

Vector-Borne and Zoonotic Diseases

General Description

Note: For specific details on use, methodology, specimen requirements, and result interpretation related to individual vector-borne and zoonotic pathogens, see the [Individual Test Listing](#) section below.

Use

Testing for vector-borne and zoonotic diseases is performed to support clinical diagnosis, disease surveillance, outbreak detection, and public health response for infections transmitted by arthropod vectors (e.g., mosquitoes, ticks) or animal reservoirs. These tests assist clinicians and public health professionals in identifying etiologic agents, guiding patient management, and implementing prevention and control measures.

Hemorrhagic fever viruses (e.g., Chikungunya, Dengue, Ebola, Hantavirus, Lassa, Rift Valley, Venezuelan and yellow fevers), which have a vector-borne or zoonotic etiology, are designated as “reportable pathogens/diseases” in the State of Oklahoma ([Oklahoma Administrative Code \(OAC\) Reportable Disease Rules – OAC 310:515](#)) that **requires immediate reporting of potential cases to the OSDH Infectious Disease Services** via the secure, web-based Public Health Investigation and Disease Detection of Oklahoma (PHIDDO) system or telephone (405-426-8710). Cases involving reportable pathogens must be reported immediately upon suspicion, diagnosis, or positive laboratory test. Information on what and how to report can be found at the Infectious Disease Prevention and Response Services (IDPR) [website](#).

OSDH IDPR Services **pre-approval is required prior to submission of specimens** from patients with suspected infection with the agents listed in this section to verify the patient meets clinical case criteria and to ensure that a proper specimen is collected and proper documentation submitted. Call 24/7/365 for telephone consultation at 405-426-8710. Once approval for submission has been obtained, please contact the OSDH PHL at 405-564-7750 before shipping.

Clinical Significance

Vector-borne and zoonotic pathogens are responsible for a wide range of illnesses, including acute febrile disease, neurologic infections (meningitis or encephalitis), hemorrhagic syndromes, anemia, and systemic disease. Many of these infections are reportable conditions of public health importance. Timely laboratory testing is essential to differentiate among clinically similar syndromes, detect emerging or re-emerging pathogens, and inform epidemiologic investigations and public health interventions.

Methodology

Testing methodologies vary by pathogen, specimen type, and stage of illness and may include:

- Molecular detection (e.g., PCR) for pathogen nucleic acid
- Serologic testing for pathogen-specific antibodies (IgM, IgG) or antigens
- Microscopic examination for parasitic organisms
- Culture or other specialized methods, when appropriate

Reflex or confirmatory testing may be performed based on initial screening results, clinical information, or public health guidance.

Specimen Type

Acceptable specimen types depend on the suspected pathogen and clinical presentation and may include:

- Whole blood, serum, or plasma
- Cerebrospinal fluid (CSF)
- Tissue or biopsy specimens
- Other specimen types, as indicated

Submitters should review individual test listings or contact OSDH IDPR at 405-426-8710 or the OSDH PHL at 405-564-7750 prior to submission to ensure appropriate specimen selection.

Collection Instructions

Specimens should be collected using aseptic technique and in accordance with test-specific requirements; see individual tests listings below. Proper timing of specimen collection relative to symptom onset is critical, particularly for molecular and serologic testing. Inadequate or improperly collected specimens may compromise test performance. Instructions for collection of serum in serum separator tubes are available in the [*Guidance for Collection and Processing of Blood in Serum Separator Tubes*](#).

Common Causes for Rejection

Specimen rejection criteria will vary depending on the assay performed and may include, but is not limited to, improper specimen type, volume, processing, or timing of collection, improper shipment, and incomplete labeling or documentation of specimens. Submitters should carefully follow instructions provided for specimen collection, shipping and storage and consult with the OSDH PHL and IDPR to avoid rejection of specimens.

Shipping and Storage

Specimens must be stored and transported to preserve integrity and viability, as required by the specific assay. Unless otherwise specified, ship specimens as soon as possible after collection, use priority overnight delivery using commercial courier of choice for delivery Monday through Friday excluding holidays. Use sufficient gel packs or dry ice to maintain appropriate temperature during transport. Do not use wet ice. For specimens requiring refrigerated conditions, use gel packs that are refrigerated (2-8°C) or frozen (-20°C or colder); if using latter, place packaging between specimens and frozen packs to ensure they do not freeze. Ship frozen specimens using at least 5 lbs. (2 kg) of dry ice. If dry ice is not available, ship with frozen (-20°C or colder) gel packs. Always use an insulated box with a Styrofoam (or equivalent) insert and choose a size that allows at least two-thirds of the space surrounding the specimens to be filled with gel packs or dry ice. Comply with all applicable regulations for shipping biological substances. Failure to meet shipping and storage requirements may result in specimen rejection or delayed testing.

