



Tick-and Mosquito-Borne Diseases in Children



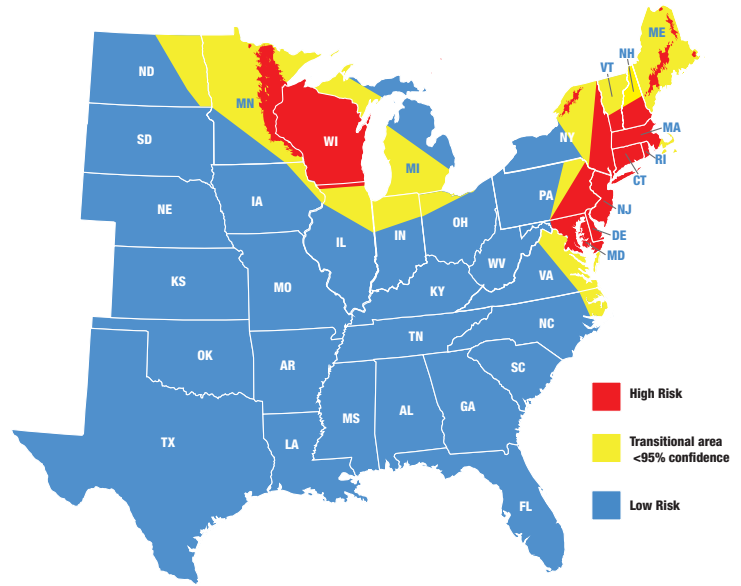
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When your child needs a hospital, everything matters.

Lyme disease and other tick- and mosquito-borne illnesses continue to increase and cause significant morbidity in Ohio. This is particularly true for children, who spend a lot of time outdoors during the spring and summer. Please consider Lyme disease and other arthropod borne diseases in the differential diagnosis for patients that present with appropriate symptoms.

Some of the primary concerns in the Midwest include Lyme disease (*Borrelia burgdorferi*), West Nile virus, and La Crosse virus. Other less common infections include those with *Babesia*, *Anaplasma*, *Ehrlichia* and Rocky Mountain Spotted Fever (*Rickettsia rickettsii*).

<https://odh.ohio.gov/wps/portal/gov/odh/know-our-programs/zoonotic-disease-program>



Map of Risk for Lyme Disease in U.S.

Lyme Disease

Lyme disease is caused by a spirochete-shaped bacterium called *Borrelia burgdorferi*. The bacteria is commonly found in mice and is transmitted to humans by the bite of an infected blacklegged tick, *Ixodes scapularis*, also known as the deer tick. Incidence of Lyme disease has increased steadily, with more than 468 reported cases in Ohio in 2019. The onset of most Lyme disease cases is in late spring and summer.

Early Signs and Symptoms

Signs and symptoms of Lyme disease may begin to manifest 3 to 30 days after a tick bite. In addition to flu-like symptoms of fever, chills, headache, fatigue, swollen lymph nodes and muscle and joint aches, the classic erythema migrans (EM) rash may appear.

The rash occurs in approximately 70-80 percent of infections. It begins at the site of the tick bite an average of 7 days after the bite but may appear 3 to 30 days later. The rash expands gradually over a period of days, reaching up 12 inches across. Sometimes the inner ring begins to clear, resulting in the target or “bullseye” appearance. The rash may feel warm to the touch, but it is rarely itchy or painful.



Classic Bull's Eye Rash of Lyme Disease



Common Ticks Found in Ohio

From left to right: blacklegged tick nymph, blacklegged tick female, blacklegged tick male, American dog tick female, American dog tick male, lone star tick female, lone star tick male.

Later Signs and Symptoms

Additional signs and symptoms may not appear until days to months after the tick bite:

- Severe headaches and neck stiffness
- Additional EM rashes on other areas of the body
- Arthritis with severe joint pain and swelling, particularly the knees and other large joints
- Facial palsy (loss of muscle tone or droop on one or both sides of the face)
- Intermittent pain in tendons, muscles, joints and bones
- Heart palpitations or an irregular heartbeat
- Episodes of dizziness or shortness of breath
- Shooting pains, numbness or tingling in the hands or feet
- Problems with short-term memory

Testing

Lyme serology should be conducted if the epidemiology as well as signs and symptoms are consistent with possible Lyme disease.

The test screens for antibodies to *B. burgdorferi* with two separate enzyme-linked immunoassays (EIA), one for IgG antibody and another for IgM antibody. It is intended for use as an aid in diagnosis of Lyme disease.

Testing is not intended or indicated as a screening procedure for the general population, and it should be done only when exposure history or symptoms suggest Lyme disease.

Negative Results

Negative results do not rule out a diagnosis of Lyme disease. Patients in early stages of infection may not produce detectable levels of antibody. Antibiotic therapy in early stages may prevent antibody production from reaching diagnostic levels. Patients with clinical history or symptoms or both suggestive of Lyme disease but with negative results should be retested in 4-6 weeks. A single positive result only indicates prior infection.

Positive Results

Positive results must be interpreted with caution. Clinical symptoms, epidemiological information and other laboratory test results must all be considered. Following CDC recommendations, Western Blot testing is performed to confirm all positive EIA results.

Confirmation by Western Blot

This method is used to confirm positive total antibody screens. The Western Blot method identifies the proteins of the bacteria to which the antibody response is directed, both IgM and IgG. This test should only be used to confirm positives, and it should not be ordered as a stand-alone diagnostic test.

