



**COMMUNICABLE DISEASE CONTROL  
REPORTABLE ZONOSSES GUIDELINE**

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## 1. INTRODUCTION

### 1.1. Preamble

Some zoonotic diseases in animals<sup>1</sup> can cause severe illness or outcomes in humans and are largely preventable. Sharing information about cases of zoonotic diseases in animals between animal health and public health professionals can improve our understanding and control of these diseases.

Two BC Acts facilitate this: the 2008 revised Public Health Act regulated the reporting of infected things (including animals) to public health authorities and the 2014 Animal Health Act regulated the reporting of an infected or exposed animal (including zoonotic diseases) to the Chief Veterinary Officer (CVO). An Information Sharing Agreement enables the CVO to share reports on zoonotic diseases in animals to the Provincial Health Officer (PHO) or delegate and on to Medical Health Officers (MHOs).

The sharing of information about human zoonotic disease cases and/or clusters by public health authorities with animal health authorities can also improve our understanding and control of these diseases in animals and should be endeavoured.

<sup>1</sup> Animals include mammals, birds and fish.



The intended audience for this guideline are: public health professionals, including the PHO and BCCDC, MHOs and EHOs; veterinarians in BC; veterinary diagnostic laboratories, including private and government operated, in BC and outside BC; the Ministry of Agriculture, including the CVO and Animal Health Centre staff, wildlife professionals; and others who may have a role to play in ensuring the protection of public health and the promotion of the “One World, One Health” concept.

## **1.2. Goals and Principles**

### **1.2.1 Goals**

The goals of this guideline are to:

- Identify the zoonotic diseases in animals with potential public health significance in BC
- Provide background information on each disease
- Outline a process for reporting of these diseases
- Facilitate communication between the veterinary and public health professions
- Outline a public health response for each of the zoonotic diseases

### **1.2.2 Principles**

The guiding principles for this document include:

- Clear response guidelines for public health professionals
- Facilitate the participation of and collaboration between all partners in the process of reporting and responding to a zoonotic disease in an animal

### **1.3. Zoonotic diseases in animals reportable to public health authorities**

- Anthrax (*Bacillus anthracis*)
- Bovine Spongiform Encephalopathy
- Brucellosis (*Brucella abortus, melitensis, suis*)
- Chlamydiosis (*Chlamydochloa psittaci*), known as Psittacosis in humans
- Influenza A in swine
- Influenza H5 and H7
- Plague (*Yersinia pestis*)
- Q fever (*Coxiella burnetii*)
- Rabies
- Trichinosis (*Trichinella spiralis*)
- Tuberculosis (*Mycobacterium bovis, tuberculosis*)
- Tularemia (*Francisella tularensis*)
- West Nile Virus
- Zoonotic Viral Hemorrhagic Fevers<sup>2</sup>

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<sup>2</sup> Zoonotic viral hemorrhagic fevers and rabies are the only two diseases for which both clinical and laboratory-confirmed cases should be reported. All other listed diseases are reported only if laboratory-confirmed.



- New or unusual animal diseases or disease clusters with potential public health significance

Each of these diseases, except “new and unusual” is described in greater detail in its own section along with the recommended public health response, as approved by the BC Communicable Disease Policy Advisory Committee.

### **1.3.1 New or unusual animal diseases or disease cluster with potential public health significance**

This category includes other zoonotic or potentially zoonotic diseases in animals that

- have never or rarely been observed in BC (new or emerging) or
- appear in a new species or show evidence of higher pathogenicity than expected (unusual) or
- appear in a higher than expected number of animals clustered in time or space (cluster)

### **1.3.2 Other non-reportable zoonotic diseases in animals**

Animal zoonotic diseases that are not included in the list under 1.3 do not need to be reported. If uncertain, the veterinarian or laboratory can discuss with the CVO and /or local public health unit. As with all cases of animal zoonotic diseases, the veterinarian should inform the animal owner of the zoonotic potential and refer the owner to their health care provider or local public health unit for further information.

## **1.4. Reporting Authority**

This document details the reporting of animal cases of zoonotic diseases to public health authorities. It is not the definitive source of information for reporting to animal health authorities.

Reporting of animal cases of zoonotic diseases will be governed by the Reportable and Notifiable Disease Regulation, pursuant to the BC Animal Health Act [2014]<sup>3</sup>. Reports will be made to the CVO who in turn will share the reports with the PHO or delegate under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

If necessary, a veterinarian may disclose information in a client’s record directly to a Medical Health Officer or Environmental Health Officer under the College of Veterinarians of BC Bylaws, Appendix A-Code of Ethics, s. 91, ‘Disclosure of Information’<sup>4</sup>.

<sup>3</sup> The Animal Health Act can be found at: [http://www.leg.bc.ca/40th2nd/3rd\\_read/gov19-3.htm](http://www.leg.bc.ca/40th2nd/3rd_read/gov19-3.htm). The list of provincially reportable animal diseases can be found at: [http://www.bclaws.ca/civix/document/id/complete/statreg/7\\_2015](http://www.bclaws.ca/civix/document/id/complete/statreg/7_2015)

<sup>4</sup> The CVBC bylaws can be found here: [http://www.cvbc.ca/temp/201441863825/Bylaws\\_App\\_A\\_-\\_Code\\_of\\_Ethics\\_Oct\\_091.pdf](http://www.cvbc.ca/temp/201441863825/Bylaws_App_A_-_Code_of_Ethics_Oct_091.pdf) ).



The animal diseases addressed in these guidelines are also reportable to animal health agencies in Canada:

- All the zoonotic diseases in animals reportable to public health authorities are reportable to the CVO under the provincial Reportable and Notifiable Disease Regulation, Animal Health Act<sup>3</sup>.
- The federal Reportable Diseases Regulations, Health of Animals Act lists<sup>5</sup>:
  - Reportable diseases (including anthrax, avian influenza, bovine spongiform encephalopathy, bovine tuberculosis (*M. bovis*), brucellosis, rabies and trichinosis). Animal owners, veterinarians, wildlife professionals and laboratories are required to immediately report an animal that is infected or suspected of being infected with one of these diseases to a CFIA district veterinarian. This is the only category of diseases which triggers a response from CFIA.
  - Immediately notifiable diseases (including avian chlamydiosis and West Nile fever); these are usually laboratory-confirmed. Laboratories are required to contact the CFIA regarding the suspicion or diagnosis of one of these diseases. These are reported to OIE.
  - Annually notifiable diseases (including Q fever and tularemia). These are diseases for which Canada must submit an annual report to the OIE indicating their presence within Canada.

### 1.5. Reporting Process

The reporting process depends on the disease.

#### 1.5.1 Rabies: both suspect and confirmed rabies cases are reportable (fig 1)

- Any person aware of a potentially rabid animal should
  1. Question whether human contact has occurred; if so, the human should be referred to the MHO in the local HA for assessment of exposure to rabies. The MHO should refer any exposed person who has an exposed animal to their veterinarian as well.<sup>6</sup>
  2. Question whether domestic animal contact occurred; if so, the domestic animal should be referred to a veterinarian for assessment of exposure to rabies.

Both of these questions and processes should occur but the priority is to assess and manage human exposures.

- A veterinarian who suspects a domestic animal was exposed to a rabid animal should
  1. Consult with the BCCDC Public Health Veterinarian

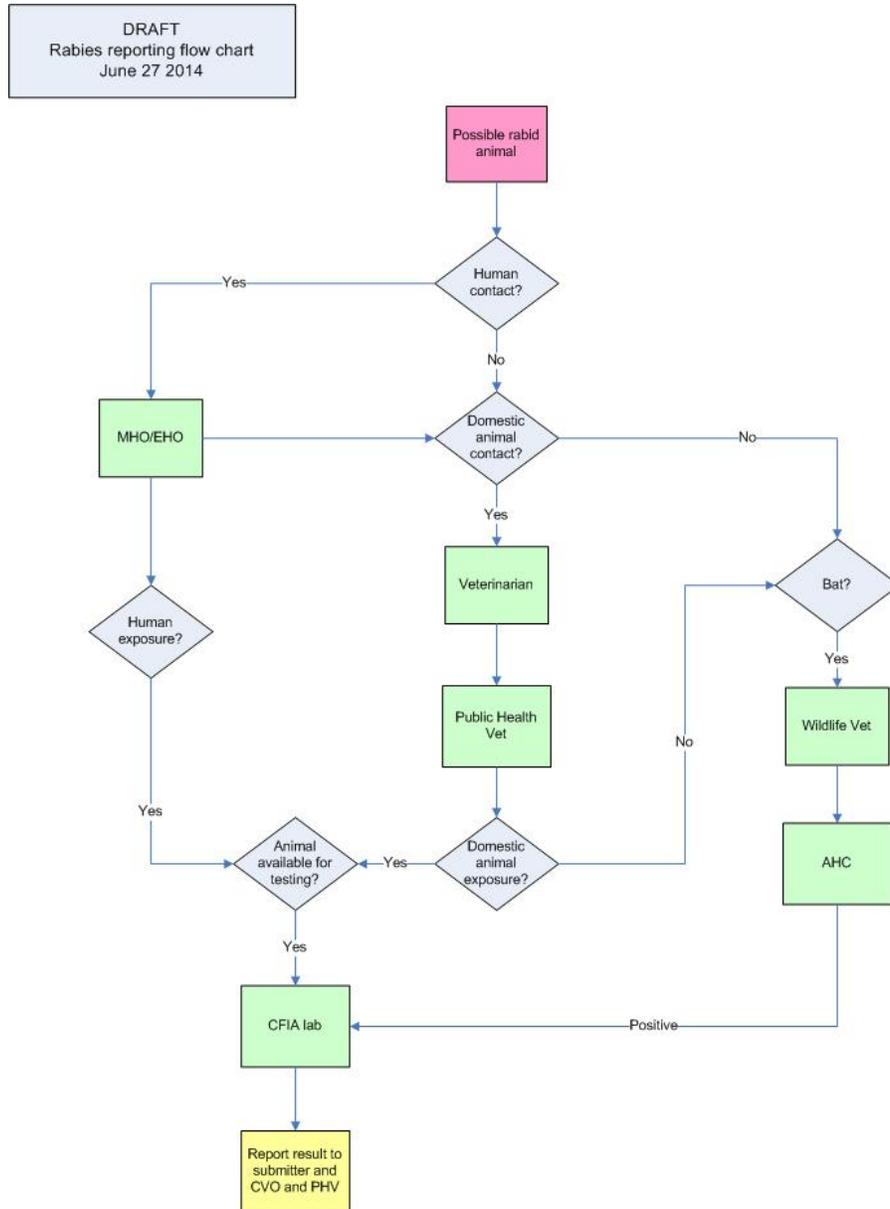
<sup>5</sup> The list of federally reportable and notifiable animal diseases can be found at: <http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/eng/1300388388234/1300388449143>.

<sup>6</sup> Public health authorities may consult the diagnosing or treating veterinarian, Public Health Veterinarian or any other animal health professional and the animal owner for information on the animal case and further advice, as appropriate.



2. Conduct a risk assessment
  3. If needed/available, submit the potentially rabid animal for testing to the CFIA lab and cc the BCCDC
  4. The CFIA lab will report results to the submitter; in addition, the CFIA lab will report positive results to the CVO and PHV
- If no human or animal contact occurred and the potentially rabid animal is a bat, the MHO, vet or other person may consult with the wildlife veterinarian. Bats are being screened for rabies and other diseases at the AHC. Other wildlife and domestic animals that may be rabid but have not had contact with or exposed a human or domestic animal may also be tested at the AHC upon consultation with the AHC.

Fig 1. Reporting of animal cases of rabies

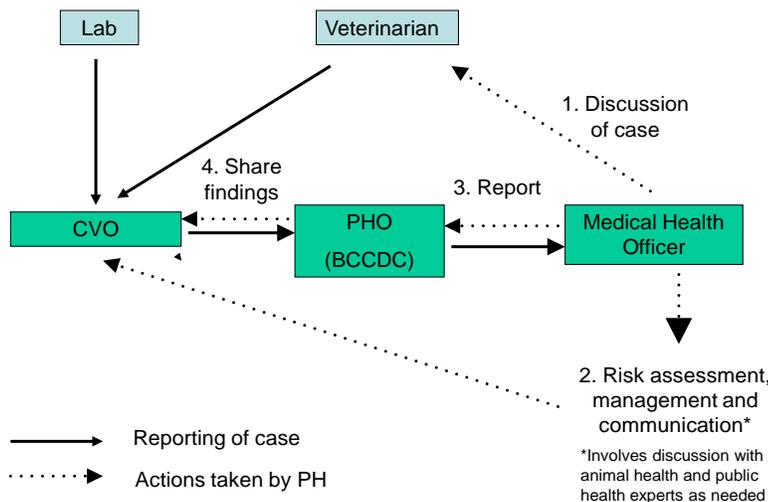


**1.5.2 All other diseases (fig 2)**

A person such as a veterinarian, producer, owner, wildlife professional (biologist, conservation officer or enforcement staff) or other member of the public who suspects a disease in an animal submits a specimen to a private or government laboratory. A BC laboratory diagnosing a reportable zoonotic disease in an animal would be required to report. A laboratory outside BC would report the result to the submitter, usually a veterinarian, who would be required to report.

- Diagnosing laboratory and/or veterinarian who receives a lab confirmation reports to CVO
- CVO report to PHO (BCCDC)
- PHO (BCCDC) reports to MHO
- MHO
  - contacts veterinarian<sup>5</sup> and/or owner to discuss case
  - takes action as needed
  - reports collected information to PHO (BCCDC)
- PHO (BCCDC) shares findings with CVO

Fig 2. Reporting of animal cases of other zoonotic diseases



### 1.5.3 Description of roles

The BC Animal Health Act Section 20 (1) states that mandatory reporting is conducted by:

- (a) a person responsible for an animal or for an animal product or byproduct;
- (b) an inspector, a veterinarian and a person responsible for administering a laboratory, acting in the course of his or her duties.

#### Owner

Any person who is responsible for an animal should consult a veterinarian and report to the CVO if they suspect the animal is infected with a reportable zoonotic disease. This includes animal owners, wildlife professionals, members of the public and others.

The animal's owner is responsible for the animal and its welfare care (see 8.0). In the case of wildlife or stray animals, the federal, provincial or local government is responsible for the animal. If the owner does not fulfill his/her responsibility to this effect, the Prevention of Cruelty to Animals Act may apply and lead the SPCA to



obtain a warrant to seize the animal. In the case of certain species-disease combinations (e.g. bovine tuberculosis), the CFIA is responsible for managing the animal disease. This responsibility is outlined for each of the reportable diseases.

### Veterinarian

The veterinarian should assess the history and examine the animal if possible and obtain and submit appropriate specimens to a laboratory. If the veterinarian obtains a lab-confirmation of a reportable zoonotic disease (see 3.1), he/she must report this to the CVO. In the case of rabies, the veterinarian reports suspect cases to the Public Health Veterinarian (see Figure 1).

If the veterinarian diagnoses any zoonotic disease in an animal, they must tell the owner the diagnosis and the fact that it is zoonotic and recommend they see their health care provider for more information or diagnosis and treatment. If the zoonotic disease is reportable to public health authorities, the veterinarian should tell the owner that the veterinarian has a duty to report the case to public health authorities and public health authorities will contact them to discuss the public health risk.

### Laboratory, CVO, PHO and BCCDC

Laboratories must also report to the Chief Veterinary Officer (CVO) or designate zoonotic diseases in animals which are reportable to public health authorities (see 3.1). The CVO reports case information and any other relevant information (see 5.1) to assist in the risk assessment to the Provincial Health Officer (PHO) or designate (BCCDC). BCCDC reports to the regional Medical Health Officer (MHO).

### MHO

The MHO or designate is responsible for investigating and addressing the public health risk (Figure 1 and 2). The MHO or designate should consult with the veterinarian and/or other animal health authorities to obtain further information about the case, disease, transmission risk and local epizootology (i.e. how common this disease is in this species/time of year/location) in order to inform the risk assessment, management and communication. Refer to Appendix 1 for suggested questions to ask the veterinarian or animal health authorities. The CVO or animal health authorities will provide as much relevant information as possible to assist public health authorities. The MHO or designate can also consult with BCCDC as needed.

Animal diagnostic information and farm (business) information is confidential and should be protected as per the Animal Health Act and FIPPA. If there is a compelling public health need to publicly disclose such information, the MHO or designate will inform the owner, the veterinarian and the CVO ahead of time.

Animal diagnosis and treatment decisions are the purview of veterinary medicine. The diagnosis and treatment of a particular animal is the responsibility of that animal's

veterinarian. If further diagnostic information is required by public health authorities, this should be discussed with and organized through a veterinarian.

If public communications or communications with the veterinary profession or animal producers are required, public health authorities will inform and/or coordinate messaging with the CVO or animal health authorities beforehand.

The MHO or designate should, when appropriate, report relevant findings to the BCCDC (on behalf of the PHO) which should, in turn, report non-personal information to the CVO.

### 1.6. Reporting Timing

An effort will be made to report cases as promptly as possible during and after working hours to ensure rapid public health risk assessment and management. All positions that receive notifications in the reporting process have an on-call system that allows them to be reached after hours.

The following diseases need to be reported **immediately**<sup>7</sup> upon diagnosis:

- Rabies (suspect and confirmed)
- Influenza H5 and H7
- Zoonotic viral hemorrhagic fevers

The following diseases need to be reported **within 24h**<sup>7</sup> of diagnosis:

- Anthrax (*Bacillus anthracis*)
- Bovine Spongiform Encephalopathy
- Chlamydiosis (Psittacosis in humans - *Chlamydochila psittaci*)
- Brucellosis (*Brucella abortus, melitensis, suis*)
- Influenza A in swine
- Plague (*Yersinia pestis*)
- Q fever (*Coxiella burnetii*)
- Tuberculosis (*Mycobacterium bovis, tuberculosis*)
- West Nile Virus
- Trichinosis (*Trichinella spiralis*)
- Tularemia (*Francisella tularensis*)
- New or unusual animal diseases or disease clusters with potential public health significance

### 1.7. Reporting and recording

Reporting of animal cases and information should be done:

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<sup>7</sup> This timeframe includes all steps in the reporting process, i.e. the initial reporter, the CVO, the PHO/BCCDC will all report the case immediately or within 24h, as required.



- By phone for immediately reportable diseases (see Appendix 2 for contact information). The reporter should speak to someone or ensure the information has been received by requesting a confirmation.
- By phone, fax or email for diseases reportable within 24h

Upon receipt of the report, the MHO or designate should contact the treating veterinarian and/or responsible animal health authorities to obtain the information necessary to make an informed risk assessment.

Data will be maintained in such a way to allow regional and provincial surveillance. Data will be received, stored and transmitted in compliance with appropriate privacy legislation and policies.

### **1.7.1 Mandatory variables**

A minimum amount of data are collected to protect the privacy of animal owners and sufficient to pursue an animal and public health response. The BC Animal Health Act Section 20 (3) states:

“A person to whom this section applies must promptly report to the chief veterinarian the following information, to the extent of the person's knowledge:

- (a) the identity and contact information, if known, of a person responsible for the animal or for the animal product or byproduct;
- (b) if the information described in paragraph (a) is unavailable, or if there is no person responsible for the animal or for the animal product or byproduct,
  - i. the last known location of the animal or the animal product or byproduct, and
  - ii. information that would assist in identifying the animal or the animal product or byproduct;
- (c) the identity or nature of the notifiable or reportable disease, or illness, including any signs;
- (d) if a diagnostic examination or other examination was done, the type of examination and the results;
- (e) any preventive measures taken;
- (f) any prescribed information;
- (g) any other relevant information requested by the chief veterinarian.”

