

Section 4

Vector-Borne and Zoonotic Disease



Notification Timeline:

Exposures to Infected Animals

The Ministry of Agriculture to Ministry of Health¹: Within 1 business day

Ministry of Health to Local Medical Health Officer: Within 1 business day

Public Health may receive notification of potential exposures from members of the public or health care providers.

Human Cases of Anthrax

From Lab/Practitioner to Public Health: Immediate

From Public Health to Ministry of Health: Routinely, within 24-48 hours.

Immediate if bioterrorism is suspected.

Public Health Follow-up Timeline: Initiate within 24-48 hours; if bioterrorism is suspected, initiation must be immediate.

Public Health Purpose for Notification of Anthrax (adapted from Public Health Ontario, 2016)

- To monitor epidemiology of Anthrax in Saskatchewan including risk factors and geographic distribution;
- To monitor disease burden and outcomes of Anthrax in Saskatchewan;
- To inform the public, occupational and health care provider communities about this disease and how to prevent it;
- To work collaboratively with the Ministry of Agriculture and agricultural partners to reduce the risk of Anthrax;
- To identify locations where increased transmission of Anthrax may be occurring in order to inform other interventions; and
- To support identification of threats or acts of bioterrorism.

Information

Table 1. Surveillance Case Definition² (Public Health Agency of Canada, 2008)

Confirmed Case	Clinical illness* with laboratory confirmation of infection: <ul style="list-style-type: none"> • isolation of <i>Bacillus anthracis</i> from a clinical specimen OR
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¹ Via confidential fax or mailbox 306-787-9576 or cdc@health.gov.sk.ca

² Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definition is not intended to be used for clinical or laboratory diagnosis or management of cases.

	<ul style="list-style-type: none"> demonstration of <i>B. anthracis</i> in a clinical specimen by immunofluorescence
Probable Case	<ul style="list-style-type: none"> suspected case with detection of <i>B. anthracis</i> DNA in a clinical specimen
Suspected Case	<ul style="list-style-type: none"> clinical illness in a person who is epidemiologically linked to a confirmed or suspected animal case or contaminated animal product
*Refer to Table 2 for clinical illnesses of different presentations	

Table 2. Presentation

Cutaneous (Public Health Agency of Canada, 2008)	Clinical illness is characterized by the appearance of small, painless but often pruritic papules. As the papule enlarges, it becomes vesicular and, within two to six days, ulcerates to form a distinctive black eschar, with surrounding edema.
Inhalation (Public Health Agency of Canada, 2008)	Clinical illness is characterized by an upper-respiratory flu-like syndrome that, after a few days, takes a fulminant course, manifested by dyspnea, cough, chills and a high-grade bacteremia.
Gastrointestinal (Public Health Agency of Canada, 2008)	Clinical illness is characterized by abdominal pain, fever and signs of septicemia.
Injection Site	<p>Similar to cutaneous anthrax.</p> <p>A group of small blisters or bumps that may itch, appearing where the drug was injected. A painless skin sore with a black center that appears after the blisters or bumps. Swelling around the sore. Abscesses deep under the skin or in the muscle where the drug was injected (US Center for Disease Control and Prevention, 2020).</p> <p>Serious soft tissue edema presenting like necrotizing fasciitis, cellulitis or abscess (Heymann, 2022).</p>

Epidemiology and Occurrence

Anthrax in humans remains extremely rare in Canada with no reported cases since 2007 <https://dsol-smed.phac-aspc.gc.ca/notifiable/charts?c=pl> .

The following table is a list of anthrax outbreaks occurring in animals Saskatchewan, dating back to the introduction of the provincial Anthrax Response Program in 2014 (Government of Saskatchewan).

Table 3. Anthrax Outbreaks in Saskatchewan (2014-2022)

Year	Location of Outbreak	Species Affected
2014	RM of Preeceville No. 334	Bovine
2015	RM of Harris No. 316	Bovine
2015	RM of Harris No. 316	Bovine
2015	RM of Paynton No. 470	Bison
2019	RM of Chester No. 125	Bison
2021	RM of Qu'Appelle No. 157	Sheep
2022	RM of Piapot No. 110	Bison

Additional Background Information

Causative Agent

- *Bacillus anthracis* is an aerobic, gram-positive, encapsulated, spore-forming, non-motile, non-hemolytic rod shaped bacterium.
- *B. anthracis* produce three major virulence factors: an antiphagocytic capsule and two exotoxins, called lethal and edema toxins.
- The toxins are responsible for the significant morbidity and clinical manifestations of haemorrhage, edema, and necrosis (American Academy of Pediatrics, 2018)

Table 4. Symptoms and Complications (Heymann, 2022)

Presentation	Symptoms	Complications
Cutaneous	<ul style="list-style-type: none"> • Initial itching of exposed skin followed by a lesion (papular rash) that becomes vesicular and develops into a depressed black eschar in 2-6 days. • Moderate to severe edema usually surround the eschar and may have small secondary vesicles. • Pain is uncommon, however if present, is usually due to the edema or secondary infection of the soft tissues. • Site of cutaneous infection is most commonly the head, forearms and hands. 	<ul style="list-style-type: none"> • Spread of infection into the bloodstream causing septicemia. • Edema associated with lesions of the head and neck can compress the trachea resulting in respiratory compromise. • The case-fatality rate of untreated cutaneous anthrax is between 5-20%.
Inhalation	<ul style="list-style-type: none"> • Symptoms initially are mild and non-specific (fever, chills, malaise, mild cough, chest pain) and progress to respiratory distress, stridor, dyspnea, shock and cyanosis over 3-4 days. • X-ray evidence of mediastinal widening with pulmonary infiltrates and pleural effusion are common. 	<ul style="list-style-type: none"> • Hemorrhagic meningitis • Swelling of lymph nodes in the chest (mediastinal adenopathy) • Fluid build-up in the chest (pleural effusion) • Shock

		<ul style="list-style-type: none"> The maximum case fatality rate is estimated to be >85%; early diagnosis, aggressive combination antimicrobial therapy and supportive care can reduce this (Heymann, 2022).
Gastrointestinal	<ul style="list-style-type: none"> Rare and more difficult to recognize. Presents as oropharyngeal (pharyngitis [sore throat], difficulty swallowing, swelling of the neck) or gastrointestinal symptoms (abdominal pain, nausea, vomiting, diarrhea, abdominal swelling) depending where the spores germinate. Occurs in outbreaks following consumption of meat from anthrax-infected animals. 	<ul style="list-style-type: none"> Severe bleeding (hemorrhage) Shock The case fatality rate is approximately 40% Death
Injection	<ul style="list-style-type: none"> Fever is not prominent. A group of small blisters or bumps that may itch. Serious localized soft tissue infection along with significant soft tissue edema. Compartment syndrome may be present. May not involve local injection-related lesions; rather systemic symptoms such as hemorrhagic meningitis and multi-organ failure and coagulopathy. 	<ul style="list-style-type: none"> Hemorrhagic meningitis Multi-organ failure The case fatality rate of injection anthrax is 20%.

Reservoir/Source

- Infected animals shed the bacteria in terminal hemorrhages at death. Most human infections result from handling infected animals, carcasses, meat, hides, or wool.
- The cells sporulate when exposed to the air. The spores are resistant to environmental conditions and disinfection and remain viable in the soil for years.
- The spores from the soil may contaminate food or water and be consumed by a grazing animal.
- Environmental events such as floods can disturb the soil over previous burial sites and result in epizootics.
- Dried or otherwise processed skins and hides, bones, etc. from infected animals may harbour spores for years and are the fomites by which disease is spread worldwide (Heymann, 2022).

- Animals generally acquire the disease from a contaminated environment. Humans usually acquire this disease directly from infected animals or via occupational exposure to contaminated animal products (Government of Canada, 2019) <https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/anthrax/eng/1330045348336/1330045807153>

Incubation Period (Heymann, 2022)

Cutaneous – generally 5-7 days with a range from 1-12 days

Inhalation – ranges from 1-43 days but instances of up to 60 days are possible

Gastrointestinal – ranges from 1-6 days

Injection – ranges from 1-10 days or more

Period of Communicability (Heymann, 2022)

Person-to-person transmission of cutaneous anthrax is rare and requires direct contact with cutaneous lesions. Articles and soils contaminated with the spores may remain infective for years.

Mode of Transmission (Heymann, 2022)

Infection occurs through contact with infected animals, their carcasses, or tissues or parts including contaminated hair, wool, hides or products made from them (e.g. drums, brushes and rugs), or contact with soil associated with infected animals or contaminated bone meal used in gardening.

- Cutaneous anthrax occurs almost exclusively at the site of a pre-existing lesion.
- Inhalation anthrax results from the inhalation of spores. This may occur in risky industrial processes (tanning hides) or bio warfare events. Exposure to *B. anthracis* spores in soil is not considered a substantial risk for human inhalation anthrax.
- Gastrointestinal anthrax may occur from ingestion of undercooked meat.
- Injection anthrax has been associated with injection or snorting of heroin contaminated with anthrax spores.

Lab Reports and Interpretation

If testing is occurring following an anthrax exposure, clinicians must let their laboratory know so appropriate biosafety precautions can be taken.

Table 5. Interpretation of Test Results (RRPL, personal communication, Sept 2022)

Results	Interpretation as per Case Definition	Test details
Isolate identified as <i>B. anthracis</i> , by PCR	Confirmed	The identification of <i>B. anthracis</i> , after it is cultured from a patient specimen, is performed by PCR at RRPL
PCR positive for <i>B. anthracis</i>	Probable	PCR for <i>B. anthracis</i> is not usually performed on direct patient specimens, but may be considered in specific situations through consultation with the RRPL Microbiologist on-call
Culture or PCR negative, or not yet reported, for <i>B. anthracis</i>	Suspect	If <i>B. anthracis</i> is suspected, please notify the local Microbiology laboratory before submitting specimens so appropriate precautions can be taken
n/a	"not a case"	

Treatment/Supportive Therapy

The primary care provider is responsible for the treatment and clinical management of cases in consultation with an infectious disease specialist and local Medical Health Officer (MHO). The following serves as a reference for the public health investigator:

- The Infectious Diseases Society of America (IDSA) published guidelines for the treatment of both naturally acquired and bioterrorism-related cases of cutaneous anthrax (see [Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections: 2014 Update by the Infectious Diseases Society of America](#)).
- Human anthrax immune globulin ([Anthraxil](#)) is approved by Health Canada as Extraordinary Use New Drug and is indicated for treatment of **toxemia associated with inhalational anthrax**¹ (Government of Canada, 2021) in adults and children in combination with antibiotic therapy.
 - Anthrasil may be accessed through the National Emergency Strategic Stockpile and requires local MHO consultation with the Ministry of Health Chief Medical Health Officer.

¹ Inhalation anthrax results from the inhalation of spores. This may occur in risky industrial processes (tanning hides) or bio warfare events. Exposure to *B. anthracis* spores in soil is not considered a substantial risk for human inhalation anthrax.

Public Health Investigation

I. Case

History

Classify case in consultation with the attending physician, the presentation and the case definitions. Refer to [Attachment – Anthrax Data Collection Worksheet](#) to assist in the investigation.

- Investigate for the possible source of exposure – consult with the Ministry of Agriculture to enquire about known sources, whether other cases may have been exposed to an identified source and to determine whether bioterrorism is possible. Clinical manifestation and onset dates can help identify exposure timelines.
- Considerations³ include the following and the associated timelines:
 - Animal exposure - contact with animals known to be infected;
 - Animal exposure – farms
 - Occupational exposure – Farmer
 - Occupational exposure – Veterinarian or related worker (e.g. necropsy), including adequacy of preventive measures;
 - Other Occupational exposures, for example to animal products such as meats, hides and hair (e.g. tanneries and meat packing plants), inquire for adequacy of preventive measures.
 - recent history of travel within Saskatchewan, outside of Saskatchewan or outside of Canada; and
 - Substance use – Injection Drug Use
- Specify where the exposure occurred.
- When source of exposure is not obvious, deliberate use of anthrax should be considered and investigated accordingly.

Outcome

- Did the patient require:
 - Hospitalization
 - ICU admission or intensive medical care
 - Was the outcome fatal?

³ Anthrax in humans is traditionally classified: (1) based on how the occupation of the individual led to exposure, as **non-industrial anthrax**, occurring in farmers, butchers, knackers/renderers, veterinarians, etc., or **industrial anthrax**, occurring in those employed in the processing of bones, hides, wool and other animal products; OR (2) based on the route of infection. Non-industrial anthrax, resulting from handling infected carcasses, usually manifests itself as the (a) **cutaneous** form; it tends to be seasonal and parallels the seasonal incidence in the animals from which it is contracted. Industrial anthrax also usually takes the cutaneous form but has a far higher probability than non-industrial anthrax of taking the (b) **inhalational** form as a result of exposure to spore-laden dust. (World Health Organization, 2008)

Public Health Interventions

Assessment

- Assess for contacts paying particular attention individuals that have had exposure to the same source.

Communication

- Individuals should be notified directly. A follow-up letter can be used to reinforce the need to symptom monitoring and when to seek medical attention (see Sample letter).

Education

- All cases should be provided disease information as well as information on prevention and control measures including the proper disposal of materials from draining lesions (i.e. either incinerated or managed as biohazard waste).

Environmental Health

- When acquisition is linked to a public facility, public health inspection may be warranted.
- When acquisition is linked to an agricultural setting, the Ministry of Agriculture will inform the owner of proper management and disposal of carcasses.
- If suspected that an exposure is related to criminal activity (e.g., tampering, sabotage, terrorism), law enforcement agencies (local police, provincial police, or the Royal Canadian Mounted Police) assume the responsibility for the criminal investigation and law enforcement response of the investigation.

Immunoprophylaxis

- None

Referrals

- Refer to Infectious Disease Specialist to confirm treatment and medical management.
- The Ministry of Health will notify the Ministry of Agriculture of human cases of cutaneous anthrax where livestock is the suspected or known source.
- When a case of anthrax is associated with an occupational exposure, Section 9 of *The Disease Control Regulations*⁴ stipulates that the medical health officer (MHO) shall notify the director (as defined in *The Occupational Health and Safety Act, 1993*⁵). In order to fulfill this obligation, they must complete and send the form in [Appendix L – Notification of Occupational Health and Safety](#) within 14 days.

⁴ <http://www.qp.gov.sk.ca/documents/english/Regulations/Regulations/p37-1r11.pdf>.

⁵ <http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/P37-1.pdf>.

Exclusion

- Standard Precautions are considered adequate for patients with inhalational and gastrointestinal anthrax, since person-to-person transmission for these forms of disease has not been reported.
- Contact Precautions should be followed for patients who have draining cutaneous lesions and soiled dressings should be incinerated or autoclaved.

II. Contact

Contact Definition

- Human-to-human transmission of anthrax is very rare.
- Contacts include individuals who have had direct contact with cutaneous lesions of a human case, infected animals or exposure to a common source.
- Human contacts of cases do not require investigation unless a common exposure is suspected. (Manitoba Health, 2015).

Table 6. Exposure Definitions

Cutaneous	High Risk	<ul style="list-style-type: none"> • Exposure of <u>non-intact</u> skin with contaminated animal products (hair, wool, blood, etc.) from an anthrax-infected animal.
	Low Risk	<ul style="list-style-type: none"> • Exposure of <u>intact</u> skin with contaminated animal products (hair, wool, blood, etc.) from an anthrax-infected animal.
	No Risk	<ul style="list-style-type: none"> • Appropriate use of personal protective equipment (PPE) while handling contaminated animals products of infected with anthrax (hair, wool, blood, etc.) from an anthrax-infected animal. • Human contacts of human anthrax cases.
Inhalation		<ul style="list-style-type: none"> • Inhalation of spores that have been aerosolized during the industrial processing of contaminated materials such as wool, hides or hair. • Indoor or outdoor anthrax attack, with spores aerosolized by a disseminating device or by handling of an agent-containing package (e.g., in processing of mail).
Gastrointestinal		<ul style="list-style-type: none"> • Consuming meat from an infected animal.
Injection		<ul style="list-style-type: none"> • Injecting or snorting drugs contaminated with anthrax spores.

Public Health Interventions

NOTE: Consultation with the Ministry of Agriculture may be required to assist in the assessment of exposures when an anthrax-positive animal has been identified.

Assessment

- Assess for symptoms.

Education

- All contacts of the animals and the environment should be provided with information on the disease, what symptoms to monitor for, and what to do if symptoms develop.

Symptom Monitoring

- **Active** - Individuals with [high-risk cutaneous exposures](#) should be monitored for development of cutaneous anthrax for three weeks (BCCDC, 2019).
 - Maintain continuing medical care of all suspicious skin lesions.
- **Passive** - Individuals with [low-risk cutaneous exposures](#) should self-monitor for development of cutaneous anthrax for three weeks; at the first sign of symptoms (itching, rash), contact public health and the health care provider.

Prophylaxis

- Chemoprophylaxis (ciprofloxacin or doxycycline [preferred] or amoxicillin [as an alternate if susceptible]) is recommended⁶ for:
 - **high-risk cutaneous** exposures (10-14 days) (Heymann, 2022)
 - **gastrointestinal** exposures (10-14 days) (Heymann, 2022)
 - **inhalation exposures** (60 days) (Heymann, 2022; Bower et al, 2021)
- The indication for anthrax vaccine adsorbed (BioThrax) was expanded in November 2015 to include post-exposure use following inhalation exposure during an anthrax mass-casualty incident where medical treatment is unavailable or limited such as a *bioterrorism attack*. In these circumstances, Biothrax⁷ may be given at 0, 2 and 4 weeks in addition to chemoprophylaxis. Refer to Tables 3 and 4 in the original article⁶. (Bower et al, 2019).

Referral

- Symptomatic contacts should be referred to their primary care provider for assessment.

Testing

- Symptomatic contacts should be tested based on clinical assessment of the practitioner.

⁶ [Use of Anthrax Vaccine in the United States: Recommendations of the Advisory Committee on Immunization Practices, 2019 | MMWR \(cdc.gov\)](#). Antimicrobial choices and dosages are the same, regardless of exposure route. Post-exposure prophylaxis should start as soon as possible following exposure and ideally within 48 hours, because its effectiveness decreases with delay in administration. Vaccination is not recommended following either cutaneous or gastrointestinal exposure.

⁷ Biothrax is only available through the NESS and must be requested by the Ministry of Health Office of the Chief Medical Health Officer.

III. Environment

The Saskatchewan Ministry of Agriculture has established a provincial [Anthrax Response Plan](#) to assist affected producers so that animal and public health are protected.

Elements of the plan include:

- anthrax testing (either in lab or via a veterinarian conducting carcass side-testing);
- quarantining the affected pasture and exposed animals;
- investigating to determine the source of the anthrax and to trace animal movement on and off the farm in the risk period;
- providing information on anthrax prevention and management and oversight of proper carcass disposal, cleaning and disinfecting; and
- recommending treatment and vaccination of animals as indicated.

Anthrax is a federally reportable disease and more information from the Canadian Food Inspection Agency (CFIA) can be found at the following link:

<https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/anthrax/eng/1330045348336/1330045807153>

Prevention Measures

Refer to the [Vector Borne and Zoonotic Diseases – Introduction and General Considerations](#) section of the manual that highlights topics for client education that should be considered and provides further information on high-risk groups and activities.

Immunization

- Vaccine is not available for routine use in humans.
- BioThrax⁸ (Anthrax Vaccine Adsorbed) is approved for active immunization for the prevention of disease caused by *Bacillus anthracis*, in individuals 18 through 65 years of age, whose occupation or other activities place them at risk of exposure, regardless of the route of exposure⁹. This vaccine is not publicly funded and may be available through occupational health programs if appropriate.
- The CFIA makes recommendations for vaccinating animals when anthrax is found in livestock.

⁸ <https://www.emergentbiosolutions.com/sites/default/files/inline-files/Product%20Monograph%20BioThrax%20%28EN%29.pdf> (retrieved July 27, 2021)

⁹ <https://www.globenewswire.com/en/news-release/2018/12/17/1668306/33240/en/Emergent-BioSolutions-Receives-Health-Canada-Approval-of-BioThrax-Anthrax-Vaccine-Adsorbed.html>

Education

- Transmission to humans is primarily through contact with infected animals; livestock owners should be aware of signs of Anthrax and must immediately notify the local veterinarian regional CFIA office if Anthrax is suspected. Animals suspected of dying from anthrax should not be opened or moved as this can facilitate contamination of the environment. Refer to the Ministry of Agriculture’s Website for additional information: <https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/agribusiness-farmers-and-ranchers/livestock/animal-health-and-welfare/anthrax#:~:text=The%20Saskatchewan%20Ministry%20of%20Agriculture,anthrax%20cases%20to%20the%20CFIA>
- All confirmed cases of anthrax must be reported to Ministry of Agriculture, Livestock Branch.
- Educate individuals who may be exposed to contaminated materials about the modes of transmission.

Infection Prevention and Control Measures

- In Saskatchewan, the main risk for human anthrax is from contact with infected animals.
- High-risk occupational exposure is typically found in industries where people are exposed to dead animals. Wool, hides, and meat are common sources for occupational exposure. Infection prevention and control measures are the responsibility of the workplace and may include measures within the hierarchy of controls (Elimination, Substitution, Engineering Controls, Administrative Controls and PPE). Examples include:
 - Control dust and properly ventilate work areas in hazardous industries.
 - Wearing protective clothing and having access to adequate facilities for washing and changing clothes after work;
 - Eating facilities in these high-risk workplaces must be located away from places of work.
- Thoroughly wash, disinfect, or sterilize hair, wool, and bone meal or other feed of animal origin prior to processing.
- Do not sell the hides of animals exposed to anthrax or use their carcasses as food or feed supplements.

Epidemic Measures

All cases of animal anthrax are reportable to the Office of the Provincial Chief Veterinary Officer and to the CFIA.

Revisions

Date	Change
April 25, 2023	Corrected section number from 4-50 to 4-20. Listed the preferred medications for chemoprophylaxis and directed users to the link where dosages is provided (page 10).
December 27, 2022	Provided clarity that consultation with MHO is required to assist in conducting risk assessment is needed before treating patients with Anthrasil. Added footnote to provide clarification of exposure risks for inhalation anthrax.
October 11, 2022	New

References

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Please complete all sections.