Turn-around-Time

Variable depending on assay.

Reportable Results

Results are reported as positive/negative, detected/not detected, reactive/nonreactive, or with organism identification, depending on the assay performed.

Interpretation

Interpretation of results should always be made in conjunction with clinical information and other laboratory findings. Consideration should also be given to timing of specimen collection, exposure history, travel history, vaccination status, and local epidemiology and surveillance data. A negative result does not necessarily exclude infection, particularly if testing is performed outside the optimal diagnostic window. Consultation with OSDH PHL and IDPR is recommended for complex or discordant results.

Limitations/Interferences

General limitations of the various test modalities used to detect vector borne and zoonotic pathogens in clinical samples include, but are not limited to, timing of specimen collection (too early or too late in course of infection), the type of specimen, specimen integrity due to handling, transport and storage, analytic sensitivity (limits of detection; inability to detect certain strains, serotypes or variants), analytic specificity (cross-reactivity), status of the patient (immunocompromised, pregnant, vaccinated, prior or co-infection)

ability to distinguish acute from past exposure and viable from infectious organisms , and inhibitory substances.

Individual Test Listing

The following tests are part of the *Vector-Borne and Zoonotic Diseases* category for which laboratory testing is available via CDC Infectious Diseases Laboratories, other state public health laboratories, and commercial reference laboratories. Testing for vector-borne/zoonotic organisms not included in the list may be available; contact the OSDH IDRP at 405-426-8710 (24/7/365) or the OSDH PHL at 405-564-7750 to inquire about availability of testing.

- [Babesia \(*Babesia* spp.\)](#)
 - [Chikungunya virus \(CHIKV\)](#)
 - [Colorado tick fever virus](#)
 - [Chagas disease \(*Trypanosoma cruzi*\)](#)
 - [Dengue virus \(DENV\)](#)
 - [Eastern equine encephalitis virus \(EEEV\)](#)
 - [Ehrlichiosis](#)
 - [Hantavirus](#)
 - [Japanese encephalitis virus \(JEV\)](#)
 - [La Crosse virus \(California Serogroup \(CSG\) Virus\)](#)
 - [Malaria \(*Plasmodium* spp.\)](#)
 - [Oropouche virus](#)
 - [Powassan virus](#)
 - [Rift Valley fever virus](#)
 - [Rocky Mountain spotted fever virus \(RMSF\)](#)
 - [St. Louis encephalitis virus \(SLEV\)](#)
 - [Venezuelan equine encephalitis virus \(VEEV\)](#)
 - [Western equine encephalitis virus \(WEEV\)](#)
 - [West Nile virus \(WNV\)](#)
 - [Yellow fever virus \(YFV\)](#)
 - [Zika virus \(ZIKV\)](#)
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Babesiosis (*Babesia* spp.)

Use: Diagnosis of tick-borne parasitic infection, particularly in individuals with hemolytic anemia or immunocompromised. Babesiosis is a [nationally notifiable condition](#).

Clinical Significance: May cause severe hemolytic anemia, especially in immuno-compromised individuals.

Also, see CDC's [Clinical Overview of Babesiosis](#).

Methodology: Blood Smear Microscopy; Molecular; Immunofluorescence Assay (IFA)

Specimen Type: Whole blood; serum

Collection: Smear/Molecular: Whole blood in EDTA tube. Serum: Acute serum at onset of symptoms and convalescent serum 2-4 weeks later. Collect blood and separate using a serum-separator tube (red top, gold/yellow, tiger-top or equivalent) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). Dates of specimen collection and onset of symptoms are required.

Shipping & Storage: Ship promptly refrigerated (molecular) or frozen (IFA), as applicable.

Results & Interpretation: Low-level parasitemia may require molecular confirmation

Availability of Testing: Wadsworth Center NYS Department of Health: Test ID 1451: Giemsa stain and molecular detection; Wadsworth Test ID 595 *Babesia microti* IgG-IgA-IgM Serology IFA; commercial reference laboratories

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Babesiosis, see [Wadsworth Parasitology Laboratory Services](#).

Chagas Disease (*Trypanosoma cruzi*)

Use: Diagnosis of acute or chronic Chagas disease and public health surveillance.

Clinical Significance: Chronic infection may lead to cardiac or gastrointestinal disease.

