

# 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. Serologic and molecular tests available for *B. microti* infection do not typically detect other *Babesia* agents.

## 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 lactate dehydrogenase (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](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 important sources of food for adult ticks but do not transmit *Babesia* to ticks.

#### **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. Prior to blood supply screening in endemic areas, *Babesia microti* had been 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. In May 2019, the FDA issued final [Recommendations for Reducing the Risk of Transfusion-Transmitted Babesiosis](#). These recommendations include donation testing year-round when blood is collected in N.J.

Rare cases of congenital/perinatal transmission have been reported.

#### **E. Incubation Period**

Symptoms typically appear in 1-4 weeks after a tick bite or 1-9 weeks (up to 24 weeks) after a contaminated blood transfusion. 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 positive *Babesia spp.* Test result should be excluded from blood donation for at least 2 years. Individuals with a history of babesiosis should discuss their babesiosis history with the blood donation agency prior to donation. Asymptomatic blood donors have been shown to be infectious for as long as 12 months after the initial infection.

There are no recommendations/policies for transplant safety and babesiosis. There have only been two cases reported in kidney recipients from the same donor, not enough to inform any recommendation. Out of an abundance of caution, CDC recommends that donors defer organ donation for two years from the date of positive blood donation screening or babesia laboratory test results. There is no evidence of persistence of *Babesia* in the body beyond one year.

## 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 2019, 88% of reported cases were from 7 states: Connecticut, Massachusetts, Minnesota, New Jersey, New York, Rhode Island, and Wisconsin. In 2019 CDC was notified of a total of 2,418 cases of babesiosis by 25 of the 40 states in which babesiosis was a reportable condition. This was an 11% increase from the total of 2,161 cases for 2018 and the highest number of cases reported for any year since babesiosis became a nationally notifiable disease. The median age of reported cases was 64 years. Most cases developed symptoms in the spring or summer months, and primarily between June and August. Between 2018 and 2022, an average of 255 cases per year were reported in New Jersey (ranging from 236 to 294), with the highest incidence rates in the northwestern counties (refer to [NJDOH Vector-borne Disease Dashboard](#)).

# 2 CASE DEFINITION

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

Babesiosis Case Definition: <https://ndc.services.cdc.gov/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 meet the public health surveillance case definition 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  $\geq 1:512$ .

NOTE: IgM antibody testing alone is NOT acceptable. If an IgM result is positive but the IgG result is negative, a follow-up blood specimen drawn at least one week after the first should be tested. If the IgG result remains negative in the second specimen, the IgM result likely was a false positive.

### 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).

**NOTE:** If clinical information is provided by either a healthcare provider or the patient that does not meet clinical criteria, the case should be classified as “NOT A CASE.”

## 3 LABORATORY TESTING

Testing for symptomatic persons is often performed through detection of parasites in blood smears. PCR testing is often more sensitive than microscopy and can provide species-level identification. 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. If the laboratory is not confident in their identification of the organism, fresh EDTA whole blood, stained and unstained smears and a completed [BACT-109 form](#) should be sent to NJDOH Public Health and Environmental Laboratories (PHEL) for confirmatory testing.

### 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. Serologic tests available for *B. microti* infection do not typically detect other *Babesia* agents.

## 4 PURPOSE OF SURVEILLANCE AND REPORTING

- To better understand the local epidemiology of infection with *Babesia*
- To promptly identify potential transfusion transmitted infections 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 enter critical details into CDRSS within 5 business days (Disease investigation priority level 3). To assist with the investigation, the NJDOH CDS Babesiosis Investigation Worksheet can be used to obtain essential information from the healthcare provider and patient:

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

All information on the worksheet should be entered into CDRSS (do not send worksheets 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
<b>Laboratory and Diagnostic Test Information</b>	<ul style="list-style-type: none"> <li>• Enter percent parasitemia (enter as new test name: <i>Babesia</i> infected red blood cells), if available</li> </ul>
<b>Industry and Occupation</b>	<ul style="list-style-type: none"> <li>• Enter industry/occupation</li> </ul>
<b>Signs/Symptoms</b>	<ul style="list-style-type: none"> <li>• Inquire if the patient had each sign/symptom and update the response to Yes, No or Unknown accordingly. Not Asked should not be left as a default response. Enter onset and resolution dates, if known.</li> <li>• Enter any complications of babesiosis in signs and symptoms.</li> </ul>



CDRSS Screen	Required Information
<b>Additional Requirements: Babesiosis</b>	<ul style="list-style-type: none"> <li>List all blood transfusions received by the patient in past 12 months, including transfusion dates, products, source of product and where received.</li> <li>If patient donated blood in the prior 12 months, document date and location. Notify the CDS Vector Team (<a href="mailto:CDSVectorTeam@doh.nj.gov">CDSVectorTeam@doh.nj.gov</a>) by email.</li> <li>NJDOH CDS Vector-borne Disease staff will complete questions related to transfusion-associated infections.</li> </ul>
<b>Clinical Status</b>	<ul style="list-style-type: none"> <li>Ensure illness onset date is entered</li> <li>Enter hospitalization status (as part of this investigation, was this patient hospitalized)</li> <li>Enter whether the patient died (during the course of illness)</li> <li>Document pre-existing conditions, particularly any immunosuppressive conditions, noting the condition(s)</li> </ul>
<b>Contact Tracing</b>	<ul style="list-style-type: none"> <li>In transfusion transmitted infection case investigations, the donor and recipient information will be linked by CDS Vector-borne Disease staff.</li> </ul>
<b>Laboratory and Diagnostic Test Information</b>	<ul style="list-style-type: none"> <li>Select IB under method within the lab test for all immunoblots</li> </ul>
<b>Medical Facility and Provider Information</b>	<ul style="list-style-type: none"> <li>For hospitalized patients, ensure patient status = INPATIENT and admission and discharge dates are entered.</li> </ul>
<b>Risk Factors</b>	<ul style="list-style-type: none"> <li>Answer all risk factor questions, including receipt of blood transfusion or organ transplant, tick exposure, and if the patient is asplenic. Notify the REP and CDS Vector Team (<a href="mailto:CDSVectorTeam@doh.nj.gov">CDSVectorTeam@doh.nj.gov</a>) by email if positive response to blood transfusion or organ transplant.</li> </ul>
<b>Treatment</b>	<ul style="list-style-type: none"> <li>Document all medications received with duration/dates of treatment. Babesiosis is typically treated with combination therapy.</li> </ul>