Panorama QA complete: Yes No
 Initials: _____

Panorama Client ID: _____
 Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: <input type="checkbox"/> Work <input type="checkbox"/> Personal
Phone #: <input type="checkbox"/> Primary Home: <input type="checkbox"/> Mobile contact: <input type="checkbox"/> Workplace:		
Place of Employment/School:	Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Other <input type="checkbox"/> Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: <input type="checkbox"/> No fixed <input type="checkbox"/> Postal Address <input type="checkbox"/> Primary Home <input type="checkbox"/> Temporary <input type="checkbox"/> Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection if not the same:	

B) INVESTIGATION INFORMATION

LHN-> SUBJECT SUMMARY-> VECTOR-BORNE AND ZONOTICS ENCOUNTER GROUP->CREATE INVESTIGATION

Disease Summary Classification: CASE:	Date	Classification: CONTACT:	Date	LAB TEST INFORMATION:
<input type="checkbox"/> Confirmed	YYYY / MMM / DD	<input type="checkbox"/> Contact	YYYY / MMM / DD	Date specimen collected: YYYY / MMM / DD
<input type="checkbox"/> Does Not Meet Case	YYYY / MMM / DD	<input type="checkbox"/> Not a Contact	YYYY / MMM / DD	
<input type="checkbox"/> Person Under Investigation	YYYY / MMM / DD	<input type="checkbox"/> Person Under Investigation	YYYY / MMM / DD	
<input type="checkbox"/> Probable	YYYY / MMM / DD			
<input type="checkbox"/> Suspect	YYYY / MMM / DD			
Disposition: FOLLOW UP: <input type="checkbox"/> In progress YYYY / MMM / DD <input type="checkbox"/> Complete YYYY / MMM / DD <input type="checkbox"/> Incomplete - Declined YYYY / MMM / DD <input type="checkbox"/> Not required YYYY / MMM / DD <input type="checkbox"/> Incomplete – Lost contact YYYY / MMM / DD <input type="checkbox"/> Referred – Out of province YYYY / MMM / DD <input type="checkbox"/> Incomplete – Unable to locate YYYY / MMM / DD (Specify where) YYYY / MMM / DD				
REPORTING NOTIFICATION		Location:		
Name of Attending Physician or Nurse:				
Provider's Phone number:		Date Received (Public Health): YYYY / MMM / DD		
Type of Reporting Source: <input type="checkbox"/> Health Care Facility <input type="checkbox"/> Lab Report <input type="checkbox"/> Nurse Practitioner <input type="checkbox"/> Physician <input type="checkbox"/> Other _____				

C) DISEASE EVENT HISTORY

INVESTIGATION->DISEASE SUMMARY (UPDATE)->DISEASE EVENT HISTORY

Site / Presentation: <input type="checkbox"/> Cutaneous <input type="checkbox"/> Gastrointestinal <input type="checkbox"/> Inhalational <input type="checkbox"/> Injection site <input type="checkbox"/> Other
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Please complete all sections

Panorama Client ID: _____
Panorama Investigation ID: _____

D) SIGNS & SYMPTOMS

INVESTIGATION->SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Cellulitis		YYYY / MMM / DD	Meningitis		YYYY / MMM / DD
Chills		YYYY / MMM / DD	Pain - abdominal		YYYY / MMM / DD
Cough		YYYY / MMM / DD	Pain - chest		YYYY / MMM / DD
Cyanosis		YYYY / MMM / DD	Pain - cutaneous		YYYY / MMM / DD
Dyspnea - shortness of breath		YYYY / MMM / DD	Pharyngitis (sore throat)		YYYY / MMM / DD
Edema - around eschar		YYYY / MMM / DD	Pleural effusion		YYYY / MMM / DD
Edema - soft tissue		YYYY / MMM / DD	Pulmonary infiltrates		YYYY / MMM / DD
Eschar		YYYY / MMM / DD	Rash - papules		YYYY / MMM / DD
Fever		YYYY / MMM / DD	Rash - papules - pruritic		YYYY / MMM / DD
Gastrointestinal symptoms (nausea, vomiting, diarrhea, abdominal swelling)		YYYY / MMM / DD	Rash - vesicles		YYYY / MMM / DD
Infection - soft tissue		YYYY / MMM / DD	Respiratory distress		YYYY / MMM / DD
Lymphadenopathy - mediastinal		YYYY / MMM / DD	Sepsis		YYYY / MMM / DD
Malaise		YYYY / MMM / DD	Stridor		YYYY / MMM / DD
Necrotizing fasciitis		YYYY / MMM / DD			
Other Signs & Symptoms if applicable					

E) INCUBATION AND COMMUNICABILITY

INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case:	
Earliest Possible Exposure Date: YYYY / MMM / DD	Latest Possible Exposure Date: YYYY / MMM / DD
<i>Exposure Calculation details:</i>	

F) RISK FACTORS

INVESTIGATION-> SUBJECT->RISK FACTORS

DESCRIPTION	YES	N – No NA – not asked U - Unknown	DESCRIPTION	YES	N – No NA – not asked U - Unknown
Animal Exposure - Farms (specify)	YYYY / MMM / DD		Occupation - Veterinarian or related worker	YYYY / MMM / DD	
Animal Exposure - Petting zoos/zoos/special events/other (specify)	YYYY / MMM / DD		Substance Use - Injection drug use (including steroids)	YYYY / MMM / DD	
Animal Exposure - Infected animal (specify)	YYYY / MMM / DD		Travel - Outside of Canada (specify)	YYYY / MMM / DD	
Occupation - Farmer	YYYY / MMM / DD		Travel - Outside of Saskatchewan, but within Canada (specify)	YYYY / MMM / DD	
Occupation - Other (specify)	YYYY / MMM / DD		Travel - Within Saskatchewan (Specify)	YYYY / MMM / DD	

G) MEDICATIONS

INVESTIGATION-> MEDICATIONS->MEDICATIONS SUMMARY

Medication (<i>Panorama = Other Meds</i>): _____
Prescribed by: _____ Started on: YYYY / MMM / DD

H) INTERVENTIONS

INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Assessment: <input type="checkbox"/> Assessed for contacts (individuals exposed to the same source) YYYY / MM / DD Investigator name	Immunization: <input type="checkbox"/> Eligible Immunizations recommended YYYY / MM / DD Investigator name
Communication: <input type="checkbox"/> Letter (specify) YYYY/ MM /DD <input type="checkbox"/> Other communication (specify) YYYY/ MM /DD Investigator name	Other Investigation Findings <input type="checkbox"/> Investigator Notes YYYY/ MM /DD <input type="checkbox"/> See Document Management YYYY/ MM /DD

Notification Timeline for Potential Exposures to Notifiable Avian Influenza (NAI)¹:

The Ministry of Agriculture to Ministry of Health²: Within 1 business day

The Ministry of Environment to Ministry of Health²: Within 1 business day

Ministry of Health to Local Medical Health Officer: within 1 business day

Public Health may receive notification of potential exposures from members of the public or health care providers.

From Public Health to Ministry of Health:

Reporting symptomatic contacts (i.e suspect cases, Refer to Section 2-60 Influenza):

Within 24 hours

Public Health Follow-up Timeline: Initiate within 24-48 hours.

Public Health Purposes for Surveillance (adapted from BCCDC, 2015)

To:

- better understand the epizootology and epidemiology of avian influenza,
- prevent potential viral re-assortment,
- prevent transmission to humans,
- facilitate early diagnosis and treatment, and
- inform the development of prevention and control strategies.

¹ In Canada, highly pathogenic avian influenza and low pathogenicity H5 and H7 avian influenza viruses are considered to be Notifiable Avian Influenza, which is a [reportable disease](#) under the federal *Health of Animals Act*. Animal owners, veterinarians and laboratories are required to immediately report cases to the Canadian Food Inspection Agency (CFIA). See [Attachment – Avian Influenza Exposures](#).

² Via confidential fax or mailbox 306-787-9576 or cdc@health.gov.sk.ca

Epidemiology and Occurrence

Avian influenza (AI) occurs worldwide and different strains are more prevalent in certain areas of the world than others. The World Organization for Animal Health (OIE) requires ongoing surveillance and reporting of outbreaks. The CFIA conducts serological surveillance for highly pathogenic AI, as well as low pathogenicity H5 and H7, in commercial poultry for purposes of international trade. AI viruses do not normally infect humans, but sporadic infections have occurred, and the potential emergence of novel strains with the ability to spread easily from person to person is a public health concern.

The CFIA website³ provides a summary of Avian influenza cases and outbreaks in Canada:

- September 2007 – a single poultry farm in Saskatchewan was infected with high pathogenic avian flu (H7N3) and was depopulated to prevent spread of the disease.
- January 2009 – a low pathogenic avian flu was isolated in British Columbia (H5N2). All birds in the infected premise were humanely destroyed.
- November 2010 – a low pathogenic avian influenza (H5N2) was identified in Manitoba. All birds in the infected premise were humanely destroyed.
- December 2014 – a high pathogenic avian flu (H5N2) was identified in British Columbia.
- April 2015 – a highly pathogenic H5N2 AI was identified in a turkey farm in Ontario. Two additional commercial farms were found to be infected. All birds on the infected farms were depopulated and properly disposed of to prevent further spread of the virus.
- 2021 and 2022 – at the time of writing, investigations are ongoing into cases of highly pathogenic AI (H5N1) in farmed birds across Canada in most provinces.

Causative Agent

Avian influenza (AI) is an infection of birds with a wide variety of clinical presentations caused by influenza A viruses. Influenza viruses, including AI, are subtyped based on 16 H (hemagglutinin) and 9 N (neuraminidase) surface protein groups. AI viruses are classified into two broad categories, low pathogenic avian influenza (LPAI) and highly pathogenic avian influenza (HPAI), based upon specific diagnostic and/or sequence criteria and severity of the illness caused in poultry in a laboratory setting. AI should not be confused with seasonal human influenza generally caused by H1 and H3 virus subtypes.

³ <https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/avian-influenza/disease-incident/eng/1334851398063/1334851488454>

Symptoms

The severity of symptoms and clinical outcome varies by the virus causing infection. Whether a virus is characterized as highly pathogenic (HPAI) or low pathogenic (LPAI) in birds does not predict the effect it may have on people. For human infections with A(H7N7) and A(H9N2) viruses, disease is typically mild or subclinical. The case fatality rate for A(H5) and A(H7N9) subtype virus infections among humans is much higher than that of seasonal influenza infections.

Infections in humans mainly manifest with respiratory symptoms ranging from conjunctivitis (i.e. red eyes with discharge) to influenza-like illness (i.e. fever, sore throat, muscle aches) to severe respiratory illness (e.g., pneumonia, acute respiratory distress, viral pneumonia). Nausea, diarrhea, vomiting and neurological signs may occur.

In birds, LPAI illness is expressed as ruffled feathers, reduced egg production, or mild respiratory symptoms. HPAI involves multiple organs and tissues and can result in massive internal haemorrhaging and/or the following signs (BCCDC, 2015):

- a drop in egg production, many of which are soft-shelled or shell-less,
- diarrhea,
- haemorrhages on the hock,
- high and sudden mortality rate,
- quietness and extreme depression,
- swelling of the skin under the eyes,
- swollen and congested wattles and combs.
- Death can occur in 48 hours and the mortality rate can approach 100%

Incubation Period

The CDC reports that the estimated incubation period for human infection with AI viruses is generally 3 to 5 days but has been reported to be 7 to 10 days. For A(H5N1) virus infections in humans, current data indicate an incubation period averaging 2 to 5 days and ranging up to 17 days. For human infections with the A(H7N9) virus, incubation period ranges from 1 to 10 days, with an average of 5 days. For both viruses, the average incubation period is longer than that for seasonal influenza (2 days) (Heymann, 2015).

In birds, the incubation period ranges from 2 to 7 days.

Reservoir/Source

Avian influenza viruses can infect a great variety of birds, including wild birds, caged birds and domestic poultry species. Waterfowl are transient latent carriers of LPAI viruses that are harbored in the intestinal tract and passed into the environment through their feces. Stable reservoirs of LPAI viruses have been recognized in wild waterfowl (BCCDC, 2015).

Mode of Transmission

Human infections are primarily acquired through direct contact with infected birds or contaminated environments, including via:

- Direct transmission – viruses can be spread through direct contact with secretions or excretions from infected birds, including feces. There is no evidence that consumption of cooked eggs or poultry can transmit AI to humans.
- Indirect transmission – viruses can also be spread indirectly through contaminated items such as feed, water, equipment, clothing. Airborne spread may occur over limited distances.

In general, AI viruses are readily transmitted from farm-to-farm by the movement of live birds (domestic & wild), people, equipment and vehicular traffic. These viruses have not acquired the ability of sustained transmission among humans, and person-to-person transmission is rare.

Period of Communicability

Person-to-person transmission of AI viruses has been reported rarely (US CDC, 2022). Detailed public health investigations are required to determine whether person-to-person transmission has occurred.

Specimen Collection and Transport

WHO, through its Global Influenza Surveillance and Response System (GISRS), periodically updates technical guidance protocols for the detection of zoonotic influenza in humans using molecular e.g. RT-PCR and other methods. Refer to [Section 2-60 Influenza](#) for testing recommendations.

Animal specimens are submitted by the local veterinarian.

Table 1. Avian Influenza Case Definition for Birds

Confirmed	A bird with or without clinical illness with laboratory confirmation by PCR or isolation of the influenza type A virus and subtyping as H5 or H7
Probable	A bird with or without clinical illness with laboratory confirmation by PCR or isolation of the influenza type A virus

Public Health Investigation

I. Cases

Refer to [Section 2-60 Influenza](#) for investigation of novel influenza cases.

II. Contacts/Contact Investigation

Identify individuals who may have been exposed or are at risk of being exposed to AI (e.g. farm family, farm workers, visitors). Table 2 identifies levels of risk for individuals exposed.

Table 2. Categorizing contacts into their Risk Exposure Groups (Public Health Agency of Canada, 2006) https://www.phac-aspc.gc.ca/publicat/daio-enia/pdf/nat-ai-guide-2006_e.pdf

Level of Risk	Definition
High exposure risk groups	<ul style="list-style-type: none"> Individuals with unprotected and very close exposure to a flock or group of sick or dead animals infected with AI or to particular birds that have been directly implicated in human cases (e.g., farm family member or worker who handled sick animals) Personnel involved in handling sick animals or decontaminating affected environments (including animal disposal) as part of outbreak control efforts (e.g., cullers)⁴
Moderate exposure risk groups	<ul style="list-style-type: none"> Individuals who handle single or small groups of sick or dead animals infected with AI in an open air environment which is not densely populated by animals of the same species as the infected animal (e.g., single wild bird in a park)

⁴ CFIA occupational health and safety is responsible for follow up and monitoring personnel employed by the CFIA involved in culling and other outbreak control activities

	<ul style="list-style-type: none"> • Household/family contacts of a suspected or confirmed human AI patient (defined as living under the same roof as the index case for 24 hours or more within the period when the case is presumed to be contagious) • HCWs (i.e., those working in a setting where health care is being provided) who had no, or insufficient, PPE in place when 1) in close contact (i.e., within 1 meter) of a strongly suspected or confirmed human AI case, or 2) in direct contact with respiratory secretions or other potentially infectious specimens from the case • HCWs or laboratory personnel who might have unprotected contact (i.e., did not have or was wearing insufficient PPE) with specimens/secretions which may contain virus or with laboratory isolates
<p>Low exposure risk groups</p>	<ul style="list-style-type: none"> • Personnel involved in culling non-infected or likely non-infected animal populations as a control measure (e.g., those exclusively culling asymptomatic animals in a control area outside of the infected and restricted zones) • Individuals who handle (i.e., have direct contact with) asymptomatic animals that may be infected with AI based on species and possibly proximity to a geographic area where AI has recently been identified (e.g., bird banders) • HCWs who used appropriate PPE during contact with human AI cases (i.e., in the absence of significant human to human transmission) • HCWs not in close contact (i.e., distance greater than 1 metre) with suspected or confirmed human AI cases and having no direct or indirect contact with infectious material from that case(s) • Laboratory personnel working with the influenza virus using appropriate laboratory procedures and infection control precautions

The extent of investigation for individuals exposed to infected animals is dependent on the extent of illness and specific organism and will be directed by the MHO. See [Attachment – Sample Contact Management Form.](#)

In addition to reviewing the epidemiology of the outbreak, the following considerations will inform the risk assessment and management of human contacts:

- Degree of certainty the flock has been infected with avian influenza;
- Human health risk based on the subtype;
- Observation of human illness linked to the current outbreak and their severity of illness;
- Timing of implementation of control measures;
- Individual risk factors in the exposed individuals (e.g. immunocompromised);
- Level of confidence that public health recommendations are being followed; and
- Number of cases/contacts.

Public Health Interventions

Details on exposure assessment, management of contacts, and infection control, along with sample information letters can be found at: https://www.phac-aspc.gc.ca/publicat/daio-enia/pdf/nat-ai-guide-2006_e.pdf and <https://www.who.int/publications/i/item/who-guidance-on-public-health-measures-in-countries-experiencing-their-first-outbreaks-of-h5n1-avian-influenza>.

Communication

- Letters can be used to inform contacts of the exposure, symptom monitoring and when to seek medical attention (see [Attachment – Template Exposure Letter](#)).

Education

- All individuals exposed should be provided information about avian influenza as well as information on prevention and control measures.
- Provide advice on minimizing further exposure.
- Those involved in the care, culling or cleaning up of infected birds or their environments should wear appropriate personal protective equipment and follow the biosecurity measures outlined by the Ministry of Agriculture or CFIA.
- Individuals, particularly producers whose flocks have been impacted, may require assistance in determining where to access mental health supports.

Monitoring

- Individuals should be advised to self-monitor for the development of fever, respiratory symptoms, and/or conjunctivitis (eye infection) for 10 days after the last exposure to a known or suspected source of avian influenza virus or a contaminated environment, and report any symptom development immediately to public health (BCCDC, 2015);
 - Signs and symptoms may include fever (temperature of 100°F [37.8°C] or greater) or feeling feverish, cough, sore throat, runny or stuffy nose, muscle or body aches, headaches, fatigue, eye redness (or conjunctivitis), shortness of breath or difficulty breathing. Fever may not always be present. Less common signs and symptoms are diarrhea, nausea, vomiting, or seizures (US CDC, March 2022).
- Anyone that develops symptoms following exposure should be considered a suspect Novel Influenza case. See Testing below.
- CFIA occupational health and safety is responsible for monitoring personnel employed by the CFIA involved in culling and other outbreak control activities. Notification of illness to local MHO shall occur when illness is identified.

Testing

- Consult with MHO for recommendations.
- Individuals that develop signs and symptoms should be tested for influenza, isolated and managed as a suspect novel influenza case according to infection prevention and control measures. Refer to the [Section 2-60 – Influenza \(Attachment - Novel Influenza\)](#).

Immunization

- Review immunization history for contacts.
- The current human influenza vaccines do not protect against AI; however, the seasonal influenza vaccine can potentially reduce the possibility of dual infection with avian and human influenza viruses. During periods of human influenza activity (i.e., “influenza season”), contacts who have not received the most recent seasonal influenza vaccine should be offered vaccine.
- Promote seasonal influenza vaccine for individuals involved in poultry industry or who may come in contact with migratory birds.

Prophylaxis

- The current objective for antiviral use is to minimize the direct risk and impact of zoonotic infection. In conjunction with other measures, antiviral prophylaxis may also reduce the risk of the emergence of a virus with pandemic potential. (PHAC, 2006 https://www.phac-aspc.gc.ca/publicat/daio-enia/pdf/nat-ai-guide-2006_e.pdf). Refer to **Table I-3** for the Antiviral Prophylaxis Risk Assessment in conjunction with **Table I-2**. Exposure Risk Categorization.
- Prophylaxis may be recommended based on the human health risk assessment at the direction of the Ministry based on technical guidance provided by PHAC.

Table I-3. Antiviral prophylaxis Risk Assessment (Public Health Agency of Canada, 2006)

		Exposure Risk		
		Low Risk Groups	Moderate risk groups	High risk groups
Human illness risk⁵	Subtype has previously been identified and is not known to have caused human illness	No prophylaxis	No prophylaxis	No prophylaxis
	Subtype is known to cause predominantly mild human illness	No prophylaxis	Consider prophylaxis	Prophylaxis
	Subtype is known to cause predominantly severe human illness	No prophylaxis	Prophylaxis	Prophylaxis

Antivirals for Prophylaxis

If post-exposure antiviral chemoprophylaxis is initiated:

- It should begin as soon as possible (within 48 hours) after the first exposure to the confirmed or probable case;
- The dosing and frequency aligns with the *treatment dosing* for the neuraminidase inhibitors oseltamivir or zanamivir (i.e. **one dose twice daily**) is recommended in these instances instead of the typical antiviral chemoprophylaxis regimen (once daily).

⁵ If there are no data available on the human illness risk for the strain/subtype for the virus identified, antiviral prophylaxis is not recommended unless implementation of an early antiviral treatment cannot be ensured (e.g. if the worker may not be accessible or able to access medical services in the 10 days following their last exposure). The need for antiviral prophylaxis could be reassessed if culling was indicated.

-
-
- The course of Antiviral use should be continued for 5 or 10 days (5 days for a time-limited exposure and 10 days for ongoing exposures).
 - Refer to AMMI guidelines⁶ or specific dosage recommendations by age group.

More information on CDC guidance for Follow-up of Close Contacts of Persons Infected with Novel Influenza A Viruses and Use of Antiviral Medications for Chemoprophylaxis.

Antivirals for early treatment

Refer to [Section 2-60 – Influenza](#) for recommendations and considerations for antiviral treatment.

III. Environment

Personal Protective Measures

It is important for individuals to take appropriate personal protective measures and to use appropriate protective equipment when handling unknown animals or animals that are seemingly unwell. Standards exist for veterinarians and other occupational groups to prevent exposure to zoonotic illnesses. Refer to the Western College of Veterinary Medicine (WCVI) infection control manual for details.

Workplace and Animal Control Measures

The Ministries of Labour Relations and Workplace Safety and Agriculture as well as the CFIA regulate and advise on workplace and animal control measures:

- Strict biosecurity measures on poultry farms including keeping wild birds away, sanitation of poultry houses and equipment, and proper disposal of dead birds and manure; routine surveillance and outbreak management are the key measures in prevention of AI spread among poultry.
- The CFIA is responsible for the administration and enforcement of the federal Health of Animals Act and Regulations. HPAI subtypes H5 and H7 regardless of pathogenicity are immediately notifiable to the CFIA. CFIA will conduct disease control activities which may include depopulation of infected birds and other control measures as required.

⁶ <https://jammi.utpjournals.press/doi/full/10.3138/jammi.2019.02.08>

- The province, including the Ministry of Agriculture (MoA), supports the federal government in response to AI. The MoA support can include diagnosing, monitoring and assisting in controlling and preventing the disease in the province. It provides diagnostic testing of animal samples on a routine basis and coordinates with CFIA for the confirmation of AI positive samples.
- Occupational Health and Safety for CFIA is responsible for monitoring human health among exposed workers. If human illness is reported, the Medical Health Officer shall be notified.

IV. Outbreak Measures

The CFIA is the lead authority for monitoring, control and eradication of terrestrial diseases in Canada, including AI. The provincial Ministry of Agriculture provides support to the CFIA for a coordinated animal disease emergency response to an outbreak, including notifying Saskatchewan Public Safety Agency (SPSA) and collaborating with CFIA to jointly lead the provincial response.

In the event of an animal disease outbreak, Ministry of Health will:

- Determine the public health risk and impact, and advise CFIA, SPSA and MoA accordingly;
- Collaborate with PHAC, the CFIA and local public health units to coordinate case and contact management of specific human cases;
- Where applicable, assess and advise on the public health risk associated with destruction, disposal and disinfection activities;
- Monitor human health impacts through ongoing surveillance activities (e.g., laboratory testing of suspect cases, syndromic respiratory surveillance systems, etc.)
- Provide guidance for local public health units and other health partners on response strategies, such as recommendations on occupational health and safety and infection prevention and control measures for health workers.

Refer to TADEs plan for details.

V. Pandemic Measures

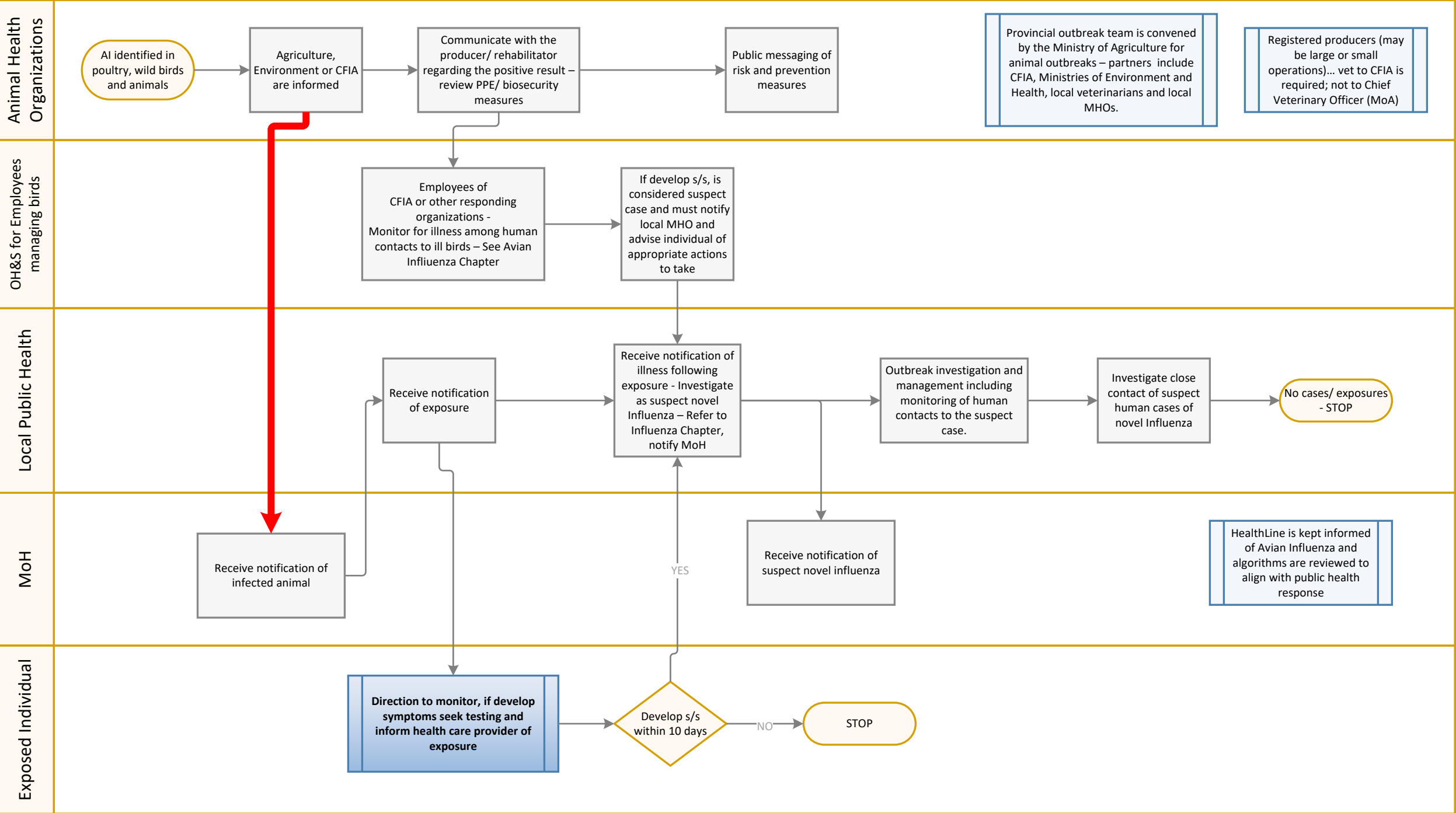
See local, provincial, national pandemic plans

Revisions

Date	Change
May 2022	New

References

- BCCDC (2015). Communicable Disease Control Reportable Zoonoses Guideline. Retrieved April 2022 from <http://www.bccdc.ca/Documents/CompleteReportableZoonosesGuidelineFinalVersions%20August%202019.pdf>
- Li, Y. T., Linster, M., Mendenhall, I. H., Su, Y., & Smith, G. (2019). Avian influenza viruses in humans: lessons from past outbreaks. *British medical bulletin*, 132(1), 81–95. <https://doi.org/10.1093/bmb/ldz036>
- Public Health Agency of Canada (2006). Human Health Issues related to Avian Influenza in Canada. Retrieved from http://www.phac-aspc.gc.ca/publicat/daio-enia/pdf/nat-ai-guide-2006_e.pdf
- US Center for Disease Control and Prevention (March 24, 2022). Interim Guidance on Influenza Antiviral Chemoprophylaxis of Persons Exposed to Birds with Avian Influenza A Viruses Associated with Severe Human Disease or with the Potential to Cause Severe Human Disease. Retrieved April 6, 2022 from <https://www.cdc.gov/flu/avianflu/guidance-exposed-persons.htm>
- US Center for Disease Control and Prevention (2022). Past Examples of Possible Limited, Non-Sustained Person-to-Person Spread of Bird Flu. Retrieved May 2022 from <https://www.cdc.gov/flu/avianflu/h5n1-human-infections.htm>



Non-STBBI and Non-VPD Contact Line List/Worksheet

Contact Line List/Worksheet

Investigation ID# _____ Index Client ID# _____

Organism: _____

Communicable Period dates: from _____ to _____

Page: ____ of ____

Prophylaxis criteria: _____

Uploaded to Panorama Index case investigation by _____ on _____.

