



Arbovirus

Disease Plan

Including:

- California serogroup viruses (California encephalitis, Jamestown Canyon, Keystone, La Crosse, Snowshoe hare, and Trivittatus viruses)
- **Chikungunya virus**
- Eastern equine encephalitis virus
- Powassan virus
- **St. Louis encephalitis virus**
- **West Nile virus**
- Western equine encephalitis virus

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Last updated: 05/06/15, by JoDee Baker

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

✓ DISEASE AND EPIDEMIOLOGY

Why are arboviral diseases important to public health?

Arboviral (short for arthropod-borne viral) diseases are caused by certain viruses that are transmitted by blood-feeding arthropod vectors (e.g., mosquitoes or ticks). Arboviral diseases are important to public health for many reasons. Some of these diseases are well established in the United States, but many are not. When West Nile virus first emerged in the United States, no one had immunity; it spread across the country rapidly, infecting thousands. With the climate changing, new vectors can establish themselves in areas where they haven't been before, bringing the potentially deadly diseases that they may carry with them, such as malaria and dengue fever. Conducting surveillance for these diseases not only allows us to determine when new viruses are emerging, but can reinforce the importance of awareness and appropriate behaviors that may easily prevent many of these diseases.

Clinical description

Arboviral infections may be asymptomatic, or may result in febrile illnesses of variable severity which are sometimes associated with central nervous system (CNS) involvement. When the CNS is affected, clinical syndromes include meningitis, myelitis and encephalitis, which are clinically indistinguishable from similar syndromes caused by other viruses.

- Arboviral meningitis is usually characterized by fever, headache, stiff neck, and white blood cells in the cerebrospinal fluid (pleocytosis).
- Arboviral myelitis is usually characterized by fever and acute bulbar (impairment of function of the cranial nerves) (pertaining to the circulatory or respiratory system) or limb paresis (partial paralysis) or flaccid paralysis.
- Arboviral encephalitis is usually characterized by fever, headache, and altered mental status ranging from confusion to coma with or without additional signs of brain dysfunction.
- Less common neurological syndromes can include cranial and peripheral neuritis or other neuropathies, including Guillain-Barré syndrome (ascending paralysis).

Non-neuroinvasive syndromes caused by these viruses can include myocarditis (inflammation of the sac surrounding the heart), pancreatitis, or hepatitis. In addition, they may cause febrile illnesses that are non-localized, self-limited illnesses with headache, myalgias, and arthralgias, sometimes accompanied by skin rash or lymphadenopathy. Fatigue has been reported to last several weeks to several years.

Chikungunya (CHIK) has a unique presentation compared to other arboviral diseases; in general, signs and symptoms begin abruptly with fever and malaise following an incubation period of two to four days (range 1-14). Fever typically lasts 3-5 days with joint pain in multiple joints beginning 2-5 days after onset of fever. In older reports, CHIK fever was described as a self-limited illness, although severe complications and death have been reported in more recent outbreaks. It is unclear whether these differences reflect a modulation in virus virulence,

improved epidemiologic observation, or both. Severe complications and death occur more often among patients older than 65 years and in those with underlying chronic medical problems.

Causative agent

There are about 570 viruses worldwide that are spread through arthropods. More than 30 of these arboviruses have been identified as human pathogens in the western hemisphere. There are new emerging arboviral illnesses, such as CHIK, that are making appearances in the United States. In Utah, three mosquito-borne arboviruses that can cause encephalitis in humans have been identified: Western equine encephalitis (WEE), Saint Louis encephalitis (SLE), and currently the most common, West Nile virus (WNV).

- WEE is of the genus *Alphavirus* and in the family *Togaviridae*.
- SLE is a member of the family *Flaviviridae*.
- WNV is a member of the *Flaviviridae* family and *Flavivirus* genus.

Other important arboviral encephalitides in the Americas include:

- Powassan encephalitis
- Chikungunya
- Venezuelan equine encephalitis (VEE)
- Eastern equine encephalitis (EEE)
- LaCrosse encephalitis (part of the California encephalitis virus serogroup)
- Tensaw encephalitis
- Everglades encephalitis
- Ilheus encephalitis, and
- Snowshoe hare encephalitis.

