Babesiosis

Disease Plan

Quick Links

CDC Treatment of Babesiosis

CONTENTS

Last updated: February 25, 2020, by Dallin Peterson

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

✓ CRITICAL CLINICIAN INFORMATION

Clinical Evidence

Signs/Symptoms

- Non-specific influenza-like symptoms – fever, chills, sweats, headache, myalgia, arthralgia, malaise and fatigue
- Splenomegaly
- Hepatomegaly
- Jaundice
- Hemolytic anemia
- Thrombocytopenia

Period of Communicability

- No human-to-human transmission outside of blood transfusions and rare maternal-fetal transmission.

Incubation Period

- Tickborne – 1-3 weeks or longer
- Bloodborne – varies from weeks to months
    - Median interval from transfusion to onset of symptoms is 37 days.

Mode of Transmission

- Tick bites
- Blood-borne through blood transfusion

Laboratory Testing

Type of Lab Test/Timing of Specimen Collection

- Giemsa, Wright or Giemsa-Wright-stained blood films – collect as soon as suspected; multiple smears might be needed. Can take smears in 8-12 hour intervals over 2-3 days.
- Serologic (IFA) – High sensitivity – will show rise in concentration 2-4 weeks after infection.
- PCR – Expensive – use if undetectable in blood smears.
- Nucleic acid amplification.

Type of Specimens

- Blood

Treatment Recommendations

Type of Treatment

- *B. microti* – Mild
    - Adults – Atovaquone: 750 mg orally every 12 hours PLUS Azithromycin: 500 mg/d orally on day 1; 250 mg/d orally from day 2 on. Duration of therapy: 7-10 days.
    - Children – Atovaquone: 20 mg/kg orally every 12 hours (maximum 750 mg/dose) PLUS Azithromycin: 10 mg/kg/d orally on day 1 (maximum 500 mg/dose); 5mg/kg/d orally from day 2 on (maximum 250 mg/dose). Duration of therapy: 7-10 days.
- *B. microti* – Severe
    - Adults – Atovaquone: 750 mg orally every 12 hours PLUS Azithromycin 500mg/day IV. Alternative therapy – Clindamycin: 600 mg IV every 6 hours PLUS Quinine: 650 mg orally every 8 hours. Duration of therapy: 7-10 days.
    - Children – Atovaquone: 20 mg/kg orally every 12 hours (maximum 750 mg/dose) PLUS Azithromycin: 10 mg/kg/d IV (maximum 500 mg/dose). Clindamycin: 7-10 mg/kg intravenously every 6-8 hours (maximum 600 mg/dose) PLUS Quinine: 8 mg/kg orally every 8 hours (maximum 650 mg/dose). Duration of therapy: 7-10 days.

- *B*. divergens
  - Infections due to *B. divergens* is rare in the United States and may be more severe than those with *B. microti.* Fulminant disease can occur, and infection with this species may be considered a medical emergency.
  - Adults – Clindamycin: 600 mg intravenously every 6-8 hours PLUS Quinine: 650 mg orally every 8 hours. Some patients may require supportive care including blood transfusions or exchange transfusions for anemia.
  - Children – Clindamycin: 7 to 10 mg/kg intravenously every 6-8 hours (maximum 600 mg/dose) PLUS Quinine: 8 mg/kg orally every 8 hours (maximum 650 mg/dose). Some patients may require supportive care including blood transfusions or exchange transfusions for anemia.

Time Period to Treat

- Once diagnosis is confirmed via laboratory testing

Prophylaxis

- None

Contact Management

Isolation of Case

- Exclusion from blood donation

Quarantine of Contacts

- None

Infection Control Procedures

- Standard precautions
- Implicated blood donors should refrain from blood donations

✓ WHY IS BABESIOSIS IMPORTANT TO PUBLIC HEALTH?

Babesiosis is a tickborne malaria-like illness; it is fairly new to the National and Utah Notifiable Disease List. Babesiosis is spread through the bite of an infected tick (*Ixodes scapularis),* which though uncommon, is found in Utah. In the United States, it is most commonly found in the Northeast and upper Midwest and peaks during the summer months. The symptoms may be mild, but like all tickborne illnesses, can be severe. This disease is important to public health because it can be severe and is preventable through proper education and simple behavioral changes.