Based on this, the reporting of a case should include:

- Name and contact information of the person who has custody or is in charge of the animal, where applicable and known
- Location of the animal(s)
- Etiology or diagnosis
- Animal species



### 1.8. Abbreviations

- ADRI: Animal Disease Research Institute
- AHA: Animal Health Act
- AHC – Animal Health Centre
- BCCDC – BC Centre for Disease Control
- CFIA – Canadian Food Inspection Agency
- CVO – Chief Veterinary Officer
- DV – CFIA District Veterinarian
- EHO – Environmental Health Officer
- FLNRO - Forests, Lands and Natural Resource Operations
- FIPPA – Freedom of Information and Protection of Privacy Act [RSBC 1996] Chapter 165
- HA – Health Authority
- iPHIS – integrated Public Health Information System
- MHO – Medical Health Officer
- PHO - Provincial Health Officer
- PIPA – Personal Information Protection Act [SBC 2003] Chapter 63
- OIE – Office International des Epizooties (World Organisation for Animal Health)

### 1.9. History

In January 2006, the BCVMA met with the Ministry of Health and BCCDC and asked which zoonoses in animals should be reported to public health authorities under the BC Health Act and Communicable Disease Regulation current at the time.

In 2007, a working group of 5 BC public health and animal health professionals used the national criteria for determining human disease reportability and modified them to suit zoonotic diseases in animals (2). All BC human reportable diseases of zoonotic nature were included for review. Each disease was scored according to each of the modified criteria. Average scores were derived and added. Each disease was ranked according to the total score. The ranking was reviewed for consistency. A threshold was determined for reportability based on the national work and on attaining a practical number of reportable diseases (2).

The group recommended 14 diseases, plus new or unusual diseases or clusters be reported to public health authorities in BC in order to consider and possibly initiate a public health response. The list was circulated to animal health and public health stakeholders for comments in 2009 and approved by the BC Communicable Disease Policy Advisory Committee in September 2009.

Public health guidelines were developed for each disease by a multidisciplinary (veterinarians and public health practitioners) provincial group between 2010 and



2014. Guidelines were approved by the BC Communicable Disease Policy Advisory Committee throughout this period.

#### **1.10. References**

1. Medline Plus website. [Accessed on Dec 20, 2010.] Available at: <http://www.merriam-webster.com/medlineplus/zoonosis>
2. Doherty J. Final report and recommendations from the National Notifiable Diseases Working Group. Canada Communicable Disease Report. Oct 1 2006. 32(19). Available at <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/06vol32/dr3219a-eng.php>



## APPENDIX 1: RISK ASSESSMENT QUESTIONS

This is a suggested list of questions public health authorities can ask the diagnosing veterinarian or other animal health expert when a case of a zoonotic disease in an animal is reported to them.

### About the disease

- How was diagnosis confirmed?
- What is the animal species?
- What are the symptoms?
- What is the clinical course of illness in this species?
- How susceptible is this animal species to this disease?
- What is the epizootology of this disease in BC/this region? How common is it? Has this changed recently?
- When was the illness onset?

### About the animal

- Where is the animal from?
- Where is the animal now?
- Who is taking responsibility for it?
- Has it been euthanized? How will it be disposed of?
- Have other animals been exposed? What is being done with those animals? Who is assessing or managing that risk?

### About exposed humans

- Have humans been exposed to it?
- Who has been exposed?
- Was this in the course of their work (refer to WorkSafe BC if necessary)?
- What kind of exposure has occurred?
- When did the exposure occur?



**APPENDIX 2. CONTACT INFORMATION FOR PUBLIC HEALTH AND ANIMAL HEALTH AUTHORITIES IN BC**

<b>Agency</b>	<b>Position</b>	<b>Contact information</b>
Fraser Health Authority	Central Communicable Disease Intake Line - Health Protection	604-507-5478 and 1-866-990-9941
Fraser Health Authority	Medical Health Officer (MHO) on call after hours	604-527-4806
Interior Health Authority	Communicable Disease Unit	1-866-778-7736
Interior Health Authority	MHO on call after hours	1-866-457-5648
Island Health Authority	South Island Communicable Disease Hub	1-866-665-6626
Island Health Authority	Central Island Communicable Disease Hub	1-866-770-7798
Island Health Authority	North Island Communicable Disease Hub	1-877-887-8835
Island Health Authority	MHO on call after hours	1-800-204-6166
Northern Health Authority	Northeast Manager	250-719-6500
Northern Health Authority	Northern Interior Manager	250-565-2150
Northern Health Authority	Northwest Manager	250-631-4249
Northern Health Authority	MHO on call after hours	250-565-2000
Vancouver Coastal Health	Communicable Disease Control	604-675-3900
Vancouver Coastal Health	MHO on call after hours	604-527-4893
BCCDC	Public Health Veterinarian Physician Epidemiologist	604-829-2110 604-707-2558
BCCDC	Physician on call during and after hours	604-312-9220
FLNRO	Wildlife Veterinarian	250-953-4285 250-361-7619
FLNRO	Wildlife Biologist	250-751-3219
Ministry of Agriculture	Chief Veterinary Officer	604-556-3013
Ministry of Agriculture	Public Health Veterinarian	604-556-3066
CFIA	District Offices	<a href="http://www.inspection.gc.ca/animals/terrestrial-animals/offices/eng/1300462382369/1300462438912">http://www.inspection.gc.ca/animals/terrestrial-animals/offices/eng/1300462382369/1300462438912</a>

### **APPENDIX 3. AGENCIES' ROLES WITH RESPECT TO REPORTABLE ANIMAL ZONOTIC DISEASES**

#### Animal Health Centre and private veterinary laboratories:

Conduct tests

Report results and provide support to submitter (typically veterinarian, but sometimes animal owner)

Report all positive tests for reportable zoonotic diseases to CVO or designate

#### Conservation Officer

Enforces wildlife and environmental protection laws

Prevents conflict between wildlife and humans through education and control activities

Responds to and investigates predator attacks

Reports sick or dead wild animals to wildlife vet

#### CFIA

Conducts the animal disease investigation, including diagnosis, depending on disease

Implements animal control measures, depending on disease

Communicates with appropriate partners

#### CVO or designate

Makes recommendations to treating veterinarian (if no veterinarian involved, then to owner) on animal management and treatment of reportable zoonotic diseases (ministerial authorization is required before issuing any orders with respect to the infected animal or premise)

Acts as a consultation resource for public health on zoonotic diseases

Reports to BCCDC

#### Wildlife Veterinarian

Receives reports of sick or dead wild animals from public or government staff

Obtains samples from live animals or performs necropsies on dead wild animals and submits samples to Animal Health Centre or other laboratories

Receives reports from laboratories and interprets results

Provides advice on wild animal disease investigations as requested

#### Public Health (Medical Health Officer and Environmental Health Officer)

Discuss animal case with treating veterinarian

Conduct risk assessment (assess zoonotic risk to humans) in consultation with other agencies

Conduct risk management (manage exposed humans or human cases of zoonotic disease, implement control measures specific to public health)

Conduct risk communication (provide information to exposed individuals and the general public)

Report investigation findings to PHO (BCCDC) as necessary



### Animal investigator<sup>8</sup>

Start the investigation upon receipt of a case report  
Determine the number, distribution and severity of cases  
Conduct investigation to identify causes and risk factors  
Implement measures to stop or reduce transmission  
Report investigation findings to partners on routine basis

### BC Centre for Disease Control

Report the animal case to the appropriate MHO  
Provide advice to MHO on risk assessment and management, as needed  
Share public health investigation findings with PHO and CVO  
Compile regular provincial statistics on animal cases of reportable zoonotic diseases  
Disseminate findings to partners

### Veterinarian in Private Practice

Assess, diagnose, submit appropriate samples for confirmation, and provide owner with treatment recommendation  
Provide owner with basic information on zoonotic disease potential of their animal  
Counsel owner to speak with their physician regarding risk of acquiring infection to themselves or to other family members  
Consult with appropriate government agency when required in regulation

### Animal Owner

Provide welfare and care, including medical care, of their animal  
Ensure that persons who may come in contact with their animal incur minimal risk of contracting a zoonotic disease; to that end, the owner of an animal with a zoonotic disease should consult with a local veterinarian

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<sup>8</sup> This refers to the person or agency most responsible for investigating and managing the animal case. This is disease and species dependent. Most often, it will be the CFIA but it can also be the CVO, the Wildlife Veterinarian or no one at all. This is clarified in the guideline for each disease.



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**2.0 ANTHRAX**

**2.1. Introduction**

Anthrax is a globally distributed acute zoonotic disease caused by the spore forming bacteria, *Bacillus anthracis*. The spores of *B. anthracis* are the infectious agent and remain viable in the environment for many years. (1) The spores are resistant to many environmental conditions and disinfection. Environmental events such as floods or disruption of soil over areas where infected carcasses were buried are believed to be the initiating cause of most animal disease outbreaks. (1,2) Typically anthrax occurs during the hot summer months when short grass and dusty conditions prevail but specific conditions can vary with the location of the outbreak. (2)

**Reason for surveillance**

To monitor the epidemiology of anthrax in animals in BC in order to prevent transmission to humans

**Public Health Significance**

Human disease is rare but can be severe. Disease can be spread to humans through direct contact with infected animals or contaminated animal materials. Anthrax has also been used a bioterrorism agent. Prevention mechanisms implemented early by public health authorities can decrease the risk of infection.

**Authority**

Anthrax is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing



Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

Anthrax is a reportable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act Animal. Owners, veterinarians and laboratories are required to immediately report an animal that is infected or suspected of being infected to a CFIA district veterinarian.

### **Reporting and timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal cases in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### **Epidemiology in British Columbia (BC)**

Between 1993 and 2012, one human case of cutaneous anthrax was reported in BC (2001). The infection was attributed to direct contact with contaminated imported animal hides used for drum-making. (3) The last known outbreak of anthrax involving animals in BC occurred in 1962 involving two cattle deaths. (4) There is no known history of anthrax in wildlife in BC (personal communications: Helen Schwantje, June 2010). In 2012, an outbreak of anthrax occurred on a cattle farm in Oregon (personal communications: Kara Levri, October 2012). Though anthrax occurs in endemic areas regularly (such as the Canadian Prairies), there are no known foci of infection in BC.

## **2.2. Disease in animals**

**Species affected** – Anthrax is principally a disease of livestock with cattle and sheep most commonly affected, and farmed bison, horses and goats less commonly affected. All mammals are susceptible, although pigs, dogs and cats are less susceptible. (1)

**Reservoir** – The reservoir for anthrax is the environment where the spores can survive for years in alkaline calcium-rich soil. (2)

**Transmission** – Transmission occurs through ingestion or inhalation of spores during grazing on contaminated land or eating of contaminated meat. Biting flies appear to facilitate animal-to-animal transmission. (1,2) Scavengers and the movement of contaminated soil may contribute in the dissemination of spores.

**Incubation period** – Usually 3 to 7 days, but can range from 1 to 14 days.



**Clinical manifestations** - The most common sign is sudden death, however, anthrax can present in three forms: peracute, acute/subacute and chronic. (5)

Form	Species affected	Clinical Manifestations
peracute	cattle, sheep, goats, bison	sudden onset with rapid death
acute/subacute	cattle, horses, sheep, bison	fever, halted rumination, excitement followed by depression, respiratory difficulty, convulsions and death; bloody discharges from orifices
chronic	pigs, cattle, horses, dogs	pharyngeal and lingual edema; foamy sanguinolent discharge from the mouth; death from asphyxiation

**Case definition** - A confirmed case of anthrax in any mammal species as determined by detection of *B. anthracis* using PCR or culture

**Prevention and control in animals** – Animals in endemic areas may be vaccinated as a preventive measure. Animals on farms affected by a current or past outbreak may be vaccinated to contain spread or prevent reoccurrence. (6)

### 2.3. Disease in humans

**Risk factors** – Farmers, abattoir workers, butchers, workers in factories that process hides (tanneries), veterinary staff, laboratory workers, taxidermists and drum makers are at risk of occupational exposure to anthrax. (1)

**Transmission** – Can occur in several ways:

- direct contact with tissues, fluids or any parts of infected live or dead animals
- direct contact with hair, wool, bones, hides harvested for trade and products made from these materials
- inhalation of *B. anthracis* spores during necropsy, slaughter, tanning of hides or sorting of wool
- ingestion of *B. anthracis* spores through eating the meat of infected animals
- potentially from biting flies that have fed on infected animals/carcasses (7)

**Incubation period** – From 1-7 days, although periods of up to 60 days are possible. (5)



**Clinical manifestations** - Anthrax can present in one of three forms depending on the route of exposure (5):

Form	Exposure	Clinical Manifestation
cutaneous	direct contact with infected animals/carcasses or contaminated wool, hides and fur	initial itching at the affected site followed by a painless papular lesions that becomes vesicular and develop into a black eschar in 2-6 days; head, neck, forearms and hands are common sites of infection; if left untreated, can lead to septicemia and death
pulmonary	inhalation of spores	upper respiratory tract symptoms followed by fever, shock and death.
gastrointestinal	ingesting meat from infected animals	gastroenteritis with vomiting and bloody stools

**Case definition** – Clinical illness with laboratory confirmation of infection:

- Isolation of *B. anthracis* in a clinical specimen; or
- Demonstration of *B. anthracis* in a clinical specimen by immunofluorescence (8)

**Communicability** – Person-to-person transmission does not occur

#### 2.4. Public health response

The goal of the public health response to a reported animal case of anthrax is to identify individuals who have been exposed and may require chemoprophylaxis as well as to minimize further risk of exposure and provide relevant information to the public. Risk assessment should take into account that anthrax is a potential bioterrorism agent.

#### Risk assessment

Public health authorities, under direction from the MHO, are responsible for assessing if humans are exposed or at risk of being exposed. They can:

- Contact the diagnosing veterinarian and/or the CFIA to discuss the case and collect relevant information.
- Identify individuals who may have been exposed to anthrax through contact with infected animals or animal parts or by inhalation of spores during necropsy, slaughter, or processing of infected animals.
- Determine the type of exposure and whether testing, fever watch or chemoprophylaxis may be necessary.



- The investigation and control of an animal case is the responsibility of the animal owner or producer. Assistance should be sought from a private veterinarian. Further advice can be obtained from animal, environmental and public health authorities.

### **Risk management**

#### **CONTACT MANAGEMENT**

Public health authorities are responsible for managing the risk to potentially exposed individuals:

- Decrease risk of contact
  - Gloves should be used and open wounds should be covered when handling any dead animal. (9)
  - Post-mortem examinations should not be conducted on anthrax-infected animals as spores will form when the carcass is opened and exposed to oxygen.
  - If contact with anthrax-infected materials occurs, immediately wash exposed skin with soap and water to get rid of vegetative bacteria.
  - Workers who will be exposed to anthrax should use appropriate PPE (suits, boots, gloves, respirators, etc.) (9)
  - Ensure infected animals do not enter the food chain.
- Chemoprophylaxis is usually reserved for high risk exposures.
  - Chemoprophylaxis is recommended for certain inhalational exposures such as bioterrorism, laboratory exposure and occupational exposure to highly contaminated animal materials (e.g. textile mills). (10) This does not include possible inhalational exposure due to opening of an anthrax infected carcass.<sup>1</sup> Ciprofloxacin is the antibiotic of choice. An extended duration of therapy is recommended. (10)
  - Consider chemoprophylaxis for unprotected contact of non-intact skin with a known infected carcass, blood or animal product. Intact skin exposure to cutaneous anthrax and anthrax animal vaccine needlestick injuries do not usually require chemoprophylaxis.<sup>2</sup>
  - There is limited experience in the use of chemoprophylaxis following the ingestion of contaminated meat. A decision should be made on a case-by-case basis. (10, 11)
- Observe for symptoms

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<sup>1</sup> Pulmonary anthrax has not occurred in association with livestock (in farm settings) in North America (personal communications: R. Sebastian, 2006 Saskatchewan outbreak field epidemiologist, 2010). (10)

<sup>2</sup> There are no studies on the effectiveness of chemoprophylaxis for cutaneous exposure. (10) This recommendation is based on Canadian experience in Manitoba (2005) and Saskatchewan (2006).



- People who have had significant exposures may be put under symptom watch to ensure they do not develop symptoms or if they do, refer for immediate care.
- Other
  - Anthrax vaccine for humans is available to the military but not for public use in Canada. (12)
  - Infected animal carcass disposal should be discussed with the diagnosing veterinarian, the CFIA, and municipal authorities (waste disposal or animal control program/department), as required.
    - Acceptable disposal methods include incineration on site or deep burial. (6) Municipal or provincial regulations may affect the available disposal options.
    - If incineration or burial are not immediately possible, carcasses may be covered under a plastic tarp to prevent scavenging or other means of spread. (6)

#### CASE MANAGEMENT

- Refer any possible cases for medical management and antibiotic therapy
- Standard hygiene is recommended for cases (e.g. wash hands, cover wounds)
- Soiled articles and clothing have to be washed with hypochlorite, hydrogen peroxide, formaldehyde or other sporicide. (7)

#### OUTBREAK RESPONSE

- Outbreaks are rarely reported. In developed countries, they have been associated with deliberate release of anthrax and tanneries or other occupational settings; in developing countries, with consuming infected meat. (7) As no person-to-person spread occurs, outbreak management entails identifying and eliminating the source, managing cases and contacts on an individual basis and providing education to exposed individuals and the public.

#### **Risk communication**

Public health messaging:

- Anthrax can be a serious disease but it is very rare. It is not contagious from person-to-person.
- Anthrax occurs naturally in the environment. If disturbed from soil, it can cause infection in animals and rarely, in humans.
- If a person is exposed to a potentially infected animal or shows signs of illness, they should seek immediate medical attention. Antibiotics can be given to prevent or treat an infection.



## Resources

- BCCDC: <http://www.bccdc.ca/dis-cond/a-z/a/Anthrax/default.htm>
- HealthLink: <http://www.healthlinkbc.ca/kb/content/special/ty6357.html>
- PHAC: <http://www.phac-aspc.gc.ca/ep-mu/anthrax-eng.php>
- CFIA: <http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/anthrax/eng/1330045348336/1330045807153>

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## 3.0 BOVINE SPONGIFORM ENCEPHALOPATHY

### 3.1. Introduction

Bovine spongiform encephalopathy (BSE) is a transmissible spongiform encephalopathy (TSE) of cattle. Humans and some other mammal animal species can be affected by TSEs; a group of slowly progressing, invariably fatal neurodegenerative diseases. TSEs are caused by an abnormal form of a self-replicating protein or prion. The pathology of all TSEs in affected brain tissue is similar. (1) In 1995, a variant form of Creutzfeldt-Jakob disease (vCJD), a progressive dementia, emerged in humans in the UK. This was attributed to the consumption of contaminated beef from BSE-infected cattle. (1,2) In the UK, 176 human deaths have been due to vCJD from 1995 to 2012. The annual number of cases has been decreasing since 2001 and no cases have been reported since 2011. (3)

#### Reason for surveillance

To monitor the occurrence of BSE in cattle in BC in order to inform public health authorities and provide the opportunity to educate the public

#### Public Health Significance

Human disease is very rare but uniformly fatal. It can spread through foodborne routes but this is unlikely to happen in Canada due to the rapid response to an animal case (see Animal Disease Control section). Public concern about BSE and food safety is high; public health authorities need to be able to provide information to the public.



### **Authority**

BSE is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

BSE is a reportable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act Animal. Owners, veterinarians and laboratories are required to immediately report an animal that is infected or suspected of being infected to a CFIA district veterinarian.

### **Reporting and timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal cases in BC within 24h of confirming/receiving the diagnosis. The CVO should notify the PHO (BCCDC) within 24h. The BCCDC should notify the MHO in the affected HA within 24h.

### **Epidemiology in British Columbia**

The CFIA BSE surveillance program samples cattle over 30 months of age that are dead, down, dying or show clinical signs. The BC Ministry of Agriculture Animal Health Centre screens approximately 3000 samples per year; positive results are submitted to a CFIA laboratory for confirmation. (4) As of February 2011, 18 cases of BSE had been diagnosed in Canada since the BSE surveillance program began in 2003. Four of these were diagnosed in cattle born and raised in the Fraser Valley area of BC, with 0-2 cases per year. These occurred in 2006 (1 case), 2007 (1 case) and 2008 (2 cases).