Other arboviral diseases include:

- Dengue (Dengue Hemorrhagic Fever – DHF; Dengue shock syndrome – DSS)
- Japanese encephalitis virus (JEV)
- Powassan
- Yellow Fever, and
- Other less common infections.

Differential diagnosis

These diseases require differentiation from other infectious and non-infectious acute neurological diseases. Infectious causes may include:

- Other insect-borne encephalitides
- Herpes encephalitis
- Aseptic meningitis due to enterovirus
- Poliomyelitis
- Rabies
- Meningoencephalitis due to mumps or measles
- Post-vaccination or post-infectious encephalitides

- Bacterial, mycoplasmal, protozoal, leptospiral, and mycotic meningitides, or encephalitides

Laboratory identification

Laboratory diagnosis is based upon demonstration of specific IgM in serum or CSF, or antibody rises between early (acute) and late (convalescent) specimens of serum. The virus occasionally can be isolated from blood or CSF. Cross-reactions may occur within related virus groups.

Since CHIK is so new, specific laboratory identification is generally accomplished by testing serum or plasma to detect virus, viral nucleic acid, or virus-specific immunoglobulin (Ig) M and neutralizing antibodies. Viral culture may detect virus in the first three days of illness; however, CHIK virus should be handled under biosafety level “3” (BSL3) conditions. During the first eight days of illness, CHIK viral RNA can often be identified in serum. CHIK virus antibodies normally develop toward the end of the first week of illness. Therefore, to definitively rule out the diagnosis, convalescent-phase samples should be obtained from patients whose acute-phase samples test negative.

The Utah Public Health Laboratory (UPHL) acts as a referral agent to the Centers for Disease Control and Prevention (CDC) for confirmation of arboviruses outside of WNV and SLE.

Treatment

There is no specific treatment available for arboviral infections. Treatment of symptoms and supportive care are the only methods of treatment available for arboviral infections.

Case fatality

The case-fatality ratios range from less than 1-60%.

- WEE: case-fatality rates vary for adults and children, but range from 3-4%.
- WNV: 70-80% of people who become infected with WNV don't develop any symptoms. Approximately 20% develop febrile illness, and less than 1% of infected people develop neurological illness. About 10% of those with neurological illness die. Increased risk of death comes with increased age.
- SLE: The case-fatality rate ranges from 5-15%, especially in the elderly.
- CHIK: Mortality is rare and occurs mostly in older adults.

Reservoir

- Birds are a reservoir for WNV. The virus usually resides in birds and the mosquitoes that feed on them.
- The principle reservoirs for SLE are wild birds and domestic fowl.
- Humans are the major reservoir of CHIK virus. However, in Africa, natural hosts of Chikungunya virus are wild primates bitten by forest-dwelling *Aedes*

mosquitoes, and the life cycle for the virus also involves other small mammals such as bats.

- Reservoirs for many of the other arboviral diseases are not known.

The vectors for WNV and SLE are *Culex* species (*Culex tarsalis* and *Culex pipiens*), both of which are found in Utah. The vectors for CHIK are *Aedes aegypti* and *Aedes albopictus*, which are common in many parts of the world, such as Africa, Asia, Europe and the Indian and Pacific Oceans, but are not currently found in Utah.

Transmission

Most arboviruses are spread to humans by the bite of an infected mosquito. Direct person-to-person spread of arboviral infections does not occur. Rarely, they may be transmitted from mother to newborn around the time of birth. It is possible, though unlikely, for arboviruses to be transmitted through breastmilk. Blood transfusions are also a possible route of transmission, although blood donation centers have screening methods in place to prevent it. WNV, WEE, and SLE are transmitted by *Culex* mosquitoes (*pipiens* and *tarsalis*) which are evening biters (dawn to dusk). For CHIK specifically, mosquitoes become infected when they feed on a person already infected with the virus. Infected mosquitoes can then spread the virus to other people through bites. CHIK is spread by *Aedes* mosquitoes (*aegypti* and *albopictus*) which are daytime biters.

Susceptibility

The elderly, children, and the immunocompromised are more susceptible to arboviral illnesses. With most arboviruses, infection is thought to confer immunity.