✓ DISEASE AND EPIDEMIOLOGY

Clinical Description

Babesiosis can range anywhere from subclinical to life-threatening. Most infections are asymptomatic. Symptoms include non-specific influenza-like symptoms such as fever, chills, sweats, headache, myalgia, arthralgia, malaise, and fatigue. Splenomegaly, hepatomegaly, or jaundice may also occur. Laboratory findings commonly indicate hemolytic anemia and thrombocytopenia. Additionally, proteinuria, hemoglobinuria, elevated liver enzymes, blood urea nitrogen, and creatinine may be observed. Severe cases, in addition to hemolytic anemia and thrombocytopenia, may present disseminated intravascular coagulation, hemodynamic instability, acute respiratory distress, myocardial infarction, renal failure, hepatic compromise, altered mental status, and death.

Causative Agent

Babesia microti is the most frequently identified agent of babesiosis in the United States. Other agents include *B. duncani* (formerly the WA1 parasite) and related organisms (CA1-type parasites) "*B. divergens*- like" (MO1 and others).

Differential Diagnosis

The differential diagnoses for babesiosis include: *Plasmodium spp.* (malaria), *Borrelia burgdorferi* (Lyme disease), Rickettsial disease, *Rickettsia rickettsii* (Rocky Mountain spotted fever), *Rickettsia typhi* (typhus), Ehrlichiosis, Colorado tick fever, Human Granulocytic Anaplasmosis (HGA), *Brucella* spp. (brucellosis), dengue fever virus, Francisella *tularensis* (tularemia), *Leptospira* spp, and parvovirus.

Laboratory Identification

According to the Centers for Disease Control and Prevention (CDC), if the diagnosis of babesiosis is being considered, manual (non-automated) review of blood smears should be requested explicitly. In symptomatic patients with acute infection, *Babesia* parasites typically can be detected by light-microscopic examination of blood smears, although multiple smears may need to be examined depending on parasitemia. It can be difficult to distinguish between

Babesia and *Plasmodium* (especially *P. falciparum*) parasites and sometimes between parasites and stain or platelet debris. Consider having a reference laboratory confirm the diagnosis.

Diagnosis can be made by microscopic examination of thick and thin blood smears stained with Giemsa, Wright, or Giemsa-Wright stains. Repeated smears may be needed.

- Giemsa, Wright, or Giemsa-Wright-stained blood films in patients from endemic areas
  - Diagnostic, if parasites noted.
  - Relatively insensitive due to low parasite level in most patients.
  - Thick smears of hemolyzed blood are most useful for screening purposes in cases with low-level parasitemia; thin smears are used for parasite classification.

- Serologic (IFA) testing
  - Test of choice for laboratory diagnosis for patients from endemic areas.
  - High sensitivity and specificity in *Babesia* detection.
  - Rises 2-4 weeks after infection and wanes at 6-12 months.
  - Strain MO-1 (found in Missouri) and *B. duncani* (found in Pacific Northwest) will not be detected by *B. microti* serology.

- PCR
  - Highly sensitive and specific, but relatively expensive.
  - Available at CDC with limited availability elsewhere.

- Nucleic acid amplification
  - Detection of *Babesia spp.* genomic sequences in a whole blood specimen

- Isolation of *Babesia* organisms from a whole blood specimen by animal inoculation

In areas of co-infection, consider concurrent testing for Lyme disease and HGA in the second specimen since the IgM result may be a false positive. 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 (i.e., 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.

Treatment

Most asymptomatic cases do not require treatment. Treatment decisions should be individualized, especially for patients 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 is standard of care for more severe cases). See regimen under Critical Clinical Information.

Case Fatality

Reported case-fatality rates for symptomatic *Babesia* infection have ranged from 5-9%, and as high as 21% in immunocompromised patients.

