

Babesiosis

DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS

Per N.J.A.C. 8:57, healthcare providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of babesiosis to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. A directory of local health departments in New Jersey is available at:

<http://localhealth.nj.gov>

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609.826.5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.



1 THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Babesiosis is a parasitic infection caused by protozoan parasites of the genus *Babesia*, which infect red blood cells. Of the more than 100 species that have been described as parasitic for mammals, only a few are known to infect humans (*B. microti*, *B. divergens*, *B. duncani*). Of these, *Babesia microti* is the predominant species causing illness in the eastern and midwestern United States.

B. Clinical Description

Infection is often asymptomatic; but may be life-threatening in some individuals. Some people develop flu-like symptoms such as fever, chills, sweats, headache, body aches, loss of appetite, nausea or fatigue. Because *Babesia* parasites damage red blood cells, Babesiosis can cause hemolytic anemia.

Clinical findings include low hemoglobin and hematocrit and elevated LDH, which may be accompanied by splenomegaly, hepatomegaly, or jaundice. Thrombocytopenia is common. Parasitemia levels in red blood cells range from 1% to 10% in patients with an intact spleen to as high as 85% in asplenic patients.

Risk factors for severe babesiosis include asplenia, advanced age, and other causes of impaired immune function (e.g., HIV, malignancy, corticosteroid therapy). Some immunosuppressive therapies or conditions may affect the clinical manifestations (e.g., the patient might be afebrile). Severe cases can be associated with marked thrombocytopenia, disseminated intravascular coagulation, hemodynamic instability, acute respiratory distress syndrome, myocardial infarction, renal failure, hepatic compromise, altered mental status, and death.

The tick vector for *babesia* may also carry the organisms that cause Lyme disease and anaplasmosis (formerly granulocytic ehrlichiosis). Co-infections have been documented and may complicate the clinical picture.

Treatment

Most asymptomatic persons do not require treatment. For ill patients, babesiosis is usually treated with one of two combination therapies. Healthcare providers can consult with CDC on treatment decisions: https://www.cdc.gov/parasites/babesiosis/health_professionals/index.html#tx

C. Vectors and Reservoirs

The primary vector for Babesiosis in New Jersey is the blacklegged or deer tick, *Ixodes scapularis*.

Ticks become infected as larvae or nymphs when they feed on infected animals, particularly the white-footed mouse. Nymphal ticks pose the greatest threat of transmitting infectious organisms to animals and humans because they are small in size (<2 mm) and may go undetected. Nymphs are most abundant between May and July, and they are typically found in wooded areas, brush,

and grassy areas near woodland edges. Although adult ticks are capable of transmitting babesiosis, they are larger in size and easier to detect. As such, adult ticks are often removed before they can transmit babesiosis. Deer are an important source of food for adult ticks but do not transmit *Babesia*.

D. Modes of Transmission

Babesiosis is most often acquired from the bite of an infected tick. In most cases, the tick must be attached for 36 to 48 hours before the parasite can be transmitted. Ticks can attach to any part of the human body but are often found in hard-to-see areas such as the groin, armpits, and scalp. As a result, cases of diagnosed babesiosis frequently have no known history of a tick bite.

Person-to-person transmission may occur through blood transfusion. *Babesia microti* is the most commonly reported transfusion-transmitted pathogen in the United States. Until 2018, there were no FDA-licensed tests for screening blood donors for *Babesia*, although some blood collection centers had voluntarily implemented investigational testing. Federal regulations requiring screening of blood donors with the new FDA-licensed test have yet to be written.

Rare cases of congenital/perinatal transmission have been reported.

E. Incubation Period

Symptoms typically appear in one to three weeks or longer for tickborne transmission and weeks to months for transfusion-associated transmission. Symptom onset may be acute or gradual.

F. Period of Communicability or Infectious Period

Babesiosis is not generally transmitted from person-to-person with the exception of blood transfusion. Anyone with a history of babesiosis should be permanently excluded from blood donation. Asymptomatic blood donors have been shown to be infectious for as long as 12 months after the initial infection.

