Ministry of Health

Requirements for Programs, Services and Accountability

Infectious Diseases Protocol

Appendix 1: Case Definitions and Disease-Specific Information

Disease: Babesiosis

Effective: July 2023

Ontario

Babesiosis

☐ Communicable

☐ Virulent

Health Protection and Promotion Act **(HPPA)[1]**

Ontario Regulation (O. Reg.) 135/18 (Designation of Diseases)[2]

Provincial Reporting Requirements

☒ Confirmed case

☒ Probable case

As per Requirement #3 of the "Reporting of Infectious Diseases" section of the *Infectious Diseases Protocol, 2018* (or as current), the minimum data elements to be reported for each case are specified in the following:[3]

- O. Reg. 569 (Reports) under the HPPA;
- The iPHIS User Guides published by Public Health Ontario (PHO); and
- Bulletins and directives issued by PHO.[3,4]

Type of Surveillance

Case-by-case.

Case Definition

Confirmed Case

Laboratory confirmation of infection with or without clinically compatible signs and symptoms.

Probable Case

Supportive laboratory evidence of infection; **AND**

- Clinically compatible signs and symptoms of infection;

OR

- Blood or solid organ transplant recipient with an epidemiologic link to a confirmed or probable case of babesiosis;

OR

- Neonate from a mother with confirmed or probable babesiosis.

Suspect Case

Not applicable.

Outbreak Case Definition

Not applicable.

Clinical Information

Clinical Evidence

Clinically compatible signs and symptoms are characterized by fever, chills, intense sweats, headache, dark urine, jaundice, myalgia, arthralgia, hepatosplenomegaly, anemia, and/or thrombocytopenia. Most infections are asymptomatic.

Clinical Presentation

Symptoms typically occur after 1-4 weeks from a bite of an infected tick (e.g., *Ixodes scapularis* for *B. microti*, *Ixodes ricinus* for *B. divergens*) located in a blacklegged tick risk area, and 1-9 weeks (up to 6 months) after contaminated blood transfusion. Congenital transmission has also been rarely reported. Most infections are asymptomatic, however, infected individuals may show mild to severe systemic symptoms such as fever, chills, sweats, headache, body aches, loss of appetite, nausea, or fatigue. Since *Babesia* parasites infect and destroy red blood cells (RBCs), babesiosis can cause a type of anemia called hemolytic anemia. Clinical symptoms of hemolytic anemia include fatigue, jaundice and dark urine (haemoglobinuria). Chronic infections may last weeks to months.[5,6]

Babesiosis can become severe and life-threatening in individuals with the following risk factors:

- *Babesia* parasitemia level ≥ 4%;
- Hemoglobin < 100 g/L;
- Functional or anatomical asplenia or hyposplenism;
- Weakened immune system (e.g., due to cancer, AIDS, transplantation, or certain medications);
- Serious health conditions (e.g., chronic liver or kidney disease);
- Neonatal prematurity; or
- > 50 years of age.

Complications can include:

- A low and unstable blood pressure;
- Severe hemolytic anemia (hemolysis);
- A very low platelet count (thrombocytopenia);
- Disseminated intravascular coagulation (also known as "DIC" or consumptive coagulopathy);
- Malfunction of vital organs (such as the kidneys, lungs, and liver); or
- Death.

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:

1. Laboratory evidence of *Babesia* infection in the recipient and donor; **AND**
2. Transfusion recipient received one or more RBC or platelet unit(s) within one year before the collection date of the recipient's positive specimen; **AND**
3. Transfused unit(s) was/were plausibly infectious based on assessment of donor infectivity at time of donation of implicated unit(s); **AND**
4. Transfusion-associated infection is considered at least as plausible as tick-borne transmission.

Laboratory Evidence

Laboratory Confirmation

- Detection of *Babesia* spp. (including *B. microti, B. duncani, B. divergens*, *B. venatorum*, and others species) nucleic acid by molecular methods from an appropriate clinical specimen (e.g., whole blood).

OR

- Identification of *Babesia* spp. organisms by microscopic examination from an appropriate clinical specimen.

Supportive Laboratory Evidence of Infection

- Serological demonstration of *B. microti* total or IgG antibody titres ≥ 1:64 by indirect immunofluorescence assay (IFA).

OR

- Serological demonstration of *B. divergens* total or IgG antibody titres ≥ 1:256 by IFA.

OR

Serological demonstration of *B. duncani* total or IgG antibody titres ≥ 1:512 by IFA.

Indications and Limitations

- Microscopy on its own is usually adequate to diagnose babesiosis when performed by laboratories with expertise in *Babesia* morphological identification (e.g., Public Health Ontario's laboratory). Speciation is not possible by microscopy alone. A single negative microscopic examination is not sufficient to rule out infection.
- All laboratories identifying *Babesia* organisms by microscopy should forward their whole blood sample as well as two unstained thick and thin smears to Public Health Ontario's reference laboratory for confirmation.

