Rabies and emerging vectors and vector-borne diseases in British Columbia

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April 26, 2026
Society of BC Veterinarians

BC Centre for Disease Control
Provincial Health Services Authority

Provincial Health Services Authority

We gratefully acknowledge that we are gathered on the unceded, traditional, and ancestral lands of Lekwungen Peoples, specifically the Songhees and Esquimalt First Nations.

First Nations have been responsible for stewarding this land for all time and we give thanks as uninvited settlers on these lands.

We recognize the historic and ongoing colonial impacts on all First Nations, Métis Peoples and Inuit that call this land home.

Learning outcomes

1. Increase knowledge of scientific evidence, prevalence, geographic distribution, and transmission dynamics of rabies and selected emerging vectors and vector-borne pathogens in BC
2. Enhance understanding of role of surveillance in early detection of zoonotic and emerging vector-borne disease threats
3. Improve familiarity with policies and best practices for private practitioners regarding the detection, prevention and control of rabies and emerging vector-borne pathogens
4. Increase awareness of reliable sources of up-to-date information for rabies and vector-borne disease monitoring in BC

What's coming up?

Rabies

1. Refresh on the basics
2. Epidemiology
3. Risk assessment and risk management
4. Human health considerations
5. Roles and responsibilities

Vectors and Vector-borne diseases

1. Reportable and notifiable diseases
2. Emerging vectors and pathogens
3. Climate change and vector-borne diseases

Background

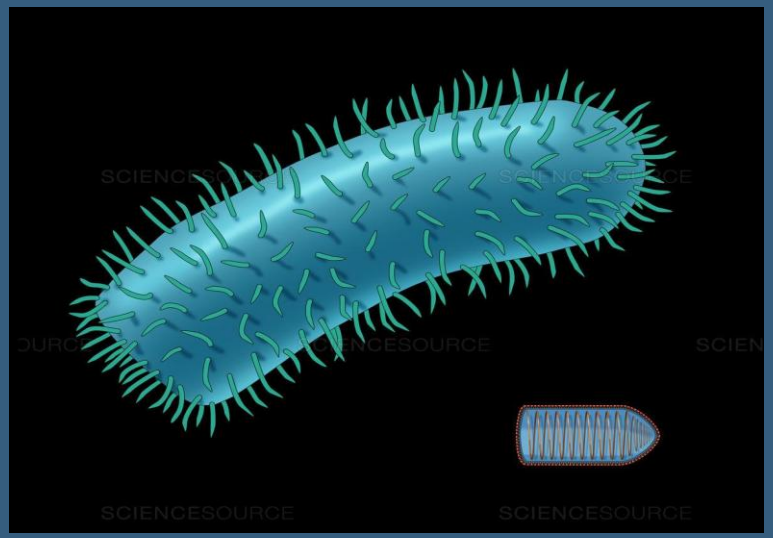
Rabies

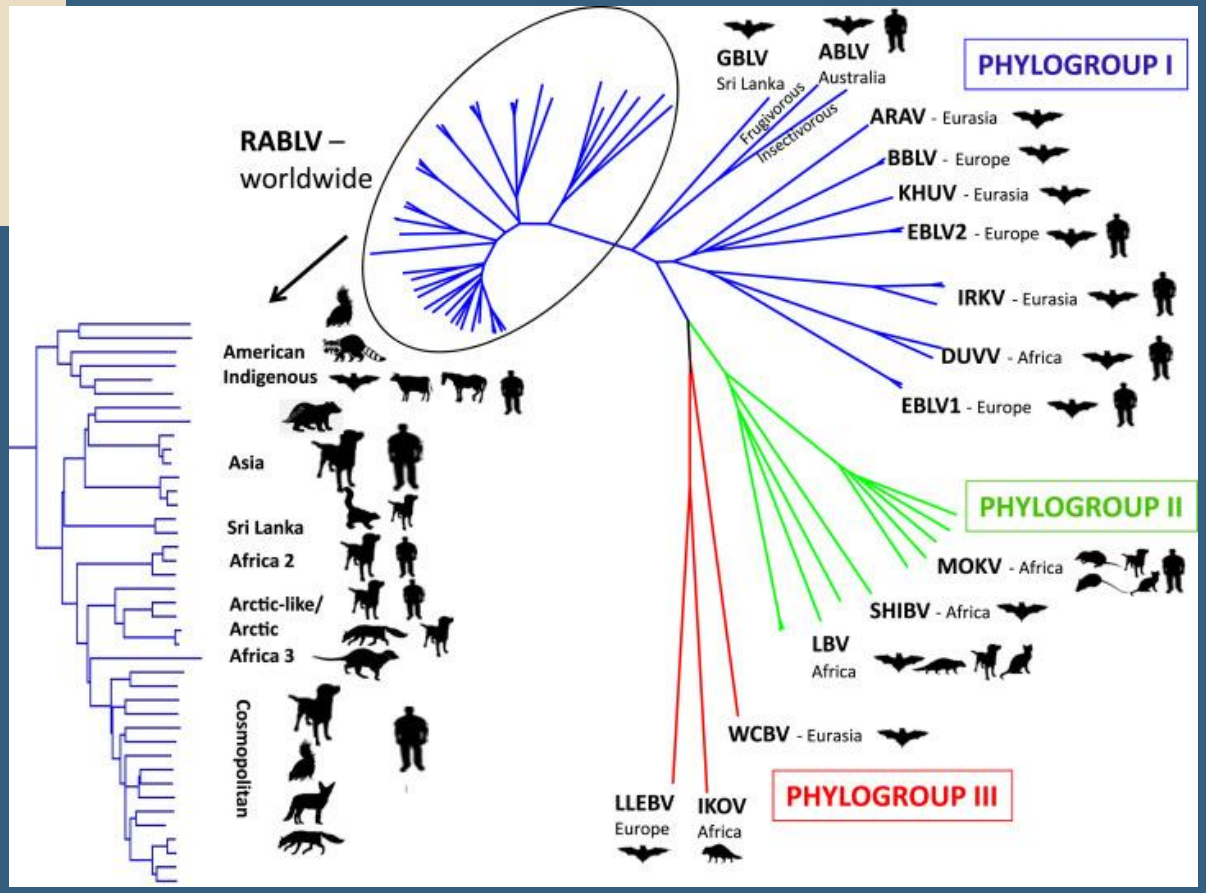
- One of the oldest described diseases
- Originates from Latin word ‘rabere’ which means to rage or to do violence.
- The Greeks called rabies *lyssa* or *lytta*, which means frenzy or madness

Background

Rabies

- Genus Lyssavirus in the Rhabdovirus family
- Enveloped, neurotropic RNA virus





Source: Banyard and Fooks, 2021

Background

Rabies

- **Rabies** is an acute, progressive encephalitis
- Infectious disease with the highest case to fatality rate
- 100% preventable
- All mammals are susceptible
- Distinct variants associated with animal reservoirs

Burden of illness

Rabies

- ~60,000 human deaths per year
- Predominantly in Asia and Africa
- Dogs are the most important reservoir
- Wildlife species most important reservoir in North America

Rabies is a major public health problem

World Health Organization

Fatal once symptoms appear

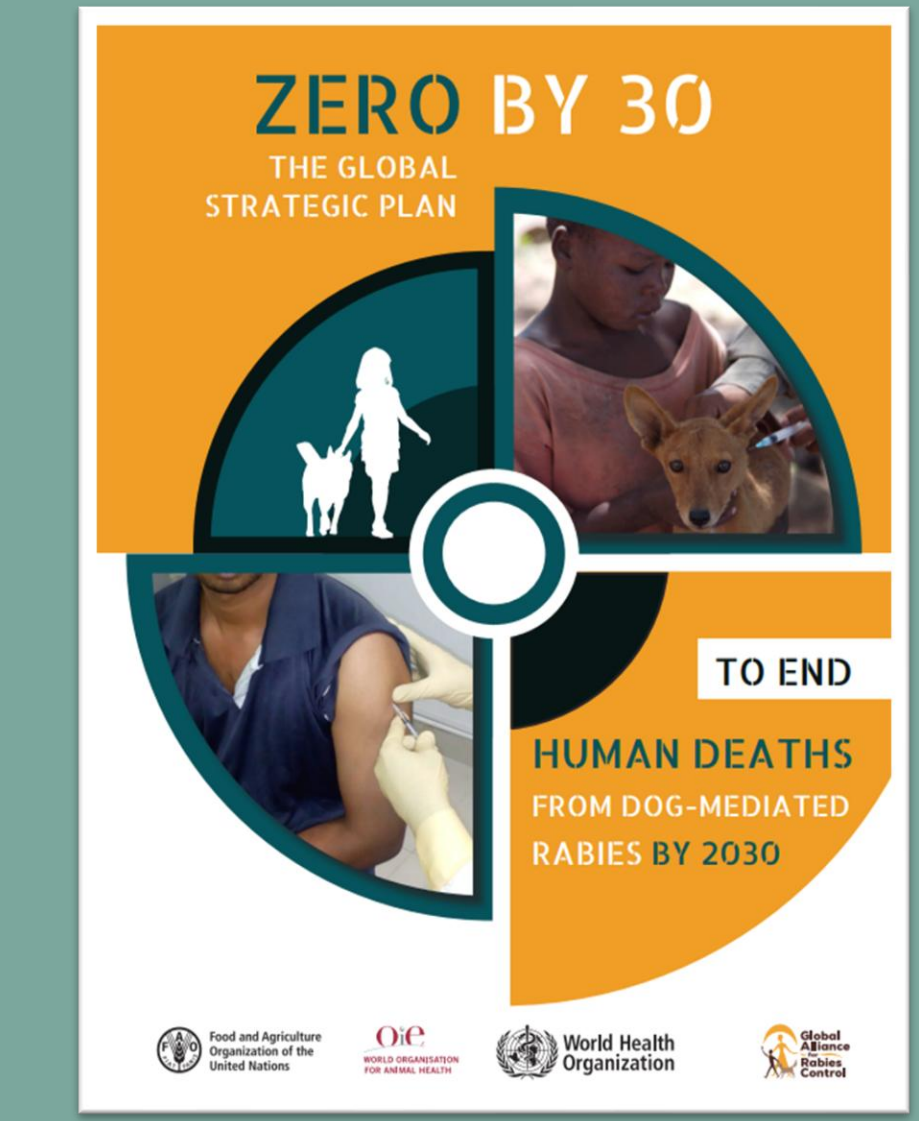
One death every 15 min worldwide

99% human cases result from dog bites

4 out of 10 deaths are in children

Zero by 30

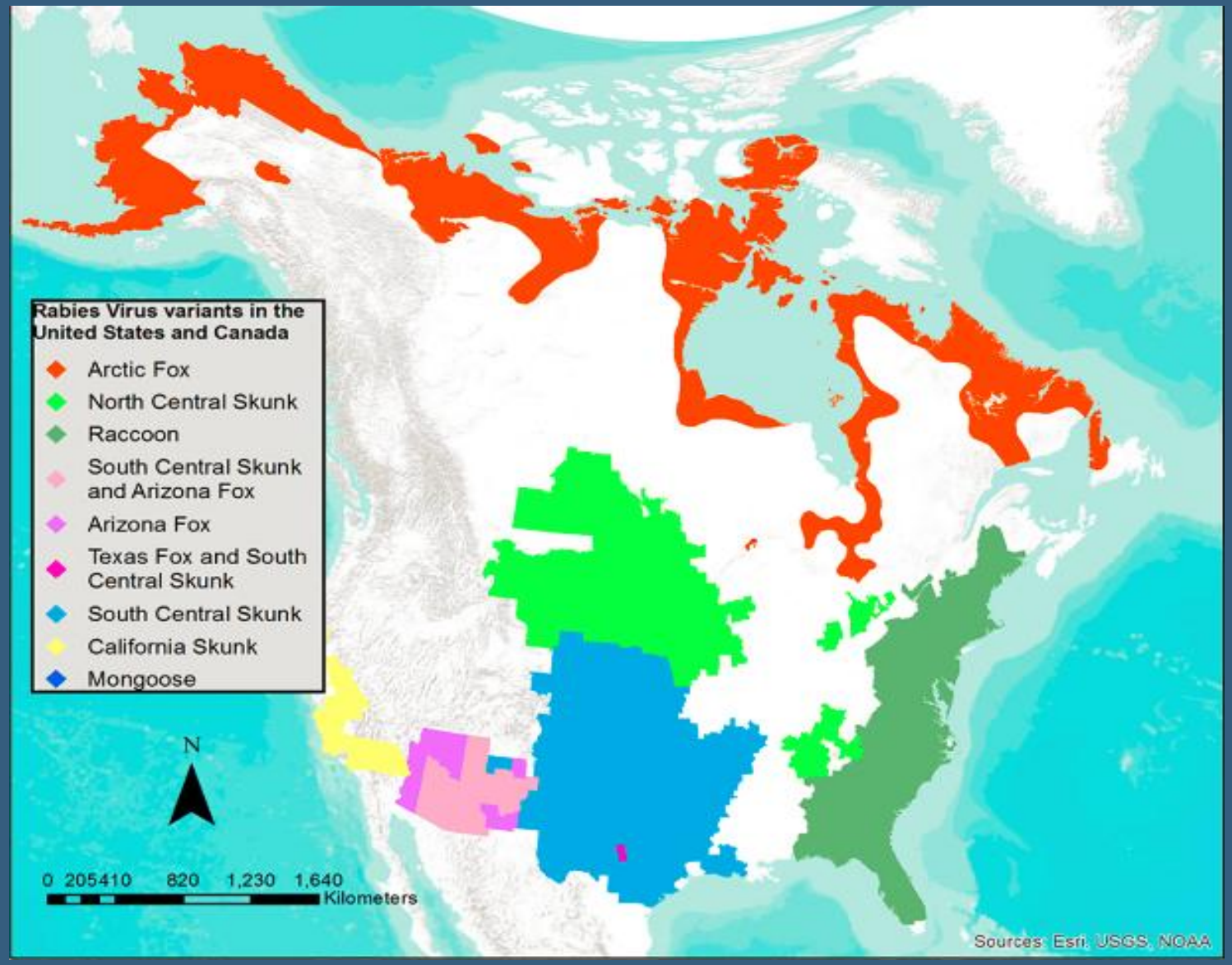
28 September - World Rabies Day



Bats are the only rabies reservoir in British Columbia (<0.5% positive)

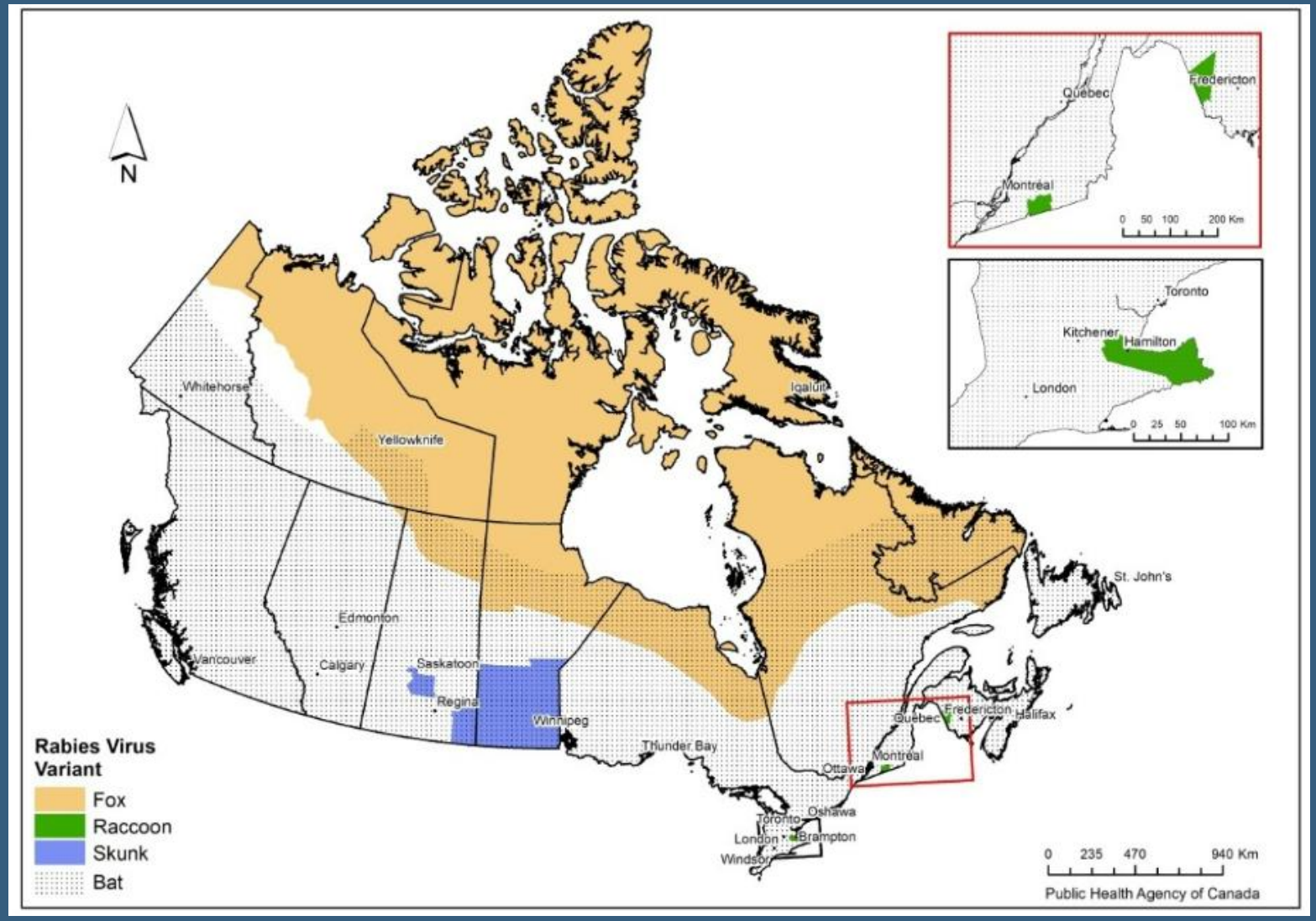
Terrestrial animal rabies distribution

Rabies



Terrestrial animal rabies distribution

Rabies



Source: PHAC, 2020-2024 data

Rabies testing results BC

Rabies

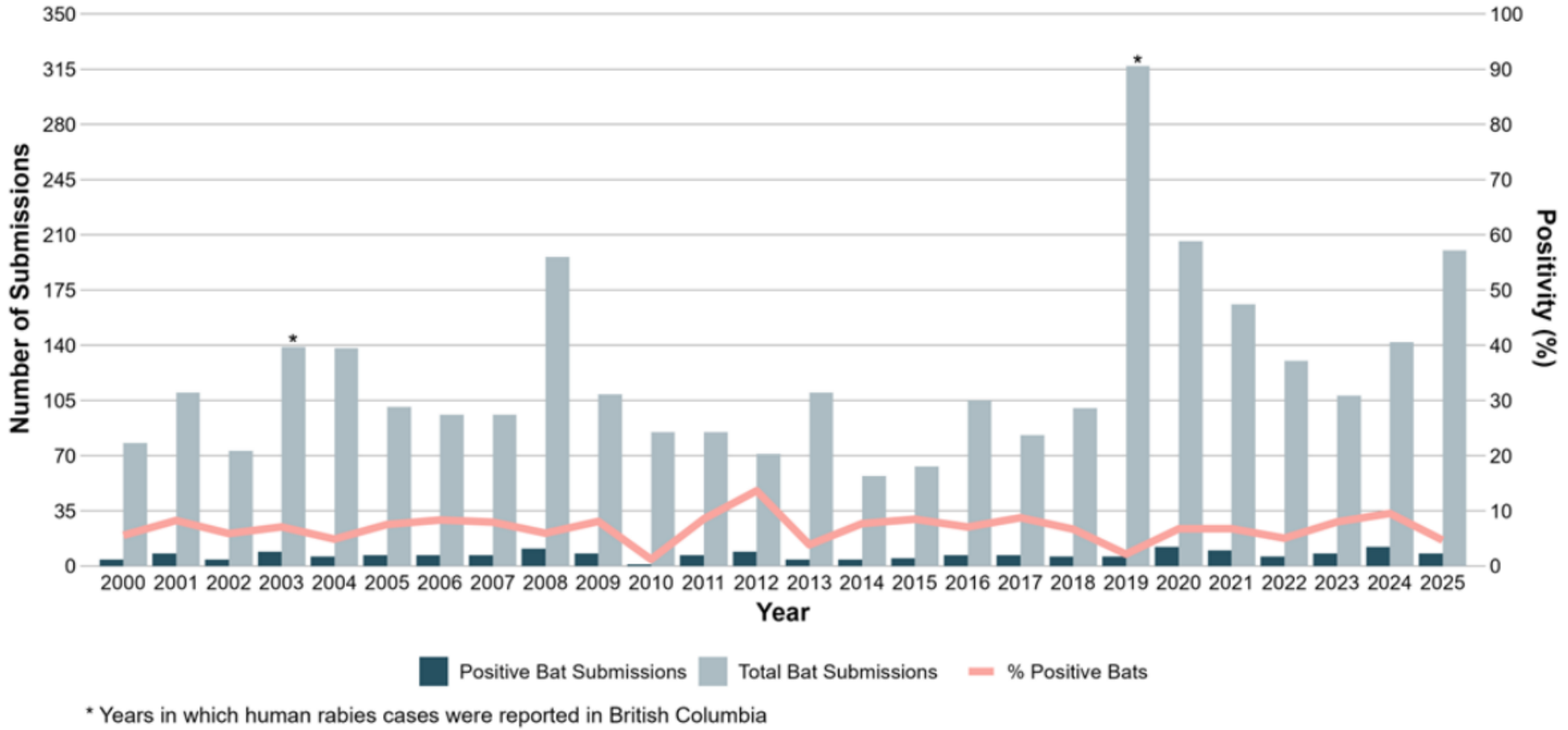


Figure 1. Annual number of submitted and rabies-positive bats with reported human or domestic animal contact, BC, 2000 - 2025.

Source: BCCDC, rabies surveillance report

Rabies testing results BC

Rabies

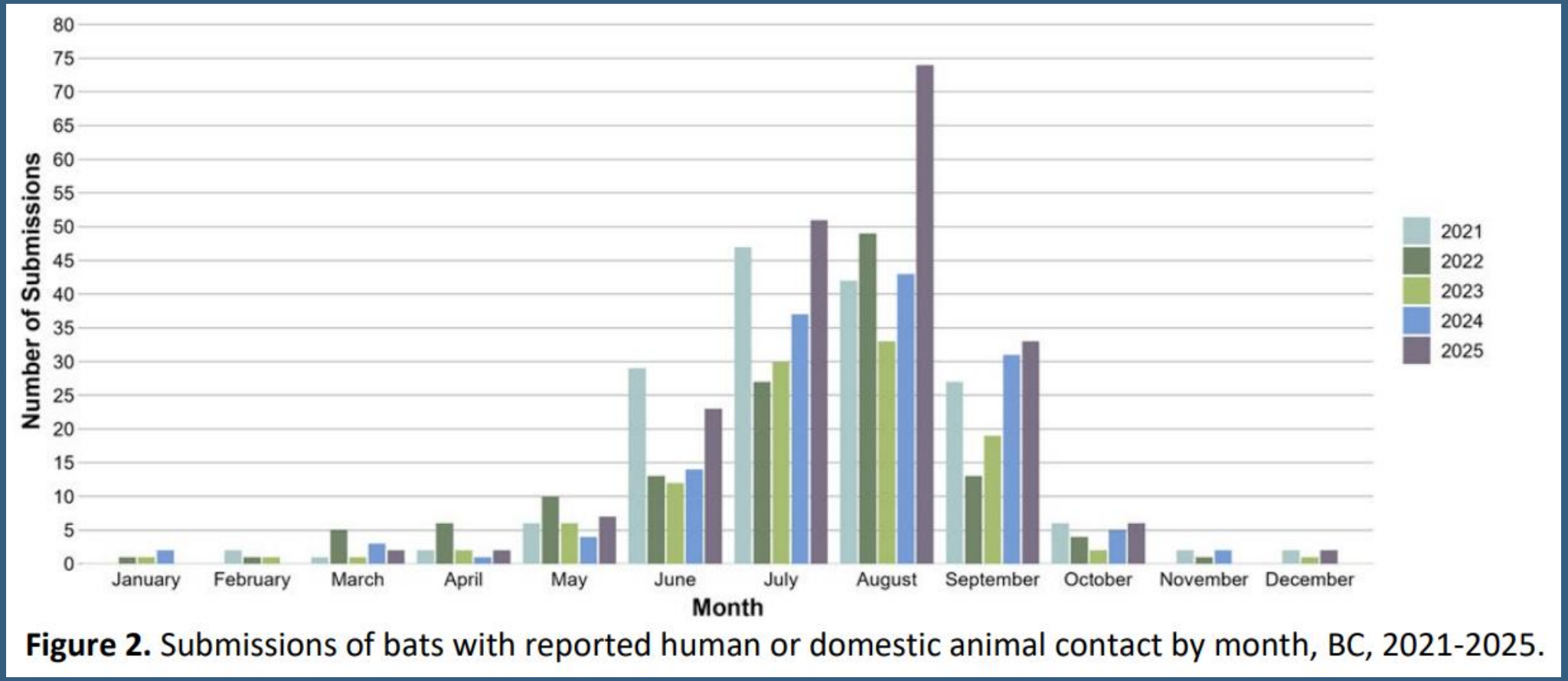


Figure 2. Submissions of bats with reported human or domestic animal contact by month, BC, 2021-2025.

Source: BCCDC, rabies surveillance report

Rabies lab submissions by species, 2025

Source: BCCDC, rabies surveillance report

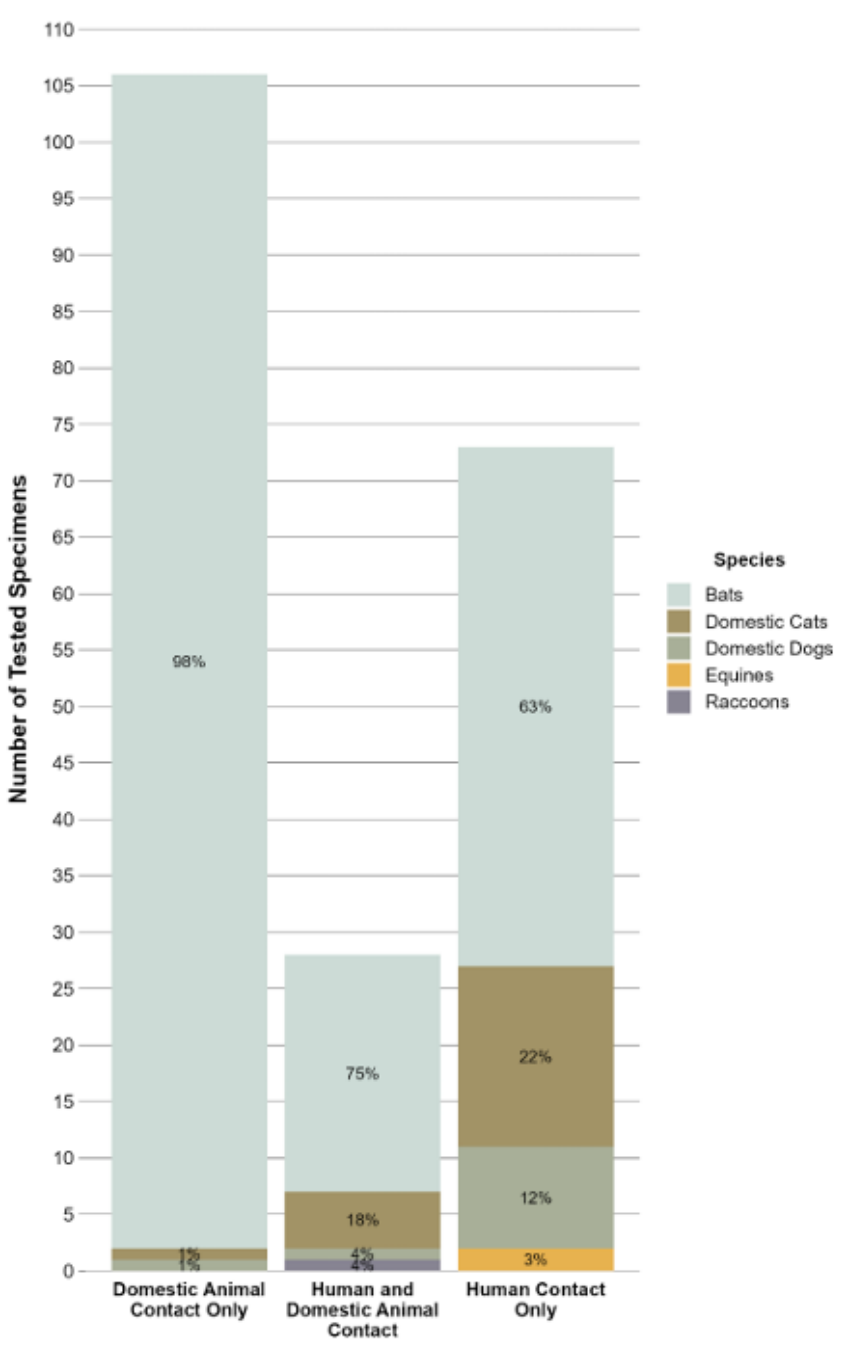
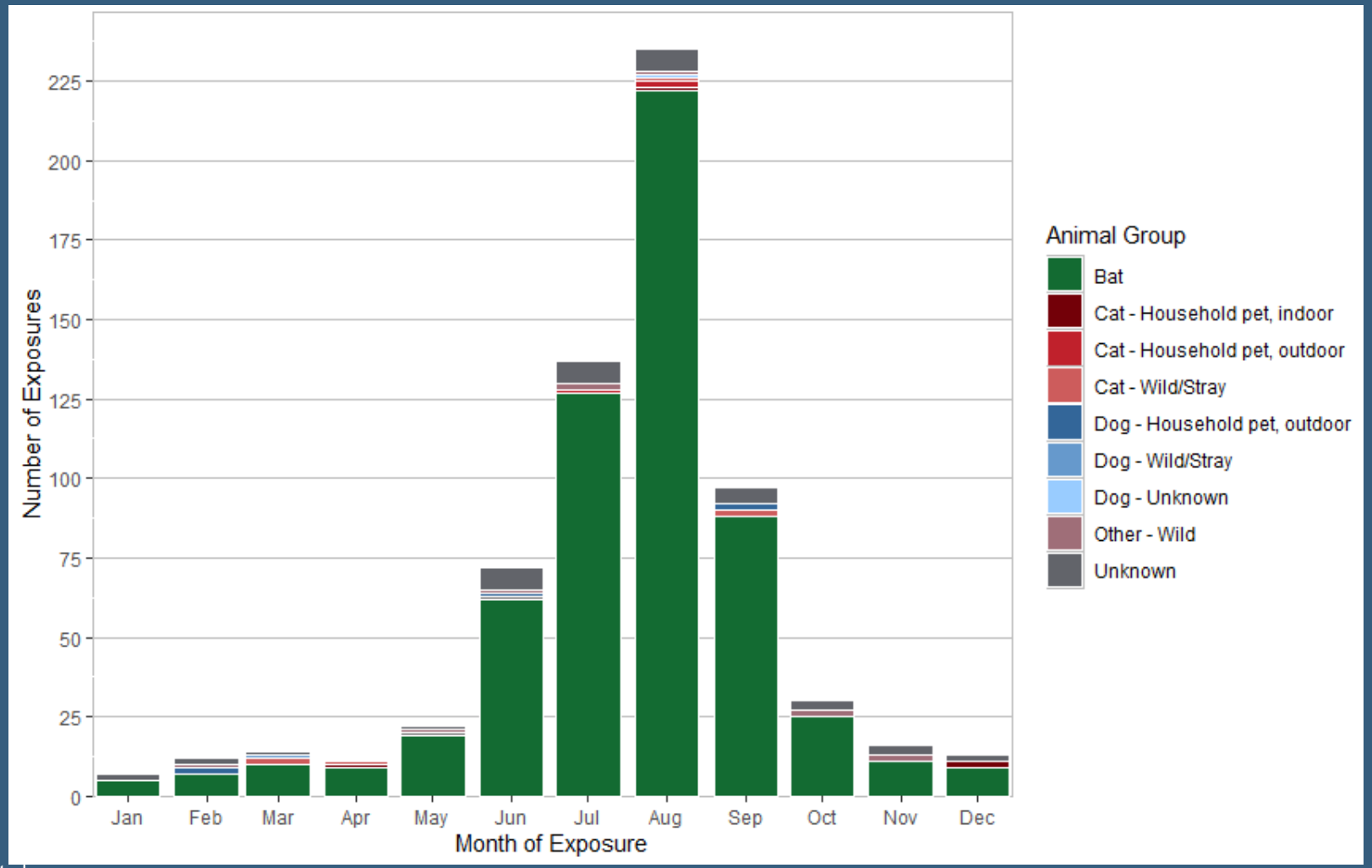


Figure 3. Number and proportion of tested submissions by species and contact type, BC, 2025.

