

Requirements for Programs, Services and Accountability  
Infectious Diseases Protocol

# Appendix 1: Case Definitions and Disease- Specific Information

## Disease: Anaplasmosis

Effective: July 2023

# Anaplasmosis

Communicable

Virulent

[Health Protection and Promotion Act \(HPPA\)](#)<sup>1</sup>

[Ontario Regulation \(O. Reg.\) 135/18 \(Designation of Diseases\)](#)<sup>2</sup>

## 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:<sup>3</sup>

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

## 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 human granulocytic anaplasmosis.

## Suspect Case

Not applicable.

## Outbreak Case Definition

Not applicable.

## Clinical Information

### Clinical Evidence

Clinically compatible signs and symptoms are characterized by fever and at least one of the following: headache, malaise/asthenia, arthralgia, myalgia, nonhemolytic anemia, thrombocytopenia, leukopenia, elevated hepatic transaminase levels, or elevated numbers of immature neutrophils (left shift).

### Clinical Presentation

Symptoms of anaplasmosis typically begin to show within 1-2 weeks (up to 21 days) from a bite of an infected tick (*Ixodes scapularis* in eastern North America, *I. pacificus* in western North America, and *I. ricinus* in Europe). Symptoms can include fever, chills, severe headache, myalgia, abdominal pain, nausea, vomiting, diarrhea, and/or loss of appetite. Respiratory, central nervous symptoms, and rash are infrequently reported. Infections usually last 1-2 weeks if untreated, with persistent symptoms up to 60 days infrequently seen in subacute cases.<sup>5</sup>

Rarely, if treatment is delayed or other medical conditions are present, anaplasmosis can lead to severe illness. Symptoms of severe illness can include respiratory failure, bleeding problems, organ failure, and/or death.<sup>5</sup>

Risk factors for severe illness include:

- Coinfection with other tick-borne diseases (e.g., *Borrelia burgdorferi*)
- Delayed treatment
- Advanced age
- Weakened immune system (due to cancer, AIDS, transplantation, or certain medications)

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 *Anaplasma* 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

- Serological demonstration of a four-fold or greater increase in *Anaplasma phagocytophilum* IgG-specific antibody titres by indirect immunofluorescence assay (IFA) between acute and convalescent sera taken 2-4 weeks apart;  
**OR**
- Detection of *A. phagocytophilum* nucleic acid by molecular methods from an appropriate clinical specimen (e.g., whole blood, buffy coat, cerebrospinal fluid [CSF], or bone marrow/tissue biopsy);  
**OR**
- Detection of *A. phagocytophilum* antigen by immunohistochemistry (IHC) from an appropriate clinical specimen;
- Isolation of *A. phagocytophilum* in cell culture from an appropriate clinical specimen followed by molecular confirmation;

### Supportive Laboratory Evidence of Infection

- Serological demonstration of elevated *A. phagocytophilum* IgG antibody titres by IFA or by enzyme-linked immunosorbent assay (ELISA);  
**OR**
- Identification of typical morulae (microcolonies of *A. phagocytophilum*) in the cytoplasm of granulocytes by microscopic examination from an appropriate specimen.

### Indications and Limitations

- Microscopy strongly supports diagnosis of anaplasmosis when typical morulae are present, however identification requires morphological expertise and may not distinguish between *A. phagocytophilum* and other organisms

infecting granulocytes (e.g., *Ehrlichia ewingii*). A single negative microscopic examination is not sufficient to rule out infection.

- Molecular detection methods have increased sensitivity over microscopy including specific species identification. *A. phagocytophilum* nucleic acids clear within days of treatment initiation.
- A cut-off threshold antibody titre  $\geq 1:64$  by IFA is used to defined elevated titres against *A. phagocytophilum* at the National Microbiology Laboratory.
- Serological antibody titres may be negative early in infection or in patients with severe immunosuppression. Antibody titres remain elevated for years following clearance of infection and may be positive in health individuals living in areas of endemicity. Therefore, a single elevated IgG antibody titre result is usually insufficient to confirm acute/active infection, and a four-fold rise in titres between acute and convalescent sera are required.
- Cross-reactivity may occur with *Ehrlichia* spp. at lower titre levels for IFA, however, titres are usually comparatively higher against the infecting agent.