Reservoir

White-footed mice (*Peromyscus leucopus) and other small mammals* are considered the primary reservoir for *B. microti* in the United States. In Europe, the reservoir for *B. divergens* is cattle. Reservoirs of other *Babesia* species have not been established. The vector for *Babesia* is the deer tick.

Transmission

Babesiosis is acquired from a tick bite. However, bites from *Ixodes scapularis* are often painless and may occur on parts of the body that are difficult to observe, so cases may have no known history of a tick bite. Rarely, babesiosis may be transmitted perinatally or through a blood transfusion.

Susceptibility

Susceptibility is assumed to be universal; however, the elderly, immunocompromised, and persons who are asplenic are at increased risk for severe clinical disease.

Incubation Period

The incubation period for babesiosis varies based on host, parasite, and epidemiologic factors. For tickborne transmission, the incubation period is one to three weeks or longer. The incubation period for bloodborne transmission varies from weeks to months. The median interval from transfusion to onset of symptoms is 37 days. Symptoms may appear many months, and up to a year, after the initial exposure, especially in the immunocompromised.

Period of Communicability

There is no human-to-human transmission outside of blood transfusions and rare maternal-fetal transmission.

Epidemiology

Babesiosis was not identified in humans until 1957. The geographic range of the disease varies, with most cases occurring in the Northeastern and North Central United States. High-incidence areas include coastal southern New England and the chain of islands off the coast that include Martha's Vineyard and Nantucket Island, MA; Block Island, RI; and eastern Long Island and Shelter Island, NY. Other species of *Babesia* have been found to cause disease in California, Washington State, and Missouri. Sporadic cases of babesiosis have also been reported in Europe (*B. divergens* and *B. microti*), Africa, Asia, and South America. Babesiosis only occurs in patients who live in or travel to areas of endemicity or who have received a blood transfusion containing the parasite within the previous nine weeks. The disease is commonly underreported because those with mild symptoms are not likely to seek a diagnosis. In 2011, the first year babesiosis was a nationally notifiable disease; only 1,000 cases were reported in the United States. The incidence of babesiosis is associated with the density of infected tick vectors and their animal hosts. As with Lyme disease, most cases of babesiosis arise during the summer and early fall. Co-infection with other tickborne diseases such as Lyme disease and HGA is common. Utah has reported only one case of babesiosis since 2011, and it was imported from another state. There have been no known cases of endemic babesiosis in Utah.

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Determine the probable source (location) of where the infection was acquired.
    - Remember that due to the small size of this tick, many patients will not recall a tick bite during the investigation.
- Determine if and where transmission is occurring in Utah.
- Classify cases according to CDC and Council for State and Territorial Epidemiologists (CSTE) criteria so that accurate records on babesiosis can be maintained at the national level.
- If babesiosis transmission is found to occur in Utah, public health will educate the public about the mode of tick transmission and the ways to avoid infection.
- Educate physicians on diagnosis, testing, and reporting.

Prevention

Environmental measures

Prevention of diseases spread by ticks involves making the yard less attractive to ticks:

- Keep grass cut short.
- Remove leaf litter and brush from around the yard.
- Prune low lying bushes to let in more sunlight.
- Keep woodpiles and bird feeders off the ground and away from the home.

- Keep the plants around stone walls cut short.
- Use a three-foot wide woodchip, mulch, or gravel barrier where the lawn meets the woods, and remind children not to cross that barrier.
- Ask a landscaper or local nursery about plants to use in the yard that do not attract deer.
- Use deer fencing (for yards 15 acres or more).

If an individual chooses to use a pesticide to reduce the number of ticks on his/her property, he/she should be advised to hire a licensed applicator who is experienced with tick control. A local landscaper or arborist may be a licensed applicator. In general, good tick control can be achieved with no more than two pesticide applications in any year. Advise individuals to ask, when selecting an applicator, if they will provide:

- A written pest control plan that includes information on the pesticide to be used.
- Information about non-chemical pest control alternatives.
- Signs to be posted around the property after the application.