Bats are the predominant rabies exposure source in BC, human rabies exposures, 2025



BC Centre for Disease Control
Provincial Health Services Authority

Source: BCCDC

False positive kitten in BC, 2025

Rabies

Feral kitten, repeated visits to vet clinic, then tested for rabies

Response activities (human and animal health)

False positive confirmed by CFIA

1st week Jul

2nd week Jul

3rd week Jul

End Jul-Mid Aug

3rd week Aug

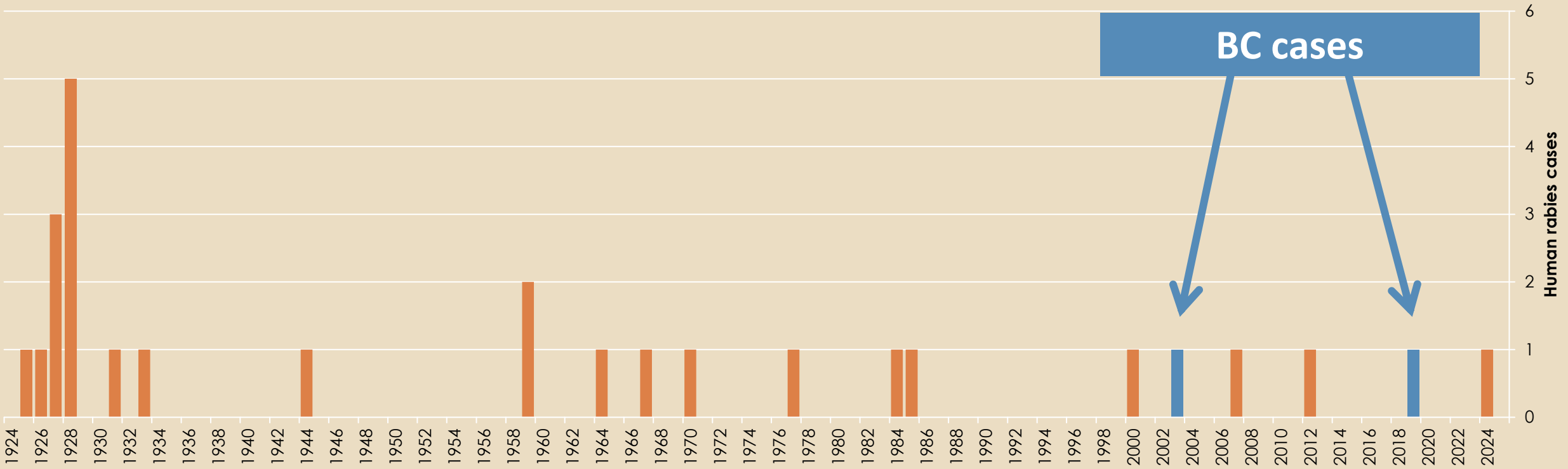
3rd-4th week Aug

CFIA rabies confirmed

CFIA lab, attempt to subtype and follow up testing

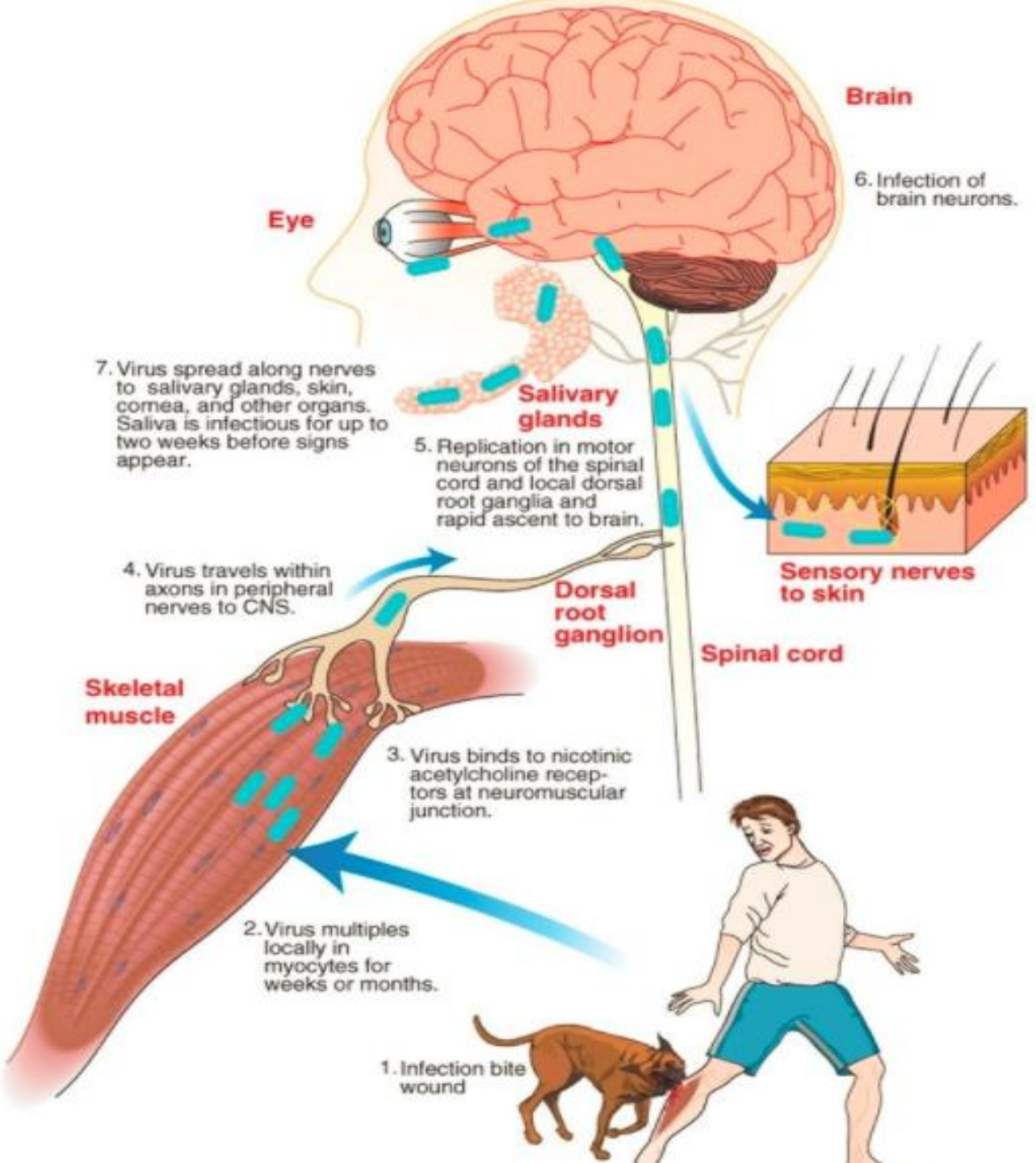
Follow-up human and animal health activities

Human rabies in Canada



Transmission

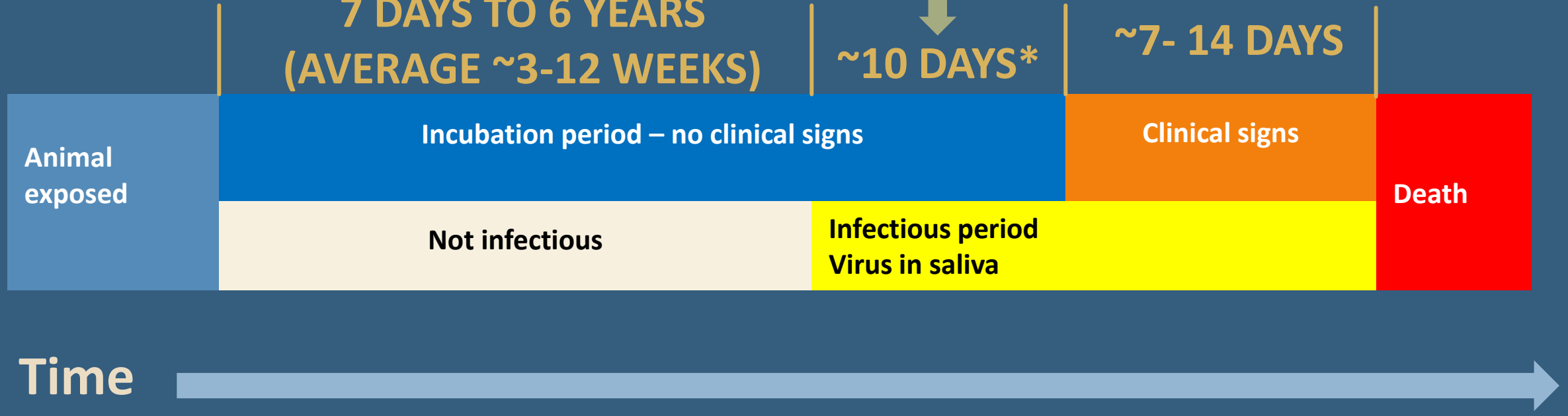
- Infected saliva and cerebral spinal fluid transmitted via bite, scratch, wound
- Corneal or other transplants
- No direct human-to-human transmission reported



Incubation period

Rabies

*time only known for dogs, cats, and ferrets



Clinical signs, animals

Rabies

- Highly variable, initial presentation can be non-specific
- Behavioural changes: e.g nocturnal species become active in the day, calm animals become excitable, timid animals become vicious
- After 2 to 5 days:
  - **Furious form:** aggression, loss of fear, attack without provocation, seizures, loss of muscle coordination, progressive paralysis, death
  - **Paralytic/dumb form:** throat and face muscles paralyzed, excessive salivation, inability to swallow, progressive paralysis, death
- Once clinical signs appear, always leads to death

Rabies in bats

- Rabies virus pathogenesis and maintenance in bats is not well understood
- Clinical signs can be difficult to detect
- **Behaviour changes**
  - Increased activity during the day
  - Found in unusual locations
  - Inability to fly
  - Easily approachable
- Weakness, inappetence, aggression, incoordination
- Morbidity period: 4 to 20 days

Source: iNaturalist

Risk assessment

Rabies

Exposure: must have had **direct** contact with a suspect animal

Direct contact: contact with a rabid or potentially rabid animal whereby rabies virus present in undessicated saliva or neural tissue could be introduced through contact with eyes or mucous membranes, or through a break in the skin by means of a bite or scratch.

Bat exposures can be very difficult to detect

Risk assessment

Rabies

Confirmed direct contact with a suspect animal

Then assess the following:

Animal species
Geographic location
Animal behaviour
Animal rabies vaccination status
Type of exposure (bite vs other)
Body part exposed

Likelihood of exposure to rabies

"Exposing" species	Geographic location of exposure	Likelihood of exposure
Bat	Globally	Consider rabies exposure unless bat is tested and shown to be negative
Domestic or wild terrestrial mammal	BC	Unlikely rabies exposure, unless animal: • demonstrated neurological behavior indicative of rabies or dies; if so, consider rabies exposure unless tested and shown to be negative • known to have contact with bat in last 6 months • import/travel from/to a rabies-endemic area in last 6 months
Wild terrestrial animal (e.g. skunk, racoon, fox, monkey, etc)	Outside BC (except in rabies-free countries)	Consider rabies exposure unless animal is tested and shown to be negative
Domestic animals	Enzootic areas outside of BC	Consider rabies exposure unless animal is tested and shown to be negative. The vaccination status of the 'exposing' animal should be considered.

Human health risk assessment: exposure in BC

Rabies

Table 1A. Summary of rabies risk assessment and management for exposures in BC

Risk level:	Very high	High	Medium	Low	Very Low
Species and risk factors	**Bats** Risk further elevated if: • Bite (vs scratch) • Exposure to face/head or hand •Signs compatible with rabies	**Wild or domestic mammal with signs compatible with rabies.**[1]	**Wild or domestic mammal without clinical signs** • Imported from a rabies-endemic area in last 6 months AND/OR • Known bat contact in last 6 months, particularly if unvaccinated	**Wild or domestic mammal** with no known risk factors	**Rodents and lagomorphs** with no known risk factors
Action following direct contact AND saliva exposure not ruled out	Consider immediate RPEP. May be discontinued if animal tested and shown to be negative.		For a dog, cat, ferret: Consider observing/ confining if possible for 10 days[2] give RPEP if animal develops signs compatible with rabies.[1] If no observation possible and for other species: RPEP rarely indicated.	RPEP rarely indicated	RPEP almost never indicated

Source: BCCDC Communicable Disease Manual, Rabies 2025

Human health risk assessment: exposure outside of BC

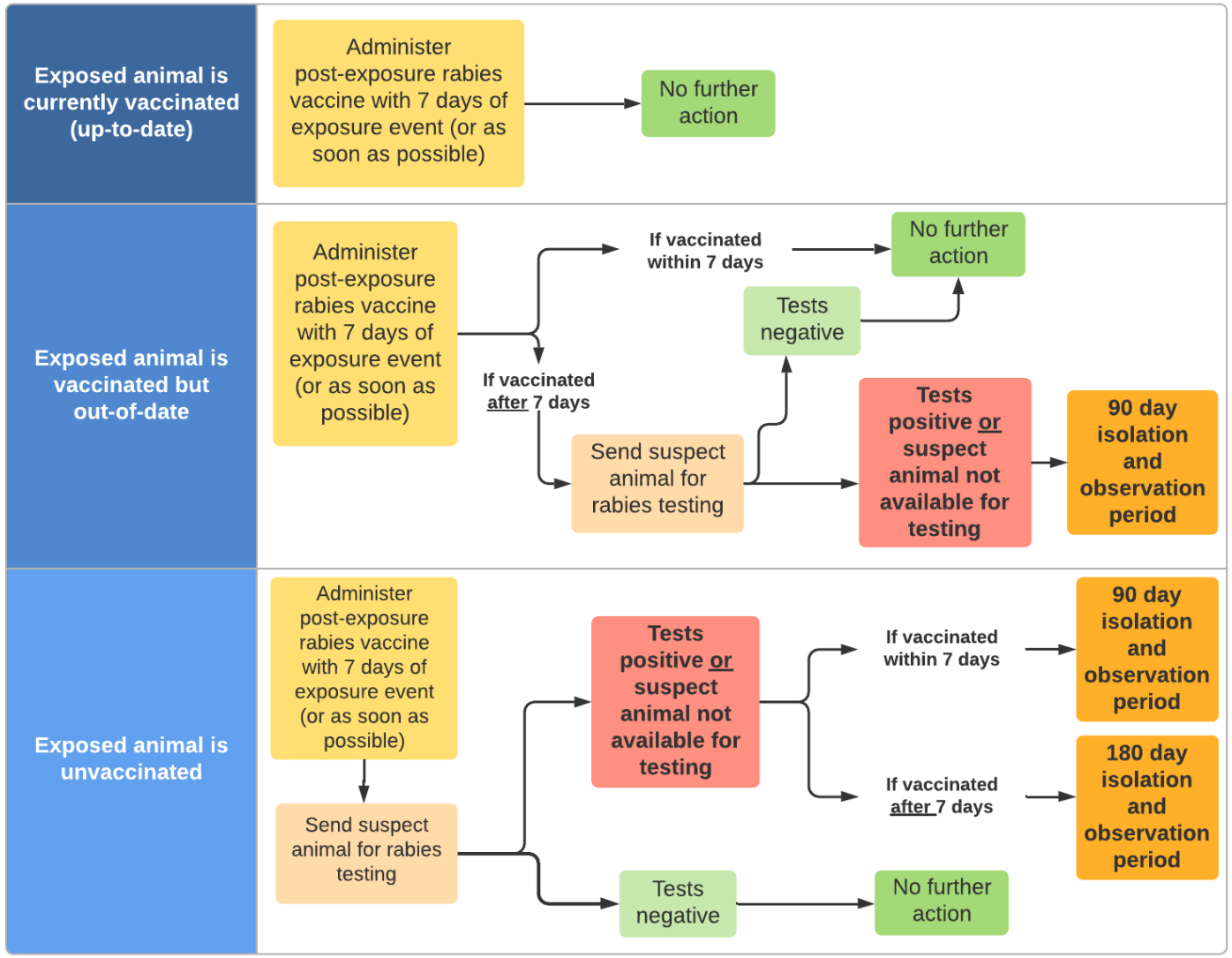
Rabies

Table 1B. Summary of rabies risk assessment and management for exposures outside BC

Risk level:	Very high	High	Medium	Low	Very Low
Species and risk factors	**Bats** anywhere **Dogs** in enzootic countries **Wildlife** in enzootic areas	**Wild or domestic mammal** not known to be a reservoir species **with signs compatible with rabies.**[1] Wild **monkeys**[3] with or without signs of rabies	**Wild or domestic mammal** with no known risk factors		**Rodents and lagomorphs** with no known risk factors
Action following direct contact AND saliva exposure not ruled out	Consider immediate RPEP. May be discontinued if animal tested and shown to be negative.		Dog, cat, ferret: Observe if possible and give RPEP if animal exhibits signs of rabies.[1] If no observation possible and for other species: case-by-case basis[4]		RPEP almost never indicated

Source: BCCDC Communicable Disease Manual, Rabies 2025

Rabies exposure management in animals



Dog bites and rabies

Rabies

Dog bites are not provincially reportable in BC

Situations where public health needs to be involved:

1. Dog is exhibiting clinical signs of rabies
2. Dog was imported or travelled out of BC in prior 6 months
3. Dog had known contact with bat in prior 6 months
4. Dog is not available for assessment and management

Rabies testing

All rabies tests performed by the Canadian Food Inspection Agency
Ottawa

Perform Direct Fluorescent Antibody (DFA) test. Meets rabies case definition.

** June 1 2026 Lethbridge lab is closing, look for updates in BC Rabies Guidance for Veterinarians

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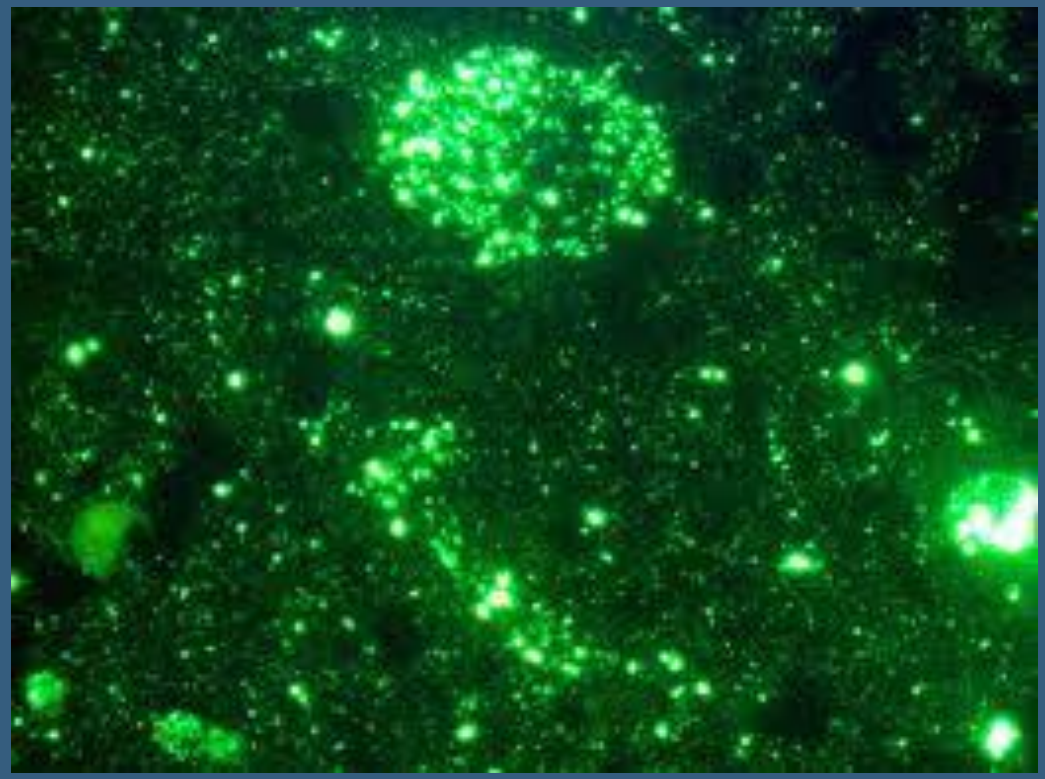

Rabies testing: Who can submit samples?

Only public health and animal health professionals can submit samples (or practice staff on their behalf)

Members of the public should not submit samples directly to the lab

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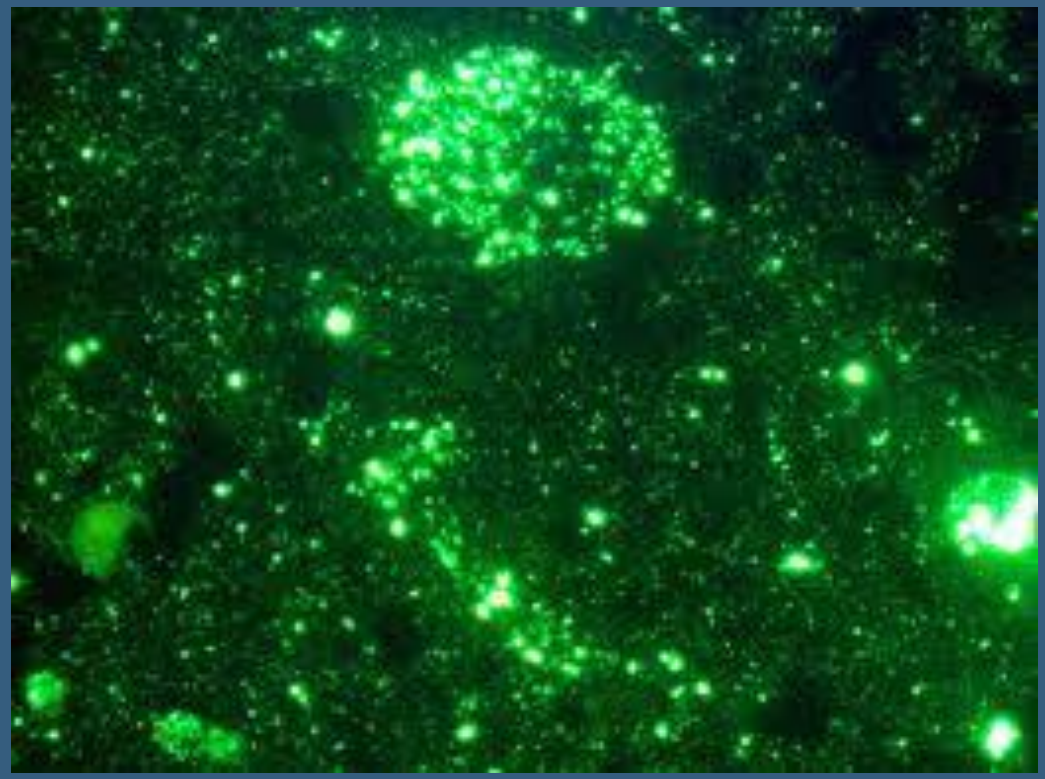

Rabies testing: What samples to submit?