Methodology: Molecular (acute phase); Serology (later infection)

Specimen Type: Serum; Whole blood

Collection: Molecular: EDTA-treated whole blood stored refrigerated (2-8°C) and shipped within 7 days of collection. Serum: Collect blood and separate using a serum-separator tube (gold/yellow, tiger-top or equivalent) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) up to 7 days or freeze (-20°C or colder) for up to 8 weeks.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Chronic infection typically requires multiple serologic assays.

Availability of Testing: CDC-10475 Chagas Disease Molecular Detection – CLIA; CDC-10458 Chagas Disease Serology – CLIA; commercial reference laboratories

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Chagas Disease, see the [CDC Clinical Testing Guidance for Chagas Disease](#) website.

Chikungunya Virus (CHIKV)

Use: Diagnosis of acute febrile illness with severe arthralgia following mosquito exposure or travel.

Chikungunya virus disease is a [nationally notifiable condition](#).

Clinical Significance: CHIKV commonly causes prolonged joint pain and disability.

Methodology: Molecular (acute phase); Serology (later infection)

Specimen Type: Serum, CSF

Collection: Collect early for molecular testing. Serum: Collect blood and separate using a serum-separator tube (gold/yellow, tiger-top or equivalent) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect 1-3 mL in a dry, sterile, leak-proof container and refrigerate (2-8°C) or freeze (-20°C or colder).

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Positive results support recent or current infection.

Availability of Testing: CDC-10283 Arbovirus Neutralization Antibody – CLIA; commercial reference laboratories

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Chikungunya Virus, see the [CDC Clinical Testing Guidance for Chikungunya Virus Disease](#) website.

Colorado Tick Fever Virus

Use: Diagnosis of biphasic febrile illness following tick exposure.

Clinical Significance: Can cause prolonged viremia.

Methodology: Molecular (acute phase); Serology (later infection)

Specimen Type: Acute serum only (0-14 days post-onset date)

Collection: Serum: Collect blood and separate using a serum-separator tube (gold/yellow or tiger-top) then aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder).

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: PCR may remain positive for extended periods.

Availability of Testing: CDC-10280 Arbovirus Molecular Detection - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Colorado Tick Fever Virus, see the [CDC Clinical Features and Diagnosis of Colorado Tick Fever Virus](#) website.

Dengue Virus (DENV)

Use: Detection of acute or recent dengue virus infection associated with febrile illness and potential hemorrhagic complications. Dengue virus infection is a [nationally notifiable condition](#).

Clinical Significance: Dengue may cause febrile illness and, in severe cases, hemorrhagic manifestations or shock.

Methodology: Molecular (acute phase); Serology (IgM/IgG or antigen detection later in infection)

Specimen Type: Whole Blood; Serum, Plasma

Collection: Timing relative to symptom onset is critical for test selection. Whole Blood: Collect in citrate (ACD/yellow top) and heparin (green top) tubes. Serum: Collect blood and separate serum using a serum-separator tube (gold/yellow, tiger-top or equivalent). Store refrigerated (2-8°C) and ship within 72 hours of collection. If shipping is delayed, aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and freeze (-20°C or colder).

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Positive molecular or serologic results indicate infection; cross-reactivity with other flaviviruses may occur.

Availability of Testing: CDC-10307 Dengue Virus Detection and Serology – CLIA; CDC-10283 Arbovirus Neutralization Antibody - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Dengue Virus, see the [CDC Clinical Testing Guidance for Dengue Virus](#) website.

Eastern Equine Encephalitis Virus (EEEV)

Use: Diagnosis of severe mosquito-borne encephalitis and support of surveillance activities. EEEV infection is a [nationally notifiable condition](#).

Clinical Significance: EEEV has high mortality and neurologic sequelae.

Methodology: Serology

Specimen Type: Serum; CSF

Collection: During neurologic illness. Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect in a dry, sterile leak-proof container and promptly refrigerate (2-8°C) or freeze (-20°C or colder); CSF may be stored refrigerated for up to 120 days and frozen for up to 1-year post-collection but must not exceed 3 freeze/thaw cycles.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Positive IgM supports recent infection.

Availability of Testing: CDC-10282 Arbovirus Serology – CLIA; CDC-10283 Arbovirus Neutralization Antibody - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Eastern Equine Encephalitis Virus, see the [CDC Clinical Testing and Diagnosis for Eastern Equine Encephalitis Virus](#) website.

Ehrlichiosis

Use: Detection of acute or recent *Ehrlichia* bacterial infection associated with febrile illness and potential hemorrhagic complications. *Ehrlichia* infection is a [nationally notifiable condition](#).

Clinical Significance: Ehrlichiosis is a potentially severe tick-borne infection causing acute febrile illness with

cytopenia and elevated liver enzymes and can progress to life-threatening complications, particularly in older adults, immunocompromised individuals, children, and those with delayed treatment.

