

## BABESIOSIS

### REPORTING INFORMATION

- **Class B:** Report by the end of the next business day in which the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism:
  - The Ohio Disease Reporting System (ODRS) should be used to report lab findings to the Ohio Department of Health (ODH). For healthcare providers without access to ODRS, you may use the [Ohio Confidential Reportable Disease Form](#) (HEA 3334, rev. 1/09)
  - The Centers for Disease Control and Prevention (CDC) [Babesiosis Case Report Form](#) (CDC 50.153, rev. 8/11) is available for use to assist in local health department disease investigation. Information collected from the form should be entered into ODRS and sent to the Ohio Department of Health (ODH), Zoonotic Disease Program, 35 E. Chestnut Street, 6<sup>th</sup> Floor, Columbus, Ohio 43215.
- Key fields for ODRS reporting include: fields in the Clinical Information module, fields in the Epidemiology Information module, Travel history and illness onset date.

### AGENT

A parasitic disease caused by the intraerythrocytic protozoa of the *Babesia* genus (*Babesia microti* and other species).

### CASE DEFINITION

#### Clinical Description

*Babesia* infection can range from subclinical to life-threatening. Clinical manifestations, if any, can include hemolytic anemia and nonspecific influenza-like signs and symptoms (i.e., fever, chills, sweats, headache, myalgia, arthralgia, malaise, fatigue, generalized weakness). Splenomegaly, hepatomegaly, or jaundice may be evident. In addition to signs of hemolytic anemia, laboratory findings may include thrombocytopenia, proteinuria, hemoglobinuria, and elevated levels of liver enzymes, blood urea nitrogen, and creatinine. 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 mask or modulate the clinical manifestations (e.g. the patient may be afebrile). Severe cases can be associated with marked thrombocytopenia, disseminated intravascular coagulation, hemodynamic instability, acute respiratory distress, myocardial infarction, renal failure, hepatic compromise, altered mental status, and death.

*Babesia* spp. are transmitted in nature through the bites of infected ticks but can also be acquired through contaminated blood components from asymptomatic parasitemic donors or, more rarely, transplacentally.

#### Clinical Evidence

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.

### **Epidemiologic evidence for transfusion transmission**

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

(a) In the transfusion recipient:

- i. 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**
- ii. At least one of these transfused blood components was donated by the donor described below; **and**
- iii. Transfusion-associated infection is considered at least as plausible as tickborne transmission; **and**

(b) In the blood donor:

- i. Donated at least one of the RBC or platelet components that was transfused into the above recipient; **and**
- ii. 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.)

### **Laboratory Criteria for Diagnosis**

For the purposes of surveillance:

Laboratory Confirmed:

- 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 a *Babesia microti* Indirect Fluorescent Antibody (IFA) total immunoglobulin (Ig) or IgG antibody titer of greater than or equal to (  $\geq$  ) 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 of greater than or equal to (  $\geq$  ) 1:256; **or**
- Demonstration of a *Babesia duncani* IFA total Ig or IgG antibody titer of greater than or equal to (  $\geq$  ) 1:512.

### **Case classification**

**Suspected:** 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).

**Probable:** (a) 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** (b) a case that is in a blood donor or recipient epidemiologically linked to a confirmed or probable babesiosis case (as defined above) **and:**

- i. Has confirmatory laboratory evidence but does not meet any objective or subjective clinical evidence criteria; **or**
- ii. Has supportive laboratory evidence and may or may not meet any subjective clinical evidence criteria but does not meet any objective clinical evidence

criteria.

**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).

### **Comments**

The validity of the diagnosis of babesiosis is highly dependent on the laboratory that performs the testing. For example, differentiation between *Plasmodium* and *Babesia* organisms on peripheral blood smears can be difficult. Confirmation of the diagnosis of babesiosis by a reference laboratory is strongly encouraged, especially for patients without residence in or travel to areas known to be endemic for babesiosis.