For further information about human diagnostic testing, contact the PHO Laboratories at [customerservicecentre@oahpp.ca](mailto:customerservicecentre@oahpp.ca) or refer to the PHO Laboratory Services webpage: <https://www.publichealthontario.ca/en/Laboratory-Services/About-Laboratory-Services>.<sup>6</sup>

## 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:

- Travel to blacklegged tick risk areas and activities in the previous 30 days<sup>a</sup>;
- Outdoor recreational activities and outdoor occupations;
- Symptoms and date of symptom onset;

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<sup>a</sup> PHO's [Lyme Disease Risk Map](#) provides a provincial picture of where there are known blacklegged tick populations.<sup>7</sup>

- History of blood transfusion within one year from the infection; 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 anaplasmosis.

## 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, and using diethyltoluamide (DEET) or icaridin (picaridin) insect repellents, or permethrin-treated clothing<sup>8</sup>;
- 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<sup>9</sup>;
- Shower soon after being outdoors;
- Check your body for ticks after being outdoors;
- Create a tick-safe zone to reduce ticks in the yard<sup>10</sup>; and
- Removing ticks from domestic animals<sup>9</sup>.

### 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** – Anaplasmosis (also known as human granulocytic anaplasmosis) is a tick-borne disease caused by the intraleukocytic bacterium *Anaplasma phagocytophilum*. *A. phagocytophilum* typically infects neutrophils and other granulocytes in humans.

**Modes of Transmission** - *A. phagocytophilum* is mostly spread to humans by the bite of an infected tick. It usually requires at least 12 hours for *A. phagocytophilum* to be acquired from a blood-feeding tick. Less commonly, *A. phagocytophilum* can spread through blood transfusions, solid organ transplantation, direct contact with infected blood (human or animal), or inhalation of aerosolized infected carcass while butchering infected hosts (e.g., deer carcass). There has been rare reports of perinatal acquisition of anaplasmosis but the mechanism of perinatal transmission is yet to be established. In Ontario, the bacteria is carried by the blacklegged tick (*Ixodes scapularis*). In Western Canada, the bacteria is carried by *Ixodes pacificus*.

**Incubation Period** – Signs and symptoms of anaplasmosis begin to typically appear from 5-21 days after exposure, with an average of 7-14 days.

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

**Reservoir** – The life cycle of *A. phagocytophilum* involves deer, sheep, cattle, goats, or small mammal reservoir hosts (e.g. rodents) and a tick vector (most often the blacklegged or deer tick vector *Ixodes scapularis* in eastern 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. In Ontario, surveillance testing of blacklegged ticks has shown an *A. phagocytophilum* prevalence of 0.30% between 2008-2012 and 0.43% between 2011-2017.

**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 *A. phagocytophilum* 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.<sup>11</sup>

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](mailto:IDPP@ontario.ca) for awareness.

## References

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6. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Laboratory Services [Internet]. Toronto, ON: King's Printer for Ontario; c2023 [cited 2023 Jun 20]. Available from: <https://www.publichealthontario.ca/en/laboratory-services/about-laboratory-services>
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9. Centers for Disease Control and Prevention, National Center for Emerging and Zoonotic Infectious Diseases, Division of Vector-Borne Diseases. Preventing ticks on your pets [Internet]. Atlanta, GA: Centers for Disease Control and Prevention; [2019] [cited 2023 Jun 20]. Available from: [https://www.cdc.gov/ticks/avoid/on\\_pets.html](https://www.cdc.gov/ticks/avoid/on_pets.html)
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11. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Infectious Disease Trends in Ontario [Internet]. Toronto, ON: King's Printer for Ontario; c2023 [modified 2022 Dec 15; cited 2023 Jun 20]. Available from: <https://www.publichealthontario.ca/en/Data-and-Analysis/Infectious-Disease/Reportable-Disease-Trends-Annually>

## 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.