Incubation period

The incubation period for the arboviral encephalitides of most importance locally are as follows:

- WNV: 2–6 days
- SLE: 4–21 days
- WEE: 5–10 days
- CHIK: 3–7 days

Period of communicability

Arboviral infectious agents are not communicable from person-to-person, except in rare instances (blood transfusion, organ donation).

Epidemiology

Most cases of arboviral encephalitis in North America occur in the late summer and early to mid-fall. The elderly, children, and immunocompromised persons are at greatest risk of encephalitis with SLE, and WNV.

- WNV has been found in 48 states (not Hawaii or Alaska at this time). It has also been documented in Europe and the Middle East, Africa, India, parts of Asia, and Australia. In 2012, the national incidence of WNV neuroinvasive disease was 0.92 per 100,000 person-years. In Utah, for 2014, the incidence was .07 per 100,000 person-years.
- SLE is found in most of the U.S., as well as in parts of Canada, the Caribbean Islands, and Central and South America. In 2014, a total of 10 cases of SLE were reported to CDC, none of which were in Utah. Utah has not had a case of SLE for many years.
- CHIK outbreaks (prior to 2013) have been identified in Africa, Asia, Europe, and the Indian and Pacific Oceans. In late 2013, the first local transmission of CHIK virus in the Americas was identified in Caribbean countries and territories. Local transmission means that mosquitoes in the area have been infected with the virus and are spreading it to people. As of February 10, 2015 a total of 25 CHIK virus disease cases have been reported to CDC from eight U.S. states. All reported cases occurred in travelers returning from affected areas. No locally-transmitted cases have been reported from states within the U.S.

✓ PUBLIC HEALTH CONTROL MEASURES

Public health responsibility

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of this disease.
- Identify sources of exposure and stop further transmission.

Prevention

Environmental measures

People should be encouraged to reduce mosquito populations around their homes and neighborhoods by getting rid of any standing water that might support mosquito breeding. Mosquitoes will begin to breed in any puddle or standing water that lasts for more than four days. People should be advised of the following:

- Dispose of or regularly empty any metal cans, plastic containers, ceramic pots, and other containers (including trash cans) on their property that might hold water.

- Pay special attention to discarded tires. Stagnant water in tires is a common place for mosquitoes to breed.
- Drill holes in the bottom of recycling containers that are left outdoors so that water can drain out.
- Clean clogged roof gutters; remove leaves and debris that may prevent drainage of rainwater.
- Turn over plastic wading pools and wheelbarrows when not in use.
- Do not allow water to stagnate in birdbaths; aerate ornamental ponds or stock them with fish.
- Keep swimming pools clean and properly chlorinated; remove standing water from pool covers.
- Use landscaping to eliminate standing water.

Personal preventive measures/education

- Get vaccinated for diseases which have available vaccines (Yellow Fever and Japanese Encephalitis Virus (JEV)) if you live, work, or plan to travel to an endemic area.) People should also be advised to take the following precautions if they live in or visit an area with mosquitoes:
 - Avoid outdoor activities during the time of greatest mosquito activity (depends on mosquito species). Unlike other vectors, the principal mosquito vectors of CHIK bite during daytime hours.
 - Repair any holes in screens, and make sure they are tightly attached to all doors and windows.
 - Use mosquito netting when sleeping.
 - Use repellents containing DEET (N, N-diethyl-m-toluamide), and choose a product that will provide sufficient protection for the amount of time spent outdoors. Product labels often indicate the length of time that someone can expect protection from a product. DEET is considered safe when used according to the manufacturer's directions. The efficacy of DEET levels off at a concentration of 30%, the highest concentration recommended for children and adults. Some important things to keep in mind when using DEET include:
 - DEET products should not be used on children less than two months of age. Mosquito netting may be used to cover infant carriers or to protect other areas for children less than two months of age.
 - The following precautions should be observed when using DEET products:
 - ▲ Avoid using DEET products that combine the repellent with a sunscreen. Sunscreens may need to be reapplied often, resulting in over-application of DEET.
 - ▲ Apply DEET on exposed skin, using only as much as needed.

