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June 28, 2021, 2021 1700 EDT (5:00 PM EDT)

NH-HAN 20210628



Mosquito-Borne Diseases Update, New Hampshire, 2021

Key Points and Recommendations:

1. The first ever detection of Jamestown Canyon virus (JCV) in a mosquito has been detected from a batch of *Aedes excrucians* collected on 6/8/2021 in Bow, NH. During the 2020 season, one human case of JCV was identified in Bow.
2. Three different mosquito-transmitted infections can be acquired in New Hampshire: West Nile Virus (WNV), Eastern Equine Encephalitis Virus (EEEV), and JCV.
3. All three mosquito-borne diseases can cause a range of clinical symptoms including asymptomatic infection, non-specific febrile illness, and severe neurological disease including meningitis and encephalitis.
4. Clinicians should consider testing for WNV, EEEV, and JCV, especially in patients hospitalized with signs or symptoms of meningitis or encephalitis (e.g. confusion or altered mental status).
5. Testing for Powassan (POW) virus (a tickborne viral infection) should also be considered in patients presenting with unexplained neurologic illness.
6. Report all suspect or confirmed arboviral illnesses to the Division of Public Health Services (DPHS) within 24 hours at 603-271-4496 (after hours 603-271-5300 and ask for the public health nurse on call).
7. Clinicians should contact their reference laboratories for mosquito-borne disease testing for the 2021 season. DPHS will continue to coordinate testing for POW and JCV as well as confirmatory testing for EEEV and WNV through the CDC.

Background

Mosquito-borne diseases transmitted in New Hampshire (NH) include West Nile virus (WNV), Eastern Equine Encephalitis virus (EEEV), and Jamestown Canyon virus (JCV). Other mosquito-borne diseases are possible in travelers. The greatest risk in NH for human mosquito-borne infection due to WNV and EEEV is between July and October. The risk for JCV is present earlier, however, and likely begins as soon as the snow melts and mosquitoes are present and biting. Risk for these diseases decreases after the first hard frosts kill active mosquitoes and as the daytime shortens.

To help communities assess their risk for mosquito-borne diseases, DPHS supports towns that trap mosquitoes to have them tested at the Public Health Laboratories for WNV and EEEV. For the 2021 mosquito season, DPHS has partnered with Cornell University, the Northeast Regional Center of Excellence in Vector-Borne Diseases, the NH Department of Natural and Cultural Resources, and the NH Fish and Game Department to launch a pilot project performing mosquito testing for JCV in targeted areas of NH where there have been recent human cases of JCV. This testing may contribute to the understanding of human risk when mosquitoes are positive, and provide an early signal to alert the public for improved mosquito-bite prevention.

Mosquito trapping and testing occurs from July through mid-October, primarily in the southeastern part of the State (see attached map). Please note that even in communities where there is no mosquito trapping/testing, people may be at risk for WNV, EEEV, and JCV. A weekly report of NH's mosquito, animal, and human testing information can be found at: <https://www.dhhs.nh.gov/dphs/cdcs/arboviral/results.htm>.

Epidemiology

In NH, WNV was first identified in mosquitoes in 2000 with the first human case occurring in 2003. Since 2003, there have been 7 cases of WNV identified in humans, most recently in 2017.

EEEV was first identified in NH mosquitoes in 2004 with the first human case also occurring in 2004. Since 2004 there have been 15 cases of EEEV identified in humans in NH; our last human case of EEEV was in 2014 (three cases during that year).

In 2020 there was significant EEEV activity in Massachusetts and other states to our south. Drought conditions, such as those NH is currently experiencing, disrupt the transmission cycle of EEEV due to having less available appropriate mosquito habitat for EEEV vectors. This may lead to fewer spillover events into humans and other animals. Even with fewer biting mosquitoes present, mosquito-bite avoidance measures should still be taken to prevent disease transmission. Risk of EEEV transmission is highest during the late summer months through the early fall (August-October).