For most animals:

- Submit entire head
- Include cervical spinal cord if the skull has been damaged

For small animals (<500 g)

- Submit entire carcass (e.g. bat)

For large animals (>100 kg and all livestock)

- Submit the entire brain and portion of cervical spine
- If not possible, sections of brain tissue bilaterally from the cerebellum, hippocampus and brain stem

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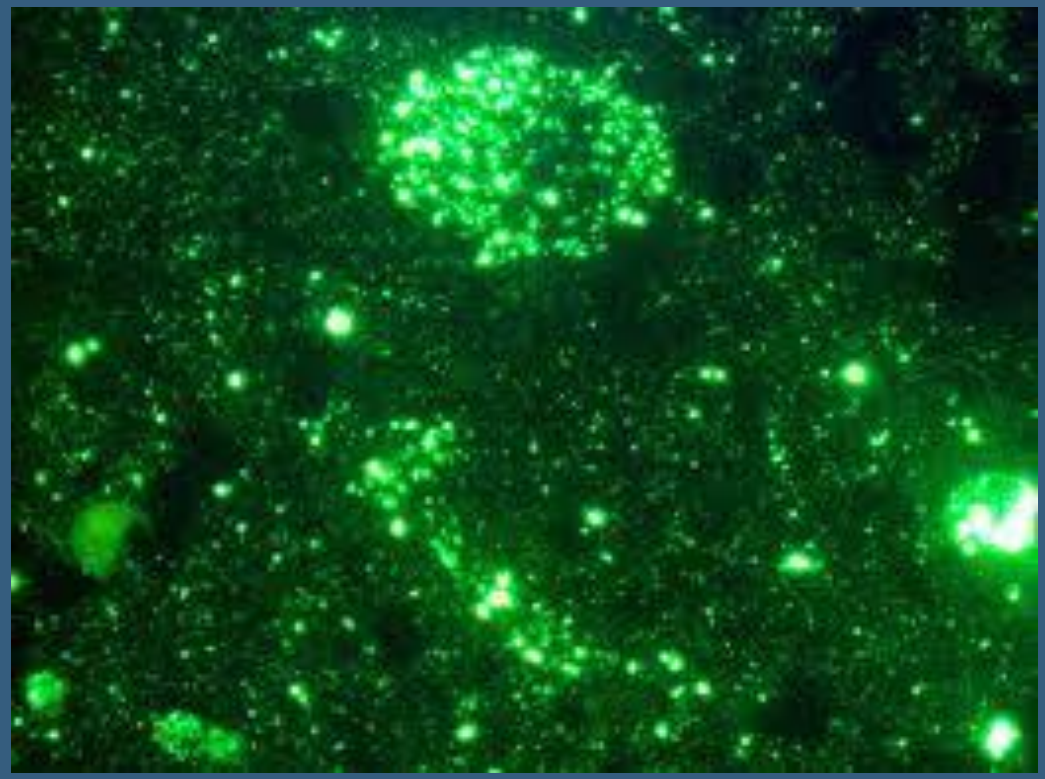
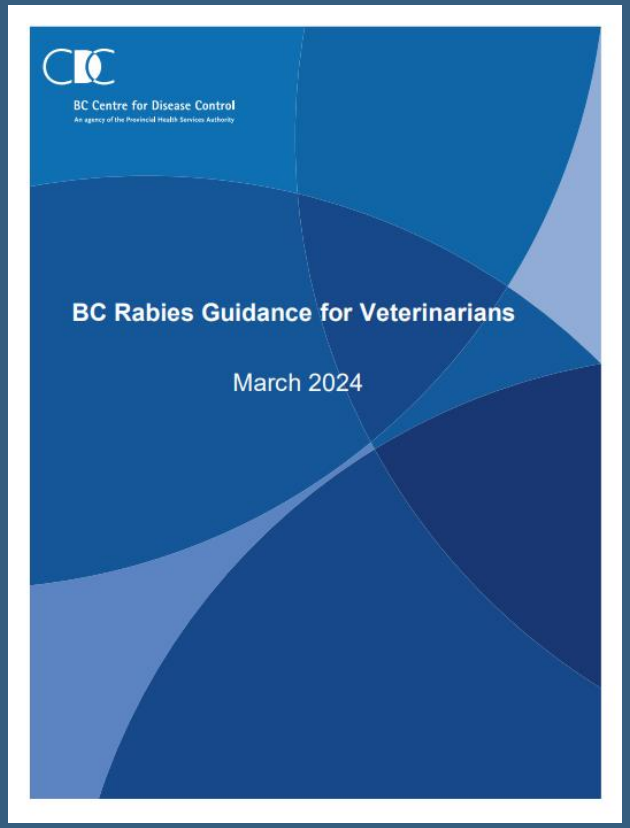


Rabies testing: Submission instructions

Appendix C



https://www.bccdc.ca/Documents/BC_Rabies_Guidance_for_Veterinarians.pdf

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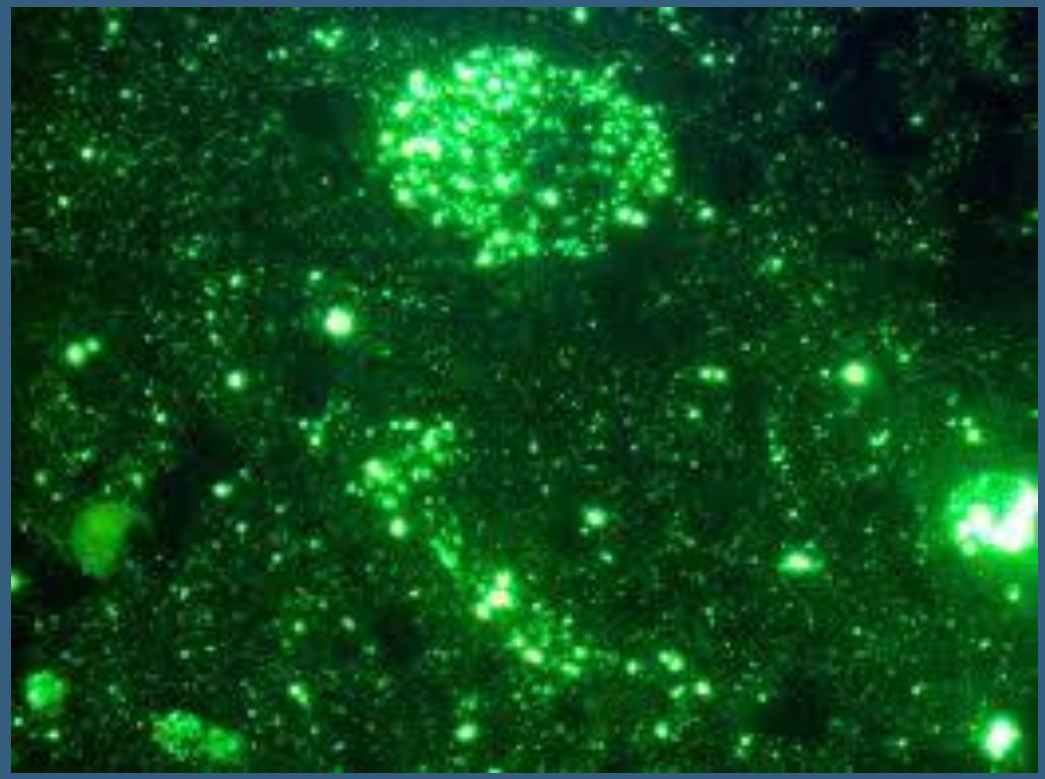


Prevention: human health

- Occupational health and safety measures
  - Exposure control plan for rabies
  - Pre-exposure vaccination of staff
- Exposure response
  - Reporting responsibilities
  - Post-exposure assessment
  - Post-exposure treatment

WORK SAFE BC

1

Engineering controls

This type of control involves making physical modifications to control the hazard or reduce exposure. Some questions to consider:

- Are nets or other equipment available that will allow the animal to be captured at a distance?
- Are restraint devices (e.g., restraint poles, muzzles, and kennel squeeze panels) available to help restrain a suspect animal?

2

Administrative controls

This type of control involves changing work practices and policies. Some questions to consider:

- Have workers been immunized with the rabies vaccine?
- Are safe work procedures for handling aggressive or suspect animals available and in use?
- Are handwashing facilities and alcohol-based hand rub dispensers available?

3

Personal protective equipment (PPE)

This is the least effective type of control. When used, there must always be at least one other control in place as well. Some questions to consider:

- Are workers wearing bite-proof gloves?
- Are workers wearing heavy protective clothing, surgical masks, and eye protection?

Human health: Risk Management

Rabies

Wound care:

- Wash with a mild soap and flush the wound with copious amounts of water (ideally warm).
  - At least 15 minutes.
- Iodine-containing or alcohol solution or other topical virucidal disinfectant to further decrease the viral load.

Refer to a healthcare provider

Human: Risk Management

Rabies

Rabies Post-Exposure Prophylaxis:

- One dose of rabies immune globulin (RIg) and 4 doses of vaccine
- RIg is infiltrated into the wound site on Day 0
- Rabies vaccine is given on days 0, 3, 7 and 14

Rabies Pre-Exposure Prophylaxis:

For higher risk occupations and activities

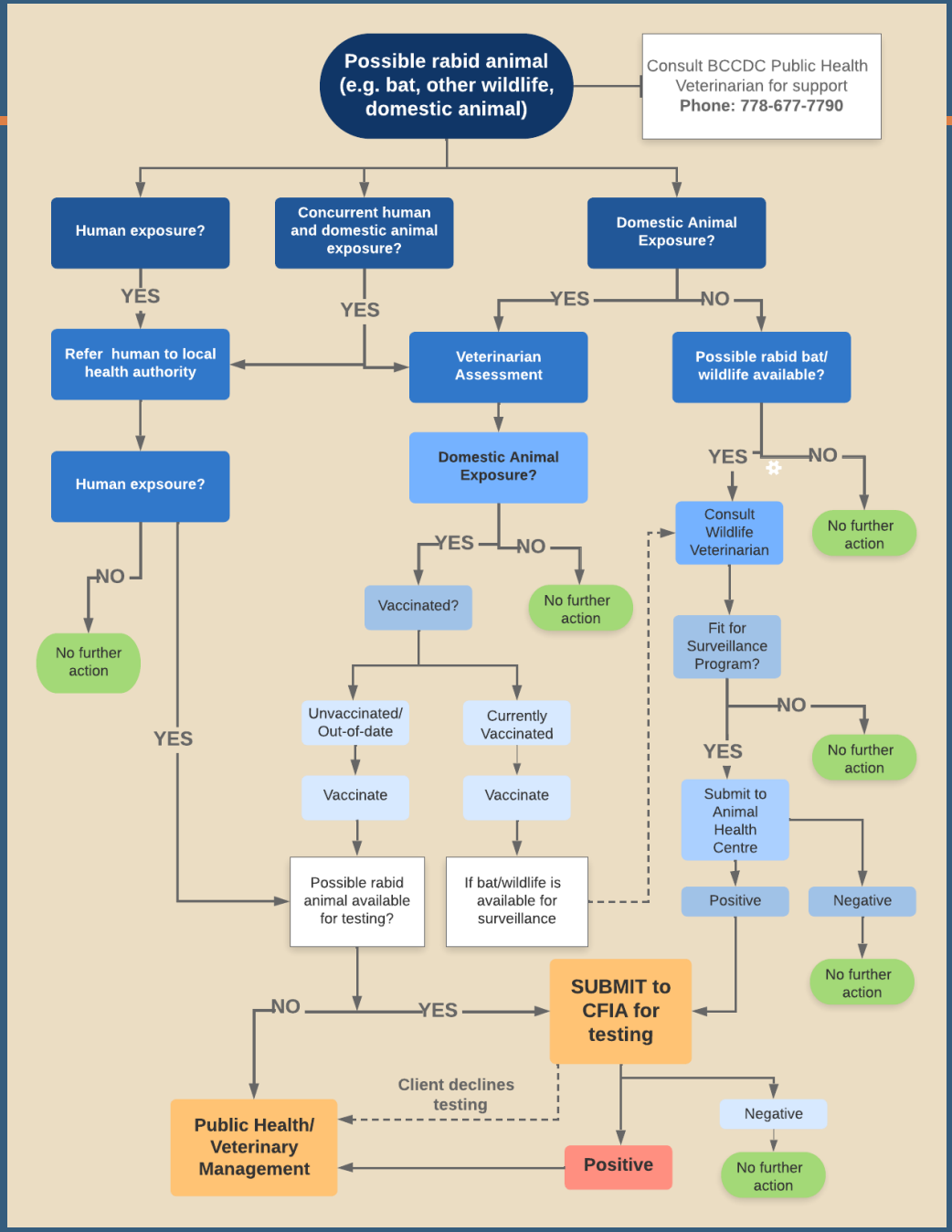
BC pre-exposure immunization and monitoring

Rabies

Personal Risk Category	Nature of Risk	Typical Populations	Pre-exposure Immunization
Very low risk	Rare exposure to virus . Potential for mucous membrane, bite or non-bite exposure.	BC population at large, Environmental Health Officers or other public health staff handling potentially rabid dead animals and most travellers to enzootic areas not in any of the higher risk groups below.	No immunization necessary.
Low risk	**Exposure to virus nearly always episodic with source recognized. Potential for mucous membrane, bite, or non-bite exposure.**	**Veterinarians and staff**, animal control and wildlife workers in areas of low rabies enzooticity (BC); **veterinary and animal health technology students.** Children and travellers visiting foreign enzootic areas for one month or more. Travellers to foreign epizootic areas, trekking/hiking for any length of time, and far from a major medical centre.	**Initial series. Booster only following a subsequent exposure, or as determined by post-exposure serology**.
Moderate Risk	Virus present episodically, with source recognized, but **exposure may be unrecognized**. Potential for mucous membrane, bite, non-bite or aerosol exposure.	Rabies diagnostic lab workers and spelunkers. **Veterinarians and staff,** animal control, wildlife biologists and wildlife workers in **rabies enzootic areas**. Hunters and trappers in high-risk areas such as the far north.	Initial series. Serologic testing every 2 years. Booster immunization when antibody level is < 0.5 IU/ml.
High Risk	Frequent exposure. Virus present continuously, often in high concentrations. Potential for mucous membrane, bite, non-bite or aerosol exposure. Specific exposures may go unrecognized.	Rabies research lab workers; rabies biologicals production workers; bat biologists.	Initial series. Serologic testing every 6 months. Booster immunization when antibody level is < 0.5 IU/ml

One Health

- Intersecting issues at the human-animal-environment interface
- **Communication, coordination, and collaboration** are essential
  - Animal health: vets, labs, animal owners
  - Human health: frontline healthcare, local public health, labs
  - Wildlife health

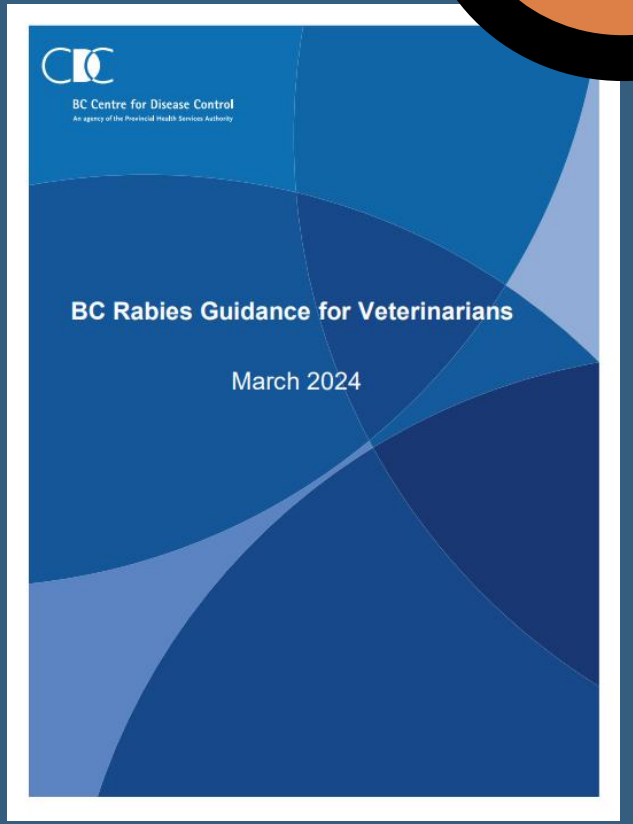


BC: *Rabies roles and responsibilities*

Rabies

Public Health Vet

- Guideline development (lead for vet guidance, support PH guidance, support BC sick and dead bat protocol)
- Ensure availability of support for common issues via BCCDC's rapid response team
  - Access to this service via publichealthvet@bccdc.ca
- Consult/liaise with veterinarians and RHA teams for rare and unusual issues (more clinical in nature)
- Knowledge translation, continuing education for veterinarians
- Reporting/information sharing to BC Chief Vet



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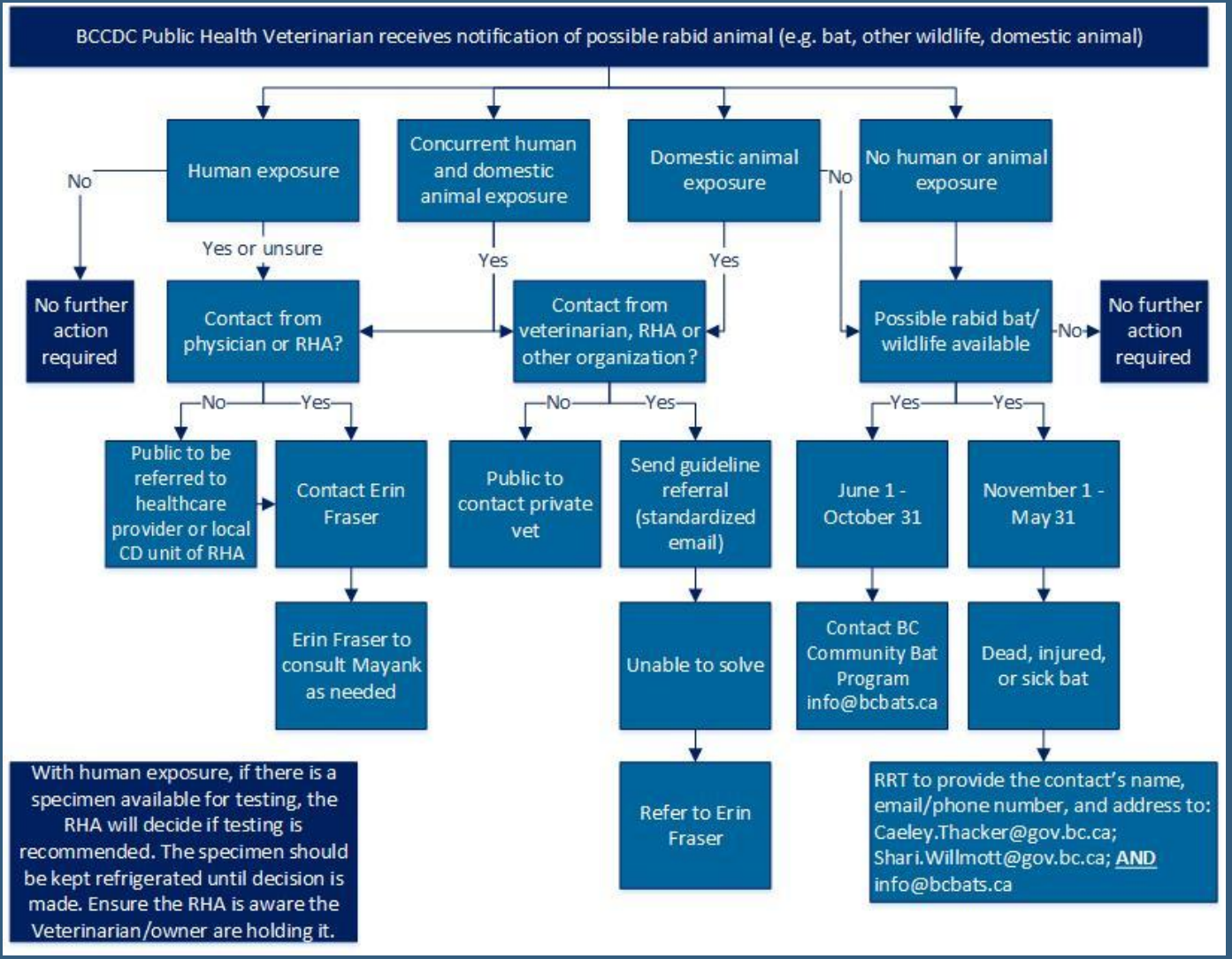
Triage of publichealthvet@bccdc.ca inbox



- Linking to appropriate agency or guidance
- Support rabies lab sample submission issues
- Triage high priority queries to BCCDC's PH vet or PH physician

BC: *Rabies roles and responsibilities*

Rabies

Vet practice owner

- Understand reporting requirements
- Ensure practice follows WorkSafe BC guidance to protect staff
  - Exposure control plan
  - Pre-exposure prophylaxis of staff
- Maintain access to current BCCDC's Rabies Guidance for Veterinarians and ensure staff are aware of contents such as:
  - Exposure management, submitting samples
  - Reporting requirements and requirement to submit samples
  - Occupational health and safety

BC: *Rabies roles and responsibilities*

Veterinarians - clinicians

- Maintain awareness of rabies risks, symptoms and exposure management steps (see BCCDC's Rabies Guidance for Veterinarians)
- Understand legal responsibilities to report:
  - Federally reportable disease under Health of Animals Act
  - Provincially reportable under the Reportable and Notifiable Disease Regulation, BC Animal Health Act
    - Submitting suspect animals for testing fulfills these reporting requirements
  - Report to a Medical Health Officer (MHO) all known or suspected cases of a person exposed to rabies.

BC sick and dead bat protocol: *Rabies*

Has a domestic animal (cat, dog, or livestock) been in contact (bitten, scratched) with bat? Or is the pet owner concerned about the risk of rabies

IF YES

- Advise the animal owner to immediately contact their veterinarian.
- Private veterinarian is responsible for:
  - risk assessment and management. Following BCCDC's Rabies Guidance for Vets
  - submitting the bat directly to CFIA rabies lab (to meet legal reporting reqs)
- Precautionary action is almost always advised as rabies is fatal without post-exposure vaccination

BC sick and dead bat protocol: *Rabies*

Rabies

Human exposure

Has a person been in "close contact" with a bat that was alive or recently dead (not completely desiccated) (e.g. handled with bare hands, was bitten, scratched, or had contact with an open wound on the person)? Or is the person very concerned about the health implications even if you perceive risk to be low? If there is any doubt of what close contact is, presume **YES** as a precaution because rabies is fatal if not treated.

IF YES

- **Advise the person to immediately contact their physician and/or their local public health office**; **in addition, you must email publichealthvet@bccdc.ca or phone the regional health authority office**, report this bat exposure, and provide the contact information of the person exposed.
- The Health Authority will contact the person to evaluate the situation and decide if post-exposure prophylaxis (i.e. rabies vaccination) is required and if the bat should be submitted for testing for rabies. If the bat is to be submitted for testing, the public health office will coordinate the euthanasia process if the bat is still alive, and submitting of the bat for rabies testing directly to CFIA

One health: *Rabies*

Must balance:

- Risk response
- Human-animal bond
- Ecological benefits of bats
- Biodiversity and conservation risks to bats, threats from white nose syndrome
- Collaboration in surveillance

5

Case #1: Bat/cat/person

Rabies

Women at cabin on Gulf Islands, sleeping in bed with her 2 cats
- Woke up to find bat that could not fly in bedroom
- Appeared to be wounds on bat
- Bat was humanely euthanized and placed in the freezer

Woman noticed a small mark on her cheek

Cats were vaccinated against rabies but are both 2 years out of date

Husband called public health vet around 2PM
- By this time owner and cats were on the ferry heading home
- Luckily, the woman had packed the bat in her cooler

Case #1: Bat/cat/person

Rabies

Confirm whether direct contact occurred or not

Then assess the following:

- Animal species
- Geographic location
- Animal behaviour
- Animal rabies vaccination status
- Type of exposure (bite vs other)
- Body part exposed

Case #1: Bat/cat/person

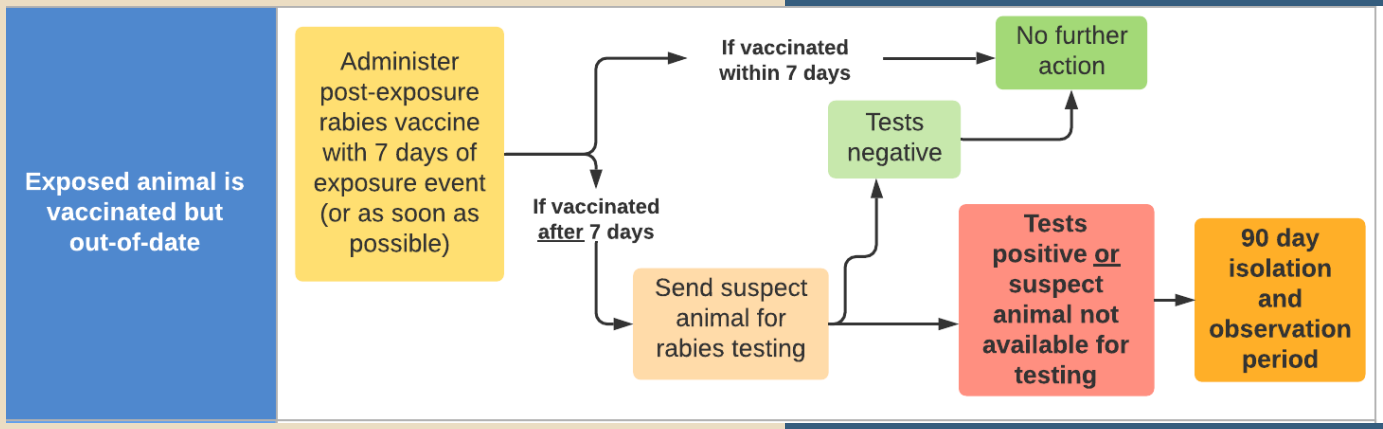
Rabies

Risk Management

Level of risk: very high

Recommendations on:

- refer to public health?
- rabies testing?
- vaccination of animal?
- observation period?
- quarantine period?
- rabies post-exposure prophylaxis?



Case #2: Bat-dog interaction

Rabies

3 yo female lab went out in yard and found a small bat underneath a tree
Dog played with it by batting it around and mouthed it before it flew away
Dog is completely up to date on rabies vaccination
Owner brought dog to clinic due to concern for rabies exposure

Case #2: Bat-dog interaction

Rabies

Confirm whether direct contact occurred or not

Then assess the following:

- Animal species
- Geographic location
- Animal behaviour
- Animal rabies vaccination status
- Type of exposure (bite vs other)
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Case #2: Bat-dog interaction

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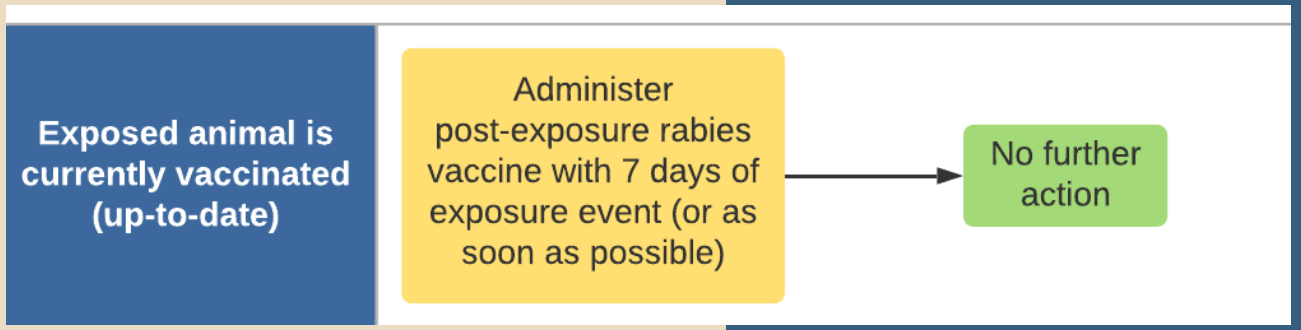
Risk Management

Level of risk: very high

Recommendations on:

- refer to public health?
- rabies testing?
- vaccination of animal?
- observation period?
- quarantine period?
- rabies post-exposure prophylaxis?



Case #3: Raccoon bite

Rabies

- Unvaccinated, 2yo mixed breed dog attacked by a raccoon while off leash at a park in Richmond, BC
- Raccoon appeared to be a female protecting its 3 kits, no indication of signs compatible with rabies (according to report from dog owner)
- Incurred wounds on flank and lower limbs
- Owner intervened to scare off the raccoon but was not bitten or scratched
- Raccoon ran off so is not available for testing
- Dog brought into clinic for wound management and exposure follow-up

Case #2: Raccoon bite

Rabies

Confirm whether direct contact occurred or not

Then assess the following:

- Animal species
- Geographic location
- Animal behaviour
- Animal rabies vaccination status
- Type of exposure (bite vs other)
- Body part exposed

Case #3: Raccoon bite

Rabies

Risk Management

Level of risk: low

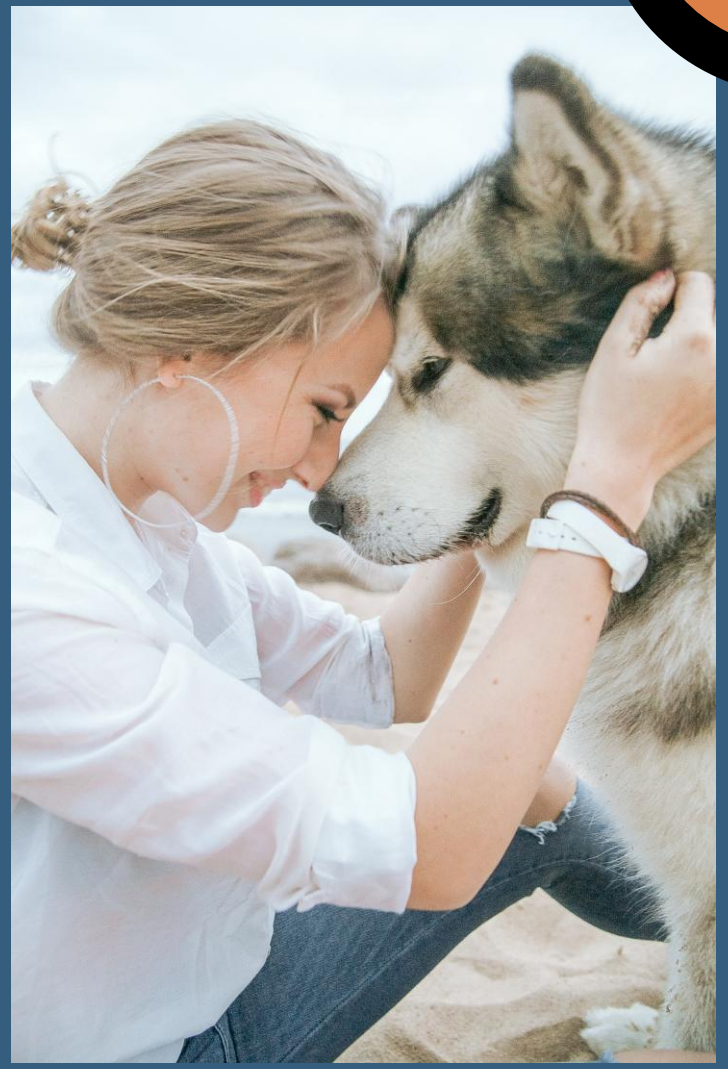
Recommendations on:

- rabies testing?
- vaccination of animal?
- observation period?
- quarantine period?
- rabies post-exposure prophylaxis?

Summary

Rabies

1. Refresh on the basics
2. Epidemiology
3. Risk assessment and risk management
4. Human health considerations
5. Roles and responsibilities



What's coming up?

Vectors and Vector-borne diseases

1. Reportable and notifiable diseases
2. Emerging vectors and pathogens
3. Climate change and vector-borne diseases

Vectors and vector-borne diseases

Trends and Emerging Issues in BC

BC reportable and notifiable tick-borne diseases

Reportable

- **Q fever** (vector transmission not primary route of transmission)
- **Tularemia**
- Lumpy skin disease (also transmitted by biting flies and mosquitoes)
- African swine fever
- Equine piroplasmosis
  - Babesia caballi
  - Theileria equi
- Crimean-Congo fever
- Flaviviruses (Kyasanur Forest disease, Omsk hemorrhagic fever)

Notifiable

- **Anaplasmosis**
- **Lyme disease**
- **Rocky Mountain spotted fever**

Reportable and notifiable diseases - Province of British Columbia

BRITISH COLUMBIA

BC reportable and notifiable mosquito-borne diseases

Reportable

- African horse sickness
- Eastern, Western and Venezuelan equine encephalomyelitis
- Vesicular stomatitis
  - multiple insect vectors
- **Bunyaviruses**
  - E.g. **La Crosse, Snowshoe hare**, Cache Valley, Rift Valley
- Yellow fever (flavivirus)

*Bluetongue (transmitted by biting midges)

Notifiable

- **West Nile virus**
- **Epizootic hemorrhagic diseases**
  - E.g. EHDV in white-tailed deer
  - Biting midges primary vector, mosquitoes secondary

Reportable and notifiable diseases - Province of British Columbia

BRITISH COLUMBIA

Responsibility to report listed diseases in BC

Anyone who has reasonable grounds to suspect that a reportable or notifiable disease has occurred must submit a report to the Chief Veterinarian within 24 hours.