G. Epidemiology

Reports of babesiosis have been increasing in the United States since the disease was originally recognized in 1966. Babesiosis became a nationally notifiable disease in 2011. The geographic distribution of babesiosis has expanded in a pattern similar to that of Lyme Disease but at a slower pace. In 2014, 94% of reported cases were from 7 states: Connecticut, Massachusetts, Minnesota, New Jersey, New York, Rhode Island, and Wisconsin. The median age of reported cases was 63 years, with the largest number of cases reported in persons aged 60-69 years. Most cases developed symptoms in the spring or summer months, and primarily between June and August. Each year, approximately 1,400 cases are reported to CDC. Between 2011 and 2016, an average of 178 cases per year were reported in New Jersey (ranging from 92 to 297). The majority of New Jersey cases are reported from Monmouth, Ocean, Burlington, Hunterdon, Atlantic, Camden and Gloucester counties.

2 CASE DEFINITION

The NJDOH Zoonotic Disease Program follows the most current case definition as published on the CDC National Notifiable Disease Surveillance System (NNDSS) website.

Babesiosis Case Definition: <https://wwwn.cdc.gov/nndss/conditions/babesiosis/>

Case definitions enable public health to classify and count cases consistently across reporting jurisdictions, and should not be used by healthcare providers to determine how to meet an individual patient's health needs.

A. Clinical Criteria (for the purposes of surveillance):

Objective—one or more of the following: fever, anemia, or thrombocytopenia

Subjective—one or more of the following: chills, sweats, headache, myalgia or arthralgia

NOTE: People can be asymptotically infected with *babesia* organisms but will be considered a surveillance case only if they meet clinical criteria.

B. Laboratory Criteria:

Laboratory confirmatory:

- Identification of intraerythrocytic *Babesia* organisms by light microscopy in a Giemsa, Wright, or Wright-Giemsa–stained blood smear; **OR**
- Detection of *Babesia microti* DNA in a whole blood specimen by polymerase chain reaction (PCR); **OR**
- Detection of *Babesia* spp. genomic sequences in a whole blood specimen by nucleic acid amplification; **OR**
- Isolation of *Babesia* organisms from a whole blood specimen by animal inoculation.

Laboratory supportive:

- Demonstration of *Babesia microti* Indirect Fluorescent Antibody (IFA) total immunoglobulin (Ig) or IgG antibody titer $\geq 1:256$ (or $\geq 1:64$ in epidemiologically linked blood donors or recipients); **OR**
- Demonstration of a *Babesia microti* Immunoblot IgG positive result; **OR**

- Demonstration of a *Babesia divergens* IFA total Ig or IgG antibody titer \geq 1:256; **OR**
- Demonstration of a *Babesia duncani* IFA total Ig or IgG antibody titer \geq 1:512.

IgM antibody testing alone is NOT acceptable due to the possibility of false positive results.

C. Epidemiologic evidence for transfusion transmission

For the purposes of surveillance, epidemiologic linkage between a transfusion recipient and a blood donor is demonstrated if all the following criteria are met:

- In the transfusion recipient:
 - Received one or more red blood cell (RBC) or platelet transfusions within one year before the collection date of a specimen with laboratory evidence of *Babesia* infection; **AND**
 - At least one of these transfused blood components was donated by the donor described below; **AND**
 - Transfusion-associated infection is considered at least as plausible as tickborne transmission; **AND**
- In the blood donor:
 - Donated at least one of the RBC or platelet components that was transfused into the above recipient; **AND**
 - The plausibility that this blood component was the source of infection in the recipient is considered equal to or greater than that of blood from other involved donors. (More than one plausible donor may be linked to the same recipient.)

C. Case classification

CONFIRMED

A case that has confirmatory laboratory results and meets at least one of the objective or subjective clinical evidence criteria, regardless of the mode of transmission (can include clinically manifest cases in transfusion recipients or blood donors).

