Newfoundland and Labrador Disease Control Manual	
Section 6	**Vectorborne and other Zoonotic Diseases**

6.1 Introduction

This section outlines the Newfoundland and Labrador policy and procedure required to complete investigation, control and reporting measures for vectorborne and zoonotic diseases. While the risk of rabies is an issue in Labrador, the other vectorborne and zoonosis diseases are rarely reported in Newfoundland and Labrador but they may be identified in travelers. These diseases are reported in the province or territory in which they are identified.

Policy

All laboratory confirmed vectorborne and zoonosis related diseases are to be reported to the Regional Medical Officer of Health (RMOH) or designate, who is responsible for ensuring that the appropriate investigation, treatment, case follow up and reporting to the provincial Chief Medical Officer of Health (CMOH) or designate occurs. Environmental Health Officers have the responsibility for carrying out the investigation.

Vectorborne and other Zoonotic Diseases Reportable in Newfoundland and Labrador include:

Anthrax
Brucellosis
Lyme Disease
Malaria
Plague
Q fever
Rabies
Typhus
Tularemia
West Nile Virus infection
Yellow fever
Zika

Roles and Responsibilities

Laboratory

Report to CMOH, RMOH and attending physician within four working days for list B, immediately by telephone for list A, aggregate data within one week

RMOH or designate

- Assign and initiate investigation within four working days
- Ensure confidentiality
- Ensure completion of investigation, follow up and reporting
- If outbreak occurs assign outbreak committee

Investigator

- Ensure case has been informed and treated

- Followed up as necessary with contacts (through the physician or public health)
- Ensure education for prevention has been appropriately disseminated

Guidelines around confidentiality

- Be sensitive to personal circumstances of the situation
- Explain the method of contact notification to case to ensure full cooperation
- Divulge personal information of the case or any contacts only with signed consent form
- Never e-mail names of cases or contacts; fax only if using secure fax line
- Mark all correspondence as personal and confidential

Reports from other Provinces and Territories

Reports of persons tested in other provinces are reportable in the province or territory where tested but if the person has moved back to NL reports are forwarded to the office of the CMOH for follow-up as necessary. When follow up is complete the region must notify the office of CMOH of the outcome of follow-up within two months.

Persons who have moved from Newfoundland and Labrador who may be cases or contacts will also be followed up through contact within provincial/territorial CMOH office through the Newfoundland and Labrador Provincial Medical Officer of Health.

6.2 Anthrax

http://www.phac-aspc.gc.ca/ep-mu/anthrax-eng.php

Case Definition

Confirmed Case

Laboratory confirmation of infection:

- isolation of *Bacillus anthracis* from blood, lesions, or discharge (tier 3 laboratory only)

OR

- demonstration of *Bacillus anthracis* in blood, lesions, or discharge by immunofluorescence

Probable Case

Clinical illness, as described below, in a person who is epidemiologically linked to a laboratory-confirmed item/event of *Bacillus anthracis*, or to a probable infected item/event.

Suspected Case

Clinical illness, as described below, in a person who is not epidemiologically linked to a laboratory-confirmed or probable item/event infected with *Bacillus anthracis.*

Clinical Presentation

Anthrax is a disease of herbivores that is incidental in humans. Infection is generally associated with occupational exposure. Case fatality can be between 5-20% but is almost nullified with appropriate treatment. Three forms of anthrax infection have been identified. Though caused by the same agent they are named based on route of entry.

- Cutaneous Anthrax: Occurs when the agent enters a pre-existent cut or abrasion. The infected area becomes raised and itchy. The site becomes liquid filled and ruptures to produce a painless ulcer with a characteristic black necrotic center. A patient is likely to exhibit marked edema caused by *Bacillus anthracis* toxins. Local lymph nodes may also swell. If left untreated death can occur from systemic infection, or respiratory distress from cervical and thoracic edema.
- Gastrointestinal Anthrax: Generally occurs after consumption of meats from contaminated animals but may also come from food otherwise contaminated with *Bacillus anthracis.* Acute inflammation of the intestinal tract is characteristic. Initial symptoms may include nausea, loss of appetite, vomiting, and fever. Abdominal pain, vomiting of blood and severe diarrhea may follow. Case fatality may be 20-60% if left untreated.
- Inhalation Anthrax: Occurs through the inhalations of anthrax spores. Onset is slow beginning with non-specific symptoms of malaise, fatigue, coughing,

mild chest discomfort. Initial symptoms are followed by an improvement that can be as long as several days or as short as several hours. This is followed by an abrupt decline with severe respiratory distress, dyspnea, diaphoresis, stridor, and cyanosis. X-rays show a characteristic widened mediastinum with pleural effusion likely without infiltrates. Shock occurs within 24-36 hours of onset. Case fatality is close to 100% in late stage, despite treatment. This high case fatality makes this the most serious form for bioterrorism purposes.

Epidemiology

Occurrence

While anthrax is not present in North America, it is endemic in other agricultural areas of the world though, especially where animals or bone products are used. It is associated with contact, generally occupational, with infected herbivorous animals. Humans are an incidental host for anthrax.

Bioterrorism exposure is most likely through inhalations of *Bacillus anthracis* spores. The agent has been aerosolized in the past by burning. The only recent use of anthrax for bioterrorism was in 2001 when it was mailed to various high profile media and political targets, killing 5 people.

The most recent case of anthrax in North America was 1976 in the United States

Reservoir

The reservoir for this virus is herbivorous animals.

Transmission

World-wide, anthrax general occurs from exposure to infected animals. Infection can occur through cuts, ingestion, or inhalation. Each different route of infection causes a different clinical manifestation of illness. Bioterrorism use employed physical dispersal, producing cutaneous and inhalation infections. Human to human transmission is very rare.

Incubation Period

The incubation period is usually 1-7 days after exposure. Periods as long as 43 days have been recorded.

Period of Communicability

Person to person transmission is extremely rare. Spores, in articles or soil, can remain contaminated for years.

Diagnosis

This is consistent with the above listed case definition.

Control Measures

Management of Case

Even a single case of inhalation anthrax, especially in an urban centre, warrants investigation. The case should undergo disinfection of articles, such as clothing, that may have come in contact with the source. Steam sterilization or burning is required to destroy spores **. Antibiotic treatment is effective and ciprofloxacin should be the first drug used, though combinations of drugs should be used for inhalation anthrax. Corticosteroids have also been used to effect when treating symptoms of inhalation anthrax.

Management of Contacts

Person to person transmission is very rare. However, contact with cutaneous anthrax effluence or spores from articles of cases could create infection in contacts. In this case prophylactic antibiotic use can be administered.

Management of Outbreaks

General anthrax outbreaks are associated with occupational exposure. Disinfection of the area, equipment, and personal articles should occur**. Proper ventilation in the facility is essential.

A single case of inhalation anthrax should result in investigation. Notification of one case would result in a national response. The response to an outbreak would involve deployment of an expert team from Health Canada's Center for Emergency Preparedness and Response Division. Further health direction would come from this team. Other criminal investigation authorities should also be notified and included in planning.

When deliberate use is suspected than specific measures should be taken as directed by the Newfoundland and Labrador Bioterrorism Response Handbook.

Preventive Measures

Because of widespread susceptibility and a lack of person-to-person transmission prevention initiatives are minimal. Occupational exposure can be reduced through education, proper ventilation, immunizing high-risk workers, and disinfecting suspect animal feed and excrement.

Reporting Requirements

Regional MOH will notify

- Local physicians, nurse practitioners, communicable disease control nurses (CDCNs) and infection control nurses (ICN) in the particular region.
- Provincial office of the CMOH as per list A

Provincial Public Health is responsible for

- Reporting the data related to the disease to PHAC and other regions.
- Analysis of cases and reporting in the Communicable Disease Report (CDR)

6.3 Brucellosis

Case Definition

Confirmed Case

Laboratory confirmation of infection:

- isolation of *Brucella*[1] from an appropriate clinical specimen using serological test positive for agglutinating antibodies and non-agglutinating antibodies (tier 3 laboratory only)

OR

- detection of antibodies to rough-lipopolysaccharide antigens (necessary for *B. canis* confirmation).

Probable Case

- Clinical illness, as defined below, in a person who is epidemiologically linked to a laboratory-confirmed animal/event of *Brucella*, or to a probable infected animal/event.

Suspected Case

- Clinical illness, as defined below, in a person who is not epidemiologically linked to a laboratory-confirmed or probable animal/event infected with *Brucella*

Clinical Presentation

Brucella is a systemic bacterial infection of variable length and intermittency. It can last days, months, or (rarely) years. Symptoms include irregular fever, headache, weakness, profuse sweating, chills, arthralgia, depression, weight loss, generalized aching. Suppurative infection of organs and chronic localized infections may occur. Sometimes it is subclinical. Osteoarticular complication can arise in 20-60% of patients, most frequently sacroilitis. Genitourinary involvement is seen in 2-20% (commonly as orchitis or epididymitis). Case-fatality is 2%, generally from endocarditis associated with *B. melitensis*. Brucellosis is sometimes confused with neurotic symptoms complex

Diagnosis

Case confirmation is based on findings consistent with the above listed case definition.

[1] * *Brucella* illness is associated with *Brucella aboritus*, *B. Melitensis*, *B. suis*, and *B. canis*

Epidemiology

Occurrence

Brucella is rare in Canada but is endemic worldwide, most prevalent in and around Mediterranean regions. Risk is generally occupational with veterinarians and agricultural workers being most at risk. Outbreaks only occur occupationally or with the drinking of unpasteurised milk.