In Canada, two human case of vCJD has been reported (in 2002 and 2011). Both cases were attributed to exposure outside Canada. No cases have been reported from BC. No cases have been reported linked to eating Canadian beef. (5,6)

## **3.2. Disease in Animals**

**Species affected** – BSE occurs in cattle. (7) Dairy cattle have predominantly been affected. This is likely attributed to their longer life span compared with beef cattle, and the wider use of concentrate feeding in dairy herds. (1)

**Transmission** – Transmission occurs when an animal ingests tissues containing the BSE prion such as feed containing proteins derived from infected cattle. Epidemiological studies suggest that most cattle become infected as calves. (7)



**Incubation period** – The incubation period is estimated to be 2.5 to 8 years in cattle. (7) The peak incidence of disease occurs in 4 to 6 year old animals. (1)

**Clinical manifestation** - BSE normally presents with neurological changes such as locomotive and behavioural abnormalities. Nervousness and aggressiveness are common. Cattle will spend less time ruminating and exhibit increased head tossing or abnormal head carriage, nose licking and grinding of the teeth. Hesitation at gates and barriers has been seen with increased sensitivity to sound, touch or sight stimuli. An increased startle response, ataxia, weight loss and decreased lactation can occur. Recumbency, coma and death follow weeks to months later. Once the symptoms appear, BSE is always progressive and fatal. (1,2,7) Other conditions (e.g. lead toxicosis) can mimic these symptoms so laboratory confirmation is necessary.

**Case definition** - A confirmed BSE case is an animal with

- Positive immunohistochemistry or
- Positive Scrapie Associated Fibril (SAF) immunoblot

on a brain sample tested by the National BSE Reference Laboratory in Lethbridge, Alberta. (8)

**Prevention in animals** –BSE can be prevented by not feeding cattle ruminant tissues containing prions. Cooking or rendering does not inactivate prions. No vaccine is available.

To prevent BSE, the Government of Canada banned most proteins, including specified risk materials or SRM (e.g. brain, spinal cord) of any ruminant species from cattle feed in 1997. To provide further animal health protection, as of July 12, 2007, SRM were also banned from all animal feed, pet foods and fertilizers. (8)

**Animal Disease Control** – BSE is a federally reportable animal disease. Cases must be reported to the Canadian Food Inspection Agency (CFIA). The CFIA takes immediate disease control actions including:

- precautionary quarantine of the suspect carcass
- investigation to identify any animals that may have been exposed to the same source of contamination as the BSE-infected animal
- quarantine and destruction of all animals that may have been exposed to the same source of contamination as the BSE-infected animal, as well as the last two progeny of that animal
- disposal of carcasses and all potentially contaminated feed by incineration or deep burial in an authorized landfill



- under the Health of Animals Act, the CFIA may compensate owners of cattle operations for animals ordered destroyed during disease response situations (9)

### 3.3. Disease in Humans

**Transmission** – Transmission of BSE from cattle to humans is through consumption of contaminated beef and beef products. This transmission is thought to have been eliminated due to changes in animal feeding and slaughtering practices, both in Canada and around the world. (10)

**Incubation period** – The incubation period of vCJD is believed to be 10-15 years, but can be longer. For three patients with vCJD infected through blood transfusion, the incubation period ranged from 6.6-8.5 years. (10)

**Clinical manifestations** - vCJD presents with psychiatric or behavioural disturbances and typically affects a younger age group than sporadic (genetic) CJD (29 vs 68 years average onset), and has a longer average clinical course (14 vs 7 months). (10) Clinical manifestations may include confusion, progressive dementia, paresthesias and ataxia. (2) Once the symptoms of vCJD develop, the disease is always fatal.

**Case definition** – A confirmed case of vCJD has

- progressive neuropsychiatric disorder AND
- neuropathologic confirmation through spongiform change, extensive prion protein (PrP) deposition and florid plaques throughout cerebrum and cerebellum. (11)

**Communicability** – Person-to-person transmission of vCJD does not occur during casual contact. Due to vCJD's long incubation period, subclinical infections of vCJD represent a potential reservoir of infection for spread by blood transfusion, organ transplantation or contaminated medical instruments. Probable human-to-human spread has been reported in several patients who received blood transfusions from asymptotically infected individuals. (10) In Canada, blood donors are pre-screened verbally for risk factors associated with contracting vCJD including living in the UK or France for 3 months or more, or anywhere else in Western Europe for 5 years or more between 1980-1996. Canadian Blood Services does not conduct screening for vCJD. (personal communication: Dr. Mark Bigham, CBS, 2010)



### 3.4. Public Health Response

The goal of the public health response to a reported animal case of BSE is risk communication: being aware of the case and having the opportunity to educate the public concerning the risk of variant Creutzfeldt-Jakob Disease (vCJD).

#### Risk Assessment

- CFIA investigates animal cases. CFIA assesses the risk to other animals and to the foodchain.
- If human cases were to be reported, public health authorities, under direction from the MHO, would investigate these.

#### Risk Management

- Risk management is conducted by the CFIA (see Animal Disease Control section). Once the infected animals are removed from the foodchain, there is minimal risk of human illness.
- There are no known chemoprophylactic measures or vaccine for vCJD.
- Occupational medicine should inform potentially exposed workers of the necessary precautions to take.

#### Risk Communication

- The CFIA takes the lead in public communication on this disease. Any public health messaging should be coordinated with the CFIA.
- Public health messaging:
  - vCJD is extremely rare in Canada.
  - The main cause of vCJD is eating beef contaminated with BSE.
  - The CFIA is taking measures to eliminate the risk of contaminated beef entering the foodchain.

#### Communication Resources

- HealthLink: <http://www.healthlinkbc.ca/healthfiles/hfile55b.stm>
- PHAC: <http://www.phac-aspc.gc.ca/cjd-mcj/vcjd-faq-eng.php>
- CFIA  
BSE: <http://www.inspection.gc.ca/english/anima/disemala/bseesb/bseesbfse.shtml>



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## 4.0 BRUCELLOSIS

### 4.1. Introduction

Brucellosis is a bacterial disease which infects people who work closely with infected animals and those who consume unpasteurized dairy products, mostly in the developing world. Its zoonotic potential depends highly on the state of its control in domestic animals. (1) This guideline pertains to *Brucella* species that are clearly zoonotic (*B. abortus*, *B. melitensis* and *B. suis*). Other *Brucella* species (*B. canis*, *B. ovis*) whose zoonotic potential is unclear are not reportable and not addressed in this guideline.

#### Reason for surveillance

To monitor the epidemiology of brucellosis in animals in BC in order to prevent transmission to humans

#### Public Health Significance

Human disease is rare but can be severe. Disease can be spread to humans through direct contact with infected animals or consumption of unpasteurized dairy products. Prevention mechanisms implemented early by public health authorities can decrease the risk of infection.

#### Authority

Brucellosis is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.



Brucellosis is a reportable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act Animal. Owners, veterinarians and laboratories are required to immediately report an animal that is infected or suspected of being infected to a CFIA district veterinarian.

### Reporting and timelines

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal cases in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### Epidemiology of brucellosis in British Columbia (BC) and Canada

Canada has successfully eradicated brucellosis in livestock (*B. abortus*, *B. melitensis*, *B. suis*). The last confirmed outbreak of *B. abortus* in Canada occurred in 1989. Surveillance is conducted to ensure Canadian livestock remain *Brucella*-free. (2) Outside BC, wildlife in limited parts of Canada are infected with brucellosis. Wood bison living in and around Wood Buffalo National Park, located on the border of Northern Alberta and the North West Territories, are a wildlife reservoir of *B. abortus*. CFIA reports that as of 2010 there has been no known spread of *B. abortus* from wood bison to livestock, a disease containment plan is in place and enhanced livestock surveillance is conducted south of the park (3). *B. suis biovar 4* is considered enzootic in Canadian barren ground caribou and not subject to control or eradication. (4) Marine mammals can also be affected by brucellosis (5-6). Few cases of zoonotic transmission have been reported from marine mammals and none in Canada.

Between January 1993 and June 2010, 10 human cases of brucellosis were reported in BC. Those that had species identified were caused by *B. melitensis*. All cases with available information likely acquired their infection during international travel. (7)

## 4.2. Disease in animals

**Species affected** - Different species of *Brucella* are adapted to animals that can be reservoir hosts; species of interest here include:

*Brucella abortus* – cattle, elk, bison, goats, horses, dogs, coyotes

*Brucella suis* – pigs, horses, cattle and dogs, barren ground caribou (not present in BC) *Brucella melitensis* – goats, sheep, cattle, dogs (1)

**Transmission** – Is dependent on species of *Brucella* but generally occurs through ingestion of contaminated food or water, licking and other direct contact



of contaminated young, placentas or fetuses. Among reservoir animals, *Brucella* species are also transmitted sexually. (1)

**Incubation period** – Difficult to measure and varies according to virulence and dose of bacteria, route of infection and species and susceptibility of the animal. (1,2)

**Clinical manifestation** –in most animals, spontaneous abortion or, infertility in females and epididymitis/orchitis in males are the most common manifestations of *Brucella* infection.

Table 1: The clinical manifestations of *Brucella* in affected animal species (1)

Host	Species	Transmission	Clinical Manifestation
Sheep, goats	<i>B. melitensis</i> ; <i>B. abortus</i>	Direct contact, sexual contact	Abortion
Cattle	<i>B. abortus</i>	Ingestion	Abortion, infertility, epididymitis, arthritis
Swine	<i>B. suis</i>	Ingestion, sexual contact	Abortion, sterility, spondylitis, orchitis

**Case definition** (adapted from CFIA)

**Suspect**

Any animal which has brucellosis in the differential diagnoses or tests positive to OIE approved and CFIA validated screening and ancillary tests (Buffered plate agglutination test, fluorescence polarisation assay, ELISA) for that species.

**Confirmed**

Any animal with *B. abortus*, *B. melitensis* or *B. suis* identified by culture

**Reporting to public health**

PH should be alerted once CFIA takes control measures and/or once CFIA informs the owner and CVO, whichever comes first, i.e. suspect case should be reported once ELISA is positive. All confirmed cases should also be reported.

**Prevention in animals** – In livestock: Test and eliminate the reservoir of infection through quarantine and depopulation.

**Livestock disease control** – Brucellosis (*B. abortus*, *B. melitensis* or *B. suis*) in livestock is a federally reportable animal disease in Canada. The Canadian Food Inspection Agency (CFIA) is responsible for disease response, control and eradication of reportable animal disease. The CFIA immediately implements disease control measures if brucellosis is detected in a livestock herd in Canada. Disease control measures include the humane destruction and disposal of all



infected animals and of animals that were exposed to the infection. Cleaning and disinfection is required for contaminated areas of the infected farm and once restocked, periodic testing of the herd to confirm that the infection has been eliminated is required. Animal vaccines are available, however vaccination of cattle does not occur in Canada. (8)

### 4.3. Disease in Humans

*B. abortus*, *B. melitensis* and *B. suis* are all zoonotic. *B. melitensis* causes most cases of brucellosis in humans. Since this strain has not been identified in Canadian livestock, it is likely that cases reported in Canada have been acquired abroad.

**Risk factors** – In the developed world, brucellosis is primarily an occupational disease of those working with infected animals or their tissues, particularly farm workers, veterinarians, laboratory workers and abattoir workers. Handling of placentas, infected aborted fetuses and new born animals is considered a particularly high-risk activity. (1,9)

**Transmission** – Occurs through various modes:

- Contact through breaks in the skin with animal tissues, blood, urine, vaginal discharges, aborted fetuses and placentas
- Ingestion of raw milk and dairy products from infected animals
- Airborne infection in laboratories and abattoirs (1,9)

**Incubation period** – Difficult to ascertain and variable; usually 5-60 days but occasionally several months (9)

**Clinical manifestations** - An acute or insidious febrile illness with symptoms including headache, anorexia, myalgia, night sweats, fatigue, arthralgia, joint pain, abdominal pain, diarrhea, vomiting and weight loss. Depression is commonly a prominent feature. Rare but severe infection can lead to epididymitis, orchitis, uveitis, endocarditis, and meningitis. (1,9)

**Case definition** - clinical illness with laboratory confirmation of infection by one of the following:

- isolation of *Brucella* sp from an appropriate clinical specimen
- 4-fold or greater rise in *Brucella* agglutination titre between acute-and convalescent-phase serum specimens obtained 2 or more weeks apart and studied at the same laboratory



- demonstration by immunofluorescence of *Brucella* sp in an appropriate clinical specimen (10)

**Communicability** - Person to person transmission is rare but risk may exist for medical and laboratory personnel through exposure to contaminated tissues and blood. (9) Transmission has also been reported through breastfeeding, bone marrow transplants, childbirth, sexual contact, and blood transfusions, however, these modes of transmission are considered exceptional. (1)

#### 4.4. Public health response

The goal of the public health response to brucellosis is to identify exposed individuals, assess whether there is an ongoing source of risk (and mitigate where appropriate) and provide relevant information to the public to decrease the risk of transmission.

##### **Risk Assessment**

The CFIA has responsibility for investigating the risk associated with brucellosis in livestock and will collaborate with the BC Ministry of Forests, Lands and Natural Resource Operations, in laboratory investigations of the disease in wildlife.

Public health authorities, under direction from the MHO, are responsible for assessing if humans are exposed or at risk of being exposed. They can:

- contact the diagnosing veterinarian to discuss the case and collect relevant information
- assess whether individuals may have been exposed to *Brucella* through the ingestion of raw milk products, the contact of broken skin with infected materials or through inhalation of particles during an abortion or in an abattoir
- assess the source of infection and determine if there is an ongoing risk of transmission

##### **Risk Management**

The CFIA is responsible for responding to and mitigating the risk associated with brucellosis in livestock and the BC Ministry of Forests, Lands and Natural Resource Operations, in wildlife.

##### **CONTACT MANAGEMENT**

Public health authorities are responsible for managing the risk to potentially exposed individuals:

- Provide information to exposed individuals re: symptoms to watch for and refer for early treatment.



- Provide information to individuals at risk of exposure re: preventive measures.
- Chemoprophylaxis is not usually required but is available for inhalational exposures in the laboratory or in a bioterrorism setting.
- No human vaccine is approved for use in Canada.
- Occupational health should ensure proper personal protective equipment is being used by farm, abattoir and other workers when handling known infected animals and by hunters in endemic areas (aprons, boots, gloves, respirators, etc.). (9,11,12)
- If there is an ongoing risk of exposure in non-livestock animals, work with relevant agencies to mitigate it (e.g. Ministry of Forests, Lands and Natural Resource Operations, Ministry of Agriculture)

#### **CASE MANAGEMENT**

- Refer any possible cases for medical management and antibiotic therapy.

#### **OUTBREAK RESPONSE**

- Outbreaks are rarely reported in developed countries.

#### **Risk Communication**

- The CFIA takes the lead in public communication on this disease. Any public health messaging should be coordinated with the CFIA.
- Public health messaging
  - In Canada, brucellosis in humans is rare. Most Canadian cases are infected while travelling in developing countries through the consumption of unpasteurized milk products. Person-to-person spread is extremely rare.
  - In Canada, brucellosis in animals is rare. It can occur in wildlife.
  - To decrease the risk of infection even further, avoid consuming unpasteurized milk products and take precautions when handling potentially infected animals.

#### **Communication Resources**

- BCCDC: <http://www.bccdc.ca/dis-cond/a-z/ b/Brucellosis/default.htm>
- HealthLink BC: <http://www.healthlinkbc.ca/kb/content/nord/nord206.html>
- PHAC : <http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/msds23e-eng.php>
- CFIA: <http://www.inspection.gc.ca/english/anima/disemala/brucello/brucellofse.shtml>



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**5.0 CHLAMYDIOSIS/PSITTACOSIS (*CHLAMYDOPHILA PSITTACI*)**

**5.1. Introduction**

*Chlamydophila psittaci* infection can occur in birds and humans. More commonly, it is referred to as *chlamydiosis* in birds and *psittacosis* in humans (1). *C. psittaci* is susceptible to most disinfectants as well as heat and dessication but is resistant to acid and alkali.

**Reason for Surveillance**

To prevent transmission to humans, to facilitate early diagnosis and treatment, and to inform the development of prevention strategies.

**Public health significance**

Illness is rare but can be severe and outbreaks may occur.

**Authority**

Chlamydiosis/psittacosis caused by *C. psittaci* is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

Chlamydia is an immediately notifiable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act Animal. Laboratories are required to immediately notify cases to the CFIA.



### **Reporting and timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal case in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### **Epidemiology of *C. psittaci* infection in British Columbia (BC)**

In BC, chlamydiosis has been diagnosed in pet birds, pigeons, owls, raptors and turkeys (personal communication: Dr. Victoria Bowes, BCMAL, 2010). Eight human cases of psittacosis were reported in BC between 1993 and 2002. These were distributed in Vancouver Island (4 cases), Interior (3 cases) and Vancouver Coastal (1 case) Health Authorities. No human cases have been reported in 2002-12 (5).

## **5.2. Disease in Birds**

### **Species affected**

All avian species are susceptible to infection with *C. psittaci*. The chlamydiosis bacterium has been isolated from more than 175 birds species; most commonly from psittacines (parrot-like birds) and pigeons [10-30% of surveyed avian populations are positive]. The normal chlamydia-host relationship involves long-term unapparent infection in birds that may last for months or years until stress initiates active shedding (2).

There are six known serovars of *C. psittaci* with differing host species: serovar A is predominately found in psittacines birds, serovar B in pigeons and serovar D in turkeys. Caged pet birds, owls, raptors, ratites, colonial nesting birds (egrets, herons), and domestic poultry can be affected. Among poultry, the species most commonly infected include turkeys and pigeons while chickens and ducks are rarely affected (2).

*Chlamydia psittaci* infection has also been reported in mammals, including sheep and domestic cats, most commonly associated with abortions and respiratory disease (1).

### **Reservoir/Vectors**

The principal reservoir of *Chlamydia psittaci* is birds.

### **Risk factors**

Risk of infection is increased by close contact with infected birds that are latent shedders of organisms. Poor sanitation and/or ventilation plus the ability of the agent to survive drought facilitates aerosol spread. Stress, including reproductive



activities, rearing of young, relocation, shipping, crowding and chilling can induce shedding and overt clinical disease (3).

### **Transmission**

The bacteria are shed in the feces and respiratory discharges of infected birds leading to transmission through the fecal-oral and respiratory routes. Carriers can shed the organism intermittently for extended periods (weeks to months) (2). Nasal, ocular and uterine discharges in mammalian species can lead to direct inoculation into mucous membranes or aerosol transmission. Breeding birds can pass the organism to their young (3).

### **Incubation period**

Ranges from three days to several weeks (1-4 weeks) and lifetime latent infection is possible (2).

### **Clinical manifestations**

Avian chlamydiosis can present as an asymptomatic infection, or as an acute, subacute or chronic disease of both wild and domestic birds (2). Acute infections can be either newly acquired or activation of latent infections. The most common clinical signs in birds are nasal and ocular discharges, conjunctivitis, sinusitis, green droppings, ruffled feathers, inactivity, fever, weakness, loss of appetite and weight loss. Death may occur in severely affected birds, especially if the infection is complicated by other bacterial infections (2). Young birds are more susceptible to severe infection than adult birds.

### **Case Definition**

#### **Confirmed Case**

Laboratory confirmation by:

- Isolation and identification of *C. psittaci* from a clinical specimen
- Positive PCR for *C. psittaci*
- Identification of chlamydial antigen in tissues by use of immunohistochemistry or indirect fluorescent antibody

### **Prevention in Birds (3)**

- Isolate newly acquired, ill or known-exposed birds; isolation should include housing in a separate air space from other birds.
- Practice preventive husbandry: position cages to prevent the transfer of fecal matter, feathers, food, and other materials from one cage to another. All food bowls, water bowls and cages should be cleaned daily and any soiled bowls cleaned with disinfectant. Between occupancies by different birds, cages should be thoroughly scrubbed with soap and water, disinfected and rinsed.



- Practice strict biosecurity measures on poultry farms including isolation from wild birds, sanitation of poultry houses and equipment, proper disposal of dead birds and manure, routine disease surveillance and outbreak management.
- The CFIA oversees a mandatory minimum 45-day quarantine of imported psittacine birds from countries other than the United States, during which time birds may be prophylactically treated for *Chlamydophila* (4).
- Pet shops and aviaries are advised to quarantine and test birds before introduction to areas with other birds. The introduction of new birds should be preceded by a minimum 30-day period of isolation and monitoring for disease.
- Screen birds with frequent public contact (e.g. pet zoo or traveling bird show)
- There is no vaccine for *C. psittaci*; treatment involves separating infected birds and long term antimicrobial therapy.