PROBABLE

- A case that has supportive laboratory results and meets at least one of the objective clinical evidence criteria (subjective criteria alone are not sufficient); **OR**

- A case that is in a blood donor or recipient epidemiologically linked to a confirmed or probable babesiosis case **AND**:
 - has confirmatory laboratory evidence but does not meet any objective or subjective clinical evidence criteria; **OR**
 - has supportive laboratory evidence and may or may not meet any subjective clinical evidence criteria but does not meet any objective clinical evidence criteria.

POSSIBLE

A case that has confirmatory or supportive laboratory results, but insufficient clinical or epidemiologic information is available for case classification (e.g., only a laboratory report was provided).

3 LABORATORY TESTING

Testing for symptomatic persons is often performed through detection of parasites in blood smears. PCR testing is often more sensitive than blood smear and can provide species-level testing. Antibody detection tests are useful for detection in individuals with low levels of parasitemia, for diagnosis after infection has cleared by therapy, and for distinguishing between *Babesia* and *Plasmodium falciparum* infection. Culture is rarely performed.

Parasite identification by blood smear

Diagnosis of babesiosis is typically made by identifying the organism on a thin smear of peripheral blood. Multiple thick and thin smears may be necessary to identify the parasite. It can be difficult to distinguish between *Babesia* and *Plasmodium* parasites. Confirmatory testing is available from the NJ Public Health and Environmental Laboratory.

Molecular methods

In some infections, the morphologic characteristics observed on microscopic examination of blood smears do not allow an unambiguous differentiation between *Babesia* and *Plasmodium*. Moreover, potential blood donors may have subclinical symptoms and very low parasitemia, undetectable in blood smears. In such cases, the diagnosis can be derived from molecular techniques, such as PCR. PCR testing is available at commercial laboratories and can identify the *Babesia* species.

Serologic methods

Serological testing for babesiosis is available at commercial laboratories. The indirect fluorescent antibody test (IFA) detects *B. microti* antibodies in 88-96% of patients with *B. microti* infection. Titers generally rise to $\geq 1:1024$ during the first weeks of illness and decline gradually over 6 months to titers

of 1:16 to 1:256 but may remain detectable at low levels for a year or more. Specificity is 100% in patients with other tick-borne diseases or persons not exposed to the parasite. Cross-reactions may occur in serum specimens from patients with malaria infections, but generally titers are highest with the homologous antigen. The extent of cross-reactivity between *Babesia* species is variable.

4 PURPOSE OF SURVEILLANCE AND REPORTING

- To better understand the local epidemiology of infection with *Babesia*
- To identify potential transfusion transmitted infections as early as possible so that blood products from infected donors can be removed from circulation
- To recognize areas in New Jersey where babesiosis incidence has increased or decreased
- To focus preventive education

5 CASE INVESTIGATION

A. Investigation

Because of concerns about possible transfusion-transmitted babesiosis infections, local health departments are asked to initiate investigations of laboratory positive cases within 2 business days and complete the investigation within 5 business days. To assist with the investigation, the NJDOH CDS Babesiosis Investigation Worksheet can be used to obtain essential information from the healthcare provider: <http://www.nj.gov/health/cd/topics/babesiosis.shtml>.

All information on the worksheet should be entered to CDRSS. Worksheets should not be sent to NJDOH. If the patient received a blood transfusion within the past year, additional investigation is required (see Section 6 B, Managing Special Situations).

B. Key CDRSS Fields Specific for Babesiosis

CDRSS Screen	Required Information
Signs/Symptoms	<ul style="list-style-type: none"> • Enter any complications of babesiosis in signs and symptoms.
Contact Tracing	<ul style="list-style-type: none"> • In transfusion transmitted infection case investigations, the donor and recipient information will be linked by CDS Vectorborne Disease staff.