Methodology: Molecular (acute phase); Serology (IFA for IgG antibodies later in infection)

Specimen Type: Whole Blood or Tissue (molecular); Acute and Paired Convalescent Serum (serology)

Collection: Timing relative to symptom onset is critical for test selection. Collect an acute specimen, i.e., within 14 days of illness onset AND before or within 72 hours after initiation of a tetracycline class antibiotic (e.g., doxycycline).

Whole blood: EDTA or ACD A tube. Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) and promptly ship refrigerated (2-8°C). If shipping is delayed, aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and freeze (-20°C or colder). Tissue: Sterile specimen container in saline-moistened gauze.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Positive molecular or serologic results indicate infection; serological cross-reactivity may occur with *Anaplasma*.

Availability of Testing: CDC-10499 Ehrlichia Molecular Detection - CLIA; CDC-10311 Ehrlichia Serology - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Ehrlichiosis, see the [CDC Clinical Testing and Diagnosis for Ehrlichiosis](#) website.

Hantavirus

Use: Detection of antibodies indicative of infection with New World hantaviruses in patients with suspected hantavirus pulmonary syndrome (HPS). Results support clinical diagnosis and public health surveillance, particularly in individuals with compatible symptoms and rodent exposure history.

Clinical Significance: New World hantaviruses cause HPS, a severe and often fatal respiratory illness characterized by rapid onset of pulmonary edema and cardiopulmonary failure. Severe disease and higher mortality risk occur in individuals with significant rodent exposure, delayed diagnosis, or underlying cardiopulmonary conditions.

Methodology: Serology

Specimen Type: Serum

Collection: Collect blood and separate using a serum-separator tube (gold/yellow or tiger-top) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly freeze at -20°C or colder.

Shipping & Storage: Promptly ship on dry ice within 30 days of collection.

Results & Interpretation: Positive results indicate infection; serological cross-reactivity may occur with Old World Hantaviruses. Negative results do not preclude New World Hantavirus infection and should not be used as the sole basis for treatment or other patient management decisions.

Availability of Testing: CDC-10620 New World Hantavirus Testing – CLIA, testing requires CDC pre-approval

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Hantavirus, see the [CDC Clinician Brief: Hantavirus Pulmonary Syndrome](#) website.

Heartland Virus

Use: Evaluation of tick-borne febrile illness with cytopenia.

Clinical Significance: Associated with leukopenia and thrombocytopenia.

Methodology: Molecular (RT-PCR)

Specimen Type: CSF (preferred); Brain Tissue; Paired Serum

Collection: Serum: Collect acute sample at onset of symptoms and convalescent sample 2-4 weeks later. Collect 3 mL whole blood and separate using a serum-separator tube (gold/yellow or tiger-top) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly freeze (-70°C or colder). CSF: Collect 1-3 mL in a dry, sterile, leakproof container, e.g.,

tube with threaded cap and O-ring seal, and promptly freeze (-70°C or colder). State if molecular or serology testing is preferred with a CSF volume < 1 mL. Whole Blood: Collect in EDTA-treated tube. Tissue: Fresh tissue obtained by autopsy or biopsy as soon as possible after death or onset of disease and placed in individual dry, sterile, leak-proof containers; do not include fixatives or media. Freeze immediately at -70°C or colder. Urine: Collect midstream, clean-catch specimen or a catheterized specimen. Transfer aliquot to a dry, sterile, leak-proof container and promptly freeze (-70°C or colder).

Special Instructions: If an arbovirus infection is suspected, including serum, urine and whole blood for arbovirus PCR may greatly improve detection rates as viral titers may be higher and the presence of detectable virus may last longer in these specimen types. Order "Arbovirus Summer Panel Serum Urine Whole blood" (Catalog ID 5470) on these specimen types. List any relevant travel history, including location and date, and/or potential arthropod exposures.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable. If unable to ship within 24 hours, store frozen (-70°C or colder) and ship on dry ice. Ship "Priority Overnight" to be received within 24 hours. Ship directly to the Viral Encephalitis Laboratory. See additional shipping instructions at [Virology - Specimen Collection & Shipping, NYS Department of Health, Wadsworth Center](#).

Results & Interpretation: Direct evidence of heartland virus presence, confirming acute infection in the CNS (if in CSF) or bloodstream.

Availability of Testing: Wadsworth Center NYS Department of Health: Test ID 686 Viral Encephalitis Panel - Summer Jun 1 - Nov 30

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Heartland Virus, see the [Wadsworth Center NYS Department of Health](#) website.