### 5.3. Disease in Humans

Psittacosis is an acute infection with systemic and respiratory symptoms. Psittacosis outbreaks occur occasionally in humans in bird-owning households and occupational settings.

#### Risk factors

People at increased risk of infection include bird owners, veterinarians, pet store workers, zookeepers, aviary owners and workers, bird fanciers, poultry workers, processing plant workers, and diagnostic laboratory staff (1). Imported psittacine birds and feral pigeons are the most frequent source of human infection (2). Poultry processing and rendering plants have been a source of occupational disease and laboratory infections can occur (8).

#### Transmission

The organism is spread through the respiratory route. Humans can become infected from apparently sick or healthy birds through inhalation of the agent from desiccated droppings or respiratory secretions and contaminated dust of infected birds. Direct contact with infected birds (mouth-to-beak contact and handling of infected bird plumage (1, 3)) can also spread the disease.

#### Incubation period

The incubation period in humans is five to fourteen days with most infections becoming symptomatic after ten days. Longer incubation periods have also been reported (1,6).

#### Clinical manifestations



Symptoms of psittacosis include a mild, flu-like infection with fever, chills, headaches, anorexia, malaise, sore throat and photophobia that may lead to a serious atypical pneumonia with dyspnea. Respiratory symptoms are disproportionately mild compared to extensive interstitial pneumonia findings on chest X-ray. In uncomplicated infections, the fever lasts for 2 to 3 weeks then resolves. More rarely, a severe systemic illness with endocarditis, myocarditis and renal complications can develop. Hepatitis and neurologic complications including encephalitis, meningitis and myelitis have also been seen (6). Most human infections are sporadic and many infections are not diagnosed.

### **Case Definition**

#### **Confirmed Case**

Clinically compatible illness with laboratory confirmation by

- isolation of *Chlamydophila psittaci* by culture<sup>1</sup> from respiratory specimens or blood OR
- PCR from respiratory specimens or blood OR
- fourfold or greater rise in antibody in specimens taken at least 2 wks apart

### **Communicability**

Person-to-person transmission has not been confirmed. While inconclusive, features consistent with person-person spread have been seen in a small number of nurses who have cared for psittacosis patients (7) (9).

## **5.4. Public Health Response**

The goal of the public health response to psittacosis is to prevent transmission to humans, mitigate an ongoing source of infection and facilitate early diagnosis and treatment.

### **Risk Assessment**

Public health authorities informed of an animal case of chlamydiosis should:

- Contact the diagnosing veterinarian or laboratory to discuss the case and collect relevant information
- If the infected bird was part of a larger group of birds (e.g. pet store), contact the affected site to assess further bird cases and environmental conditions and control measures implemented
- Assess whether any individuals may have been exposed or are at risk of being exposed via inhalation or contact
- Assess the risk of ongoing transmission – they may need to visit the affected site to verify control measures (e.g. quarantine, isolation, depopulation, ventilation)

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<sup>1</sup> Must be done in a level 3 laboratory.



## Risk Management

Veterinarians are responsible for investigation and treatment of ill birds.

## CASE MANAGEMENT

- If an exposed individual is symptomatic, refer to treating physician. Timely referral and treatment with antibiotics is important.
- Isolation of human cases is not required; routine infection control and respiratory precautions are needed

## CONTACT MANAGEMENT

- Advise contacts on sign and symptoms of infection and when to seek medical care in order to facilitate rapid diagnosis and treatment
- Provide information on preventive measures (3). In occupational settings, contact WorkSafe BC.
  - Isolate infected and exposed birds from other birds and minimize human contact.
  - Clean affected environment
    - Wear protective clothing (gloves, eyewear, N95 respirator)
    - Clean rooms and cages using disinfectant: 1:1000 quaternary ammonium or freshly prepared 1:32 household bleach
    - Spray first then wet mop the floor using disinfectant as per above
    - Discard items that cannot be cleaned; burn or double bag and discard
    - Moisten and remove waste from cage regularly; burn or double bag and discard

## OUTBREAK MANAGEMENT

Human outbreaks are rare. Any bird case in an environment where other birds are housed should be considered a possible bird outbreak. Ministry of Agriculture takes the lead in bird outbreak management. Public Health may need to assist.

(3)

- Test exposed and ill birds; treat confirmed cases
- Isolate sick birds and confirmed birds
- Apply strict environmental controls including cleaning as per above
- Quarantine premise if necessary to limit further bird and human exposure
- Consider traceback and traceforward of infected birds to assess source and further risk



### Risk Communication

- Chlamydiosis is a common infection in birds. Occasionally it can spread to humans where it causes a respiratory infection called psittacosis.
- Effective treatment is available to treat psittacosis; treatment is not necessary for people who are in close contact with a sick person as it is not contagious

### Preventive Measures (3)

- Personal protective equipment for high risk occupation, ventilation and administrative measures
- Testing birds prior to introducing them as companion animal to immunocompromised individuals
- Education of pet owners, breeders, pet shop owners and others who may house/transport birds on risk factors, transmission, clinical manifestations and prevention
- Frequent hand washing, particularly after handling birds
- Use of good ventilation in in large bird facilities
- Screen birds with frequent public contact

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## 6.0 INFLUENZA A IN SWINE

### 6.1. Introduction

Swine influenza (SI) is a viral respiratory infection of pigs. This is a mild disease with potential to spread very quickly within swine herds. Infected pigs might not demonstrate clinical signs of infection and rapid recovery is common. Swine influenza is caused by influenza A viruses, which are further characterized by subtypes (1). The most common subtypes are *H1N1*, *H1N2* and *H3N2*. Morbidity rates among animals can reach 100% with swine influenza infections, while mortality rates are generally low.

Swine flu viruses do not normally infect humans and few human disease with swine flu have occurred (2). Pigs are susceptible to avian, human and swine influenza viruses; they potentially may be infected with influenza viruses from different species (e.g., ducks and humans) at the same time. It is possible for the genes of these viruses to mix and create a new virus that can spread easily from person-to-person. The antigenic shift results in greater potential for human infections and epidemics. If the new virus causes illness in people and can be transmitted easily from person to person, an influenza pandemic can occur as in 2009. Occasionally, swine influenza viruses can be transmitted from humans to swine; while this is possible, these events are not frequent or well documented.

### Reason for surveillance

To better understand the risk of swine influenza, to prevent transmission to humans, to prevent potential viral reassortment, to facilitate early diagnosis and treatment, and to inform the development of prevention and control strategies.



### **Public health significance**

Illness is rare but can be severe. Viral reassortment is possible in swine and humans which could lead to increased human-to-human transmissibility. There is no vaccination and increasing antiviral resistance.

### **Authority**

Swine influenza A is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

### **Reporting and Timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal case in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### **Epidemiology of Influenza A in swine in British Columbia (BC)**

The disease is enzootic in swine in the United States, Mexico, Canada, South America, Europe, and parts of Africa and Asia (1) with H1N1 being the dominant cause of swine influenza in North America (personal communication: Dr. Don McIntosh, BCMAL, 2010). Swine influenza viruses can circulate among swine throughout the year, but most outbreaks occur during the late fall and winter months similar to outbreaks in humans. Up to 40% of herds may contain antibody-positive pigs (1). The virus can persist for up to three months in infected swine resulting in carrier pigs that act as reservoirs between epidemics (1,3). Carrier pigs are usually responsible for the introduction of swine influenza viruses into previously uninfected herds and countries (1). Outbreaks start with one or two individual cases and then spread rapidly within a herd, usually within 1-3 days. In previously infected herds, outbreaks of infection reoccur as immunity wanes.

The swine farming industry in BC is small (<30 producers: personal communication D. McIntosh AHC 2010) and has decreased significantly over the past several years. The BC Ministry of Agriculture Animal Health Centre diagnoses SI in 1-3 herds annually (personal communication: Dr. John Robinson, MoA, 2010). The predominant type in BC swine herds is classical swine H1N1, though H3N2 has been found occasionally. There have not been any reported cases of direct transmission of swine influenza to humans in BC.

A review article published in 2007 found only 50 human cases of apparent zoonotic swine influenza infection (4) while eleven additional cases of swine



influenza in humans were found in the US from December 2005 through February 2009 (5). The pH1N1 pandemic in 2009 and a 2011 H3N2 cluster of human cases in the US underline the potential of this virus to cause human illness (6, 7).

## **6.2. Disease in Swine**

### **Reservoir**

Pigs are the reservoir and principal hosts for swine influenza viruses. H1N1 and H3N2 swine influenza viruses are endemic among swine populations in the United States and Canada. Outbreaks among pigs normally occur in colder weather months (late fall and winter), but can occur year round. The disease affects all susceptible sero-negative pigs of all ages. Although typically a herd disease, in enzootic herds the nursery pigs may be the only pigs affected (personal communication: Dr. Don McIntosh, BCMAL, 2010).

### **Risk factors**

Swine influenza is most commonly introduced by the movement of new pigs into a herd (personal communication: Dr. Don McIntosh, BCMAL, 2010). Facilities that do not empty their barns of pigs prior to receiving new pigs (“all-in/all-out”) are at higher risk of infection. Crowding may facilitate spread of infection (3). Immune status and co-infection with more than one strain of influenza virus or with other infectious agents (personal communication: Dr. Don McIntosh, BCCDC, 2010) also increase the risk of infection.

### **Transmission**

Respiratory droplet transmission and indirect (through contaminated environments) transmission. Infected pigs may begin excreting swine influenza viruses within 24 hours of infection, and typically shed the viruses for 7-10 days (2)

### **Incubation Period**

1-3 days (1)

### **Clinical Presentation, Animals**

Influenza is an acute upper respiratory disease characterized by fever, lethargy, anorexia, weight loss, and laboured breathing. Coughing, sneezing, and nasal discharge are commonly seen. Conjunctivitis is a less common clinical sign. Abortions may also occur. Some strains can circulate in pigs with few or no clinical signs. Swine influenza viruses can cause high levels of illness in pig herds but mortality is not high. (2)



### **Case Definition**

Presence of clinical signs and symptoms consistent with clinical presentation of swine influenza in animals and laboratory confirmation with isolation of virus from appropriate clinical specimen.

### **Prevention and Control of Disease in Animals**

Biosafety measures are important to prevent transmission through fomites and mechanical vectors. Once swine influenza is established on a farm, it can be very difficult to clear and quarantine and/or the depopulation of herds may be necessary. Inactivated H1N1 and H3N2 influenza vaccines are available. These vaccines do not always prevent infection or virus shedding, but vaccinated pigs generally have milder disease (2).

## **6.3. Disease in Humans**

### **Risk Factors**

Occupation and activities that lead to close contact with infected pigs (1,2,8)

### **Transmission**

Influenza viruses can be directly and indirectly transmitted from pigs to people and from people to pigs. Direct transmission of flu viruses via respiratory droplets from pigs are most likely to occur when people are in close proximity to infected pigs, such as in pig barns and livestock exhibits housing pigs at fairs.

### **Clinical presentation**

The symptoms of swine flu in people are similar to the symptoms of human seasonal influenza and include fever, lethargy, muscle aches, lack of appetite and coughing. Some people with swine flu also have reported runny nose, sore throat, eye irritation, nausea, vomiting and diarrhea. Recent cases suggest mild infection in most of those infected (2, 6).

### **Case Definition**

#### ***Suspected Influenza Like Illness (ILI)***

Acute onset of febrile respiratory illness with fever AND rapid onset of at least one of: rhinorrhea (runny nose) or nasal congestion, sore throat, or cough and close contact with a confirmed cases within the last 7 days (the upper range of the incubation period) or history of exposure to pigs in the last 7d in places where there have been confirmed cases.

#### ***Probable Case***

All above clinical symptoms and shedding influenza A virus through one of the rapid antigen tests available



### **Confirmed Case**

Clinical symptoms and isolation of virus from appropriate clinical specimen or confirmation with RT-PCR or 4 fold increase in antibody titers between acute and convalescent sera or detection of influenza-specific RNA by NAT or RT-PCR (9)

### **Communicability**

Person-to-person transmission through droplets or respiratory spread is uncommon (1,2,10).

## **6.4. Public Health Response**

The goal of the public health response to swine influenza is to better understand the risk of swine influenza, to prevent transmission to humans, to prevent potential viral reassortment, to facilitate early diagnosis and treatment, and to inform the development of prevention and control strategies. Response will vary with the extent of swine influenza cases and the subtype. As swine influenza is considered enzootic, an initial assessment will guide if action is necessary.

### **Risk Assessment**

Public Health Authorities made aware of an animal case of swine influenza should consider:

- contact the CVO to discuss the case and collect relevant information
- determine the human health risk based on the subtype
- identify humans who may have exposed or are at risk of being exposed (e.g. farm family, farm workers, visitors)
- determine the extent of public health measures that are needed (communications, social isolation or exclusion, outbreak management, etc.)

### **Risk Management**

Animal disease investigation, eradication and control is under authority of provincial Ministry of Agriculture. Public health is responsible for managing human health risks.

For people who have been exposed (e.g. farm worker) specific measures may include:

- provide advice on self-monitoring for symptoms during 10 days after last exposure to infected poultry or contaminated environment
- if ILI symptoms develop, obtain diagnostic specimen



- provide seasonal influenza vaccination; might offer some protection against swine influenza viruses when there is a homology between human and influenza viruses subtypes

### Risk Communication

- Swine influenza illness is rare in humans. If infection occurs, it is usually mild
- Swine influenza is not a foodborne disease. The risk of being infected with swine influenza viruses through the consumption of pork or pork products that are properly handled and cooked is zero. Influenza viruses are generally restricted to the respiratory tract of pigs, and are not detected in the muscle (meat) of pigs, even during acute illness.
- seasonal influenza vaccine may help to reduce the risk of swine influenza (depending on the strain)
- frequent hand washing and cough etiquette will decrease the risk of acquisition

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## 7.0 INFLUENZA H5 AND H7 (AVIAN INFLUENZA)

### 7.1. Introduction

Avian influenza (AI) is an infection of birds with a wide variety of clinical presentations caused by influenza A viruses. AI viruses are classified into low pathogenic avian influenza (LPAI) and highly pathogenic avian influenza (HPAI) based upon specific diagnostic and/or sequence criteria. AI viruses are subtyped into 16 H (hemagglutinin) and 9 N (neuraminidase) groups. The majority of AI infections in birds are mild, transient and LPAI (1). However, on rare occasions, some H5 and H7 LPAI viruses circulating in commercial poultry have mutated into HPAI viruses and have caused serious clinical illness and mortality resulting in devastating epizootics (2).

Most AI subtypes have limited transmissibility to humans but human cases occur on occasion. They vary from mild to severe. The public health risk is for an AI strain to reassort within a human or other host into a human-to-human transmissible strain. The public health guidance in this document is based on and consistent with the *Human Health Issues and Guidelines Related to Avian Influenza in British Columbia* (3). During an AI outbreak, further guidance should be sought from this reference document. AI should not be confused with seasonal human influenza generally caused by H1 and H3 virus subtypes.

#### Reason for surveillance

To better understand the epizootology and epidemiology of AI, to prevent transmission to humans, to prevent potential viral reassortment, to facilitate early diagnosis and treatment, and to inform the development of prevention and control strategies.



### **Public health significance**

Illness is rare but can be severe. Viral reassortment is possible in humans or other animal hosts which could lead to increased human-to-human transmissibility. There is no vaccination and increasing antiviral resistance.

### **Authority**

H5 and H7 avian influenza is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

In addition, HPAI subtypes H5 and H7 regardless of pathogenicity are immediately notifiable by veterinarians to the Canadian Food Inspection Agency (CFIA) under the federal Health of Animal Act and Canadian Notifiable AI Surveillance System (CanNAISS).

### **Reporting and Timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal case in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### **Epidemiology of Avian Influenza in British Columbia (BC)**

Avian influenza occurs worldwide and different strains are more prevalent in certain areas of the world than others. There are ongoing surveillance programs in wild birds for the detection of AI with a focus on H5 and H7. The CFIA conducts serological surveillance for highly pathogenic avian influenza, as well as low pathogenicity H5 and H7, in commercial poultry for purposes of international trade.

In February 2004, a LPAI (H7N3) was detected on a commercial chicken broiler breeder farm in the Fraser Valley and within 10 days, the virus mutated into the highly pathogenic form. The outbreak lasted 90 days and birds on 42 commercial poultry farms and 11 backyard premises were infected with HPAI (H7N3) (4). Two human cases of conjunctivitis were reported among exposed individuals (5). In November 2005, LPAI (H5N2) was detected on a commercial duck farm in the Fraser Valley with a second, related premises also testing positive (6). A third detection of notifiable avian influenza occurred in the Fraser Valley in January 2009 when a LPAI (H5N2) was identified on a turkey meat production operation (7). In December 2014, HPAI (H5N2) affected 14 farms in the Fraser Valley. (8) It was believed to be introduced by infected wild birds into multiple farms with limited farm to farm spread. No human cases were reported.



## 7.2. Disease in Animals

### Host and Reservoirs

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 the feces. Stable reservoirs of LPAI viruses have been recognized in wild waterfowl.

### Transmission

In general, avian influenza viruses are readily transmitted from farm to farm by the movement of live birds (domestic & wild), people, equipment and vehicular traffic. Direct transmission - viruses can be spread through direct contact with secretions/excretions from infected birds, including feces. Indirect transmission – viruses can also be spread indirectly through contaminated items such as feed, water, equipment, clothing. Airborne spread may occur over limited distances (2).

### Incubation period

In birds, it ranges from 2-7 days (2).

### Clinical manifestation

Avian influenza viruses can present in birds as LPAI and rapidly convert to HPAI with clinical symptoms ranging from no symptoms to severe disease.

In the low path form, signs of illness in birds are expressed as ruffled feathers, reduced egg production, or mild respiratory symptoms. In the high path form of the disease, the virus not only affects the respiratory tract, but also invades multiple organs and tissues and can result in massive internal haemorrhaging. The following signs can be seen in birds infected with a HPPAI: 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% (2).

### Case Definition

A probable case is a bird with or without clinical illness with laboratory confirmation by PCR or isolation of the influenza type A virus.

A confirmed case is 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



### **Animal Disease Control**

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.

The province, including the Ministry of Agriculture (MoA) of British Columbia, 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 of BC. MoA works closely with CFIA and Public Health and provides advice on management in outbreak scenarios. It provides diagnostic testing of animal samples on a routine basis and coordinates with CFIA for the confirmation of AI positive samples.

### **7.3. Disease in Humans**

Avian influenza viruses on rare occasions infect humans. During the 2004 HPAI (H7N3) outbreak, active surveillance identified 2 confirmed human cases of avian influenza (H7N3) infection. Symptoms included conjunctivitis and mild influenza-like illness (5). In the Netherlands outbreak of AI H7N7 in 2003, a worker died of the infection (9). Most of these cases have resulted from humans having direct or close contact with infected poultry (10). The potential for reassortment of influenza viruses are of concern due to the ability of human and avian viruses to infect pigs and humans. The possibility of reassortment and human to human transmissibility and the increasing resistance of the H5N1 AI virus to currently available antiviral treatment, coupled with lack of vaccination puts AI viruses into significant human risk category of illnesses.

#### **Risk factors**

Occupations and hobbies that lead to frequent contact with birds include poultry farm workers, poultry veterinarians and slaughterhouse workers (1).

#### **Transmission**

Avian influenza viruses may be transmitted from animals to humans through respiratory droplets directly from birds and indirectly from avian virus-



contaminated environments, and through an intermediate host, such as a pig. There is no evidence that consumption of cooked eggs or poultry can transmit AI to humans.

### **Communicability**

Person-to-person transmission of AI viruses has been limited so far. In June 2006, WHO reported evidence of human-to-human spread of HPAI H5N1 in Indonesia. In this situation, eight people in one family were infected. All influenza viruses have the potential to change rapidly (especially HPAI H5N1) and to gain the ability to spread easily from person to person (10).