CDRSS Screen	Required Information
Additional Requirements: Babesiosis	<ul style="list-style-type: none"> • List all blood transfusions received by the patient in past 12 months, including transfusion dates, products, source of product and where received. • If patient donated blood in the prior 12 months, document date and location. • NJDOH CDS Vectorborne Disease staff will complete questions related to transfusion-associated infections.
Case Comments	<ul style="list-style-type: none"> • Indicate whether or not an immunosuppressive condition was present and if so, list the condition(s). • If treatment included exchange transfusion(s), document here along with the date(s). • If requested information was not provided by the patient's healthcare provider, list the dates attempts were made to obtain information and the outcomes. For example, 1/12/17 faxed form to provider; 1/31/17, spoke with office manager and re-sent form; 2/15/17, refaxed form to provider.

6 CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements (NJAC 8:57-1.10) / Protection of Contacts of a Case

There are no isolation or quarantine restrictions.

B. Managing Special Situations

Transfusion Transmitted Babesiosis

If the patient received one or more blood transfusions in the past year, contact the infection preventionist at the facility(s) where the transfusion(s) took place and request a list of the transfusions, including:

1. Date transfused
2. Healthcare facility where transfused
3. Type of blood product (red blood cells, platelets, plasma, other)
4. Source of blood product (blood center name)

Enter this information to the disease specific tab in CDRSS and notify your regional epidemiologist as soon as possible so the appropriate blood donor investigation can be initiated.

CDS Vectorborne Disease staff will work with the hospital blood bank to monitor the investigation of possible infected blood products, positive donors and other potentially infected recipients.

Removing a Tick

Ticks should be removed as soon as they are found on the skin. Fine-tipped tweezers should be used to firmly grasp the tick very close to the skin. Using a steady motion, the tick's body should be pulled away from the skin. Efforts should be made to not twist or jerk the tick – this can cause the mouth-parts to break off and remain in the skin. If this happens, the mouth-parts should be removed with tweezers. If mouth-parts can't be removed, leave them alone and let the skin heal. After the tick is removed, the bite area should be cleaned with rubbing alcohol, an iodine scrub, or soap and water.

Dispose of a live tick by submersing it in alcohol, placing it in a sealed bag/container, wrapping it tightly in tape, or flushing it down the toilet. Never crush a tick with fingers. Petroleum jelly, a hot match, nail polish, or other products should not be used to remove a tick.

Tick Testing and Identification

Tick testing of individual ticks is not useful because:

- If the test shows that the tick contained disease-causing organisms, that does not necessarily mean that the person has been infected.
- If someone has been infected, s/he will probably develop symptoms before the results of the tick testing are available. Treatment should not be delayed while waiting for tick testing results.
- Negative results can lead to false assurances. For example, the person concerned may be been unknowingly bitten by a different tick that was infected.

Tick identification may be of value when discussing tick bit exposures with a healthcare provider. County mosquito control agencies or agricultural extension offices may offer tick identification services. The TickEncounter Resource Center has tick identification resources online:

http://www.tickencounter.org/tick_identification

C. Preventive Measures

Preventing ticks in the yard: Involves keeping wildlife (especially deer and rodents) out of the backyard and making it less attractive to ticks.

- Clear tall grasses and brush around homes and at the edge of lawns.

- Place a 3-ft wide barrier of wood chips or gravel between lawns and wooded areas and around patios and play equipment. This will restrict tick migration into recreational areas.
- Mow the lawn frequently and keep leaves raked.
- Stack wood neatly and in a dry area (discourages rodents that ticks feed on).
- Keep playground equipment, decks, and patios away from yard edges and trees and place them in a sunny location, if possible.
- Remove any old furniture, mattresses, or trash from the yard that may give ticks a place to hide.
- When using acaricides (tick pesticides) around the home, always follow the label instructions and never use near streams or other bodies of water.

Preventing ticks on pets: Although dogs and cats can get babesiosis, there is no evidence that they spread the disease directly to their owners. However, pets can bring infected ticks into the home or yard. For these reasons, it's important to use a tick preventive product for dogs.