JCV was first identified in a NH resident in 2013. Since then, we have identified a total of 14 cases in NH, five of which were identified in 2020. JCV has posed itself as the primary cause of arboviral illness in NH residents over the last eight years. Our most recent human case had an illness onset in September 2020.

JCV has been increasingly identified nationally since 2013 when the U.S. Centers for Disease Control and Prevention (CDC) implemented routine JCV testing on all samples submitted to the CDC for arboviral disease testing. A majority of cases are being identified in the upper mid-west and northeast regions of the United States, usually occurring from late spring to early fall. Co-infection of JCV and tick-borne POW have previously been identified in New Hampshire and also reported in other states: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6367605/>.

Signs and Symptoms

WNV, EEEV, and JCV can all present with a range of clinical symptoms including asymptomatic or subclinical illness, non-specific febrile illness (fever, chills, headache, weakness/fatigue, myalgia, arthralgia), and severe neurological disease (meningitis and encephalitis).

An estimated 80% of human WNV infections are subclinical or asymptomatic, and most symptomatic persons experience a non-specific febrile illness. Less than 1% of persons infected with WNV develop neuroinvasive disease, which typically manifests as meningitis, encephalitis, or acute flaccid paralysis. Approximately one-third of individuals that develop illness from EEEV, however, will develop severe encephalitis and succumb to the disease; among those who recover, many suffer from permanent brain damage. About half of known Jamestown Canyon patients that develop symptoms are hospitalized with symptoms including fever and meningoencephalitis. Mortality from JCV is rare.

Treatment for WNV, EEEV, and JCV is supportive, such as intravenous fluids, respiratory support, and prevention of secondary infections for patients with severe disease.

Laboratory Testing

Laboratory diagnosis of WNV, EEEV, and JCV is generally through testing serum and/or cerebrospinal fluid (CSF) for virus-specific IgM antibodies and confirmed by plaque reduction neutralization tests (PRNT). For the 2021 season it is requested that you coordinate with your reference laboratory to perform initial testing for EEEV and WNV. The NH Public Health Laboratories (PHL) will coordinate confirmatory testing for EEEV and WNV, as well as all testing for POW and JCV through the CDC. It is required that the arboviral case report and requisition forms be completed in full and submitted with the specimens. If this is not done testing will be delayed. The information on is necessary to initiate testing for specimens submitted to the PHL.

For more information, including specimen collection instructions, please refer to:

<http://www.dhhs.nh.gov/dphs/cdcs/arboviral/documents/arboguidelines.pdf>

When to Report Suspected Cases of Mosquito-borne Illness

Clinicians, hospitals, and laboratories should report within 24 hours any patient suspected of having a mosquito-borne disease, especially patients who meet the following criteria:

1. Any patient with encephalitis or meningitis from April through November, who meet criteria a, b and c below without an alternative diagnosis:
 - a. Fever \geq 38.0 C or 100 F, and
 - b. CNS involvement including altered mental status (altered level of consciousness, confusion, agitation, lethargy) and/or other evidence of cortical involvement (e.g., focal neurologic findings, seizures), and
 - c. Abnormal CSF profile suggesting a viral etiology (a negative bacterial stain and culture) showing pleocytosis with predominance of lymphocytes. Elevated protein and normal glucose levels.

How to Report Suspect Cases of Mosquito-borne Illness

All suspected mosquito-borne disease cases should first be reported to the New Hampshire Division of Public Health Services by telephone. A completed case report form (attached) must be faxed to the NH Bureau of Infectious Disease Control (603-271-0545) and a copy submitted with the laboratory specimen(s) to the NH Public Health Laboratories (PHL). DPHS staff members are available 24/7 to assist and to support testing.