### **Incubation period**

10 days or less (often 2-5 days) for H5N1 disease associated with poultry contact (3).

### **Clinical presentation**

The reported signs and symptoms of avian influenza in humans have ranged from conjunctivitis to influenza-like illness symptoms (e.g., fever, cough, sore throat, muscle aches) to severe respiratory illness (e.g., pneumonia, acute respiratory distress, viral pneumonia) sometimes accompanied by nausea, diarrhea, vomiting and neurological signs.

### **Case definition**

#### **Suspect Case**

An individual presenting with onset of two or more symptoms of conjunctivitis\* and/or influenza (H7 or H5) like illness (ILI) symptoms\*\* occurring between 1 day after first exposure or contact and 7 days after last exposure or contact (inclusive) to a potential source of avian influenza virus\*\*\* in the geographic area. Symptoms should not be fully attributable to another known etiology.

\*Conjunctivitis symptoms: red eye, eyelid/ conjunctiva inflammation (swelling), tearful eye, itching eye, painful eye, burning eye, discharge from eye, or sensitivity to light.

\*\*ILI (Influenza-Like Illness) symptoms: fever (if measured, greater than 38C), cough, rhinorrhea, sore throat, myalgia/arthralgia, or headache

\*\*\*Potential sources of avian influenza can be: infected or potentially infected poultry; infected or potentially infected raw or under-cooked poultry products; infected poultry manure; contaminated surfaces; contaminated vehicles, equipment, clothing and footwear at involved sites; contaminated air space; other infected or potentially infected animals (e.g., wild fowl, swine, etc.); individuals known to be infected.

#### **Confirmed Case**

An individual who fulfills the criteria of a suspect case and has laboratory confirmation of influenza A (H5 or H7) virus in any specimen(s) from the eye



(conjunctival swab), respiratory tract (nasal or nasopharyngeal swab or nasal wash) and/or serology by at least one of the following:

- Virus isolation in cell culture
- RT-PCR (confirmed by another RT-PCR test on a second specimen sample)
- Evidence of sero-conversion from acute and convalescent sera, taken at a 2 week interval, with a four-fold rise in antibody titre

### ***Asymptomatic or Atypical Case***

An individual who either has no clinical symptoms or has a clinical presentation unique from that of a suspect case yet has laboratory confirmation (i.e. as detailed above for a confirmed case) of an infection with influenza A (H5 or H7).

### **Communicability**

Possible but limited unless reassortment occurs

## **7.4. Public Health Response (3)**

The goal of the public health response to AI is to prevent transmission to humans, to prevent potential viral reassortment, to facilitate early diagnosis and treatment, and to inform the development of prevention and control strategies.

### **Risk Assessment**

Public health authorities informed of a case of H5 or H7 AI in poultry should:

- contact the CFIA or CVO to discuss the case and collect relevant information; join the CFIA Emergency Operation Centre or Joint Coordinating Committee, as appropriate
- determine the human health risk based on the subtype
- identify humans who may have exposed or are at risk of being exposed (e.g. farm family, farm workers, visitors); workers who are employed by the CFIA for culling and other control activities are covered by CFIA occupational health services
- determine the extent of public health measures needed (communications, social isolation or exclusion, outbreak management, etc.)

### **Risk Management**

The CFIA is responsible for managing the animal risk.

Public health is responsible for managing the risk to exposed individuals and/or people at risk of exposure. The management options will vary depending on disease extent (from managing sporadic case to management of clusters or outbreaks).



For people who have been exposed (e.g. farm visitor):

- provide advice on self-monitoring for symptoms during 10 days after last exposure to infected poultry or contaminated environment
- if ILI symptoms develop, obtain diagnostic specimen
- provide seasonal influenza vaccination

In addition, for people who are at continued risk of exposure (e.g. farm workers caring for ill poultry):

- consider antivirals<sup>1</sup>
- wear protective clothing during work with infected poultry including gown, mask, goggles, gloves and boots

In an AI outbreak setting, conduct surveillance for human cases, including active case finding and enhanced passive surveillance through physician reminders, as necessary.

### **Risk Communication**

- avian influenza is at low risk of infecting humans
- there is no risk to food safety
- wash hands regularly

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<sup>1</sup> Antiviral recommendations should be guided by a risk assessment focusing on the exposure risk and the human illness risk for the specific AI virus (see Human Health Issues and Guidelines Related to Avian Influenza in British Columbia)



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**8.0 PLAGUE**

**8.1. Introduction**

Plague is a serious, potentially life-threatening disease of humans and animals caused by the bacterium *Yersinia pestis*. Plague is usually transmitted to humans through the bites of rodent fleas. There are three major forms of the disease: bubonic, septicemic, and pneumonic. Plague has caused several large epidemics in the course of human history and continues to cause several thousand human cases worldwide (1). Although believed to be enzootic in BC, cases have rarely been identified.

**Reason for surveillance**

To monitor the occurrence of plague in animals in BC in order to better understand its epidemiology and prevent human transmission.

**Public Health Significance**

Human disease but can be severe and fatal and cause high public alarm. *Y. pestis* can be aerosolized and used as a bioterrorism agent.

**Authority**

Plague is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

**Reporting and timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal cases in BC. The CVO should notify the PHO (BCCDC) and the BCCDC



should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### **Epidemiology of plague in British Columbia**

The only reported case of disease caused by *Y. pestis* in a wild animal in Canada occurred near Lillooet, BC where plague was identified in 1988 in two bushy-tailed woodrats. However, other animals have also been infected as evidenced by the finding of antibodies to *Y. pestis* in 2-4% of mink, bobcats, marten, lynx and weasels from southern and central BC during a survey of wild carnivores between 1985 and 1991 (2). There is no active surveillance for plague in BC animals. The serological data and previous case history suggest that plague is enzootic in BC, however, actual prevalence and geographic range are unknown. Plague is known to occur in enzootic foci cyclically (i.e. found in some years and not in others) (3). Data from January 1993 to December 2013 indicate that no cases of human plague were reported in BC during that time period (4).

## **8.2. Disease in Animals**

### **Reservoirs and vectors**

Wild rodents are the natural vertebrate hosts of plague. In North America, the most important hosts include species of ground squirrels, prairie dogs, chipmunks, and wood rats. Deer mice and voles are suspected to act as reservoir hosts and are relatively resistant to plague mortality compared to many other rodent hosts (3,5). Rabbits, hares, wild carnivores (cougars, bobcats and mustelids) and domestic cats may also become infected. Domestic rats (*R. rattus* and *R. norvegicus*) are important reservoirs of *Y. pestis*, particularly in urban settings. Plague epizootics cause nearly 100% mortality in affected wild rodent and rabbit populations, therefore, die-offs of rodent colonies provide a warning of infection risk to humans and domestic animals (1).

The principal vectors of plague are fleas. Plague in urban locations has been linked to exposure to the oriental rat flea (*Xenopsylla cheopsis*) which commonly infests *Rattus* species. Once infected, fleas may remain infectious for a year or longer (1).

### **Transmission**

Flea bites or direct contact with an infected animal, and inhalation of infectious aerosols are routes of plague transmission (1).

### **Incubation period**

1-7 days

**Clinical manifestation** – Dependent on species, summarized in **Table 1**



**Table 1:** Animal species commonly affected by *Yersinia pestis* and associated clinical manifestations

Species	Clinical Manifestations
Rodents, rabbits	Sudden death; may be subclinical in some cases
Cats	<b>bubonic:</b> lymphadenopathy, fever, depression, dehydration, anorexia, oral ulcers; <b>septicemic:</b> fever, depression, vomiting <b>pneumonic:</b> fever, cough, bloody sputum

**Case Definition (animals)**

Laboratory confirmation with appropriate clinical specimen. Specimens: Lymphoid tissue, bone marrow, blood and serum specimens. Fleas can be submitted and tested by PCR or tested for the presence of F1 antigen by fluorescent antibodies and/or by culture.

**Prevention and Control in Animals**

Prevention is not practical for wildlife. For pets in enzootic areas, use flea control products and prevent pets from hunting rodents or having contact with rodent carcasses (1).

**8.3. Disease in humans**

**Risk factors**

Hunters, veterinarians, hikers, campers, biologists, owners of cats allowed to roam free and rural residents in enzootic areas are at increased risk of exposure. Risk of exposure to infected fleas is elevated in areas adjacent to rodent colonies experiencing widespread mortality (1).

**Transmission (1)**

- Occurs through a bite from an infected flea, direct contact with an infected animal, through handling of tissues, or inhalation of infectious respiratory droplets from infected animals
- Person to person transmission from persons with pneumonic plague through respiratory droplets
- Infected cats with pneumonic plague are also a source of respiratory spread to humans
- Intentional aerosol release resulting in pneumonic plague



**Incubation period (6)**

Generally 1 to 7 days. Plague pneumonia is usually shorter (i.e. less than 1 day to 4 days).

**Clinical Presentation**

Initial signs and symptoms of all forms of plague include: fever, chills, muscle aches, weakness, headache. Symptoms may also include nausea, vomiting, diarrhea and abdominal pain. Progression is dependent on the form of plague (Table 2).

**Table 2:** Clinical manifestations of plague in humans

Form	Transmission	Exposure	Clinical Manifestation
Bubonic	flea bite, direct contact	infected flea or animal/carcass	fever, malaise, headache, enlarged painful lymph nodes (buboes)
Septicemic	flea bite, direct contact	infected flea or animal/carcass	through primary infection or following untreated bubonic or pneumonic plague (secondary septicemia); hypotension and disseminated intravascular
Pneumonic	inhalation	infected aerosol	through primary infection or following septicemia; presents with dyspnea, cough, hemoptysis, fever

**Case Definition**

**Confirmed case**

Clinical evidence of illness with laboratory confirmation of infection:

- isolation of *Yersinia pestis* from body fluids OR
- a significant (i.e. fourfold or greater) rise in serum antibody titre to *Y. pestis* fraction 1 (F1) antigen by EIA or passive hemagglutination/inhibition titre

**Probable case**

Clinical evidence of illness with any of the following laboratory evidence:

- demonstration of elevated serum antibody titre(s) to *Y. pestis* F1 antigen (without documented significant [i.e. fourfold or greater] change) in a patient with no history of plague immunization OR
- demonstration of *Y. pestis* F1 antigen by immunofluorescence OR
- detection of *Y. pestis* nucleic acid OR



- >1:10 passive hemagglutination / inhibition titre in a single serum sample in a patient with no history of vaccination or previous infection OR
- detection of *Y. pestis* antibody by EIA

*Clinical evidence:* fever, chills, headache, malaise, prostration and leukocytosis and one or more of the following forms:

- Bubonic plague: regional lymphadenitis
- Septicemic plague: septicemia with or without an evident bubo
- Primary pneumonic plague: inhalation of infectious droplets
- Secondary pneumonic plague: pneumonia, resulting from hematogenous spread in bubonic or septicemic cases
- Pharyngeal plague: pharyngitis and cervical lymphadenitis resulting from exposure to larger infectious droplets or ingestion of infected tissues

### **Communicability**

Pneumonic plague can result in person-to-person transmission through respiratory spread (6).

## **8.4. Public Health Response**

The goal of the public health response to plague is to identify the source (and possibility of ongoing risk), identify exposed or at risk individuals, manage exposed individuals and provide information to potentially exposed, general public and partner agencies

### **Risk Assessment**

Public health authorities made aware of an animal case of plague should

- Consult the diagnosing veterinarian or laboratory to discuss the case and collect relevant information
- Assess whether any individuals may have been exposed or are at risk of being exposed to the source
- Assess whether there is an ongoing risk of exposure, the source of exposure, the mode of transmission and populations at risk

### **Risk Management**

Management depends on the extent of disease but generally include the following:

- Management of cases: Any symptomatic contact should be referred for immediate medical attention. Treatment is with antibiotics.
- Management of contacts:



- Provide education on sign and symptoms, encourage self-monitoring and reporting/consulting if symptoms develop
- Close contacts of plague pneumonia cases should receive chemoprophylaxis (7 days of tetracycline, doxycycline or chloramphenicol)
- Plague vaccines are no longer available

### **Risk Communication**

Given the rarity and seriousness of plague, it may be necessary to report internationally through the International Health Regulations.

Public messaging:

- Plague occurs sporadically in wild rodents across Canada (2)
- Do not pick up or touch dead animals.
- If you anticipate being exposed to rodent fleas, apply insect repellents to clothing and skin to prevent flea bites.
- Wear gloves when handling potentially infected animals.
- Eliminate sources of food and nesting places for rodents around homes, work places, and recreation areas. Remove brush, rock piles, junk, cluttered firewood, and potential food supplies (such as pet and wild animal food).
- Make your home rodent-proof.
- If you live in an area where rodent plague occurs, treat pet dogs and cats for flea control regularly, and do not allow pets to roam freely.

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### 9.0Q FEVER (*COXIELLA BURNETII*)

#### 9.1. Introduction

Q fever is a zoonotic disease caused by *Coxiella burnetii* which is a rickettsia, a strictly intracellular gram negative bacteria. The organism can be found in high concentrations in infected animal tissues and is highly resistant to many environmental conditions and disinfectants (1). Q fever has a low infectious dose of 1-10 organisms and therefore, the bacterium can potentially be used as bioterrorism agent (9).

#### Reason for Surveillance

To prevent transmission to humans, to facilitate early diagnosis and treatment and to inform the development of prevention strategies.

#### Public Health Significance

Q fever is rare but can have serious health outcomes in humans. Person-to-person transmission can occur rarely.

#### Authority

Q fever caused by *C. burnetii* is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

#### Reporting and timelines

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal case in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.



### **Epidemiology of Q fever in British Columbia (BC)**

Q fever is considered an enzoonotic disease in BC; most ruminant farms are infected on a regular basis. A province-wide bulk milk tank study conducted in 2002 found unpasteurized milk from 61% of dairy farms surveyed to be positive for *C. burnetii* (3). However, the incidence reported is much lower; between January 1998 and May 2011, fourteen animal cases of Q fever were diagnosed in BC. Positive animals included goats (11 cases), sheep (1 case) and cattle (2 cases) (2). No active surveillance program for Q fever in domestic or wild animals currently exists in BC; animals are tested as requested by attending veterinarians. The real incidence of human and animal disease is likely greater than that reported due to the mildness of many cases and lack of clinical suspicion (1).

Seven human cases of Q fever were reported in BC between 1998 and 2011. These cases occurred in the Fraser (6 cases), Vancouver Coastal (1 case) and Northern (1 case) Health Authorities (4).

## **9.2. Disease in animals**

### **Species affected**

*C. burnetii* is found worldwide in many species, especially ruminants like sheep, cattle and goats (9,10), which are considered the reservoir. It can also infect birds, dogs, cats, wild mammals (1) and marine mammals (11).

### **Vectors**

Ticks found on ruminants and wild animals can serve as disease vectors (8).

### **Transmission**

Animals infected with *C. burnetii* shed massive amounts of the organism at parturition. They also shed in milk, feces and urine. Animals contract the disease through the *inhalation* of infectious aerosols or through the bite of an infected tick (1). Two patterns of shedding are present in cattle: sporadic and persistent and additionally there are individual heavy shedder cows. Cows rarely shed in feces. Most cattle are asymptomatic and shed almost exclusively in milk. Goats also excrete mainly in milk while sheep shed mainly in feces and vaginal mucous.

### **Incubation Period**

The incubation period depends on the size of the infectious dose but is usually 2-3 weeks.



**Clinical manifestations**

*C. burnetii* infection is subclinical in most animals, with persistent shedding of bacteria into the environment. Clinical infections manifest differently dependent on species (1).

**Table 1: Clinical manifestations of Q fever in animals**

Species	Clinical manifestations
Sheep, cattle, goats	anorexia and reproductive disease including abortion, infertility and retained placenta
Dogs	fever, neurological syndrome with vasculitis, lethargy, anorexia, ataxia and seizures
Cats	anorexia, lethargy, fever and abortion

**Case Definition**

Confirmatory laboratory test with or without clinical illness in any animal species:

- Isolation of *C. burnetii* from an appropriate clinical specimen, or
- Demonstration of *C. burnetii* in a clinical specimen by detection of antigen or nucleic acid (PCR)

**Prevention in animals**

To reduce transmission:

- Segregate parturient animals
- Appropriately dispose of placenta, birth products and aborted fetuses (burning or burial)
- Use appropriate procedures for bagging, autoclaving and washing laboratory clothing
- Quarantine imported animals
- Maintain biosafety on farms

**9.3. Disease in humans**

Human infection with *Coxiella burnetii* ranges from asymptomatic to severe with acute and chronic manifestations.

**Risk factors**

Q fever is most commonly seen in veterinarians, meat workers and farmers. Most human infections are from handling ewes at parturition or from drinking raw milk. Epidemics have occurred among workers in stockyards, meatpacking and rendering plants, laboratories and in medical and veterinary centres that use sheep (particularly pregnant ewes) in research. Casual contact with farm environments and farm animals can also lead to infection (5). As infection in animals can go unrecognized, humans can be sentinels for infected animals (1).



### **Transmission**

The most common transmission route is through inhalation of aerosols containing *C. burnetii* during parturition or from contaminated dust in a farm environment. Windborne transmission over long distances (up to 2 km) is possible (12). Other modes of transmission, including tick bites, ingestion of unpasteurized milk or dairy products, and human to human transmission, are rare. Infected women may transmit to their infants through breastfeeding (7).

### **Incubation period**

Typically the incubation period is two to three weeks, but it can range from three to thirty days for the acute form (5).

### **Clinical presentation**

Over half of reported infections are asymptomatic. Acute Q fever is characterized by fever, chills, headache, malaise and sweats. Severe disease includes acute hepatitis, atypical pneumonia and meningoencephalitis. Pregnant women may be at risk for pre-term delivery or miscarriage. The case fatality rate is <1%. Antibiotic treatment may shorten the course of illness.

Chronic Q fever occurs in about 5% of patients months after acute infection and manifest as endocarditis, particularly in persons with underlying valvular disease and to a lesser extent in immunocompromised hosts and pregnant women (7). Long-term antibiotic therapy is required.

### **Case definition**

#### **Confirmed Case**

Clinically compatible<sup>1</sup> or epidemiologically linked case (with animal exposure) that is laboratory confirmed:

- Fourfold or greater change in antibody titer to *C. burnetii* phase II or phase I antigen in paired serum specimens taken 3-6 weeks apart, or
- Isolation of *C. burnetii* from an appropriate clinical specimen, or
- Demonstration of *C. burnetii* in a clinical specimen by detection of antigen or nucleic acid.

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<sup>1</sup> Acute infection: A febrile illness usually accompanied by rigors, myalgia, malaise, and retrobulbar headache. Severe disease can include acute hepatitis, pneumonia, and meningoencephalitis. Clinical laboratory findings may include elevated liver enzyme levels and abnormal chest film findings. Asymptomatic infections may also occur. Chronic infection: Potentially fatal endocarditis may evolve months to years after acute infection, particularly in persons with underlying valvular disease. A chronic fatigue-like syndrome has been reported in some Q fever patients.



### ***Probable Case***

Clinically compatible<sup>1</sup> or epidemiologically linked case with a single supportive immunoglobulin G (IgG) or immunoglobulin M (IgM) titer.

### **Communicability**

Person-to-person transmission is rare; however, there is a possibility of transmission through blood and organ donation and during obstetrical procedures on infected pregnant women (7).

## **9.4. Public Health Response**

The goal of the public health response to Q fever is to identify people at risk of infection, to advise them to symptom watch and to decrease the risk of further exposure.

### **Risk Assessment**

Public health authorities made aware of an animal case of Q fever should:

- contact the diagnosing veterinarian or laboratory to discuss the case and collect relevant information
- assess whether any other individuals may have been exposed or are at risk of being exposed via parturition, ingestion of unpasteurized milk/dairy or other means
- assess whether there is an ongoing risk of exposure

### **Risk Management**

Public health authorities are responsible for managing the risk to potentially exposed individuals.

### **CASE MANAGEMENT**

Case management is the responsibility of the attending physician. Timely referral and treatment with antibiotics is important.