Japanese Encephalitis Virus (JEV)

Use: Diagnosis of encephalitis in individuals with relevant travel or exposure history. Japanese encephalitis virus is a hemorrhagic fever that is a reportable disease in the State of Oklahoma ([OAC 310:515-1-3](#)).

Clinical Significance: JEV is a leading cause of viral encephalitis globally; associated with febrile illness or neurologic disease, including meningitis or encephalitis. Case fatality is high (~25%) for patients with encephalitis and up to half of survivors have significant neurologic sequelae.

Methodology: Plaque Reduction Neutralization Test (PRNT)

Specimen Type: Serum

Collection: Collect during neurologic illness. Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder).

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Positive IgM supports recent infection; vaccination history must be considered. A PRNT titer for the virus that is four-fold higher than for any other tested virus indicates a primary infection.

Availability of Testing: CDC-10283 Arbovirus Neutralization Antibody - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Japanese encephalitis virus, see the [CDC Clinical Features and Diagnosis of Japanese Encephalitis](#) website.

La Crosse Virus

Use: Diagnosis of pediatric and adult encephalitis associated with mosquito exposure. La Crosse virus disease is a [nationally notifiable condition](#).

Clinical Significance: Common cause of pediatric arboviral encephalitis in the U.S.

Methodology: Serology

Specimen Type: Serum; CSF

Collection: Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded

cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: 1-3 mL in a clean, dry, leak-proof container; immediately refrigerate (2-8°C) or freeze (-20°C or colder). May be stored at 2-8°C for up to 120 days post-collection and up to 1 year at -20°C or colder. Specimen must not exceed 3 freeze/thaw cycles.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Positive IgM supports recent infection.

Availability of Testing: CDC-10282 Arbovirus Serology – CLIA; CDC-10283 Arbovirus Neutralization Antibody - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of La Crosse Virus, see the [CDC Clinical Testing and Diagnosis for La Crosse Virus Disease](#) website.

Malaria (*Plasmodium* spp.)

Use: Detection and identification of *Plasmodium* species responsible for acute febrile illness and anemia.

Malaria is a [nationally notifiable condition](#).

Clinical Significance: Malaria is a medical emergency requiring prompt diagnosis. Determination of the infecting species being *P. falciparum* versus other species is imperative because of the potential severity and rapid development of malaria caused by this species.

Methodology: Blood Smear Microscopy; Molecular

Specimen Type: Whole blood (5 mL, EDTA)

Collection: Collect prior to treatment.

Shipping & Storage: Ship promptly refrigerated or frozen (PCR only), as applicable.

Rejection Criteria: Clotted

Expected Turn-around Time: 2 days

Results & Interpretation: Species identification and parasitemia guide treatment. This test cannot distinguish between *P. malariae* and *P. brasilianum*.

Availability of Testing: CDC-10480 Malaria Molecular Identification – CLIA; commercial reference laboratories

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of malaria, see the [CDC Clinical Guidance: Malaria Diagnosis & Treatment in the U.S.](#) website.

Oropouche virus (OROV)

Use: Diagnosis of tick-borne encephalitis.

Clinical Significance: Can cause severe neurologic disease.

Methodology: Molecular; serology

Specimen Type: Serum; CSF

Collection: Serum and CSF must be acute (0-7 days post-onset date) for OROV RT-PCR. Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect 1-3 mL in a clean, dry, leak-proof container and immediately refrigerate (2-8°C) or freeze (-20°C or colder). Specimen may be stored at refrigerated temperature (2-8°C) for up to 30 days and frozen (-20°C or colder) for up to 90 days post-collection. Specimen must not exceed 3 freeze/thaw cycles.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable. If specimen is not shipped within 2 weeks of collection, store and ship frozen (-20°C or colder).

Results & Interpretation: Consider tick exposure history.

Availability of Testing: CDC-10280 Arbovirus Molecular Detection - CLIA; CDC-10283 Arbovirus Neutralization Antibody - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of

Oropouche Virus, see the [CDC Clinical Features and Diagnosis of Oropouche Virus](#) website.

Powassan Virus

Use: Diagnosis of tick-borne encephalitis. Powassan virus disease is a [nationally notifiable condition](#).

Clinical Significance: Can cause severe neurologic disease. Consider tick exposure history.

Methodology: Molecular; Serology

Specimen Type: Whole Blood (molecular); Serum; CSF

Collection: Whole Blood: 1-5 mL in EDTA tube. Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect 1-3 mL in a clean, dry, leak-proof container and immediately refrigerate (2-8°C) or freeze (-20°C or colder). Specimen may be stored refrigerated (2-8°C) for up to 120 days or frozen (-20°C or colder) for up to 1-year post-collection; must not exceed 3 freeze/thaw cycles.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Powassan virus-specific IgM test result should be confirmed by neutralizing antibody testing. Positive IgM and confirmed neutralizing antibody support recent infection.