For additional information:

1. NH DHHS mosquito-borne disease website:
<https://www.dhhs.nh.gov/dphs/cdcs/arboviral/index.htm>
2. NH DHHS laboratory requisition form:
<https://www.dhhs.nh.gov/dphs/lab/documents/labrequisition.pdf>
3. NH DHHS arboviral case report form:
<https://www.dhhs.nh.gov/dphs/cdcs/documents/arboreportform.pdf>
4. For fact sheets on WNV, EEEV, and JCV:
<https://www.dhhs.nh.gov/dphs/cdcs/arboviral/publications.htm>
5. CDC websites:
 - <http://www.cdc.gov/ncidod/dvbid/westnile/clinicians/>
 - <https://www.cdc.gov/easternequineencephalitis/index.html>

- For any questions regarding this notification, please call the NH DHHS, DPHS, Bureau of Infectious Disease Control at (603) 271-4496 during business hours (8:00 a.m. – 4:30 p.m.)
- If you are calling after hours or on the weekend, please call the New Hampshire Hospital switchboard at (603) 271-5300 and request the Public Health Professional on-call
- To change your contact information in the NH Health Alert Network, please send an email to DHHS.Health.Alert@dhhs.nh.gov

Status: Actual
Message Type: Alert
Severity: Moderate
Sensitivity: Not Sensitive
Message Identifier: NH-HAN 20210628 Mosquito-Borne Diseases Update, NH 2021
Delivery Time: 12 hours
Acknowledgement: No
Distribution Method: Email, Fax
Distributed to: Physicians, Physician Assistants, Practice Managers, Infection Control Practitioners, Infectious Disease Specialists, Community Health Centers, Hospitals, Hospital CEOs, Hospital Emergency Departments, EMS, Nurses, NHHA, Pharmacists, Laboratory Response Network, Manchester Health Department, Nashua Health Department, Public Health Networks, DHHS Outbreak Team, DPHS Investigation Team, DPHS Management Team, Northeast State Epidemiologists, Zoonotic Alert Team, Health Officers, Deputy Health Officers, MRC, NH Schools, EWIDS, Dialysis & Transplant Clinics, STD Clinics, Immunization Practices, Travel Centers, Influenza Sentinels, Urgent Care Centers, Ambulatory Surgical Centers, Walk-in Clinics, Poison Center, Alcohol and Other Drug Treatment Centers, Long-Term Care Facilities, Community Mental Health Centers, Health Departments, Internal Medicine, Occupational Health, Gastroenterology, Schools and Daycare Providers, Regional Public Health Networks, Environmental Services, Family Planning Programs, Department of Corrections, Home Care Providers, Local and State Partners, Area Agencies

From: Abigail Mathewson, DVM, MPH, State Public Health Veterinarian
Originating Agency: NH Department of Health and Human Services, Division of Public Health Services

Attachments:

- 1) 2020 New Hampshire Town Sponsored Mosquito Trapping Map
- 2) NH Arboviral Case Report Form

**New Hampshire Case Report
Arboviral Infection
Encephalitis/Meningitis**

This form must be faxed to the New Hampshire Bureau of Infectious Disease Control (603-271-0545) and a copy submitted with the laboratory specimen(s) to the NH Public Health Laboratories

PATIENT INFORMATION

Name: _____ Date of Birth: ____/____/____ Male Female
Last First MI mm dd yy

Home Address: _____ Homeless Yes No
Street City State Zip

Phone (H) _____ (W) _____ (Cell) _____

RACE White Black/African American Asian Native Hawaiian/Pacific Islander
 American Indian/Alaska Native Unknown
 ETHNICITY Unknown Hispanic Non-Hispanic

CLINICAL INFORMATION

Current Diagnosis: Encephalitis Meningitis Other _____

Hospitalized? Yes No If yes, Hospital: _____

Date of Admission: ____/____/____ Date of Discharge/Transfer: ____/____/____

Physician/Provider: _____ Phone: _____

SYMPTOMS: Date of first symptoms ____/____/____ Date of first *neurologic* symptoms ____/____/____