Reservoir

The reservoir for this virus is generally domesticated herbivorous animals. Sometimes dogs, *B. canis.*

Transmission

Brucellosis is generally transmitted through breaks in skin contacting infected animal tissue or discharge. It can also occur through ingesting unpasteurized milk or inhalation. Pinprick exposure also occurs from Rev-1 vaccination handling.

Incubation Period

The incubation period is highly variable; anywhere from 5-60 days with 1-2 months being commonplace. This can be longer on occasion.

Period of Communicability

No person-to-person communicability.

Control Measures

Management of Case

Treatment can be complicated. A combination of rifampicin, streptomycin, and doxycycline is required for 6 weeks. Relapse occurs in 5% of individuals and should be treated with doxycycline and rifampicin.

Management of Contacts

Person-to-person transmission has not been documented.

Management of Outbreaks

Outbreaks generally occur around occupation or consumption of unpasteurized milk. Cheese can, on occasion, also produce illness. Contact investigation can determine the link and the appropriate measure can be taken to manage the outbreak, recall of products or implement safety protocols.

Brucella has been cited as a possible bioterrorist agent because it can be aerosolized. A widespread outbreak could potentially produce problems because of complication in treatment and the possibility of relapse. Long term morbidity, if there is a lack of treatment, can also occur.

Preventive Measures

Occupational exposure can be reduced through education of high-risk workers, testing and destruction of infected animals and ensuring milk is pasteurized before consumption. Control of the disease is reliant on eliminating it from the domestic animal population. Canada declared its cattle *Brucella* free in 1985.

Reporting Requirements

The PH Lab will provide case details of any identified cases.

Regional MOH will notify

- Local physicians, nurse practitioners, communicable disease control nurses (CDCNs) and infection control nurses (ICN) in the particular region.
- Provincial office of the CMOH as per list A

Provincial Public Health is responsible for

- Reporting the data related to the disease to PHAC and other regions.
- Analysis of cases and reporting in the Communicable Disease Report (CDR)

6.4 Lyme Disease

http://www.phac-aspc.gc.ca/id-mi/lyme-eng.php

http://www.health.gov.nl.ca/health/publichealth/cdc/lyme_disease.pdf

Case Definition

Confirmed Case

Clinical evidence of illness with laboratory confirmation:

- isolation of *Borrelia burgdorferi* from an appropriate clinical specimen

OR

- detection of *B. burgdorferi* DNA by polymerase chain reaction (PCR)

OR

- Clinical evidence of illness with a history of residence in, or visit to, an endemic area[2] and with laboratory evidence of infection:

Positive serologic test using the two-tier ELISA **AND** Western Blot criteria

Probable Case

Clinical evidence of illness without a history of residence in, or visit to, an endemic area* and with laboratory evidence of infection:

- positive serologic test using the two-tier ELISA and Western Blot criteria,

OR

- clinically-observed erythema migrans without laboratory evidence but with history of residence in, or visit to, an endemic area

Clinical Presentation

Erythema migrans, a circular rash that may appear in the shape of a target or in a solid color, is one of the first symptoms observed in a case of Lyme disease. The rash first appears between 3-32 days after initial infection and lasts until 8 weeks following infection. Fatigue, fever, headache, and neck stiffness may also present during the initial stages of infection. If not treated, neurological problems (e.g. encephalitis), cardiac problems (e.g. atrioventricular heart block), and Lyme arthritis can manifest in later stages of the infection. These symptoms can last weeks to years after initial infection of the disease. Lyme disease is rarely fatal.

Diagnosis

Blood tests should not be interpreted without considering the patient's clinical symptoms. False negative results from blood tests are more likely to occur during

[2] An endemic area consists of a known breeding population of *Ixodes scapularis* or *Ixodes pacificus*. Both are tick vectors that are instrumental in the transmission of *B. burgdorferi* in that area

the early phase of the disease. Blood tests become more accurate during the later stages of the disease.

Epidemiology

Occurrence

A high prevalence of Lyme disease coincides with the seasonality and habitat of the blacklegged tick. The most common source of infection is nymphal ticks, infecting humans during the summer. However, adult ticks infect during cooler parts of the year.

In North America, tick vectors primarily inhabit areas of southern Canada and New England. Cases have also been detected in China, Europe, Japan, and Russia. However, these ticks can travel on migratory birds to regions where this species of tick do not usually inhabit. The incidence of Lyme disease is increasing in Canada, however. Canadian rates are not available as the disease has been nationally notifiable since 2009.

In NL, it has been noted that about 20% of the ticks sampled in the province carry the bacteria that causes Lyme disease. However, the total number found per year remains low (approximately 25-35). While the risk of Lyme disease is considered low, residents are encouraged to take preventive measures to protect themselves from tick bites. Since 1996, a total of 7 cases of Lyme disease have been reported in the province, all of which were travel-related. Six of these cases have been reported since 2004.

Reservoir

Mainly migratory birds, deer, and wild rodents; other small mammals can be infected with this bacteria.

Transmission

Tickborne; transmission by the species *Ixodes scapularis and Ixodes pacificus* (blacklegged ticks) generally does not occur unless the tick has been attached for 24 hours or more to experimental animals. This may also be true for humans. Transmission can also occur person-to-person; blood donations should not be accepted from people with Lyme disease.

Incubation Period

If erythema migrans presents, it will appear between 3 and 32 days after tick exposure.

Period of Communicability

There has been no epidemiological evidence of person-to-person or maternal-fetal transmission.

Control Measures

Management of Cases

Supportive care and antibiotic therapy in the early stages of the disease are instrumental in achieving a full recovery. Treatment is less likely to result in complete recovery in the later stages of Lyme disease.

Management of Contacts

Contact investigation should be initiated and a search for the source of the infection.

Management of Outbreaks

An outbreak management team should be established to address infection prevention and control measures.

Education and Preventive Measures

- Education regarding transmission of *B. burgdorferi* and means of personal protection against its acquisition
- Avoidance of known or suspected tick-infested areas
- If in a tick-infested area, wear light-colored clothing that covers arms, neck, and legs so that ticks will be more visible. Pants should be tucked into socks, and repellent should be applied to the skin and/or clothing
- Perform body searches for ticks; use tweezers to remove ticks and apply soap and water to former tick attachment site. Image of how to properly remove ticks can be found at http://healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/lyme/ticks-removal-enlever-tiques-eng.php#a2
- Perform risk assessment in geographical area where cases of Lyme Disease are believed to have originated from
- Provide fact sheet regarding species of ticks that carry B. burgdorferi in this province http://www.faa.gov.nl.ca/agrifoods/animals/health/pdf/ds_08_006.pdf
- Provide fact sheets at http://www.health.gov.nl.ca/health/publichealth/envhealth/lyme_disease_nr.pdf and http://www.phac-aspc.gc.ca/id-mi/lyme-fs-eng.php

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 case investigation and follow-up.
- Perform lab analyses to determine species of tick that may be responsible for acquisition of Lyme Disease; please visit

http://www.health.gov.nl.ca/health/publichealth/cdc/infectioncontrol/lyme_disease.pdf for more information

- 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)

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 **a**ware of the risk, incubation period, possibility of delayed onset, and the primary symptoms
- **B:** Avoid being **b**itten by mosquitoes, especially between dusk and dawn
- **C:** Take antimalarial medications (**c**hemoprophylaxis) when appropriate, to prevent infection developing into clinical disease
- **D:** Immediately seek **d**iagnosis 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)

6.6 Plague

http://www.phac-aspc.gc.ca/ep-mu/plague-eng.php

Case Definition

Confirmed Case

Laboratory confirmation of infection:

- isolation of *Yersinia pestis* from an appropriate clinical specimen (tier 3 laboratory only)

OR

- serodiagnosis using *Yersinia pestis* fraction-1 antigen with four-fold titter rise

Probable Case

Clinical illness, as identified bellow, in a person as well as:

- visual identification, with bipolar staining, of “safety pin” ovoid gram negative organisms in bubo. Sputum, or CSF

OR

- presence of *Yersinia pestis* fraction-1 antigen with less than four-fold titter rise in unimmunized individual

OR

- detection of *Yersinia pestis* nucleic acid

OR

- detection of *Yersinia pestis* antibody by EIA

OR

- passive hemagglutinatilon/inhibition titre (>1:10) in a single serum sample in an unimmunized individual

Suspected Case

- Clinical illness, as identified bellow, in a person who is not epidemiologically linked to a laboratory-confirmed case or to a probable case of smallpox

Clinical Presentation

Plague can be one of three forms. Bubonic plague is the most common naturally occurring form of illness. It results from bites of infected fleas. Septicemic plague can occur with the spread of bubonic plague to other areas of the body. Pneumonic plague can result from the secondary involvement of the lungs or inhalation of droplets from individuals with bubonic plague.

Initial symptoms are indescript, fever, chills, malaise, myalgia, nausea, prostration, sore throat and headache. Lymph adenitis occurs in lymph nodes close to the original infection site, these are termed bubos. Nodes are tender, inflamed, and may suppurate. Ulceration can also occur around the site of

infection. In addition to general symptoms pneumonic plague is accompanied with overwhelming pneumonia. Besides bubo's, bubonic plague is characterized by fever, chills, headache, and extreme exhaustion. The disease may progress to septicemia, potentially causing disseminated intravascular coagulation (DIC). The prognosis of the plague has been greatly increased with modern medicine. Untreated secondary bubonic plague has a case-fatality of 50-60% but primary pneumonic plague is decidedly fatal.

Pictures of Plague can be found here, URL:
http://www.cdc.gov/plague/symptoms/

Diagnosis

Case confirmation is based on findings consistent with the above listed case definitions.

Epidemiology

Occurrence

While urban plague has been largely controlled the disease is endemic in many areas of the world including parts of Africa, Southeastern Europe, Asia, South America, and the southern United States.