Personal preventive measures/education

There is no human vaccine for babesiosis. People who live, work, or spend leisure time in an area likely to have ticks, and should be advised of the following:

- The single most important thing one can do to prevent a tickborne disease is to check oneself for ticks once a day. Favorite places ticks like to go on the body include areas between the toes, back of the knees, groin, armpits, neck, along the hairline, and behind the ears. Remember to check children and pets, too. Promptly remove any attached tick using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out using steady pressure.
- Stick to main pathways and the centers of trails when hiking.
- Wear long-sleeved, light-colored shirts, and long pants tucked into socks.
- Talk to a veterinarian about the best ways to protect pets and livestock from ticks.

Use repellents containing DEET (N,N-diethyl-m-toluamide), and choose a product that will provide sufficient protection for the amount of time spent outdoors. Product labels often indicate the length of time that someone can expect protection from a product. DEET is considered safe when used according to the manufacturer's directions. The efficacy of DEET levels off at a concentration of 30%, which is the highest concentration recommended for children and adults.

The following precautions should be observed when using DEET products:

- DEET products should not be used on children less than two months of age.
- Avoid using DEET products that combine the repellent with a sunscreen. Sunscreens may need to be reapplied often, resulting in an over-application of DEET.
- Apply DEET on exposed skin, using only as much as needed.
- Do not use DEET on the hands of young children, and avoid applying repellent to areas around the eyes and mouth.
- Do not use DEET over cuts, wounds, or irritated skin.
- Wash treated skin with soap and water after returning indoors, and wash treated clothing.
- Avoid spraying DEET products in enclosed areas.

Permethrin-containing products will kill mosquitoes and ticks on contact. Permethrin products are not designed to be applied to the skin. Clothing should be treated and allowed to dry in a well ventilated area prior to wearing. Because permethrin binds very tightly to fabrics, once the fabric is dry, very little of the permethrin gets onto the skin.

Chemoprophylaxis

There is no role for antibiotic prophylaxis for babesiosis.

Vaccine

There is no current vaccination for babesiosis.

Isolation and Quarantine Requirements

No restrictions, except exclusion from blood donation.

✓ CASE INVESTIGATION

Reporting

Report any infection or illness to public health authorities that meets any of the following criteria:

1. A person who meets at least one of the following:
    - Identification of intraerythrocytic Babesia organisms by light microscopy in a Giemsa, Wright, or Wright-Giemsa-stained blood smear
    - Detection of *Babesia microti* DNA in a whole blood specimen by polymerase chain reaction (PCR)
    - Detection of *Babesia spp.* genomic sequences in a whole blood specimen by nucleic acid amplification
    - Isolation of *Babesia* organisms from a whole blood specimen by animal inoculation
    - Elevated *Babesia microti*, *Babesia divergens*, or *Babesia duncani* Indirect Fluorescent Antibody (IFA) total immunoglobulin (Ig) or IgG antibody titer
    - Demonstration of a *Babesia microti* Immunoblot IgG positive result
2. A person whose healthcare record contains a diagnosis of babesiosis
3. A person whose death certificate lists babesiosis as a cause of death or a significant condition contributing to death.

Other recommended reporting procedures

- All cases of babesiosis should be reported.
- Reporting should be ongoing and routine.
- Frequency of reporting should follow the state health department's routine schedule. In Utah, cases should be reported within three working days of identification.

Criteria to determine whether a case should be reported to public health authorities

Criterion	Reporting
Clinical presentation	
Healthcare record contains a diagnosis of babesiosis	S
Death certificate lists babesiosis as a cause of death or a significant condition contributing to death	S
Laboratory evidence	
Identification of intraerythrocytic *Babesia* organisms by light microscopy in a Giemsa, Wright, or Wright-Giemsa-stained blood smear	S
Detection of *Babesia microti* DNA in a whole blood specimen by polymerase chain reaction (PCR)	S
Detection of *Babesia spp.* genomic sequences in a whole blood specimen by nucleic acid amplification	S
Isolation of *Babesia* organisms from a whole blood specimen by animal inoculation	S
Elevated *Babesia microti*, *Babesia divergens*, or *Babesia duncani* Indirect Fluorescent Antibody (IFA) total immunoglobulin (Ig) or IgG antibody titer	S
Demonstration of a *Babesia microti* Immunoblot IgG positive result	S

Notes:

S = This criterion alone is Sufficient to identify a case for reporting.