CDRSS Screen	Required Information
<b>Case Comments</b>	<ul style="list-style-type: none"> <li>• If treatment included exchange transfusion(s), document here along with the date(s).</li> <li>• 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, 1/12/23 faxed form to provider; 1/31/23, spoke with office manager and re-sent form; 2/15/23, refaxed form to provider.</li> <li>• Missing information should be obtained by interviewing the patient. If the patient is non-responsive, document attempts and call outcomes in Comments section as well.</li> </ul>

## 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. Blood donation

Persons who test positive for *Babesia* spp. should not donate blood for at least 2 years. Individuals with a history of babesiosis should discuss their babesiosis history with the blood donation agency prior to donation.

### C. Organ donation

Persons who test positive for *Babesia* spp. should not donate organs for at least 2 years. Individuals with a history of babesiosis should discuss their babesiosis history with the organ donation agency prior to donation.

### D. Managing Special Situations

#### Transfusion Transmitted Babesiosis

If the patient received one or more blood transfusions in the 12 months prior to illness onset, 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 “Additional Requirements” tab in CDRSS and immediately notify the CDS Vector Team via email at [CDSVectorTeam@doh.nj.gov](mailto:CDSVectorTeam@doh.nj.gov) so the appropriate donor investigation can be initiated.

CDS Vector-borne 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.

### **Transplant Transmitted Babesiosis**

If the patient received one or more organ transplants in the 30 days prior to illness onset, contact the infection preventionist at the facility(s) where the transplant took place and request a list of the transplanted organs, including:

1. Date of transplant
2. Healthcare facility where transplant occurred
3. Organ(s) received
4. Source of organ (donation center/foundation)

## **7 PREVENTION**

### **Removing a Tick**

1. Remove the tick as soon as possible.
2. Use fine-tipped tweezers to grasp the tick as close to the skin as you can.
3. Pull upward with steady, even pressure. Don't twist or jerk the tick.
4. After removing the tick, clean the bite area and your hands with rubbing alcohol or soap and water.
5. Dispose of the tick by putting it in alcohol, placing it in a sealed container (e.g. plastic bag), 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.

For more information and CDC Tick Bite Bot: [cdc.gov/ticks/removing\\_a\\_tick.html](https://www.cdc.gov/ticks/removing_a_tick.html)

## Tick Prevention

- **Know where ticks are:** ticks live in or near wooded or grassy areas. Always walk in the center of trails to avoid contact with ticks.
- **Keep your yard clean:** mow lawns, clear brush and remove leaf litter.
- **Apply insecticides:** use EPA-registered repellent with DEET on skin and permethrin on clothing, boots and camping gear. Always follow product instructions.
- **Cover up:** wear long sleeves and light-colored pants tucked into socks to prevent ticks from getting under clothes.
- **Shower:** showering (preferably within 2 hours) can help find and wash off unattached ticks.
- **Check your body for ticks:** use 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.
- **Dry clothing:** tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks on dry clothing after you come indoors.
- **Protect pets:** talk to your veterinarian about the best tick prevention products for your dog and tickborne diseases in your area.

For more information: [cdc.gov/ticks/avoid/index.html](https://www.cdc.gov/ticks/avoid/index.html)

## 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.

The tick that transmits babesiosis in N.J. also transmits Lyme disease and there are recommendations for antibiotics to prevent Lyme disease after a tick bite if certain conditions are met (refer to <https://www.cdc.gov/ticks/tickbornediseases/tick-bite-prophylaxis.html>).

# 8

## ADDITIONAL INFORMATION

### 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, they 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 have been unknowingly bitten by a different tick that was infected.

Tick identification may be of value when discussing tick bite exposures with a healthcare provider. County mosquito control agencies or agricultural extension offices may offer tick identification services. Online identification resources include the Rutgers University [NJ Ticks 4 Science](#) program and the [TickEncounter Resource Center](#) at the University of Rhode Island.

### Additional Sources of 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://ndc.services.cdc.gov/conditions/babesiosis/>

Centers for Disease Control and Prevention (CDC). Surveillance for babesiosis — United States, 2019 Annual Summary. Atlanta, Georgia: U.S. Department of Health and Human Services, CDC, 2021.

[https://www.cdc.gov/parasites/babesiosis/resources/surveillance\\_babesiosis\\_us\\_2019.pdf](https://www.cdc.gov/parasites/babesiosis/resources/surveillance_babesiosis_us_2019.pdf)

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U.S. Department of Health and Human Services Food and Drug Administration. Recommendations for Reducing the Risk of Transfusion-Transmitted Babesiosis - Guidance for Industry, May 2019:

<https://www.fda.gov/media/114847/download>.