- ▲ Do not use DEET on the hands of young children, and avoid applying repellent to areas around the eyes and the mouth.
- ▲ Do not use DEET over cuts, wounds, or irritated skin.
- ▲ Wash treated skin with soap and water after returning indoors, and wash treated clothing.
- ▲ Avoid spraying DEET products in enclosed areas.
- Picardin (KBR 3023) is a relatively new repellent that is now available in the U.S. Recent studies have shown it to be safe and effective. Picardin-containing repellents should be used according to the manufacturer's recommendations.
- A number of plant-derived products are available for use as repellents, but most of these products do not provide the same level or duration of protection as products containing DEET. However, there are studies that show that oil of lemon eucalyptus [p-methane 3,8-diol(PMD)] provides as much protection as low concentrations of DEET when tested against mosquitoes found in the U.S.

Chemoprophylaxis

None.

Vaccine

Vaccines are available for JEV and Yellow Fever. No other human vaccines exist for other arboviral infections. There is a WNV vaccine available for horses.

Isolation and quarantine requirements

Isolation: None.

Hospital: Standard body substance precautions.

Quarantine: None.

✓ CASE INVESTIGATION

Reporting

Report any illness to public health authorities that meets **any** of the following criteria.

- Any person with laboratory evidence of recent arboviral infection as indicated by:
 - Isolation of arbovirus from, or demonstration of specific arbovirus antigen or nucleic acid in, tissue, blood, cerebrospinal fluid (CSF), or other body fluid.
 - Four-fold or greater change in arbovirus-specific quantitative antibody titers in paired sera.
 - Arbovirus-specific immunoglobulin M (IgM) antibodies in CSF or serum.

- A person whose healthcare record contains a diagnosis of an arboviral infection.
- A person whose death certificate lists an arboviral infection as a cause of death or a significant condition contributing to death.

Criterion	Arboviral Neuroinvasive Disease	Arboviral Non-neuroinvasive Disease
<i>Clinical Evidence</i>		
Healthcare record contains a diagnosis of arboviral infection	S	S
Death certificate lists arboviral disease as a cause of death or a significant condition contributing to death	S	S
<i>Laboratory Evidence</i>		
Isolation of arbovirus from, or demonstration of arbovirus- specific antigen or nucleic acid in, tissue, blood, CSF, or other body fluid	S	S
Four-fold or greater change in arbovirus-specific quantitative antibody titers in paired sera	S	S
Arbovirus-specific immunoglobulin M (IgM) antibodies in CSF or serum	S	S

Case definition

Utilize the following information to determine case definition for cases of arboviral disease:

Arboviral diseases, neuroinvasive and non-neuroinvasive (2014) Case Definition

CSTE Position Statement(s)

- 13-ID-13

Clinical criteria

A clinically compatible case of arboviral disease is as 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.

Non-Neuroinvasive disease

- Fever or chills as reported by the patient or a health-care provider, AND
- Absence of neuroinvasive disease, AND
- Absence of a more likely clinical explanation.

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

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.

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.

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 and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred.

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.

Comments

Imported arboviral diseases

Human disease cases due to dengue or yellow fever viruses are nationally notifiable to CDC using specific case definitions. However, many other exotic arboviruses (e.g., CHIK, Japanese encephalitis, Tick-borne encephalitis, Venezuelan equine encephalitis, and Rift Valley fever viruses) are important public health risks for the United States as competent vectors exist that could allow for sustained transmission upon establishment of imported arboviral pathogens. Healthcare providers and public health officials should maintain a high index of clinical suspicion for cases of potentially exotic or unusual arboviral etiology, particularly in international travelers. If a suspected case occurs, it should be reported to the appropriate local/state health agencies and CDC.

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. For example, such testing might be needed to distinguish antibodies resulting from infections within genera (e.g., flaviviruses such as West Nile, St. Louis encephalitis, Powassan, Dengue, or Japanese encephalitis viruses).
- **Rise and fall of IgM antibodies:** For most arboviral infections, IgM antibodies are generally first detectable at 3-8 days after onset of illness and persist for 30-90 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.