Reservoir

The reservoir for this virus is wild rodents.

Transmission

Bubonic plague is transmitted through bites from fleas that have bitten infected rodents. Person-to-person transmission can also occur though air droplets. This is rare in the developed world and is unlikely to occur if the appropriate control measures are in place. Overcrowded facilities could create large communicability. Aerosol plague production techniques are believed to exist meaning this could be a means of transmission for bioterrorist purposes (resulting in pneumonic plague).

Incubation Period

The incubation period is usually 1 – 7 days after exposure to secondary plaque and 1 – 4 days for primary plaque.

Period of Communicability

Fleas may remain infectious for months under the right conditions. For pneumonic plague the contagious period is the length of time the patient is symptomatic. It is generally short because of rapid deterioration.

Control Measures

Management of Cases

Because the disease is so rare and, in Canada, is only found in travelers, it can be misdiagnosed. Though bubonic plague is not very communicable unless one comes in contact with bubo's, suppurate, or the infection more to pneumonia, a measure of isolation should still be in place. Drainage and secretion precautions should be in place for 48 hours after beginning effective treatment. Clothes and luggage should be rid of all fleas by using a safe insecticide. Also, search the patient's house for sick or dead rodents. Most antibiotics will effectively treat plague though streptomycin is preferred. Chloramphenicol is required for plague meningitis.

Pneumonic plague, unlike bubonic, requires strict isolation of the patient. Precautions against airborne spread are required until 48 hours after beginning an effective treatment. Disinfection, case investigation, and treatments are the same as secondary plague.

Management of Contacts

Contacts are identified by household or recent face-to-face contact. They should be given chemoprophylaxis and placed under surveillance for 7 days. Those who refuse chemoprophylaxis should be placed in isolation for 7 days. This applies for cases of both types of plague. Primary pneumonic plague requires more aggressive investigation of contacts, especially face-to-face contacts.

Management of Outbreaks

Outbreaks of bubonic plague should be addressed by identifying cases and applying the appropriate insecticide treatments to their suspected belonging and/or house. Contacts should be tracked and their suspected articles should be treated with insecticide. Rodent destruction may be necessary in the infected area. Suspected plague deaths should be autopsied. Because of the nature of the disease appropriate communication is vital to preventing potential mass hysteria. It is important to ensure that all ships are free of rodents to prevent international spread. Pneumonic plague will require immediate strict isolation of cases and contacts. The same measures as secondary plague should also be taken. Prophylaxis may be necessary if an epidemic is large. In case of sudden identification of multiple cases of plague, especially pneumonic plague, aerosol release, intentional or otherwise, may be suspected. This may require mass prophylaxis if on a large scale.

Though cases may appear because of recent travel clusters are unusual. The response to an outbreak would involve deployment of an expert team from Health Canada's Centre for Emergency Preparedness and Response Division. Further health direction would come from this team. When deliberate use is suspected than specific measures should be taken and criminal investigation authorities should also be notified and included in planning.

Education and Preventive Measures

As plague is not endemic in Canada, principle prevention methods depend on limiting its entry into the country. The strict control of rodents on ships and harbors is of the utmost importance. The disease should be suspected for individuals who have fallen ill and recently traveled to an area where plague is endemic. Often, due to its relative rarity, plague can go undiagnosed.

Reporting Requirements and Procedures

The PH Lab will provide immediate report of any identified cases

Regional MOH will notify

- Local physicians, nurse practitioners, communicable disease control nurses (CDCNs) and infection control nurses (ICN) in the particular region.
- Provincial office of the CMOH as per list A

Provincial Public Health is responsible for

- Reporting the data related to the disease to PHAC and other regions.
- Analysis of cases and reporting in the Communicable Disease Report (CDR)

6.7 Q Fever

Case Definition

Confirmed Case

Clinical illness[3] with laboratory confirmation of infection:

- fourfold or greater change in antibody titre to *Coxiella (C) burnetii* phase 11 or phase 1 antigen in paired serum specimens ideally taken 3-6 weeks apart
  OR
- isolation of *C burnetti* from a clinical specimen by culture
  OR
- demonstration of *C burnetti* in a clinical specimen by detection of antigen or nucleic acid
  OR
- demonstration of *C burnetti* in tissues by immunostaining or electron microscopy

Probable Case

- Clinical illness with a single supportive Immunoglobulin G (IgG) or Immunoglobulin M (IgM) titre or clinical illness in a person who is epidemiologically linked to a confirmed case.

Chronic infection can cause fatal endocarditis and may evolve months to years after an acute infection, particularly in person with underlying valvular disease. A chronic fatigue-like syndrome has been reported in some Q fever patients.

Clinical Presentation

Q (Query) fever is a zoonosis. Over half of the infections are asymptomatic. There are three distinct manifestation of acute Q fever: i) a self-limited febrile illness ii) pneumonia and iii) hepatitis. Fever is the most common manifestation with duration of approximately ten days.

Diagnosis

Clinical signs and symptoms must be confirmed by laboratory findings

[3] Clinical illness can be attributed to acute or chronic infection:
Acute infection is characterized by a febrile illness usually accompanied by rigors, myalgia, malaise, and retrobulbar headache. Severe disease can include acute hepatitis, pneumonia and meningoencephalitis. Asymptomatic infections may also occur

Epidemiology

Occurrence

Q fever occurs worldwide. Its real incidence is unknown due to the asymptomatic nature of some infections, the lack of availability of diagnostic assays and varying reporting requirements. Epidemics have occurred among workers in abattoirs, meat packing plants, and in medical and veterinary centers that use sheep and goats for research. In Newfoundland Labrador the first documented cases were reported in 1999.

Reservoir

Cattle, sheep and goats are the primary reservoirs of Q fever for man. *C burnetti* localizes to the uterus and mammary glands of infected animals.

Transmission

Inhalation of contaminated aerosols is the most common mode of transmission. Indirect exposure to contaminated material may also lead to Q fever such as contact with contaminated clothing.

Incubation Period

Dependent on the size of the infecting dose; typically-3 weeks; range is from 3 – 30 days

Period of Communicability

Person-to-person transmission occurs rarely

Control Measures

Management of Cases

Treat the symptoms and giving antibiotics can shorten the course of acute illness and reduce the risk of complications. Tetracycline compounds have been the mainstay of treatment in chronic Q fever. Provide information on the disease and preventative measures needed. Interview the case to determine if others have been infected. Routine practices are recommended for those providing care to a case.

Management of Contacts

Contact investigation should be initiated and a search for the source of the infection.

Management of Outbreaks

An outbreak management team should be established to address infection prevention and control measures.

Education and Preventive Measures

- Educate person in high-risk occupations (sheep, goat and dairy farmers, veterinary researchers, abattoir workers, etc.) on sources of infection and the necessity for adequate disinfection and disposal of animal products of conception
- Observe strict hygienic measures when working in high-risk occupations
- Avoid unpasteurized milk and milk products
- Do not use manure from contaminated farms in gardens
- Require biosafety level 3 facilities for the manipulation of contaminated specimens and cultivation of the organism
- A fact sheet is available at: http://www.ccohs.ca/oshanswers/diseases/qfever.html

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)

6.8 Rabies

Case Definition

Human rabies is defined as a case of acute encephalomyelitis with laboratory confirmation of infection, including: detection of viral antigen, rabies virus, or a rabies-neutralizing antibody titre greater than or equal to five in an appropriate clinical specimen.

Case Definitions for Diseases under National Surveillance CCDR Volume 26S3 http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09vol35/35s2/index-eng.php

Policy

All animal biting incidents and/or reports of potential human/animal rabies will be investigated; followed up with appropriate wound treatments, rabies prophylaxis, and animal observation/testing; and reported to the Regional Medical Officer of Health (RMOH) or designate. Laboratory confirmed cases are reported to the DHCS as per List A of the Communicable Disease Act.

Definition of "biting incident": an episode when an animal bites (e.g. dog, cat, fox, bat) or scratches a person, or transmits saliva to a person's mucous membranes or to an open wound. A bite from a bat may go unnoticed; therefore extra precaution is necessary in these cases.

Roles and Responsibilities

Regional MOH or designate will:

- Carry out biting incident investigations.
- Manage appropriate rabies vaccine treatments for victims of biting incidents for appropriate observation/testing of implicated animals.
- Notify local physicians, nurse practitioners, Environmental Health Officer (EHO), Community Health Nurse (CHN) as well as the infection control practitioners (ICP) in that region, as required, for investigation and follow-up of victims of biting incidents, or management of suspect or confirmed cases.
- Report human cases to provincial office as per list A.
- Report all suspected or confirmed animal cases to the Canadian Food Inspection Agency (CFIA).

Provincial Public Health will:

- Supply the vaccine and rabies immune globulin to the regions as needed.
- Notify the Provincial Veterinarian of any suspect or confirmed animal or human cases.
- Report the human case to the Public Health Agency of Canada and other regions.

- Conduct analysis of cases and report in the Communicable Disease Report (CDR)

Clinical Presentation

Symptoms: May be mild and result in headache, fever and malaise that can last for days; followed by parasthesia at the exposure site. Usually progresses to anxiety, confusion, and agitation progressing to delirium, abnormal behavior, hallucinations and insomnia. Rabies is almost always fatal once the clinical symptoms are present.

Epidemiology

Occurrence

Worldwide

Transmission

From saliva of an infected animal, through a bite, a break in the skin, or through the mucous membranes. Caution is advised for healthcare workers to avoid exposure to respiratory secretions and saliva from such an individual. Transmission from an infected individual through a corneal transplant has been documented. Airborne spreading has been reported in caves where bats were roosting, but this rarely occurs.