Procedures and information requirements for submitting a report are described in the Reportable and Notifiable Disease Regulation.

Submit a Report

Reportable and notifiable diseases - Province of British Columbia

BRITISH COLUMBIA

Federally reportable vector-borne diseases

Reportable

Immediately notifiable

Annually notifiable

Terrestrial animal diseases - inspection.canada.ca

Government of Canada | Gouvernement du Canada

Ticks and tick-borne diseases in BC

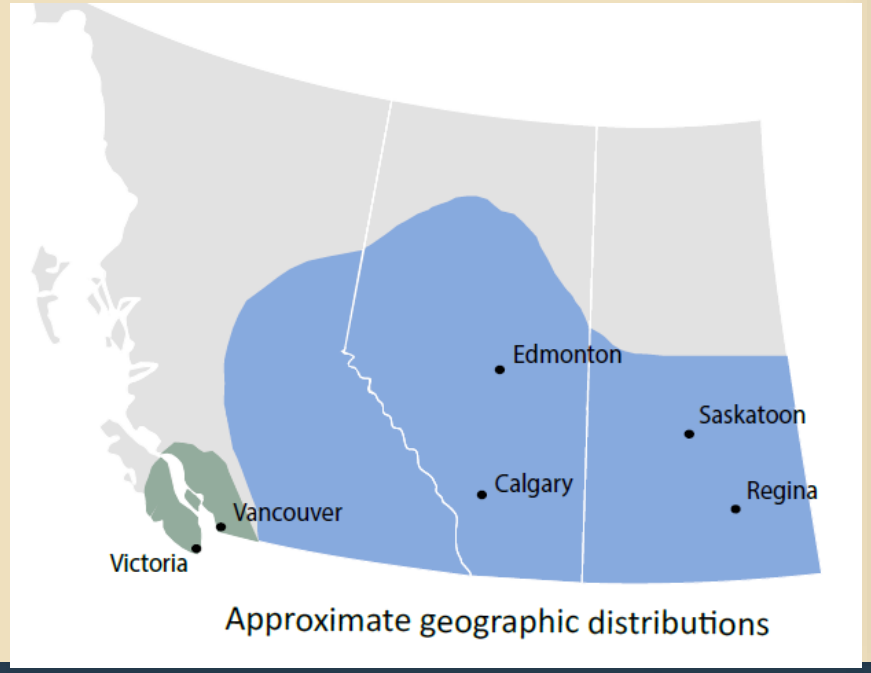
Tick vectors

- Species and distribution
- Emerging issues

Tick-borne diseases

- Lyme disease
- Anaplasmosis
- Rocky Mountain spotted fever
- Tularemia
- Q fever

Tick species of animal and human health relevance in BC



Ixodes pacificus

Western blacklegged tick

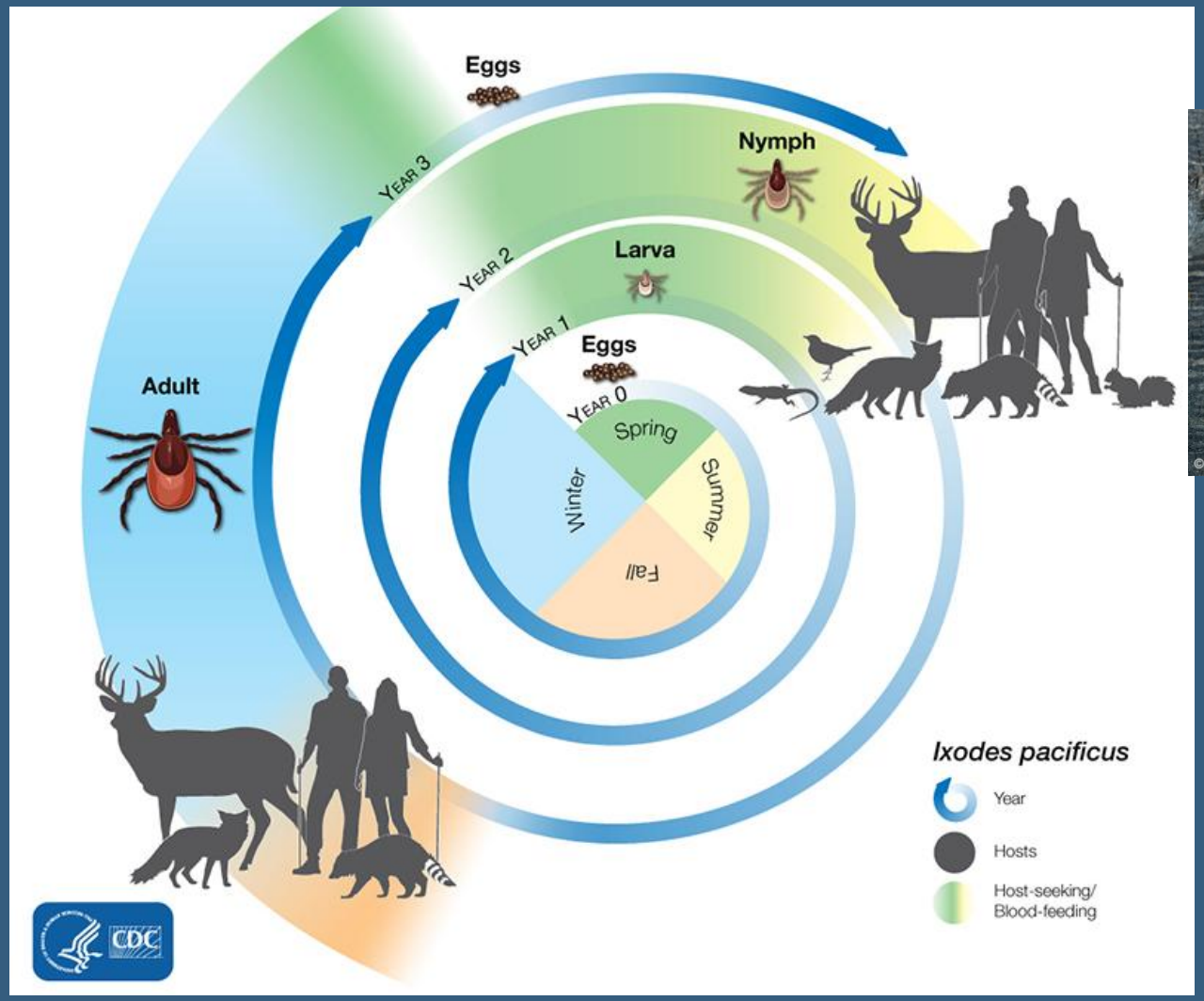
Ixodes angustus

Dermacentor spp.

Rocky Mountain Wood tick/American dog tick

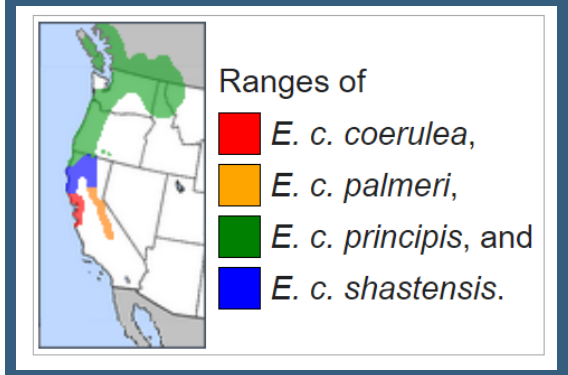
Credit: Stefan Iwasawa

Lifecycle: Western blacklegged tick (*Ixodes pacificus*)



Northwestern fence lizard *Elgaria coerulea principis*

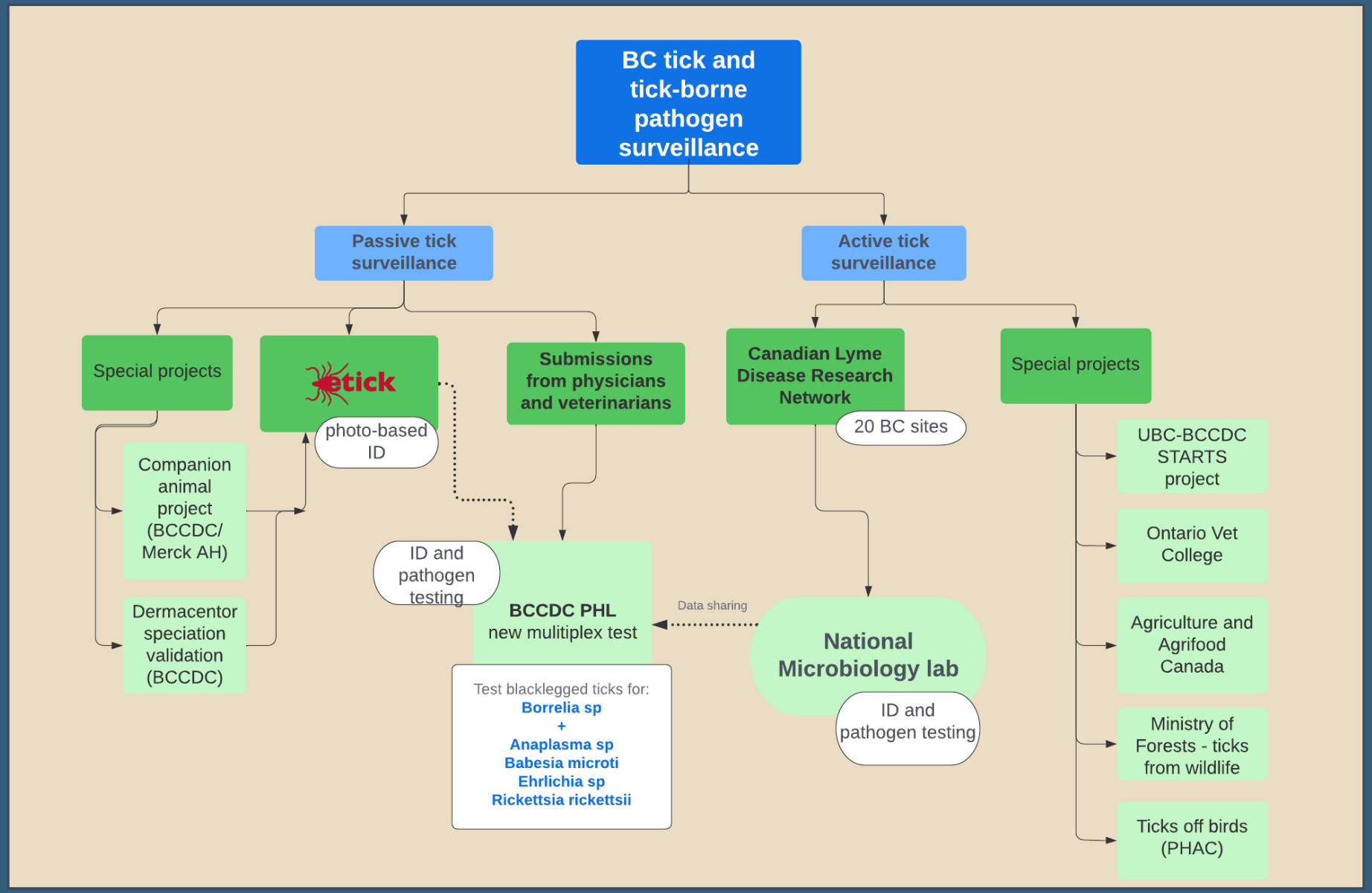
Accessed May 12, 2023 from https://californiaherps.com/lizards/pages/e.c.principis.html



Distribution of genus *Elgaria spp.*

Accessed May 12, 2023 from https://en.wikipedia.org/wiki/Western_fence_lizard

BC tick and tick-borne pathogen surveillance



Passive tick surveillance: BC Centre for Disease Control Public Health Laboratory

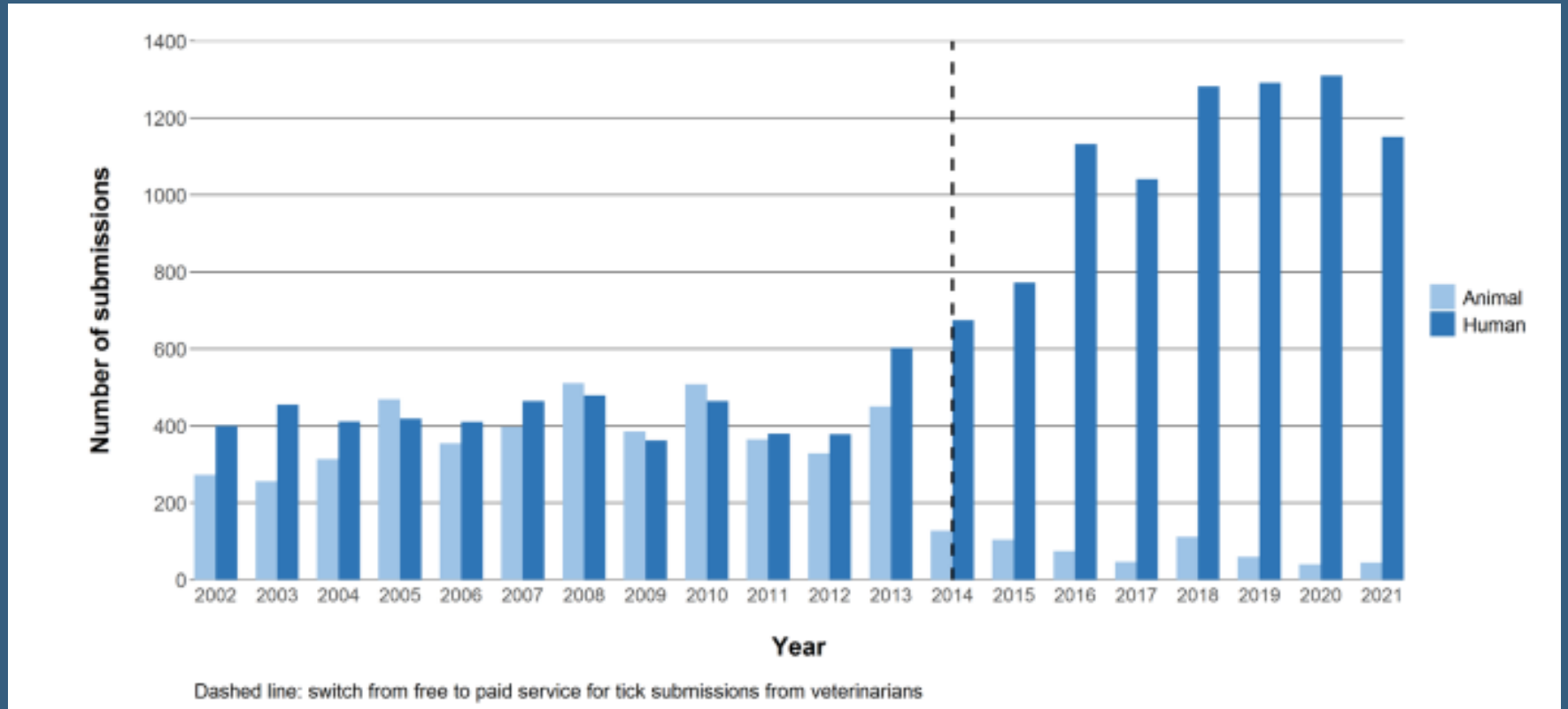


Figure 6. Number of Ticks from Humans and Animals Submitted to the BCCDC Public Health Laboratory, 2002-2021.

Source: BCCDC tick and tick-borne disease bulletin, 2023

Passive tick surveillance: BC Centre for Disease Control Public Health Laboratory

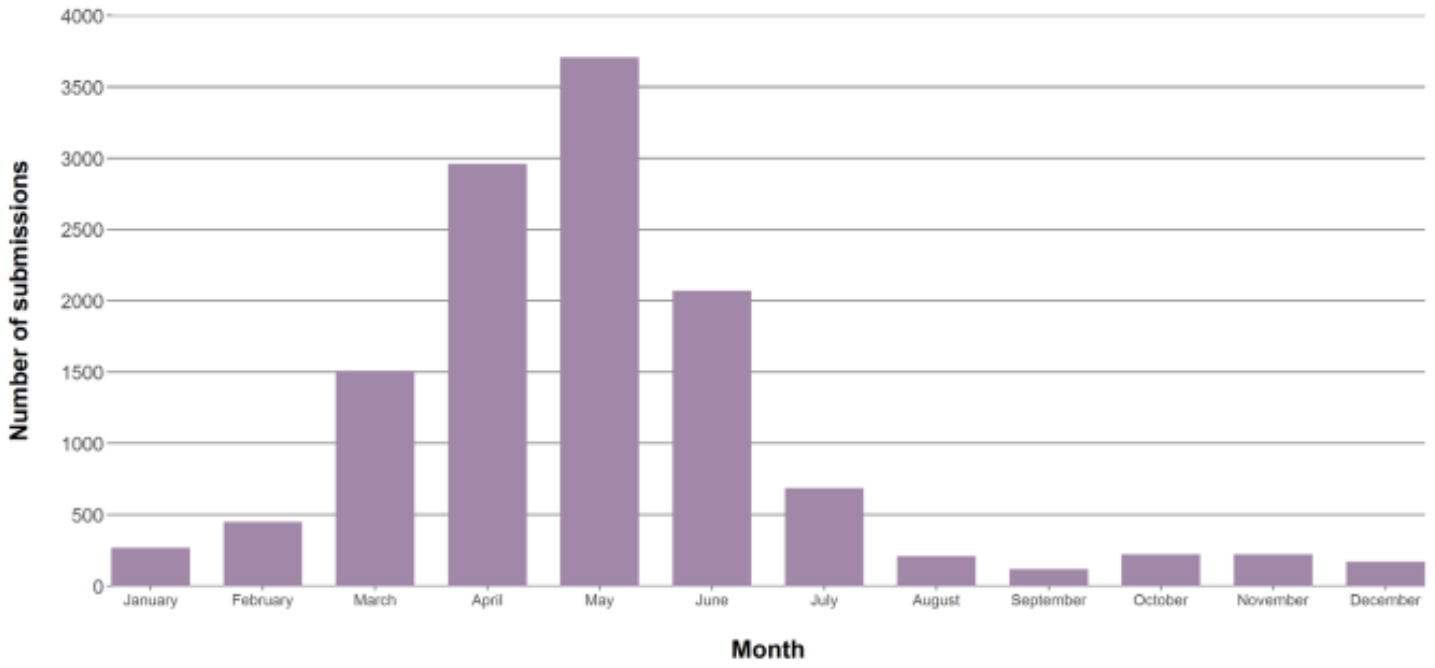


Figure 7. Seasonality of Tick Submissions from Humans to the BCCDC Public Health Laboratory, 2002-2021.

Source: BCCDC tick and tick-borne disease bulletin, 2023

Passive tick surveillance: BC Centre for Disease Control Public Health Laboratory

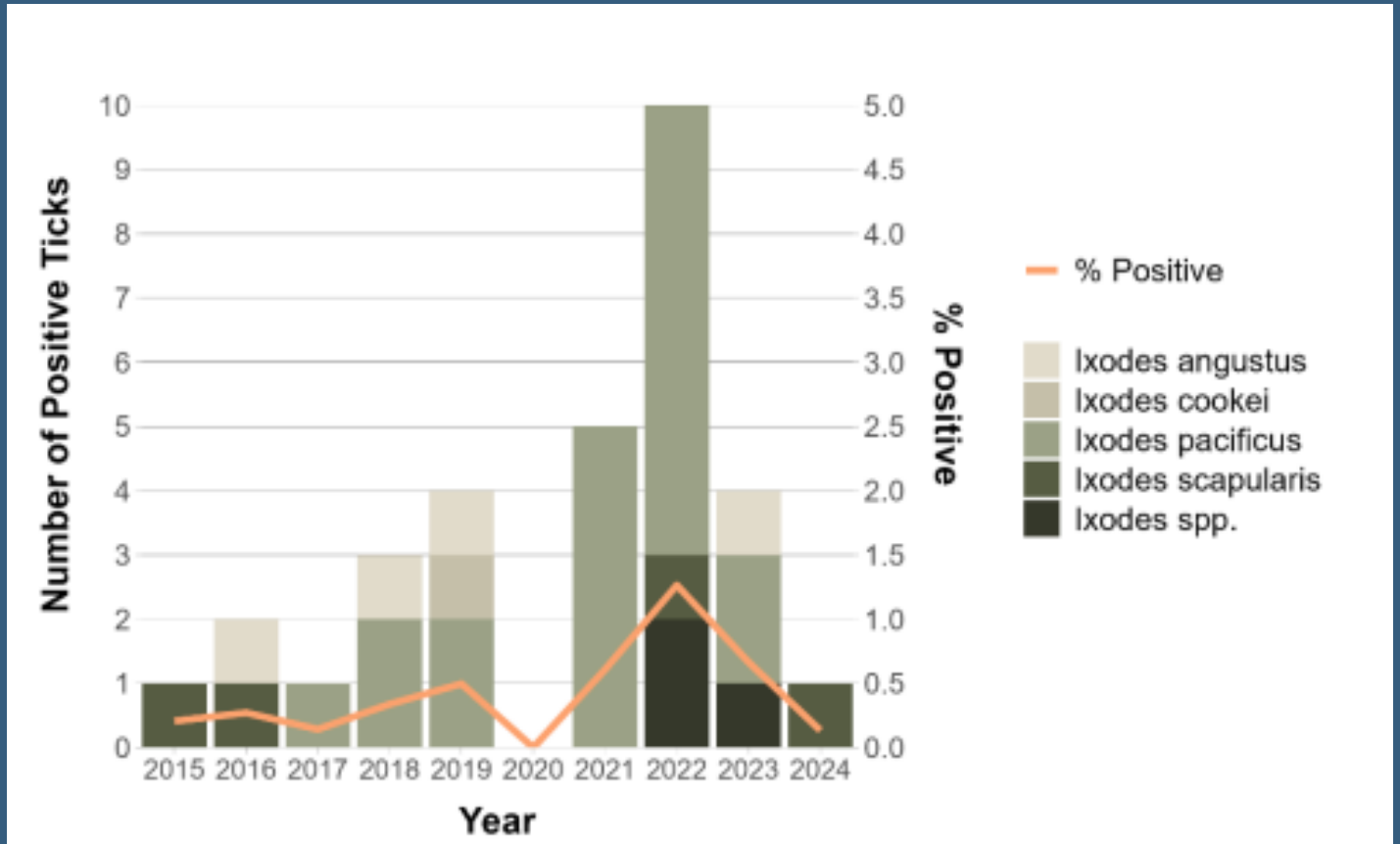


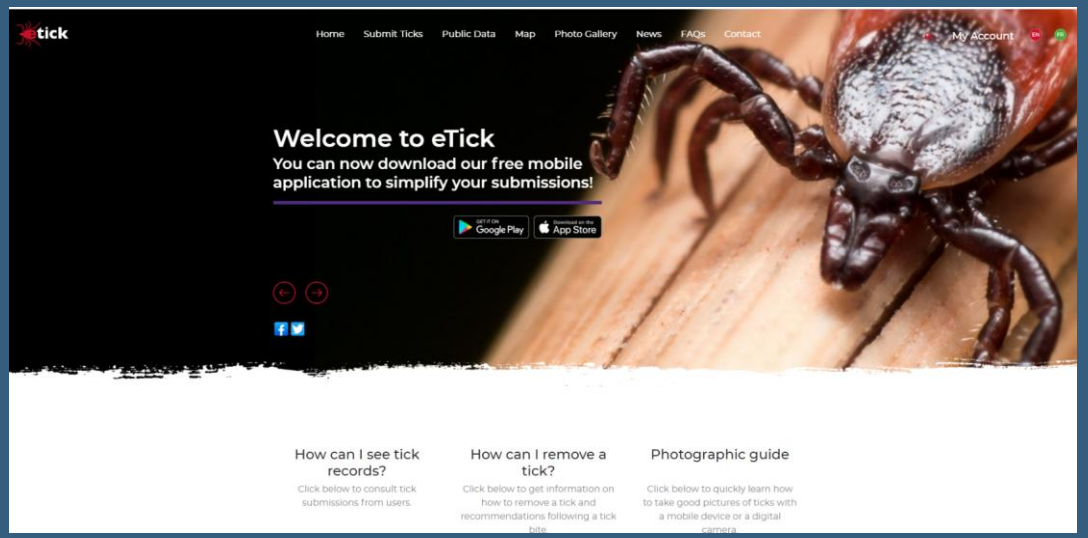
Figure 2. *B. burgdorferi*-positive *Ixodes* spp. tick submissions, 2015-2024.

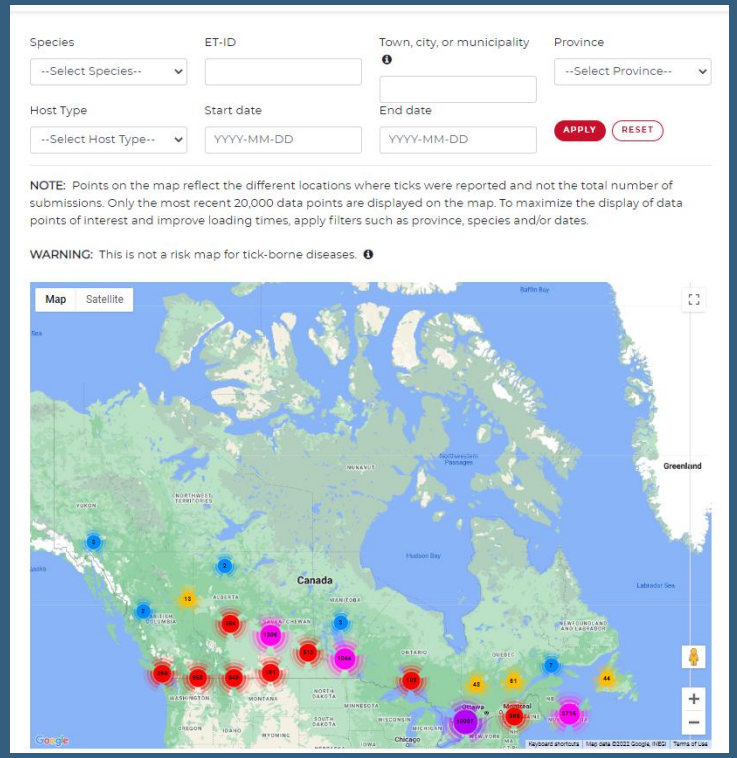
Source: BCCDC tick and tick-borne disease bulletin, 2025

Passive tick surveillance

Passive surveillance via eTick

A public platform for image-based identification and population monitoring of ticks in Canada