- Occasionally, *Babesia* morphology may be difficult to differentiate from other blood pathogens such as *Plasmodium*. In these cases, the results may be preliminarly reported as "organisms resembling *Babesia* spp." pending further identification.
- Molecular detection methods have increased sensitivity over microscopy and may be helpful to diagnose cases with submicroscopic parasitemia. Molecular methods are also useful to provide speciation. *Babesia* nucleic acids persist for months following treatment, therefore molecular methods are less useful for treatment monitoring.
- Serological antibody titres may be negative early in infection or in patients with severe immunosuppression. False positive reactions may occur in patients with autoimmune disorders (e.g., rheumatoid arthritis). Antibody titres remain elevated for years following clearance of infection. Antibody titres ≥ 1:1024, or a four-fold increase in titres between acute and convalescent sera, may be useful to distinguish acute from chronic/remote infection.
- Cross-reactivity may occur with *Plasmodium* spp. at lower antibody titre levels for IFA. Cross-reactivity is not usually reported between *Babesia* species-specific IFAs, therefore the appropriate species IFA should be requested if the epidemiological exposure is known.

For further information about human diagnostic testing, contact the PHO Laboratories at customerservicecentre@oahpp.ca or refer to the PHO Laboratory Services webpage: https://www.publichealthontario.ca/en/Laboratory-Services/About-Laboratory-Services.[7]

Case Management

In addition to the requirements set out in the Requirement #2 of the "Management of Infectious Diseases – Sporadic Cases" and "Investigation and Management of Infectious Diseases Outbreaks" sections of the *Infectious Diseases Protocol, 2018* (or as current), the board of health shall investigate cases to determine the source of infection. Refer to Provincial Reporting Requirements above for relevant data to be collected during case investigation. Additional disease specific information may

include:[3]

- Travel to blacklegged tick risk areas and activities in the previous 30 days[a];
- Outdoor recreational activities and outdoor occupations;
- Symptoms and date of symptom onset;
- History of blood transfusion within one year from the infection;
- Pregnant/peri-natal status; and
- Date of tick bite.

Treatment is under the direction of the attending healthcare provider. Provide education to healthcare providers and at-risk communities about the infection, how it is acquired, and ways to prevent babesiosis.

Contact Management

Not applicable.

Outbreak Management

Not applicable.

Prevention and Control Measures

Personal Prevention Measures

Provide public education and advice on preventive measures including education about the mode of tick transmission and the means for personal protection such as:

- Wearing closed shoes and light-coloured, long sleeve shirts and long pants, tucking pants into socks, using diethyltoluamide (DEET) or icaridin (picaridin) insect repellents, and permethrin treated clothing[9];

[a] PHO's Lyme Disease Risk Map provides a provincial picture of where there are known blacklegged tick populations.[8]

- Avoiding tick-infested areas when possible;
- Avoid wooded and brushy areas with high grass and leaf litter;
- Walk in the center of trails;

After you come indoors:

- Check your clothing for ticks;
- Examine gear and pets[10];
- Shower soon after being outdoors;
- Check your body for ticks after being outdoors;
- Create a tick-safe zone to reduce ticks in the yard; and[11]
- Removing ticks from domestic animals.[10]

Infection Prevention and Control Strategies

The board of health shall develop and utilize a local vector-borne management strategy in order to mitigate risk. This strategy shall include measures such as:

- Local risk assessments; and
- Public education and source reduction when and where applicable.

Disease Characteristics

Aetiologic Agent – Babesiosis is a tickborne disease caused by intraerythrocytic protozoan parasites of the genus *Babesia*. There are over 100 *Babesia* species known to infect vertebrates, but only a few species have been reported in humans. *Babesia microti* is the most common infectious agent in North America, while *B. divergens* is seen in Europe. Rare *B. duncani* and *B. divergens*-like cases were reported in western United States, while rare *B. venatorum* and *B. microti*-like cases were reported in western Europe.[12-15]

Modes of Transmission - *Babesia* parasites are mostly spread to humans by the bite of an infected tick. It usually requires at least 24 hours for *Babesia* to be acquired from a blood-feeding tick. Less commonly, *Babesia* parasites can spread through

blood transfusions, solid organ transplantation, and through congenital transmission (during pregnancy/delivery).

Incubation Period – Signs and symptoms of *Babesia* disease begin to typically appear from 1-4 weeks after a bite from an infected tick or 1-9 weeks (up to 6 months) after contaminated blood transfusion.

Period of Communicability – Individuals may have subclinical infection and remain infective without symptoms prior to transmission via blood transfusion, solid organ transplantation, or transplacental transfer. The period of infectivity is not yet established but case reports have reported ranges of weeks to months between primary infection and subsequent transmission.

Reservoir – The life cycle of *Babesia* involves small mammal reservoir hosts (most often rodents such as the white-footed mouse in North America) and a tick vector (most often the blacklegged or deer tick *Ixodes scapularis* in North America). The tick can become infected as larvae, nymph, or adult when they feed on an infected reservoir host, and they remain infected for life. The parasite is more commonly spread by nymphs during the spring and summer months and in areas with woods, bush, and/or grass.

Host Susceptibility and Resistance – General susceptibility, with increased risk to those that live in, work in, travel to, or visit areas of high tick prevalence or areas of known endemicity for *Babesia* infections.

Please refer to PHO's Infectious Disease Trends in Ontario reporting tool and other reports for the most up-to-date information on infectious disease trends in Ontario.[16]

For additional national and international epidemiological information, please refer to the Public Health Agency of Canada and the World Health Organization.

Comments (if needed)

As this is a newly designated Disease of Public Health Significance, please send any media advisories/alerts to IDPP@ontario.ca for awareness.

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Document History

Revision Date	Document Section	Description of Revisions
May 2023	Entire Document	New appendix - disease is a Disease of Public Health Significance as of July 1, 2023.