Incubation Period

Nine days to seven years, but most often three to eight weeks, depending upon the extent and location of the wound, if it was in a vascular area or if it was near a nerve supply.

Period of Communicability

Usually three to seven days in dogs and cats (in bats this could be up to 12 days) before clinical signs develop, and throughout the disease. Time frame varies for different animals.

Education and Preventive Measures

Animal control: Animal owners must ensure that their pets are vaccinated and are kept on a leash. Town councils must take care that stray animals are apprehended and do not roam freely in their communities. In regions where rabies is endemic, or is a growing concern, animal control may be used to reduce the at-risk animal population. Stray animals can be removed from the community by either municipal animal control officers, provincial animal health officials, or the RCMP/RNC. These animals may be confined for at least three days to determine if human exposure has occurred, prior to being destroyed, with the option to test for rabies.

At-risk individuals: Individuals who work with animals should seek advice on their need for rabies vaccination. For those who are vaccinated and have

continuous exposure to rabies, they should have a rabies titre level checked to confirm their immunity to rabies at least every two years. For those who work in a laboratory with live rabies virus then serological testing for immunity should be done every six months. (Reference: Canadian Immunization Guide 7th Edition see page 294.)

International travel: Travelers to developing countries should seek advice regarding rabies.

Investigation of "biting incidents": Biting incidents must be investigated, as outlined in Figure 1, to determine if the animal was rabid and may have passed on the virus at the time of the incident. In regions where rabies is endemic, or where rabies has been recently detected, the animal may be placed under observation for 10 days after the incident (see Appendix H-2). If the animal is alive and healthy at the end of this observation period, no treatment of the human is necessary.

The Regional Medical Officer of Health (RMOH) or designate must be kept informed of any reported biting incidents at the earliest possible stage of the investigation. The intake form (see Appendix H-3) should be used to document the details of the incident and must be forwarded to the RMOH or designate following the investigation. The information collected during the investigation will be used to determine the risk to the individual.

Please note the following when completing biting incident investigations:

- **Vaccination status** - An animal that was initially vaccinated (excluding boosters) within 30 days prior to the incident is to be considered unvaccinated.
- **"Provoked" vs. "unprovoked"** - A "provoked" incident is defined as an incident that was the result of **human-initiated actions** (regardless of human intent) such as:
  - invading or interrupting an animal's territory or actions
  - approaching or handling a sick or injured animal
  - interfering with an animal's food or possessions
  - provoking the animal's attention
  - rough handling of the animal
  - throwing objects at the animal
  - prodding, trapping, or cornering the animal.

If, after extensive investigation, the nature of the incident is uncertain because of conflicting reports or insufficient information, the incident will be handled in the same manner as an 'unprovoked' incident.

Animal health/behaviour - The possibility that rabies was transmitted to the victim will also be assessed in light of any signs of illness or unusual behaviour in the implicated animal. Assessment of animal health will likely require the consultation of a provincial, regional, local, or CFIA veterinarian (see Figure 1, Step 11.)

More information is available at:
http://www.faa.gov.nl.ca/agrifoods/animals/health/rabies.html

Figure 1: Management of Biting Incident/Rabies Reports

<table>
<tr><td>1. Call received by Public Health Office from Emergency setting, physician or the public</td><td colspan="2" rowspan="10"></td></tr>
<tr><td>↓</td></tr>
<tr><td>2. Collect caller's name and telephone number</td></tr>
<tr><td>↓</td></tr>
<tr><td>3. Collect detailed incident / report information</td></tr>
<tr><td>↓</td></tr>
<tr><td>4. If there is a wound, advise victim to clean wound with soap and water, and to seek medical attention.</td></tr>
<tr><td>↓</td></tr>
<tr><td>5. Collect detailed animal information</td></tr>
<tr><td>↓</td></tr>
<tr><td>6. Contact RMOH or MOH on call (1-866-270-7437) by telephone to discuss possible need for rabies prophylaxis treatment for victim, and/or animal observation/testing.</td><td rowspan="4">→</td><td rowspan="6">If no risk go to # 10, no reports required for non-risk incidents

11. Consult with provincial, regional, local, or CFIA veterinarian regarding animal health.</td></tr>
<tr><td>↓</td></tr>
<tr><td>7. Owner to observe animal until 10 days after incident, or have animal tested, as advised by RMOH</td></tr>
<tr><td>↓</td></tr>
<tr><td>8. Contact RMOH by telephone to discuss results of animal observation/testing, and possible need for rabies prophylaxis treatment of victim.</td><td>→</td></tr>
<tr><td>↓</td><td colspan="2" rowspan="5"></td></tr>
<tr><td>9. Follow up with biting incident victim.</td></tr>
<tr><td>↓</td></tr>
<tr><td>10. Complete reports on cases where risk is confirmed and forward to proper authorities (e.g. RMOH, CFIA, Prov. Vet, Dept. HCS).</td></tr>
</table>

If rabies is suspected in any animal, regardless of human exposure, it must be reported to the CFIA, in consultation with the RMOH/designate. The federal "Health of Animals Act and Regulations" (1990, c. 21) gives power to inspectors designated by the President of the Canadian Food Inspection Agency (CFIA) to remove, confine, and destroy animals. This power can be used in situations where animal rabies is found or suspected. Suspicion of rabies in animals will be determined in consultation with the RMOH/designate and provincial, regional, or local veterinarians, and/or CFIA Animal Health Veterinarians (see figure 1, step 11).

Suspect cases **may** include, but are not limited to, the following:

- An animal exposed to, or suspected of exposure to, a bat or other wild carnivorous mammal.
- Depending on regional epidemiology, unprovoked biting incidents where the animal was not vaccinated for rabies.
- An animal showing signs of illness or unusual behavior, suggestive of rabies, as determined in consultation with a veterinarian.

Animal observations: In regions where rabies is endemic, or there has been recently confirmed rabies in the area animals may be held for observation. The RMOH in consultation with the district veterinarian may decide to keep an animal under observation to eliminate the possibility that it was carrying rabies at the time of the incident. If testing is required CFIA officials are trained to handle and transport carcasses of potentially rabid animals. **Do not attempt to collect an animal carcass yourself.** In some circumstances the RMOH may request the CFIA to test an animal for rabies.

If the biting animal was infectious at the time of the bite, signs of rabies will usually follow within 3-5 days, with a change in behaviour, and excitability or paralysis. Once an animal begins shedding active virus, death usually occurs within 8 days. If the animal is alive and healthy 10 days after the incident, it could not have been infectious at the time of the bite.

The 10 day observation period will be counted from the date of the incident. Thus, late reporting of incidents may make observation unnecessary once the animal is verified to be healthy.

- A letter of observation (see appendix) may be sent to the owner to provide supportive documentation of the action.
- Educational materials, such as the Animal Observation for Rabies Information (see appendix), may also be supplied to the owner at this time.

The owner should be instructed to notify the RMOH/designate as soon as the animal shows any of the following signs:

- biting indiscriminately (i.e. its limbs or other objects)
- paralysis or weakness of hind limbs
- drooping jaw and/or neck
- abnormal facial expressions

- hiding away or depressed
- change in the animal's usual behaviour
- increase in drool or saliva

If there is any question about the health status of the animal, seek the advice of a veterinarian.

- During the observation period, the animal must be kept either:
  - indoors;
  - in a caged pen; or
  - on a leash.
- It may not be taken on walks beyond the owner's property.
- It must be kept separated from people and other pets, with the exception of animals with unweaned young.
- Instruct the owner to feed and provide water for their pet as normally during this time.
- The animal must not be sold, given away, or euthanized during the 10 day confinement.

If the animal is healthy on the tenth day of confinement (as confirmed by a field visit in endemic areas), it may be released from confinement. An animal should not be released if there is any doubt about its state of health. A letter of release (see appendix) may be sent to the owner (and cc to animal control, where available) to provide supportive documentation of the action.

Management of animal outbreaks: During an outbreak, strategies would be in place to educate the community on how to decrease the chance of exposure to rabies. Provincial and Regional Veterinarians may use their powers under the Department of Natural Resources' "Dog Act" (RSNL 1990 Chapter D-26) and "Livestock Health Act and Regulations" (RSNL 1990 Chapter L-22) to confine and/or destroy animals when disease is suspected or confirmed. Peace officers, such as the RCMP/RNC, also share these powers under the "Dog Act".

Control Measures

Management of Human Case and Contact

Transmission of rabies from person to person has not been documented; however, the potential for exposure does exist. If a health care worker is caring for an infected individual, caution is advised to prevent contact with respiratory secretions. In cases where humans have been exposed to the saliva of an infected individual, it is recommended that the exposed individual be treated with post-exposure prophylaxis (see Figure 2 Post-Exposure Prophylaxis).

If there is a chance that an individual has been exposed to rabies it is important to **begin wound management as quickly as possible**:

- The injury should be cleaned thoroughly with soap and water (see Figure 1, Step 4).
- Medical treatment should be sought as soon as possible, for assessment and

care of the wound.

- When there is a high suspicion of exposure to a rabid animal then, upon the approval of the RMOH, care would include post-exposure prophylaxis (see table below).
- The wound should be also assessed by a physician the same as for any other wound: the tetanus status of the individual must be updated and consideration given to the use of antibiotics.

NOTE: RPEP to be given to persons of all ages when they wake up to a bat found in the same room because the possibility of a bite cannot be reasonably be excluded (see Canadian Immunization Guide).