Name of Individual or Group (sport team, school, etc)	Demographics	Contact Type & dates	History	Exclusion	Symptoms / Info Provided	Treatment/ Proph/ Testing	Comments	PHN	Contact Inv ID# (optional):	Referred to org:
Occupation: Guardian/Coach: # on team/in group _____	Address Phone email Age DOB HSN	<input type="checkbox"/> Household <input type="checkbox"/> School/daycare <i>list:</i> <input type="checkbox"/> Other: Date of last contact:	<input type="checkbox"/> Immunocompromised Meds: <input type="checkbox"/> Medical disorder(s) <input type="checkbox"/> Allergies:	<input type="checkbox"/> Work <input type="checkbox"/> School <input type="checkbox"/> Daycare <input type="checkbox"/> Preschool	<input type="checkbox"/> Symptoms (specify): <input type="checkbox"/> None <input type="checkbox"/> Education/Counselling Date:	<input type="checkbox"/> Treatment/Prophylaxis Advised specify: <input type="checkbox"/> Not Advised <input type="checkbox"/> Testing Advised <input type="checkbox"/> Req given	MHO Consulted:			
Occupation: Guardian/Coach: # on team/in group _____	Address Phone email Age DOB HSN	<input type="checkbox"/> Household <input type="checkbox"/> School/daycare <i>list:</i> <input type="checkbox"/> Other: Date of last contact:	<input type="checkbox"/> Immunocompromised Meds: <input type="checkbox"/> Medical disorder(s) <input type="checkbox"/> Allergies:	<input type="checkbox"/> Work <input type="checkbox"/> School <input type="checkbox"/> Daycare <input type="checkbox"/> Preschool	<input type="checkbox"/> Symptoms (specify): <input type="checkbox"/> None <input type="checkbox"/> Education/Counselling Date:	<input type="checkbox"/> Treatment/Prophylaxis Advised specify: <input type="checkbox"/> Not Advised <input type="checkbox"/> Testing Advised <input type="checkbox"/> Req given	MHO Consulted:			
Occupation: Guardian/Coach: # on team/in group _____	Address Phone email Age DOB HSN	<input type="checkbox"/> Household <input type="checkbox"/> School/daycare <i>list:</i> <input type="checkbox"/> Other: Date of last contact:	<input type="checkbox"/> Immunocompromised Meds: <input type="checkbox"/> Medical disorder(s) <input type="checkbox"/> Allergies:	<input type="checkbox"/> Work <input type="checkbox"/> School <input type="checkbox"/> Daycare <input type="checkbox"/> Preschool	<input type="checkbox"/> Symptoms (specify): <input type="checkbox"/> None <input type="checkbox"/> Education/Counselling Date:	<input type="checkbox"/> Treatment/Prophylaxis Advised specify: <input type="checkbox"/> Not Advised <input type="checkbox"/> Testing Advised <input type="checkbox"/> Req given	MHO Consulted:			
Occupation: Guardian/Coach: # on team/in group _____	Address Phone email Age DOB HSN	<input type="checkbox"/> Household <input type="checkbox"/> School/daycare <i>list:</i> <input type="checkbox"/> Other: Date of last contact:	<input type="checkbox"/> Immunocompromised Meds: <input type="checkbox"/> Medical disorder(s) <input type="checkbox"/> Allergies:	<input type="checkbox"/> Work <input type="checkbox"/> School <input type="checkbox"/> Daycare <input type="checkbox"/> Preschool	<input type="checkbox"/> Symptoms (specify): <input type="checkbox"/> None <input type="checkbox"/> Education/Counselling Date:	<input type="checkbox"/> Treatment/Prophylaxis Advised specify: <input type="checkbox"/> Not Advised <input type="checkbox"/> Testing Advised <input type="checkbox"/> Req given	MHO Consulted:			

Please see the following pages for the Letter Template Notification of an Exposure to Avian Influenza.

<DATE>

<NAME>

<ADDRESS>

<CITY SK POSTAL CODE>

Re: Avian Influenza – Monitoring Following an Exposure

Dear <NAME >

You have received this letter because you were recently exposed to avian influenza virus on <DATE>. Influenza viruses that infect birds are called avian influenza, or “bird flu” viruses. These viruses have the potential to cause human illness in people who have been exposed to infected birds such as having close contact with infected live or dead poultry, or contaminated environments. Avian influenza viruses may cause illness in humans ranging from mild (e.g., eye infections, cough, sore throat) to severe (e.g., pneumonia, shortness of breath, difficulty breathing).

Because human infections are possible, all people with **direct or close exposure to infected well-appearing, sick, or dead birds, infected flocks, contaminated surfaces or other infected animals** should be monitored for illness for 10 days after their last exposure.

Please self-monitor for the following signs of illness **for 10 days** after your last exposure:

- Fever (Temperature of 37.8°C or greater) or feeling feverish/chills
- Respiratory symptoms (cough, sore throat, difficulty breathing/shortness of breath, etc)
- Eye symptoms (redness, irritation, tearing or discharge)
- Runny or stuffy nose
- Other flu-like symptoms (muscle or body aches, headaches, fatigue, etc)
- Diarrhea

If symptoms develop:

- Notify the local public health unit immediately <PUBLIC HEALTH PHONE NUMBER>.
- They will advise you on how to seek immediate testing. Inform your health care provider of your exposure to avian influenza (take this letter with you to see your physician).
- Treatment with an antiviral is most effective if given within 48 hours of onset of symptoms so see your physician right away.
- Except for visiting your physician, stay home and minimize contact with others. You should continue to minimize contact with others until you have been 24 hours without a fever.

Thank you for your cooperation during this period. We appreciate your assistance in preventing the possible spread of infection. Please see the attached fact sheet for more information and feel free to call <PUBLIC HEALTH PHONE NUMBER> as needed.

As this may be a stressful time, please reach out to further supports as needed such as:
<https://www.wellnesstogether.ca/en-CA?lang=en-ca> or
<http://www.farmstressline.ca/resources> or call 811 for other information on accessing mental health supports.

Sincerely,

<NAME OF PUBLIC HEALTH DESIGNATE>

<TITLE>

cc: Medical Health Officer

Attachment: Avian Influenza Fact Sheet

Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.

From Public Health to Saskatchewan Health: Within 72 hours.

Public Health Follow-up Timeline: Initiate within 24-48 hours.

Public Health Purpose for Notification of Hantavirus Infections (adapted from Public Health Ontario, 2016)

- To track trends of the epidemiology of Hantavirus infections in Saskatchewan including risk factors and geographic distribution;
- To monitor disease burden and outcomes of hantavirus infections in Saskatchewan;
- To inform the public, occupational and health care provider communities about this disease and how to prevent it; and
- To identify locations where increased transmission of Hantavirus may be occurring in order to inform other interventions.

Surveillance Case Definition¹ – Hantavirus Pulmonary Syndrome (HPS)

<p>Confirmed Case (Public Health Agency of Canada, 2008)</p>	<p>Clinical illness¹ with laboratory confirmation of infection:</p> <ul style="list-style-type: none"> • detection of IgM antibodies to hantavirus OR • detection of a significant (e.g., fourfold or greater) increase in hantavirus-specific IgG OR • detection of hantavirus ribonucleic acid (RNA) in an appropriate clinical specimen OR • detection of hantavirus antigen by immunohistochemistry.
<p>Probable Case (Saskatchewan Ministry of Health, 2013)</p>	<p>Clinical illness¹ with a history of exposure compatible with hantavirus transmission and lab confirmation is pending.</p>

¹ Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data and support public health investigation and management. The definition is not intended to be used for clinical or laboratory diagnosis or management of patients.

¹ Clinical illness is typically characterized by:

- a febrile illness (temperature > 38.3°C (101°F) oral) requiring supplemental oxygen
AND
- bilateral diffuse infiltrates (may resemble acute respiratory distress syndrome[ARDS])
AND
- develops within 72 hours of hospitalization in a previously healthy person.

OR

An unexplained illness resulting in death with an autopsy examination demonstrating noncardiogenic pulmonary edema without an identifiable specific cause of death.

Epidemiology and Occurrence

Under Development

Additional Background Information

Causative Agent

Any of several hantavirus strains.

Hantaviruses are RNA viruses of the *Bunyaviridae* family. The most common cause of hantavirus pulmonary syndrome (HPS) is the Sin Nombre species. There are multiple other strains of hantavirus that cause different clinical illnesses (American Academy of Pediatrics, 2015).

Symptoms

The prodromal illness of HPS is 3-7 days. Signs and symptoms during this time period include fever; chills; headache; myalgia of the shoulders, lower back and thighs; nausea; vomiting; diarrhea; dizziness and sometimes coughing. Following the onset of cough and dyspnea is the onset of respiratory tract signs and symptoms caused by pulmonary edema and severe hypoxemia, after which the disease progresses over a period of a few hours (American Academy of Pediatrics, 2012).

Complications

Rapid progression to severe respiratory failure and shock with fatality rates of approximately 35-50% (Heymann, 2015).

Reservoir/Source

The main reservoir for the Sin Nombre strain of hantavirus in North America is the deer mouse, but can also be isolated in pack rats, chipmunks and other rodents. Rodent species of the subfamily *Sigmodontinae* are mainly associated with other hantavirus strains (Heymann, 2008).

Mode of Transmission

Aerosol transmission from rodent excreta, especially inside closed, poorly ventilated homes, vehicles and out buildings is the most likely mode of transmission (Heymann, 2015). Other potential routes include ingestion, contact of infectious materials with mucous membranes, broken skin and animal bites. Person-to-person transmission is extremely rare but has occurred in Argentina (Public Health Agency of Canada, 2010).

Incubation Period

Approximately 2 weeks, with a range of a few days to 6 weeks (Heymann, 2015).

Period of Communicability

Person-to-person transmission has not been described in North America. Outside of a host, the virus is inactive within a week outdoors and after a few hours when exposed to direct sunlight (Canadian Centre for Occupational Health and Safety, 2008).

Specimen Collection and Transport

Collect blood in serum separator vacutainer (SST). Centrifuge. If shipping will be delayed, ship 2 ml serum in a screw cap tube, with cold packs or on dry ice. Follow Roy Romanow Provincial Laboratory (RRPL) specimen collection guidelines available in the RRPL Compendium of Tests at <https://rrpl-testviewer.ehealthsask.ca/>.

Risk Groups

- farmers;
- grain handlers;
- hikers;
- campers;
- people in occupations with unpredictable or incidental contact with rodents or their nesting materials are at risk (e.g., telephone installers, oil workers, plumbers, electricians, pest control officers and certain construction, maintenance and wildlife workers [Saskatchewan Ministry of Labour and Workplace Safety, 2011]).

Risk Activities

Handling or trapping rodents, cleaning/entering rarely used and closed rodent-infested structures, cleaning animal shelter or food storage areas, living in a place with an increased density of mice in or around the home, or sleeping in a structure inhabited by rodents (American Academy of Pediatrics, 2015).

Public Health Investigation

I. Case

History

Classify case in consultation with the attending physician and the case definitions. Refer to [Attachment – Hantavirus Data Collection Worksheet](#) to assist in the investigation.

- Clinical manifestation and onset dates can help identify exposure timelines.
- Exposure to mice, their saliva, and their excrement is key in the *acquisition* of hantavirus infections. In the past 6 weeks identify if the case has been involved in:
 - cleaning/entering rarely used and closed rodent-infested structures;
 - cleaning animal shelter or food storage areas;
 - handling or trapping rodents;
 - living in a place with an increased density of mice in or around the home;
 - sleeping in structure inhabited by rodents;
 - exposure through camping, hiking, etc.;
 - other.
- Identify the area where the exposure has occurred. Was there indoor exposure in closed, poorly ventilated:
 - barns;
 - outbuildings;
 - vehicles;
 - homes where visible rodent infestation is apparent?

If yes, identify geographic area where exposure occurred (e.g. city, town or RM).

Outcome

Did the patient require admission to an intensive care unit?

What was the outcome of the infection?

- recovered;
- fatal.

Treatment/Supportive Therapy

The primary care provider is responsible for the treatment and clinical management of cases. The following serves as a reference for the public health investigator: Intensive respiratory support is often required. Suspected patients should be immediately transported to a tertiary care facility so supportive management can be initiated within the critical first 24-48 hours of illness (American Academy of Pediatrics, 2015).

Public Health Interventions

Assessment

- Assess for [contacts](#) paying particular attention individuals that have had exposure to the same source.

Communication

- Letters can be used to inform contacts of the exposure, symptom monitoring and when to seek medical attention (see Sample letter).

Education

- All cases should be provided disease information as well as information on prevention and control measures.

Environmental Health

- When acquisition is linked to a public facility, inspection may be warranted.

Referrals

When a case of hantavirus is associated with an occupational exposure, Section 9 of *The Disease Control Regulations*² stipulates that the medical health officer (MHO) shall notify the director (as defined in *The Occupational Health and Safety Act, 1993*³). In order to fulfill this obligation, they must complete and send the form in [Appendix L – Notification of Occupational Health and Safety](#) within 14 days.

II. Contact

Contact Definition

Individuals who have been exposed to the same settings where the case likely acquired infection.

² <http://www.qp.gov.sk.ca/documents/english/Regulations/Regulations/p37-1r11.pdf>.

³ <http://www.qp.gov.sk.ca/documents/English/Statutes/Statutes/P37-1.pdf>.

Public Health Interventions

Assessment

- Assess for symptoms.

Education

- Hantavirus information sheet is a resource to guide content of education.
- Contacts should be informed that if they develop a fever or respiratory illness within 6 weeks of the last potential exposure they should immediately seek medical attention and inform the attending physician of the risk of having acquired hantavirus infection.

Environmental Health

- If investigation indicates potential for other persons to be exposed, environmental health assessments may be required.

Referral

- Symptomatic contacts should be referred to their primary care provider for assessment.

Testing

- Symptomatic contacts should be tested based on clinical assessment of the practitioner.

III. Environment

Safety measures must be implemented when cleaning areas that have had rodent infestations. Refer to *Hantavirus Disease: Guidelines for Protecting Workers and the Public*⁴ *A Hantavirus Exposure Control Program for Employers and Workers* (Worksafe BC, 2006)⁴ for proper cleaning procedures and use of personal protective equipment.

In situations where the public may be experiencing ongoing exposures, additional measures may need to be taken in consultation with the MHO.

Epidemic Measures

Public education regarding rodent avoidance and control.

⁴ <https://www.worksafebc.com/en/resources/health-safety/books-guides/a-hantavirus-exposure-control-program-for-employers-and-workers?lang=en&origin=s&returnurl=https%3A%2F%2Fwww.worksafebc.com%2Fen%2Fsearch%23q%3Dhantavirus%26sort%3Drelevancy%26f%3Alanguage-facet%3D%5BEnglish%5D&highlight=hantavirus>

Prevention Measures

Refer to the [Vector Borne and Zoonotic Diseases – Introduction and General Considerations](#) section of the manual that highlights topics for client education that should be considered and provides further information on high-risk groups and activities.

Prevention measures are where most emphasis should be placed; risk reduction through environmental hygiene practices that discourage rodents from colonizing the home and work environment and that minimize aerosolization and contact with virus in saliva and excreta (America Academy of Pediatrics, 2015).

Immunization

Currently, there is no vaccine available to prevent hantavirus infections.

Education

Education should be provided regarding rodent avoidance and control in homes and outbuildings. People should be informed about personal protective measures that should be taken when handling rodents and rodent excreta.

In addition to general messaging, education should be targeted to [Risk Groups](#) on prevention measures as follows:

- control rodents;
- clean buildings and worksites;
- minimize exposure to sources of infection.

Hantavirus Disease: Guidelines for Protecting Workers and the Public
A Hantavirus Exposure Control Program for Employers and Workers (Worksafe BC, 2006).

Additional information can also be found at
<http://www.saskatchewan.ca/residents/health/diseases-and-conditions/hantavirus>.

Revisions

Date	Change
August 2018	<ul style="list-style-type: none">• Incorporated Public Health Purpose of Notification.• Reorganized chapter and applied new format.• Included a placeholder for Epidemiology and Occurrence section.• Aligned with Panorama configuration.• References reaffirmed or updated as necessary.• Removed link to web content that was no longer available on a Saskatchewan website and replaced with a link to BC content.

References

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Hantavirus infection Data Collection Worksheet



Please complete all sections.

Panorama QA complete: Yes No
 Initials: _____

Panorama Client ID: _____
 Panorama Investigation ID: _____

A) CLIENT INFORMATION

LHN -> SUBJECT -> CLIENT DETAILS -> PERSONAL INFORMATION

Last Name:	First Name: and Middle Name:	Alternate Name (Goes by):
DOB: YYYY / MM / DD Age: _____	Health Card Province: _____ Health Card Number (PHN): _____	Preferred Communication Method: (specify - i.e. home phone, text): Email Address: <input type="checkbox"/> Work <input type="checkbox"/> Personal
Phone #: <input type="checkbox"/> Primary Home: <input type="checkbox"/> Mobile contact: <input type="checkbox"/> Workplace:		
Place of Employment/School:	Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Other <input type="checkbox"/> Unknown	
Alternate Contact: _____ Relationship: _____ Alt. Contact phone: _____	Address Type: <input type="checkbox"/> No fixed <input type="checkbox"/> Postal Address <input type="checkbox"/> Primary Home <input type="checkbox"/> Temporary <input type="checkbox"/> Legal Land Description Mailing (Postal address): Street Address or FN Community (Primary Home): Address at time of infection if not the same:	

B) INVESTIGATION INFORMATION

LHN-> SUBJECT SUMMARY-> ZONOTIC AND VECTORBORNE ENCOUNTER GROUP->CREATE INVESTIGATION

Disease Summary Classification: CASE:	Date	Classification: CASE:	Date	LAB TEST INFORMATION:																
<input type="checkbox"/> Confirmed	YYYY / MMM / DD	<input type="checkbox"/> Does Not Meet Case	YYYY / MMM / DD	Date specimen collected: YYYY / MMM / DD																
<input type="checkbox"/> Probable	YYYY / MMM / DD	<input type="checkbox"/> Person Under Investigation	YYYY / MMM / DD	Specimen Type																
<input type="checkbox"/> Suspect	YYYY / MMM / DD																			
Disposition: FOLLOW UP: <table style="width: 100%; border: none;"> <tr> <td><input type="checkbox"/> In progress</td> <td>YYYY / MMM / DD</td> <td><input type="checkbox"/> Complete</td> <td>YYYY / MMM / DD</td> </tr> <tr> <td><input type="checkbox"/> Incomplete - Declined</td> <td>YYYY / MMM / DD</td> <td><input type="checkbox"/> Not required</td> <td>YYYY / MMM / DD</td> </tr> <tr> <td><input type="checkbox"/> Incomplete – Lost contact</td> <td>YYYY / MMM / DD</td> <td><input type="checkbox"/> Referred – Out of province</td> <td>YYYY / MMM / DD</td> </tr> <tr> <td><input type="checkbox"/> Incomplete – Unable to locate</td> <td>YYYY / MMM / DD</td> <td>(Specify where)</td> <td>YYYY / MMM / DD</td> </tr> </table>					<input type="checkbox"/> In progress	YYYY / MMM / DD	<input type="checkbox"/> Complete	YYYY / MMM / DD	<input type="checkbox"/> Incomplete - Declined	YYYY / MMM / DD	<input type="checkbox"/> Not required	YYYY / MMM / DD	<input type="checkbox"/> Incomplete – Lost contact	YYYY / MMM / DD	<input type="checkbox"/> Referred – Out of province	YYYY / MMM / DD	<input type="checkbox"/> Incomplete – Unable to locate	YYYY / MMM / DD	(Specify where)	YYYY / MMM / DD
<input type="checkbox"/> In progress	YYYY / MMM / DD	<input type="checkbox"/> Complete	YYYY / MMM / DD																	
<input type="checkbox"/> Incomplete - Declined	YYYY / MMM / DD	<input type="checkbox"/> Not required	YYYY / MMM / DD																	
<input type="checkbox"/> Incomplete – Lost contact	YYYY / MMM / DD	<input type="checkbox"/> Referred – Out of province	YYYY / MMM / DD																	
<input type="checkbox"/> Incomplete – Unable to locate	YYYY / MMM / DD	(Specify where)	YYYY / MMM / DD																	
REPORTING NOTIFICATION		Location:																		
Name of Attending Physician or Nurse:																				
Provider's Phone number:		Date Received (Public Health): YYYY / MMM / DD																		
Type of Reporting Source: <input type="checkbox"/> Health Care Facility <input type="checkbox"/> Lab Report <input type="checkbox"/> Nurse Practitioner <input type="checkbox"/> Physician <input type="checkbox"/> Other _____																				

C) DISEASE EVENT HISTORY

LHN-> INVESTIGATION->DISEASE SUMMARY (UPDATE)->DISEASE EVENT HISTORY

Site / Presentation:	<input type="checkbox"/> Hantavirus pulmonary syndrome	<input type="checkbox"/> Hemorrhagic fever with renal syndrome	<input type="checkbox"/> Other
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Hantavirus infection Data Collection Worksheet

Please complete all sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

D) SIGNS & SYMPTOMS *(Bold text = part of case definition)*

LHN-> INVESTIGATION-> SIGNS & SYMPTOMS

Description	Yes – Date of onset	Description	Yes - Date of onset
Acute respiratory distress syndrome (ARDS)	YYYY / MMM / DD	Lab - platelet count low	YYYY / MMM / DD
Chills	YYYY / MMM / DD	Myalgia (muscle pain)	YYYY / MMM / DD
Cough	YYYY / MMM / DD	Nausea	YYYY / MMM / DD
Diarrhea	YYYY / MMM / DD	Oliguria or anuria (decreased urine output)	YYYY / MMM / DD
Dizziness	YYYY / MMM / DD	Pain - abdominal	YYYY / MMM / DD
Dyspnea (shortness of breath)	YYYY / MMM / DD	Pain - back	YYYY / MMM / DD
Fever	YYYY / MMM / DD	Pulmonary edema - noncardiogenic	YYYY / MMM / DD
Headache	YYYY / MMM / DD	Pulmonary edema - unexplained noncardiogenic (autopsy)	YYYY / MMM / DD
Hemorrhagic manifestations	YYYY / MMM / DD	Pulmonary infiltrates - diffuse - bilateral	YYYY / MMM / DD
Hypotension	YYYY / MMM / DD	Rash - petechial	YYYY / MMM / DD
Hypoxemia - severe	YYYY / MMM / DD	Respiratory compromise - oxygen therapy required	YYYY / MMM / DD
Lab - hematocrit - elevated		Respiratory failure – requiring mechanical ventilation	
Lab - hypoalbuminemia	YYYY / MMM / DD	Vomiting	YYYY / MMM / DD
Other S/S			