Tick surveillance, 2025

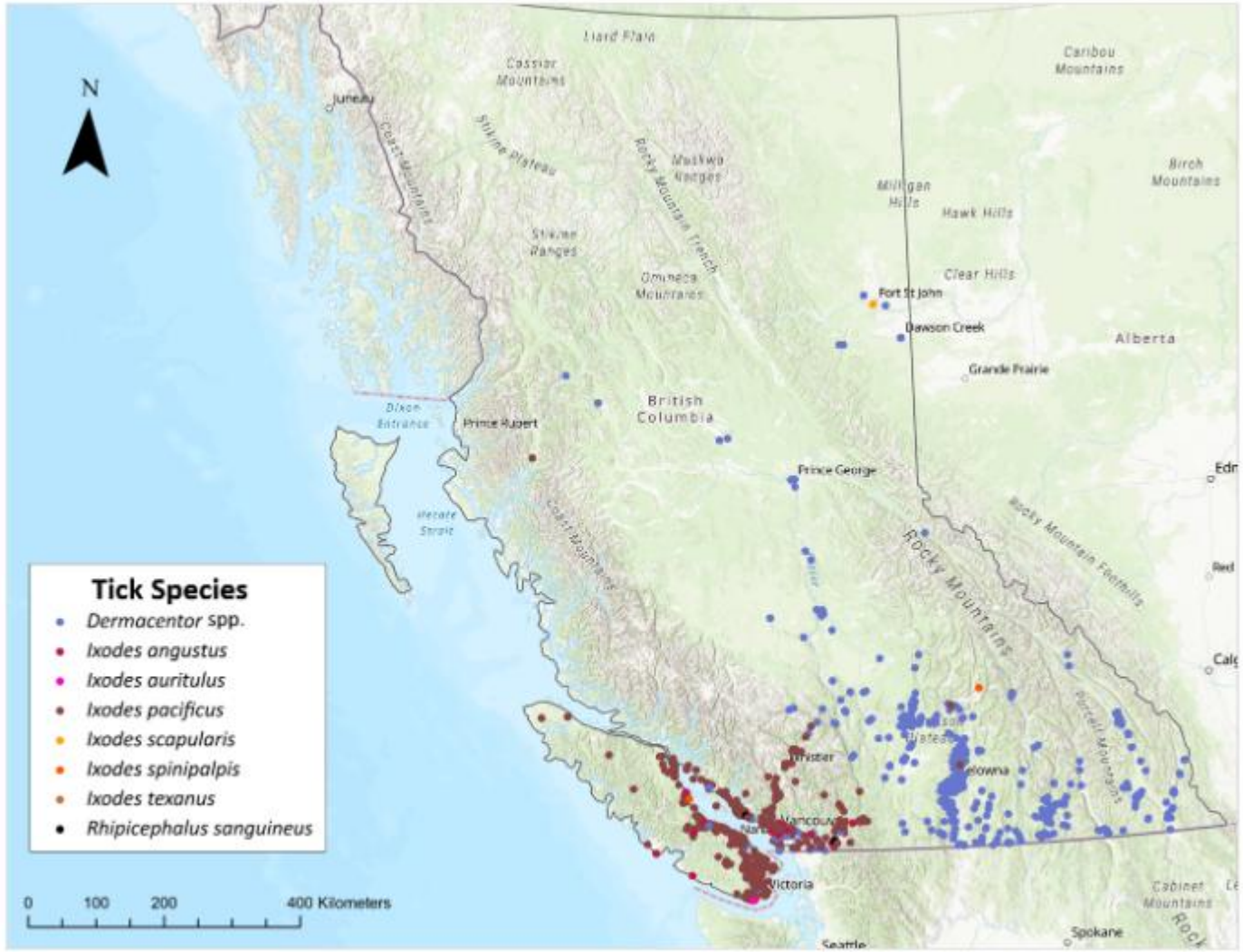
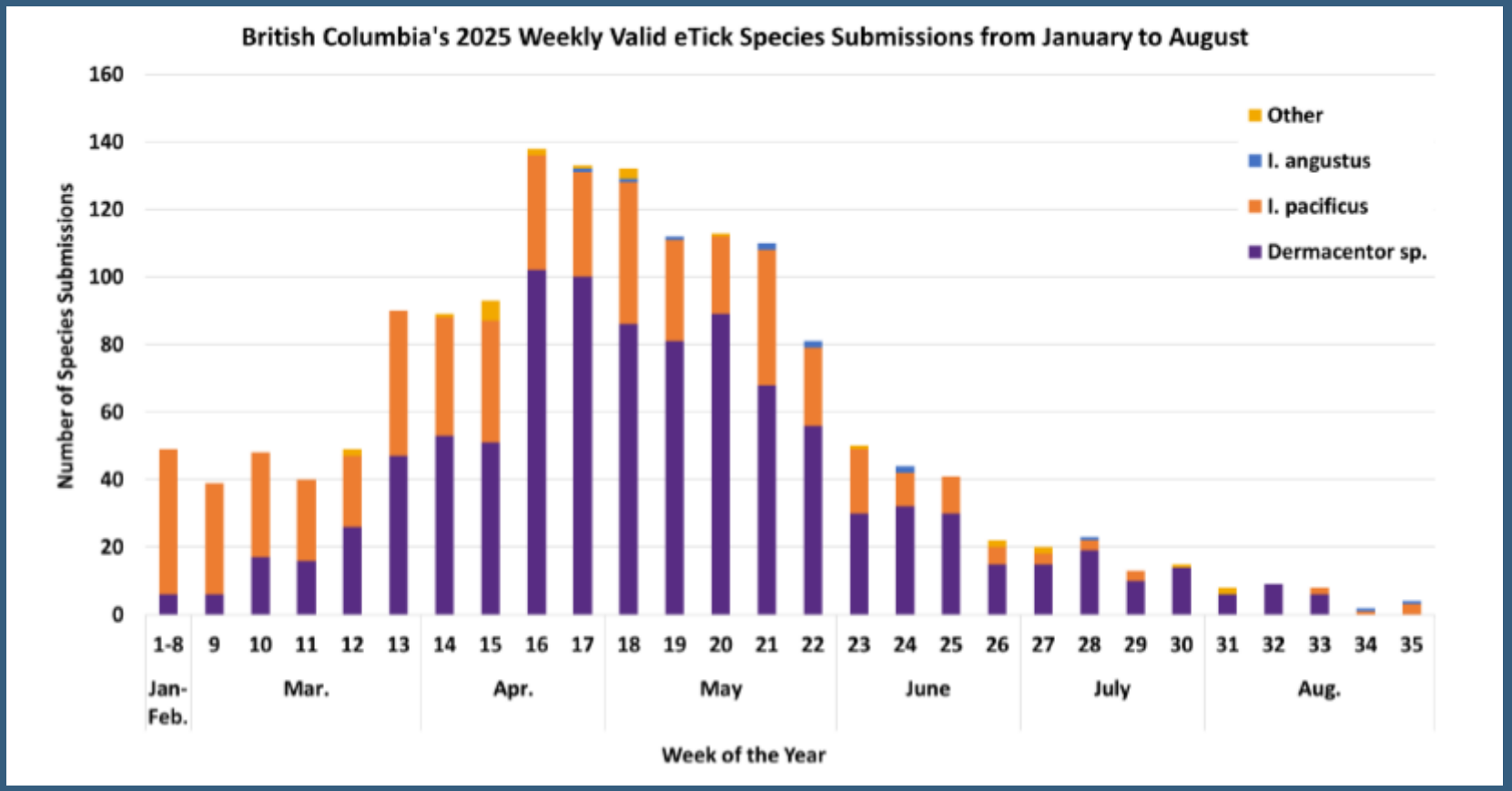
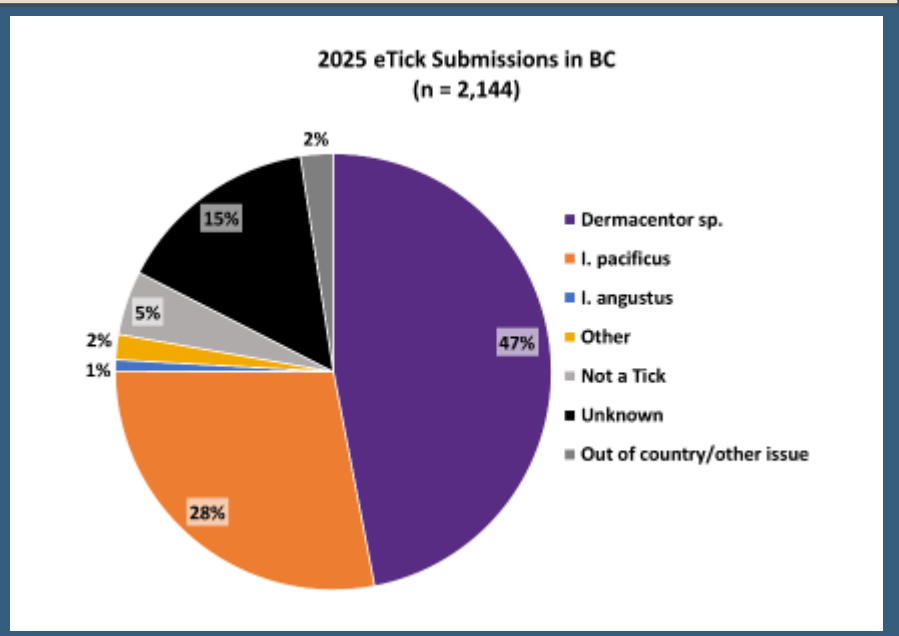


Figure 3. Map of valid tick submissions to eTick without reported out-of-province travel, 2025.

Tick surveillance, 2025

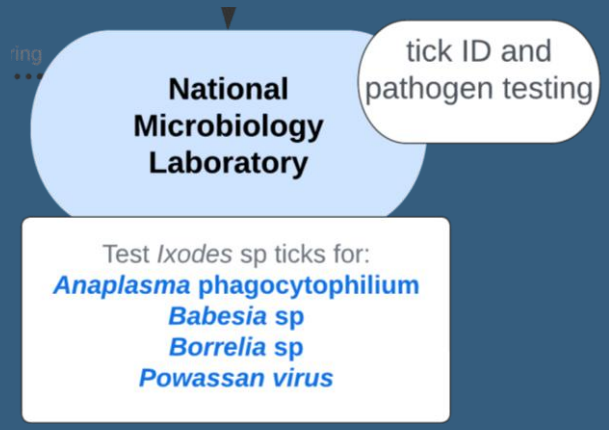




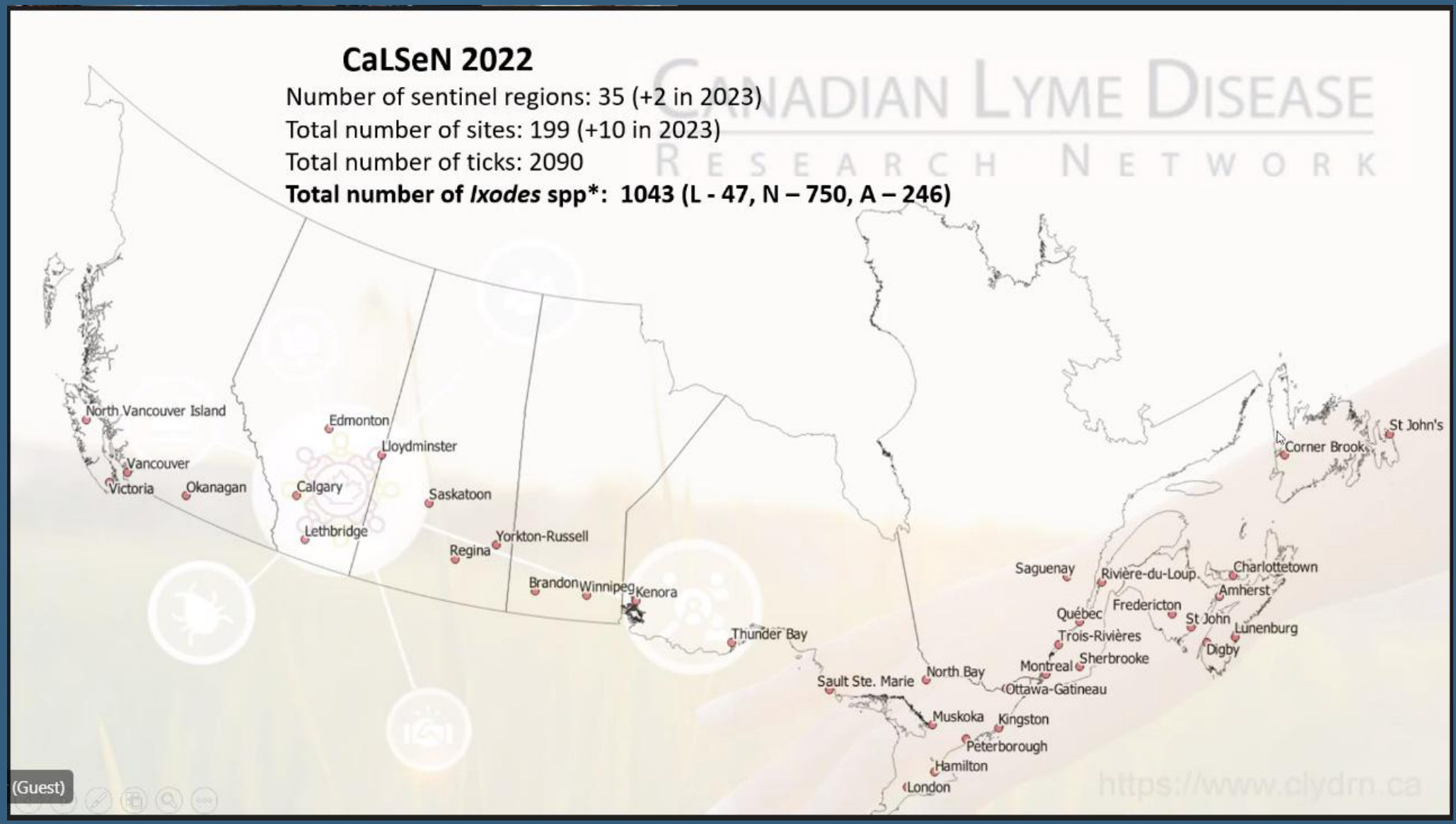
Active tick surveillance

- 2019-2025: Collaboration with Canadian Lyme Disease Research Network (CLyDRN)
  - Longitudinal sentinel surveillance across Canada
  - 20 sites in BC

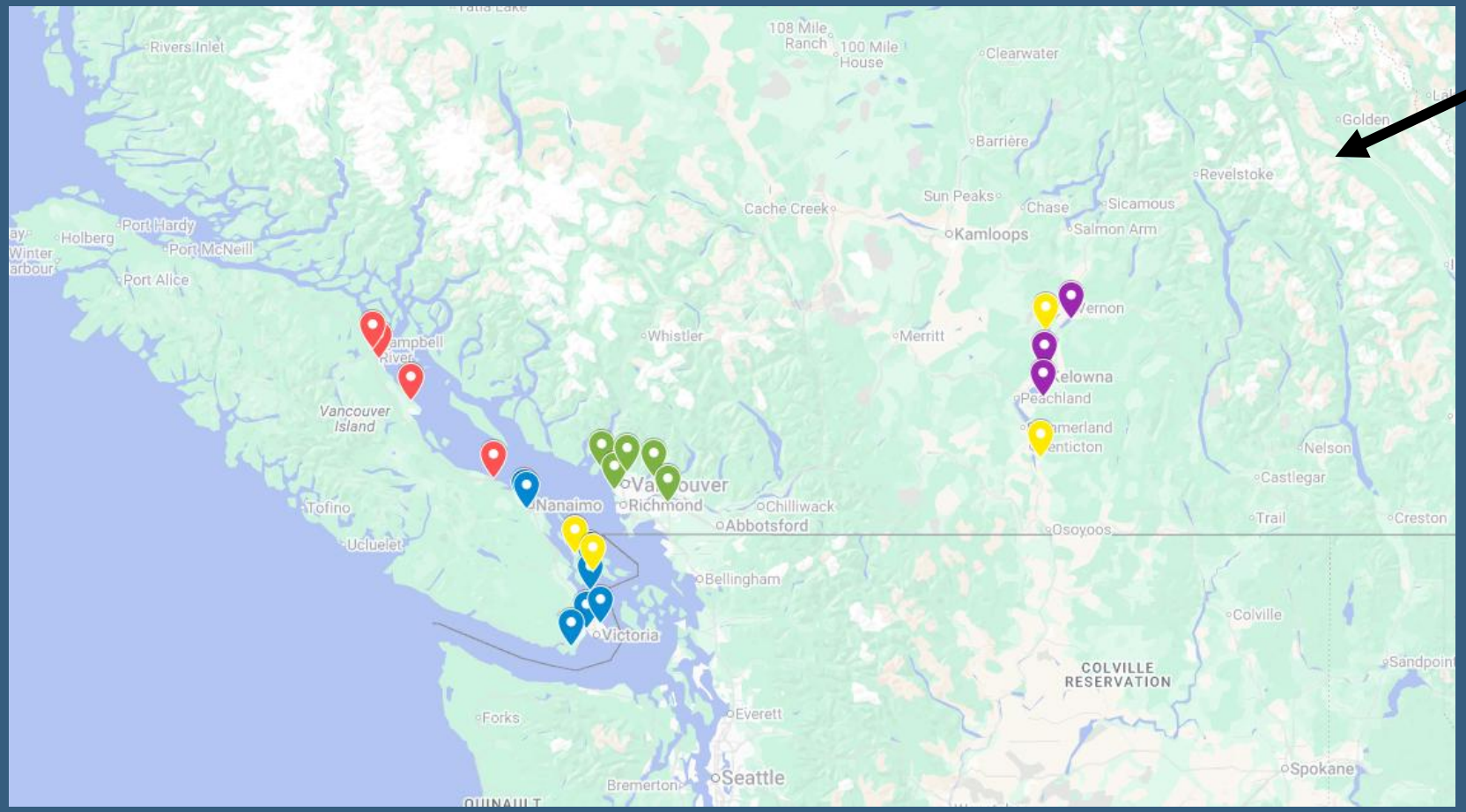
Credit: Stefan Iwasawa



The Canadian Lyme Disease Sentinel Network (CaLSeN)



CaLSeN sentinel sites in BC - 2019-2025



CaLSeN sentinel sites in BC
Pathogen detections, 2019-2024

Special projects

BCCDC-Merck companion animal project

Results of BCCDC-Merck Project

The Canadian Veterinary Journal
La Revue vétérinaire canadienne

Brief Communication Communication brève

Passive tick surveillance and detection of *Borrelia burgdorferi* in ticks from companion animals in British Columbia: 2018 to 2020

Erin Fraser, Stefan Iwasawa, Navdeep Chahil, Min-Kuang Lee, Teresa Lo, Muhammad Morshed, Nicole Colapinto, Kathy Keil, Aimee Porter

Abstract

Objective

The present study was designed to identify tick species and determine prevalence of *Borrelia burgdorferi* infection in ticks obtained from companion animals in British Columbia.

Animals and samples

Ticks were submitted by British Columbia veterinarians from client-owned companion animals over a 31-month period.

Procedure

Each tick was identified and PCR testing for *B. burgdorferi* undertaken on all *Ixodes* species identified by the Zoonotic Diseases and Emerging Pathogens Section of British Columbia Centre for Disease Control Public Health Laboratory (BCCDC PHL).

Results

Overall, 85% (n = 300) of ticks submitted were *Ixodes* spp., with the majority known to transmit *B. burgdorferi*. Furthermore, 0.8% (95% confidence interval: 0.094 to 2.78%) of these ticks were PCR-positive for *B. burgdorferi*.

Conclusion and clinical relevance

Although the *B. burgdorferi* positivity rate in this study was low, it remains important for veterinary professionals to inform pet owners that ticks are present and can pose a risk to pets and humans. In eastern North America, *B. burgdorferi* infection risk has increased rapidly, underscoring the importance of ongoing surveillance in British Columbia to understand current and future distributions of ticks and tick-borne pathogens, especially in the context of climate change.

Special projects

Birds, ticks and climate change: a citizen science surveillance toolkit

Birds, ticks, and climate change: a citizen science surveillance toolkit

- **Objectives**
  - Pilot use of VIU bird banding station
    - Collect, identify, pathogen test Ixodes ticks
      - *Anaplasma, Babesia sp., Borrelia sp., Ehrlichia sp.,and Rickettsia sp.*
  - Bird bander citizen science toolkit
- Public Health Agency of Canada
  - Comparing tick/bird data with the Rimouski bird observatory
  - Characterize the prevalence of emerging pathogens
  - Include an active environmental sample component

Migratory bird flyways in North America., North Dakota Game and Fish Department, Public Domain, https://www.fws.gov/media/migratory-bird-flyways-north-america

How it works?

Photo credit: Ariane Dumas

VANCOUVER ISLAND UNIVERSITY BIRD BANDING

Photo credit: Vancouver Island University

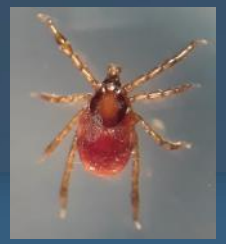
CDC

BC Centre for Disease Control

First Nations Health Authority

Photo credit: Vancouver Island University

etick



Tick prevention resources

Public Health Agency of Canada | Agence de la santé publique du Canada

PROTECT YOUR PETS FROM TICKS AND LYME DISEASE

Lyme disease is spread by the bite of infected blacklegged ticks. These ticks are often found in and near areas with trees, shrubs, tall grass or piles of leaves.

The best way to protect your pets against Lyme disease is by avoiding tick bites:

- ☑ Check your pets for ticks after being outdoors. Ticks often attach to the head, neck and ears of dogs and cats.
- ☑ Carefully remove attached ticks immediately with clean fine-point tweezers and wash the bite area with soap and water, or alcohol-based sanitizer.
- ☑ Talk with your veterinarian about tick-prevention products for pets and Lyme disease vaccines for dogs.

For more information on how to protect yourself and your pet visit
Canada.ca/LymeDisease

Canada

BC Centre for Disease Control

Going outdoors? Watch for ticks!

Ticks can grab onto you from the grass, bushes and forests of BC.
While most tick bites don't cause diseases, some can make you very sick.
Prevent tick bites and remove them quickly to avoid diseases, like Lyme disease.

Before going outdoors

1. **Wear light coloured, long sleeved clothing.**
   Tuck in your shirt and pants.
2. **Use bug spray**
   with DEET or Icaridin on your clothes and uncovered skin.

After going outdoors

3. **Do a full body check for ticks on:**
   - yourself
   - kids
   - pets
   - outdoor gear

If you find a tick on your skin

4. **Use tweezers to grab the head of the tick and remove it.**
   Wash the area with soap.
5. **Take a photo of the tick and submit to eTick.ca**
6. **Store the tick in a container in the freezer for 30 days.**

Watch for symptoms like a rash or fever.
Talk to a health care provider if you feel unwell within 30 days.

For more information, visit the BCCDC Lyme Disease website.

How to submit ticks from animals in BC?

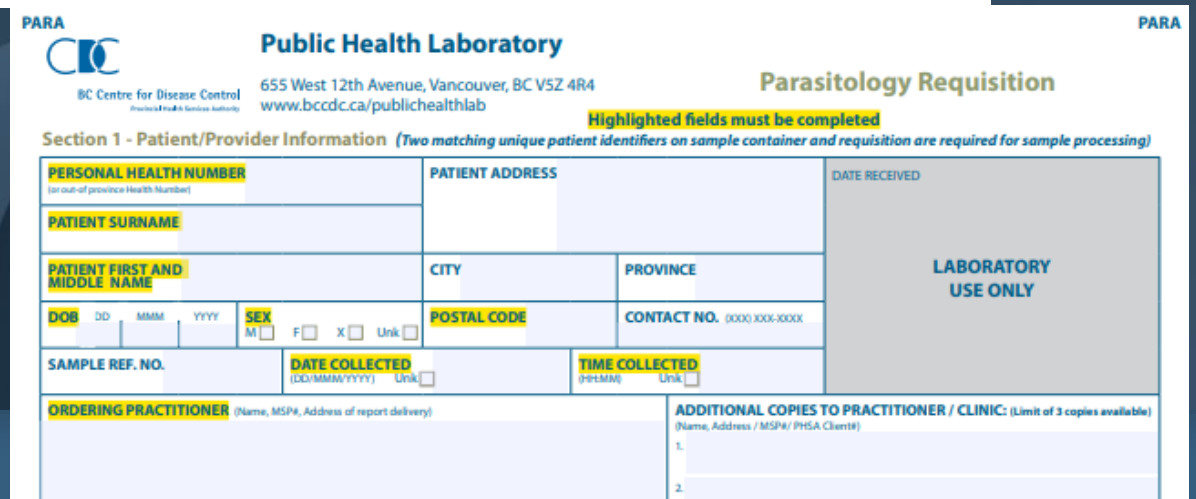
1. Submit a photo of the tick to eTick.ca

Ticks found by BC residents can be identified for free by submitting a photo of the tick to eTick. This is the preferred method to have ticks identified quickly. If the tick is identified as the type of tick that can carry diseases, you will be provided instructions to keep the tick in a freezer for 30 days and monitor for signs of illness. If signs of illness develop, see your health care provider immediately.

www.etick.ca or download the eTick app from the App Store.

2. Visit a health care provider if tick is attached to a human

Please note that the BCCDC Public Health Laboratory cannot accept tick submissions directly from individuals. All test requests must be submitted by a healthcare provider.



PARA

BC Centre for Disease Control

Public Health Laboratory

655 West 12th Avenue, Vancouver, BC V5Z 4R4
www.bccdc.ca/publichealthlab

Parasitology Requisition

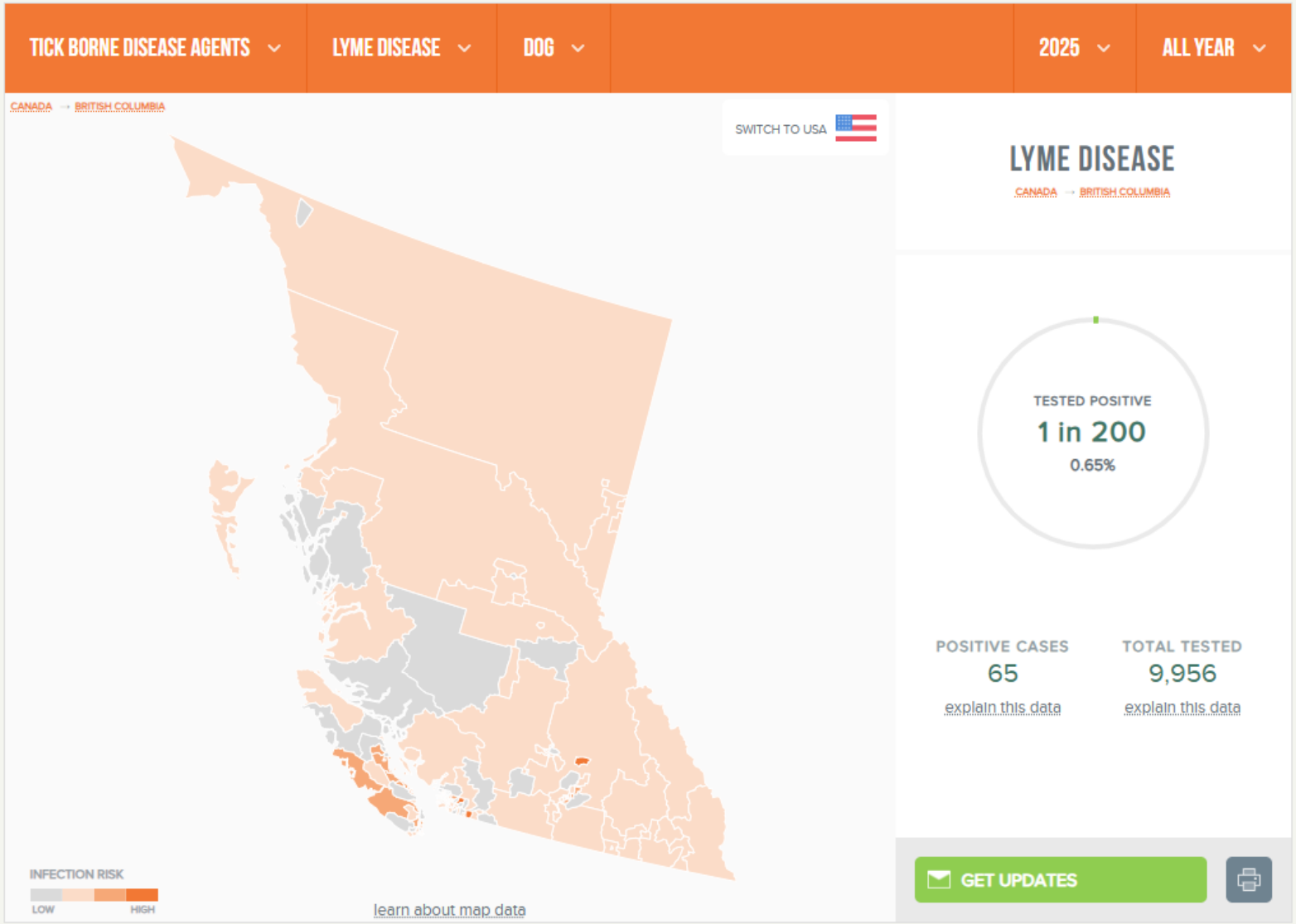
PARA

Highlighted fields must be completed

Section 1 - Patient/Provider Information *(Two matching unique patient identifiers on sample container and requisition are required for sample processing)*

PERSONAL HEALTH NUMBER (or out-of province Health Number)	PATIENT ADDRESS	DATE RECEIVED
PATIENT SURNAME		
PATIENT FIRST AND MIDDLE NAME	CITY / PROVINCE	LABORATORY USE ONLY
DOB DD MMM YYYY / SEX M F X Unk	POSTAL CODE / CONTACT NO. (XXX) XXX-XXXX	
SAMPLE REF. NO. / DATE COLLECTED (DD/MMM/YYYY) Unk / TIME COLLECTED (HH:MM) Unk		
ORDERING PRACTITIONER (Name, MSP#, Address of report delivery)	ADDITIONAL COPIES TO PRACTITIONER / CLINIC: (Limit of 3 copies available) (Name, Address / MSP# / PHSA Client#) 1. 2.	

Indication of Animal Lyme disease in BC



Consensus on Lyme borreliosis in dogs and cats, 2018

Received: 17 January 2018 | Revised: 26 January 2018 | Accepted: 30 January 2018

DOI: 10.1111/jvim.15085

CONSENSUS STATEMENT

Journal of Veterinary Internal Medicine Open Access ACVIM American College of Veterinary Internal Medicine

Consensus Statements of the American College of Veterinary Internal Medicine (ACVIM) provide the veterinary community with up-to-date information on the pathophysiology, diagnosis, and treatment of clinically important animal diseases. The ACVIM Board of Regents oversees selection of relevant topics, identification of panel members with the expertise to draft the statements, and other aspects of assuring the integrity of the process. The statements are derived from evidence-based medicine whenever possible and the panel offers interpretive comments when such evidence is inadequate or contradictory. A draft is prepared by the panel, followed by solicitation of input by the ACVIM membership, which may be incorporated into the statement. It is then submitted to the Journal of Veterinary Internal Medicine, where it is edited before publication. The authors are solely responsible for the content of the statements.

ACVIM consensus update on Lyme borreliosis in dogs and cats

Meryl P. Littman[1] | Bernhard Gerber[2] | Richard E. Goldstein[3] | Mary Anna Labato[4] | Michael R. Lappin[5] | George E. Moore[6]

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[2]The Clinic for Small Animal Internal Medicine, Vetsuisse Faculty, University of Zurich, Switzerland

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[4]Department of Clinical Sciences, Cummings School of Veterinary Medicine, Tufts University, North Grafton, Massachusetts

[5]Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, Colorado

[6]Department of Veterinary Administration, College of Veterinary Medicine, Purdue University, West Lafayette, Indiana

Correspondence
Meryl P. Littman, Department of Clinical Studies-Philadelphia, University of Pennsylvania School of Veterinary Medicine, Philadelphia, PA 19104-6010.
Email: merylitt@vet.upenn.edu

An update of the 2006 American College of Veterinary Internal Medicine (ACVIM) Small Animal Consensus Statement on Lyme Disease in Dogs: Diagnosis, Treatment, and Prevention was presented at the 2016 ACVIM Forum in Denver, CO, followed by panel and audience discussion and a drafted consensus statement distributed online to diplomates for comment. The updated consensus statement is presented below. The consensus statement aims to provide guidance on the diagnosis, treatment, and prevention of Lyme borreliosis in dogs and cats.