	YES	NO	UNK		YES	NO	UNK		YES	NO	UNK
Fever $\geq 100^\circ\text{F}$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Disorientation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Convulsions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Highest Temp (if known) _____ ^{°F}				Delirium	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Paralysis/Paresis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Headache	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Lethargy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Acute Flaccid Paralysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stiff Neck	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Stupor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cranial Nerve Palsy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tremor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Coma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Rash	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vomiting/Nausea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Muscle Weakness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Location of Rash			
Diarrhea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hyperreflexia	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Hemorrhage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Confusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Muscle Pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Joint Pain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Seizures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Rigidity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
Other _____											

OUTCOME Recovered Residual Symptoms Died Unknown If patient died, date of death ____/____/____

LABORATORY INFORMATION/TEST RESULTS (attach laboratory sheets)

Acute specimens (serum or CSF) must be collected within 3 to 10 days after onset of symptoms. Convalescent specimens should be collected 2-3 weeks after acute sample. If CSF is collected and submitted, please include serum sample.

CSF (specify units) Date ____/____/____ Abnormal? Yes No Unknown Glu _____ Prot _____ RBC _____

WBC _____ Diff. Segs% _____ Lymphs% _____ Gram stain _____ Bacterial Culture _____

Fungal/Parasitic tests _____ Viral test results (Culture/Serology/PCR) _____

CBC (specify units) Date ____/____/____ WBC _____ Diff.Segs% _____ Lymphs% _____

MRI Date ____/____/____ Result _____

CT Date ____/____/____ Result _____

EMG Date ____/____/____ Result _____

ANTIVIRAL TREATMENT Yes No Unk If Yes, list below. **Date Started** ____/____/____

RISK FACTOR INFORMATION FOR PRELIMINARY OR CONFIRMED POSITIVE CASES OF ARBOVIRAL ILLNESS

Patient Name: _____ **DOB:** ____/____/____

1. Does the patient's residence have screened windows? Yes No Unknown
2. During the two weeks before onset of illness does the patient recall being bitten by mosquitoes?
Yes No If yes, dates and places _____
3. Is the patient a smoker? Yes No Unknown
If yes, do they smoke outdoors? Yes No Unknown
4. On average, how much time has the patient spent outdoors each day in the two weeks prior to onset? _____
List any unusually long periods spent outside during the two weeks prior to onset: _____
5. Does the patient use any prevention measures to avoid mosquito bites? Yes No Unknown
If yes, list _____
Does the patient use mosquito repellent when outdoors: Always Sometimes Rarely Never
Does the repellent contain DEET (N, N-diethyl-meta-toluamide, or N, Ndiethyl-3-methylbenzamide), Picaridin, or Oil of Lemon Eucalyptus? Yes No Unknown
6. During the two weeks before onset did the patient travel outside the county of residence?
Yes No Unknown If yes, specify when and where: _____
7. Has the patient traveled outside of New Hampshire in the two weeks prior to onset? Yes No Unknown
If yes, specify when and where: _____
8. Has the patient traveled outside the U.S. in the two weeks prior to onset? Yes No Unknown
If yes, specify when and where: _____
9. Does the patient have any underlying medical conditions? Yes No Unknown
If yes, specify: _____
10. What is the patient's occupation? _____

BLOOD DONATION/TRANSFUSION/TRANSPLANT HISTORY/PREGNANCY

11. Has the patient received an organ transplant or blood product transfusion in the month prior to onset?
Yes No Unknown
If yes, specify when and where: _____
12. Has patient donated blood products or been a living organ donor in the one month prior to onset? Yes No Unknown
13. Is the patient currently pregnant? Yes No Unknown Not applicable
If yes, weeks pregnant _____ due date ____/____/____
14. Is the patient breastfeeding or planning to breastfeed? Yes No Unknown

COMMENTS: _____

REPORTED BY: _____ **DATE OF REPORT:** ____/____/____
Last Name _____ First Name _____ Title(ICN, Resident, Attending) _____
Work address _____ City _____ State _____ Zip Code _____
Phone _____ Pager _____

FOR DHHS USE:
Initial Report Taken by: _____ Report Completed by: _____
Case Status: Confirmed Probable Not a Case Unknown Other State