E) INCUBATION

LHN-> INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case (period for acquisition):	
Earliest Possible Exposure Date: YYYY / MMM / DD	Latest Possible Exposure Date: YYYY / MMM / DD
<i>Exposure Calculation details:</i>	

F) RISK FACTORS *(in the 8 weeks prior to onset of illness)*

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	YES	N – No NA – not asked U - Unknown	DESCRIPTION	YES	N – No NA – not asked U - Unknown
Animal Exposure Rodents/rodent excreta	YYYY /MM/DD		Occupation - Other (specify)		
Behaviour – Camping/hiking	YYYY /MM/DD		Travel – Outside of Canada (specify)	YYYY /MM/DD	
Behaviour – Lack of personal protective measures			Travel – Outside of Saskatchewan, but within Canada (specify)	YYYY /MM/DD	
Environmental Exposure – contaminated building	AE		Travel – Within Saskatchewan (Specify)	YYYY /MM/DD	
Occupation – Farmer					

G) COMPLICATIONS

LHN-> INVESTIGATION->COMPLICATIONS

Description	Yes Date of onset	Description	Yes Date of onset
Hemorrhage - severe	YYYY / MMM / DD	Shock	YYYY / MMM / DD
Other complications			

Hantavirus infection Data Collection Worksheet

Please complete all sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

H) TREATMENT

INVESTIGATION-> MEDICATIONS->MEDICATIONS SUMMARY

Medication (<i>Panorama = Other Meds</i>): _____
Prescribed by: _____ Started on: YYYY / MMM / DD

I) INTERVENTIONS

INVESTIGATION->TREATMENT & INTERVENTIONS->INTERVENTION SUMMARY

Intervention Type and Sub Type:				
Assessment: <input type="checkbox"/> Assessed for contacts Investigator name	YYYY / MM / DD	Environmental health: <input type="checkbox"/> Inspection Investigator name	YYYY / MM / DD	
Communication: <input type="checkbox"/> Other communication (see Investigator Notes) Investigator name	YYYY / MM / DD	<input type="checkbox"/> Letter (See Document Management) Investigator name	Referral: <input type="checkbox"/> Saskatchewan Occupational Health and Safety Investigator name	
<input type="checkbox"/> Disease-Info/Prev-Control Investigator name	YYYY / MM / DD	<input type="checkbox"/> Disease-Info/Prev-Cont/Assess'd for Contacts Investigator name	Other Investigation Findings: <input type="checkbox"/> Investigator Notes <input type="checkbox"/> See Document Management	
<input type="checkbox"/> Prevention/Control measures Investigator name	YYYY / MM / DD	<input type="checkbox"/> Disease information provided Investigator name	YYYY / MM / DD	
Date	Intervention subtype	Comments	Next follow-up Date	Initials
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	
YYYY / MM / DD			YYYY / MM / DD	

J) OUTCOMES (optional except for severe influenza)

LHN-> INVESTIGATION->OUTCOMES

<input type="checkbox"/> Not yet recovered/recovering	YYYY / MM / DD	<input type="checkbox"/> ICU/intensive medical care	YYYY / MM / DD	<input type="checkbox"/> Hospitalization	YYYY / MM / DD
<input type="checkbox"/> Recovered	YYYY / MM / DD	<input type="checkbox"/> Intubation /ventilation	YYYY / MM / DD	<input type="checkbox"/> Unknown	YYYY / MM / DD
<input type="checkbox"/> Fatal	YYYY / MM / DD	<input type="checkbox"/> Other _____	YYYY / MM / DD		
Cause of Death: (if Fatal was selected) _____					

K) EXPOSURES

Acquisition Event

LHN-> INVESTIGATION-> EXPOSURE SUMMARY-> ACQUISITION QUICK ENTRY

Acquisition Event ID: _____

Exposure Name: _____
Acquisition Start YYYY / MM / DD to Acquisition End: YYYY / MM / DD
Location Name: _____
Setting Type
<input type="checkbox"/> Travel <input type="checkbox"/> Most likely source

Initial Report completed by:	Date initial report completed: YYYY / MMM / DD
------------------------------	---

Notification Timeline:

From Lab/Practitioner to Public Health: Within 48 hours.

From Public Health to Ministry of Health: Within 2 weeks.

Public Health Follow-up Timeline: Within 72 hours.

Public Health Purpose for Notification of Lyme Disease (adapted from Public Health Ontario, 2016)

- To track trends of the epidemiology of Lyme disease in Saskatchewan including risk factors and geographic distribution;
- To inform the public and health care provider community about this emerging disease and how to prevent it;
- To identify locations where increased transmission of Lyme disease may be occurring in order to inform other interventions.

Surveillance Case Definition¹ (adapted from US Centers for Disease Control and Prevention, 2017)

Saskatchewan's Ministry of Health has adapted surveillance case definitions from US Centers for Disease Control and Prevention for surveillance of Lyme disease. The provincial case definitions will facilitate identification of Lyme disease acquired in Saskatchewan from:

- 1) adventitious infected black-legged ticks originating in the United States that are dropped by migrating birds; and
- 2) undetected reproducing infected black-legged ticks .

These case definitions acknowledge that Lyme disease is an emerging concern in this province. The Ministry is committed to surveillance of black-legged ticks in the province but this surveillance will never be exhaustive.

¹ Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data and support public health investigation and management. The definition is not intended to be used for clinical or laboratory diagnosis or management of patients.

<p>Confirmed Case</p>	<p>Clinical evidence of illness with laboratory confirmation by one of the following methods:</p> <ul style="list-style-type: none"> • isolation of <i>Borrelia burgdorferi</i> from an appropriate clinical specimen <p>OR</p> <ul style="list-style-type: none"> • detection of <i>B. burgdorferi</i> DNA by PCR in synovial fluid, cerebrospinal fluid, erythema migrans tissue biopsies or blood. <p>OR</p> <p>Clinical evidence of illness with:</p> <ul style="list-style-type: none"> • a history of a tick exposure^a OR history of residence in or visit to a risk area <p>AND</p> <ul style="list-style-type: none"> • laboratory evidence of infection: <ul style="list-style-type: none"> ○ positive serologic test results using the two-tiered approach (ELISA followed by an immunoblot assay; e.g. Western Blot or line blot).²
<p>Probable Case</p>	<p>Clinical evidence of illness without a history of exposure and with laboratory evidence of infection:</p> <ul style="list-style-type: none"> • positive serologic test results using the two-tiered approach (ELISA followed by an immunoblot assay; e.g. Western Blot or line blot). <p>OR</p> <p>Clinician-observed erythema migrans without laboratory evidence and one or more of the following:</p> <ul style="list-style-type: none"> • history of tick exposure; • residence in a risk area; • visit to a risk area
<p>Suspect Case</p>	<p>Erythema migrans rash without history of residence in or travel to a risk area and treatment with antibiotics prior to lab test confirmation. NOTE: Visual documentation (digital photo) of the erythema migrans rash may be useful in supporting this diagnosis.</p>
<p>^a Tick exposure: having been (less than or equal to 30 days before onset of EM) in wooded, brushy, or grassy areas (i.e. potential tick habitats) of Lyme disease vectors. A detailed travel history is needed since infected ticks are not uniformly distributed. History of a tick bite is not required.</p>	

² See guidelines of the Canadian Public Health Laboratory Network at: <https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2014-40/ccdr-volume-40-11-may-29-2014/ccdr-volume-40-11-may-29-2014-1.html>

Epidemiology and Occurrence

Lyme disease is a well-established tick-borne disease in many areas of North America and Europe. The risk of acquiring it increases in areas where the *Ixodes* species that carry *Borrelia burgdorferi* have become established. The range of *Ixodes scapularis* (black-legged tick) has expanded significantly in Canada and the United States, resulting in an increase in the potential for acquiring Lyme disease. The Public Health Agency of Canada has defined a risk area³ in Canada as a locality in which there is evidence for the occurrence of reproducing populations of known tick vector species (particularly *Ixodes scapularis* and *I. pacificus*) and the likely transmission of *B. burgdorferi* (Public Health Agency of Canada, 2016).

In Saskatchewan, there are **no known** reproducing populations of black-legged ticks at this time. However, each year adventitious black-legged ticks are found in the province, most likely carried by migratory birds. Since 2008, eight of these ticks have tested positive for *B. burgdorferi*. Primary care providers regularly submit hundreds of blood specimens to the Roy Romanow Provincial Laboratory for testing (**Table 1**). Each year the number of tests increases ([Figure 1 - Geographic distribution of black-legged ticks in Saskatchewan 2008–2017](#)). In Saskatchewan, the risk of acquiring Lyme disease or other tick borne infections is low, but not zero.

The known locations of Lyme disease risk areas are available at:

- In Canada - Please refer to provincial risk maps if available, if not refer to the map at this link: <https://www.canada.ca/en/public-health/services/diseases/lyme-disease/risk-lyme-disease.html#a3>
- In US - https://www.cdc.gov/ticks/geographic_distribution.html
- In Europe (vector is *Ixodes ricinus*) - <https://ecdc.europa.eu/en/disease-vectors/surveillance-and-disease-data/tick-maps>
- Elsewhere - <https://wwwnc.cdc.gov/travel/destinations/list>

³ A risk area in Canada is determined by one of the following methods:

- i) active field surveillance involving capture of wild rodent reservoirs as well as drag sampling on multiple occasions to ensure that ticks have become established (as evidenced by demonstration of all three feeding stages of the tick over more than one year) and that *B. burgdorferi* is being transmitted (as evidenced by molecular detection or culture of ticks or rodent samples);
 - ii) active field surveillance involving only drag sampling for ticks;
 - iii) evidence from passive tick surveillance when using field-validated methods of analysis of these data to improve their specificity in detecting tick populations (these may include high numbers of submitted ticks, immature ticks and multiple ticks found feeding on humans or animals);
 - iv) field-validated signals from human case surveillance; or
 - v) field-validated ecological/niche models that predict risk.
-
-

Table 1: Ticks, human cases and blood samples tested in Saskatchewan by year (2008-2017)

Year	Ticks			Human		
	Ticks (all species)	Black- legged ticks	Black-legged ticks positive for <i>Borrelia burgdorferi</i> ¹	Cases		Blood specimens Tested
				Canada	SK	
2008	N/A	5	0	N/A	0	N/A
2009	1,478	5	1	144	0	543
2010	1,139	3	0	143	0	801
2011	736	3	1	266	1 ³	599
2012	2,896	1	0	338	0	850
2013	1,726	10	1	682	1 ³	811
2014	3,176	5	0	522	0	1,174
2015	5,103	9	1	917	0	1,311
2016	5,300	9	0	987	1 ³	1,428
2017	5,112 ²	15 ²	4	N/A	4 ³	1,639 ⁴
Total	26,666	65	8	3,853⁵	7	9,156⁵

Sources: Public Health Agency of Canada and the Roy Romanow Provincial Laboratory

Notes:

¹ *Borrelia burgdorferi* is the agent that causes Lyme disease.

² Number of ticks collected to November 5, 2017.

³ 2011 case possibly locally acquired but associated with travel; 2013 and 2016 cases linked to travel outside the province; in 2017, one case acquired locally and three cases linked to travel outside the province.

⁴ Testing increased by 202 per cent from 2009 to 2017.

⁵ Canadian cases include both probable and confirmed cases; Saskatchewan cases are confirmed cases only.

Additional Background Information

Causative Agent

Borrelia burgdorferi, a tick-borne spirochete (Heymann, 2015).

Symptoms

Lyme disease is a multisystem inflammatory disease that generally manifests in three stages: early localized, early disseminated, and late disease.

Symptoms of early or late disseminated Lyme disease are described in the 2006 clinical practice guidelines of the Infectious Diseases Society of America (Wormser, 2006).

Objective evidence of Lyme disease includes the following when an alternative explanation is not found:

Lyme disease has three stages if left untreated:

- i) Early localized Lyme disease characterised by a red rash called erythema migrans (EM) that spreads from the site of the tick bite (as described below);
- ii) Early disseminated Lyme disease characterised by one of the following:
 - multiple EM rashes;
 - neurological (facial paralysis or meningitis-like) manifestations;
 - heart problems (palpitations caused by heart block) which may last several weeks to months; and
- iii) Late disseminated Lyme disease which is most commonly characterized by intermittent arthritis that may last months to over a year.

Erythema migrans: a round or oval expanding erythematous area of the skin greater than 5 cm in diameter and enlarging slowly over a period of several days to weeks. It appears 7-14 days (range 3-30 days) after infection and persists for up to eight weeks. Some lesions are uniform in redness while others have a prominent central clearing or a distinctive target-like appearance. On the lower extremities, the lesion may be partially purpuric. Signs of acute or chronic inflammation are not prominent. There is usually little pain, itching, swelling, scaling, exudation or crusting, erosion or ulceration, except that some inflammation associated with the tick bite itself may be present at the very centre of the lesion.

Note: An erythematous skin lesion present while a tick vector is still attached or that has developed within 48 hours of detachment is most likely a tick bite hypersensitivity reaction (i.e., a non-infectious process), rather than erythema migrans. Tick bite hypersensitivity reactions are usually < 5 cm in largest diameter, sometimes have an urticarial appearance and typically begin to disappear within 24-48 hours.

Complications

Post-Treatment Lyme Disease Syndrome

A small percentage of patients complain of pain, neurocognitive, or fatigue symptoms for months or years afterwards, despite resolution of the objective manifestations of the initial infection with antibiotic therapy (Steere, 2012). Indistinguishable from chronic fatigue syndrome or fibromyalgia, these patients tend to have more generalized or disabling symptoms: marked fatigue, severe headache, diffuse musculoskeletal pain, multiple symmetric tender points in characteristic locations, pain and stiffness in many joints, diffuse paresthesias, difficulty with concentration, or sleep disturbance. Patients with these conditions lack evidence of joint inflammation; they have normal neurologic test results; and they usually have a greater degree of anxiety and depression.

At the present time there is no evidence that persistent subjective symptoms after recommended courses of antibiotic therapy for Lyme disease are caused by active *B. burgdorferi* infection (Steere, 2012). Most medical experts believe that the lingering symptoms are the result of residual damage to tissues and the immune system that occurred during the infection.

Reservoir/Source

The survival and spread of *B. burgdorferi* depends on the availability of a suitable tick vector as ticks and their hosts are the primary means by which the bacteria can move from one habitat to another. Two species of ixodid ticks act as the primary reservoirs for Lyme disease in Canada: *Ixodes scapularis* (blacklegged tick) in eastern and central North America and *Ixodes pacificus* (western blacklegged tick) west of the Rocky Mountains (Ogden, 2009).

Movement of the bacteria into new geographic areas requires the presence of suitable habitat (Public Health Agency of Canada, 2008), vectors and hosts (larval and nymphal stages feed on small mammals, adult ticks feed primarily on deer), and climate (Heymann, 2015). Infected hosts can move the disease into areas with uninfected vectors and vice versa. Refer to [Surveillance](#) for approaches for monitoring for black-legged ticks in Saskatchewan.

Mode of Transmission

Infection is transmitted most often through the bite of infected nymphs and adult ticks. Transmission does not occur between infected female ticks and their eggs.

Lyme disease is not transmitted person-to-person. Mother-to-baby transmission of Lyme disease is possible in theory, but the risk appears to be very low (National Institute for Health and Care Excellence, 2018)

Incubation Period

The incubation period from infection to onset of EM is typically 7-14 days, but may be as short as three days and as long as 30 days (Heymann, 2015).

Period of Communicability

Not applicable as there is no evidence of natural transmission from person-to-person. The *B. burgdorferi* spirochete survives in stored blood so transfusion-associated transmission may be possible, though rare.

Specimen Collection and Transport

For details refer to the Roy Romanow Provincial Laboratory (RRPL) Newsletter⁴ and RRPL Compendium of Tests at <https://rrpl-testviewer.ehealthsask.ca/>.

Public Health Investigation

I. Case

History

Classify case in consultation with the attending physician and the case definitions. Refer to [Attachment – Lyme Disease Data Collection Worksheet](#) to assist.

- Clinical manifestation and onset dates (presence or history of erythema migrans (EM)-like rash or other clinical symptoms) can help identify exposure timelines.
- Risk factors with consideration to incubation period and clinical stage of illness.
- Acquisition Risk factors include:
 - history of a tick bite or exposure to ticks (tick bites may not always be noticed);
 - travel to a known risk area;
 - residential exposure during property maintenance, recreation, and leisure activities in wooded, brushy, or grassy areas;
 - occupational exposure such as landscaping, brush clearing, forestry, and wildlife and parks management in wooded, brushy, or grassy areas;

⁴ <https://www.saskhealthauthority.ca/Services-Locations/RRPL/Documents/RRPL-Newsletter-Feb-2012.pdf#search=lyme%20disease>

- recreational exposure such as hiking, camping, fishing, and hunting in wooded, brushy, or grassy areas; or
 - outdoor dog or cat with exposure to wooded, brushy or grassy areas that shares bed or living space.
- Determine if risk of transmission exists.
 - Transmission Risk factor includes history of donating blood/plasma/tissue.

Public Health Interventions

Education

- All cases should be provided disease information as well as information on prevention and control measures.

Referrals

- Complex cases require referral to an infectious disease (ID) or other specialist for case management.
- Canadian Blood Services is to be notified when a case has identified any history of receiving or donating blood or blood products. See [Appendix K – Notification to Canadian Blood Services](#) for the template form for making these referrals.

Treatment/Supportive Therapy

Treatment choices are governed by the most recent guidelines. The public health practitioner should direct any questions regarding the current treatment protocols to the physician or an infectious disease specialist. The Infectious Disease Society of America (IDSA) website provides additional information at <http://www.idsociety.org/lyme/>. or refer to the most current National Institute for Health and Care Excellence (NICE) Guidelines.

II. Contact

Contact Definition

Not applicable. Even though congenital infection occurs with other spirochetal infections, no causal relationship between maternal Lyme disease and abnormalities of pregnancy or congenital disease has been documented conclusively (American Academy of Pediatrics, 2015; National Institute for Health and Care Excellence, 2018).

III. Environment

Ecological and environmental measures that can assist in the management of Lyme disease include habitat modification (clearing underbrush and grass mowing), host exclusion (deer fencing, removing wood piles for rodents) as well as both on and off-host measures (Rahn, 1993).

[Personal protective measures](#) continue to be important prevention measures.

IV. Epidemic Measures

Reinforce personal protective measures through [education and risk communication](#). Educate public about the vector, mode of transmission and identify tick-infested areas.

Prevention Measures

Refer to the Vector-borne and Zoonotic Diseases – Introduction and General Considerations section of the manual that highlights topics for client education and provides information on high-risk groups and activities. Refer to the Government of Saskatchewan website for general information on Lyme disease and prevention measures at <http://www.saskatchewan.ca/residents/health/diseases-and-conditions/lyme-disease>

Immunization

There is no vaccine currently available.

Education and Risk Communication

Public communication about measures individuals can take to reduce the risk of tick bites may be beneficial. Key preventative measures include:

Personal Protective Measures

- Avoid tick-infested areas such as scrub land, forest/grassland fringes, forest glades, wooded, brushy, or grassy areas.
- Stay on well-cleared trails and stay in the center of trails or paths.
- Wear long sleeved shirts and long pants tucked into socks or boots.
- Apply DEET - or Icaridin-based repellents (N, N-m-diethyl toluamide; hydroxyethyl isobutyl piperidine carboxylate) according to instructions.
- Insect repellents containing lemon eucalyptus oil, soybean oil, citronella **do not** provide protection from ticks.

-
-
- Find and remove ticks from your body.
 - Do a total body check after having been outdoors in wooded, brushy or grassy areas.
 - Bathe or shower as soon as possible after coming indoors (preferably within two hours) to wash off and more easily find ticks that are crawling on you.
 - Conduct a full-body tick check using a hand-held or full-length mirror to view all parts of your body. Parents should check their children for ticks under the arms, in and around the ears, inside the belly button, behind the knees, between the legs, groin area, around the waist, and especially in their hair.
 - Examine gear and pets. Ticks can ride into the home on clothing and pets, and then attach to a person later; carefully examine pets, coats, and daypacks. Tumble clothes in a dryer on high heat for 10 minutes to kill remaining ticks (Centers for Disease Control and Prevention, 2018).

Tick Removal⁵

- If you find a tick attached to your skin:
 - Carefully remove it with fine-tipped tweezers and grasp the mouth of the tick as close to the skin as possible.
 - Pull slowly upward and out with a firm steady pressure.
 - Do not handle the tick with bare hands and be careful not to squeeze, crush or puncture the body after removal as this may also contain infectious fluids.
 - Removing ticks within 24-36 hours after the tick bite usually prevents infection.

Surveillance

Tick Surveillance

- The Saskatchewan Tick Surveillance Program monitors whether the black-legged tick is endemic or established in Saskatchewan to inform the risk assessment of acquiring Lyme disease (and other tick-borne diseases) in this province. Tick surveillance determines the distribution and level of establishment of black-legged tick populations, within an area. Tick surveillance is *passive* (examining ticks voluntarily submitted by the public) and *active* (targeted collection of ticks through surveys in their natural habitat). Both methods are useful for monitoring changes in the risk of Lyme disease.

⁵ <https://www.canada.ca/en/public-health/services/diseases/lyme-disease/removing-submitting-ticks-testing.html>

-
-
- Black-legged ticks submitted or collected are tested for *Borrelia burgdorferi* (the agent that causes Lyme disease), *Anaplasma phagocytophilum* (the agent that causes human granulocytic anaplasmosis), and, as of 2013, *Babesia microti* (the agent that causes babesiosis), *Borrelia miyamotoi* (the agent that causes relapsing fever), and *Borrelia mayonii*, a newly described organism that can cause Lyme disease.
 - Monitoring for black-legged ticks and the prevalence of infection with *Borrelia* or other bacteria allows Public Health to assess the risk of human exposure to infected ticks in a given area. The status of blacklegged tick populations in an area is classified as:
 - Established – field surveillance suggests that reproducing populations occur. This could consist of all tick life stages (larvae, nymphs and adults) found in one or more calendar years, *B. burgdorferi* or *A. phagocytophilum* infections are detected in resident reservoir hosts such as mice or squirrels or a succession of different tick cohorts is observed (i.e. collection of annual cohorts of ticks, specifically adult ticks from two different cohorts)⁶.
 - Adventitious – ticks are found only sporadically, both in time and space, and usually only a single stage of tick (i.e. adult females) is present. These ticks are carried into the area from another location in Canada or the United States by a migratory bird or other animal.
 - Not Present – ticks have not been found in an area.
 - Habitat suitability - The habitat suitability for establishment of the black-legged tick has been mapped in Saskatchewan. The map integrates various layers of data such as temperature, relative humidity, woodland habitat and other factors such as deer density and this information has been used to produce a risk map for Saskatchewan. Data from this project have identified areas of low to high potential (risk index 0-5) for the black-legged tick to be present and this has helped to further guide tick surveillance efforts in the province. Of the 64.6 million hectares of habitat classified, 106,049 have been classified as having a high-risk potential for establishment of *I. scapularis*. (Refer to [Figure 2 – Potential Risk Areas for Black-legged Tick Establishment in Saskatchewan – Low to High Potential Risk](#))
 - See the Lyme Disease page for detailed information:
<http://www.saskatchewan.ca/residents/health/diseases-and-conditions/lyme-disease>

⁶ Ogden NH, Koffi JK, Lindsay LR . Assessment of a screening test to identify Lyme disease risk. Can Comm Dis Rep 2014 40, 83-87

Figure 1. Geographic distribution of black-legged ticks in Saskatchewan 2008-2017.