KEYWORDS
Borrelia, coinfection, C_6, glomerulonephritis, Osp, tickborne

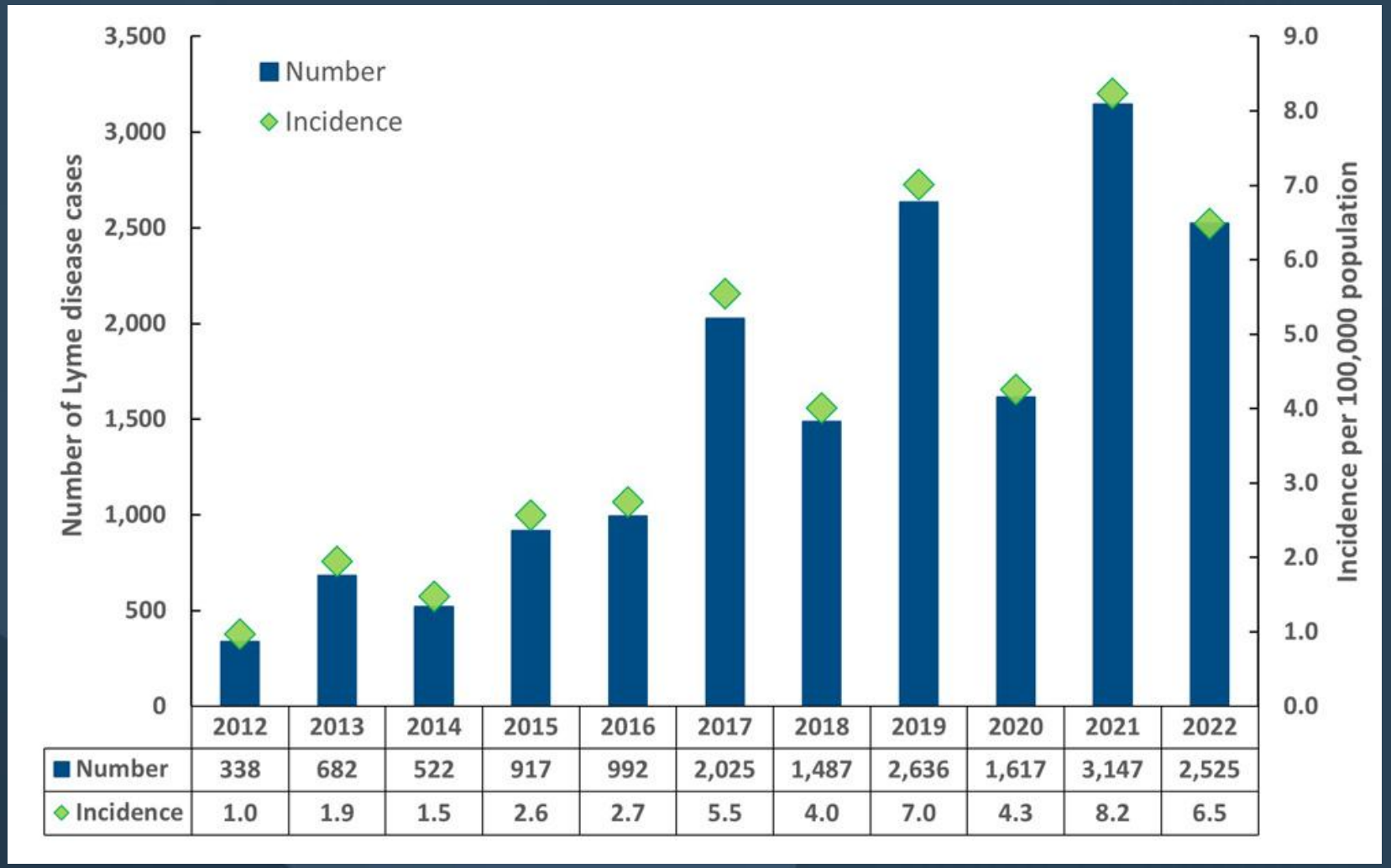
Abbreviations: Bb, *Borrelia burgdorferi sensu stricto*; Bb-sl, *Borrelia burgdorferi sensu lato*; BMDs, Bernese Mountain Dogs; CIC, circulating immune-complexes; EBM, evidence-based medicine classification; ICGN, immune-complex glomerulonephritis; LB, Lyme borreliosis; Osp, outer surface protein (eg, OspA, OspC, OspF); PLN, protein-losing nephropathy; TBD, tickborne disease(s); UPC, urine protein/creatinine ratio; VlsE, variable major protein-like sequence, expressed.

This article was published online on 22 March 2018. An error was subsequently identified. This notice is included in the online version that this has been corrected on 26 March 2018.

1 | INTRODUCTION

Over the past decade, since the first ACVIM Small Animal Lyme Consensus Statement[1] was written, a broader understanding of the large number of *Borrelia* species that exist, the variability of strains of *Borrelia burgdorferi sensu stricto* (Bb), and the diversity of other pathogens carried by *Ixodes* and other ticks has been gained. The geographic distribution of infected ticks has expanded because of bird migration,

Human Lyme disease in Canada



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Number	338	682	522	917	992	2,025	1,487	2,636	1,617	3,147	2,525
Incidence	1.0	1.9	1.5	2.6	2.7	5.5	4.0	7.0	4.3	8.2	6.5

Source: Public Health Agency of Canada

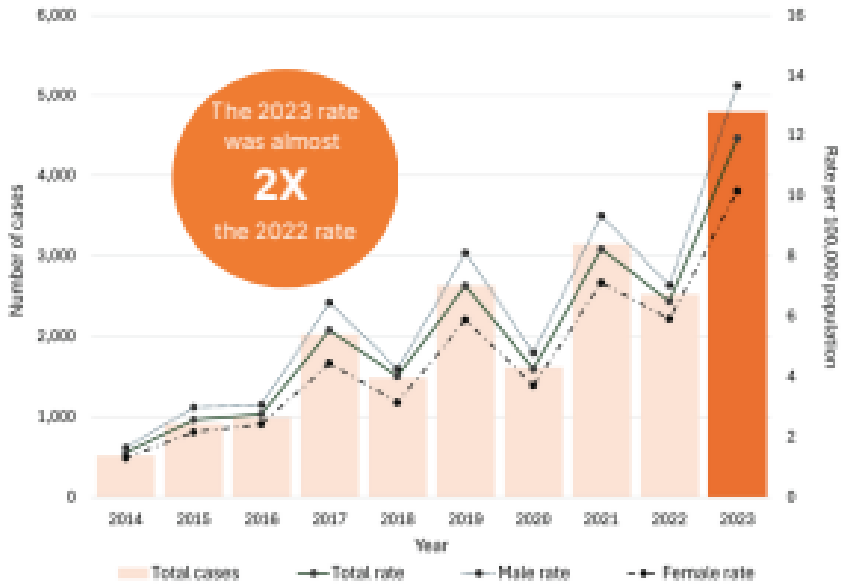
Human Lyme disease in Canada

LYME DISEASE

In 2023, 4,785 cases of Lyme disease were reported at a rate of 11.9 per 100,000 population.

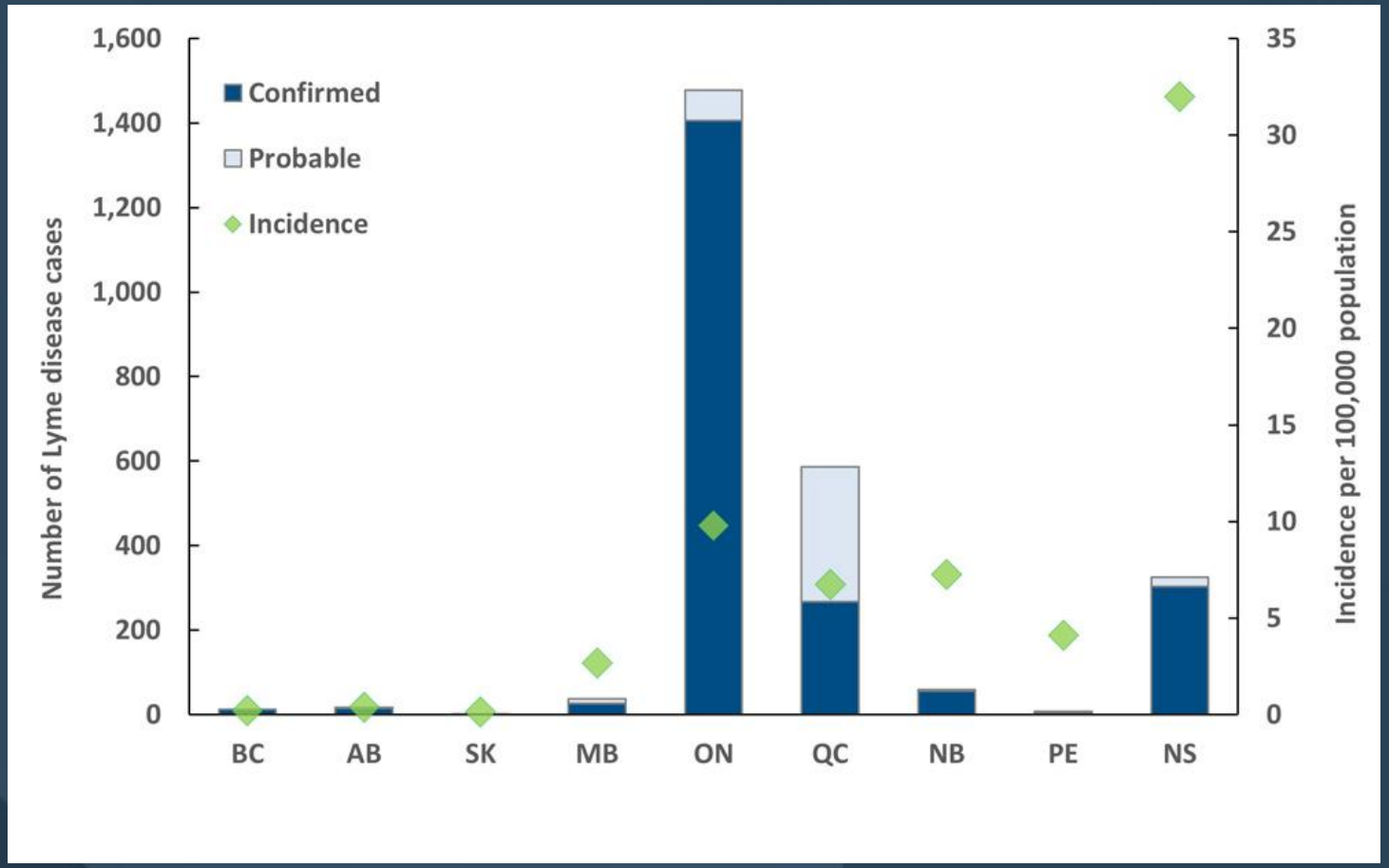
Disease rates were higher among males, people aged 60—79 and, among children, those aged 5—14, compared to similar age groups.

Reported Lyme disease cases and rates, 2014 to 2023



Source: Public Health Agency of Canada

Human Lyme disease in Canada



Source: Public Health Agency of Canada, 2022

Human Lyme disease cases in British Columbia

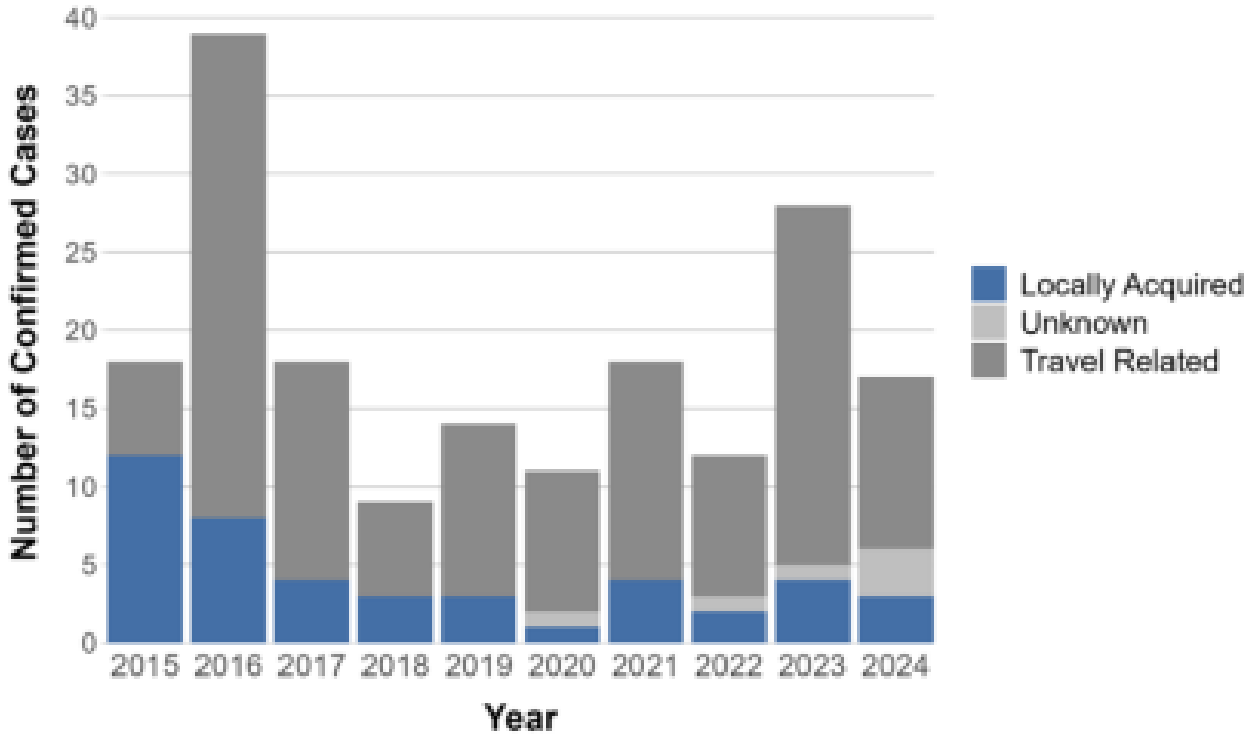


Figure 1. Confirmed Lyme disease cases in BC by likely location of acquisition, 2015-2024.

Source: BC Centre for Disease Control

Anaplasmosis

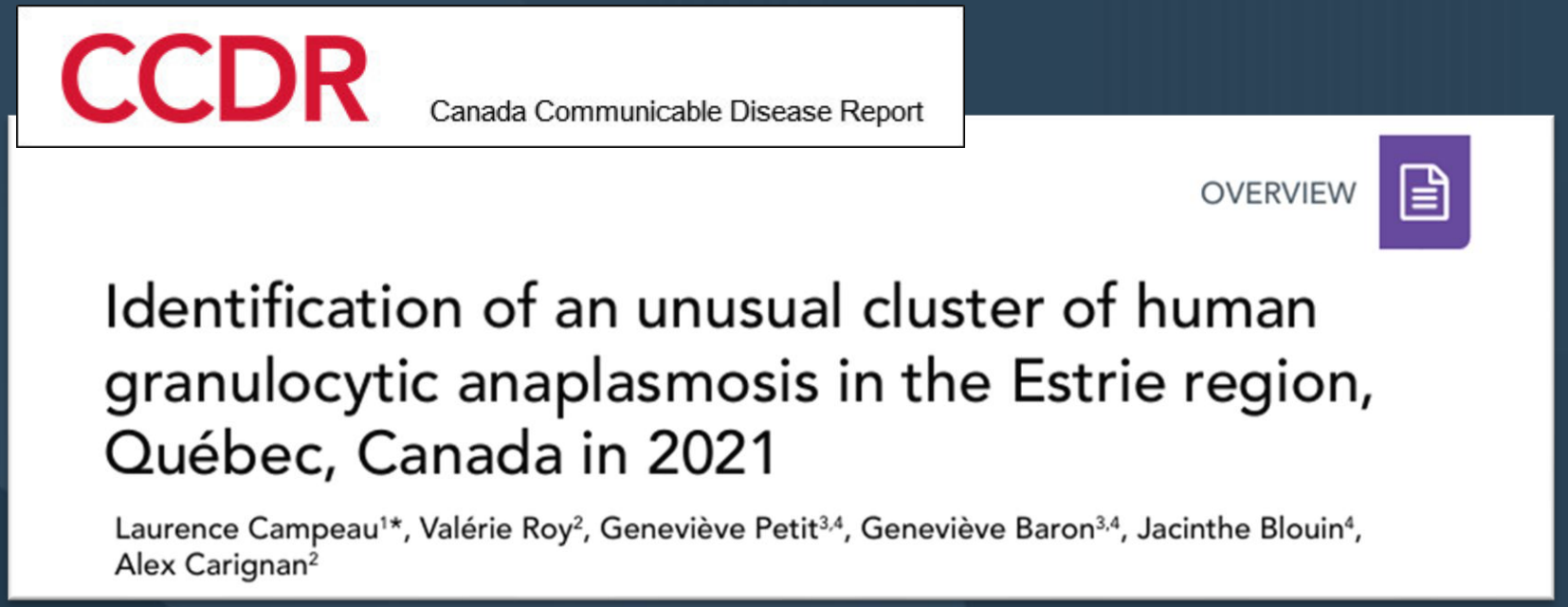
Anaplasma marginale

- Affects ruminants, not zoonotic
- Common in tropical/sub-tropical regions
- Transmitted by multiple tick species (Ixodid and Dermacentor)
- Considered endemic in US
- Sporadic cases in Canada since late 1960s
- Immediately notifiable, CFIA

Anaplasma phagocytophilum

- 2 strains: Ap-HA and Ap – variant 1
- Causes granulocytic anaplasmosis
- Species susceptibility: humans, dogs, horses, ruminants, rodents, etc
- Transmitted mainly by *Ixodes* sp ticks
- Human cases became reportable Canada in 2024, will become reportable in BC in May 2026

Human anaplasmosis in Canada



CCDR Canada Communicable Disease Report

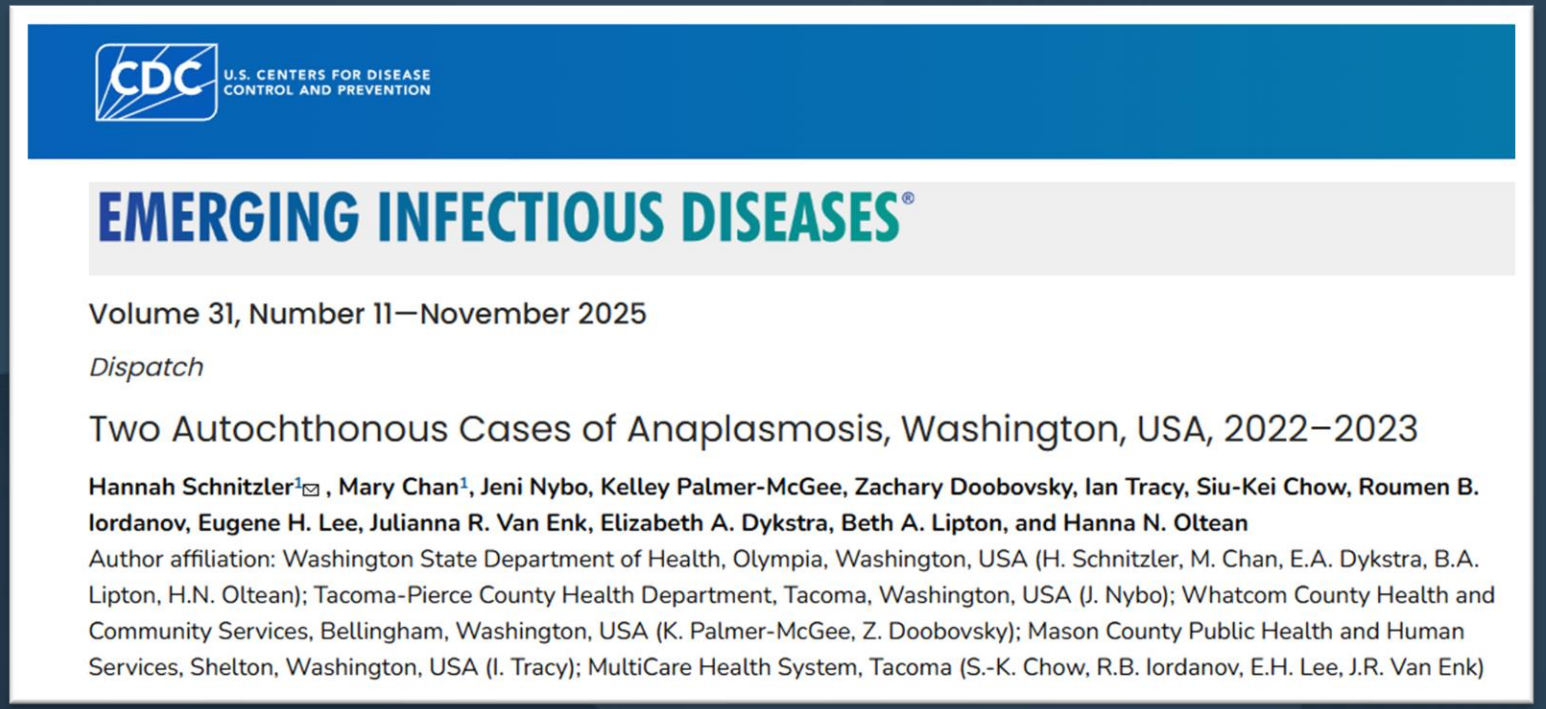
OVERVIEW

Identification of an unusual cluster of human granulocytic anaplasmosis in the Estrie region, Québec, Canada in 2021

Laurence Campeau[1*], Valérie Roy[2], Geneviève Petit[3,4], Geneviève Baron[3,4], Jacinthe Blouin[4], Alex Carignan[2]

Source: https://doi.org/10.14745/ccdr.v48i05a02

Locally-acquired cases of anaplasmosis in Washington State



U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION

EMERGING INFECTIOUS DISEASES®

Volume 31, Number 11—November 2025

Dispatch

Two Autochthonous Cases of Anaplasmosis, Washington, USA, 2022–2023

Hannah Schnitzler[1], Mary Chan[1], Jeni Nybo, Kelley Palmer-McGee, Zachary Doobovsky, Ian Tracy, Siu-Kei Chow, Roumen B. Iordanov, Eugene H. Lee, Julianna R. Van Enk, Elizabeth A. Dykstra, Beth A. Lipton, and Hanna N. Oltean

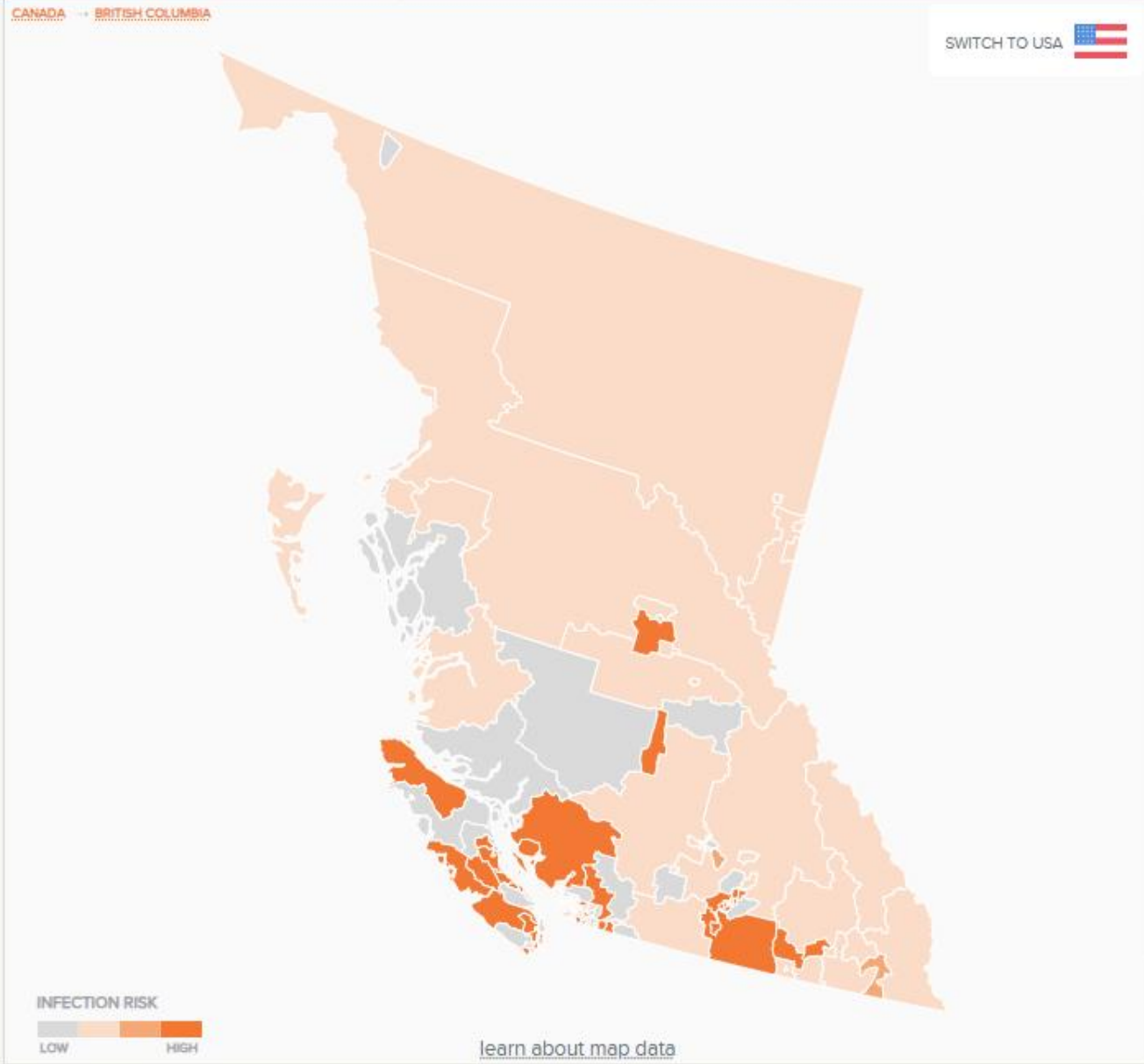
Author affiliation: Washington State Department of Health, Olympia, Washington, USA (H. Schnitzler, M. Chan, E.A. Dykstra, B.A. Lipton, H.N. Oltean); Tacoma-Pierce County Health Department, Tacoma, Washington, USA (J. Nybo); Whatcom County Health and Community Services, Bellingham, Washington, USA (K. Palmer-McGee, Z. Doobovsky); Mason County Public Health and Human Services, Shelton, Washington, USA (I. Tracy); MultiCare Health System, Tacoma (S.-K. Chow, R.B. Iordanov, E.H. Lee, J.R. Van Enk)

Source: CDC

TICK BORNE DISEASE AGENTS | ANAPLASMOSIS | DOG | 2025 | ALL YEAR

CANADA → BRITISH COLUMBIA

SWITCH TO USA



learn about map data

ANAPLASMOSIS

CANADA → BRITISH COLUMBIA

TESTED POSITIVE

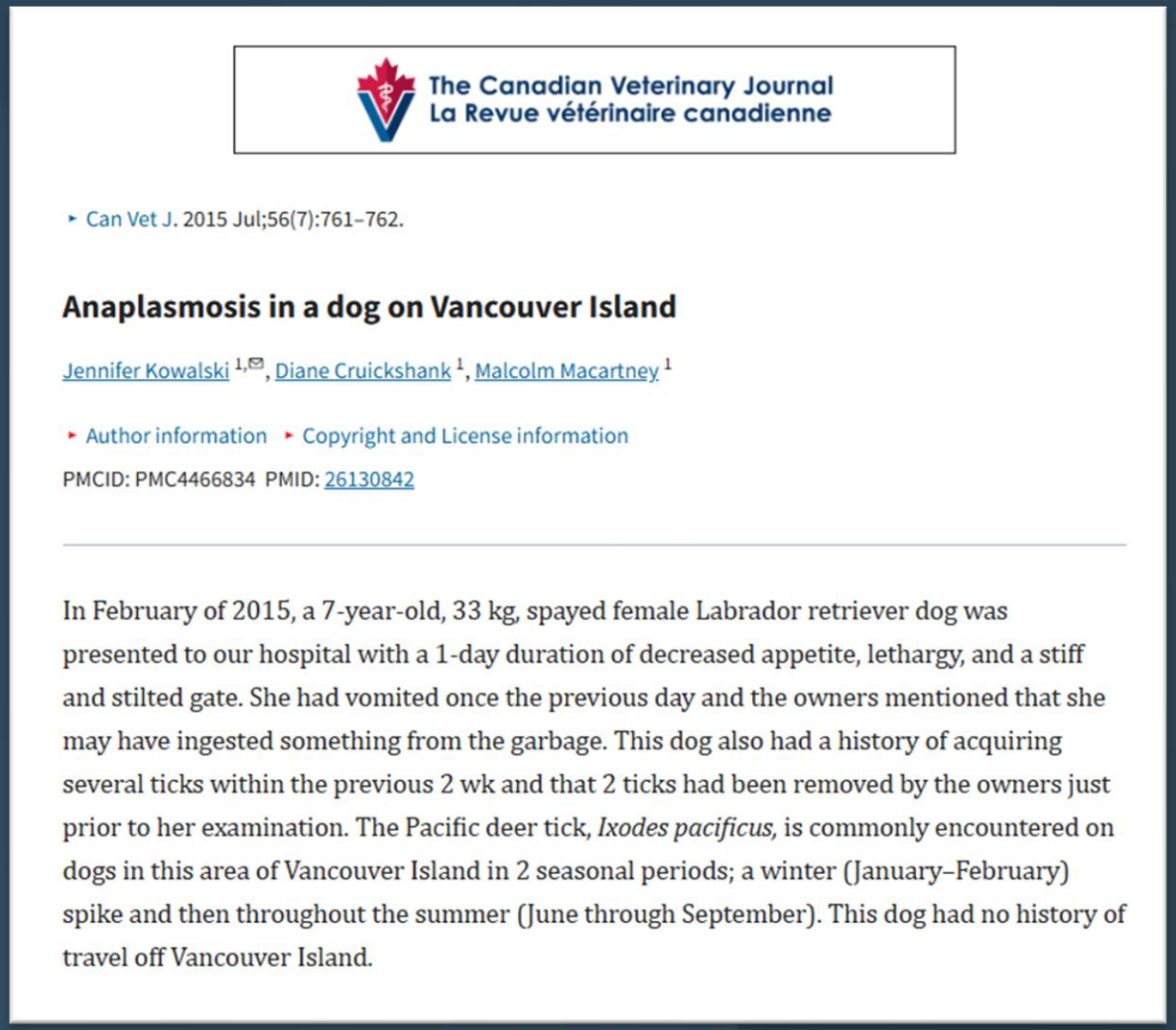
1 in 30

3.12%

POSITIVE CASES	TOTAL TESTED
311	9,956
explain this data	explain this data

GET UPDATES

Canine anaplasmosis BC



The Canadian Veterinary Journal
La Revue vétérinaire canadienne

Can Vet J. 2015 Jul;56(7):761–762.

