



Tick-and Mosquito-Borne Diseases in Children





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 due to *Babesia*, *Anaplasma*, *Ehrlichia* and Rocky Mountain Spotted Fever (*Rickettsia rickettsii*).

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

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 1700 reported cases in Ohio in 2024. 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.

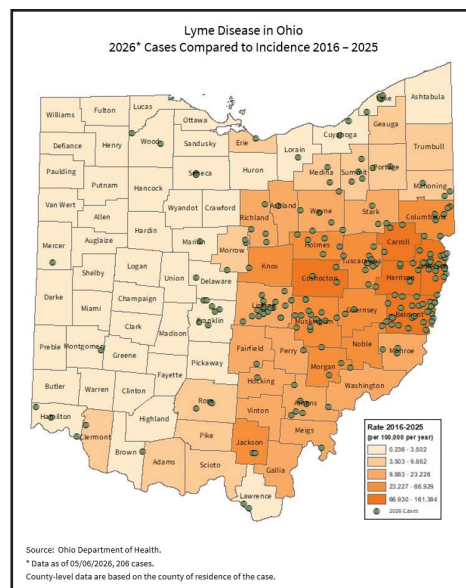


Classic Bull's Eye Rash of Lyme Disease



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.



2026 Ohio Department of Health

Later Signs and Symptoms

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

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

Testing

Lyme serology should be considered if the epidemiology as well as signs and symptoms are consistent with possible Lyme disease. A two-tiered serological approach should be performed.

In the initial screening test performed at Nationwide Children's Hospital, IgM and IgG antibodies to *B. burgdorferi* are detected in two separate enzyme-linked immunoassays (EIA). This test is intended as an aid in the 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 symptoms suggest Lyme disease.

Negative Results

Negative results do not rule out a diagnosis of Lyme disease. Patients in early stages (early localized and early disseminated) of infection may not produce detectable levels of antibody. Antibiotic therapy in early stages may prevent antibody production from reaching diagnostic levels.

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 or Enzyme-linked immunoassay (EIA)

In the standard two-tiered approach, the Western Blot method is used to confirm positive antibody screens. This test should only be used to confirm positives, and it should not be ordered as a stand-alone diagnostic test. More recently, the CDC endorsed a modified two-tiered approach, where the confirmatory Western Blot testing is replaced by EIA testing with *B. burgdorferi* antigens different than those used in the initial EIA screen.

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

Treatment

Patients presenting with the EM rash should not be tested and should be treated presumptively for Lyme disease. Those in the early disseminated stage may also be seronegative and require empirical treatment. Treatment with appropriate antibiotics in the early stages of Lyme disease generally results in a rapid and complete recovery, as well as prevention of the late arthritis manifestation. Antibiotics commonly used for oral treatment include doxycycline, amoxicillin or cefuroxime axetil. Doxycycline is contraindicated during pregnancy or lactation but is no longer contraindicated in children under 8 years of age. Patients with certain neurological or cardiac forms of illness may require intravenous treatment with drugs such as ceftriaxone or penicillin.

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 Ohio, most cases of arboviral infection are due to LaCrosse virus and West Nile virus; specific testing for these viruses should be performed.

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, confirmatory testing specific to all of these viruses should be performed.

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>)	• 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 Blot. 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>)	Immunofluorescent antibody (IFA) 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> <i>Anaplasma phagocytophilum</i>	Tick (<i>Ixodes scapularis</i>)	• Nucleic acid amplification (NAA) of DNA extracted from whole blood specimens collected during acute state of illness is preferred when collected ≤7 days of symptoms. • When symptoms have persisted for more than 7 days, serologic testing of at least two serum samples collected 2-4 weeks apart during acute and convalescent phases of illness should be performed.
<i>Ehrlichia chaffeensis</i>	Tick (<i>Amblyomma americanum</i>)	
Rock Mountain spotted fever (<i>Rickettsia rickettsii</i>)	Tick (<i>Dermacentor variabilis</i>)	• Serologic testing of at least two serum samples collected 2-4 weeks apart during acute and convalescent phases of illness is preferred.



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