Case Definition

Babesiosis (*Babesia* spp.)

2011 Case Definition

CSTE Position Statement

- 10-ID-27

Clinical Description

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.

Laboratory Criteria for Diagnosis

For the purposes of surveillance:

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 a *Babesia microti* Indirect Fluorescent Antibody (IFA) total immunoglobulin (Ig) or IgG antibody titer of ≥1:256 or ≥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 ≥1:256; **OR**
- Demonstration of a *Babesia duncani* IFA total Ig or IgG antibody titer of ≥1:512.

Epidemiologic Linkage

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:

- 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.)

Case Classification

Suspected

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

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 (as defined above); **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.

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

Babesia microti is the most frequently identified agent of human babesiosis in the United States; most reported tickborne 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.

Bloodborne 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 plausibility of bloodborne and tickborne transmission.

Criteria for classifying a case of babesiosis	**Case Definition**				
Criterion	**Confirmed**	**Probable**			**Suspect**
Clinical evidence					
Fever	O	O	A	A	
Anemia	O	O	A	A	
Thrombocytopenia	O	O	A	A	
Chills	O		A		
Sweats	O		A		
Headache	O		A		
Myalgia	O		A		
Arthralgia	O		A		
Laboratory evidence					
Laboratory confirmatory Identification of intraerythrocytic *Babesia* organisms by light microscopy in a Giemsa, Wright, or Wright-Giemsa-stained blood smear	O		O		O

Detection of *Babesia microti* DNA in a whole blood specimen by polymerase chain reaction (PCR)	O		O		O
Detection of *Babesia spp.* genomic sequences in a whole blood specimen by nucleic acid amplification	O		O		O
Isolation of *Babesia* organisms from a whole blood specimen by animal inoculation	O		O		O
Laboratory supportive Demonstration of a *Babesia microti* Indirect Fluorescent Antibody (IFA) total immunoglobulin (Ig) or IgG antibody titer of ≥1:256 or ≤1:64 in epidemiologically-linked blood donors or recipients		O		O	O
Demonstration of *a Babesia microti* Immunoblot IgG positive result		O		O	O
Demonstration of a *Babesia divergens* IFA total Ig or IgG antibody titer of ≥1:256		O		O	O
Demonstration of a *Babesia duncani* IFA total Ig or IgG antibody titer of ≥1:512		O		O	O
Epidemiological evidence					
Involved transfusion recipient Received one or more red blood cell (RBC) or platelet transfusions within one year before the detection of laboratory evidence of *Babesia* infection			N	N	
Involved transfusion recipient At least one of these transfused blood components was donated by the donor described below			N	N	
Involved transfusion recipient Transfusion-associated infection is considered as or more plausible than tickborne transmission			N	N	
Involved blood donor(s) Donated at least one of the RBC or platelet components that were transfused into the above recipient			N	N	
Involved blood donor(s) The plausibility that this blood component was the source of infection in the transfusion 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.)			N	N	

Notes:

N = All “N” criteria in the same column are Necessary to identify a case for reporting.

A = This criterion must be absent (i.e., NOT present) for the case to meet reporting criteria.

O = At least one of these “O” (Optional) criteria in each category (i.e., clinical evidence and laboratory evidence) in the same column – in conjunction with all “N” criteria in the same column – is required to

identify a case for reporting. (These optional criteria are an alternative, which means that a single column will have either no O criteria or multiple O criteria; no column should have only one O.)

Case Investigation Process

- Complete CMR in UT-NEDSS/EpiTrax.
- Verify case status.
- Complete disease investigation form.
- Determine whether patient had travel/exposure history consistent with acquisition of disease in Utah or elsewhere.
- If patient acquired disease in Utah, identify the source of transmission and eliminate it.

Outbreaks

One or more related cases of babesiosis constitutes an outbreak.

Identification of Case Contacts

Babesiosis is not transmissible from person to person. In the context of a blood transfusion, evaluate contacts that may have become infected in the same setting as the patient using epidemiological linkage.