Availability of Testing: CDC-10282 Arbovirus Serology – CLIA; CDC-10283 Arbovirus Neutralization Antibody – CLIA; commercial reference laboratories (molecular)

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis, see the [CDC Clinical Testing and Diagnosis for Powassan Virus Disease](#) website.

Rift Valley Fever Virus

Use: Diagnosis of zoonotic viral disease associated with livestock exposure and travel. Rift Valley fever is a hemorrhagic fever that is a reportable disease in the State of Oklahoma ([OAC 310:515-1-3](#)).

Clinical Significance: May cause hemorrhagic disease or ocular complications.

Methodology: Serology

Specimen Type: Whole Blood

Collection: Recommended: Whole Blood: 1-5 mL collected in EDTA tube and shipped on dry ice within 60 days of collection. If blood tube cannot withstand freezing, then transfer aliquot to a clean, dry, leak-proof container (e.g., cryotube). Alternative (not preferred): Whole Blood: 1-5 mL collected in EDTA tube, refrigerated (2-8°C) and shipped on cold packs within 3 days of collection.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Testing typically coordinated with public health authorities.

Availability of Testing: CDC-10406 Rift Valley Fever (RVF) Testing – CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Rift Valley Fever Virus, see the [CDC Laboratory Testing for Patients with a Suspected VHF or High-Consequence Disease](#) website.

Rocky Mountain Spotted Fever Virus (RMSF; *Rickettsia rickettsii*)

Use: Diagnosis of zoonotic viral disease associated with tick bite exposure. RMSF is a [nationally notifiable condition](#).

Clinical Significance: Most severe rickettsiosis in U.S. Rapidly progressive disease; fever, headache, myalgia, edema, and rash progressing to altered mental status, difficulty breathing, and multiorgan damage. Without early administration of doxycycline can be fatal within days.

Methodology: Molecular; Serology

Specimen Type: Serology - Serum; Molecular – Serum; Whole Blood; Tissue; and Eschar Swab/Scab

Collection: Serum (serology): Preferably, collect an acute-phase sample (within 14 days of illness onset or while symptomatic) paired with convalescent-phase sample (2-10 weeks after initial sample). Alternatively,

collect a single acute-phase or convalescent serum. Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). Whole Blood (molecular - *R. rickettsii*, *R. typhi*, and *R. prowazekii* only): Collect EDTA or ACD A tube within 14 days of illness onset AND before or within 72 hours of initiation of a tetracycline class antibiotic (e.g., doxycycline). Serum (molecular - available for *R. rickettsii*, *R. typhi*, and *R. prowazekii* only): Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry sterile leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). Tissue (molecular - available for all *Rickettsia* spp.): Obtain within 14 days of illness onset AND before or within 72 hours of initiation of a tetracycline class antibiotic (e.g., doxycycline) and place in sterile specimen container in saline-moistened gauze. Swab/Scab of Eschar (molecular – available for African tick bite fever, rickettsial pox, Pacific Coast tick fever, and *Rickettsia parkeri* only): Obtain swab AND residual eschar scab before or within 14 days of initiation of a tetracycline-class antibiotic (e.g., doxycycline) and store refrigerated (2-8°C) up to 7 days, or frozen at -20°C up to 2 months, or -70°C up to 1 year from time of collection.

Shipping & Storage: Ship promptly refrigerated if sample would arrive at CDC within 7 days from collection, or frozen if previously frozen or if shipping will be delayed, as applicable.

Turn-around time: 6 weeks

Results & Interpretation: Timing of collection is important. Serology can cross-react with other spotted fever viruses. Negative results do not rule out diagnosis; never delay or withhold treatment pending receipt of laboratory test results or based on an initial negative result.

Availability of Testing: CDC-10403 Rickettsia Serology Spotted Fever Group (RMSF) Serology – CLIA; CDC-10402 Rickettsia Molecular Detection - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis, see the [CDC Clinical and Laboratory Diagnosis of Rocky Mountain Spotted Fever](#) website.

St. Louis Encephalitis Virus (SLEV)

Use: Evaluation of mosquito-borne neurologic disease. SLEV disease is a [nationally notifiable condition](#).

Clinical Significance: SLEV may cause encephalitis, particularly in older adults.