Figure 2: Post-Exposure Prophylaxis

Patient History	Prophylactic Treatment	Dosage*	Location	Time*
No previous rabies vaccination	Rabies Immune Globulin (RIG); **and**	20 IU/kg body weight	Large injury: infiltrate wound and surrounding area; remainder to be injected intramuscularly at a site distant from vaccine administration	Day 0
	Rabies Vaccine	4 doses * of Human Diploid Cell Vaccine (HDCV)	Deltoid Muscle	Days 0, 3, 7, 14, booster if required
Previously vaccinated with complete series of approved HDCV, or, an unapproved schedule, **and** demonstrating neutralizing rabies antibodies when tested	Rabies Vaccine (**only**)	2 doses of HDCV	Deltoid Muscle	Days 0 and 3

Previously vaccinated but not meeting above criteria	Rabies Immune Globulin (RIG); **and**	20 IU/kg body weight	Large injury: infiltrate wound and surrounding area; remainder to be injected intramuscularly at a site distant from vaccine administration	Day 0
	Rabies Vaccine	Rabies antibodies **not** present before immunization: 5 doses of HDCV	Deltoid Muscle	Days 0, 3, 7, 14, and 28
		Rabies antibodies present before immunization: 2 doses of HDCV	Deltoid Muscle	Days 0 and 3
* **Note:** Check with product monograph and current Canadian Immunization Guide http://www.phac-aspc.gc.ca/publicat/cig-gci/p04-rabi-rage-eng.php#sched				

(Rabies) Appendix H-1 Contact Information

MOH On-Call (24 Hour Emergency Number	**1-866-270-7437**		
Canadian Food Inspection Agency	**Phone Number**	**Fax #**	**E-mail Address**
Dr. Karla Furey	**709 772-5286** **709 687-9012**	709 772-3013	karla.furey@canada.ca
Animal Health	**Phone Number**	**Fax #**	**E-mail Address**
Dr. Laura Rogers	709 729-6897 709 697-5302	709 729-0055	laurarogers@gov.nl.ca
Medical Officers of Health	**Phone Number**	**Fax #**	**E-mail Address**
Dr. Claudia Sarbu Chief Medical Officer of Health	709 729-3433 709 697-9134	709 729-4647	claudiasarbu@gov.nl.ca
Dr. Janice Fitzgerald Medical Officer of Health	709 729-3019 709 631-4980	709 729-4647	janicefitzgerald@gov.nl.ca

(Rabies) Appendix H-2 Sample Animal Observation Letter

[Name of Animal Owner]
[Address of Animal Owner]

Dear [Name],

It has been reported that your [species of animal] was involved in a biting/scratching incident on the [date].

You are asked to keep this animal under household observation until [date of release] to ensure that your animal has not passed rabies virus to the victim.

Please ensure the following during this period:

- Keep your pet separated from other animals and people, including family members.
- Feed and provide water for your pet as normal during this time.
- Use a leash when walking your pet on your outdoor property.
- Refrain from allowing your animal to roam free outside.
- Notify me **immediately** if your pet begins to show any of the following signs:
  - change in animal's usual behavior or any signs of illness
  - biting indiscriminately (i.e. its limbs or other objects)
  - weakness or paralysis of hind limbs
  - drooping jaw and/or neck
  - abnormal facial expressions
  - hiding away or depressed
  - increase in drool or saliva

You will be contacted at the end of this observation period to ensure that your animal is healthy. If deemed healthy, the animal may be released from observation at that time.

Thank you for your cooperation in this regard.

Yours truly,

_____
[Name of Investigator]
[Phone number]
cc. [MOH or designate]

Animal Observation for Rabies Information

1. What is Rabies?
Rabies is a deadly disease of animals which can also affect people. It is caused by a virus that can be passed in the saliva of an infected animal. The virus can infect another animal or a person when the infected saliva enters a bite, scratch, or a mucous membrane such as the eyes, mouth, or nose. The virus then slowly travels to the brain of the infected animal or person, at which point it will cause changes in their behavior.

2. Why do I need to keep my pet under observation?
Your animal is being observed as a result of a biting or scratching incident. An animal infected with rabies can pass the virus as early as ten days before showing rabies symptoms. If your pet shows symptoms of rabies within ten days of the incident, then there may be a chance that the rabies virus was passed in its saliva.

3. How do I look after my pet during the observation period?
Your pet must be kept indoors, in a caged pen, or on a leash during the observation period. It may not be taken on walks beyond your property. It must be kept separated from people and other pets. Please feed and provide water for your pet as normal during this time.

4. Is my family at risk by keeping our pet in the house?
There is no risk of getting rabies if you keep your pet confined and separated from you and your family.

5. Can I keep my pet around other animals?
No. Your pet must be kept apart from animals and people during the ten day observation period. One exception is in the case of pets with unweaned young, which may continue to be fed by its mother.

6. Can I sell or give away my pet, or have my pet 'put to sleep'?
No, only in exceptional circumstances. **You must have permission from the investigator to have your pet destroyed, sold, given away, or otherwise disposed of during the observation period.**

7. What should I do if my pet starts to act strangely?
Please notify the investigator **immediately** (see phone number below) if your pet begins to show any of the following signs:

- change in the animal's usual behavior or any signs of illness
- biting indiscriminately (i.e. its limbs or other objects)
- paralysis or weakness of hind limbs
- drooping jaw and/or neck
- abnormal facial expressions
- hiding away or depressed
- increase in drool or saliva

8. Is it too late to get a rabies shot for my pet?
If your pet is healthy after the observation period, and has not had its rabies shots, **we strongly recommend** that you arrange for your pet to have its shots.

9. Do any of my family members need to get rabies shots?
If your pet is healthy after the 10 day observation period, you do not need to worry about getting rabies shots. If your pet is found to have rabies, the Medical Officer of Health will decide on the course of action to avoid the risk of rabies to you and your family.

10. How can I keep this from happening again?
- Ensure that your pets have all of their rabies shots up to date.
- Keep your pets under control indoors, or on a leash when outdoors.
- If your pet tends to bite or scratch people, talk to a vet about its' behavior.
- Keep away from, and refrain from feeding, any stray pets and wild animals.
- Report to public health officials or wildlife conservation officers, if you see any animals acting strangely.

Contact Information:
Investigator:

Name: _____

Telephone #: _____

Sample Animal Release Letter

[Name of Animal Owner]
[Address of Animal Owner]

Dear [Name],

It has been reported that your [species of animal] was involved in a biting/scratching incident on the [date].

As your animal was found to be healthy at the end of the observation period there was no risk that rabies virus was passed to the victim. Therefore, your animal is officially released from its home observation.

In spite of this release, please consider the following recommendations:

- Ensure your pet is vaccinated.
- Never allow your pet to roam free. Keep it indoors, caged, penned, or on a leash.
- If your animal tends to bite people or other animals, seek advice from a vet.
- Never approach or feed wild or stray animals.
- Report any unusual animals to the Department of Natural Resources.

Thank you for your cooperation during this observation period.

Yours truly,

_____
[Name of Investigator]
[Phone number]

cc. [MOH or designate and animal control, where available]

(Rabies) Appendix H-3

Rabies Investigation And Referral Form

1. Biting Incident Information

Victim's name: _____ DOB: _____ Sex: □Male □Female
Address: _____Parent/Guardian name: _____
City: _____ Province: _____ Postal Code :_____
Phone: (Home) _____ (Work) _____
Fax:_____
Exposure date: _____ Kind of exposure: □ Bite □ Scratch □ Other:_____
Physician's name: _____
Physician's phone:_____
Short description of the incident:
_____
_____
_____
_____
_____
_____
_____
_____
_____

1.1 Wound Information

Location of wound: _____
_____
Description of wound: (Include the presence of bleeding, tissue or bone damage.)
_____
_____
_____
Treatment: (Advise victim to clean wound thoroughly with soap and water, as soon as possible.)
_____
_____
Given By: _____
Date:_____

1.2 Public Health Information

Date of last Tetanus vaccination: _____Tetanus vaccination given: □ Yes □ No
Date of previous rabies vaccination _____ Patient Weight: _____
Rabies Vaccine is released only on authority of Regional MOH or MOH on Call.
Rabies vaccine required: □ Yes □ No If yes, dosage: _____
Lot #: _____

Rabies Immune Globulin: □ Yes □ No If yes, dosage: _____
Lot #: _____
Tetanus vaccine required: □ Yes □ No If yes, dosage: _____
Lot #: _____
If no, date of previous dose: _____
Is follow-up required? □ Yes □ No If yes, describe:
_____
Follow-up completed by: _____ Date: _____

2. Animal Information

Name: _____Species: _____Breed: _____

Age: _____ Sex: _____ Colour: _____

Tattoo: _____ Microchip: _____

Other ID: _____

_____

Location of animal: _____

_____

Reason for complaint: □ Human exposure □ Signs of illness

□ Other: _____

Animal alive: □ Yes □ No Contact with wild animals: □ Yes □ No

Date of contact: _____

Animal vaccinated: □ Yes □ No Last vaccination date: _____

Name of vaccine: _____

Specimen submitted for testing: □ Yes □ No Date submitted: _____

Test results: _____

2.1 Animal Owner Information

Name: _____ Address:_____

City: _____ Province: _____ Postal code:_____ Phone: (Home) _____(Work)_____

Fax:_____

3. Animal observation to be conducted? □ Yes □ No

4. Animal Observation Information

(This section is to be completed if the animal needs to be observed until 10 days after the incident.)