A positive *Babesia* IFA result for immunoglobulin M (IgM) is insufficient for diagnosis and case classification of babesiosis in the absence of a positive IFA result for IgG (or total Ig). If the 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.

When interpreting IFA IgG or total Ig results, it is helpful to consider factors that may influence the relative magnitude of *Babesia* titers (e.g. timing of specimen collection relative to exposure or illness onset, the patient's immune status, the presence of clinically manifest versus asymptomatic infection). In immunocompetent persons, active or recent *Babesia* infections that are symptomatic are generally associated with relatively high titers (although antibody levels may be below the detection threshold early in the course of infection); titers can then persist at lower levels for more than a year. In persons who are immunosuppressed or who have asymptomatic *Babesia* infections, active infections can be associated with lower titers.

*Babesia microti* is the most frequently identified agent of human babesiosis in the United States; most reported tick-borne cases have been acquired in parts of northeastern and north-central regions. Sporadic U.S. cases caused by other *Babesia* agents include *B. duncani* (formerly the WA1 parasite) and related organisms (CA1-type parasites) in several western states as well as parasites characterized as "*B. divergens* like" (MO1 and others) in various states. Serologic and molecular tests available for *B. microti* infection do not typically detect these other *Babesia* agents.

Blood-borne transmission of *Babesia* is not restricted by geographic region or season. The epidemiologic linkage criteria for transfusion transmission that are described here provide a low threshold for asymptomatic donor or recipient cases to be considered probable cases for surveillance purposes and are not intended to be regulatory criteria. Transfusion investigations entail laboratory testing for evidence of *Babesia* infection in recipients and donors as well as epidemiologic assessments of the plausibilities of blood- and tick-borne transmission.

### **SIGNS AND SYMPTOMS**

Many people who are infected with *Babesia microti* feel fine and do not have any symptoms. Some people develop flu-like symptoms, such as fever, chills, sweats, headache, body aches, loss of appetite, nausea, or fatigue. Because *Babesia* parasites infect red blood cells, babesiosis can cause hemolytic anemia (from destruction of red blood cells).

Babesiosis can be a severe, life-threatening disease, particularly in people who:

- Do not have a spleen or whose spleen does not function normally;
- Have a weak immune system for other reasons (such as cancer, lymphoma, or AIDS);
- Have other serious health conditions (such as liver or kidney disease); or
- Are elderly.

## DIAGNOSIS

In symptomatic people, babesiosis usually is diagnosed by examining blood specimens under a microscope and seeing *Babesia* parasites inside red blood cells.

The validity of the diagnosis of babesiosis is highly dependent on the laboratory that performs the testing. For example, differentiation between *Plasmodium* and *Babesia* organisms on peripheral blood smears can be difficult. Confirmation of the diagnosis of babesiosis by a reference laboratory is strongly encouraged, especially for patients without residence in or travel to areas known to be endemic for babesiosis.

A positive *Babesia* IFA result for immunoglobulin M (IgM) is insufficient for diagnosis and case classification of babesiosis in the absence of a positive IFA result for IgG (or total Ig). If the 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.

## EPIDEMIOLOGY

### Source

Babesiosis is caused by microscopic parasites that infect red blood cells. Many different species of *Babesia* parasites have been found in animals, only a few of which have been found in people. *Babesia microti*—which usually infects white-footed mice and other small mammals—is the main species that has been found in people in the United States. Occasional cases caused by other *Babesia* species have been detected.

*Babesia microti* is transmitted in nature through the bite of infected *Ixodes scapularis* ticks (also called blacklegged ticks or deer ticks), especially the nymphs which are active in the spring and early summer. Tickborne transmission primarily occurs in the Northeast and upper Midwest, especially in parts of New England, New York State, New Jersey, Wisconsin, and Minnesota, but cases can occur in Ohio.