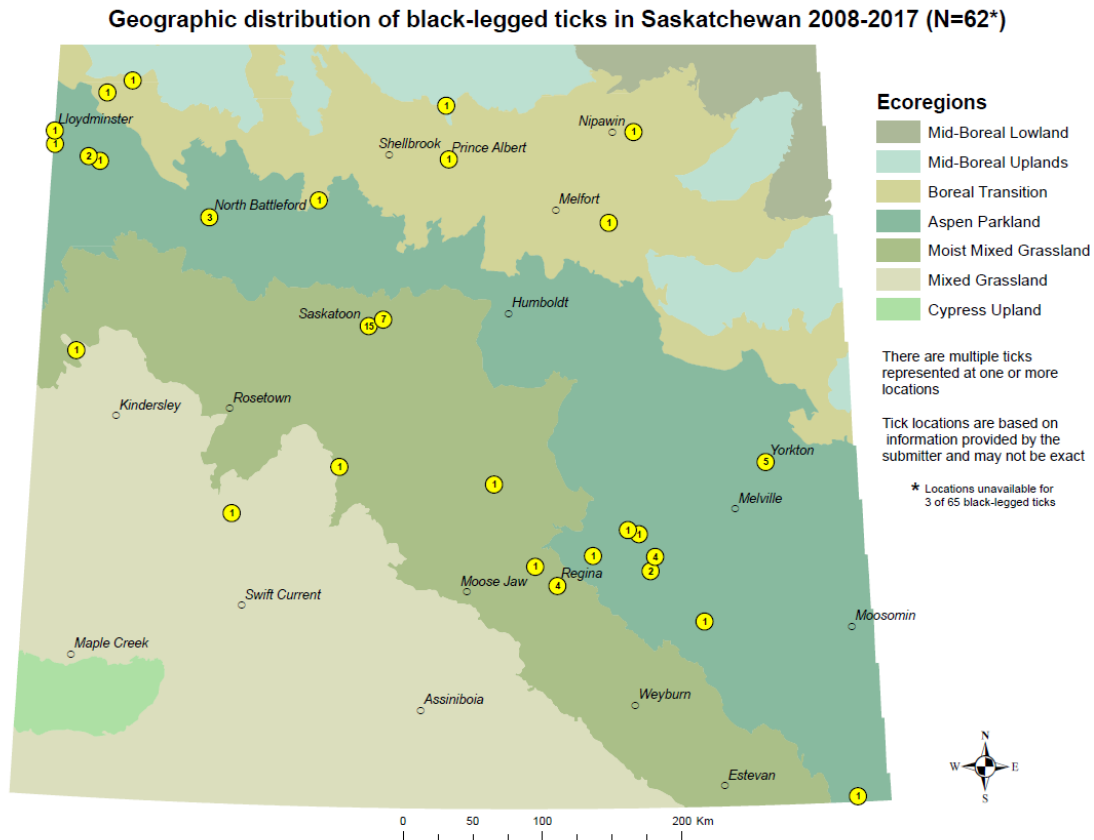
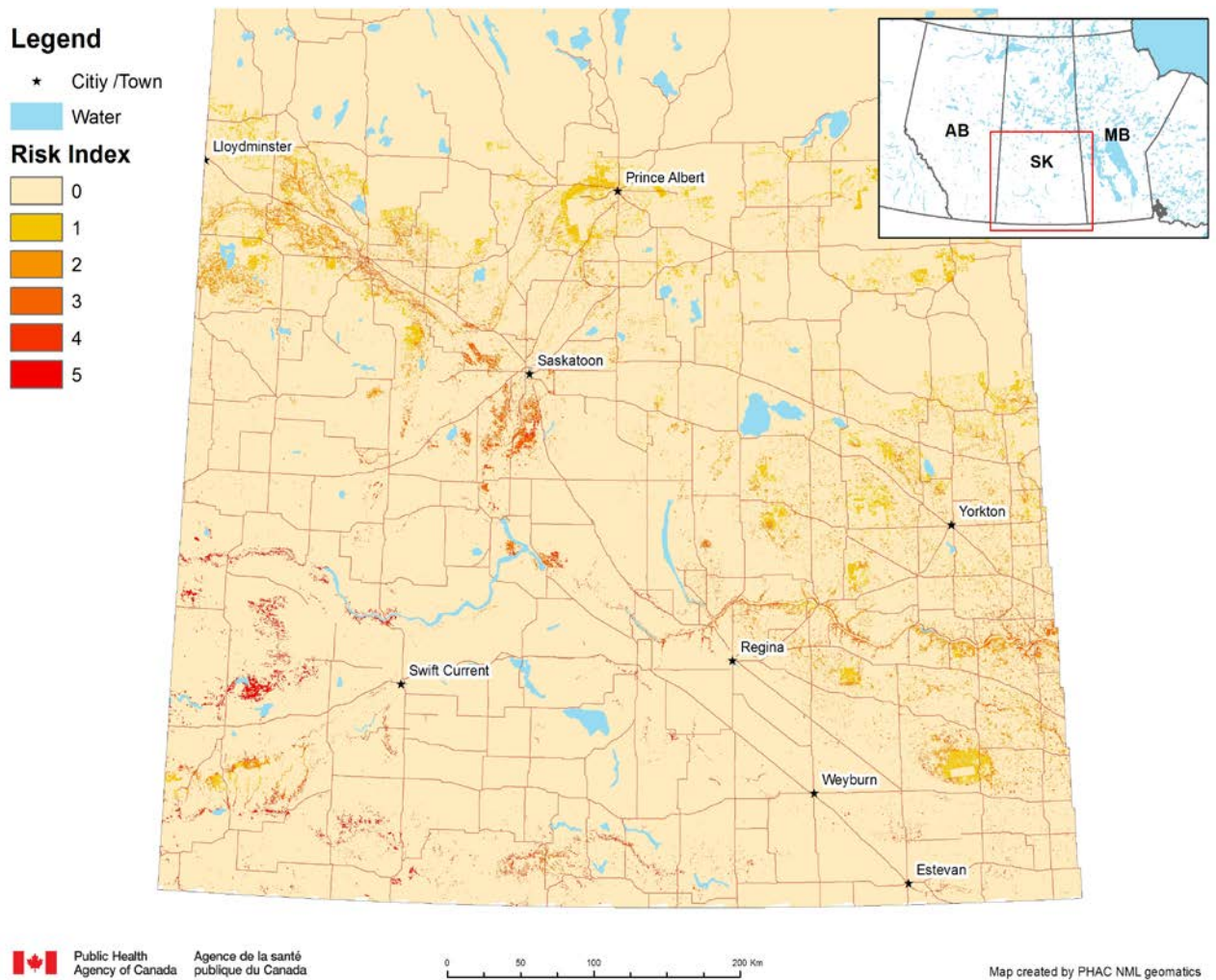


Figure 2: Potential Risk Areas for Black-legged Tick Establishment in Saskatchewan – Low to High Potential Risk (Risk Index 0 – 5)



Revisions

Date	Change
May-September 2018	<ul style="list-style-type: none"> • Reorganized chapter and applied new format. • Incorporated Public Health Purpose of Notification. • Updated case definition based on adaptation of CDC 2017 definition. • Added Epidemiology and Occurrence section. • Updated the information on Risk Areas. • Aligned with Panorama configuration. • Incorporated reference to National Institute for Health and Care Excellence (2018)

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Lyme disease Data Collection Worksheet

Please complete all sections.

Panorama Client ID: _____
Panorama Investigation ID: _____

D) SIGNS & SYMPTOMS *(bold are part of confirmed case definition)*

LHN-> INVESTIGATION-> SIGNS & SYMPTOMS

Description	No	Yes – Date of onset	Description	No	Yes - Date of onset
Arthralgia		YYYY / MM / DD	Meningitis - lymphocytic		YYYY / MM / DD
Arthritis		YYYY / MM / DD	Meningitis-like manifestations		YYYY / MM / DD
Cardiac - arrhythmia		YYYY / MM / DD	Myalgia (muscle pain)		YYYY / MM / DD
Cardiac - myopericarditis		YYYY / MM / DD	Neck stiffness (nuchal rigidity)		YYYY / MM / DD
Cardiac - palpitations		YYYY / MM / DD	Confusion		YYYY / MM / DD
Chills		YYYY / MM / DD	Neurologic - memory loss or lapses		YYYY / MM / DD
Dizziness		YYYY / MM / DD	Neurologic - paresthesia (numbness)		YYYY / MM / DD
Encephalomyelitis		YYYY / MM / DD	Neuropathy - cranial (including motor and sensory palsies)		YYYY / MM / DD
Encephalopathy		YYYY / MM / DD	Neuropathy - mononeuropathy multiplex		YYYY / MM / DD
Fever		YYYY / MM / DD	Neuropathy - peripheral (including motor and sensory palsies)		YYYY / MM / DD
Headache		YYYY / MM / DD	Neuropathy - radiculopathy		YYYY / MM / DD
History of tick bite		YYYY / MM / DD	Paralysis - facial		YYYY / MM / DD
Joint effusion		YYYY / MM / DD	Rash - erythema migraines - single lesion (> 5 cm) at site of tick bite (Bull's eye)		YYYY / MM / DD
Lethargy (fatigue, drowsiness, weakness, etc)		YYYY / MM / DD	Rash - erythema migraines - multiple lesions		YYYY / MM / DD
Lymphadenopathy		YYYY / MM / DD			YYYY / MM / DD

E) INCUBATION AND COMMUNICABILITY

INVESTIGATION->INCUBATION & COMMUNICABILITY

Incubation for Case (period for acquisition):	
Earliest Possible Exposure Date: YYYY / MMM / DD	Latest Possible Exposure Date: YYYY / MMM / DD
<i>Exposure Calculation details:</i>	

F) RISK FACTORS

LHN-> SUBJECT->RISK FACTORS

DESCRIPTION	YES	N – No NA – not asked U - Unknown	DESCRIPTION	YES	N – No NA – not asked U - Unknown
Behaviour - Lack of personal protective measures			Travel - Outside of Canada (Add'l Info)	YYYY/MM/DD AE	
Bite - Tick	YYYY/MM/DD		Travel - Outside of Saskatchewan, but within Canada (Add'l Info)	YYYY/MM/DD AE	
Tick - Infested area (Add'l Info)	YYYY/MM/DD		Travel - Within Saskatchewan (Add'l Info)	YYYY/MM/DD AE	

G) TREATMENT

LHN-> INVESTIGATION-> MEDICATIONS->MEDICATIONS SUMMARY

Medication (<i>Panorama = Other Meds</i>): _____
Prescribed by: _____ Started on: YYYY / MM / DD

Two-tiered algorithm for the laboratory diagnosis of Lyme disease

The two-tiered approach to testing is illustrated in Figure 1.

1. The first tier involves the use of an EIA. If this EIA test is negative, WB testing is not indicated. If symptoms persist, the EIA test can be repeated on a convalescent sample collected 3-6 weeks later.
2. If the EIA is positive or equivocal, the second tier or corroborative Western blot assay is performed. In early infections (i.e. symptoms for less than six weeks), both the IgM and IgG Western blot tests are performed; however, if the patient has had symptoms for more than six weeks, only the IgG Western blot assay is performed.

The final result of serological testing is considered positive only when the EIA is reactive (positive or equivocal) and the WB is also positive (Table 3). This two-tiered system maximizes the sensitivity and specificity of the assays and increases the likelihood of observing a seroconversion (from IgM to IgG) that is evident in most bona fide *B. burgdorferi* infections

Figure 1. Two-tiered approach to testing Lyme

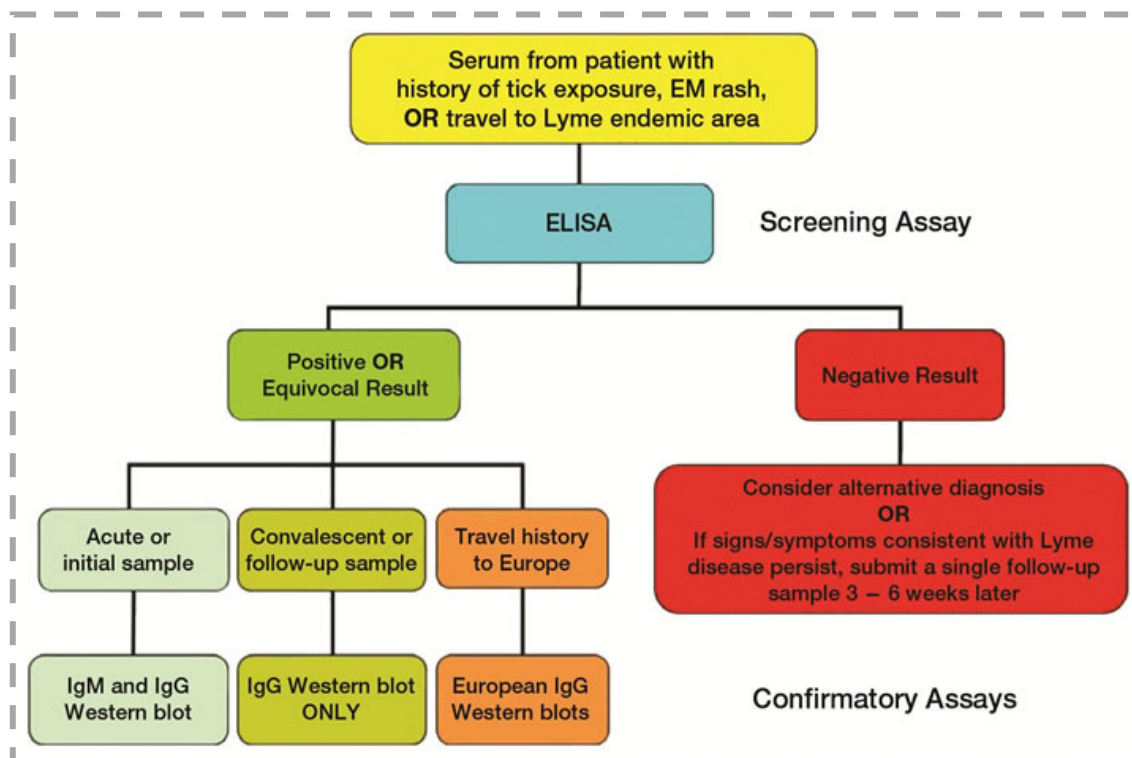


Table 1. Interpretation of Western blot result (in conjunction with an equivocal or positive EIA)

Western blot result	Interpretation
Both IgM and IgG Western blots negative	Result not consistent with a <i>B. burgdorferi</i> infection; however, if symptoms persist submit a follow-up sample 3-6 weeks later.
Only IgM Western blot positive Table 3 Footnote*	Potentially a false-positive result if this is NOT an acute case (i.e. < 6 weeks post onset of symptoms).
Only IgG Western blot positive Table 3 Footnote**	Result consistent with an infection with <i>B. burgdorferi</i> of greater than 4 weeks' duration.
Both IgM and IgG Western blots positive	Result indicates recent or previous infection with <i>B. burgdorferi</i> .
Note: IgM Line Blot is not performed if the sample tested positive by IgG Westernblot	

Source: Canadian Public Health Laboratory Network (retrieved September, 2018) from <https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2014-40/ccdr-volume-40-11-may-29-2014/ccdr-volume-40-11-may-29-2014-1.html>

Notification Timeline for Animal Bites Where Rabies Transmission is Possible:

From Veterinarian/Health Care Practitioner to Public Health: Immediate.

From Public Health to Saskatchewan Health: Only cases where Rabies post-exposure prophylaxis (RPEP) is administered – within one month of incident.

Public Health Follow-up Timeline: Initiate within 24 hours.

All incidents of an individual having being exposed to saliva or other potentially infectious material of an animal that may be infected with rabies should be investigated and a risk assessment should be conducted to determine if risk of rabies transmission exists. When notification of an exposure is delayed, prophylaxis may be started as late as 6 months or more after the exposure.

Causative Agent

RNA virus classified Lyssaviruses, such as rabies virus, are in the family *Rhabdoviridae* in the genus *Lyssavirus*.

Symptoms

Animal Rabies – can be characterized by either:

Dumb rabies

- Domestic animals may become depressed and try to hide in isolated places.
- Wild animals may lose their fear of humans and appear unusually friendly.
- Wild animals, that usually only come out at night, may be out during the day.
- Animals may have paralysis. Areas most commonly affected are the face or neck (which causes abnormal facial expressions, difficulty swallowing, or drooling) or the hind legs.

Furious rabies

- Animals may become very excited and aggressive.
- Periods of excitement usually alternate with periods of depression.
- Animals may attack objects or other animals. They may even bite or chew their own limbs.

Complications

Illness almost invariably progresses to death. The differential diagnosis of acute encephalitic illnesses of unknown cause with atypical focal neurologic signs or with paralysis should include rabies (American Academy of Pediatrics, 2012).

Incubation Period

The period is highly variable but usually 3-8 weeks; very rarely as short as a few days, or as long as several years. Length of incubation depends in part on wound severity, wound location in relation to nerve supply, and relative distance from the brain; the amount and variant of virus; the degree of protection provided by clothing and other factors.

Reservoir/Source

All mammals are susceptible. Reservoirs and important vectors include wild and domestic Canidae, such as dogs, foxes, coyotes, wolves and jackals; also, skunks, raccoons, raccoon dogs, mongooses and other common carnivores, such as cats. Infected vampire, frugivorous and insectivorous bats occur in Mexico and Central and South America, and infected insectivorous bats are present throughout Canada and the USA and Eurasia.

Many other mammals such as rabbits, squirrels, chipmunks, rats, mice and opossums are very rarely infected.

Mode of Transmission

- Most commonly through virus laden saliva from a rabid animal introduced through a bite or scratch (very rarely into a fresh break in the skin or through intact mucous membranes).
- Airborne spread has been suggested in a cave where heavy infection of bats were roosting, and demonstrated in a laboratory setting, but this occurs very rarely.
- Person-to-person transmission is theoretically possible, but is rare and not well documented. Several cases of rabies transmission by transplant of cornea, solid organs and blood vessels from person dying of undiagnosed central nervous system (CNS) disease have been reported from Asia, Europe and North America.

Period of Communicability

Defined periods of communicability of animal hosts are only known with reliability of domestic dogs, cats and ferrets, and are usually for 3-7 days before onset of clinical signs (rarely over 4 days) and throughout the course of the disease. Longer periods of excretion before onset of clinical signs (14 days) have been observed with certain canine rabies virus variants in experimental infections, but these are the exception. Excretion in other animals is highly variable. For example, studies have indicated that bats shed virus for 12 days before evidence of illness while skunks can shed virus from 8-18 days and raccoons can shed virus from 5-10 days before onset of clinical signs.

Specimen Collection and Transport

The brain of the animal that was involved in the human exposure is required for testing. Testing occurs through the coordination with the provincial Rabies Risk Assessment Veterinarian (RRAV). See [Attachment – Animal Investigation and Testing Consultation](#).

NOTE: The RRAV will direct that the animal be taken to a designated veterinary clinic or laboratory so specimens can be collected when the possibility of rabies exists and the animal has been in contact with humans or domestic animals. The RRAV could be contacted to explain specimen collection, storage (in remote areas) and transport. The contact information for RRAV is:

Dr. Clarence Bishop

Cell – 1-306-529-2190

Email – RRAV@gov.sk.ca

Fax Number – 1-844-666-DOGS (844-666-3647)

Diagnosis

Intact brain tissue is the key specimen for confirming rabies infection - care must be taken to avoid destroying a sample intended for testing if the animal is being destroyed. Most commonly, rabies diagnosis is confirmed using direct fluorescent antibody test from the animal's brain. Confirmation is provided by the CFIA Laboratory in Lethbridge, AB or the CFIA Reference Laboratory in Ottawa, ON.

Methods of Control/Role of Investigator

Prevention and Education

Refer to the [Vector-Borne and Zoonotic Diseases - Introduction and General Considerations](#) section of the manual that highlights topics for client education that should be considered and as well as provides information on high-risk groups and activities.

Immunization

Pre-exposure vaccination

Vaccinate individuals who are potentially at high-risk of contact with rabid animals (e.g., veterinarians, veterinary technicians, animal control staff, wildlife workers, spelunkers, laboratory and field personnel working with rabies virus and travellers to rabies endemic areas where there is poor access to adequate and safe post-exposure management). These people should consider pre-exposure immunization with either human diploid cell culture vaccine (HDCV) or purified chick embryo cell vaccine (PCECV) (Public Health Agency of Canada, 2006).

Post-immunization serological testing is advisable every 2 years for persons with continuing high-risk of exposure, such as certain veterinarians, veterinary technicians, and animal control staff. Those whose titres fall below protective levels (0.5 IU/mL) should receive a pre-exposure booster dose of vaccine (Public Health Agency of Canada, 2006).

Vaccination of Animals

The public should be aware of the benefits of vaccinating animals and take measures to protect their pets or other domestic animals (i.e., horses). The public can also help reduce the spread of rabies through informing authorities when an animal is suspected of having the disease (*The Health of Animals Act*¹ requires individuals who have knowledge of or who suspect rabies in an animal to notify CFIA). The public can also report animals suspected on having rabies to the provincial rabies hotline number at: 1-844-7-RABIES (1-844-772-2437). The veterinary profession can educate individuals regarding the value of vaccinating pets, and the vaccination requirements for pets travelling to other countries.

¹ http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.%2C_c._296/index.html.

Various wildlife departments are involved in vaccinating wildlife species, surveying the extent of wildlife rabies in certain geographic areas, as well as surveying the extent of rabies in certain species (Canadian Food Inspection Agency, 2009).

Animal Control Measures

The management of domestic animals falls under the jurisdiction of the Ministry of Agriculture in Saskatchewan as follows:

- The RRAV and private veterinarians investigate all cases of suspected rabies in any domestic animal;
- Ministry of Agriculture veterinarians (including the RRAV) may quarantine any domestic animal that is known or suspected to have had contact with a rabid animal.
- The management of wild animals falls under the Ministry of Environment or municipal animal control officers, in some instances.

Education

Keeping pets under control, teaching children not to play with wild animals or pets they do not know, keeping a safe distance from wildlife and not trying to raise orphaned or injured wildlife all contribute to preventing rabies (Canadian Food Inspection Agency, 2009). Children should be cautioned against provoking or attempting to capture stray or wild animals, and against touching carcasses.

International travelers to areas with endemic canine rabies should be warned to avoid exposure to stray dogs, and if traveling to an area with enzootic infection where immediate access to medical care and biologicals (e.g., vaccine and immunoglobulin) is limited, pre-exposure prophylaxis is indicated (American Academy of Pediatrics, 2012). Refer to Saskatchewan International Travel Manual for travel-related recommendations.

Pet owners should be reminded of the importance of vaccinating their pets.

Children, pet owners and the general public should be made aware of how to act/behave around animals such as dogs and cats and be informed how to interpret body language of an animal.

Personal Protective Measures

It is important for individuals to take appropriate personal protective measures and to use appropriate protective equipment when handling unknown animals or animals that are seemingly unwell. Standards exist for veterinarians and other occupational groups to prevent exposure to rabies and other zoonotic illnesses. Refer to the Western College of Veterinary Medicine (WCVI) infection control manual for details.

Environmental Measures

Inadvertent contact of family members and pets with potentially rabid animals, such as raccoons, foxes, coyotes and skunks, may be decreased by securing garbage and refuse to decrease attraction of domestic and wild animals. Similarly, chimney and other potential entrances for wildlife, including bats, should be identified and covered. Bats should be excluded from human living quarters. Bat exposure is considered to be high-risk. Refer to the following website for more information on bat-proofing human dwellings: <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09pdf/acs-dcc-07.pdf>.

Management

I. Exposed Individual

Note: Pregnancy and infancy are not contraindications to providing RPEP. Persons presenting even months after the bite must be assessed and managed in the same way as recent exposures.

History

It is important to do a risk assessment. See [Attachment – Animal Bite Investigation Worksheet](#) to determine if RPEP is required or recommended.

[Attachment – Animal Encounter Follow-Up Flowchart](#) is another tool that has been developed to assist the front line physician in determining the urgency for consulting an MHO regarding the need for RPEP.

The risk assessment involves getting information about the following:

Animal species

- The most common animals in Canada proven rabid are wild terrestrial carnivores (foxes, skunks, and raccoons), bats, cattle, dogs and cats (Public Health Agency of Canada, 2006). The Canadian Food Inspection Agency (CFIA) keeps track of positive specimens by species and province. Refer to the [CFIA website](#).
- In Saskatchewan, horses, cows, goats, skunks, dogs, cats, bats, bears and raccoons have tested positive for rabies.
- The [Ministry of Agriculture](#) reports on rabies specimen submissions and positive results by species and municipality

Exposure type

- The World Health Organization (WHO) (2014) categorizes animal exposures into the following:
 - Category I – touching or feeding of animals. Licks of intact skin.
 - Category II – nibbling of uncovered skin. Minor scratches or abrasions without bleeding
 - Category III – single or multiple trans-dermal bites or scratches, licks on broken skin. Contamination of mucous membranes with saliva (i.e. licks).
- Bites – teeth penetrated the skin.
- Non-bite includes contamination of scratches, abrasions or cuts of the skin or mucous membranes by saliva or other potentially infectious material (Public Health Agency of Canada, 2006). Petting a rabid animal, handling blood, urine or feces is not considered an exposure. Additionally, being sprayed by a rabid skunk is not considered an exposure.
- Bat exposures – see page 8 for detailed recommendations on assessing and managing bat exposures.