Anaplasmosis in a dog on Vancouver Island

Jennifer Kowalski [1,✉], Diane Cruickshank [1], Malcolm Macartney [1]

Author information · Copyright and License information

PMCID: PMC4466834 PMID: 26130842

In February of 2015, a 7-year-old, 33 kg, spayed female Labrador retriever dog was presented to our hospital with a 1-day duration of decreased appetite, lethargy, and a stiff and stilted gate. She had vomited once the previous day and the owners mentioned that she may have ingested something from the garbage. This dog also had a history of acquiring several ticks within the previous 2 wk and that 2 ticks had been removed by the owners just prior to her examination. The Pacific deer tick, *Ixodes pacificus,* is commonly encountered on dogs in this area of Vancouver Island in 2 seasonal periods; a winter (January–February) spike and then throughout the summer (June through September). This dog had no history of travel off Vancouver Island.

Anaplasmosis in a dog on Vancouver Island - PMC

Rocky Mountain spotted fever

Rickettsia rickettsii

- pleomorphic, obligate intracellular, Gram-negative coccobacilli
- Humans and dogs are susceptible, other species can act as reservoir hosts (e.g. rodents, rabbits)
- Western NA/Canada: primarily spread by Rocky Mountain wood tick - *Dermacentor andersoni*
- Eastern NA/Canada: primarily spread by American dog tick - *Dermacentor variabilis*
- *Transmission is relatively quick compared to other TBD*
  - *influenced by length of time tick feeds on host and if it had previously fed on another host*
  - *If previously fed, can transmit quickly (minutes)*
  - *If hadn't previous fed (hours)*
- *Incubation period: 2-14 days*

Rocky Mountain spotted fever

Rickettsia rickettsii

- Clinical signs
  - *Asymptomatic, mild, severe manifestations*
  - *Variable but can include:*
    - *Anorexia, depression*
    - *Respiratory signs, conjunctivitis*
    - *Gastrointestinal signs: diarrhea, vomiting, painful abdomen*
    - *Joint, muscle pain*
    - *Petechiae or ecchymoses on skin or mucous membranes*
    - *Edema: ears, lips, or other parts of face*
    - *Hemorrhages, ocular signs, renal failure, DIC, hypotension, shock*

Rocky Mountain spotted fever

Ontario

Ministry of Health

Office of Chief Medical Officer of Health, Public Health

Box 12
Toronto, ON M7A 1N3

Fax.: 416 325-8412

Ministère de la Santé

Bureau du médecin hygiéniste en chef, santé publique

Boîte à lettres 12
Toronto, ON M7A 1N3

Téléc. : 416 325-8412

September 15, 2025

MEMORANDUM

TO: Public Hospitals and Primary Care

FROM: Office of the Chief Medical Officer of Health

RE: Rocky Mountain Spotted Fever Exposures at Long Point, ON

The purpose of this memo is to highlight the need for increased awareness of Rocky Mountain spotted fever (RMSF) in Ontario.

Recent reports have confirmed the emergence of RMSF in Ontario, with two confirmed human cases with compatible clinical presentation and confirmatory laboratory evidence, both with exposures at Long Point, Ontario. Additionally, multiple dogs with a history of travel to the Long Point area were diagnosed with RMSF this summer.

RMSF is a serious, potentially life-threatening tick-borne illness caused by the bacterium *Rickettsia rickettsii*. The American dog tick (*Dermacentor variabilis*), a known vector for *R. rickettsii*, is a common tick species in Ontario. Local tick surveillance in the Long Point area has identified *R. rickettsii* in American dog ticks.

RMSF symptoms usually appear within 2 to 14 days after a tick bite and may include fever, headache, rash, nausea, vomiting, muscle pain, and abdominal pain. The rash typically starts as a maculopapular rash on the wrists, forearms and ankles, then spreads to the trunk and becomes petechial over time. The characteristic rash may be absent or delayed, and the illness can progress rapidly. Prompt recognition and treatment are critical to preventing severe outcomes. Diagnosis is primarily clinical, and treatment with doxycycline should not be delayed while awaiting laboratory confirmation.

Reporting

Anyone who has reasonable grounds to suspect that a reportable or notifiable disease has occurred must submit a report to the Chief Veterinarian within 24 hours.

Procedures and information requirements for submitting a report are described in the Reportable and Notifiable Disease Regulation.

Submit a Report

Reportable and notifiable diseases - Province of British Columbia

BC-specific tick and tick-borne disease surveillance resources

etick

CAPC
Companion Animal Parasite Council

Other resources

Canadian Animal Health Surveillance System CAHSS DIVISION OF ANIMAL HEALTH CANADA

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Search

Home > CAHSS Networks > Vector-Borne Diseases

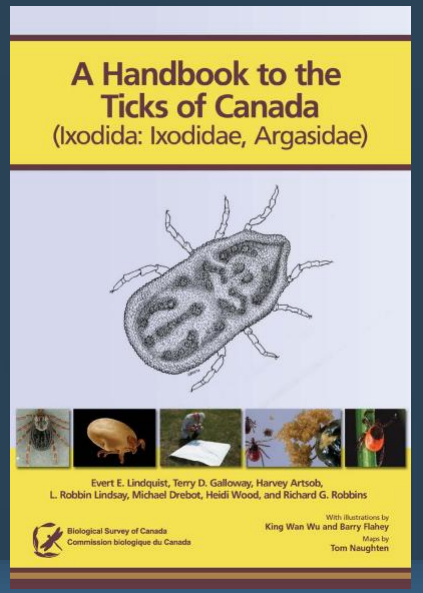
CAHSS Vector-Borne Diseases Network

Mosquitoes, ticks, flies and fleas are more than annoying pests. These insects, amongst others, are vectors that can spread disease with a single bite. Working together with our partners and collaborators, CAHSS is looking closely at changing vector ranges and disease transmission risks across North America, developing an understanding on how climate change is affecting species ranges and survival, studying animal-vector interactions and sentinel patterns, and planning protection of unsuspecting animals from infection and outbreaks.

Public Health Agency of Canada

Canada

BC Centre for Disease Control



University of Saskatchewan | Western College of Veterinary Medicine > Learn About Parasites

Emerging issues – ticks and tick-borne diseases

Climate change will affect ticks and tick-borne diseases by:

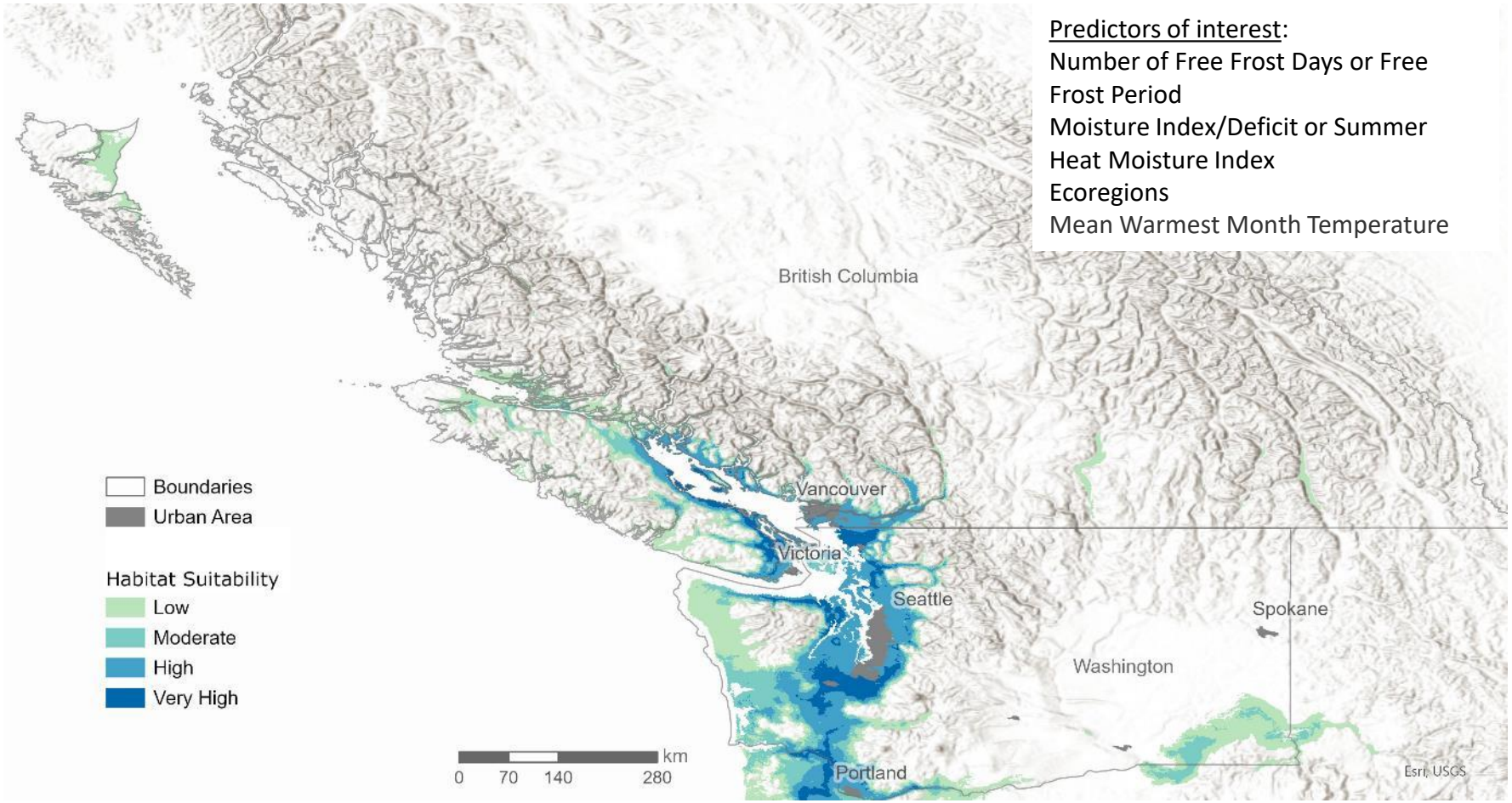
- Increasing habitat for ticks
- Improving tick survival throughout the year
- Allowing more ticks to be active for more months of the year
- Increasing the types and amounts of pathogens in a region
- Changing tick habitat, which may:
  - Introduce ticks to new environments
  - Increase host exposure to tick bites
  - Increase disease transmission

Climate change may lead to altered risks from:

- Changing habitat suitability
- Introduced pathogens
- Introduced species

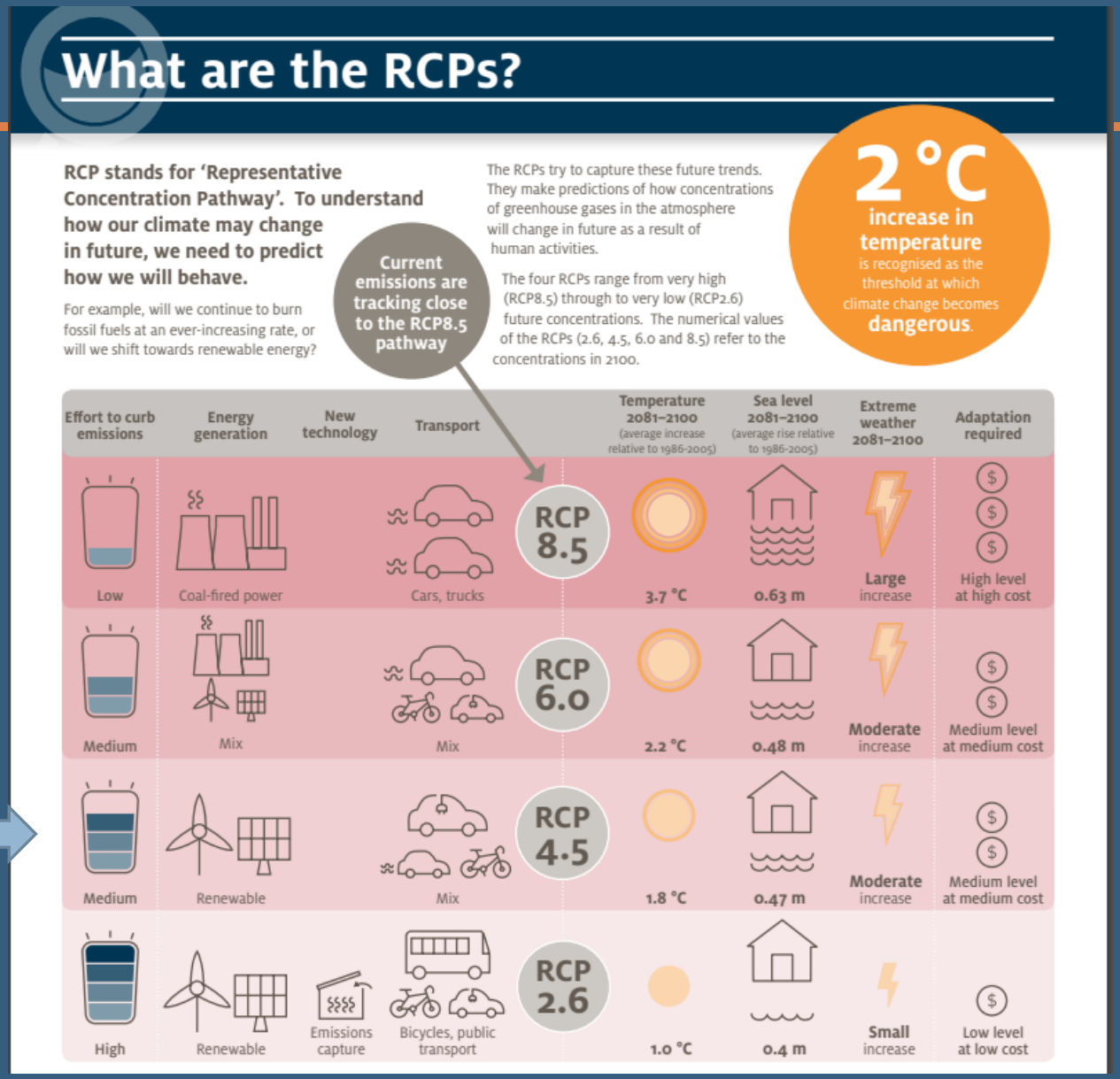
Ixodes pacificus under Current Climate

- Ensemble of habitat suitability maps from annual ClimateNA data and seasonal ClimateNA data at 1 km resolution
  - Mean + uncertainty via standard deviation (-1.96σ for 95% C.I.)

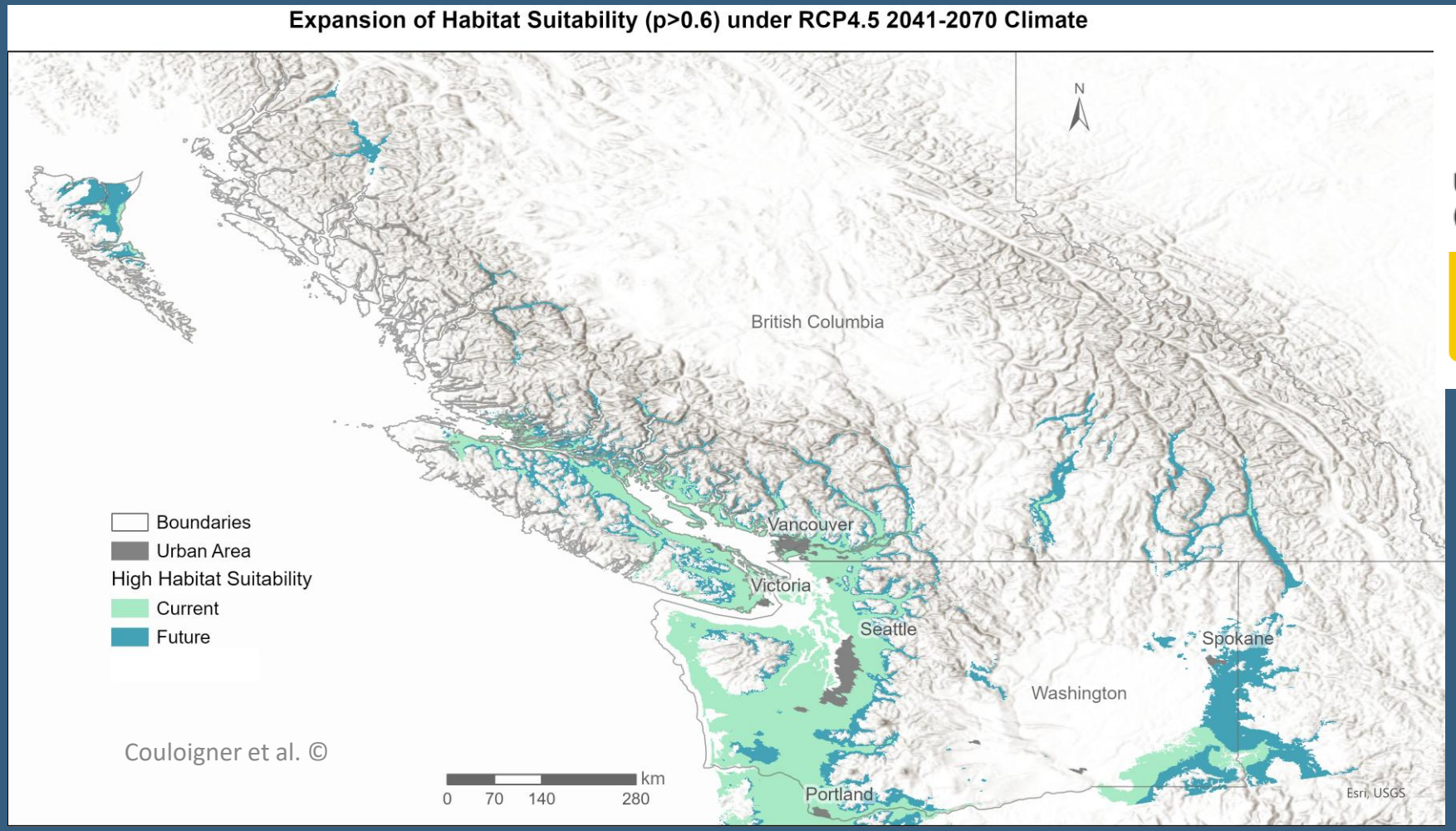


Predictors of interest:
Number of Free Frost Days or Free Frost Period
Moisture Index/Deficit or Summer Heat Moisture Index
Ecoregions
Mean Warmest Month Temperature

RCP =
Representative Concentration Pathway



Climate change and ticks: *Ixodes pacificus*



UNIVERSITY OF CALGARY

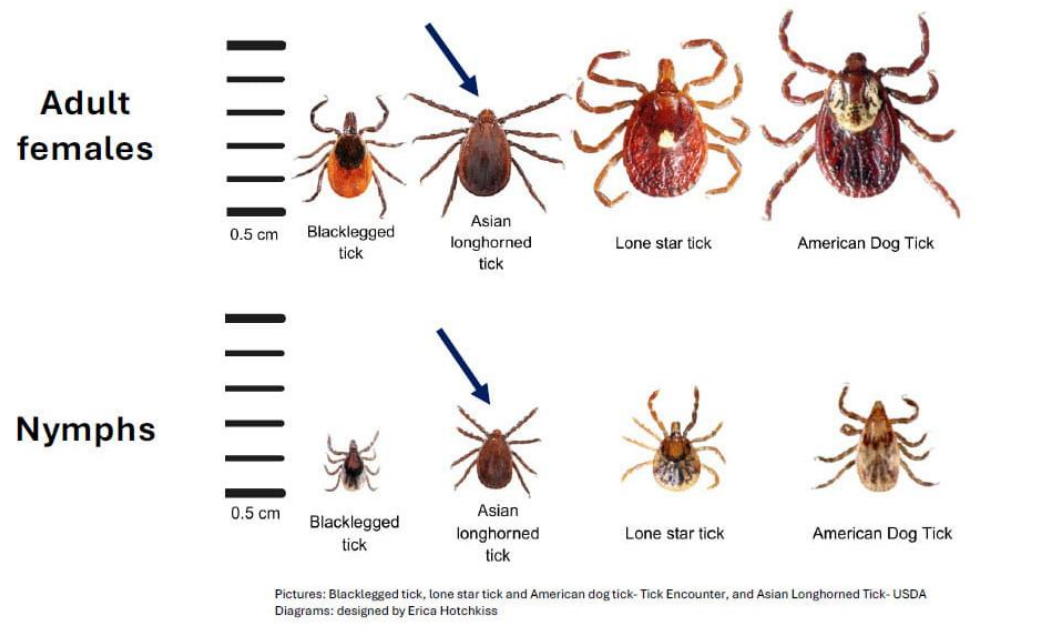
TCC-3W

Financial support from: Public Health Agency of Canada / Agence de la santé publique du Canada

Preliminary work to verify models

Kitselas Lands and Resources Department

Asian Longhorned tick



Pictures: Blacklegged tick, lone star tick and American dog tick- Tick Encounter, and Asian Longhorned Tick- USDA
Diagrams: designed by Erica Hotchkiss

Protect Your Herd from the Asian Longhorned Tick

An emerging tick and disease threat to Canadian cattle

Why It Matters to Farmers

- The Asian longhorned tick feeds on livestock, wildlife, pets, and even people.
- Heavy infestations can cause stress, weight loss, lower milk yield, and in severe cases, death.
- The tick can also carry a parasite that affects red and white blood cells in cattle, causing a disease called **bovine theileriosis**.
- U.S. herds with infections have reported death losses of **5–20% during outbreaks.**
- Early veterinary care can help animals recover, **but once infected, cattle remain carriers for life, and a potential source of infection for other cattle.**

What You Can Do

- **Discuss tick control and prevention with your veterinarian.**
- Check the ears, neck, udder, and legs for ticks, especially for imported cattle.
- **Use good biosecurity practices:** isolate and monitor newly purchased or imported cattle before introducing them to the herd.
- Watch for pale or yellow gums (anemia or jaundice), weakness, fever, abortions, or a sudden drop in milk yield.
- Call your veterinarian if cows seem weak or pale.
- **Submit photos** to eTick.ca for free!

Found a Tick? Scan to Report It.

The Asian longhorned tick is a small, reddish-brown tick that has spread across many U.S. states since 2017. The tick has not been found in Canada as of November 2025. In October 2025, an imported dairy cow tested positive for bovine theileriosis, a disease caused by the parasite *Theileria orientalis* Ikeda, which can be spread by the Asian longhorned tick. Female ticks reproduce without mating, so one tick can start a new population. Theileriosis is an immediately notifiable disease in Canada.

North American Distribution

- The Asian longhorned tick is present in many **U.S. states bordering Canada**, including Maine, New York, Michigan, and North Dakota, **increasing the risk of it spreading into southern Canada**.
- **Early detection and reporting are key to protecting your herd.**

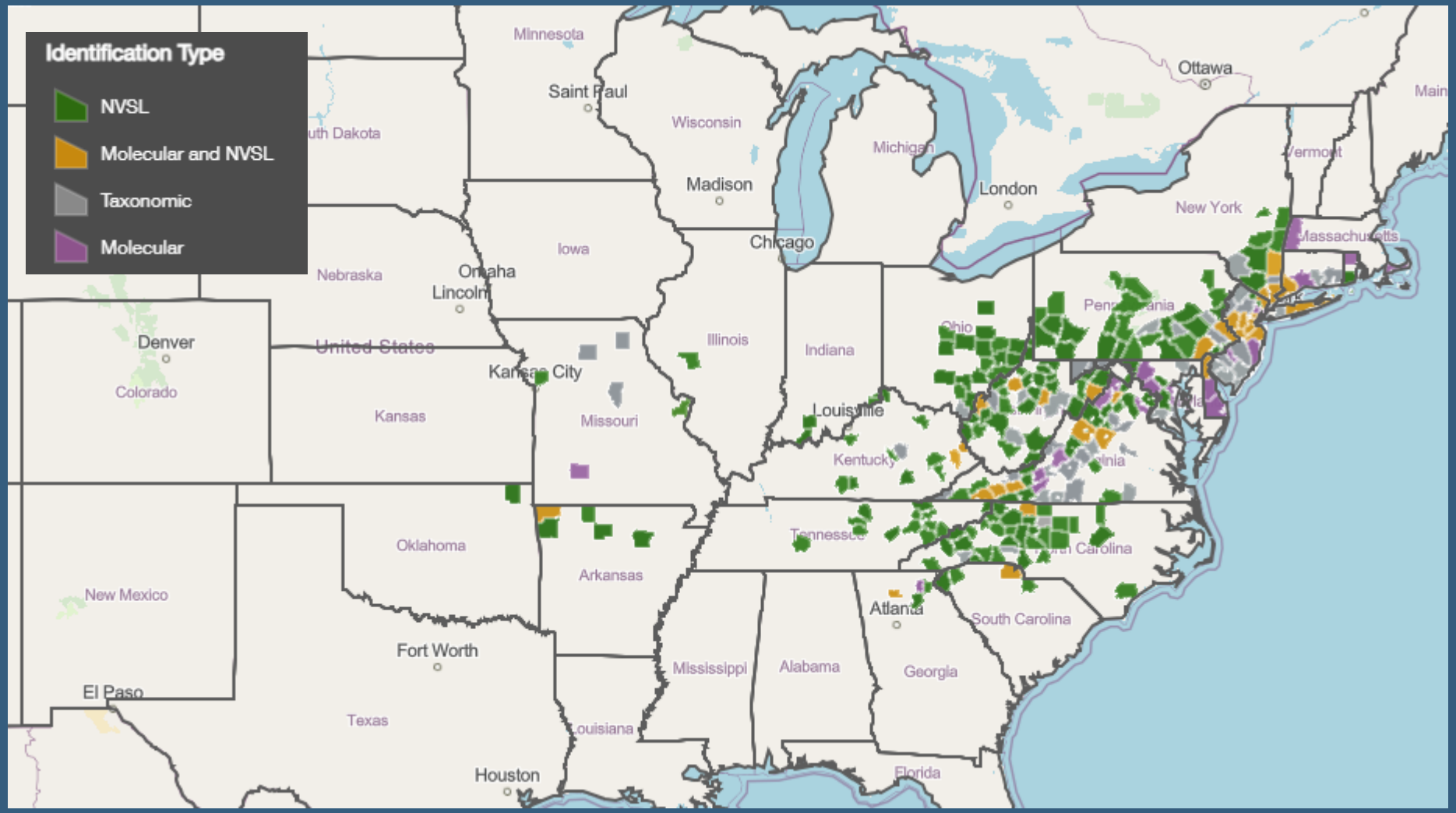
Stay Informed Scan or click for Updates

AnimalHealthCanada

CAHSS

Produced by Animal Health Canada in collaboration with the Canadian Animal Health Surveillance System (CAHSS) Longhorned Tick Task Force to raise awareness about the presence and potential risks of the Asian longhorned tick and *Theileria orientalis* Ikeda (November 2025)
For resources or support, contact info@animalhealthcanada.ca or visit www.cahss.ca

Asian longhorned tick – United States



Theileria orientalis Ikeda

Transmitted by Asian longhorned tick

Emerging Risk Notice

January 2021

Theileria orientalis Ikeda

Key Points

- *Theileria orientalis* is a tickborne protozoon that infects red and white blood cells and causes bovine infectious anemia. Clinical signs of theileriosis are similar to anaplasmosis in cattle and include anemia, jaundice, and weakness. Native genotypes of *T. orientalis* in the United States are usually nonpathogenic; however, the virulent *Theileria orientalis* Ikeda genotype was identified in the United States.[3]
- The last documented theileriosis case in the United States was a beef herd in Missouri infected by *T. buffeli* in 2000.[7,13]
- In August 2017, seven cattle from a herd in Albemarle County, Virginia died after showing signs of illness including severe lethargy and weakness. The cattle ranged in age from 3 months to 13 years and included bulls, cows, and steers.[3]
- In September 2017, an additional cow from the same herd was examined for weakness, icterus, and anemia. Anaplasmosis was suspected, however, testing revealed an infection with T. orientalis, which prompted quarantine of the affected farm and further investigation including a foreign animal disease investigation initiated in December 2017.[3]
- During the investigation, Virginia-Maryland College of Veterinary Medicine (CMCVM) identified the blood-borne parasite as the virulent *T. orientalis* Ikeda genotype.[15]
- A recently published study reported that Haemaphysalis longicornis ticks, also known as the Asian longhorned tick (ALHT), were found in all sampled habitat types and were the most abundant of ticks collected from the environment at the T. orientalis index farm in Virginia. A relatively high percentage (~13%) of questing H. longicornis nymphs from this site were positive for T. orientalis Ikeda, further implicating this tick in the pathogen transmission on the index farm.[11]
- A recent preliminary report of an experimental transmission trial performed by USDA's Agricultural Research Service (ARS) in conjunction with the Virginia Tech Animal Laboratory Services (ViTALS) laboratory has confirmed vector competence of *H. longicornis* for *T. orientalis* Ikeda in the United States.[16]
- *T. orientalis* Ikeda has been documented in cattle since September 2017 in at least 28 counties in Virginia and three counties in West Virginia.[14,15] The National Veterinary Services Laboratories (NVSL) confirmed the initial two cases in Virginia. The remaining cases have been confirmed by blood smears and polymerase chain reaction (PCR) along with sequence and phylogenetic analyses at Kansas State Veterinary Diagnostic laboratory, Virginia-Maryland College of Veterinary Medicine, and the ViTALS laboratory.[3]
- Some species of *Theileria* (*T.parva* and *T. annulate*) are reportable to the World Organisation for Animal Health (OIE); however, *T. orientalis* is currently not reportable to the OIE.[17]
- There are no known risks to human health.