Methodology: Serology

Specimen Type: Serum; CSF

Collection: Collect during acute illness. Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect 1-3 mL in a clean, dry, leak-proof container and immediately refrigerate (2-8°C) or freeze (-20°C or colder). Specimen may be stored refrigerated (2-8°C) for up to 120 days or frozen (-20°C or colder) for up to 1-year post-collection; must not exceed 3 freeze/thaw cycles.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Cross-reactivity with other flaviviruses may occur.

Availability of Testing: CDC-10282 Arbovirus Serology – CLIA; CDC-10283 Arbovirus Neutralization Antibody - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of West Nile Virus, see the [CDC Clinical Testing and Diagnosis for St. Louis Encephalitis Virus](#) website.

Venezuelan Equine Encephalitis Virus (VEEV)

Use: Diagnosis and surveillance of equine-associated encephalitis or travel-related encephalitis. VEEV is a hemorrhagic fever that is a reportable disease in the State of Oklahoma ([OAC 310:515-1-3](#)).

Clinical Significance: VEEV can cause febrile illness and neurologic disease.

Methodology: Serology; Molecular

Specimen Type: Serology - Serum; Molecular – Serum; CSF; Whole Blood; Tissue; and Urine

Collection: Serum: Collect acute sample at onset of symptoms and convalescent sample 2-4 weeks later.

Dates of specimen collection and onset of symptoms are required. Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect 1-3 mL in a clean, dry, leak-proof container and immediately refrigerate (2-8°C) or freeze (-20°C or colder). Whole Blood: Collect using EDTA-treated tube. Tissue: Fresh frozen tissue obtained by autopsy or biopsy must be collected as soon as possible after death or onset of disease. Place in a dry, sterile leak-proof container and freeze immediately at -70°C or colder. Urine: Collect midstream, clean-catch specimen or a catheterized specimen. Transfer aliquot to a dry, sterile, leak-proof container and promptly freeze (-70°C or colder).

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable. See additional shipping instructions at [Virology - Specimen Collection & Shipping, NYS Department of Health, Wadsworth Center](#).

Results & Interpretation: Consider occupational or travel exposure. Depending on timing of collection, molecular methods may not be as sensitive as serology.

Availability of Testing: Wadsworth Center NYS Department of Health: Test ID 775: Alphavirus RNA by RT-PCR; Wadsworth Test ID 3170: Arbovirus Plaque Reduction Neutralization (PRNT)

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Venezuelan Equine Encephalitis Virus, see the [Wadsworth Center, NYS Department of Health](#) website.

Western Equine Encephalitis Virus (WEEV)

Use: Detection of mosquito-borne encephalitis and support of surveillance activities. WEEV is no longer nationally notifiable condition although historically it was reportable.

Clinical Significance: WEEV can cause neurologic disease, particularly in children.

Methodology: Molecular; Serology

Specimen Type: Serology - Serum; Molecular – Serum; CSF; Whole Blood; Tissue; and Urine

Collection: Serum: Collect acute sample at onset of symptoms and convalescent sample 2-4 weeks later.

Collect 3 mL whole blood and separate using a serum-separator tube (gold/yellow or tiger-top) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly freeze (-70°C or colder). CSF: Collect 1-3 mL in a dry, sterile, leakproof container, e.g., tube with threaded cap and O-ring seal, and promptly freeze (-70°C or colder). State if molecular or serology testing is preferred with a CSF volume < 1 mL. Whole Blood: Collect in EDTA-treated tube. Tissue: Fresh tissue obtained by autopsy or biopsy as soon as possible after death or onset of disease and placed in individual dry, sterile, leak-proof containers; do not include fixatives or media. Freeze immediately at -70°C or colder. Urine: Collect midstream, clean-catch specimen or a catheterized specimen. Transfer aliquot to a dry, sterile, leak-proof container and promptly freeze (-70°C or colder).

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable. If unable to ship within 24 hours, store frozen (-70°C or colder) and ship on dry ice. Ship "Priority Overnight" to be received within 24 hours. Ship directly to the Viral Encephalitis Laboratory. See additional shipping instructions at [Virology - Specimen Collection & Shipping, NYS Department of Health, Wadsworth Center](#).

Results & Interpretation: Interpret with clinical and epidemiologic data. Depending on timing of collection, molecular methods may not be as sensitive as serology.

Availability of Testing: Wadsworth Center NYS Department of Health: Test ID 775: Alphavirus RNA by RT-PCR; Wadsworth Test ID 3170: Arbovirus Plaque Reduction Neutralization (PRNT); Wadsworth Test ID 606: Arbovirus Screen, Serum

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Western Equine Encephalitis Virus, see the [CDC Clinical Features, Diagnosis, and Treatment of Western](#)

[Equine Encephalitis](#) or [Wadsworth Center NYS Department of Health](#) website.