Observation by: □ GSC □ CFIA □ Other _____

Date of referral : _____
Date observation period started: _____ Date observation period will end: _____ Description of animal behavior prior to incident: _____ _____ _____ Condition of the animal at the end of the observation period _____ _____ _____ _____
5. Rabies suspected? □ Yes □ No (If rabies is suspected, it must be reported to the CFIA.)
Information completed by: _____ Date_____

6.9 Tularemia

http://www.phac-aspc.gc.ca/tularemia/index-eng.php

Case Definition

Confirmed Case

Laboratory confirmation of infection:

- isolation of *Francisella tularensis* from an appropriate clinical specimen

OR

- ELISA-based seriological test for *Francisella tularensis*

OR

- fourfold serum antibody titre change to *Francisella tularensis* antigen

Probable Case

Clinical illness, as described below, and:

- epidemiologically link to a laboratory-confirmed case or event

OR

- detection of *Francisella tularensis* nucleic acid

OR

- microagglutination titre (≥1:128)

Suspected Case

- Clinical illness, as described below, in a person who is not epidemiologically linked to a laboratory-confirmed case or to a probable case of smallpox

Clinical Presentation

Tularemia and Influenza both present very similarly. Sudden onset involves high fever, chills, fatigue, general aching, headache, and nausea. Most commonly it is accompanied with a skin ulcer at the point of infection. There is also swelling of the local lymph node, potentially accompanied by a glandular ulcer. This may give the appearance of a plague bubo. With ingestion of contaminated food, ulceration can present as pharyngitis, abdominal pain, diarrhea, and vomiting. Inhalation can produce pneumonia or septicemia. *Francisella tularensis* type A has a case fatality of up to 30%, if untreated. The less virulent type B has a negligible case-fatality even without treatment.

Diagnosis

Case confirmation is based on findings consistent with the above listed case definition.

Epidemiology

Occurrence

Tularemia is largely endemic in North America, Europe and East Asia. It peaks during May through August but is present year round.

Reservoir

In North America tularemia is found mainly in rabbits, but can also be found in other larger rodents. Some wood ticks may also harbour the disease.

Transmission

Arthropod bites, principally from the wood and dog tick are the most common means of transmission. Tularemia may also be found in untreated water of areas where tularemia is present. Additionally, it can occur through eating the meat of infected animals. Direct person-to-person transmission does not occur. Tularemia is believed to be a possible bioterrorist threat because it can be aerosolized.

Incubation Period

The incubation period is usually 3-5 days after exposure but can range from 1-14.

Period of Communicability

No person-to-person transmission occurs. Ticks remain infectious their entire life span. Rabbit meat has been found to be infectious even after 3 years in frozen storage.

Control Measures

Management of Cases

For cases of tularaemia, no isolation is required. Disinfection of drainage and secretions may be done as a precaution. Aminoglycosides are the most effective and should last for 10-14 days. Tetracyclines can also be used but for 21 days. Beta-lactam and cephalosporines are ineffective treatments.

Management of Contacts

Tularemia is not transmitted through person-to person contact so contact management is unnecessary.

Management of Outbreaks

Outbreak management procedures depend on the type of outbreak. Enteric or tick borne manifestations require management consistent with other vector borne diseases. If a number of respiratory tularemia cases are found at one time, bioterrorist dispersal may be suspect. Cases require prompt identification and

treatment. Prophylaxis can be pursued in extreme cases and treatment should be handled as with cases: Aminoglycosides for 10-14 days or tetracyclines for 21 days.

Preventive Measures

The principle prevention methods rely on education of the public. Areas where the disease is present should be informed to refrain from drinking untreated ground water and how to avoid tick bites. Similarly, hunters should know to thoroughly cook rabbit and other large rodent meat.

Reporting Requirements

The PH Lab will provide immediate report of any identified cases

Regional MOH will notify

- Local physicians, nurse practitioners, communicable disease control nurses (CDCNs) and infection control nurses (ICN) in the particular region.
- Provincial office of the CMOH as per list A

Provincial Public Health is responsible for

- Reporting the data related to the disease to PHAC and other regions.
- Analysis of cases and reporting in the Communicable Disease Report (CDR)

6.10 West Nile Virus Infection

http://www.phac-aspc.gc.ca/wn-no/index-eng.php

Case Definition

Confirmed Case

There are three different categories of West Nile Virus (WNV) in humans:

- West Nile Virus Asymptomatic Infection (WNAI)
- West Nile Virus Non-Neurological Syndrome (WN Non-NS or West Nile Fever)
- West Nile Virus Neurological Syndrome (WNNS or Severe West Nile Disease)

20% of individuals who acquire WNV will develop West Nile Fever, and approximately 1 in 150 will develop Severe West Nile Disease.

West Nile Virus Asymptomatic Infection (WNAI)

Confirmed Case

Confirmed case diagnostic test criteria in the absence of clinical criteria

Probable Case

Probable case diagnostic test criteria in the absence of clinical criteria

Confirmed Case Diagnostic Test Criteria

At least one of the following must be confirmed for a diagnosis:

- a significant (e.g. fourfold or greater) change in WN virus neutralizing antibody titres in paired acute and convalescent sera, or cerebrospinal fluid (CSF)
  OR
- isolation of WNV from, or demonstration of WN virus-specific genomic sequences in, tissue, blood, CSF or other body fluids
  OR
- demonstration of WNV antigen in tissue
  OR
- demonstration of flavivirus antibodies in a single serum or CSF sample using a WN virus IgM enzyme immunoassay (EIA) confirmed by the detection of WN virus specific antibodies using a PRN (acute or convalescent specimen)
  OR
- a significant (e.g. fourfold or greater) change in flavivirus haemagglutination inhibition (HI) titres in paired acute and convalescent sera or demonstration of

a seroconversion using a WN virus IgG EIA AND the detection of WN specific antibodies using a PRN (acute or convalescent serum sample)

Probable Case Diagnostic Test Criteria

At least one of the following must be confirmed for a diagnosis:

- detection of flavivirus antibodies in a single serum or CSF sample using a WN virus IgM EIA without confirmatory neutralization serology (e.g. PRN)
  OR
- a significant (e.g. fourfold or greater) change in flavivirus HI titres in paired acute and convalescent sera or demonstration of a seroconversion using a WN virus IgG EIA
  OR
- a titre of > 1:320 in a single WN virus HI test or an elevated titre in a WN virusIgG EIA, with a confirmatory PRN result
  OR
- demonstration of Japanese encephalitis (JE) serocomplex-specific genomic sequences in blood by NAT screening on donor blood, by Blood Operators in Canada

West Nile Virus Non-Neurological Syndrome (WN Non-NS)

Confirmed Case

Clinical criteria **AND** at least one of the confirmed case diagnostic test criteria

Probable Case

Clinical criteria **AND** at least one of the probable case diagnostic test criteria

Suspect Case

Clinical criteria in the absence of or pending diagnostic test criteria **AND** in the absence of any other obvious cause

Clinical Criteria

- history of exposure in an area where WNV activity is occurring

OR

- history of exposure to an alternative mode of transmission

AND

- at least two of the following:
  - fever
  - myalgia
  - arthralgia
  - headache
  - fatigue
  - lymphadenopathy
  - maculopapular rash

West Nile Virus Neurological Syndrome (WNNS)

Confirmed Case

Clinical criteria **AND** at least one of the confirmed case diagnostic test criteria

Probable Case

Clinical criteria **AND** at least one of the probable case diagnostic test criteria

Suspect Case

Clinical criteria in the absence of or pending diagnostic test criteria AND in the absence of any other obvious cause

Clinical Criteria

- history of exposure where and when West Nile virus (WNV) activity is occurring
  OR
- history of exposure via a different mode of transmission
  AND
- onset of fever
  AND
- recent onset of at least one of the following:
  • encephalitis (acute signs of central orperipheral neurologic dysfunction)
  OR
  • viral meningitis (pleocytosis and signs of infection, e.g. headache, nuchal rigidity)
  OR
  • acute flaccid paralysis (e.g. poliomyelitis-like syndrome or Guillain-Barré-like syndrome)
  OR
  • movement disorders (e.g. tremor, myoclonus)
  OR
  • Parkinsonism or Parkinsonian-like conditions (e.g. cogwheel rigidity, bradykinesia, postural instability)
  OR
  • other neurological syndromes

Clinical Presentation

WNAI: Blood is screened using a nucleic acid amplification test (NAT) to determine if the person has WNV. No physical symptoms/ailments are present and detectable.

WN Non-NS: There is a large variety and severity of symptoms associated with this form of WNV. They include the clinical criteria listed above. Some clinical symptoms may emerge that are not characteristic of the disease, such as

gastrointestinal symptoms. This was evident in WNV cases in Canada and the US in 2003 and 2004.

WNN: A highly prominent feature of this form of WNV is severe muscle weakness, developing early in the course of the viral infection. This symptom may occur on its own, or altered reflexes, fever, encephalitis or meningitis may also develop. Other clinical criteria are listed above.

Muscle weakness and paralysis may also be a symptom of Guillain-Barre Syndrome. It is important to differentiate between WNNS and Guillain-Barre Syndrome by doing a lumbar puncture; pleocytosis, an increase of lymphocytes in the cerebrospinal fluid (CSF), is seen in acute flaccid paralysis due to WNV, but is not generally a feature of Guillain-Barre syndrome. WNNS requires constant monitoring, as development of acute neuromuscular respiratory failure is associated with high morbidity and mortality.

Diagnosis

Clinical signs and symptoms must be confirmed by laboratory findings

Epidemiology

Occurrence

Outbreaks of WNV have been reported in North America, Europe, Asia, and Africa. In Canada, cases have been decreasing from 2008 to 2010; 36 cases were reported in 2008, 13 in 2009, and 5 in 2010. Most of the cases were from Saskatchewan. Other cases have been found in Manitoba, Alberta, British Columbia, Ontario, and Quebec. Very few have been reported in Atlantic Canada. As of 2015, no cases have ever been reported in Newfoundland and Labrador. This is due the vectors' inability to survive over winter.