Investigation of the incident

- The type of the animal (indoor pet/outdoor pet/stray/wild/livestock).
- Consider the risk of rabies in the animal species involved, the behaviour of the domestic animal, and the circumstances surrounding the exposure:
 - What were the individual and the animal doing leading up to the incident?
 - Was the animal acting in a manner that is unusual for it?
 - Was the animal healthy or sick?
 - Was the animal eating or drinking?

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- Some situations when an exposure may be expected (i.e., considered “provoked”) include: entering a dog’s habitat, interfering with a dog/cat fight, feeding or taking food from a dog, taking puppies/kittens from their mother, physical abuse (i.e., beating a dog), stepping on or bumping into an animal.)
 - Consult the RRAV if insight on animal behaviour, clinical signs and risk of rabies in particular species is required.
 - Vaccination status of the animal.

Other considerations

- Location of the injury (head, arm, leg, etc.). Injury to the upper body or face may require more timely response (Public Health Agency of Canada, 2008).
- Usual environment of the animal, particularly if it is a pet (is it an exclusively indoor pet or has there been an opportunity for interaction with a rabid animal?). What setting does the animal reside in (city versus rural)? Note: there have been rabies positive bats caught by apartment dwelling cats that never go outside.
- If it is a domestic cat or dog, is it available for observation? If the animal has been euthanized, is the brain available for testing?
- Immunization history of the individual exposed.

Bat Exposures (Public Health Agency of Canada, 2009)

The National Advisory Committee on Immunization (NACI) is now recommending intervention only when **both** of the following conditions apply:

- there has been “direct contact” with a bat
AND
- a bite, scratch, or saliva exposure into a wound or mucous membrane cannot be ruled out.
- Note: “direct contact” is defined as the bat touching or landing on a person.

NACI recommends that RPEP be initiated without delay when there is a known bat bite, scratch, or saliva exposure in a wound or mucous membrane. This is especially important when the exposure involves the face, neck, or hands, or when the behaviour of the bat is clearly abnormal (such as when it hangs on tenaciously or when the bat has attacked the person). If the bat is available for testing, RPEP can be discontinued if the bat is found to be negative for rabies. The clinician may feel it will be safe to delay RPEP in some instances where the exposure is less certain (i.e., when the bat touches the individual while in flight) if the bat is being tested for rabies. However, if RPEP is indicated based on the NACI recommendations, it should never be delayed beyond 48 hours while waiting for bat testing results.

Recommendations Regarding Bat Testing

No direct contact with the bat: If there has been no “direct contact” with the bat, it should not be captured for testing. There are risks of direct contact when attempting to capture the bat; this potentially exposes the individual to rabies. If the bat is inadvertently tested and comes back positive, determining the need for RPEP should be based on whether direct contact with the bat occurred; not the rabies status of the bat.

In order to get the bat out of a house in which there has been no direct contact with the bat, the area with the bat should be closed off from the rest of the house. The doors or windows in the area with the bat should be opened to the exterior, allowing the bat to escape. People and pets should be kept away from the area.

Direct contact with the bat: If there has been “direct contact” with the bat, it is best to call a trained animal control or wildlife professional to capture the bat, if possible. Capturing the bat and testing it will mean that RPEP is not needed if the results come back negative. The Centers for Disease Control (2011) identifies steps that can be used to catch a bat at the following website:

<http://www.cdc.gov/rabies/bats/contact/capture.html>.

Extreme care should be taken to ensure that there is no further exposure to the bat if it is captured. If attempting to capture the bat, the person should always wear thick leather gloves and place the bat in a closed secure container. Once the bat has been captured, the local public health department should be contacted to make arrangements with the RRAV to send the bat for rabies testing.

Referrals

1. Animal Exposures that pose a rabies risk require follow-up in a timely manner.
2. Animal Exposures involving either the victim or animal (or both) from other regions or jurisdictions (such as other provinces, territories or counties) require assistance or coordination in completing the follow-up.
3. Sharing of information with other P/Ts must ensure that privacy and confidentiality standards are maintained. (i.e. information sharing should be limited to the information required to carry out the requested action).

To facilitate efficient referrals for coordinated follow-up, complete the relevant sections of the [Attachment – Interjurisdictional Referral Following an Animal Exposure](#) and follow routine communicable disease referral processes.

Animal Bite Exposures

Table 1 - PEP Recommendations for Persons Not Previously Immunized Against Rabies (Public Health Agency of Canada, 2006)

Animal species	Condition of animal at time of exposure	Management of exposed person
Dog, cat or ferret	Healthy and available for 10 days observation.	1. Local treatment of wound. 2. At first sign of rabies in animal, give RPEP as per Table 2 . If bite or wound to head or neck, begin treatment immediately.
	Rabid or suspected to be rabid.* Unknown or escaped.	1. Local treatment of wound. 2. RPEP as per Table 2 .
Skunk, bat, fox, coyote, raccoon, and other carnivores.	Regard as rabid* unless geographic area is known to be rabies-free.	1. Local treatment of wound. 2. RPEP as per Table 2 .**
Livestock, rodents or lagomorphs (hares and rabbits)	Consider individually. Consult appropriate public health and Ministry of Agriculture officials. Bites of squirrels, chipmunks, rats, mice, hamsters, gerbils, other rodents, rabbits and hares may warrant PEP if the behaviour of the biting animal was highly unusual.	

*If possible, the animal should be humanely killed and the brain tested for rabies as soon as possible; holding for observation is not recommended. Discontinue vaccine if fluorescent antibody test of animal brain is negative.

**See text for potential [bat exposure](#).

Management of the Animals Involved in a Exposure Incidents

- Detain and observe any **healthy-appearing** dog, cat or ferret known to have bitten a person for 10 days. These animals should be confined and observed at the owner’s residence. They should be confined in such a way that prevents contact with other animals or people during the observation period to prevent further exposures if the animal is found to have rabies.

If the biting animal is infective at the time of the bite, it usually develops signs of rabies within 4-7 days, such as change in behaviour, excitability or paralysis, followed by death. Owners should make the vet aware that the animal was involved in a biting incident and is currently under 10 day observation.

- **Stray or ownerless** dogs or cats may be euthanized for testing. Contact RRAV for collection of specimen. Contact animal protection services to capture the animal.
- **Dogs and cats showing suspicious clinical signs of rabies and all wild mammals** that have bitten a person should be euthanized for testing. Animal owner to be made aware that this should be ideally done by a vet, or to ensure the animals head is not destroyed. Contact RRAV to arrange for collection of specimen.

The Ministries of Agriculture and Health have established policies that outline their roles with respect to rabies. In general:

- The RRAV will conduct a rabies risk assessment and direct trained veterinarians to submit samples from any suspect rabid domestic animal, and any suspect wild animal that has been in contact with a human or a domestic animal.
- Emergency submissions on weekends and holidays are only accepted in the case of a bite to the head or neck, when ordered by the MHO and when there is a weekend contact number for health provider. For some veterinary offices and locations, there is no means of getting samples to the lab over a weekend; in these cases it is recommended to start treatment if can't wait 3-4 days and submit the sample as soon as possible. Treatment can be stopped if results are negative.
- In the case of healthy domestic animals (dogs, cats or ferrets) biting or scratching, a 10 day observation period is preferred and should be encouraged/emphasized to the animal owner over euthanasia and sampling.

Treatment/Supportive Therapy

Immediate flushing of the wound with soap and water is imperative and is probably the most effective procedure in the prevention of rabies (Public Health Agency of Canada, 2006). If available, a viracidal agent such as a povidone-iodine solution should be used to irrigate the wounds (Centers for Disease Control, 2010). Suturing the wound should be avoided if possible.

Rabies Post-exposure prophylaxis (RPEP)

When the risk assessment deems necessary, the MHO will authorize RPEP involving the administration of Rabies Immune Globulin (Rablg) and/or rabies vaccine. RPEP should be provided as per [Table 2](#).

The WHO considers the intradermal (ID) regime an acceptable alternative to IM pre-exposure rabies vaccination. However, due to the precise nature for ID administration and the potential consequences of improper administration, post-immunization antibody titres should be determined at least 2 weeks after completion of ID vaccine series to ensure that an acceptable level of protection has been achieved. Refer to [Attachment – Post Exposure Management of Individuals Who Received Pre-Exposure Intradermal Rabies Vaccine](#) for guidance based on results of titres following ID administration.

Table 2 – RPEP Recommendations based on Previous Rabies Immunization History

Vaccination Status	Regimen ¹
1. Previously Unimmunized Individuals	(1A) Unimmunized immunocompetent² individuals to receive Rablg and a 4 dose series of Rabies Vaccine: <ul style="list-style-type: none"> • 1 mL IM on days 0 – 3 – 7 – 14. • Day 0³: 1 mL IM as soon as possible after exposure PLUS Rablg.⁴ • Days 3, 7, and 14: 1 mL IM.
	(1B) Unimmunized immunocompromised² individuals to receive Rablg and a 5 dose series of Rabies Vaccine: <ul style="list-style-type: none"> • 1 ml IM on days 0 – 3 – 7 – 14 – 28. • Day 0³: 1 mL IM as soon as possible after exposure PLUS Rablg.⁴ • Days 3, 7, 14 and 28: 1 mL IM.
2. Previously Immunized Individuals	(2A) For individuals with a history of previous immunization with an approved course of either pre- or post-exposure prophylaxis with either human diploid cell culture vaccine (HDCV) or purified chick embryo cell vaccine (PCECV), the procedure is as follows: <ul style="list-style-type: none"> • Rabies Immune Globulin (Rablg) - not necessary. • Rabies vaccine – 2 doses: on day 0³ and day 3.

Vaccination Status	Regimen ¹
2. Previously Immunized Individuals	(2B) For individuals with a history of previous immunization with an unapproved schedule or with a vaccine other than HDCV or PCECV, but has had an acceptable level of antibodies demonstrated in the past, the procedure is the same as above.
2. Previously Immunized Individuals	<p>(2C) For individuals with a history of previous immunization with an unapproved schedule or with a vaccine other than HDCV or PCECV, but who did not have an acceptable level of antibodies demonstrated in the past, the following applies:</p> <ul style="list-style-type: none"> • A sample for serology may be drawn at the time of exposure (before Rablg or vaccine is administered) to potentially reduce the number of doses of vaccine needed. • Rablg is to be administered. • Rabies vaccine – Refer to 1. Previously Unimmunized Individuals above. <p>The MHO may recommend discontinuing additional doses of rabies vaccine provided that 2 doses have been administered if serology indicates adequate immunity (≥ 0.5 IU/mL).</p>
<p>¹Regimens are applicable for all age groups, including children. ²Includes those taking antimalarials and/or any immunosuppressants (e.g., corticosteroids) that can result in immunosuppression. Refer to Saskatchewan Immunization Manual² for details on determining immune status of individuals. ³Day 0 is the day the 1st dose of vaccine is administered. ⁴Vaccine-induced antibodies begin to appear within 1 week of beginning vaccination with an approved course, therefore there is no benefit of administering Rablg more than 8 days after vaccine has been initiated.</p>	

Source: *Rabies Post Exposure Prophylaxis Recommendations*. Memo from Saskatchewan Ministry of Health Chief Medical Health Officer to MHOs, December 20, 2007.

Rabies Immune Globulin (Rablg)

- Administer 20 IU/kg body weight. Calculate dose with the following formula:

$20 \text{ IU/kg} \times (\text{client wt in kg}) \div \text{Rablg IU concentration per mL} = \text{dose in mL}$
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² <http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx>.

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- If anatomically feasible, *the full dose* should be infiltrated into the wound(s) and surrounding tissues; any remaining volume should be administered intramuscularly (IM) at an anatomic site distant from that of vaccine administration.
 - Rablg should not be administered in the same syringe or location as the vaccine.
 - Because Rablg may interfere with active production of antibody, no more than the recommended dose should be given.
 - Vaccine-induced antibodies begin to appear within 1 week of beginning vaccination with an approved course, therefore there is no benefit of administering Rablg more than 8 days after vaccine has been initiated.

Rabies Vaccine

Rabies vaccine should be administered as outlined in [Table 2](#). Refer to Saskatchewan Immunization Manual³ for details about immunocompromised individuals.

It has been documented that subjects with severe immunodeficiency (very low CD4 counts) will not respond well to rabies vaccination. Some may not develop neutralizing antibody at all. Careful wound cleansing and the use of immunoglobulin is thus of great importance in such patients. Vaccination must be administered at the usual dose. A serum specimen should be collected at the time when the last dose of vaccine is administered and tested for rabies antibodies. If sensitization reactions appear in the course of immunization, consult the medical health officer for guidance.

Refer to [Rabies Immunization Fact Sheet](#) to guide discussion about immunization.⁴

Immunization

There is no treatment for human rabies so appropriate and timely management of potential or confirmed exposures is vital. Immunization is the only measure that can prevent human rabies.

³ <http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx>

⁴ <http://www.saskatchewan.ca/immunize>

The vaccination schedule for post-exposure prophylaxis should be adhered to as closely as possible (especially the first 2 doses) and it is essential that all recommended doses of vaccine be administered (CD Subcommittee of Medical Health Officers of Saskatchewan, Mar 2016).

Early Dose:

- If a dose of vaccine is given at less than the recommended interval, that dose should be ignored and the dose given at the appropriate interval from the previous dose. This is especially important for the first 3 doses in the series (day 0, 3, 7)
- Observe the appropriate spacing between rabies vaccines, to optimize immunogenicity
- Example:
 - Doses received on days 0, 3 and 5
 - Ignore dose received on day 5 and repeat at appropriate interval on day 9 (i.e. appropriate spacing of 4 days which would normally be observed between 2nd and 3rd doses), with dose #4 on day 16.

Late Dose:

- If the recommended rabies vaccine schedule is interrupted or delayed, the series should be continued ensuring that the recommended time intervals between remaining doses are maintained.

Serologic Testing:

- If repeating an invalid dose or providing a delayed dose results in an interval *more than 3 days longer* than the recommended interval, immune status should be assessed by performing serologic testing 7-14 days after administration of the final dose in the series (Centers for Disease Control, Ask the Experts, 2017).

Administering a 5th dose:

Should the results for the serological testing under the circumstances mentioned above not be back at the time of the 5th dose (day 28), proceed with providing the 5th dose.

Individuals should also be offered the appropriate tetanus vaccine based on their immunization history and eligibility based on the Saskatchewan Immunization Manual.⁵

⁵ <http://www.ehealthsask.ca/services/manuals/Pages/SIM.aspx>

II. Contacts/Contact Investigation

Contact Definition

Anyone who has had direct contact with the saliva or infectious material of an animal confirmed to have rabies.

Contact Management

All contacts of a suspected or proven rabid animal should be followed up and a risk assessment completed to determine the extent of exposure; only those with skin or mucosal contact with the animal's saliva should be considered for post-exposure treatment.

Testing/Prophylaxis

Individuals who have been previously vaccinated should be followed as outlined in [Table 2](#).

III. Environment

Child Care Centre Control Measures

In-house pets should be kept up-to-date on vaccinations.

Institutional Control Measures

Refer to the following website for more information on bat proofing human dwellings: <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09pdf/acs-dcc-07.pdf>.

Epidemic Measures

Establish control area under authority of laws, regulations, and ordinances, in cooperation with appropriate human, agricultural and wildlife conservation authorities.

Immunize dogs and cats in defined areas of risk through officially sponsored intensified mass programs that provide immunizations at temporary and emergency stations. For protection of other domestic animals, use approved vaccines appropriate for each animal species.

In urban areas of industrialized countries, strict enforcement of ownerless and stray dogs, and of non-immunized dogs found off owners' premises; control of the dog population by castration, spaying or drugs have been effective in breaking transmission cycles.

Immunization of wildlife through baits containing vaccine has contained red fox rabies in Western Europe and southern Canada coyote, gray fox, and raccoon rabies in the USA (Heymann, 2008). Programs to control raccoon rabies through trap-vaccinate-return (TVR) programs have been successfully implemented in New Brunswick and Quebec. There is a lack of effective oral vaccines for skunks, although a new adenovirus-rabies recombinant vaccine (ONRAB® is showing promise). TVR programs are not appropriate for all species (i.e., bats). Any wildlife control programs would be established in partnership with the Ministry of Environment, Agriculture and other authorities.

Revisions

Date	Change
July 2019	Updated Rabies Immune Globulin formula calculation (pg 13) to reflect the different Rablg product concentrations on the market.
July 2017	Included reference to anti-malarial medications in Table 2 to align with the Saskatchewan Immunization Manual.
April 2017	<p>Incorporated recommendations for CD Subcommittee of Medical Health Officers of Saskatchewan on managing schedule interruptions of early or late doses of rabies post-exposure prophylaxis vaccine.</p> <p>Updated hyperlinks on page 7.</p> <p>Incorporated into new CDC Manual format.</p>

Notification Timeline for Human Rabies Confirmed Cases:

From Lab/Practitioner to Public Health: Immediate.

From Public Health to Saskatchewan Health: Immediate.

Public Health Follow-up Timeline: Immediate.

Information

Table 3 - Case Definition of Human Rabies (Public Health Agency of Canada, 2008)

Confirmed Case	Clinical evidence of illness ¹ with laboratory confirmation of infection: <ul style="list-style-type: none"> • detection of viral antigen in an appropriate clinical specimen, preferably the brain or the nerves surrounding hair follicles in the nape of the neck, by immunofluorescence OR • isolation of rabies virus from saliva, cerebrospinal fluid (CSF), or central nervous system tissue using cell culture or laboratory animal OR • detection of rabies virus RNA in an appropriate clinical specimen.
Probable Case	Clinical evidence of illness ¹ with laboratory evidence: <ul style="list-style-type: none"> • demonstration of rabies-neutralizing antibody titre ≥ 5 (complete neutralization) in the serum or CSF or an unvaccinated person.
Clinical evidence of illness ¹ - Rabies is an acute encephalomyelitis that almost always progresses to coma or death within 10 days after the first symptom.	

Causative Agent

RNA virus classified Lyssaviruses, such as rabies virus, are in the family *Rhabdoviridae* in the genus *Lyssavirus*.

Symptoms

Human Rabies – Onset is generally heralded by a sense of apprehension, headache, fever, malaise and sensory changes (paresthesia) at the site of an animal bite. The most frequent symptoms include excitability, aero-and/or hydrophobia often with spasms of swallowing muscles. Delirium (sudden severe confusion and rapid changes in brain function) with occasional convulsions follows. Such classic symptoms of furious rabies are noted in two-thirds of the cases, whereas the remaining present as paralysis of limbs and respiratory muscles with sparing of consciousness. Phobic spasm may be absent in this paralytic form. Coma and death ensue within 1-2 weeks, mainly due to cardiac failure (Heymann, 2008).

Complications

Illness almost invariably progresses to death. The differential diagnosis of acute encephalitic illnesses of unknown cause with atypical focal neurologic signs or with paralysis should include rabies (American Academy of Pediatrics, 2009).

Incubation Period

The period is highly variable but usually 3-8 weeks; very rarely as short as a few days, or as long as several years. Length of incubation depends in part on wound severity, wound location in relation to nerve supply, and relative distance from the brain; the amount and variant of virus; the degree of protection provided by clothing and other factors.

Period of Communicability

Not well defined for human cases.

Diagnosis

Human rabies diagnosis is made through specific fluorescent antibody (FA) staining of brain tissue or made by specific FA staining of viral antigens in frozen skin sections taken from the back of the neck at the hairline, detection of viral antibodies in serum and CSF, and specific amplification of viral nucleic acids in saliva or skin biopsies by reverse transcriptase PCR (RT-PCR). Serological diagnosis is based on neutralization tests in cell culture or in mice (Heymann, 2008).

Methods of Control/Role of Investigator

Prevention and Education

Refer to the [Vector-Borne and Zoonotic Diseases - Introduction and General Considerations](#) section of the manual that highlights topics for client education that should be considered and as well as provides information on high-risk groups and activities.

Immunization

Pre-exposure vaccination

Vaccinate individuals who are potentially at high risk of contact with rabid animals (e.g., veterinarians, veterinary technicians, animal control staff, wildlife workers, spelunkers, laboratory and field personnel working with rabies virus and travellers to rabies endemic areas where there is poor access to adequate and safe post-exposure management).

These people should consider pre-exposure immunization with either human diploid cell culture vaccine (HDCV) or purified chick embryo cell vaccine (PCECV) (Public Health Agency of Canada, 2006).

Post-immunization serological testing is advisable every 2 years for persons with continuing high risk of exposure, such as certain veterinarians. Those whose titres fall below protective levels (0.5 IU/mL) should receive a pre-exposure booster dose of vaccine (Public Health Agency of Canada, 2006).

Vaccination of Animals

The public should be aware of the benefits of vaccinating animals and take measures to protect their pets or other domestic animals (i.e., horses). The public can also help reduce the spread of rabies through informing authorities when an animal is suspected of having the disease (*The Health of Animals Act*⁶ requires individuals who have knowledge of or who suspects rabies in an animal to notify CFIA). The public can also report animals suspected on having rabies to the provincial rabies hotline number at: 1-844-7-RABIES (1-844-772-2437). The veterinary profession can educate individuals regarding the value of vaccinating pets, and the vaccination requirements for pets travelling to other countries or importing into Canada.

Various wildlife departments are involved in vaccinating wildlife species, surveying the extent of wildlife rabies in certain geographic areas, as well as surveying the extent of rabies in certain species (Canadian Food Inspection Agency, 2009).

Animal Control Measures

The management of rabies in domestic animals falls under the jurisdiction of the Ministry of Agriculture in Saskatchewan as follows:

- The RRAV and private veterinarians investigate all cases of suspected rabies in any domestic animal;
- Ministry of Agriculture veterinarians (including the RRAV) institutes appropriate control actions such as revaccination, observation periods, quarantine or euthanasia of any domestic animal that is known or suspected to have had contact with a rabid animal.

Education

Keeping pets under control, teaching children not to play with wild animals or pets they do not know, keeping a safe distance from wildlife and not trying to raise orphaned or injured wildlife all contribute to preventing rabies (Canadian Food Inspection Agency, 2009). Children should be cautioned against provoking or attempting to capture stray or wild animals and against touching carcasses.

⁶ http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.%2C_c._296/index.html

International travelers to areas with endemic canine rabies should be warned to avoid exposure to stray dogs, and if traveling to an area with enzootic infection where immediate access to medical care and biologicals (e.g., vaccine and immunoglobulin) is limited, pre-exposure prophylaxis is indicated (American Academy of Pediatrics, 2009). Refer to Saskatchewan International Travel Manual for travel-related recommendations.

Pet owners should be reminded of the importance of vaccinating their pets.

Children, pet owners and the general public should be made aware of how to act/ behave around animals such as dogs and cats and be informed how to interpret body language of an animal.

Dog owners should be educated on preventing their animals from biting people.

Personal Protective Measures

It is important for individuals to take appropriate personal protective measures and to use appropriate protective equipment when handling unknown animals or animals that are seemingly unwell. Standards exist for veterinarians and other occupational groups to prevent exposure to rabies and other zoonotic illnesses. Refer to the Western College of Veterinary Medicine (WCVI) infection control manual for details.

Environmental Measures

Inadvertent contact of family members and pets with potentially rabid animals, such as raccoons, foxes, coyotes and skunks, may be decreased by securing garbage and refuse to decrease attraction of domestic and wild animals. Similarly, chimney and other potential entrances for wildlife, including bats, should be identified and covered. Bats should be excluded from human living quarters. Bat exposure is considered to be high-risk. Refer to the following website for more information on bat-proofing human dwellings: <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/09pdf/acs-dcc-07.pdf>.

I. Contacts/Contact Investigation

Contact Definition

Individuals who have had direct contact with the saliva or infectious material of an individual confirmed to have rabies. Routine delivery of health care to a patient with rabies is not an indication for RPEP (Centers for Disease Control and Prevention, 2008).

Contact Management

Rabies post-exposure prophylaxis (RPEP) is indicated for contacts (e.g., household, health care workers) who are reasonably certain they were bitten by the patient or had mucous membrane or non-intact skin directly exposed to potentially infectious saliva or neural tissue (Centers for Disease Control and Prevention, 2008). Refer to [Table 2](#) in Part I – Follow-up of Animal Bites/Exposures for the RPEP regime.