### **CONTACT MANAGEMENT**

- Advise contacts on sign and symptoms of infection and when to seek medical care in order to facilitate rapid diagnosis and treatment
- Provide information to individuals at risk of exposure re: preventive measures.
- Determine if the contact donated blood or tissues and notify appropriate authority.
- Antibiotic prophylaxis is not recommended for exposed but asymptomatic contacts. For exposed laboratory personnel - consult infectious disease specialist to discuss a need for post exposure prophylaxis.



- If there is an ongoing risk of exposure, work with relevant agencies to mitigate it (e.g. Ministry of Agriculture, WorkSafeBC).

## OUTBREAK MANAGEMENT

Outbreaks can occur, especially in workplace settings. When a cluster of human cases occurs, initiates an investigation to identify risk factors or source of infection and eliminate source.

### Risk Communication

- Q fever is an infection caused by the bacterium *Coxiella burnetii*. Q fever is spread to humans from infected animals from breathing in particles from ruminants giving birth or by ingestion of raw milk.
- The bacteria remain stable in the environment for up to two weeks and can be resistant to heat, drying and many disinfectants. *Coxiella burnetii* can survive for months in birth products, animal faeces, urine, milk or sputum.
- Acute Q fever can cause an influenza-like illness that is sometimes associated with hepatitis (inflammation of the liver) and pneumonia. About half of people infected with Q fever may not have any symptoms.
- Chronic Q fever most commonly results in inflammation of the heart (endo- or myocarditis). People who already have heart valve disease or are immunocompromised are at increased risk
- Pregnant women who contract Q fever have increased risk of complications, such as miscarriage, particularly during the 1st trimester of pregnancy

### Preventive steps

- Wash hands and arms thoroughly in soapy water after any contact with animals
- Wash animal urine, faeces, blood and other body fluids from the work site and equipment, and disinfect equipment and surfaces where practicable
- Properly dispose animal tissues including placentas and fluids by incineration or deep burial
- Minimize dust in slaughter and animal housing areas
- Keep housing for sheep and cattle away from domestic living areas
- Remove and isolate clothing contaminated with bacteria before returning to the home environment; launder these separately
- Wear a mask when mowing lawn or gardening in areas where there are livestock
- Avoid the use of manure from contaminated farms in gardens
- Avoid unpasteurized milk and milk products
- Do not eat, drink, or smoke while handling animals or in animal housing areas



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**10.0 RABIES**

**10.1. Introduction**

This guideline is abridged since considerable background information and detailed public health response is found in the BC Rabies Guideline, Communicable Disease Control Manual, accessible at <http://www.bccdc.ca/discod/comm-manual/CDManualChap1.htm>.

**Reason for surveillance**

To be informed in a timely manner of animals at risk of rabies, to assess whether there has been exposure to humans and to take immediate preventive actions to decrease the risk of human infection.

**Public Health Significance**

Rabies is a nearly uniformly fatal disease in humans which can be prevented through the use of post-exposure prophylaxis.

**Authority**

Rabies is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

Rabies is a reportable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act. Owners, veterinarians and laboratories fulfill their reporting requirements to the CFIA by submitting suspect animals for testing.



### **Reporting and timelines**

Veterinarians who suspects rabies in an animal, must inform the BCCDC Public Health Veterinarian (PHV) to obtain assistance with risk assessment and management. All lab-confirmed rabies cases in BC animals must be reported by the labs to the CVO and PHV. If the MHO is not copied on the lab result, the PHV reports lab-confirmed rabies cases to the MHO. All reporting should occur immediately. The MHO reports human animal exposures requiring rabies post-exposure prophylaxis (RPEP) to the PHO (BCCDC) via iPHIS/PARIS/Panorama.

### **Epidemiology of rabies in British Columbia (BC)**

The only known reservoirs for rabies in BC are a number of bat species. Infected bats are more likely to come into contact with humans and subsequently be tested. Between 4 and 8% of the bat specimens sent for testing to the CFIA are positive. (1) It is estimated that less than 0.5% of bats are actually infected.

Other species which tested positive for rabies in BC include (except as noted, all were found to have bat-variant rabies): 1 cat in Maple Ridge (2007), 4 striped skunks in Stanley Park (2004), 3 cats in Delta (one cat had skunk strain) (1992), 1 beaver (skunk strain) (late 80s), 1 horse in the Sorrento area (1984), 1 cat on Vancouver Island (strain unknown, but presumed to be bat-variant) (1969).

A wildlife survey in Delta (prior to 1989), following the isolation of the skunk strain rabies in a beaver, and intense testing of cats following the Delta incident indicated that the skunk strain of rabies is not enzootic in BC.

Human cases of rabies in Canada are very rare. In BC, there has only been 1 human case diagnosed since 1983: a 60 year old male who died of bat-variant rabies in 2003. (2)

## **10.2. Disease in animals**

### **Species affected and clinical manifestations**

All mammals are susceptible to infection. (3) Animals may show behavioural changes: nocturnal species may be active in the day, calm animals may be excitable and timid ones may become vicious. “Furious” rabies is marked by aggression and a loss of fear of humans and other animals. The animal may attack suddenly and without provocation. There are seizures and loss of muscle coordination. Progressive paralysis results in death. In “dumb” or “paralytic” rabies, the throat and masseter muscles are paralyzed, resulting in excessive salivation and inability to swallow. The animal is generally passive and death results quickly from progressive paralysis.



**Case definition** (adapted from CFIA):

**Suspect**

Any animal exhibiting non-specific CNS clinical signs (ataxia, abnormal vocalization, biting and eating abnormal objects, aggression, etc.) that include rabies as a differential diagnosis should be considered suspect rabies particularly where there is a supportive history of potential exposure and where the local geographic rabies epidemiology supports the possibility of rabies

OR

Any animal with a positive screening test including:

- direct rapid immunohistochemical test (DRIT)
- immunohistochemistry

**Confirmed**

Any animal whose CNS tissue tests positive for rabies in a Fluorescent Antibody Test (FAT).

**Reporting to public health**

Report suspect and confirmed cases in any species immediately.

### 10.3. Disease in humans

**Clinical manifestations**

After an incubation period of several weeks to several years, the individual may experience fever, malaise and anxiety. After a number of days, neurological signs appear, and can manifest as either excitement or paralysis. The excited or “furious” version of rabies may include hypersalivation, hydrophobia and aerophobia, ending in coma and death. The paralytic or “dumb” version entails a steady, quiet decline into coma and death.

**Transmission**

Infection occurs by percutaneous introduction of the virus-laden saliva or cerebrospinal fluid of a rabid animal through a bite or scratch, or into a fresh break in the skin, or by contact with intact mucous membranes.

**Case definition (4)**

Clinical illness (acute encephalomyelitis (headache, fever, hydrophobia, delirium, convulsions, paralysis) progressing to coma and death) with laboratory confirmation of infection:

- 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 or central nervous system tissue using cell culture or laboratory animal OR
- detection of rabies virus RNA by PCR in an appropriate clinical specimen

#### **10.4. Public health response**

The goal of the public health response to a suspect or confirmed animal case of rabies is to identify exposed individuals, assess the level of risk and provide post-exposure prophylaxis as needed.

##### **Risk Assessment**

###### *Human exposure*

Public health authorities, under the direction of the MHO, are responsible for assessing risk in potentially exposed humans. Details can be found in reference 4. Assistance can be obtained from the BCCDC Physician Epidemiologist and Public Health Veterinarian at 604-707-2400 as well as from the Wildlife Veterinarian at 250-953-4285.

###### *Domestic animal exposure*

The owner's private veterinarian is responsible for conducting the risk assessment. A rabies exposure is deemed to have occurred if:

- the exposing animal species is known to carry rabies OR is behaving abnormally AND
- saliva or neural tissue contaminates an open wound or mucous membranes

More details can be found in the BC Rabies Guidance for Veterinarians (5). Assistance can be obtained from the BCCDC Public Health Veterinarian and the Wildlife Veterinarian.

The CFIA conducts rabies testing.

##### **Risk Management**

###### *Human exposure*

###### **CONTACT MANAGEMENT**

Rabies post-exposure prophylaxis for people who have been exposed to animals infected or potentially infected with rabies includes (4)

- First aid to the wound site
- Rabies immune globulin and 4 doses of vaccine for immunocompetent individuals who have not been immunized before (5 doses for those who are immunosuppressed)
- Two doses of vaccine for those who have been immunized in the past with WHO-approved products and schedule



## CASE MANAGEMENT

A possible human case of rabies requires intensive medical management.

## OUTBREAK RESPONSE

Outbreaks do not usually occur.

### *Animal exposure (5)*

If a domestic animal has had physical contact with an animal suspected of having rabies (including any bats), the domestic animal's private veterinarian will conduct a risk assessment of rabies transmission based on the species involved, the animals' behaviours and the type of exposure. Consultation with the BCCDC Public Health Veterinarian is available.

1. Exposures deemed at no risk need no further action.
2. For domestic animal exposures assessed by the veterinarian to pose a risk of rabies transmission and in which the **exposed domestic animal is currently vaccinated**, the private veterinarian should provide a rabies vaccine booster to the exposed animal within a 7 day window of the exposure event. No further action is required.

In cases where a booster vaccination is not administered within 7 days, a booster vaccination should still be administered as soon as possible after the exposure event. The private veterinarian, together with the Public Health Veterinarian, will make decisions about further actions (e.g. need for isolation and observation) on a case by case basis based on the exposure event and age, health status and vaccination history of the exposed domestic animal. In most cases, an animal that is currently vaccinated at the time of exposure will not require isolation, even if administration of the post-exposure booster vaccination is delayed until after 7 days.

3. For animal exposures assessed to pose a risk of rabies transmission and in which the **exposed domestic animal is unvaccinated**, the private veterinarian should:
  - (1) Vaccinate the exposed domestic animal within a 7 day window of the exposure event. In cases where a booster vaccination is not administered within 7 days, a booster vaccination should still be administered as soon as possible after the exposure event.
  - (2) If the suspect animal (e.g. the bat) is available, offer to have it tested. If testing is agreed upon, the private veterinarian coordinates the suspect animal's euthanasia (if required), sampling



- 
- (if required), packaging and shipment to the CFIA Animal Disease Research Institute (ADRI) in Lethbridge, Alberta.
- (a) If the suspect animal tests negative, no further steps are recommended.
  - (b) If the suspect animal is unavailable or tests positive, the private veterinarian can recommend:
    - (i) euthanasia of the exposed domestic animal OR
    - (ii) for the owner to isolate and observe the domestic animal on the owner's property AND for the owner to consult their veterinarian if the animal exhibits changes in behavior or health that indicate signs of rabies. The recommended isolation and observation period is 90 days for animals that receive a rabies vaccine within 7 days of the exposure event, and 180 days for animals that do not receive a rabies vaccine or that receive a rabies vaccine more than 7 days after the exposure event.
4. For animal exposures assessed to pose a risk of rabies transmission and in which the **exposed domestic animal is previously vaccinated, but out of date**, the private veterinarian should:
- (1) Vaccinate the exposed domestic animal within a 7 day window of the exposure event. In cases where a booster vaccination is not administered within 7 days, a booster vaccination should still be administered as soon as possible after the exposure event.
  - (2) If the suspect animal (e.g. the bat) is available, offer to have it tested. If testing is agreed upon, the private veterinarian coordinates the suspect animal's euthanasia (if required), sampling (if required), packaging and shipment to the CFIA Animal Disease Research Institute (ADRI) in Lethbridge, Alberta.
    - (a) If the suspect animal tests negative, no further steps are recommended.
    - (b) If the suspect animal is unavailable or tests positive, the private veterinarian, together with the PHV, will make decisions about further actions (e.g. isolation and observation) on a case by case basis based on the exposure event and age, health status and vaccination history of the exposed domestic animal.
      - (i) In most cases when the exposed animal is administered a booster vaccine within 7 days, no isolation and observation period would be necessary.
      - (ii) In cases where a booster vaccination is not administered within 7 days, the private veterinarian, together with the PHV, will make decisions about further actions (e.g. need for isolation and observation) on a case by case basis based on



the exposure event and age, health status and vaccination history of the exposed domestic animal. In most cases, a 90 day isolation and observation period would be required.

### Risk Communication

Specific messaging addressing the risk of disease should include the following information:

- Location and species of animal(s)
- How to avoid risk of exposure:
  - Receive pre-exposure immunization if in a high risk occupation or area
  - Vaccinate pets
  - Avoid physical contact with suspect animals
- What to do in the event of exposure:
  - First aid
  - Seek medical attention

### Communication Resources

- BCCDC: <http://www.bccdc.ca/dis-cond/a-z/r/Rabies/default.htm>
- HealthLink BC: <http://www.healthlinkbc.ca/healthfiles/hfile07.stm>
- PHAC: <http://www.phac-aspc.gc.ca/id-mi/az-index-eng.php#rabies>
- CFIA: <http://www.inspection.gc.ca/english/anima/disemala/rabrag/rabragfse.shtml>
- BC CFIA district offices: <http://www.inspection.gc.ca/english/anima/heasan/offburse.shtml>

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### 11.0 TRICHINOSIS/TRICHINELLOSIS

#### 11.1. Introduction

Trichinellosis (also known as trichinosis) is a foodborne zoonotic disease caused by *Trichinella* roundworms. Although a number of species and genotypes exist, *T. spiralis*, *T. nativa*, *T. murrelli*, *T. pseudospiralis* and genotype T6 are of potential concern in British Columbia (BC). (1) *T. spiralis* occurs in temperate zones and can affect domestic and wild animal hosts. T6 and *T. nativa* are found in the Arctic where they circulate among wild carnivores and their prey. (2) *T. pseudospiralis* can be found worldwide. Within host species the prevalence of infection varies considerably according to their carnivorous diets. (1)

#### Reason for surveillance

To monitor the occurrence of trichinellosis in animals in BC in order to prevent transmission to humans.

#### Public Health Significance

Human disease is rare in BC but can be severe. Diagnosis in humans is challenging. Identification of an infected animal can lead to appropriate diagnosis and management of infected humans and prevention of further cases.

#### Authority

Trichinosis is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing



Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

Trichinosis is a reportable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act. Animal owners, veterinarians, wildlife professionals and laboratories are required to immediately report an animal that is infected or suspected of being infected to a CFIA district veterinarian.

### Reporting and timelines

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal cases in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### Epidemiology of trichinosis in British Columbia

Canada's swine herd is currently considered to be *T. spiralis*-free. The last Canadian occurrence of *T. spiralis* in swine occurred in 1996. (3) The Canadian Food Inspection Agency (CFIA) conducts surveillance which involves testing for trichinosis at time of slaughter of a statistically representative number of swine to ensure that reintroduction of *T. spiralis* into swine in Canada has not occurred. In addition, all horses slaughtered at CFIA-regulated abattoirs for human consumption are tested for trichinosis at time of slaughter. (3)

In BC, trichinosis (*T. nativa*) is known to infect wildlife. Prevalence data from surveys conducted between 1951 and 1997 indicated that 35% of grizzly bears, 9.8% of cougars, 17.6% bobcats and 11.9% of black bears, in addition to several other species in BC were infected with *Trichinella* sp. (4) A more recent survey conducted on fifteen species of mammals killed or found dead in Canada between 1998 and 2007 found evidence of *Trichinella* sp. in all fifteen host species providing confirmation that all mammalian species can serve hosts. In North America, wolverines, polar bears, cougars and wolves are among the strictest carnivores and were found to be the most commonly infected animals in this study (42.9–76.6%). (1)

In 2005, an outbreak of 26 probable and 14 confirmed cases of trichinosis in humans on Vancouver Island was caused by consumption of undercooked black bear meat. (5) A cluster of trichinosis cases related to consumption of sausage and jerky containing bear meat occurred in 1997 involving 3 families in Cranbrook. During this outbreak, four people became ill and had positive serology tests for trichinosis. (6)



## 11.2. Disease in Animals

### Species Affected/Reservoir

Infection has been confirmed in 150 species of mammals including swine, dogs, cats, rodents (*T. spiralis*); foxes, wolves, bears, walrus and other cold-climate mammals (*T. nativa*); birds (*T. pseudospiralis*) (2)

### Transmission

Carnivores and omnivores acquire infection from consumption of infected tissues of other mammals, especially rodents. Evidence for transmission due to coprophagia in pigs exists. (2)

**Incubation Period** – unknown

### Clinical presentation

Most infections in wild and domestic animals are asymptomatic and undiagnosed. (7)

### Case definition

*Trichinella* cysts present on visual inspection of meat or on laboratory testing of meat suited for human consumption or positive laboratory post-mortem animal specimen.

### Prevention in animals

Proper feeding practices (no animal carcasses or raw waste (garbage) should be fed to swine), prevention of contact between domestic swine and infected rodents, and prevention of cannibalism in swine. (2)

In Canada, trichinosis is a reportable disease in swine under the Health of Animals Regulations, and all suspected cases must be reported to the Canadian Food Inspection Agency (personal communications: Dr. B. Thompson, CFIA, 2010). Disease control methods employed by the CFIA as part of an effort to eradicate trichinosis may include the humane destruction of all infected and exposed swine, surveillance and tracing of potentially infected or exposed swine, strict quarantine to control the slaughter and meat distribution of potentially infected swine and decontamination of infected premises. (3)

## 11.3. Disease in Humans

### Risk Factors for Disease Acquisition

Ingestion of undercooked meat



### **Transmission**

Ingestion of raw or under-cooked meat containing viable encysted *Trichinella* larvae. Meat products from wild or domestic swine and wild carnivore/omnivore or marine mammal present the highest risk. (2, 8) Organism is not transmitted person to person (8).

### **Incubation period**

Depending on the number of parasites involved, systemic symptoms caused by larvae usually begin 8-15 days after ingestion of contaminated meat but incubation varies from 5-45 days (8)

### **Clinical presentation**

Ranges from asymptomatic to fatal depending on the number of larvae ingested. Early signs include sudden onset of muscle soreness due to larval migration and encapsulation in muscle together with edema of the upper eyelids and fever, followed by ocular signs including sub-conjunctival and retinal hemorrhages, pain and photophobia. Thirst, profuse sweating, chills, weakness and prostration may follow. Gastrointestinal symptoms caused by adult worms can be severe and may precede the ocular manifestation. Eosinophilia is common. Death due to myocardial failure may occur between the fourth to eighth weeks in the most severe cases. (8)

Trichinosis should be suspected in any person who has any of the cardinal disease features such as periorbital edema, myositis, fever, and eosinophilia in particular if history reveals consumption of poorly cooked meat, especially pork products or wild (game) meat. Antibodies are not detectable until at least three weeks after infection. (9) Muscle biopsy is usually not necessary, however, if there is doubt about the diagnosis a specimen may be taken and identified by microscopy.

### **Case definition (10)**

#### **Confirmed Case**

Clinical illness (see below) with laboratory confirmation of infection:

- Positive serologic test for *Trichinella* sp.

OR

- If a muscle biopsy is conducted, such as during autopsy, demonstration of *Trichinella* sp. encysted larvae or larvae in tissue by microscopy or nucleic acid amplification

#### **Probable Case**

Clinical illness in a person who:

- is epidemiologically linked to a confirmed case

OR



- has consumed food (meat) which had demonstration of *Trichinella* sp. encysted larvae or larvae

### **Clinical illness**

Symptoms depend on the stage of the lifecycle. Systemic invasion by larvae result in fatigue, fever, myalgia/myositis, periorbital edema, sub-conjunctival and/or sub-retinal hemorrhages and eosinophilia. Adult worms in the intestine may rarely cause diarrhea, abdominal cramps and vomiting.

### **Communicability**

Trichinosis is not transmitted person to person. Animal hosts remain infective for months. Meat from infected animals remains infective for considerable periods unless it is irradiated or cooked for a sufficient time to allow all parts to reach temperatures of at least 71° C. Some of the of the *Trichinella* species (the arctic species of *Trichinella* (*T. nativa* and T6) are resistant to freezing and are killed by sufficient cooking at 67°C) (11).

## **11.4. Public health response**

The goal of the public health response to trichinosis is to identify the source (and possibility of ongoing risk), identify exposed or at risk individuals and provide information to the public.