### Mode of Transmission

*Babesia* parasites are not transmitted from person-to-person like the flu or the common cold. People can get infected with *Babesia* parasites in several ways:

- The main way is through the bite of an infected tick—during outdoor activities in areas where blacklegged ticks and babesiosis are found. The nymphal ticks are small and easily overlooked, but usually must stay attached to a person for 36 hours or longer to be able to transmit the parasite.
- A less common way of becoming infected is by getting a transfusion from a blood donor who has a silent *Babesia* infection. (No tests have been licensed yet for screening blood donors for *Babesia*.)
- A few possible cases of congenital transmission—from an infected mother to her baby (during pregnancy or delivery)—have been reported.

### Incubation Period

Variable, symptoms typically occur 1-4 weeks or longer for tickborne transmission and from weeks to months for blood borne transmission.

## PUBLIC HEALTH MANAGEMENT

### Case

#### Investigation

A complete history of travel and any known tick exposure for the 30 days prior to onset should be obtained. Note: Infected people might not recall a tick bite because *I. scapularis* nymphs are very small (about the size of a poppy seed).

#### Treatment

Effective treatments are available, and most people respond well. The first step is to make sure the diagnosis is correct. Most patients who are asymptomatic do not require treatment. Health care providers may consult with CDC staff about whether to treat someone who has babesiosis, what type(s) of therapy to use, how to monitor the status of the infection, and how long to treat. Treatment decisions should be individualized, especially for people who have (or are at risk for) severe or relapsing infection.

For ill patients, babesiosis usually is treated for at least 7-10 days with a combination of two prescription medications — typically either:

- Atovaquone **PLUS** azithromycin; **OR**
- Clindamycin **PLUS** quinine (this combination is the standard of care for severely ill patients).

The typical daily doses for **adults** are provided in the table below.

Drug	Adult dosage (usually treat for at least 7-10 days)
Atovaquone	750 mg orally twice a day
<b>along with</b>	
Azithromycin	On the first day, give a total dose in the range of 500-1000 mg orally; on subsequent days, give a total daily dose in the range of 250-1000 mg
<b>or</b>	
Clindamycin	600 mg orally 3 times a day <b>or</b> 300-600 mg intravenously 4 times a day
<b>along with</b>	
Quinine	650 mg orally 3 times a day

Some patients—including those with severe illness—might require or benefit from supportive care, such as:

- Antipyretics;
- Vasopressors (if the blood pressure is low and unstable);
- Blood transfusions;
- Exchange transfusions (in which portions of a patient's blood or blood cells are replaced with transfused blood products);
- Mechanical ventilation; or
- Dialysis.

### Isolation and Follow-up Specimens

Isolation is not indicated. Follow-up specimens are usually not indicated.

### **Contacts**

Prophylaxis of contacts is not indicated.

### **Prevention and Control**

No vaccine is available to protect people against babesiosis. Tick avoidance in endemic areas is probably the best preventive measure at present. Tuck pants cuffs into sock tops, spray insect repellent on pants and socks and wear light-colored clothing to facilitate frequent checks for crawling ticks. Inspect every hour or two for attached and crawling ticks. Remove ticks promptly. Inspect pets for ticks every day. It is important to note that blacklegged tick nymphs are active in Spring and early Summer and are considerable smaller (about the size of a poppy seed) than the adults, which are active in Fall and Winter. Both life stages may harbor *Babesia* parasites. Keep grass and weeds mowed short. Reduce mouse populations by habitat reduction and exclusion from and to buildings.

### **Prevention of Transfusion-associated Babesiosis**

In the pre-donation interview, potential blood donors are asked if they have ever been diagnosed with babesiosis. If the answer is "yes," they are indefinitely deferred from donating blood. No *Babesia* tests have been licensed yet for screening U.S. blood donors. Also, *Babesia* parasites appear to survive well during typical blood storage conditions.