Criterion	Neuroinvasive		Non-neuroinvasive	
	Confirmed	Probable	Confirmed	Probable
<i>Clinical Evidence</i>				
Fever (chills)	O	O	N	N
Headache	O	O	O	O
Myalgia	O	O	O	O
Rash	O	O	O	O
Arthralgia	O	O	O	O
Vertigo	O	O	O	O
Vomiting	O	O	O	O
Paresis	O	O	O	O
Nuchal rigidity	O	O	O	O
Neurologic illness	N	N	A	A
Aseptic meningitis	O	O	A	A
Encephalitis	O	O	A	A
Myelitis	O	O	A	A
Disorientation	O	O	A	A
Obtundation	O	O	A	A
Peripheral demyelinating neuropathy	O	O	A	A
Acute Flaccid Paralysis	O	O	A	A
Nerve palsies	O	O	A	A
Peripheral neuritis	O	O	A	A
Sensory deficit	O	O	A	A
Abnormal reflexes	O	O	A	A

Seizures	O	O	A	A
Absence of a more likely clinical explanation for the illness	N	N	N	N
<i>Laboratory evidence</i>				
CSF pleocytosis	O	O	A	A
Isolation of arbovirus from tissue, blood, or other body fluid, excluding CSF	O	A	O	A
Demonstration of specific viral antigen in tissue, blood, or other body fluid, excluding CSF	O	A	O	A
Demonstration of nucleic acid in tissue, blood, or other body fluid, excluding CSF	O	A	O	A
Isolation of arbovirus in CSF	O	A	A	A
Demonstration of specific viral antigen or nucleic acid in CSF	O	A	A	A
Four-fold or greater change in virus-specific quantitative antibody titers in paired sera	O	A	O	A
Arbovirus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in same or later specimen	O	A	O	A
Arbovirus-specific IgM antibodies in CSF and a negative result for IgM antibodies in CSF for other arboviruses in the same virus family endemic to the region where exposure occurred	O	A	A	A
Arbovirus-specific IgM antibodies in CSF but with no other testing	A	O	A	A
Arbovirus-specific IgM antibodies in serum but with no other testing	A	O	A	N

<i>Criteria to distinguish a new case:</i>				
Not counted as a new case if previously classified as a case, e.g., previously documented to have virus-specific IgM antibodies in CSF or serum	N	N	N	N

Notes:

S = This criterion alone is Sufficient to classify a case.

N = All “N” criteria in the same column are Necessary to classify a case. A number following an “N” indicates that this criterion is only required for a specific disease/condition subtype (see below).

A = This criterion must be absent (i.e., NOT present) for the case to meet the classification criteria.

O = At least one of these “O” (Optional) criteria in each category (e.g., clinical evidence and laboratory evidence) in the same column—in conjunction with all “N” criteria in the same column—is required to classify a case. (These optional criteria are alternatives, which mean that a single column will have either no O criteria or multiple O criteria; no column should have only one O.) A number following an “O” indicates that this criterion is only required for a specific disease/condition subtype.

Case investigation process

- Verify case status
- Enter information into UT-NEDSS
- Determine whether patient had travel/exposure history consistent with acquisition of disease in Utah or elsewhere
- If patient acquired disease in Utah, identify the source of transmission and eliminate it.

Outbreaks

An outbreak will be defined as:

- A larger than normal number of cases by county, or
- One case of an unusual or exotic arboviral etiology.

Identification of case contacts

This disease is not spread person to person.

Case contact management

None.

✓ REFERENCES

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UpToDate (2015) Arboviral Surveillance.

✓ VERSION CONTROL

Updated February 2015. Focused plan toward WNV, SLE, and CHIK and removed information about rare arboviruses. Updated case status, included reporting and case classification tables and updated the majority of the plan with current information.

Updated May 2015. Incorporated some definitions for medical terminology and changed formatting.

✓ UT-NEDSS MINIMUM/REQUIRED FIELDS BY TAB

Demographic

- County
- State
- Date of Birth
- Birth Gender
- Ethnicity
- Race
- First Name
- Last Name
- Middle Name
- Area Code
- Email Address
- Extension
- Phone Number

Clinical

- Date Diagnosed
- Date of Death
- Died (Field will change to “Did patient die from the illness or complications”)
- Disease
- Onset Date
- Was patient a blood donor?
 - Does the patient have fever?
 - Does the patient have headache?
 - Does the patient have myalgia?
 - Does the patient have rash?
 - Does the patient have vertigo?
 - Is the patient vomiting?
 - Does the patient have paresis?
 - Does the patient have nuchal rigidity (stiff neck)?
 - Does the patient have aseptic meningitis?
 - Does the patient have encephalitis?
 - Does the patient have Myelitis (inflammation of the spinal cord)?
 - Is the patient disoriented?