### **Risk assessment**

Public health authorities made aware of an animal case of trichinosis should

- contact the diagnosing veterinarian or laboratory to discuss the case and collect relevant information
- assess whether any other individuals may have been exposed or are at risk of being exposed via ingestion of affected meat
- assess whether there is an ongoing risk of exposure

### **Risk management**

Public health authorities are responsible for managing the risk to potentially exposed individuals:

- Address any ongoing risk of exposure by ensuring that any potentially contaminated meat is tested (at BCPHMRL) and safely disposed.
- Infected animal carcasses should be disposed of according to local by-laws, ensuring that they are not available to scavengers (e.g. deep burial or incineration).
- Counsel exposed persons on clinical picture and when to seek medical treatment



### Risk communication, specific messaging

- Trichinosis is naturally occurring in some wildlife species potentially consumed in Canada (5)
- Trichinosis is transmitted to people through ingestion of contaminated undercooked meat (5)
- Trichinosis is a rare disease in Canada: approximately 18 cases are reported each year (4)
- Trichinosis is not contagious from person-to-person (8)
- To decrease the risk of infection: avoid eating improperly cooked wild game meat (8). All meats should be cooked thoroughly and achieve an internal temperature of at least 71 degrees Celsius (5). Freezing of meat is not sufficient to prevent trichinosis (5)
- Avoiding raw waste as a feed for domestic animals.
- Food handlers need to be aware about proper meat preparation and storage: proper cleaning of meat and surfaces that came into contact with meat (cutting boards, grinders) before and after cooking, separation of meat from other produce to prevent cross contamination; meat storage (deep freezing-150 for 3 weeks); thoroughly cooking according to recommended cooking temperatures for different meat types. (12)

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### 12.0 TUBERCULOSIS (*M. BOVIS*, *M. TUBERCULOSIS*)

#### 12.1. Introduction

Tuberculosis (TB) affects animals and humans and can be spread from one to the other. The etiologic agents of mammalian tuberculosis in North America include *Mycobacterium bovis*, the main cause of tuberculosis in cattle, and *Mycobacterium tuberculosis*, the main cause of human tuberculosis. (1)

#### Reason for surveillance

To monitor the epidemiology of tuberculosis in animals in BC in order to prevent transmission to humans

#### Public health significance

Human disease is rare but can be severe and transmissible to others. Disease can be spread to humans through various routes including ingestion and inhalation. Prevention mechanisms implemented early by public health authorities can decrease the risk of infection and early referral of symptomatic cases for antibiotic treatment can decrease morbidity.

#### Authority

Tuberculosis is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

Tuberculosis is a reportable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act Animal. Owners,



veterinarians and laboratories are required to immediately report cases to a CFIA district veterinarian.

### **Reporting and timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal cases in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### **Epidemiology in British Columbia (BC)**

Canada is considered *M. bovis*-free for farmed bovines and farmed cervids under the international standards set by the World Organization for Animal Health (OIE). (2) Sporadic cases of *M. bovis* are expected to occur during the final stages of the eradication program due to the extremely long incubation period and the presence of latent undetectable infection in some animals. (2)

- Prior to 2007, the last confirmed case of *M. bovis* in BC occurred in 1976 when it was found in a herd of farmed deer, while *M. bovis* in cattle was last reported in 1990. (2)
- In 2007, *M. bovis* was confirmed in a bull from a beef cattle herd located in the central interior of BC. (3)
- In 2008, *M. bovis* was confirmed in two BC-origin heifers slaughtered in the United States. (3)
- In 2011, an additional herd of beef cattle was identified as *M. bovis* positive in British Columbia. (4)

For updated information on newly identified cases of *M. bovis* in Canada, refer to: <http://inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/tuberculosis/eng/1330205978967/1330206128556>

There are two known wildlife reservoirs of *M. bovis* in Canada which include free-ranging populations of wood bison in and around Wood Buffalo National Park (Alberta/Northwest Territories border) and elk in and around Riding Mountain National Park (Manitoba). (5) No known tuberculosis has been diagnosed in other wildlife species in BC (personal communication: Helen Schwantje, Ministry of Environment, 2010).



## 12.2. Disease in Animals

**Species affected** Various mammal species are susceptible to tuberculosis (Table 1). Different species of tuberculosis mycobacteria are adapted to different host species (Table 1), although interspecies transmission can occur. (6)

**Reservoirs** – Cattle are the most significant reservoir of *M. bovis* worldwide. In North America, wildlife is the most significant reservoir. Wildlife reservoirs in North America include deer, elk and bison which act as sources of infection for pastured animals primarily through contamination of water and food sources within the shared environment. (6)

**Transmission** Respiratory infection can occur in herds or closely housed animals through aerosolized infectious particles due to pulmonary disease or inhalation of the products of draining lymphadenopathy. Infection is also acquired by ingestion of infected meat or milk, sharing of infected food and water sources, and through direct contact via grooming and exposure to secretions. (6) *M. bovis* can be transmitted back and forth between wildlife and cattle with populations being infected for long periods of time before the disease is identified within the population.

**Incubation period:** usually 2-6 months. Dormant infections can last a lifetime and may reactivate during periods of stress or in old age.

**Clinical presentation** Tuberculosis can be either a chronic or rapidly progressing disease. (6) In most cases, tuberculosis has a chronic course, with effects limited to the lungs, may remain clinically unapparent for a long time. Clinical manifestations are dependent upon species and infective agent (Table 1) (1)



**Table 1: Clinical manifestation and transmission of tuberculosis in commonly affected animal species (1,6)**

<b>Species</b>	<b>Agent</b>	<b>Transmission</b>	<b>Clinical Manifestations</b>
cattle	<i>M. bovis</i>	inhalation of contaminated aerosol; ingestion of contaminated milk by calves	may be inapparent or chronic; bronchopneumonia, coughing and reduced milk production; dyspnea; metritis; mastitis; cachexia; lymphadenitis; diarrhea
cervids	<i>M. bovis</i>	inhalation; ingestion of contaminated food/water source	may be chronic or acute; similar presentation to cattle
	<i>M. tuberculosis</i>	inhalation; ingestion	very uncommon
sheep/goats	<i>M. bovis</i> (relatively resistant to <i>M. tuberculosis</i> )	inhalation; ingestion	nannies may develop mastitis; pulmonary commonly seen in goats
swine	<i>M. bovis</i>	ingestion due to shared grazing or contaminated dairy products;	can be rapidly progressive disseminated disease with caseation and liquefaction of lesions
dogs	<i>M. bovis</i> ; <i>M. tuberculosis</i>	inhalation; ingestion of contaminated food/water source	chronic debilitation: wasting, anorexia; cough, shortness of breath; GI symptoms
cats	<i>M. bovis</i> (resistant to <i>M. tuberculosis</i> )	primarily through ingestion of contaminated milk;	chronic debilitation: wasting, anorexia; cough, shortness of breath; GI symptoms
monkeys/apes	<i>M. tuberculosis</i> ; <i>M. bovis</i>	primarily inhalation; ingestion	may be inapparent, chronic primary, rapidly progressing fulminant or reactivation TB
elephants	<i>M. tuberculosis</i>	inhalation; ingestion	chronic debilitation: weakness, weight loss, coughing; vaginal discharge or conjunctivitis



**Case definition** – adapted from CFIA

*Culture-confirmed case* – Isolation by culture of *M. bovis* or *M. tuberculosis* in the tissues of any animal.<sup>1</sup>

*PCR-confirmed case* – Any animal with presence of a *Mycobacterium tuberculosis* complex organism<sup>2</sup> on DNA extracted from fixed tissues in which acid-fast bacilli were observed on histopathology

**Prevention and control**

Tuberculosis is a reportable animal disease in Canada. All confirmed cases in animals needs to be reported to CFIA. The CFIA follows a strict testing and eradication program in response to reports of disease in livestock. Disease eradication measures are determined on a case-by-case basis. The Health of Animals regulations require that all infected and exposed susceptible animals be destroyed which is the only proven way to eliminate the disease (7).

**12.3. Disease in Humans**

Tuberculosis (TB) is caused by mycobacteria belonging to the *Mycobacterium tuberculosis* complex (MTBC), predominantly acquired through inhalation and rarely through ingestion or percutaneous inoculation (laboratory or hospital accident). Bovine TB, which in the past was caused by ingestion of infected (unpasteurized) milk and tended to involve the tonsils and intestines, has been largely eradicated as a result of the tuberculin testing of cattle and the subsequent slaughter of those found to be infected. Sporadic human cases may result from inadvertent exposure of abattoir workers, veterinarians and wild game handlers to infected animals. Immigrants may harbour *M. bovis*, and occasionally this organism may be reactivated in older persons who acquired the infection before milk-borne disease had been controlled (8).

In developed countries, approximately 1% of human tuberculosis cases are caused by *M. bovis* and the rest are caused by *M. tuberculosis*. (9) The vast majority of cases of *M. tuberculosis* cases are transmitted from other humans; the majority of *M. bovis* cases are reactivation of an infection acquired in the past. It is very rare for newly infected humans in Canada to acquire their infection zoonotically.

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<sup>1</sup> Although CFIA does not routinely conduct antimicrobial resistance testing of isolates, if significant human exposure occurred, CFIA could forward the isolate to a human reference laboratory for further testing.

<sup>2</sup> This includes *M. bovis*, *M. microti*, *M. africanum* and *M. canetti* for the animal MTBC as opposed to human case definition that encompasses more species of *M. Tuberculosis* under MTBC (*M. tuberculosis* subsp. *canetti*, *M. bovis*, *M. bovis* BCG, *M. africanum*, *M. caprae*, *M. microti* and *M. pinnipedii*) Canadian TB Standards, 6<sup>th</sup> Edition



**Risk factors for disease acquisition** Certain occupational groups are at risk of zoonotic tuberculosis transmission including people who work with livestock, hunters, abattoir workers, veterinarians, workers in zoos or wildlife parks, and animal care workers in primate facilities. (6)

**Transmission** *M. bovis* is most likely to be transmitted to humans through the ingestion of raw dairy products or undercooked meats and leads mainly to non-pulmonary tuberculosis such as intestinal or skin lesions and cervical lymphadenopathy. (9) However, it can also be transmitted via respiratory droplets and lead to pulmonary tuberculosis or less commonly, extrapulmonary tuberculosis. Respiratory transmission is considered to be the most important route of transmission in developed countries where pasteurization of milk occurs and cattle disease is mainly pulmonary (10). Farm, abattoir and laboratory workers can also be at risk of pulmonary disease from the aerosolization of infectious particles from any type of animal lesion during hosing down activities (11). Hunters and abattoir workers can be at risk of skin infection through direct contact of an open wound with animal tuberculous lesions. Humans can also contract *M. tuberculosis* from infected animals through inhalation of aerosolized droplets. (12) *M. bovis* is rarely transmitted from person-to-person (9,13). Although it is more likely for mycobacteria to be transmitted through milk if the udder is infected, they can also be transmitted via milk or other secretions even when the primary infection is localized to an organ distant from those secretions (e.g. lymph nodes) (14).

**Incubation period** 2-10 weeks from time of infection (12)

**Clinical manifestation** Disease caused by *M. bovis* and *M. tuberculosis* is clinically indistinguishable (9). Pulmonary disease symptoms include cough, fever, fatigue, night sweats, weight loss and pleuritic pain. Extrapulmonary disease affects the lymph nodes, bones and joints, meninges, genito-urinary tract, the gastro-intestinal tract and peritoneum, and the pericardium (12). Primary gastrointestinal tuberculosis may manifest as abdominal pain, fever, and a tender mass in the ileocecal area.

#### **Case definition (15)**

**Laboratory confirmed case** - Cases with Mycobacterium tuberculosis complex demonstrated on culture, specifically *M. tuberculosis*, *M. africanum*, *M. canetti*, *M. caprae*, *M. microti*, *M. pinnipedii* or *M. bovis* (excluding *M. bovis* BCG strain)

**Clinically confirmed case** – In the absence of culture proof, cases clinically compatible with active tuberculosis that have, for example:

- positive Mantu and/or compatible signs and symptoms of TB
- chest x-ray changes compatible with active tuberculosis;



- active nonrespiratory tuberculosis (meningeal, bone, kidney, peripheral lymph nodes etc.);
- pathologic or post-mortem evidence of active tuberculosis;
- favourable response to therapeutic trial of antituberculosis drugs.

**Communicability** Interspecies communicability occurs with *M. bovis* and person-to-person occurs with *M. tuberculosis*

#### 12.4. Public Health Response

The goal of the public health response to tuberculosis in animals is to identify and investigate exposed individuals, minimize further risk of exposure and provide relevant information to the public.

##### Risk Assessment

Public health authorities made aware of an animal case of tuberculosis should

- contact the Canadian Food Inspection Agency/diagnosing veterinarian to discuss the case and collect relevant information
- identify any individuals who may have been exposed or are at risk of being exposed via ingestion or inhalation routes
- assess whether there is an ongoing risk of exposure and determine the potential route(s) of exposure
- determine through history if screening is necessary for exposed individuals
- determine if any individuals are exhibiting clinical signs of disease

##### Risk Management

Animal disease investigation, eradication and control are under the authority of the Canadian Food Inspection Agency and will be managed according to the Health of Animals Act and associated regulations. (7)

Public health authorities are responsible for managing the risk to potentially exposed individuals.

- Screening
  - People at highest risk of infection should undergo screening according to the BC Manual. (16) This involves a tuberculin skin test performed through the local health unit as soon as possible after the exposure. A 939 form filled out by the testing agency should be sent to BCCDC TB Control stating the reason for skin testing.
  - People at highest risk include any of the following<sup>3</sup>:

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<sup>3</sup> These risk categories are derived from a review of the literature, a scan of practices in other jurisdictions (DOH and National Assembly for Wales 2000, reference 17) and discussions with experts at BCCDC TB Control.



- People who shared airspace with an animal with respiratory infection (e.g. lung, pharyngeal)
- People who consumed unpasteurized dairy products or undercooked meat from an infected animal
- People exposed to procedures that may have aerosolized infectious particles from an animal lesion
- People with open wounds in direct contact with animal lesions
- Vulnerable populations exposed to Mycobacterium regardless of route of exposure
  - Children <5years
  - Immunosuppressed individuals (e.g. on immunosuppressive therapy, transplant recipient, HIV infected, cancer)
- Positive screening results may lead to assessment of further people at risk using expanding circles of screening. This should be discussed with BCCDC TB Control physician at 604 707 2692.
- Any individuals showing clinical signs of disease should be referred to their health care provider for assessment.
- Address any ongoing risk of exposure.
- Occupational health should assess the health of possibly exposed workers and ensure proper personal protective equipment is being used by workers when handling known infected animals.

### **Risk Communication**

- The CFIA takes the lead in public communication on this disease. Any public health messaging should be coordinated with the CFIA.
- Public health messaging
  - To decrease the risk of infection:
    - Avoid ingesting unpasteurized dairy products
    - The CFIA is responsible for eradication and control of *M. bovis* in animals
    - Zoonotically transmitted tuberculosis is very rare in Canada due to pasteurization of dairy products and the CFIA's eradication program
    - If an exposed individual shows signs of illness, medical attention should be sought immediately for assessment and to reduce risk of person-to-person spread

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**13.0 TULAREMIA**

**13.1. Introduction**

Tularemia is an acute febrile illness in humans and animals. It is enzootic in certain North American animal species. Three bacterial subspecies with differing virulence and different reservoir species may cause human disease. *F. tularensis tularensis* (Type A) is the most virulent and is most commonly found in North American rabbit and hare species. *F. tularensis holarctica* (Type B) is the most prevalent and less virulent and is present in aquatic rodents (e.g. beavers). *F. tularensis novicida* is the rarest subspecies and associated with the mildest clinical presentation. (1)

**Reason for surveillance**

To monitor the epidemiology of tularemia in animals in BC in order to prevent transmission to humans

**Public Health Significance**

Human disease is rare but can be severe. Disease can be spread to humans through various routes including ingestion, direct contact or via vectors. *F. tularensis* has also been used as a bioterrorism agent. Prevention mechanisms implemented early by public health authorities can decrease the risk of infection and early referral of symptomatic cases for antibiotic treatment can decrease morbidity.

**Authority**

Tularemia is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing



Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

Tularemia is an annually notifiable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act Animal. Owners, veterinarians and laboratories are required to annually report cases to a CFIA district veterinarian.

### **Reporting and timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal cases in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### **Epidemiology in British Columbia (BC)**

Between 1993 and 2009, a total of 10 locally acquired human cases in BC were reported, with 0-3 cases per year. All reported human cases resided within the Fraser Health, Northern Health and Interior Health Authorities. Where the type of exposure was known, infections occurred due to animal and insect bites. (2,3) Tularemia has also been diagnosed in wild animals in BC, including five beavers and one case each of snowshoe hare, muskrat, and house mouse. (4) There is no formal surveillance program for tularemia in animals in BC. However, acute mortality of wild animals of the most commonly affected species may be reported and, if suitable carcasses are available, they are submitted for diagnostic evaluation. Available case information suggests that tularemia is enzootic in BC.

## **13.2. Disease in animals (1)**

**Species affected** – Tularemia can affect more than 250 species of mammals, birds, reptiles, and fish. Rabbit species and aquatic wild rodents (particularly beavers and muskrats) are most commonly involved and are seen with clinical disease or acute mortality. Domestic sheep and cats are particularly susceptible.

**Vectors** – Several species of ticks, deer flies, and to a much lesser extent, mites, lice, midges, fleas, bedbugs and mosquitoes.

**Transmission in animals** – Transmission occurs through a variety of mechanisms including:

- direct inoculation through a bite from an infected arthropod vector
- direct inoculation through a bite, scratch or conjunctival contact from an infected animal
- inhalation of aerosols containing the infectious agent



- ingestion of contaminated food or water

**Incubation period** – 1 to 10 days for rabbits, rodents and sheep and 2-7 days for cats and dogs

**Clinical presentation** – Tularemia presents differently depending on route of transmission and animal species (Table 1).

Table 1: Clinical manifestations of tularemia in the most commonly affected animal species (1)

Species	Clinical Manifestation
Rabbits, rodents	Ranges from subclinical to abnormal behaviour and poor appearance (i.e. not running away, obvious illness), to acute death often of more than one animal in an area.
Cats, dogs	Fever, anorexia, lethargy, lymphadenopathy
Sheep	Fever, septicemia, diarrhea, respiratory distress, rigid gait, death

**Case definition** –

Laboratory confirmation of infection in any animal through:

- Isolation of *Francisella tularensis* in an appropriate clinical specimen OR
- Detection of *F. tularensis* nucleic acid by PCR

**Prevention in animals** – Vaccines are not available for any species. Cats and dogs should be kept from hunting rodents in endemic areas.

**13.3. Disease in humans**

**Risk factors and zoonotic potential** - Tularemia is an occupational hazard for trappers, hunters, butchers, farmers, fur/wool handlers, conservation officers, veterinarians, laboratory workers and others who come into contact with infected animals. (1) It can be developed into a bioterrorist agent.

**Incubation period** – 3 to 15 days; most often, clinical signs appear after 3 to 5 days. (1)

**Transmission to humans and clinical manifestation** - The clinical manifestation depends on the route of transmission and virulence of the agent (Table 2). Onset is typically sudden with influenza-like symptoms including fever, chills, fatigue, general body aches, headache and nausea.