Case Contact Management

None.

✓ REFERENCES

Centers for Disease Control and Prevention (2014). Babesiosis FAQs. Retrieved from: http://www.cdc.gov/parasites/babesiosis/gen_info/faqs.html.

American Lyme Disease Foundation. (2012). *Other tickborne diseases: Babesiosis*.

ARUP Labs; Physician's Guide to Laboratory Test Selection and Interpretation.

Centers for Disease Control and Prevention (2012). National Notifiable Diseases Surveillance System (NNDSS). *Babesiosis (Babesia spp.).* Retrieved from www.cdc.gov.

Centers for Disease Control and Prevention (2014). Babesiosis. *Treatment of Babesiosis: Guidelines for Clinicians (United States)*. Retrieved from www.cdc.gov.

Gelfand, Jeffery A. "Clinical manifestations, diagnosis, treatment, and prevention of babesiosis." Jan. 2017 *UptoDate.com,* Retrieved 02/21/2017.

Heymann, D.L. (2008). Control of Communicable Diseases Manual (19th Edition).

Massachusetts Department of Public Health, Bureau of Communicable Disease Control. (2006, June). *Guide to surveillance, reporting and control: Babesiosis*.

Pickering, L.K. (2012). 2012 Report of the Committee on Infectious Diseases (29th Edition), Red Book.

Council for State and Territorial Epidemiologists (CSTE) Position statements. Available from URL: http://www.cste.org/default.asp?page=PositionStatements.

Up-to-Date. Babesiosis: Treatment and prevention. https://www.uptodate.com/contents/babesiosis-treatment-and-prevention?search=Babesiosis&source=search_result&selectedTitle=2~69&usage_type=default&display_rank=2. Accessed July 31, 2018.

✓ VERSION CONTROL

Updated February 2015 – Updated epidemiology section and added tables for reporting babesiosis and for interpreting case status from CSTE. General formatting changes were made and references were revised.

Updated February 2017 – Added "Critical Clinical Information" Section. Updated "Reporting" section.

Update May 2018 – Updated Critical Clinical Information and updating Reporting section.

Update February 2020 – Updated Laboratory section.

✓ UT-NEDSS/EpiTrax Minimum/Required Fields by Tab

Demographic

- Birth Gender
- County
- Date of Birth
- Ethnicity
- First Name
- Last Name
- Phone Number
- Race
- State

Clinical

- Date Diagnosed
- Date of Death
- Died
- Disease
- Onset Date
- Pregnant
- Anemia
- Eschar
- Fever
- Headache
- Hepatic transaminase elevation
- Liver enzymes, elevated
- Myalgia
- Macular Rash
- Rash
- Thrombocytopenia
- Leukopenia
- Vomiting
- Respiratory symptoms
- Afebrile periods
- Malaise
- Neurological signs
  - Neutropenia
  - Myocarditis
  - Bleeding
  - Encephalitis

Laboratory

- Organism
- Specimen Source
- Test Result

Epidemiological

- Imported From

Investigation

- Was patient bitten by a tick during the above time period?
- List date
- Was patient bitten in Utah?
- Was patient in a wooded, brushy or grassy area (potential tick habitat) <30 days prior to onset of symptoms?
- Traveled outside of Utah?
- List places and dates

Contacts

- NA

Reporting

- Date first reported to public health

Administrative

- State Case Status

✓ Babesiosis Rules for Entering Laboratory Test Results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS/EpiTrax. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-Specific Rules

Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS/EpiTrax, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS/EpiTrax.

Test Type	Test Result	Create a New Event	Update an Existing Event
IgG Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
IgM Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
PCR/amplification	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
Culture	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes

Whitelist Rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Babesiosis Morbidity Whitelist Rule: If the specimen collection date of the laboratory result is two years or less after the event date, the laboratory result should be added to the morbidity event.

Babesiosis Contact Whitelist Rule: Never added to a contact.

Graylist Rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.

Babesiosis Graylist Rule: If the specimen collection date of the laboratory result is 30 days before to seven days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

Other Electronic Laboratory Processing Rules

- If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.