A risk assessment should be conducted for all contacts of a human rabies case and RPEP should be provided as necessary.

Testing/Prophylaxis

Individuals who have been previously vaccinated should be followed as outlined in [Table 2](#) in Part I – Follow-up of Animal Bites/Exposures for the RPEP regime.

Treatment

Rabies has the highest case fatality rate of any infectious disease. There is not proven effective medical treatment for human rabies cases once clinical signs have developed. Provision of rabies vaccine after development of clinical symptoms is not recommended as it may be detrimental to the individual (Centers for Disease Control and Prevention, 2008).

II. Environment

Institutional Control Measures

Human rabies cases do not pose any greater risk of infection to health care workers than more common bacterial or viral infections. Medical staff should adhere to standard and droplet precautions. Staff should wear gowns, goggles, masks, and gloves, particularly during intubation and suctioning (Centers for Disease Control and Prevention, 2008).

Additional precautions, such as wearing face shields when performing higher-risk procedures that can produce droplets or aerosols of saliva (i.e., suction of oral secretions), might be warranted (Centers for Disease Control and Prevention, 2010). Aerosol transmission of rabies has occurred only in laboratory settings.

The Centers for Disease Control and Prevention (2010) identified measures to avoid risk of transmission at autopsy of a suspected rabies cases:

- Require appropriate personal protective equipment including an N95 or higher respirator, full face shield, goggles, gloves, complete body coverage by protective wear, and heavy or chain mail gloves to help prevent injury from instruments or bone fragments.
- Minimize aerosols by using a handsaw rather than an oscillating saw when cutting bone, and by avoiding contact of the saw blade with brain tissue.
- Use a 10% solution of sodium hypochlorite for disinfection of all exposed surfaces and equipment during and after the autopsy.
- If injury or mucous membrane contamination occurs during an autopsy, provide rabies post-exposure prophylaxis.

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Please see the following pages for the Animal Bite Investigation Form.

Animal Bite Investigation Form

**Shaded areas are mandatory for reporting to Saskatchewan Ministry of Health
[Indicates field in iPHIS]**

Please use yyyy/mm/dd for all dates

Date: _____

Client Information

Victim's Name:		<input type="checkbox"/> Male	DOB:
PHN:		<input type="checkbox"/> Female	Age:
Parent/Guardian (if victim is a minor):		Phone number: H: W:	
Mailing Address:	Postal Code:	First Nation:	
Attending Physician or Primary Care Nurse:	Attending Physician/Nurse Phone number:	Date first attended by Physician:	
Previously immunized for Rabies: Yes <input type="checkbox"/> Unknown <input type="checkbox"/> No <input type="checkbox"/>	Date immunization completed:		

Incident & Initial Assessment

Date of Exposure:	Unique Animal ID Number: ¹
Place of Exposure: Name of town/city (if within city limits) OR RM (rural) OR First Nations Community:	
Type of Exposure: ² Bite <input type="checkbox"/> Scratch <input type="checkbox"/> Saliva on intact skin <input type="checkbox"/> Saliva on existing lesion <input type="checkbox"/> Saliva on mucous membranes <input type="checkbox"/> Occupational - Bite <input type="checkbox"/> Occupational - Scratch <input type="checkbox"/> Occupational - Saliva on intact skin <input type="checkbox"/> Occupational - Saliva on existing lesion <input type="checkbox"/> Occupational - Saliva on mucous membranes <input type="checkbox"/> No known contact <input type="checkbox"/> Other <input type="checkbox"/> , specify:	
Type of attack: Provoked <input type="checkbox"/> Unprovoked <input type="checkbox"/> Unknown <input type="checkbox"/>	
Wound Location: Head/Neck <input type="checkbox"/> Face <input type="checkbox"/> Arm <input type="checkbox"/> Hand/Finger <input type="checkbox"/> Torso <input type="checkbox"/> Leg <input type="checkbox"/> Foot/Toe <input type="checkbox"/> Mucosa <input type="checkbox"/> Unknown <input type="checkbox"/> Other <input type="checkbox"/> , specify:	
Animal Species: Dog <input type="checkbox"/> Cat <input type="checkbox"/> Bat <input type="checkbox"/> Cow <input type="checkbox"/> Horse <input type="checkbox"/> Skunk <input type="checkbox"/> Raccoon <input type="checkbox"/> Hog <input type="checkbox"/> Fox <input type="checkbox"/> Other <input type="checkbox"/> , specify:	
Animal Type: Pet (indoor) <input type="checkbox"/> Pet (outdoor) <input type="checkbox"/> Pet (indoor/outdoor) <input type="checkbox"/> Outdoor Farm Animal <input type="checkbox"/> Wild <input type="checkbox"/> Stray <input type="checkbox"/> Unknown <input type="checkbox"/> Animal healthy at time of incident: Yes <input type="checkbox"/> Unknown <input type="checkbox"/> No <input type="checkbox"/>	
Symptoms:	
History of Incident/Exposure:	

¹ This is a unique animal identifier that should be used in each case report on iPHIS that involves the same animal in the following format: <health region 3-4 letter acronym>-<four digit calendar year>-<R to indicate Rabies>-<three digit sequential number beginning at 001> (e.g. SCHR-2007-R-001). This is to be documented in iPHIS in the "Animal Services Incident Number" field.

² Occupational exposures are when the person is exposed through performing job duties (i.e. a mail carrier bitten would not be an occupational exposure, however a veterinarian handling a sick animal would be).

Animal Vaccinated: No <input type="checkbox"/> Unknown <input type="checkbox"/> Yes <input type="checkbox"/> , please provide details/dates:		
Veterinarian:		Vet Phone number:
Owner Name:	Address:	Phone Number H: W:
Observation Following Exposure: No <input type="checkbox"/> Yes <input type="checkbox"/> Where?		Date Observation Completed:
Animal Retention Result: Became ill <input type="checkbox"/> Released <input type="checkbox"/> Natural death <input type="checkbox"/> Destroyed <input type="checkbox"/> Escaped <input type="checkbox"/>		
Brain Sent for Testing? Yes <input type="checkbox"/> Date sent:		No <input type="checkbox"/> Why not?
Primary Lab Results: Positive <input type="checkbox"/> Negative <input type="checkbox"/> Final Lab Results: Positive <input type="checkbox"/> Negative <input type="checkbox"/>		

Immunization Recommendation

Tetanus Indicated? Yes <input type="checkbox"/> No <input type="checkbox"/>
Administered? Yes <input type="checkbox"/> Date: _____ No <input type="checkbox"/> Why not?
Rabies Immune Globulin & Vaccine:
Recommended <input type="checkbox"/> Not recommended <input type="checkbox"/> Unknown at this time <input type="checkbox"/> If recommended, complete immunization record (below)

Date received:	Date MHO Review:	Date sent to CFIA:
----------------	------------------	--------------------

Immunization Information

RIG Dosage: $\frac{[20 \text{ IU/kg} \times \text{Weight in kg}]}{[\text{vaccine IU concentration/mL}]} = \text{_____ mL}$
--

Date:	Site(s)/Amount (ml)	Administered by:
-------	---------------------	------------------

Prior to initiation of Rabies Post Exposure Prophylaxis, all persons must be screened for immunosuppressive disorders which may include: • Asplenia; • Congenital immunodeficiencies involving any part of the immune system; • Human immunodeficiency virus infection (HIV); • Immunosuppressive therapy; • Haematopoietic stem cell transplant (HSCT) recipient; • Islet cell transplant (candidate or recipient); • Solid organ transplant (candidate or recipient); • Chronic kidney disease; • Chronic liver disease including hepatitis B and C; and • Malignant neoplasms including leukemia and lymphoma. (<http://www.ehealthsask.ca/services/manuals/Documents/sim-chapter7.pdf>). **Consultation with the MHO should be done in case of any significant illness or for clarification if a candidate for rabies vaccine may be immunosuppressed due to the clinical condition or therapy.**

Vaccine	Series	Date	Administered by	If series not completed, why not?
	1 st Dose			<input type="checkbox"/> Animal well after observation period <input type="checkbox"/> Animal results negative <input type="checkbox"/> Victim previously immunized <input type="checkbox"/> Victim refused further doses <input type="checkbox"/> Lost to follow-up <input type="checkbox"/> Referred out of province <input type="checkbox"/> Other
	Day 3			
	Day 7			
	Day 14			
	Day 28*			

Remarks (e.g. vaccine reactions):

*Only required for immunocompromised individuals

RETURN COMPLETED FORM TO REGIONAL MHO

Health Region/Authority: _____

Reported by: _____

Job Designation: _____

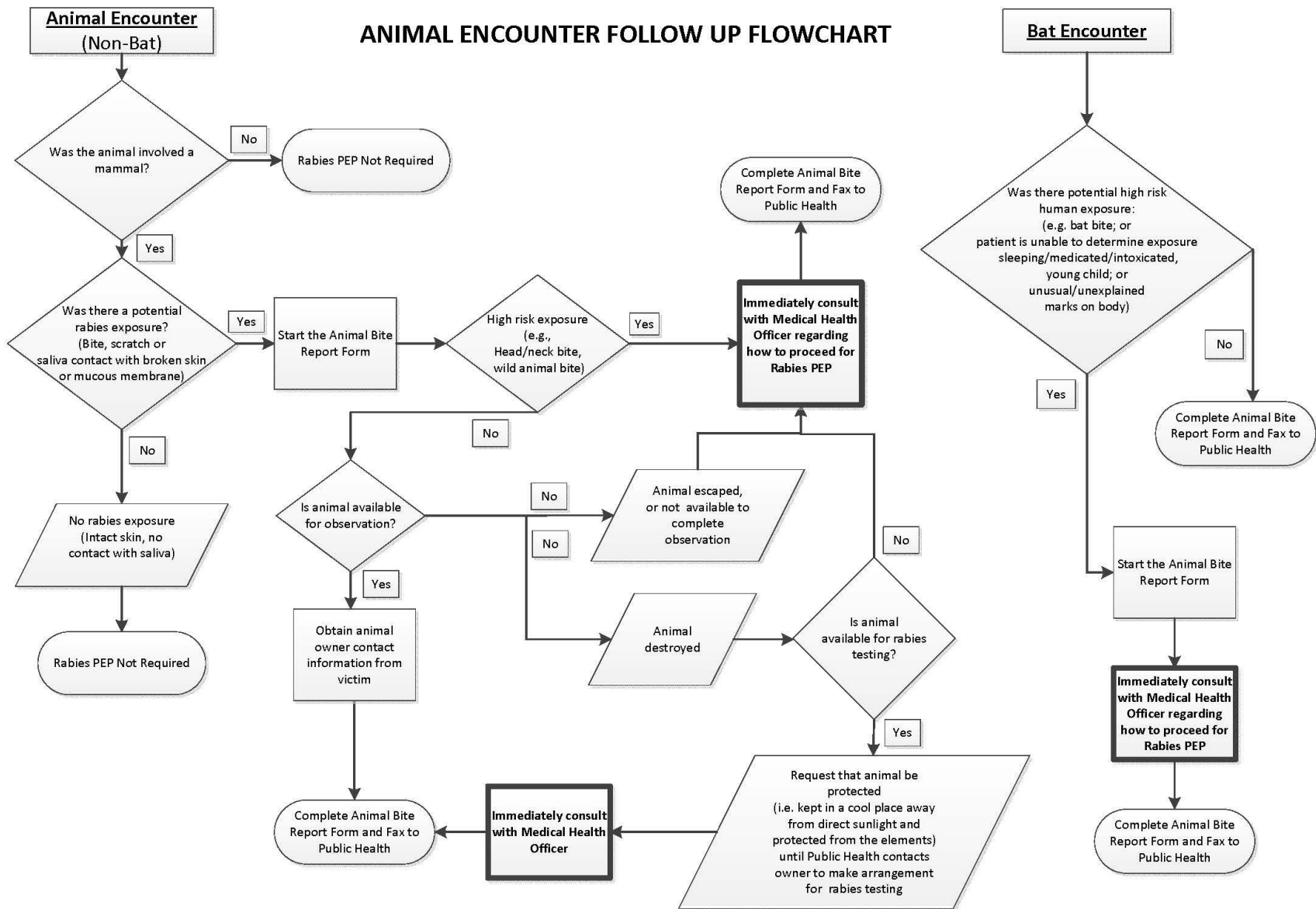
Phone: _____ Fax: _____

MHO or Designate Signature: _____

Date: _____

Please see the following page for the Animal Encounter Follow up Flowchart.

ANIMAL ENCOUNTER FOLLOW UP FLOWCHART



Note: This flowchart is to be used as a general guideline. Please contact the Medical Health Officer directly with specific questions regarding administering Rabies PEP.

Please see the following pages for the Interjurisdictional Referral Following an Animal Exposure form.

Interjurisdictional Referral Following an Animal Exposure

- Action Required: Victim AND Animal Require Follow-Up (Complete All Sections)
- Victim Requires Follow-Up (Referring Jurisdiction complete I and II)
- Status of Animal Required (Referring Jurisdiction complete II and III)
- Assess Other Humans for Exposure (Referring Jurisdiction Complete II and III)
- For Information Only

FROM (Health Region)	TO (Health Region/Jurisdiction)
----------------------	---------------------------------

I. Demographic Details of Exposed Person (Complete only if victim requires follow-up)

Name:	Date of Birth (YYYY/MM/DD):	
Address:	Health Services Number:	
Contact Information		
Home phone :	Cell:	E-mail:

II. Exposure and Assessment Details (Complete in all referrals)

Date of Exposure (YYYY/MM/DD):	Type of Animal:	Body Site/Type of Exposure (eg. head/arm; eg. bite/scratch)
Assessment of Exposure ¹ : <input type="checkbox"/> High Risk Exposure <input type="checkbox"/> Low Risk Exposure		
Has Rabies Post-Exposure Prophylaxis (RPEP) been recommended ?		
<input type="checkbox"/> No <input type="checkbox"/> Yes Date Started (YYYY/MM/DD): _____		
<input type="checkbox"/> Awaiting Animal Observation/Testing Results – Date Expected (YYYY/MM/DD): _____		
<input type="checkbox"/> Assessment Not Completed – Please Assess for Possible Exposure		

III. Contact Information of Owner of Animal (Complete if animal requires follow-up)

Name of Owner:	Relationship of owner to the exposed person:	
	<input type="checkbox"/> Same <input type="checkbox"/> Family Member <input type="checkbox"/> Unknown	
	<input type="checkbox"/> Friend <input type="checkbox"/> Other: _____	
Phone Number(s):	Address:	
Name of Animal:	Type of Animal (eg. dog/cat/other)	Status of Animal:
		<input type="checkbox"/> Alive <input type="checkbox"/> Deceased <input type="checkbox"/> Unknown
Additional details related to the animal (e.g. description of animal) Include rabies status if known:		

IV. Public Health Contact Details – Receiving Agency direct inquiries to:

Name/Title:	Phone Number:
Results of the completed assessment required? <input type="checkbox"/> No <input type="checkbox"/> Yes	
Fax Number:	Fax Attention To:

¹ High Risk (unprovoked, stray animals or animals with unusual behavior, significant exposure); Low Risk (provoked, vaccinated animal or animal known to victim, etc.)

Intramuscular (IM) administration of pre-exposure rabies vaccine is the gold standard, however the World Health Organization (WHO) considers the intradermal (ID) regime an acceptable alternative as it uses less vaccine and produces a comparable degree of protection against rabies (Canadian Immunization Guide, Evergreen).

Due to the precise nature for ID administration and the potential consequences of improper administration, post-immunization antibody titres should be determined at least 2 weeks after completion of ID vaccine series to ensure that an acceptable level of protection has been achieved.

The following scenarios may arise when managing clients who have received 3 doses of pre-exposure ID rabies vaccine at the appropriate intervals as outlined in the Canadian Immunization Guide (CIG)¹. Post-exposure management is outlined for each scenario.

Titre done following ID pre-exposures Rabies vaccine

- 1. Titre conducted at least 2 weeks after the last dose indicates immunity²**
 - **Post-exposure:**
 - Rablg not needed (as per CIG evergreen¹).
 - Give 2 IM doses of rabies vaccine on days 0 and 3.

- 2. Titre conducted at least 4 weeks after 3rd dose and after one additional dose indicates non-immune**
 - **Post exposure:**
 - Give Rablg.
 - Give full post exposure vaccine course (as per [1. Previously Unimmunized Individuals \[Table 2\]](#)).

Titre not done following ID pre-exposures Rabies vaccine

- 1. Routine management when client did not have titre conducted 4 weeks after final dose**
 - **Post-exposure:**
 - take rabies titre.
 - Give Rablg (assuming titre will not be immediately available as it currently takes up to 8 weeks which will be after the entire course is done).
 - Give 2 IM doses of rabies vaccine on days 0 and 3.

¹ <http://www.phac-aspc.gc.ca/publicat/cig-gci/p04-rabi-rage-eng.php>

² at least 0.5 IU/mL by the rapid fluorescent-focus inhibition test

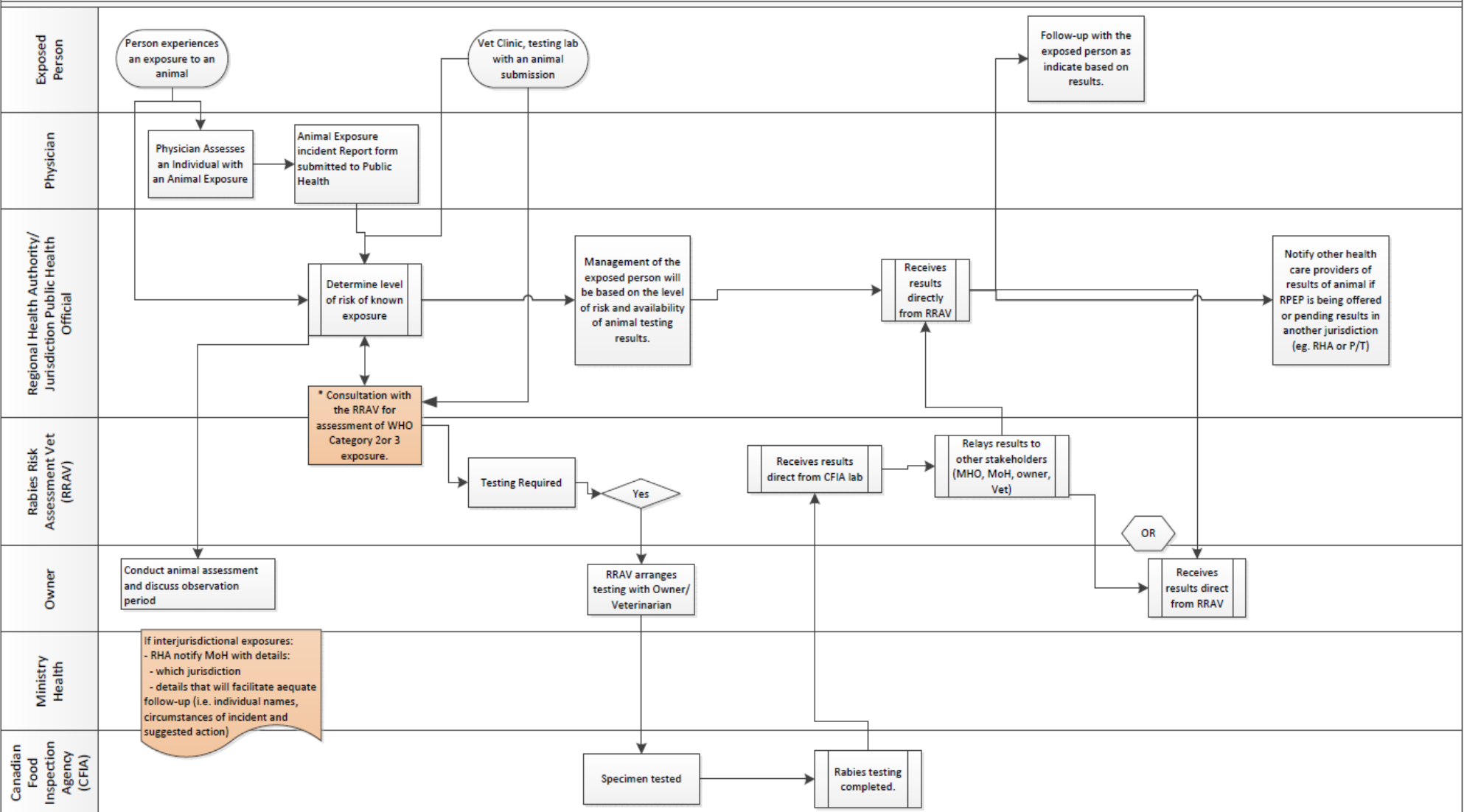
-
-
- Continue series until titre results are received indicating immunity
 - If titre results are not available or are non-immune/suboptimal: complete post-exposure vaccine course (as per [1. Previously Unimmunized Individuals \[Table 2\]](#)).
- 2. Alternate management for low risk exposures if acceptable to the client and the MHO if the following criteria are met.**
- i. No risk factors for a poor response to ID vaccine
AND
 - ii. Risk of rabies in animal is low
AND
 - iii. Likelihood of transmission from exposure is low
AND
 - iv. Other individuals in ID vaccine group were tested and were immune.
- **Post-exposure:**
 - take rabies titre
 - Rablg not needed
 - Give 2 IM doses of rabies vaccine on days 0 and 3.

Individual did not complete the series of pre-exposure ID vaccine

- **Post-exposure:**
 - give Rablg and rabies vaccine (as per [1. Previously Unimmunized Individuals \[Table 2\]](#))

The diagram on the following page highlights the process for consulting with animal health experts in the investigation of human exposures to animal potentially infected with rabies.

Animal Investigation and Testing Consultations



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Notification Timeline:

From Lab/Practitioner to Public Health: As soon as possible (not more than 48 hours)

From Public Health to Ministry of Health:

West Nile Virus Neuroinvasive Disease (WNND) – Within 72 hours.

West Nile Virus Non-Neuroinvasive Disease (WN Non-ND) – Not required.

Public Health Follow-up Timeline:

West Nile Virus Neuroinvasive Disease (WNND) – Within 72 hours.

West Nile Virus Non-Neuroinvasive Disease (WN Non-ND) – Not required.

Information

Case Definitions – West Nile Virus Neuroinvasive Disease (WNND) (Adapted from Council of State and Territorial Epidemiologists, 2013)

Confirmed Case –WNND	Clinical criteria AND at least one of the following laboratory criteria: <ul style="list-style-type: none">• Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, CSF, or other body fluid, OR <ul style="list-style-type: none">• Four-fold or greater change in virus-specific quantitative antibody titers in paired sera OR <ul style="list-style-type: none">• Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or a later specimen OR <ul style="list-style-type: none">• Virus specific IgM antibodies in serum with confirmatory avidity test* in the same or later specimen OR <ul style="list-style-type: none">• Virus-specific IgM antibodies in CSF and a negative result for other IgM antibodies in CSF for arboviruses endemic to the region where exposure occurred.
Probable Case – WNND	Clinical criteria AND the following laboratory criteria: <ul style="list-style-type: none">• Virus-specific IgM antibodies in CSF or serum but with no other testing.

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Clinical Criteria – WNND	<ul style="list-style-type: none"> • history of exposure in an area where West Nile virus (WNV) activity is occurring[†] <p>OR</p> <ul style="list-style-type: none"> • history of exposure to an alternative mode of transmission[‡] <p>AND</p> <ul style="list-style-type: none"> • Meningitis, encephalitis, acute flaccid paralysis, or other acute signs of central or peripheral neurologic dysfunction, as documented by a physician <p>AND</p> <ul style="list-style-type: none"> • Absence of a more likely clinical explanation.
<p>* The presence of both IgM antibody and low avidity IgG in a patient’s convalescent serum sample is consistent with current cases of viral-associated illness. However, test results that show the presence of IgM and high avidity IgG are indicative of exposures that have occurred in the previous season.</p> <p>[†] History of exposure when and where West Nile virus transmission is present, or could be present, or history of travel to an area with confirmed WNV activity in birds, horses, other mammals, sentinel chickens, mosquitoes or humans or other plausible explanation of exposure to infected mosquitoes.</p> <p>[‡] Alternative modes of transmission, identified to date, include laboratory acquired; in utero; receipt of blood components; organ/tissue transplant; and, possibly, through breast milk.</p>	

Case Definition – West Nile Virus Non-Neuroinvasive Disease (WN Non-ND) (Adapted from Council of State and Territorial Epidemiologists, 2013)

Confirmed Case – WN Non-ND	<p>Clinical criteria AND at least one of the following laboratory criteria:</p> <ul style="list-style-type: none"> • Isolation of virus from, or demonstration of specific viral antigen or nucleic acid in, tissue, blood, or other body fluid, excluding CSF <p>OR</p> <ul style="list-style-type: none"> • Four-fold or greater change in virus-specific quantitative antibody titers in paired sera <p>OR</p> <ul style="list-style-type: none"> • Virus-specific IgM antibodies in serum with confirmatory virus-specific neutralizing antibodies in the same or later specimen. <p>OR</p> <ul style="list-style-type: none"> • Virus specific IgM antibodies in serum with confirmatory avidity test* in the same or later specimen
Probable Case – WN Non-ND	<p>Clinical criteria AND the following laboratory criteria:</p> <ul style="list-style-type: none"> • Virus-specific IgM antibodies in serum but with no other testing.