Reservoir

Mainly birds, especially the common crow

Transmission

The primary carriers of WNV are the mosquito species *Culex pipiens*, *Culex tarsalis* and *Aedes vexans*. *Culex pipiens* inhabits areas of the Newfoundland's west coast.

Incubation Period

The incubation period is between 3 and 12 days.

Period of Communicability

This disease cannot be spread through person-to-person contact. There has been maternal-placental transmission, but this has been rare. Carrier

mosquitoes, however, are likely to spread the disease throughout their life course.

Control Measures

Management of Cases

Treatment is supportive. Many therapies for treating WNV are under investigation. Information on clinical trials regarding WNV treatment can be found at: www.cdc.gov/ncidod/dvbid/westnile/clinicalTrials.htm

Management of Contacts

Contact investigation should be initiated and a search for the source of the infection.

Management of Outbreaks

The following steps can be applied to managing a WNV outbreak:

- Determine number of mosquitoes in area effected by WNV outbreak
- Identify breeding place of mosquitoes carrying the virus and exterminate it
- Identify infected animals and provide serological information to determine prevalence of infection and geographical area involved
- Immunize cattle, sheep, and other animals at risk of being infected
- Ensure that approved mosquito repellents are used by humans at risk of acquiring WNV

Education and Preventive Measures

The following websites provide information regarding preventive measures against acquiring WNV. They provide information on insect repellent use, application of repellents to mosquito nets, and other means of personal protection:

Health Canada Fact Sheet – Insect Repellents:

http://healthycanadians.gc.ca/product-safety-securite-produits/pest-control-products-produits-antiparasitaires/pesticides/about-au-sujet/insect_repellents-insectifuges-eng.php

Proper Application of Insect Repellent

- Insect repellent does not have to be applied in large doses.
- It should be rubbed on all exposed skin surfaces
- It should not be applied under clothing or on open wounds
- It should not be applied in closed spaces with poor ventilation, like tents
- It should not be applied near food.

There is currently no vaccine available for the prevention of WNV in humans at this time.

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 A
- CDCN enters the case into the electronic reporting system and completes an outbreak report form if indicated
- Provincial Disease Control
    - Reports the aggregate case data to Public Health Agency of Canada on a weekly basis during the summer and early fall

6.11 Yellow Fever

Case Definition

Confirmed Case

Clinical illness with laboratory confirmation of infection:

- isolation of yellow fever virus

OR

- detection of yellow fever viral antigen in body fluids or tissue

OR

- detection of yellow fever nucleic acid in body fluids or tissue

OR

- a significant (i.e. fourfold or greater) rise in antibody titre to the yellow fever virus in the absence of yellow fever vaccination

OR

- a single elevated yellow fever IgM antibody titre in the absence of yellow fever vaccination within the previous two months

Probable Case

Clinical illness with laboratory evidence of infection:

- a stable elevated antibody titre to yellow fever virus with no other known cause
- cross-reactive serologic reactions to other flaviviruses must be excluded, and the patient must not have a history of yellow fever vaccination

Clinical Presentation

Yellow fever is a mosquito-borne viral illness characterized by acute onset of fever and constitutional symptoms followed by a brief remission and a recurrence of fever, hepatitis, albuminuria and, in some instances, renal failure, shock and generalized hemorrhages. The onset of clinical symptoms can take between 3 and 5 days.

- Symptoms usually include sudden onset of fever, headache, joint pain, loss of appetite, abdominal pain, vomiting and dehydration. Most patients recover after this stage.
- Severe cases, can lead to shock, internal bleeding, jaundice (yellowing of the skin and eyes) and organ failure. This occurs in about 15% of patients. The case fatality ratio for those who develop severe yellow fever disease is 15-50%.

Diagnosis

Clinical signs and symptoms must be confirmed by laboratory test findings.

Epidemiology

Occurrence

Yellow fever is endemic (always present) in many tropical areas of South America and Africa. In South America, the countries considered to have the greatest risk of contracting yellow fever include Bolivia, Brazil, Colombia, Ecuador and Peru. Several Caribbean islands are also at low risk for epidemics. Countries at risk for yellow fever in Africa are typically situated on or around the equator. Yellow fever is not endemic in Asia, however since both the mosquitoes and the non-human primates are present in different parts of Asia, there is potential for future epidemics.

Reservoir

The main source of Yellow fever is infected mosquitoes- mainly the *Aedes aegypti*, however other *Aedes* species in Africa and *Haemagogus* species in South America also play a role in transmission. A secondary source of Yellow fever is infected humans who carry the disease with them into areas where mosquitoes are capable contracting and spreading the disease.

Transmission

Spread through the bite of infected mosquitoes. These mosquitoes are domestic, wild, or semi-domestic types. Non-human primates (monkeys) can also be infected with the yellow fever virus, which allows for the virus to remain present in the absence of human hosts.

Incubation Period

3-6 days in humans; 9-12 days in infected mosquitoes at usual tropical temperatures.

Period of Communicability

Blood of patients is infective for mosquitoes shortly before the onset of fever and for the first 3-5 days of illness. However the virus has been found in the blood up to 17 days after illness onset. Mosquitoes remain infected for life.

Control Measures

Management of Cases

- Reported to the local health authority: Events involving yellow fever are required to be assessed at a national level for potential notification to the

World Health Organization under the *International Health Regulations (*http://www.who.int/ihr/en/*).*

- Isolation: Contact precautions. Prevent access from mosquitoes to patient for at least 5 days after the onset (screening the sickroom, spraying quarters with residual insecticide, and using insecticide-treated bed-nets).
- Disinfect: The homes of patients promptly with an effective insecticide.

Management of Contacts

- Concurrent disinfection: Disinfect the homes of all contacts as well as homes in the general vicinity promptly with an effective insecticide.
- Immunization of all contacts: Family, neighbors and all other contacts who have not been immunized should be vaccinated promptly

Management of Outbreaks

- Investigation of contacts and source infection: inquire about all contacts and all places including travel history and forested areas visited by cases, 3-6 days before onset to locate focus of yellow fever; observe other people visiting that area.
- Search places such as the home, place of residence and visiting premises of the case/patient within in several days for mosquitoes capable of transmitting the disease. Apply effective insecticide and investigate unexplained illness/deaths that may suggest yellow fever.
- Mass immunizations beginning with those most exposed to mosquitoes (specifically *Ae*. *aegypti*-infested areas) and who have not been vaccinated in the last 10 years. Immediately immunize all those living next to forest settings if outbreak occurs in a rural/jungle area.
- Ensure those immunized avoid yellow fever focused areas, such as forested areas where there are potentially infected mosquitoes, for 7-10 days.
- Eliminate or treat all actual and potential breeding locations

Education and Preventive Measures

- Create a public health program that vaccinates everyone over the age of 9 months against Yellow fever in areas where people are at risk of being infected due to residence, occupation or travel.
- When travelling to endemic areas, travelers should be vaccinated or re-vaccinated every 10 years before trips.
- In urban areas where yellow fever is present, control measures such as mosquito nets and bug repellant could be used to eradicate the vector.
- People who are exposed to areas that make them susceptible to mosquito bites should wear long pants and sleeves/use bug spray. (http://www.phac-aspc.gc.ca/tmp-pmv/info/yf-fj-eng.php)

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)

6.12 Zika

Etiology

Zika virus is a mosquito-associated flaviviral disease caused by Zika virus (ZIKV). It is related to other *Flaviviridae*, including Japanese Encephalitis, West Nile, Yellow Fever, St. Louis, Encephalitis and Dengue viruses.

Case Definitions

Clinical Criteria
A person with one or more of the following:

- acute onset of fever (measured or reported)
- maculopapular rash
- arthralgia
- conjunctivitis
- complication of pregnancy
  - fetal loss in a mother with compatible illness and/or epidemiologic risk factors;

    OR
  - in utero findings of microcephaly and/or intracranial calcifications with maternal risk factors

- Guillain-Barré syndrome not known to be associated with another diagnosed etiology.

Epidemiologic Linkage

- Travel to a country or region with known ZIKV transmission, OR
- Sexual contact with a laboratory confirmed case of ZIKV infection, OR
- Receipt of blood or blood products within 30 days of symptom onset; OR
- Organ transplant recipient within 30 days of symptom onset; OR
- Association in time and place with a confirmed or probable case.

Case Classification

Probable

Meets clinical criteria
AND

- resides in or has recently traveled to an area with ongoing ZIKV transmission, **OR**

- has direct epidemiologic linkage to a person with laboratory evidence of recent ZIKV infection (e.g. sexual contact, in utero or perinatal transmission, blood transfusion, organ transplantation),

- OR-

- association in time and place with a confirmed or probable case.

AND meets the following laboratory criteria:

- positive ZIKV-specific IgM antibodies in serum or cerebrospinal fluid (CSF);
- **AND**
- negative dengue virus-specific immunoglobulin M (IgM) antibodies;
- **AND**
    - No neutralizing antibody testing performed;
    - **OR**
    - Less than four-fold difference in neutralizing antibody titers between ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred.

Confirmed
Meets clinical criteria
AND
Has laboratory evidence of recent ZIKV infection by:

- Detection of ZIKV by culture, viral antigen or viral ribonucleic acid (RNA) in serum, CSF, tissue, or other specimen (e.g. amniotic fluid, urine, semen, saliva); **OR**
- ZIKV IgM antibodies in serum or CSF with ZIKV neutralizing antibody titers 4-fold or greater than neutralizing antibody titers against dengue or other flaviviruses endemic to the region where exposure occurred.

Zika Virus, Congenital Infection

Clinical Criteria
An infant with microcephaly or intracranial calcifications or central nervous system abnormalities.