Prevention of transfusion-associated babesiosis largely depends on intervening before donation. If you have a patient who tests positive for *Babesia* infection, advise the patient to indefinitely refrain from donating blood. If the patient has recently donated blood, alert the appropriate blood collection agencies and public health authorities (i.e. local or state health department).

**What is babesiosis?**

Babesiosis is caused by microscopic parasites that infect red blood cells. It is transmitted by a tick called the blacklegged tick (formerly known as the deer tick). The bacteria are normally found in mice and other small mammals.

**How is babesiosis spread?**

Babesiosis is acquired most commonly through the bite of an infected tick, *Ixodes scapularis*. Most cases are caused by immature ticks called nymphs, which are very small and may go unnoticed even when biting and which are active in Spring and early Summer. Cases may less commonly be caused by the adult stage, which is active in Autumn and Winter. No direct transmission occurs from person to person. Other possible ways of becoming infected with *Babesia* include: receipt of a contaminated blood transfusion (no tests have been licensed yet for donor screening); or transmission from an infected mother to her baby during pregnancy or delivery.

**Who is most at risk for getting babesiosis?**

People who spend time outdoors in tick-infested environments are at an increased risk of exposure.

**How is babesiosis diagnosed?**

In symptomatic people, babesiosis usually is diagnosed by examining blood under a microscope and seeing *Babesia* parasites inside red blood cells.

**What are the symptoms of babesiosis?**

Many people who are infected feel fine and do not have any symptoms. However, some people develop flu-like symptoms, such as fever, chills, sweats, headache, body aches, loss of appetite, nausea, or fatigue. Babesiosis can be a severe, life-threatening disease, especially in people with other illnesses, the elderly, and individuals without a spleen.

**How soon do symptoms occur?**

Variable, symptoms typically occur 1-4 weeks or longer for tickborne transmission and from weeks to months for blood borne transmission

**What is the treatment for babesiosis?**

Most patients who are asymptomatic do not require treatment. For ill patients, babesiosis usually is treated for 7-10 days with a combination of two prescription medications.

**What can be done to prevent babesiosis?**

If you are in areas where ticks might be present, the following precautions can reduce the risk of acquiring babesiosis or other tick-borne diseases:

- Wear light-colored, long pants, tuck pant cuffs into sock tops and spray pant legs and socks with insect repellent. Repellents containing 0.5% permethrin or 20-30% DEET are effective in repelling ticks. Follow application directions carefully.
- When possible, avoid walking in tall grass and weeds.
- Conduct visual "tick checks" on yourself and children every hour or two.
- Check pets for ticks before allowing them into the home.
- Carefully remove attached ticks as soon as possible.
- Keep yard and play areas well mowed to discourage ticks.

**How should a tick be removed?**

Although disease transmission occurs 24 to 36 hours or more after attachment, it is important to remove ticks as soon as possible after discovery. To remove an attached tick, grasp it with tweezers as close as possible to the skin and pull with firm, steady pressure straight out. Do not twist or jerk the tick, as the mouthparts may break off. If tweezers are not available, protect fingers with rubber gloves or tissue paper.

- Do not handle ticks with bare hands.
- Do not squeeze, crush or puncture the body of the tick as it may contain infected fluids.
- After removing the tick, thoroughly disinfect the bite site and wash your hands.
- See or call your doctor if there is a concern about incomplete tick removal.

For more information, contact your local health department or the Zoonotic Disease Program at ODH by calling 614-752-1029.

**For more information please visit the following websites:**

CDC Learn about Babesiosis - <http://www.cdc.gov/parasites/babesiosis/>

CDC Public Information Guide - [http://www.cdc.gov/parasites/babesiosis/resources/babesiosis\\_fact\\_sheet.pdf](http://www.cdc.gov/parasites/babesiosis/resources/babesiosis_fact_sheet.pdf)

ODH Zoonotic Disease Program Tick-borne Diseases (statistics and educational materials) – <http://www.odh.ohio.gov/ticks>