West Nile Virus (WNV)

Use: Diagnosis of acute or recent West Nile virus infection and public health surveillance of mosquito-borne encephalitis and febrile illness. West Nile virus disease is a [nationally notifiable condition](#).

Clinical Significance: WNV can cause asymptomatic infection, febrile illness, or neuroinvasive disease including meningitis and encephalitis.

Methodology: Molecular on appropriate specimens; Serology (IgM ± IgG)

Specimen Type: Serum; CSF

Collection: Collect during acute illness. Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect 1-3 mL in a clean, dry, leak-proof container and immediately refrigerate (2-8°C) or freeze (-20°C or colder). Specimen may be stored refrigerated (2-8°C) for up to 120 days or frozen (-20°C or colder) for up to 1-year post-collection; must not exceed 3 freeze/thaw cycles.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: IgM or PCR positivity supports recent infection. Negative results do not exclude infection if collected early.

Availability of Testing: CDC-10282 Arbovirus Serology – CLIA; CDC-10283 Arbovirus Neutralization Antibody - CLIA

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of West Nile Virus, see the [CDC Clinical Testing and Diagnosis for West Nile Virus Disease](#) website.

Yellow Fever Virus (YFV)

Use: Diagnosis of acute yellow fever infection and public health investigation of travel-associated cases. Yellow fever is a reportable disease in the State of Oklahoma ([OAC 310:515-1-3](#)).

Clinical Significance: YFV can cause severe hepatic disease and hemorrhage.

Methodology: Molecular; Serology with confirmatory testing

Specimen Type: Serology - Serum; Molecular – Serum; Whole Blood; Urine

Collection: Collect during acute illness. Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect 1-3 mL in a clean, dry, leak-proof container and immediately refrigerate (2-8°C) or freeze (-20°C or colder). Specimen may be stored refrigerated (2-8°C) for up to 120 days or frozen (-20°C or colder) for up to 1-year post-collection; must not exceed 3 freeze/thaw cycles. Urine: Collect midstream, clean-catch specimen or a catheterized specimen. Transfer aliquot to a dry, sterile, leak-proof container and promptly freeze (-70°C or colder).

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Vaccination history is critical for interpretation.

Availability of Testing: CDC-10282 Arbovirus Serology – CLIA; CDC-10283 Arbovirus Neutralization Antibody - CLIA; Wadsworth Center Test Catalog ID 4491

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Yellow Fever Virus, see the [CDC Clinical Testing and Diagnosis for Yellow Fever](#) or [Wadsworth Center NYS Department of Health](#) website.

Zika Virus (ZIKV)

Use: Diagnosis of acute Zika virus infection and evaluation of potentially exposed individuals, including pregnant individuals. Zika virus disease/infection is a [nationally notifiable condition](#).

Clinical Significance: ZIKV infection is associated with congenital infection and neurologic complications.

Methodology: Molecular; Serology with confirmatory testing as indicated.

Specimen Type: Serology – Serum; CSF; Molecular – Serum; CSF; Whole Blood; and Urine

Collect during acute illness. Serum: Collect blood and separate using a serum-separator tube (gold/yellow tiger-top or equivalent) then aseptically transfer serum to a dry, sterile, leak-proof container, e.g., tube with threaded cap and O-ring seal, and promptly refrigerate (2-8°C) or freeze (-20°C or colder). CSF: Collect 1-3 mL in a clean, dry, leak-proof container and immediately refrigerate (2-8°C) or freeze (-20°C or colder).

Whole Blood: Collect in EDTA -treated tube. Urine: Collect midstream, clean-catch specimen or a catheterized specimen. Transfer aliquot to a dry, sterile, leak-proof container and promptly freeze (-70°C or colder). Specimens may be stored refrigerated (2-8°C) for up to 120 days or frozen (-20°C or colder) for up to 1-year post-collection; must not exceed 3 freeze/thaw cycles.

Shipping & Storage: Ship promptly refrigerated or frozen, as applicable.

Results & Interpretation: Positive PCR indicates acute infection; serology requires careful interpretation due to flavivirus cross-reactivity.

Availability of Testing: CDC-10282 Arbovirus Serology – CLIA; CDC-10283 Arbovirus Neutralization Antibody – CLIA; Wadsworth Center Test Catalog ID 3070 Zika Serology, Test Catalog ID 3031 Zika PCR

Additional Resources: For more comprehensive information on laboratory testing and clinical diagnosis of Zika Virus, see the [CDC Clinical Testing and Diagnosis for Zika Virus Disease](#) or [Wadsworth Center NYS Department of Health](#) website.