Case Classification

Probable : An infant meets the clinical criteria **AND**:

- Mother lived in or traveled to a country or area with ongoing ZIKV transmission during the pregnancy;
- **OR**

- Mother has laboratory evidence of ZIKV or unspecified flavivirus infection during pregnancy;

AND the infant meets the following laboratory criteria:

- ZIKV IgM antibodies detected in serum or CSF;
- **AND**
- Tests negative for dengue or other endemic flavivirus-specific IgM antibodies; **AND**
    - No neutralizing antibody testing performed; OR
    - Less than four-fold difference in neutralizing antibody titers between ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred.

Confirmed

An infant meets the clinical criteria AND meets one of the following laboratory criteria:

- ZIKV detection by culture, antigen test, or polymerase chain reaction (PCR) in serum, CSF, amniotic fluid, urine, placenta, umbilical cord, or fetal tissue; OR
- ZIKV IgM antibodies present in serum or CSF with ZIKV neutralizing antibody titers 4-fold or greater than neutralizing antibodies against dengue or other flaviviruses endemic to the region where exposure occurred.

Clinical Features

The disease symptoms are usually mild and last for 2 to 7 days. An estimated 80% of Zika virus infections are asymptomatic. Most people fully recover without severe complications and require only simple supportive care. Hospitalization rates are low. Symptoms include:

- fever (often less than 38.5ºC)
- nonpurulent conjunctivitis
- maculopapular rash (face and body)
- arthralgias

Diagnosis

See case definitions. Preliminary diagnosis is based on clinical features and a history of travel to an area with Zika virus transmission. Include on the laboratory requisition travel dates and destination and description and date of onset of symptoms.

Investigations

Who should be tested?

- Any patient with:
  - a history of travel to an area with Zika virus transmission

    -**AND-**
  - two or more symptoms consistent with Zika virus infection during or within 2 weeks of travel
- Pregnant women with:
  - a history of travel to an area with Zika virus transmission

    -AND-
  - two or more symptoms consistent with Zika virus infection during or within 2 weeks of travel

    -OR-
  - ultrasound findings of fetal microcephaly or intracranial calcification
  - Consider testing asymptomatic pregnant women with a history of travel to an endemic area if it will influence clinical decision making. Screening of asymptomatic pregnant women should be discussed on a case-by-case basis between the woman and her health care provider.

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- Mothers of newborns with microcephaly who have a history of travel to an area with Zika virus transmission
- Infants:
  - with microcephaly or intracranial calcifications born to women who traveled to or resided in an area with Zika virus transmission while pregnant

    –OR-
  - born to mothers with positive or inconclusive test results for Zika virus infection.
- Obtain travel history from all pregnant women.
- Serial obstetrical ultrasounds are recommended every three to four weeks for all pregnant women returning from an area with Zika virus transmission.
- Test for Dengue and Chikungunya as well.
- Testing is generally not warranted for returning male travelers who remain asymptomatic. Please see the section on **Prevention: male travelers** for advice on preventing sexual transmission of Zika

Table 1: Laboratory Testing for Suspected Zika Virus

Clinical Presentation	Recommended Tests	Required Information on Requisition
Asymptomatic:		1. Country(-ies) visited in last 2 weeks 2. Date of arrival in affected area 3. Date of return to NL 4. Indicate whether asymptomatic 5. Date of symptom onset 6. Clinical symptoms -fever -conjunctivitis -rash -arthralgias 7. Pregnancy status and gestational age
Asymptomatic, non-pregnant	No testing	
Asymptomatic pregnant • No symptoms during or within 2 weeks of travel	• Zika serology • Collect sample ≥ 1 month after return from affected area	
Symptomatic:		
Acutely ill • ≥2 symptoms • Symptom onset during or within 2 weeks of travel • Onset of symptoms within last 10 days	1. 5ml gold top serum separator tube for RT-PCR 2. Urine in sterile container for RT-PCR 3. 1 ml CSF (as indicated)	
Recovered • ≥2 symptoms • Symptom onset during or within 2 weeks of travel • Not currently symptomatic and onset of symptoms was >10 days ago	1. 5ml gold top serum separator tube for Zika virus serology 2. Collect sample > 2 weeks after return from affected area	

Diagnostic tests for Zika virus infection are available through the NL Public Health Laboratory via the National Microbiology Laboratory in Winnipeg. For information on testing visit the Public Health Laboratory website: http://publichealthlab.ca/laboratory-guidance-for-zika-virus-testing/

There are two types of testing currently available:

1. Zika virus RT-PCR
   - The test of choice for direct detection of viral RNA
   - Recommended in suspected cases within 7 days of onset of symptoms
   - Submit serum and urine, and, if indicated, cerebrospinal fluid (CSF)

- Viral RNA in urine may persist up to 10 days or more after symptoms are noted. This may be considered an alternative or additional sample for RT-PCR testing.
    - Serum is submitted in the yellow/gold serum separator tube (SST)
    - Urine can be submitted in any sterile container
    - CSF (1.0 ml) is in a sterile container (usually the specific CSF tube).
- Turnaround time for RT PCR is about 2 days.

2. Serology
    - Detection of Zika virus IgG and IgM antibodies at least 4 days after symptom onset
    - Serum samples collected after 7 days can be tested for Zika virus antibody

Confirmation of Zika virus-specific antibody in serum samples can be challenging, particularly in the case of previous infection with a related *Flavivirus*, such as dengue. This is due to the cross-reactivity

Epidemiology

Zika virus, first described in Rhesus monkeys in the Zika forest, Uganda in 1947, has led to outbreaks in Africa, Asia and the Oceanic Pacific region. In late 2015, Zika virus was reported for the first time in a number of countries in Central and South America with a concomitant 20-fold increase in microcephaly rates in affected parts of Brazil. This association is currently under investigation. The list of countries reporting transmission is evolving and now includes many Caribbean nations.
The PHAC website has an up to date list of affected nations:
http://www.healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/zika-virus/risks-countries-pays-risques-eng.php

Occurrence

- As of August 25, 2016, 232 travel related cases, 2 sexually transmitted cases and 3 reports of maternal-to-fetal transmission have been detected in Canada. There's ongoing low risk to Canadians .If you're pregnant or planning a pregnancy, you should avoid travel to countries or areas in the U.S. with reported mosquito-borne Zika virus
- Travel related cases of Zika virus have been reported in Canada , for up to date information please visit Public Health Agency of Canada (PHAC) website :
  http://www.healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/zika-virus/risks-countries-pays-risques-eng.php

Reservoir

The main source of Zika virus is infected mosquitoes – mainly *Aedes* mosquitoes. A secondary source of Zika virus are infected humans.

Incubation

The incubation period ranges from 3 to 12 days. The disease symptoms are usually mild and last for 2 to 7 days.

Transmission

Zika virus is a mosquito-borne single-strand RNA flavivirus transmitted by *Aedes* mosquitoes. This species also transmits dengue and Chikungunya viruses. It is a day-biting mosquito with highest activity in the hours just after sunrise and just before sunset. This vector is established in subtropical, tropical, and temperate regions but not in Canada, therefore local transmission here is highly unlikely.

The natural cycle of ZIKV involves mosquito vectors and vertebrate hosts. In the current outbreak the vertebrate hosts are humans. Aside from mosquitos, blood transfusion-associated and sexual transmission have been documented.

A significant concern with the current ZIKA outbreak is the potential for vertical transmission from mother to infant which can cause microcephaly and other congenital abnormalities.

There is evidence of Zika virus transmission through sexual intercourse. It is recommended that men who have travelled to an area with Zika virus transmission: (1) use condoms with a partner who could become pregnant for six months after their return and use condoms for the duration of an established pregnancy (2) use condoms with any partner for 6 months.

Control Measures

Management of the case

Hospitalized individuals should be managed on Routine Practices.

Treatment

There is no specific treatment for Zika virus infection. Symptomatic treatment with analgesics and fluids will suffice in most cases. Avoidance of acetylsalicylic acid and other nonsteroidal anti-inflammatory drugs is recommended until dengue infection has been excluded.

Management of contacts

- Identify close contacts
- Provide education on the signs and symptoms of Zika Virus
- Arrange follow up for pregnant contacts as necessary.

Prevention

- There is no prophylaxis or treatment so postponement of travel or avoidance of mosquito bites is advised. **Pregnant women and those planning a pregnancy should avoid travel to countries with ongoing Zika virus outbreaks.**

  If travel cannot be avoided or postponed strict mosquito bite prevention measures should be followed due to the association between Zika virus infection and increased risk of serious health effects on their developing fetus.
- **Travelers returning from countries and areas in the United States with reported mosquito-borne Zika virus:**
  - **For pregnant women, if you develop symptoms that could be consistent with Zika virus infection, you should consult a health care provider.**
  - **For women planning a pregnancy**, it is strongly recommended that you wait **at least 2 months** before trying to conceive to ensure that any possible Zika virus infection has cleared your body.
  - **For male travelers**, Zika virus can persist for an extended period of time in the semen of infected males, therefore:
    - It is strongly recommended that, if you have a pregnant partner, you should use condoms or avoid having sex for the **duration of the pregnancy**.
    - It is strongly recommended that you and your partner wait to conceive **for 6 months** by using a condom or by avoiding having sex.
    - It is recommended that you should consider using condoms or avoid having sex with **any** partner for **6 months.**
- Delay donating cells, blood, tissues, or organs for a minimum of **21 days.**
- Men should postpone semen donations for **6 months.**
- http://www.who.int/csr/disease/zika/information-for-travelers/en/

Notifiable Disease

Zika virus is a notifiable disease in NL. As of May 25, 2016 there has been one case of Zika virus identified in NL, which was travel related.