation Period</b>	7-30 days	~14 days	Unknown
<b>Signs and Symptoms</b>	<ul style="list-style-type: none"> <li>Primarily asymptomatic</li> <li>Fever</li> <li>Headache</li> <li>Vomiting</li> <li>Meningitis</li> <li>Encephalitis (loss of coordination, speech difficulties, altered mental status, seizures)</li> </ul>	<ul style="list-style-type: none"> <li>Fever</li> <li>Fatigue</li> <li>Anorexia</li> <li>Nausea</li> <li>Diarrhea</li> </ul>	<ul style="list-style-type: none"> <li>Fever</li> <li>Fatigue</li> <li>Anorexia</li> <li>Nausea</li> <li>Diarrhea</li> <li>Diffuse, maculopapular rash</li> </ul>
<b>Duration (if symptomatic)</b>	50% of survivors have permanent neurological symptoms. 10% of POW virus encephalitis cases are fatal.	Most people fully recovered, a few patients have died. Case fatality statistics are largely unknown.	Unknown
<b>Clinical Laboratory Findings</b>	Lymphocytic pleocytosis in CSF, CSF protein mildly elevated liver enzymes (ALT, AST)	Leukopenia, thrombocytopenia, elevated liver enzymes (ALT, AST)	Leukopenia, thrombocytopenia, elevated liver enzymes (ALT, AST)
<b>Reporting to Public Health</b>	All cases must be reported within 3 days to the <a href="#">LHD</a> .	CDC requests voluntary notification from states using the <a href="#">Arboviral case definition</a>	CDC requests voluntary notification from states using the <a href="#">Arboviral case definition</a>
<b>Testing</b>			
<b>Specimen Type</b>	<ul style="list-style-type: none"> <li>Serum (≥2ml)</li> <li>CSF (1-2ml)</li> </ul>	<ul style="list-style-type: none"> <li>Serum (≥2ml)</li> <li>CSF (1-2ml)</li> </ul>	<ul style="list-style-type: none"> <li>Serum (≥2ml)</li> <li>CSF (1-2ml)</li> </ul>
<b>Test Type, Sensitivity</b>	<ul style="list-style-type: none"> <li>IgM: POW IgM testing in serum and CSF can indicate an acute neuroinvasive POW infection. IgM may be cross-reactive with WNV or SLE.</li> <li>PRNT: Useful to confirm a positive POW disease case</li> </ul>	<ul style="list-style-type: none"> <li>RT-PCR/NAT: Most sensitive when performed &lt;7 days after onset</li> <li>IgM: IgM response develops ≥7 days after onset</li> <li>PRNT: Useful to confirm Heartland infection</li> </ul>	<ul style="list-style-type: none"> <li>RT-PCR/NAT: Most sensitive when performed &lt;7 days after onset</li> <li>IgM: Testing not yet available</li> <li>PRNT: Useful to confirm Bourbon infection</li> </ul>
<b>Labs and Testing Priority</b>	<ul style="list-style-type: none"> <li>Public health testing for POW at DCLS is available.</li> <li>PRNT: CDC performs PRNT for confirmatory testing; results take ~1 month</li> </ul>	<ul style="list-style-type: none"> <li>Serology and PRNT: <a href="#">CDC only</a> (may submit through DCLS for forwarding to CDC)</li> <li>Consider testing for Heartland or Bourbon virus in patients being treated for ehrlichiosis who do not respond to treatment with doxycycline</li> </ul>	<ul style="list-style-type: none"> <li>Serology and PRNT: <a href="#">CDC only</a> (may submit through DCLS for forwarding to CDC)</li> <li>Consider testing for Heartland or Bourbon virus in patients being treated for ehrlichiosis who do not respond to treatment with doxycycline</li> </ul>
<b>Treatment</b>	Supportive treatment; consult a physician	Supportive treatment; consult a physician	Supportive treatment; consult a physician
<b>Prevention and Control</b>	<p>To <a href="#">avoid tick bites</a>:</p> <ul style="list-style-type: none"> <li>Avoid ticks by avoiding wooded and bushy areas</li> <li>Treat clothing and gear with permethrin and wear light-colored long sleeves, pants, tall socks. Tuck pant legs into socks to avoid ticks crawling up legs.</li> <li>Conduct a full-body tick check on yourself, children, pets, gear, and others; bathe or shower after being outdoors to wash off and help find ticks on your body</li> </ul>	<p>To <a href="#">avoid tick bites</a>:</p> <ul style="list-style-type: none"> <li>Avoid ticks by avoiding leaf litter and grassy areas</li> <li>Treat clothing and gear with permethrin and wear light-colored long sleeves, pants, tall socks. Tuck pant legs into socks to avoid ticks crawling up legs.</li> <li>Conduct a full-body tick check on yourself, children, pets, gear, and others; bathe or shower after being outdoors to wash off and help find ticks on your body</li> </ul>	<p>To <a href="#">avoid tick bites</a>:</p> <ul style="list-style-type: none"> <li>Avoid ticks by avoiding leaf litter and grassy areas</li> <li>Treat clothing and gear with permethrin and wear light-colored long sleeves, pants, tall socks. Tuck pant legs into socks to avoid ticks crawling up legs.</li> <li>Conduct a full-body tick check on yourself, children, pets, gear, and others; bathe or shower after being outdoors to wash off and help find ticks on your body</li> </ul>
<b>More Information</b>	<a href="#">CDC Powassan Virus</a>	<a href="#">CDC Heartland Virus</a>	<a href="#">CDC Bourbon Virus</a>