For more information regarding test availability or specimen requirements, please call (800) 934-6575 or visit NationwideChildrens.org/Lab.

La Crosse and West Nile, Arboviruses

The arboviruses are a group of viruses transmitted by arthropod vectors, particularly mosquitoes and ticks. The most commonly detected arboviruses in the United States belong to the following families: *Alphavirus* (Eastern equine encephalitis virus, Western equine encephalitis virus), *Flavivirus* (St. Louis encephalitis virus, West Nile Virus) and *Bunyavirus* (La Crosse encephalitis virus). In the Midwest, most cases of arboviral infection occur from June through October, when arthropods are most active.

Symptoms

The severity of symptoms of La Crosse virus and West Nile virus infection in humans ranges from asymptomatic to severe and requiring hospitalization. While both occur in people of all ages, La Crosse is more common than West Nile in children in the Midwest. Symptoms of La Crosse generally appear 5-15 days after infection and include fever, headache, nausea, vomiting, fatigue and lethargy. In severe cases, neurological symptoms, including seizures, hemiparesis and cognitive abnormalities may occur.

Most people (70-80 percent) who become infected with West Nile virus do not develop any symptoms. About 1 in 5 people who are infected will develop a fever with other symptoms such as headache, body aches, joint pains, vomiting, diarrhea or rash. Most people with this type of West Nile virus disease recover completely, but fatigue and weakness can last for weeks or months. Less than 1 percent of people who are infected will develop a serious neurologic illness such as encephalitis or meningitis with symptoms including headache, high fever, neck stiffness, disorientation, coma, tremors, seizures or paralysis.

People with certain medical conditions, such as cancer, diabetes, hypertension or kidney disease, as well as people who have received organ transplants, are also at greater risk for serious illness from arboviruses. Recovery from severe disease may take several weeks or months, and some of the neurologic effects may be permanent.

Testing

La Crosse Virus or West Nile Virus Antibodies, IgG and IgM

These tests are intended to be used as a means of detecting La Crosse virus- or West Nile virus-specific IgG and IgM in serum or spinal fluid specimens in which there is a clinical suspicion of infection. Because other members of the Flaviviridae family, such as St. Louis encephalitis virus, show extensive cross-reactivity with West Nile virus, serologic testing specific for all of these viruses should be considered.

Treatment

In mild to moderate cases, over-the-counter pain relievers can be used to reduce fever and relieve symptoms. In severe cases, patients may need to be hospitalized to receive supportive treatment, such as intravenous fluids, pain medication and nursing care.

No vaccine or specific antiviral treatments for La Crosse virus or West Nile virus infection are available.

Disease/Agent	Vector	Testing
More Common in Ohio		
Lyme (<i>Borellia burgdorferi</i>)	Tick (<i>Ixodes scapularis</i>)	<ul style="list-style-type: none"> • Use a two-tier serologic approach to test for <i>B. burgdorferi</i> infection using an enzyme immunoassay (EIA) • All specimens positive or equivocal by EIA are reflexed for a Western immunoblot. Specimens negative by EIA need not be tested further. • PCR should not be ordered routinely. Highest sensitivity in joint fluids.
West Nile virus	Mosquito (<i>Culex sp.</i>)	Enzyme immunoassay (EIA) testing of serum samples, preferable 2 collected 2-4 weeks apart during acute and convalescent phases of illness. CSF is also an appropriate sample for testing in suspected cases.
La Crosse virus	Mosquito (<i>Aedes triseriatus</i>)	Enzyme immunoassay (EIA) testing of serum samples, preferable 2 collected 2-4 weeks apart during acute and convalescent phases of illness.
Less Common in Ohio		
<i>Babesia microti</i>	Tick (<i>Ixodes scapularis</i>)	<ul style="list-style-type: none"> • Immunofluorescent antibody (IFA) testing of at least two serum samples collected 2-4 weeks apart during acute and convalescent phases of illness -OR • PCR amplification of DNA extracted from whole blood specimens collected during the acute state of illness • Serologic sensitivity is poor early in the course of infection. If serology is negative in patients with possible early infection, repeat serology 3 to 4 weeks later which may demonstrate seroconversion.
<i>Anaplasma phagocytophilum</i>	Tick (<i>Ixodes scapularis</i>)	
<i>Ehrlichia chaffeensis</i>	Tick (<i>Amblyomma americanum</i>)	
Rocky Mountain spotted fever (<i>Rickettsia rickettsii</i>)	Tick (<i>Dermacentor variabilis</i>)	

Treatment

Patients treated with appropriate antibiotics in the early stages of Lyme disease usually recover rapidly and completely. Antibiotics commonly used for oral treatment include doxycycline, amoxicillin or cefuroxime axetil. Doxycycline is relatively contraindicated during pregnancy or lactation and in children <8 years of age. Patients with certain neurological or cardiac forms of illness may require intravenous treatment with drugs such as ceftriaxone or penicillin.

Referrals and Consultations

Online: [NationwideChildrens.org/Infectious-Diseases](https://www.nationwidechildrens.org/Infectious-Diseases)

Phone: (614) 722-6600 or (877) 722-6220

Physician Direct Connect Line for 24-hour urgent physician consultations:

(614) 355-0221 or (877) 355-0221.

Laboratory Testing and Pathology Consultations

Online: [NationwideChildrens.org/Lab](https://www.nationwidechildrens.org/Lab)

Phone: (614) 722-5477 or (800) 934-6575



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