

6.5 Malaria

Case Definition

Confirmed Case

Laboratory confirmation of infection with or without clinical evidence of infection:

- demonstration of *Plasmodium* species in a blood smear/film (thick and thin)

Probable Case

Laboratory confirmation of infection with or without clinical evidence of infection:

- detection of *Plasmodium* species antigen in an appropriate clinical specimen

Cases are classified into one of the following categories:

Autochtonous: a confirmed case of malaria obtained via mosquito transmission within Canada

Imported: a confirmed case of malaria acquired outside Canada

Induced: a confirmed case of malaria acquired through blood transfusion from a donor in whom the parasite has been confirmed

Congenital, confirmed: a confirmed case of malaria in an infant < 3 months old who has not left Canada since birth, with confirmation of the parasite in the mother

Congenital, probable: a confirmed case of malaria in an infant < 3 months old who has not left Canada since birth, without demonstration of presence of the parasite in the mother

Note:

- A case is counted if that is the individual's first attack in Canada, even though they may have experienced an attack (s) outside of Canada
- A new attack in the same person is counted as an additional case if caused by a different *Plasmodium* (*P.*) species (sp.)
- Another attack by the same species is not considered as a new case unless the individual has traveled to a malaria-endemic area since the previous attack.

Clinical Presentation

There are a variety of symptoms that an individual may experience in the initial stages of malaria such as back pain, chills, cough, diarrhea, headache, myalgia, nausea, sweating, and vomiting. Vague symptoms create difficulty in diagnosing malaria without laboratory confirmation of the parasite.

Severe malaria caused by *Plasmodium falciparum* can manifest with anemia, seizures, renal failure, respiratory distress, and/or lactic acidosis. Untreated

severe malaria is usually fatal. Infection caused by *P. malariae*, *P. ovale*, or *P. vivax* is not usually fatal, but untreated infection can manifest as anemia, prostration, and/or splenomegaly.

Diagnosis

Demonstration of malaria parasites in blood or detection of parasite antigens.

Epidemiology

Occurrence

Malaria is no longer endemic in temperate and subtropical climates, but is still responsible for a great deal of illness in tropical and other subtropical regions. It causes 1 million deaths globally every year, primarily among young children living in Africa.

Both in Canada and in Newfoundland and Labrador, malaria surveillance is crucial due to importation from travelers. Around 400 cases of malaria are reported in Canada per year. Underreporting is likely to be occurring, as approximately 30% to 50% of cases are reported to public health agencies. From 2012-2015, there have been 15 cases in Newfoundland and Labrador, ranging from 1-7 cases per year over that interval.

Reservoir

Mainly humans; also non-human primates.

Transmission

The bite of an infective female *Anopheles* sp. mosquito. Induced and congenital malaria can be transmitted person-to-person.

Incubation Period

The incubation period is dependent on *Plasmodium* sp. It is 9-14 days for *P. falciparum*, 12-18 days for *P. ovale* and *P. vivax*, and 18-40 days for *P. malariae*. When infected via blood transfusion, the incubation period may be very short or may last up to 2 months.

Period of Communicability

This varies with response to treatment and type of *Plasmodium* species. Untreated or poorly treated individuals may provide a source of infection for *P. falciparum* for less than a year, up to 5 years for *P. vivax*, and for several years for *P. malariae*. Stored blood can remain infective for a month, while the parasite remains infective in a mosquito carrier for the duration of their lifespan.

Control Measures

Management of Cases

Course of treatment is dependent on the *Plasmodium* species, severity of infection, age of the person infected, and whether the strain is resistant to certain medications in certain geographic regions. Regardless, it is crucial to quickly diagnose and treat any type of malaria before it manifests into severe malaria.

P. falciparum: The primary pharmaceutical treatment of malaria caused by this parasite is artemisinin-based combination therapy (ACT).

P. malariae, *P. ovale*, and *P. vivax*: 25 mg chloroquine base/kg body weight over three days. Primaquine may be used to prevent relapse. However, this is determined on a case-by-case basis, as people deemed deficient in glucose-6-phosphatase should not take this drug.

Management of Contacts

Individuals diagnosed with malaria should be in isolation to prevent exposure to mosquitoes and spreading of bloodborne diseases.

Blood donors who have had malaria in the past, or who have traveled to an area that is endemic, need to be screened to ensure that their blood does not contain any *Plasmodium* sp. Canadian Blood Services announced changes in 2007 to their blood donation policy regarding those who have been exposed to malaria:

- **People who spend less than six consecutive months in malaria-risk zone** will be temporarily ineligible to donate blood for one year following the departure from the malaria-risk zone.
- **People who spend six or more consecutive months in a malaria-risk zone** will be temporarily deferred for three years after they leave the malaria-risk zone.
- **People who have had malaria:** will no longer be able to donate blood

Management of Outbreaks

An outbreak of *P. falciparum* requires immediate action to treat cases, contain the infection's spread, and prevent further infection. Mass fever treatment without a confirmatory diagnosis will be permitted in the event of an outbreak. Artemether-lumefantrine may be administered when disasters occur in endemic areas, resulting in a malaria outbreak.

Vector control measures should also be implemented immediately. Indoor residual spraying is the primary method of control, as its effects are rapid. Widespread use of insecticide-treated mosquito nets (ITNs) and long-lasting insecticidal nets (LLINs) are subsequently recommended.

Education and Preventive Measures

It is imperative to follow the **A, B, C, and Ds** of malaria prevention for endemic areas:

- **A:** Be aware of the risk, incubation period, possibility of delayed onset, and the primary symptoms
- **B:** Avoid being bitten by mosquitoes, especially between dusk and dawn
- **C:** Take antimalarial medications (**chemoprophylaxis**) when appropriate, to prevent infection developing into clinical disease
- **D:** Immediately seek diagnosis and treatment if a fever develops more than one week after entering an area where there is a malaria risk and up to 3 months (or, rarely, later) after departure from a risk area.

For more specific information on malaria prevention, please consult the Canadian Recommendations for the Prevention and Treatment of Malaria among International Travelers, published by Canadian Communicable Disease Report and Public Health Agency of Canada.

A fact sheet is provided at:

http://www.phac-aspc.gc.ca/media/advisories_avis/mal_faq-eng.php

A link to the Canadian Malaria Network can be provided at:

<http://www.phac-aspc.gc.ca/tmp-pmv/quinine/>

Reporting Requirements and Procedures

- Physicians, laboratories and communicable disease control nurses (CDCNs), and infection control practitioners (ICPs) must immediately report suspect or confirmed cases to the Regional Medical Officer of Health (RMOH)
- RMOH office will notify local physicians, nurse practitioners, environmental health officers, community health nurses, CDCNs, and ICPs, in the particular region as required for follow-up and case investigation
- RMOH reports to provincial office as per list B
- CDCN enters the case into the electronic reporting system and completes an outbreak report form if indicated
- Provincial Disease Control
 - Reports the identified case to other health regions
 - Reports the identified case to Public Health Agency of Canada
 - Provides an analysis of the case/s with reports in the Communicable Disease Report (CDR)