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Clinical Criteria – WN Non-ND	<ul style="list-style-type: none">• history of exposure in an area where West Nile virus (WNV) activity is occurring[†] <p>OR</p> <ul style="list-style-type: none">• history of exposure to an alternative mode of transmission[‡] <p>AND</p> <ul style="list-style-type: none">• fever or chills as reported by the patient or a health care provider <p>AND</p> <ul style="list-style-type: none">• Absence of neuroinvasive disease <p>AND</p> <ul style="list-style-type: none">• Absence of more likely clinical explanation
<p>* The presence of both IgM antibody and low avidity IgG in a patient's convalescent serum sample is consistent with current cases of viral-associated illness. However, test results that show the presence of IgM and high avidity IgG are indicative of exposures that have occurred in the previous season.</p> <p>[†] History of exposure when and where West Nile virus transmission is present, or could be present, or history of travel to an area with confirmed WNV activity in birds, horses, other mammals, sentinel chickens, mosquitoes or humans or other plausible explanation of exposure to infected mosquitoes..</p> <p>[‡] Alternative modes of transmission, identified to date, include laboratory acquired; in utero; receipt of blood components; organ/tissue transplant; and, possibly, through breast milk.</p>	

Case Definition – Asymptomatic Blood Donors (Public Health Agency of Canada, 2008)

<ul style="list-style-type: none">• Demonstration of West Nile Virus-specific nucleic acid amplification test on positive donor screen test result.
<p>Canadian Blood Services perform a nucleic acid amplification test (NAT) on all blood donations to detect all viruses in the Japanese encephalitis (JE) serocomplex – WNV and 9 other viruses, most of which are not endemic to Canada.</p> <p>Confirmatory testing using a WNV-specific NAT is then performed on donor blood that has screened positive..</p>

Canadian Blood Services (CBS) reports all cases of positive blood donors to the regional MHO as per Section 32 of *The Public Health Act*. No follow-up by public health is required on these reports.

Causative Agent

The West Nile virus (WNV) is a single-stranded RNA Flavivirus.

Symptoms

The vast majority of WNV infections are asymptomatic.

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Approximately 20% of persons experience an acute systemic febrile illness that often includes headache, weakness, myalgia, or arthralgia; gastrointestinal symptoms and a transient maculopapular rash also are commonly reported. This form of illness is called WNV non-neuroinvasive disease (previously West Nile non-neurological syndrome)

Less than 1% of infected persons develop WNV neuroinvasive disease (previously West Nile neurological syndrome), which typically manifests as meningitis, encephalitis, or acute flaccid paralysis. For every case of neuroinvasive disease, there are approximately 150 WNV infections.

Meningitis generally presents with fever, headache and nuchal rigidity (neck stiffness).

Encephalitis generally presents with fever and altered mental status, seizures, focal neurologic deficits, or movement disorders such as tremor or parkinsonism.

Acute flaccid paralysis due to WNV is clinically and pathologically identical to poliovirus-associated poliomyelitis. It often presents as an isolated limb paresis or paralysis and can occur with or without fever or apparent viral prodrome. It may progress to respiratory paralysis requiring mechanical ventilation.

WNV-associated Guillain-Barré syndrome and radiculopathy have also been reported.

Rarely, cardiac dysrhythmias, myocarditis, rhabdomyolysis, optic neuritis, uveitis, chorioretinitis, orchitis, pancreatitis, and hepatitis have been described in patients with WNV disease.

Complications

Most persons with WNV non-neuroinvasive disease recover completely, but fatigue, malaise, and weakness can last for weeks or months. Persons with WNV neuroinvasive disease presenting with meningitis generally recover completely but persons presenting with encephalitis or acute flaccid paralysis often have residual neurologic deficits. Among persons with WNV neuroinvasive disease, the overall case-fatality ratio is approximately 10% (U.S. Centers for Disease Control and Prevention, 2013).

Incubation Period

Typically 2 to 6 days, ranging up to 14 days but can be several weeks for immunocompromised individuals (U.S. Centers for Disease Control and Prevention, 2013).

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Reservoir/Source

Wild birds are the predominant reservoir including > 300 different species found in North America. Mammals, including humans, are considered incidental or dead-end hosts because viral concentrations are not high enough to create the infection in mosquito vectors. It is unclear how West Nile virus is maintained in Saskatchewan, but is most likely re-introduced through migrating birds, present in over-wintered or hibernating *Culex* mosquitoes, or maintained in resident bird or other mammal, amphibian, or reptile populations. Squirrels have been implicated as competent reservoirs for WNV in California and other arboreal animals may contribute to maintenance and transmission ecology of WNV in North America (Platt et al. 2008).

Mode of Transmission

Enzootic cycle involving mosquitoes, primarily *Culex* sp., and birds or birds eating other birds. Mosquitoes acquire the virus after feeding on infected birds or to a lesser extent, through transovarial transmission from an infected mother. Viremia in birds tends to peak 1 to 4 days after exposure. The extrinsic incubation period (EIP) of the virus within the mosquito varies and is dependent on temperature and a number of other factors.

The minimum developmental temperature for West Nile virus incubation and replication within the mosquito is 14.3°C and 109 accumulated Degree Days above this base temperature are required to complete the EIP for the virus within the mosquito and for that mosquito to become fully infective and efficiently transmit the virus to another bird, or to a human. The female must complete at least one biting/egg-laying cycle before she can effectively transmit the virus. The EIP can be quite short during warm weather (5-7 days) and quite long (> 2-3 weeks) under cooler conditions.

The risk of transmission to humans increases when there are high numbers of infected “bridge” species (mosquitoes that bite both birds and other animals) such as *Culex tarsalis* and there are hot, humid conditions during the evening and night-time period.

Alternative modes of transmission exist although they are extremely rare. Those identified to date, include laboratory acquired; in utero; receipt of blood components; organ/tissue transplant; and, possibly, through breast milk.

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Risk Groups

- Individuals who work outside or participate in outdoor activities are at higher risk of acquiring infection because of greater exposure to mosquitoes
- Individuals with chronic illnesses, such as cancer, diabetes, hypertension and kidney disease, are at higher risk of serious illness

Period of Communicability

Not applicable.

Specimen Collection and Transport

The following specimens should be submitted on persons presenting with meningitis, encephalitis, acute flaccid paralysis, or other acute signs of central or peripheral neurologic dysfunction (with or without fever) may have West Nile virus (WNV) neuroinvasive disease:

- serum sample for WNV IgM antibodies
- CSF for WNV PCR¹

When a plasma PCR is indicated, send EDTA plasma, separated¹.

With paired sera, convalescent samples should be taken 14 days after the initial sample.

Methods of Control/Role of Investigator

Prevention and Education

Refer to the [Vector-borne and Zoonotic Diseases – Introduction and General Considerations](#) section of the manual that highlights topics for client education that should be considered as well as provides information on high-risk groups and activities. Prevention measures are where the most emphasis should be placed.

Refer to the Government of Saskatchewan website for information on West Nile Virus Awareness and Prevention.²

¹ If the sample can reach SDCL within four hours, send on ice packs. If it will take longer than four hours to reach the SDCL, send the sample frozen on dry ice.

² <http://www.saskatchewan.ca/live/health-and-healthy-living/health-topics-awareness-and-prevention/seasonal-health-concerns/west-nile-virus/west-nile-virus-awareness-and-prevention>

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Surveillance

Various activities to determine the presence and risk of West Nile virus transmission can be undertaken including:

- avian and equine morbidity/mortality surveillance;
- larval and adult mosquito collection and testing;
- surveillance of weather and other environmental risk factors;
- surveillance of human illness locally and in neighbouring provinces/states.

Immunization

- There is no human vaccine currently available.
- Equine (horse) vaccines are available.

Communication/Education

Population health communication strategies should include a combination of risk communication and implementation of environmental and personal protective measures. This information should be disseminated prior to the emergence of mosquitoes and repeated during the summer months as the transmission risk begins to increase.

Key preventative measures include:

Environmental Prevention Measures

- Clean eaves troughs and regularly empty bird baths and other items that might collect water.
- Ensure rain barrels are covered with mosquito screening or are tightly sealed around the downspout.
- Clear yards of old tires or other items that collect water.
- Improve landscaping to prevent standing water around the home.
- Remove decaying debris such as fallen leaves, grass clippings, and dense shrubs that provide shelter for adult mosquitoes.
- Areas with shallow standing water, particularly those with high organic matter content that cannot be drained can be treated with a larvicide to kill mosquitoes in their larval stage.
- Municipal mosquito control programs that use integrated pest management (IGM) principals should be encouraged. These programs include: larval and adult mosquito surveillance, source reduction, larval and in some cases, adult mosquito control, and public education.

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-
-
- Refer to Government of Saskatchewan handout “[West Nile Virus and Your Property](#)”³.

Personal Protective Measures

- Wear loose fitting, light color clothing that covers as much exposed skin as possible.
- Reduce the amount of time spent outdoors during times when mosquito activity is the greatest (between dusk and dawn).
- Individuals who are highly active with outdoor activities or who work outdoors can be at greater risk of infection.
- Use DEET containing personal insect repellents on exposed skin. Refer to the Government of Canada website for guidelines on DEET use: <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/insect-eng.php>. Repellents with Icaridin and oil of eucalyptus are also effective. See Health Canada website for more information: <http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/life-vie/insect-eng.php>
- Maintain door and window screens so they fit tightly and are free of holes.
- Refer to Government of Saskatchewan brochure “[Protect Yourself: West Nile Virus](#)”³

Management

I. Case

History

Physicians are required to report to Public Health if:

- the patient is a donor or recipient of blood or blood products or is a tissue recipient
- the patient has clinical presentation of neuroinvasive disease

Human case investigation will be performed by the attending physician and Public Health. Information collected includes:

- clinical manifestation;
- clinical information (onset dates, hospitalization, outcome of illness, etc.);
- travel history;
- history of suspected exposures/mode of transmission;
- blood/plasma donor or recipient or tissue recipient information.

³ <http://www.saskatchewan.ca/live/health-and-healthy-living/health-topics-awareness-and-prevention/seasonal-health-concerns/west-nile-virus/west-nile-virus-awareness-and-prevention>

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See Attachments:

- [Physician Reporting Form for West Nile Virus](#);
- [West Nile Virus Case Investigation Form](#);
- [Decision-Making Algorithm for Notification](#).

Treatment/Supportive Therapy

Supportive therapies only. Clinical trials to evaluate proposed treatments are ongoing.

Immunization

Not applicable.

Exclusion

There is a deferral period for donating blood or blood products to Canadian Blood Services (CBS). CBS should be contacted directly for detailed information.

Referrals

CBS is to be notified when a case has identified any history of receiving or donating blood or blood products. See [Appendix K – Notification to Canadian Blood Services](#) for the template form for making these referrals.

The Saskatchewan Transplant Program is to be notified when a case has identified receiving a tissue transplant in the 8 weeks prior to onset of symptoms. See [Appendix M – Notification to Saskatchewan Transplant Program](#) for the template form for making these referrals.

II. Contacts/Contact Investigation

Contact Definition

Not applicable.

III. Environment

See [Environmental Prevention Measures](#) above. Refer to the Government of Saskatchewan website for information on mosquito control.⁴

⁴ <http://www.saskatchewan.ca/live/health-and-healthy-living/health-topics-awareness-and-prevention/seasonal-health-concerns/west-nile-virus/west-nile-virus>.

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The risk of human disease is calculated weekly according to an empirical risk assessment framework using numbers of vector mosquitoes, infection rates, age structure of the mosquito population, human population at risk, and other surveillance indicators (bird, horse, human, and environmental risk factors such as degree day accumulations, night-time temperatures, amount of mosquito habitat, etc.). The risk assessments help guide the WNV response in terms of risk communication, mosquito control, and other prevention activities.

Dead birds are a potential source of transmission however the risk is minimal. Special handling considerations are required for all dead animals regardless of suspected WNV infection. The following procedure should be used:

- Do not handle the bird, its blood, or secretions with bare hands.
- If possible, use a shovel to handle the carcass and bury it if a location is convenient.
- Use durable plastic gloves or, at minimum, several plastic bags. Bags should be inverted prior to grabbing the animal. Fold the bag back around the carcass so it ends up inside.
- Take care not to grab the claws or beak or allow these parts to puncture the bag or gloves.
- Double bag the carcass and tie it off tightly. The animal can be disposed of with municipal waste.
- Once disposed of, wash hands thoroughly.

Larval Mosquito Control

Larviciding is the application of chemical/biological agents to areas where mosquito larvae are present. Thorough identification of larval development sites is critical to a successful larviciding program.

Adult Mosquito Control

During periods of high transmission risk determined from thorough analysis of the surveillance and environmental risk factors, targeted adult mosquito control may be considered as part of the WNV response program. This is used to quickly reduce the number of infected mosquitoes in an area and to break the transmission cycle.

Reduction of Occupational Exposures

- Steps to limit occupational exposure to the West Nile virus can be taken by applying the general prevention strategies to worksites and workplaces.

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- Refer to “Protecting Outdoor Workers from West Nile Virus” available at <http://www.lrws.gov.sk.ca/ohs-booklets-brochures-guides>.

Child Care Centre Control Measures

- Considerations to minimize exposure to mosquitoes should be given to children playing outside or taken on field trips.
- Openable windows in child care centres should have tight fitting screens to prevent insect entry.
- See [Prevention and Education](#) above.

Institutional Control Measures

- Staff within institutional settings should be aware of the signs and symptoms of West Nile virus infection so residents, particularly those with compromised immune systems can be assessed medically without delay.
- Openable windows should have tight fitting screens to prevent insect entry.
- See [Prevention and Education](#) above.

Epidemic Measures

- Public education regarding prevention activities is essential.
- Chemical/biological control of mosquitoes in larval and adult stages should be maintained or increased during epidemic periods.
- Immunize livestock.
- Refer to Government of Saskatchewan website for information on WNV risk.⁵

⁵ <http://www.saskatchewan.ca/live/health-and-healthy-living/health-topics-awareness-and-prevention/seasonal-health-concerns/west-nile-virus/west-nile-virus>

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West Nile Virus

Attachment – Physician Reporting Form for West Nile Virus

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Please see the following pages for the Physician Reporting Form for West Nile Virus.

The following form must be completed within 48 hours of receiving positive laboratory reports (eg. IgM, PCR) for WNV for either:

- Individuals with a history of:
 - Donation of blood or blood products to Canadian Blood Services in the 2 weeks prior to onset of symptoms;
 - Receipt of blood or blood products within the 8 weeks before onset of symptoms;
 - Receipt of tissue within the 8 weeks before onset of symptoms

OR

- Individuals with neuroinvasive disease and the absence of a more likely explanation

Physician Reporting Form for West Nile Virus

Report to public health within 48 hours if the criteria in Section C or D apply.

SECTION A. PATIENT INFORMATION

Health card number (PHN): _____

Last name: _____ First name: _____

DOB: ____/____/____ (yyyy/mm/dd) Phone: (____) _____

Address: _____

SECTION B. EVIDENCE OF INFECTION

Laboratory evidence of West Nile Virus infection? No Yes

Indicate onset date for first sign/symptom: ____/____/____ (yyyy/mm/dd)

Symptoms: _____

SECTION C. BLOOD/TISSUE DONOR OR RECIPIENT

Has this individual received a blood transfusion/blood product in the 8 weeks prior to onset of symptoms? No Yes

Has this individual donated blood in the 2 weeks prior to the onset of their symptoms? No Yes

Has this individual received a tissue in the 8 weeks prior to the onset of their symptoms? No Yes

SECTION D. NEUROINVASIVE DISEASE

Check the appropriate manifestation of West Nile Neuroinvasive Disease:

Meningitis Encephalitis Acute Flaccid paralysis

Other acute signs of central or peripheral neurologic dysfunction

Hospitalized? No Yes Where: _____

Deceased? No Yes Date of Death: ____/____/____ (yyyy/mm/dd)

Has a more likely explanation of illness has been ruled out (i.e. stroke)? No Yes

Physician (Please print or stamp)

Phone number

Date (yyyy/mm/dd)

Fax the completed form back to <health region confidential fax number goes here>

An electronic version of the form can be obtained <http://www.ehealthsask.ca/services/manuals/Documents/4-150-WNV-Physician-Reporting-Form.doc>

West Nile Virus

Attachment – WNV Case Investigation Form

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Please see the following pages for the West Nile Virus Case Investigation Form.

West Nile Virus Case Investigation Form

Data should be entered and updated in iPHIS immediately. Saskatchewan Ministry of Health will take the information from iPHIS.

The bolded data fields with asterisks are mandatory for surveillance. The shaded, bolded and bracketed information indicates where the data is entered in iPHIS. Please use yyyy/mm/dd for all dates.

SECTION A. PATIENT INFORMATION (*Demographics Module*):

1. ***Health card number (PHN):** _____
2. ***Last name:** _____
3. ***First name:** _____ **Middle name:** _____
4. ***Date of birth:** ____/____/____ (yyyy/mm/dd) 5. ***Age:** _____ 6. ***Sex:** Male Female
7. ***Street Address OR Legal Land Description:** _____
 Apartment number: _____
8. ***City/town:** _____ 9. ***Postal code:** [][][][][][]
10. Telephone number: Home (____) ____-____ 11. Work (____) ____-____
12. ***If the primary residence is on a First Nations reserve enter in First Nations section** Yes No
(First Nations, Status)
13. Attending physician: _____ 14. Physician phone number: (____) ____-____

SECTION B. CASE MANIFESTATION:

(Please consult the Case Definitions for West Nile virus (WNV) in the [Vector-borne and Zoonotic Diseases – West Nile Virus](#) section of the Saskatchewan Communicable Disease Control Manual for explanation of these categories), *The Case Status or Manifestation in iPHIS should be updated if further available information warrants.*

15. Identify case manifestation in table below. (*CD Module/Case tab/Subtype field*)

*Manifestation – as per the attending physician	
West Nile Virus Neurological Disease (to be used for reporting West Nile Virus Neuroinvasive Disease(WNND))	<input type="checkbox"/>
West Nile Virus Non-Neurological Syndrome (to be used for reporting West Nile Virus Non-Neuroinvasive Disease (WN Non-ND))	<input type="checkbox"/>
Asymptomatic (to be used for documenting Asymptomatic Blood Donors)	<input type="checkbox"/>

16. ***Date lab specimen was collected:** ____/____/____ (yyyy/mm/dd) (*Lab Module*)

SECTION C. CLINICAL INFORMATION:

17. ***Onset date of signs and symptoms** ____/____/____ (yyyy/mm/dd) **confirmed by the attending physician** (*CD Module/Signs&Symp*)

Signs and Symptoms must be documented when WNND is reported. These symptoms MUST be related to WNV infection or have worsened in a case with a previous underlying neurological condition.

- | | | |
|---|---|--|
| <input type="checkbox"/> Fever ($\geq 38^{\circ}\text{C}$ or 100°F) | <input type="checkbox"/> Facial paralysis | <input type="checkbox"/> Movement disorders |
| <input type="checkbox"/> Acute demyelinating encephalomyelitis | <input type="checkbox"/> Fatigue | <input type="checkbox"/> Myalgia |
| <input type="checkbox"/> Acute Flaccid Paralysis | <input type="checkbox"/> Headache | <input type="checkbox"/> Optic neuritis |
| <input type="checkbox"/> Arthralgia | <input type="checkbox"/> Lymphadenopathy | <input type="checkbox"/> Parkinson-like symptoms |
| <input type="checkbox"/> Encephalitis | <input type="checkbox"/> Maculopapular rash | <input type="checkbox"/> Peripheral neuropathy |
| | <input type="checkbox"/> Meningitis | <input type="checkbox"/> Polyradiculopathy |

18. If the patient is of childbearing age, is she **pregnant**? Yes No Not asked (*CD Module/Risks – Medical Risk*)

19. ***Hospitalized:** Yes No (*CD Module/Outcome*) Hospital name: _____

20. Date of admission: ____/____/____ (yyyy/mm/dd) 21. Date of discharge: ____/____/____ (yyyy/mm/dd)

22. ***Outcome of illness (at time of interview):** (*CD Module /Outcome*)

- | | |
|--|-------------------------------------|
| <input type="checkbox"/> Alive | <input type="checkbox"/> Recovered |
| <input type="checkbox"/> Deteriorating | <input type="checkbox"/> Recovering |
| <input type="checkbox"/> Fatal *Date of death ____/____/____
(yyyy/mm/dd) | <input type="checkbox"/> Stable |

23. ***If Died, how did West Nile Virus relate to the cause of death:** (*CD Module /Outcome*)

- Underlying cause of death
- West Nile Virus contributed to the death, but was not the underlying cause
- West Nile Virus did not contribute to the death, and was an incidental finding
- Unknown

SECTION D. TRAVEL HISTORY: (*CD Module/Exposure*)

24. ***Ask this question for ALL cases with onset of symptoms prior to July 31. If the onset of symptoms is on July 31 or later, ask only for cases with an out-of-province travel history.**

In the 10 days before onset of symptoms, was there travel to an area in Canada or the USA where WNV is currently active, or to the tropics where other flavivirus diseases exist (e.g., Dengue)?

- No Yes If yes, where _____

Exposure Category	Case Event/Location	Comments
<input type="checkbox"/> Travel inside province	Location by health region:	Further details if available:
<input type="checkbox"/> Travel outside province/country	Type province/state/country:	Further details if available

25. For health regions wishing to evaluate the effect of larvaciding in their jurisdiction, ask this question:

In the 10 days before onset of symptoms, name the places where you spent your early mornings or evenings out of doors (e.g., name of lake, golf course, park, sports field)?

*SECTION E. 23. Likely mode of transmission (<i>CD Module/Exposure</i>)	Check those that apply
Mosquito bite	<input type="checkbox"/>
Non-Mosquito transmission, including:	<input type="checkbox"/>
Blood transfusion recipient (After 1985) NOTE - use this category for tissue recipients as well)	<input type="checkbox"/>
Blood product recipient (After 1985)	<input type="checkbox"/>
Breastfed Infant	<input type="checkbox"/>
Infant born to case	<input type="checkbox"/>
Laboratory-acquired infection	<input type="checkbox"/>
Occupational Exposure (Medical) or Occupational Exposure (Non-Medical) If Yes, please specify:	<input type="checkbox"/>

*SECTION E. 23. Likely mode of transmission (CD Module/Exposure)	Check those that apply
Exposure to birds 10 days prior to symptom onset If Yes, please specify:	<input type="checkbox"/>
Other, please specify:	<input type="checkbox"/>

SECTION F. BLOOD/PLASMA DONORS AND RECIPIENTS

If patient/client was a *donor* and/or *recipient* of blood/plasma/blood components, **local public health will notify the Canadian Blood Services using the referral form in the CDC Manual - <http://www.ehealthsask.ca/services/manuals/Documents/AppendixK.pdf>.**

Blood, plasma or blood components	Donated in past 2 weeks?	Received in past 8 weeks?	Date: ____/____/____ (yyyy/mm/dd)
	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	City: _____ Prov/Territory: _____

SECTION G. TISSUE RECIPIENTS

If patient/client was a *recipient* of a tissue as defined below, **local public health will notify the Saskatchewan Transplant Program using the referral form in the CDC Manual - <http://www.ehealthsask.ca/services/manuals/Documents/AppendixM.pdf>.**

Tissues	Indicate the tissue the client received below:	Received in past 8 weeks?	Date: ____/____/____ (yyyy/mm/dd)
	<input type="checkbox"/> bone <input type="checkbox"/> skin <input type="checkbox"/> tendon <input type="checkbox"/> cornea <input type="checkbox"/> heart valve <input type="checkbox"/> sclera	<input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> Unknown	City: _____ Prov/Territory: _____

Investigator's signature: _____

Date of interview: ____/____/____ (yyyy/mm/dd)

Date entered to iPHIS: ____/____/____ (yyyy/mm/dd)

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Attachment – Decision Making Algorithm for Notification

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