- Does the patient have obtundation (altered level of consciousness)?
- Does the patient have peripheral demyelinating neuropathy?
- Does the patient have acute flaccid paralysis?
- Does the patient have nerve palsies?
- Does the patient have sensory deficit?
- Does the patient have abnormal reflexes?
- Has the patient experienced seizures?
- Absence of a more likely clinical explanation for the illness?

Laboratory

- Lab Test Date
- Organism
- Specimen Source
- Test Result

Epidemiological

- Imported From

Investigation

- Is the patient being breastfed?
- Is the patient breastfeeding?
- During the exposure period, has patient traveled outside of Utah?
- Please list all places and dates:
- During the above period, has the patient received a blood transfusion?
- During the above period, has the patient donated blood or blood products?
- During the above period, has the patient received an organ transplant?
- During the above period, has the patient donated organ or tissues?

- During the above period, has the patient received a bloodborne exposure (e.g., needlestick)?
- Was the patient an infant that was born to a mother who had a WNV infection during their pregnancy?
- Was the patient identified as having WNV infection through routine blood donation screening by the blood collection agency? (Patient may or may not be symptomatic)
- Lab Acquired
- Occupationally acquired/not lab
- What was the date of blood donation?
- What lab did the testing?
- Before the patient's infection, did a health care provider ever tell them that they had diabetes?
- Before the patient's infection, did a health care provider ever tell the patient that he/she had hypertension?
- Before the patient's infection, did a health care provider ever tell the patient that he/she had a heart attack?
- Before the patient's infection, did a health care provider ever tell the patient that he/she had angina or coronary artery disease?
- Before the patient's infection, did a health care provider ever tell the patient that he/she had congestive heart failure?
- Before the patient's infection, did a health care provider ever tell the patient that he/she had a stroke?
- Before the patient's infection, did a health care provider ever tell the patient that he/she had a chronic obstructive pulmonary disease (COPD)?
- Before the patient's infection, did a health care provider ever tell the patient that he/she had chronic liver disease?
 - Before the patient's infection, did a health care provider ever tell the patient that he/she had kidney/renal disease or failure?
- Did the patient have a history of alcoholism?
- Did the patient have a history of bone marrow transplant?
- Did the patient have a history of a solid organ transplant?
- If the patient had an organ transplant, which organ was transplanted?
- If the patient had an organ transplant, in which year was the transplant?
- Did the patient have a history of cancer?
- If the patient had cancer, which type(s) of cancer did they have?
- If the patient had cancer, in which year was the cancer diagnosed?
- Is the patient currently being treated for cancer?
- At the time of the patient's diagnosis with WNV, was the patient immune suppressed?
- If the patient is immune suppressed, what is the immune condition?
- At the time of the patient's diagnosis with WNV, was the patient undergoing chemotherapy?
- At the time of the patient's diagnosis with WNV, was the patient receiving medications that suppress the immune system?
- At the time of the patient's diagnosis with WNV, was the patient undergoing other treatments for cancer?
- At the time of the patient's diagnosis with WNV, was the patient undergoing hemodialysis?
- At the time of the patient's diagnosis with WNV, was the patient undergoing other

treatments for kidney disease?

- At the time of the patient's diagnosis with WNV, was the patient receiving oral or injected steroids?
- At the time of the patient's diagnosis with WNV, was the patient receiving insulin or other medications to treat diabetes?
- At the time of the patient's diagnosis with WNV, was the patient receiving insulin or other medications to treat high blood pressure?
- At the time of the patient's diagnosis with WNV, was the patient receiving medications to treat coronary artery disease?
- At the time of the patient's diagnosis with WNV, was the patient receiving medications to treat congestive heart failure?
- Was the patient the source of the medical information?
- Was the provider the source of the medical information?
- Was the patient's family the source of the medical information?
- Is the medical record the source of the medical information?

Contacts

NA

Reporting

- Date first reported to public health

Administrative

- State case Status
- Event Name