Preventing tick bites on people: The best preventive measure is to avoid tick-infested areas. In areas where contact with ticks may occur, individuals should be advised to do the following:

- Wear long-sleeved shirts and long, light-colored pants tucked into socks or boots.
- Stay on trails when walking or hiking and avoid high grass.
- Use repellent that contains 20 percent or more DEET, picaridin or IR3535 on exposed skin for protection that lasts several hours. Always follow product instructions. Parents should apply this product to their children, avoiding hands, eyes, and mouth.
- Use products that contain permethrin on clothing. Treat clothing and gear, such as boots, pants, socks and tents with products containing 0.5% permethrin. It remains protective through several washings.
- Bathe or shower as soon as possible after coming indoors (preferably within 2 hours) to wash off and more easily find ticks that are crawling on you.
- Conduct a full-body tick check using a hand-held or full-length mirror to view all parts of your body upon return from tick-infested areas. Parents should check their children for ticks under the arms, in and around the ears, inside the belly button, behind the knees, between the legs, around the waist and especially in their hair.
- Examine gear and pets. Ticks can ride into the home on clothing and pets, then attach to a person later, so carefully examine pets, coats, and day packs.

- Tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing after you come indoors.

Tick Bite Prophylaxis

The Infectious Disease Society of America (IDSA) does not recommend antibiotic treatment following a tick bite as a means to prevent babesiosis. There is no evidence this practice is effective, and it may simply delay onset of disease. Instead, persons who experience a tick bite should be alert for symptoms suggestive of tickborne illness and consult a physician if fever, rash, or other symptoms of concern develop.

Additional Information

NJDOH: <http://www.nj.gov/health/cd/topics/babesiosis.shtml>

CDC: <https://www.cdc.gov/parasites/babesiosis/index.html>

References

AABB (formerly American Association of Blood Banks) Association Bulletin #14-05: Babesiosis. <https://www.aabb.org/programs/publications/bulletins/Documents/ab14-05.pdf>

Centers for Disease Control and Prevention. Case definitions for Babesiosis. <https://wwwn.cdc.gov/nndss/conditions/babesiosis/case-definition/2011/>

Centers for Disease Control and Prevention. Babesiosis Surveillance-- 18 States, 2011. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6127a2.htm>. MMWR Morb Mortal Wkly Rep July 13, 2012 / 61(27);505-509.

Centers for Disease Control and Prevention. Surveillance for Babesiosis – U.S., 2014 Annual Summary. https://www.cdc.gov/parasites/babesiosis/resources/babesiosis_surveillance_summary_2016.pdf

Diuk-Wasser MA, Liu Y, Steeves TK, Folsom-O’Keefe CF, Dardick KR, Lepore T, Bent SJ, Usmani-Brown S, Telford SF, Fish D, Krause PJ. Monitoring human babesiosis emergence through vector surveillance, New England, USA. *Emerging Infectious Diseases* 2014;20(2);225-231.

Heymann, David L., ed. *Control of Communicable Diseases Manual*. 20th ed. Washington, DC: American Public Health Association; 2015.

National Center for Biotechnology Information, National Institutes of Health. Zimmer A, Simonsen K. Tick Diseases, Babesiosis. Updated 2/7/2017. <https://www.ncbi.nlm.nih.gov/books/NBK430715/>

New Jersey Department of Health Communicable Disease Service. Reportable Disease Statistics. <http://www.state.nj.us/health/cd/statistics/reportable-disease-stats/index.shtml>

Moritz ED, Winton CS, Tonnetti L, Townsend RL, Berardi VP, Hewins ME, Weeks KE, Dodd RY, Stramer SL. Screening for *Babesia microti* in the U.S. Blood Supply. *New England Journal of Medicine* 2016; 375;23; 2236-2245.

U.S. Food and Drug Administration. FDA News Release: FDA approves first tests to screen for tickborne parasite in whole blood and plasma to protect the U.S. blood supply, 3/6/2018.

<https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm599782.htm>