Table 2: Types, routes of transmission, common exposures and clinical manifestations of tularemia in humans (1,5,6,7)

Form	Transmission	Exposure	Clinical Manifestation
Ulceroglandular	Inoculation/direct contact	meat preparation, hunting or skinning wild animals; arthropod bite	indolent skin ulcer at the site of introduction of the agent along with the presence of one or more enlarged and painful lymph node(s).
Glandular	Inoculation/direct contact	meat preparation, hunting or skinning wild animals; arthropod bite	similar to ulceroglandular but without primary lesion; usually involvement of axillary or epitrochlear lymph nodes
Typhoidal	Ingestion	food or water contaminated by infected carcasses or excretions from infected animals	fever, painful pharyngitis, abdominal pain, diarrhea, vomiting, pneumonia, septicemia
Pneumonic	Inhalation	aerosols containing the infectious agent during mowing, weeding, farming or laboratory work	pneumonitis and bronchitis, or primary septicaemia
Oculoglandular	Contact with conjunctivae	infected material, contaminated water or hands	purulent conjunctivitis, lymphadenopathy
Oropharyngeal	Ingestion	food or water contaminated by infected carcasses or excretions from infected animals	persistent fever, pharyngitis and/or tonsillitis and cervical adenitis

**Case definition** – Clinical illness with laboratory confirmation of infection through:

- Isolation of *Francisella tularensis* in an appropriate clinical specimen OR
- Fourfold or greater change in serum antibody titre to *F. tularensis* antigen
- Detection of *F. tularensis* nucleic acid by polymerase chain reaction (PCR) or sequence-based analysis (8)

**Communicability** – Person-to-person transmission has not been reported. (5)



#### **13.4. Public health response**

The goal of the public health response to tularemia is to identify the source (and possibility of ongoing risk), identify and manage exposed or at risk individuals and provide information to the public. The risk assessment should also take into account that tularemia is a potential bioterrorism agent where animal cases may serve as a sentinel.

##### **Risk assessment**

Public health authorities made aware of an animal case of tularemia should

- contact the diagnosing veterinarian to discuss the case and collect relevant information;
- assess whether any individuals may have been exposed or are at risk of being exposed via ingestion, contact or inhalational routes;
- assess whether there is an ongoing risk of exposure and determine the potential route of exposure.

##### **Risk management**

###### **CONTACT MANAGEMENT**

Public health authorities are responsible for managing the risk to potentially exposed individuals:

- Chemoprophylaxis is not usually required but is available for inhalational exposures in a bioterrorism setting.
- No vaccine is approved for use in Canada.
- Address any ongoing risk of exposure
- Infected animal carcass disposal in the field should be discussed with the diagnosing veterinarian or the Chief Veterinary Officer, and disposed of as local facilities and provincial regulations direct.

###### **CASE MANAGEMENT**

Refer any symptomatic exposed individuals for medical management and antibiotic therapy.

###### **OUTBREAK MANAGEMENT (9)**

Outbreaks occur on occasion. Recent outbreaks have been associated with hunting parties, laboratory settings and contaminated natural environments. As no person-to-person spread occurs, outbreak management entails identifying and limiting exposure to the source, managing cases and contacts on an individual basis and providing education to exposed individuals and the public.

##### **Risk communication**

Public health messaging

- Tularemia is naturally occurring in certain wildlife species in Canada



- Tularemia in humans is rare in Canada
- Tularemia is not contagious from person-to-person
- To decrease the risk of infection:
  - Avoid drinking untreated water.
  - Protect drinking water sources and food stores from contact with rodents and rabbit species.
  - Avoid insect bites using insect repellent and long pants and sleeves.
  - Wear gloves when skinning animals, especially rabbits and rodents (e.g. muskrat). Cook the meat thoroughly.
  - Avoid creating dust and aerosols in areas where rodents and rabbits inhabit (e.g. mowing lawn).
  - Wash hands after contact with animals.

### Resources

- BCCDC: <http://www.bccdc.ca/dis-cond/a-z/ t/Tularemia/default.htm>
- HealthLink BC: <http://www.healthlinkbc.ca/kb/content/nord/nord1155.html>
- PHAC: <http://www.phac-aspc.gc.ca/tularemia/tul-qa-eng.php>

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**14.0 WEST NILE VIRUS INFECTION**

**14.1. Introduction**

West Nile virus (WNV) was first detected in North America during an epizootic in wild birds starting in New York in 1999. Since then it has spread across North America. Numerous species of birds (particularly corvids) provide the reservoir for WNV, and it is spread by mosquitoes between birds and to humans and animals (horses are the most sensitive domestic species).

**Reason for surveillance**

To monitor the occurrence of WNV in animals which act as sentinels for the presence of the virus in BC.

**Public Health Significance**

Human illness is rare but can be severe. Prevention mechanisms implemented early by public health authorities can decrease the risk of infection.

**Authority**

WNV infection is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate.

WNV infection is an immediately notifiable animal disease to the CFIA under the federal Reportable Diseases Regulations, Health of Animals Act. Laboratories are required to contact the CFIA regarding the suspicion or diagnosis of one of these diseases.



### **Reporting and timelines**

Laboratories and veterinarians should notify the CVO of any laboratory-confirmed animal cases in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur within 24h of diagnosis.

### **Epidemiology of WNV in British Columbia (BC) (1)**

In 2009, the first 2 locally acquired human cases of WNV infection were reported in BC, in central Okanagan residents. Three horses also tested positive: 2 in the south Okanagan and 1 in the Fraser Valley. In 2010, 1 locally acquired human case occurred in a central Okanagan resident and 5 birds tested positive, also in central Okanagan. In 2011, 1 horse tested positive in the central Okanagan. In 2013, 1 human in south Okanagan, 1 horse and 1 bird, both in Central Okanagan, tested positive. There were no positive WNV indicators in 2012 and 2014.

In BC, WNV risk is assessed through passive surveillance of horses and humans and activity in neighbouring jurisdictions.

## **14.2. Disease in animals (2)**

Although many species of birds become viremic with WNV, not all succumb to the infection. Corvids (crows, ravens, magpies and jays) are highly susceptible to infection, resulting in death, and as a result, the mortality of these species is used as an initial indicator of the presence of WNV.

Horses are the most susceptible domestic animal species to WNV infection. Similar to humans, many cases are subclinical. Clinical signs can include inability to stand, colic, anorexia, muscle fasciculation, weakness, lameness, staggering and fever. Approximately 10% of non-vaccinated horses develop encephalitis with neurological signs. The case fatality rate for horses with the most severe form of disease, West Nile encephalitis, is 30-40%. Several vaccines against WNV are available for horses. Horses infected with WNV can be the first indication of, and are often used as, a sentinel indicator for WNV activity in the immediate area.

Both humans and horses are dead end hosts. Other animals reported to be susceptible to WNV include raptors, squirrels, cats, dogs, raccoons, reindeer, marine mammals, etc.



### **Case definition (3)**

#### ***Confirmed case***

Compatible clinical signs<sup>1</sup> plus one or more of the following:

- isolation of West Nile virus from tissues<sup>2</sup>;
- an associated 4-fold or greater change in IgG ELISA testing or seroneutralization (SN) test antibody titre to WNV in appropriately-timed<sup>3</sup>, paired sera;
- detection of IgM antibody to WNV by ELISA testing in serum or cerebrospinal fluid (CSF) - see first assumption below;
- a positive polymerase chain reaction (PCR) to WNV genomic sequences in tissues and appropriate histological changes;
- a positive immuno-histochemistry (IHC) for WNV antigen in tissue and appropriate histological changes.

#### ***Possible Case***

Compatible clinical signs<sup>1</sup> plus one of the following:

- elevated titre to WNV antibody by SN test in serum or positive IgG ELISA test, but only one sample is available;
- static IgG titres to WNV (SN test or ELISA) in appropriately-timed<sup>3</sup>, paired sera.

<sup>1</sup>Clinical signs must include ataxia (including stumbling, staggering, wobbly gait, or incoordination) or at least two of the following: circling, hind limb weakness, inability to stand, multiple limb paralysis, muscle fasciculation, proprioceptive deficits, blindness, lip droop/paralysis, teeth grinding, fever, acute death.

<sup>2</sup>Preferred diagnostic tissues from equine are brain or spinal cord; although tissues may include blood or CSF, the only known reports of WNV isolation or positive PCR from equine blood or CSF have been related to experimentally infected animals.

<sup>3</sup>The first serum should be drawn as soon as possible after onset of clinical signs and the second drawn at least seven days after the first.

#### ***Reporting to public health***

All confirmed and possible cases in any animal

### **14.3. Disease in humans**

Humans are infected via the bite of an infected mosquito. The incubation period is 3-14 days. Although 80% of people infected will be asymptomatic, 20% will have a milder form of infection, termed WN non-Neurological Syndrome (WNnon-NS). The symptoms include fever, headache, rash, arthralgia, myalgia, photophobia and last for a week or more. (4) About 1 in 150 cases will develop the more severe WN Neurological Syndrome (WNNS). Symptoms include severe headache, stiff neck, meningoencephalitis and paralysis. The fatality rate is about



1 in 1000 cases. Infection cannot be spread from person to person except by blood transfusion and organ transplant. Canadian Blood Services conducts testing on blood donations to assess the risk to recipients. Treatment is symptomatic. No vaccine is available.

#### **14.4. Public health response**

The goal of the public health response to WNV is to increase awareness regarding the presence of WNV in the immediate area and provide relevant information to the public to decrease the risk of transmission. In the case of a positive horse, travel information is of interest, to assess whether the infection was acquired locally or during travel.

##### **Risk assessment**

When an animal is positive for WNV, the BC Ministry of Agriculture:

- conducts the laboratory testing and interpretation
- for horses: conducts follow-up with the veterinarian and/or owner to collect information on clinical symptoms, vaccination status and location and travel history of the horse
- shares information with BCCDC and the HA where the animal is located

The MHO can request additional information required in order to take appropriate actions.

##### **Risk management**

In response to a reported animal case, public health authorities may

- conduct public messaging
- conduct mosquito control activities (e.g., larviciding)

Contact management and outbreak response are not applicable for this disease. Human cases should be managed medically.

##### **Risk communication**

Risk communication focuses on personal protection, mosquito larvae habitat reduction and positive specimens found.

Communication resources

- BCCDC: [http://www.bccdc.ca/dis-cond/a-z/\\_w/WestNileVirus/default.htm](http://www.bccdc.ca/dis-cond/a-z/_w/WestNileVirus/default.htm)
- CFIA: <http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/immediately-notifiable/west-nile-virus/eng/1305840783267/1305840912854>
- HealthLink BC: <http://www.healthlinkbc.ca/healthfiles/hfile88.stm>
- PHAC: <http://www.phac-aspc.gc.ca/wn-no/index-eng.php>



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**15.0 ZOOBOTIC VIRAL HEMORRHAGIC FEVERS (VHF)**

**15.1. Introduction**

Viral hemorrhagic fevers (VHF) are a group of illnesses caused by zoonotic viruses that often lead to multi-organ failure and hemorrhage in humans and some animal species. This document covers all viruses that can cause hemorrhagic fever in humans and can be transmitted from animals. Four groups of viruses include viruses that can cause VHF in humans (1)

- Arenaviruses: Lassa, Junin, Machupo, Guanarito, Sabia, Chapare, Lujo
- Bunyaviruses
  - Hantaviruses, incl. Haantan, Puumala, Dobrava, Seoul, Saaremaa (Sin Nombre and other hantaviruses in the Americas do not cause VHF)
  - Nairovirus (Crimean-Congo hemorrhagic fever )
  - Rift Valley Fever virus
- Filoviruses: Marburg, Ebola
- Flaviviruses: yellow fever, Kyasanur forest disease virus, Omsk hemorrhagic fever

None of these viruses are endemic to Canada. There have been occasional importations to developed countries of animals infected with viruses that can cause VHF in humans. Marburg was imported via asymptomatic African green monkeys from Uganda to Germany and Yugoslavia in 1967; 31 people were infected and 7 died. (2) *Ebolavirus*-Reston was diagnosed in cynomolgus monkeys imported from the Philippines to the US and to Italy on several occasions in the 1980s and 90s. This strain caused high mortality in the monkeys, but only asymptomatic seroconversion in humans. (2,3)



### **Reason for surveillance**

To identify cases of VHF in animals in BC in order to prevent transmission to humans.

### **Public Health Significance**

Although VHF is exceedingly rare in animals and humans in North America, human illness can be fulminant and the outcome, poor. Subsequent transmission can also occur from person-to-person with some of the viruses.

### **Authority**

Confirmed and suspect animal cases of viral hemorrhagic fever (VHF) is a reportable animal disease to the Chief Veterinary Officer (CVO) under the Reportable and Notifiable Disease Regulation of the Animal Health Act. The CVO can report the case to the PHO under the Information Sharing Agreement for the Sharing of Zoonotic Communicable Disease Reports from the CVO to the PHO or Delegate. Some VHF in animals are also reportable to the OIE.

### **Reporting and timelines**

Laboratories and veterinarians should notify the CVO of any animal cases in BC. The CVO should notify the PHO (BCCDC) and the BCCDC should notify the MHO in the affected HA. Reporting of the animal case to the MHO should occur immediately.

### **Epidemiology of viral hemorrhagic fevers in British Columbia (BC)**

None of these viruses have been reported in animals or humans in BC. The importation of bats, primates and rodents, the return of human travelers from outbreak zones, as well as inadvertent importation of vectors from endemic areas present a very small risk of introduction of these viruses into BC.

## **15.2. Disease in Animals**

### **Affected (symptomatic) species**

- Ebola and Marburg: mainly primates
- Rift Valley Fever: ruminants incl. sheep, cows, goats
- Yellow fever: primates

### **Reservoir (asymptomatic) species**

- Ebola and Marburg: believed to be bats
- Arenaviruses, hantaviruses, Kyasanur forest disease virus, Omsk hemorrhagic fever virus: rodents



### **Vectors**

- Yellow fever, dengue: mosquitoes
- Crimean-Congo hemorrhagic fever, Kyasanur forest disease, Omsk hemorrhagic fever: ticks

### **Transmission in animals**

- Ebola and Marburg: through direct contact with blood and other secretions and possibly droplet spread
- Arenaviruses and hantaviruses: horizontal transmission from mother to offspring in rodents, aerosols or direct contact of contaminated excreta with mucosa or open wounds
- Yellow fever, Crimean-Congo hemorrhagic fever, Kyasanur forest disease, Omsk hemorrhagic fever: vector bites

**Incubation period** – various

### **Clinical presentation (3,4)**

- Ebola and Marburg (in primates): weakness, vomiting, diarrhea followed by acute hemorrhagic disease with high mortality
- Yellow fever (in primates): from asymptomatic to acute hemorrhagic fever
- Rift Valley Fever (in ruminants): listlessness, fever, loss of appetite, jaundice, diarrhea, hemorrhage, abortion, neonatal death

### **Case definition**

Both confirmed and suspect cases are reportable.

#### ***Confirmed***

Laboratory confirmation through validated testing (discuss with level 4 National Microbiology Laboratory virologist)

#### ***Suspect***

Any animal suspected to have a viral infection which could lead to hemorrhagic fever in humans

### **Prevention in animals**

Isolate infected animals where possible (e.g. in captivity)



### 15.3. Disease in Humans

#### Transmission from animals to humans (2,3)

- Ebola, Marburg: direct contact with tissues or body fluids of infected animals (i.e. primates) or contaminated medical/laboratory equipment, for Marburg: direct contact with bats
- Arenaviruses, hantaviruses: through aerosol or direct contact with excreta of infected rodents or rodents themselves or through contaminated food or water.
- Yellow fever: through mosquito bites
- Crimean-Congo hemorrhagic fever, Kyasanur forest disease, Omsk hemorrhagic fever: through tick bites
- Rift Valley Fever: through mosquito bites and via direct contact of non-intact skin with, and aerosols from, infected animals during birthing or other animal handling procedures

#### Incubation period (2)

- Ebola: 2-21 days
- Marburg: 3-7 days
- Lassa: 6-21 days
- Hantaviruses: 2-4 wks
- Yellow fever: 3-6 days
- Rift Valley Fever: 2-6 days

#### Clinical manifestations (1,2)

- Ebola and Marburg: sudden onset of fever, malaise, myalgia, headache, conjunctival injection, pharyngitis, maculopapular rash, vomiting and diarrhea that can be bloody. Bleeding from gums, nose, injection sites and GI tract occurs in about 50% of patients. In severe cases, the hemorrhagic diathesis may be accompanied by shock and multi-organ dysfunction. Ebola has a 53-81% case fatality and Marburg, 29%.
- Lassa: Acute illness lasting one to four weeks. Gradual onset of symptoms, including fever, headache, generalized weakness, malaise, sore throat, cough, nausea, vomiting, diarrhea, myalgia, and chest and abdominal pain. Many cases are mild or asymptomatic. Severe cases may result in hypotension, shock, pleural effusion, hemorrhage, seizures, encephalopathy and proteinuria. Fetal loss occurs in 80% of pregnant cases and maternal death is frequent. Case fatality is 1% of all cases.
- Hemorrhagic fever with renal syndrome (hantaviruses including Seoul, Puumala, Haantan and Dobrava): acute febrile illness (fever, headache, malaise, abdominal and lower back pain and vomiting), hypotension and hemorrhaging and renal involvement (oliguria followed by diuretic phase). Case-fatality of 5-15%.



- Yellow fever: most have no or mild symptoms including sudden fever, chills, severe headache, back pain, general body aches, nausea, and vomiting, fatigue, and weakness; about 15% progress to high fever, jaundice, bleeding, shock and organ failure.
- Rift Valley Fever: most have no or mild symptoms such as fever, weakness, dizziness; about 10% develop more severe illness such as blurred or loss of vision, encephalitis or hemorrhagic fever (in 1%); 50% of those with VHF die.

### **Communicability (2,3)**

- Ebola and Marburg: person-to person transmission occurs through direct contact with infected blood, tissues, organs, secretions, or semen; prolonged close contact such as in nosocomial or household care of an infected patient increases risk
- Lassa: Through direct contact with infected blood, pharyngeal secretions and urine, and through sexual contact
- Hantaviruses: person-to-person transmission is very rare
- Vectorborne viruses can be transmitted to others only if the appropriate vector is present

### **Case definition (5, 7)**

Laboratory confirmation of a viral hemorrhagic fever with clinically compatible symptoms through:

- Virus isolation from appropriate specimen (e.g. blood)
- Antigen detection by ELISA in serum
- Viral genome detection by PCR
- Demonstration of IgM antibody in serum
- Demonstrating a four-fold rise in IgG antibody in serum

## **15.4. Public health response**

The goal of the public health response to VHF is to identify and manage infected animals and individuals and provide information to the public.

### **Risk assessment**

Public health authorities made aware of an animal case of VHF should

- Inform CFIA and BCCDC immediately. BCCDC should contact PHAC Centre for Emergency Preparedness or PHAC on-call at 1-800-545-7661.
- Contact the diagnosing veterinarian to discuss the case and collect relevant information.
- Assess whether any individuals may have been exposed through unprotected mucous membrane or open wound contact with the infected animal or contaminated equipment.



### **Risk management (5)**

- The affected animal should be humanely euthanized and disposed of using incineration or deep burial.
- Public health should ensure exposed individuals are placed under surveillance. (6)
  - Record their temperature twice daily for 3 weeks following the last exposure.
  - Post-exposure prophylaxis of exposed individuals is not recommended/ available.
- If the temperature  $\geq 38.0^{\circ}\text{C}$ , they should report to the MHO and be immediately isolated and treated as a VHF patient. The following are recommended (7):
  - Isolation should occur in hospital in a private room with negative air flow
  - Gowns, gloves, fluid resistant masks and eye protection should be used
  - Dedicated or disposable patient care equipment should be used
  - Caregivers should wash hands with antiseptic solution after patient contact
- If the diagnosis is confirmed further precautions are needed

### **Risk communication**

- Public communications need to be coordinated with provincial and national agencies
- Messaging may include:
  - Viral hemorrhagic fevers are a group of diseases caused by viruses that can lead to fever and bleeding in animals and people.
  - The disease is serious and can lead to death. There is no treatment although hospital care can help.
  - Infected animals can spread the disease to humans, but appropriate precautions will minimize this risk.



## Resources

BCCDC <http://www.bccdc.ca/dis-cond/a-z/ e/Ebola/default.htm>

PHAC <http://www.healthycanadians.gc.ca/diseases-conditions-maladies-affections/disease-maladie/ebola/index-eng.php>

CDC <http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/vhf.htm>.

CVMA <http://www.canadianveterinarians.net/uploads/userfiles/files/guidance%20regarding%20animal%20ownership%20and%20contact%20by%20individuals%20with%20potential%20ebola%20virus%20exposure.pdf>

Worms and Germs

Blog <http://www.wormsandgermsblog.com/2015/01/articles/animals/dogs/canadian-companion-animal-ebola-guidance/>

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