

Heartland and Bourbon virus testing guidance

Background on Heartland and Bourbon virus

Heartland virus is an RNA virus in the genus *Phlebovirus*, family *Phenuiviridae* believed to be transmitted by the Lone Star tick (*Amblyomma americanum*). First discovered as a cause of human illness in 2009 in Missouri, more than 35 cases of Heartland virus disease have been reported from states in the midwestern and southern United States to date. Most people diagnosed with the disease became sick during May through September.

Bourbon virus is an RNA virus in the genus *Thogotovirus*, family *Orthomyxoviridae* that was recently discovered in Bourbon County, Kansas. Only a few cases of Bourbon virus disease have been identified in the United States, and the geographic distribution appears to be similar to that of Heartland virus. Although it is not yet known how people become infected with Bourbon virus, most patients reported exposure to ticks before becoming ill and the virus has been identified in Lone Star ticks.

Symptoms for both diseases have included fever, fatigue, anorexia, nausea, and diarrhea. Patients with Bourbon virus disease might also present with a diffuse, maculopapular rash. Both viruses have been found to cause leukopenia, thrombocytopenia, and elevated liver transaminases.

Update on status of Heartland and Bourbon virus testing

For several years, CDC has been working with state health departments under IRB-approved protocols to identify additional cases of Heartland or Bourbon virus disease and validate diagnostic tests for these novel pathogens. Enrollment into the protocols has been concluded and CDC Arboviral Diseases Branch will now offer routine diagnostic testing for Heartland and Bourbon viruses.

Who should be tested for Heartland and Bourbon virus disease?

Testing for Heartland or Bourbon virus should be considered for patients with an acute febrile illness within the past 3 months AND at least one epidemiologic criterion AND at least one clinical criterion.

Epidemiologic criteria

- 1) Known tick bite, finding tick on body, or potential exposure to ticks through outdoor activities in the 3 weeks prior to illness onset during spring through fall (e.g., April–October); OR
- 2) Resides in or recently traveled to an area with previous evidence of Heartland or Bourbon virus

Clinical criteria

- 1) Leukopenia (white blood cells <4,500 cells/ μ L) or thrombocytopenia (platelets <150,000 cells/mL) not explained by another known condition; OR
- 2) Suspected tickborne disease (e.g., ehrlichiosis, Rocky Mountain spotted fever) with no clinical response to appropriate treatment (e.g., doxycycline)

Samples collected >3 months after symptom onset will not be tested at this time based on limitations of our current understanding of antibody kinetics.

Prior to submitting specimens, healthcare providers should consult an epidemiologist in their state or local health department to facilitate diagnostic testing and determine if a case meets the criteria.

Testing for evidence of Heartland and Bourbon virus disease

As of July 2018, the following tests for Heartland and Bourbon virus are available at CDC:

Test	Heartland virus	Bourbon virus
RT-PCR	Yes	Yes
IgM MIA	Yes	Not available
IgG MIA	Yes	Not available
PRNT	Yes	Yes

Abbreviations: IgM – immunoglobulin M; IgG – immunoglobulin G; MIA – microsphere-based immunoassay; RT-PCR – reverse transcriptase-polymerase chain reaction; PRNT – plaque reduction neutralization test

For specimens collected <7 days after onset of symptoms, serum and/or whole blood should be submitted for Heartland and Bourbon virus RT-PCR and antibody testing.

For specimens collected ≥ 7 days after onset of symptoms, serum specimens should be submitted for antibody testing. If the patient is immunocompromised, RT-PCR also may be performed on serum collected >7 days after onset.

Because there is no specific IgM antibody test yet available for Bourbon virus, acute and convalescent samples will be needed to make the diagnosis of an acute Bourbon virus infection using serologic assays.

Submitting specimens to CDC for Heartland and Bourbon virus testing

To submit samples for Heartland or Bourbon virus testing at the CDC Arboviral Diseases Branch, please send the sample through the state health department laboratory.

All samples should be submitted with a CDC submission form (CDC 50.34) with the following information completed: 1) Patient name or unique ID, date of birth, and sex; 2) Date of illness onset; 3) Date of specimen collection; 4) Immunocompromising conditions or medications; and 5) Travel history within 3 months prior to symptom onset.

Healthcare providers and health departments are encouraged to include the specific epidemiologic and clinical criteria used to determine that testing for Heartland and Bourbon virus disease is appropriate.

More information on submitting a sample for testing at CDC Arboviral Diseases Branch is provided at: <https://www.cdc.gov/ncezid/dvbd/specimensub/arboviral-shipping.html>.

Reporting of Heartland or Bourbon virus disease cases

Heartland and Bourbon virus disease are not nationally notifiable conditions but they can be reported to ArboNET. CDC requests that states report cases of Heartland and Bourbon virus disease on a voluntary basis using the current CSTE case definition for Arboviral Diseases, Neuroinvasive and Non-neuroinvasive (<https://www.cdc.gov/nndss/conditions/arboviral-diseases-neuroinvasive-and-non-neuroinvasive/>).

Additional information

CDC Bourbon virus website: <https://www.cdc.gov/ncezid/dvbd/bourbon/index.html>

CDC Heartland virus website: <https://www.cdc.gov/heartland-virus/index.html>

Missouri Department of Health and Senior Service Heartland and Bourbon virus fact sheet:

<https://health.mo.gov/living/healthcondiseases/communicable/tickscarrydisease/pdf/HeartlandBourbonVirus.pdf>

Additional questions regarding Heartland or Bourbon virus disease can be directed to the CDC Arboviral Diseases Branch at 970-221-6400; ask for the epidemiologist on call.