Potential Economic Concerns

- *T. orientalis* Ikeda has caused major economic losses in Asia, New Zealand, and Australia primarily as a result of deaths or illness in beef and dairy cattle and ongoing milk losses.[3]
- An analysis of one dairy affected by T. orientalis in New Zealand in 2014 estimated the loss at more than $400 per cow.[19]

Epidemiology

- *Theileriae* are obligate intracellular protozoan parasites that infect wild and domestic animals in the Bovidae family worldwide. They are transmitted by ixodid ticks.[1]

Theileria orientalis Ikeda – detection in Ontario

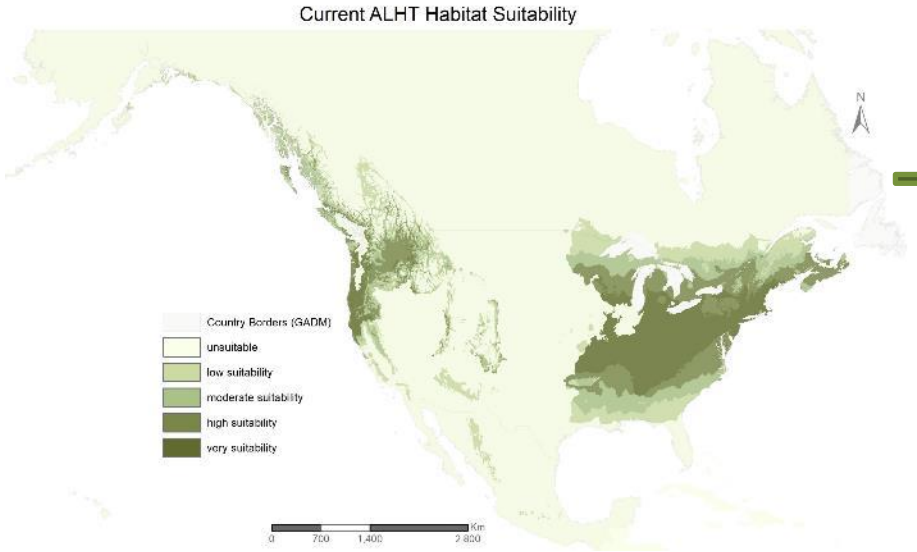
Theileria orientalis Ikeda in Ontario, October 21, 2025

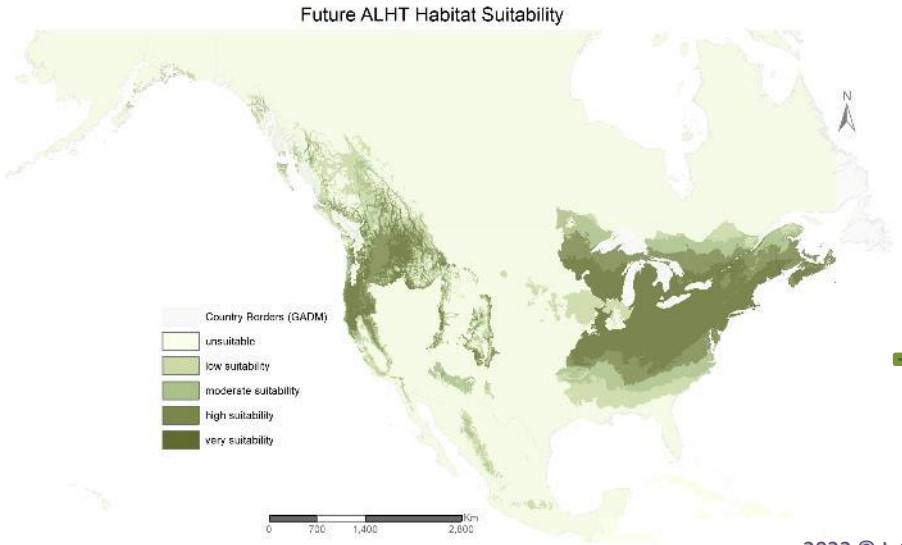
Canadian Food Inspection Agency

Share:

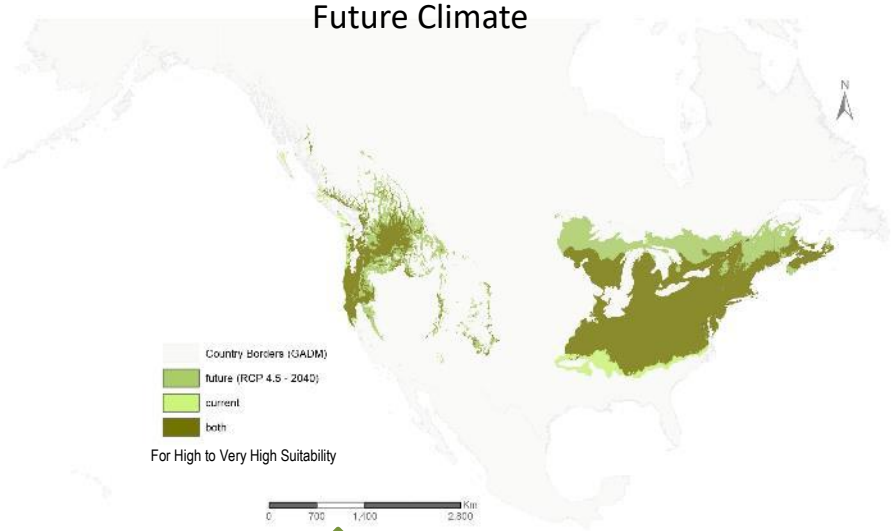
The Canadian Food Inspection Agency (CFIA) was notified on October 8, 2025, of a suspicion of Theileriosis in a dairy cow with regenerative anemia located in Kawartha Lakes, Ontario. The cow was imported from the USA on July 15, 2025. The CFIA National Centre for Foreign Animal Disease has confirmed the sample to be positive for *Theileria orientalis* Ikeda through metagenomic sequencing and genotype identification. This is the first detection of Theileriosis in Canada. No control measures are undertaken to control the disease.

ALHT Habitat Suitability Modelling: Projection onto Current and Future Climate



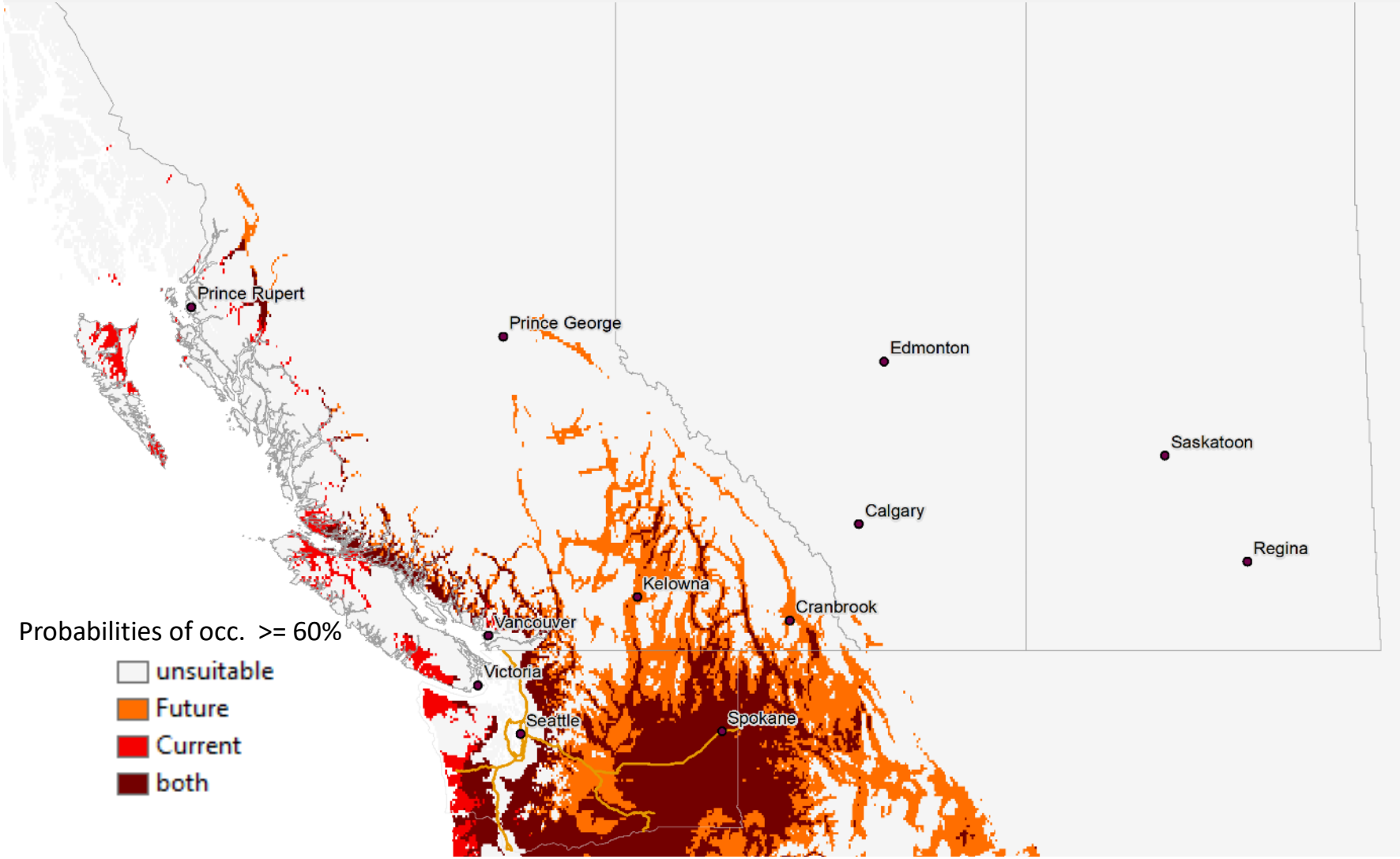


Comparison of Suitability Maps under Current and Future Climate



Habitat Expansion at 2.5’ for 3W provinces + WA, *if* *H. longicornis introduced,* Current vs Future (2040 RCP4.5)

(median of 7 future projections vs current projection)

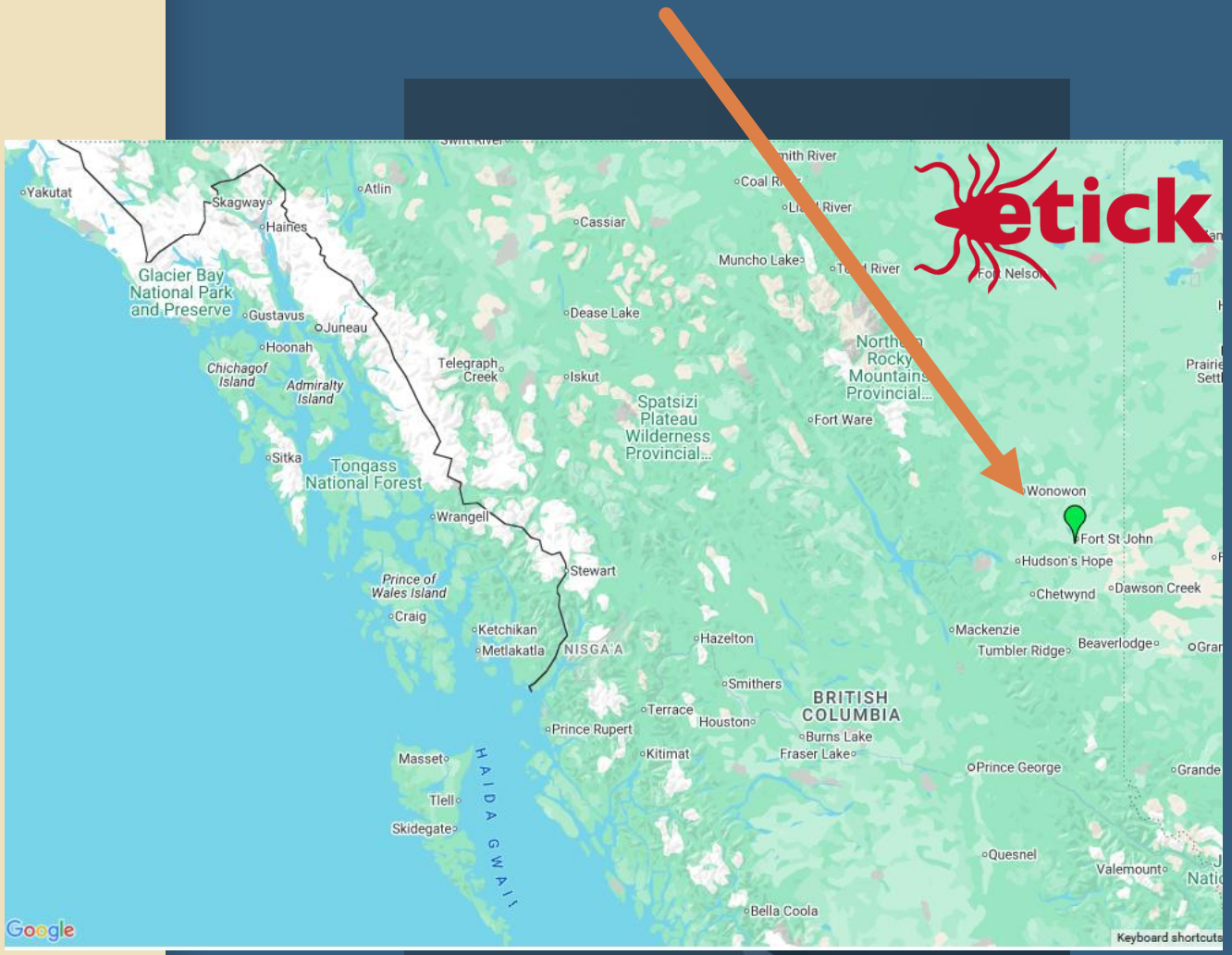


Ixodes scapularis confirmed in Fort St John area

- Found on dog with no travel history
- Submitted to eTick
- Confirmed by molecular testing at BCCDC Public Health Lab
- Tick infected with *Borrelia burgdorferi*
  - Agent of Lyme disease

Just an isolated signal so follow up is needed:

- Encourage submissions to eTick from ticks collected on people and pets from this area
- Active field surveillance (tick dragging)



Mosquitoes and mosquito-borne diseases in BC

Pathogens:

1. Epizootic hemorrhagic Disease
2. Western equine encephalitis
3. West Nile
4. California serogroup viruses

Invasive mosquito species of concern

.

Epizootic hemorrhagic disease virus in white-tailed deer

- *Orbivirus*
- Vectors: primarily biting midges, mosquitoes secondary
- Vertebrate hosts: white-tailed deer, antelopes
- Symptoms:
  - Fever, rapid difficult breathing, excessive salivation, nasal exudate, swollen tongue, generalized hemorrhagic symptoms
- Mortality: up to 90%
- BC outbreaks: white-tailed deer primarily but also in big-horned sheep

CBC

British Columbia

Nearly 100 deer found dead in Grand Forks, B.C. as epizootic hemorrhagic disease confirmed

Dozens of deer have been found dead from disease in past weeks

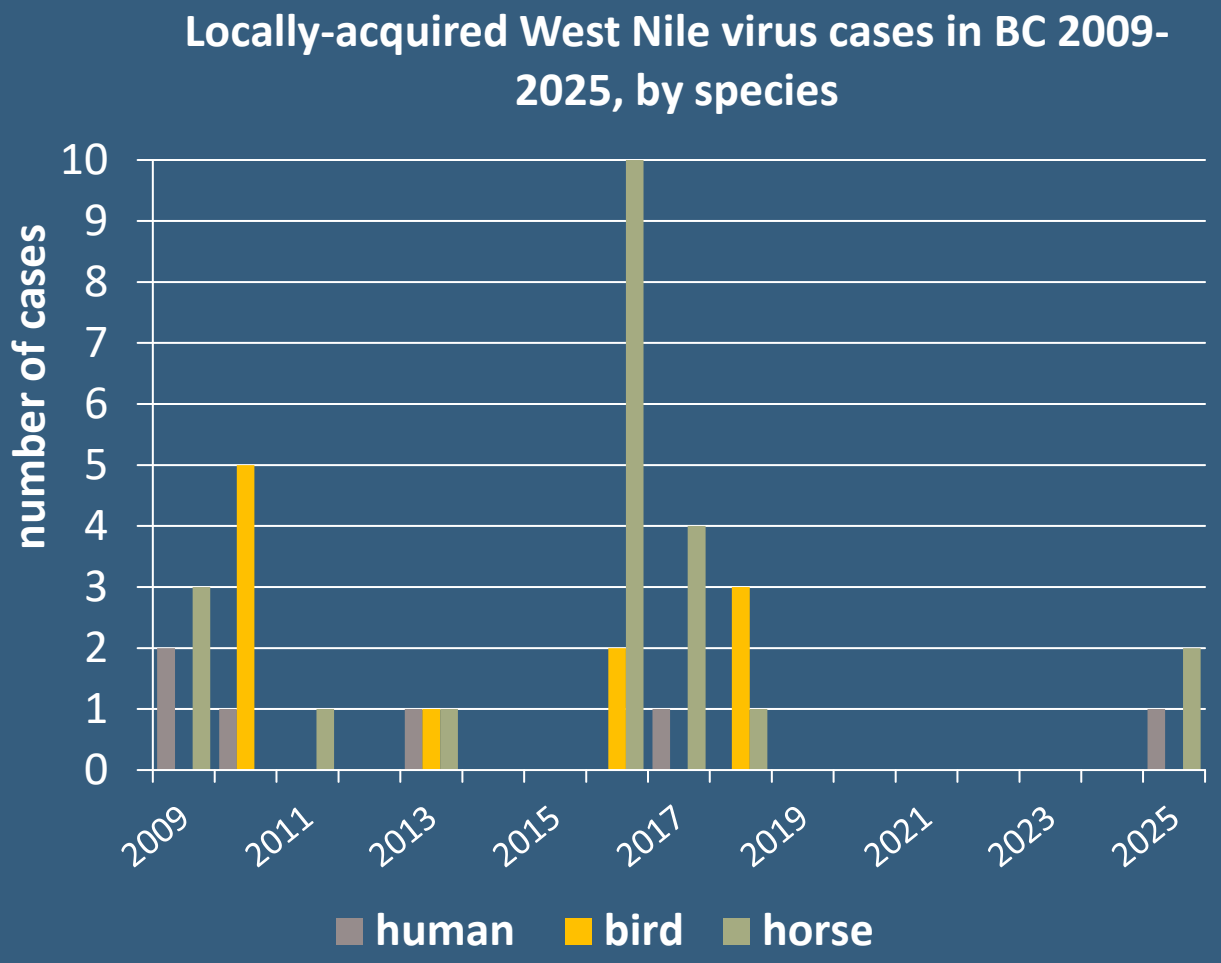
CBC News · Posted: Oct 03, 2025 4:32 PM PDT | Last Updated: October 3, 2025

Western equine encephalitis virus

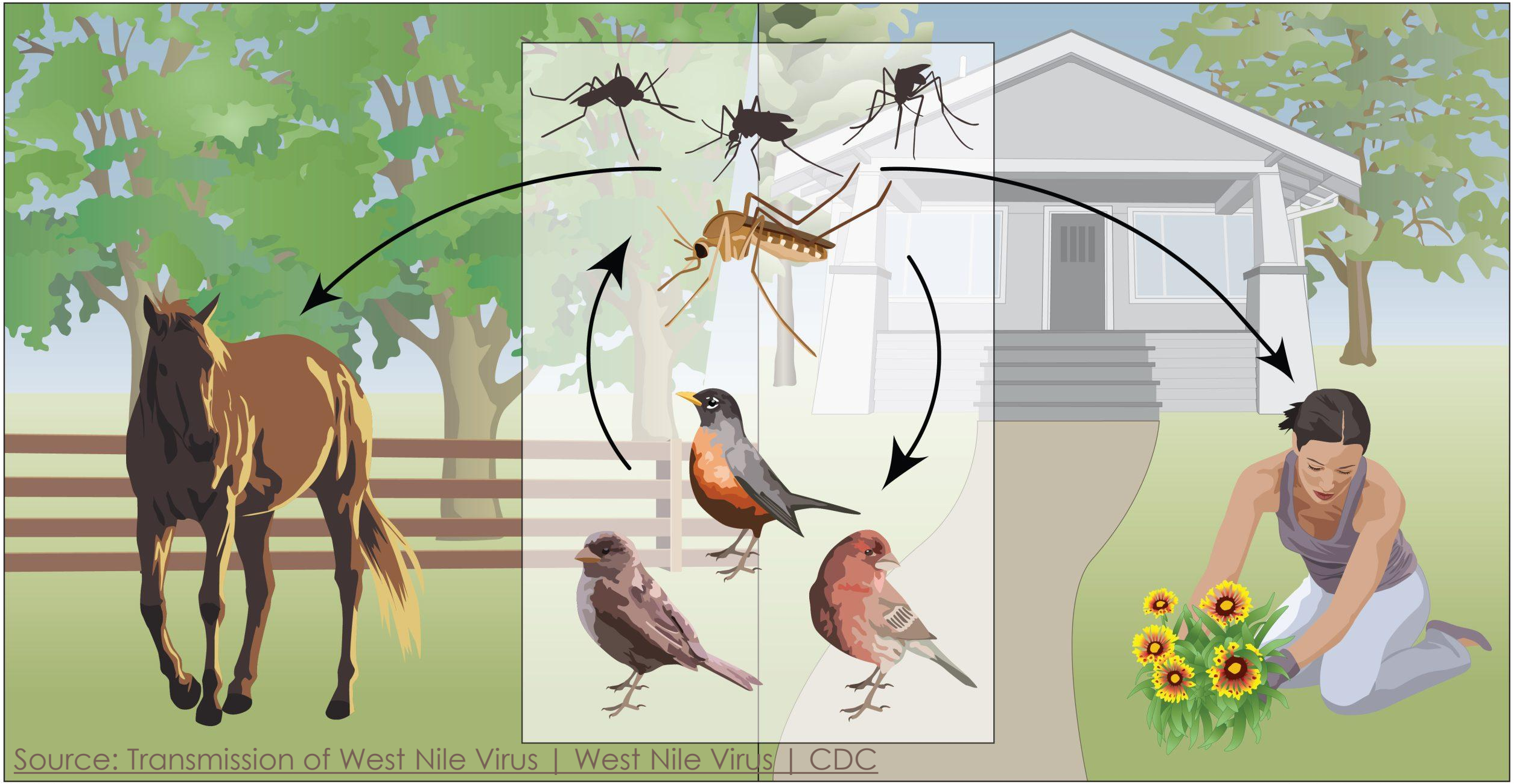
- Family *Togaviradae, genus Alphaviruses*
- Vectors: mosquitoes (*Culex, Culiseta, Aedes*)
- Vertebrate hosts: passerine birds, ground squirrel, blacktail jackrabbit, snakes, frogs
- Accidental hosts: humans, equids
- Symptoms in equids:
  - Fever, fatigue, somnolence, incoordination, teeth grinding, encephalomyelitis, inability to swallow
- Mortality: 20-30%
- Fresh water swamp ecosystems
- 17 major WEE epidemics in Canada
  - 12,000 and 52,000 horses in MB and SK in 1930s (28% fatality rate)
- Vaccine preventable

West Nile virus

- Family *Flaviviridae, genus Flavivirus*
- Vectors: mosquitoes (Culex sp primarily)
- Vertebrate hosts: birds, (ground squirrels, chipmunks, amphibians occasionally)
- Accidental hosts: humans, equids
- Symptoms in animals:
  - Equids: Fever, encephalomyelitis, ataxia, paresis, paralysis
  - Birds: fatal systemic disease in corvids (American crow highly susceptible). Depression, ataxia, paralysis, multi organ inflammation
- Mortality: up to 25%
- Vaccine preventable in equids



West Nile Virus Transmission Cycle



Source: Transmission of West Nile Virus | West Nile Virus | CDC

Location of WNV Detections in British Columbia

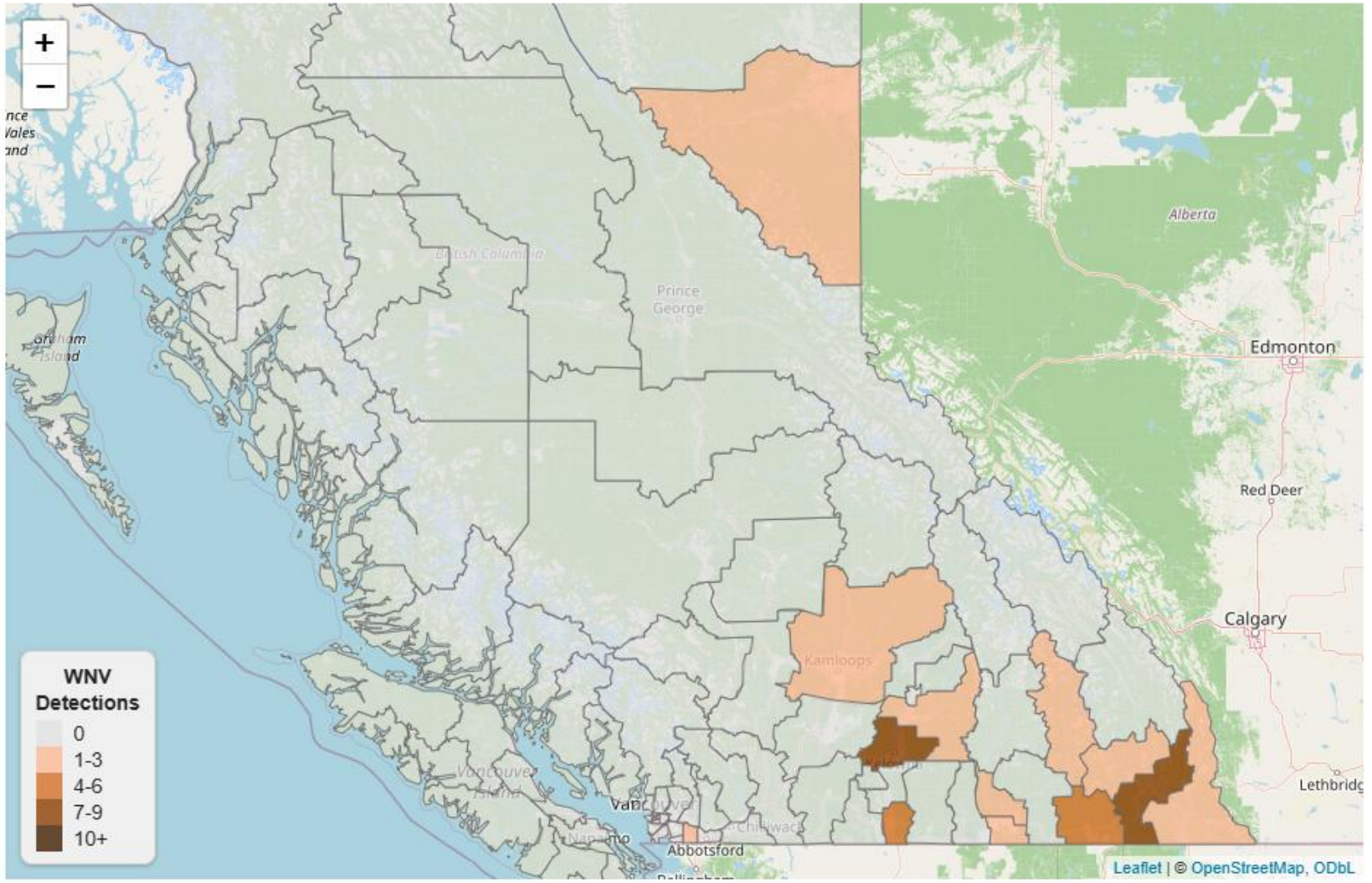
The following map shows human and horse cases of WNV with no history of travel and WNV detections in birds in British Columbia by Local Health Area. For human cases, the location shown reflects where the person lived at the time of their illness.

Select year(s):

2009 — 2026

Select Species:

Humans, Horses, Birds



Emerging issues – mosquitoes and mosquito-borne diseases

Climate change impacts

Increasing temperatures can:

Increase mosquito exposure

- Multiple generations per season
- Mosquito habitats shifting north
- Increased larval and mosquito survival

Increase pathogen transmission

- Increased vertical transmission from mosquitos to offspring (overwintering)
- Increased viral replication in mosquitos and transmissibility to humans

Altered habitats will also change risks

Invasive species and pathogens of human (animal) importance

Vectors:

- *Aedes japonicus*
- ***Aedes albopictus****

Pathogens:

- California serogroup viruses (Snowshoe Hare, Jamestown Canyon)
- West Nile virus
- Chikungunya*
- Dengue*
- St. Louis encephalitis*

* Not found in BC to date

Pilot mosquito surveillance

- First detection of *Aedes japonicus* in the Nanaimo region in 2024.
  - 9/10 traps caught at least 1 *Aedes japonicus*
- *Aedes japonicus*
  - First recorded 2015 in lower mainland
  - Currently unknown range in BC
  - Potential for range expansion
  - Aggressive biter
  - Pathogen transmission concern
    - Japanese encephalitis
    - West Nile virus
    - La Crosse virus
    - Cache Valley virus

Financial contribution from

Public Health Agency of Canada
Agence de la santé publique du Canada

Mosquito and mosquito-borne disease surveillance resources

BC Centre for Disease Control
Provincial Health Services Authority

West Nile Virus Surveillance

Table of contents

How to navigate this report

This report features information on detections of West Nile virus (WNV) in human and animal populations in British Columbia (BC). This page is updated as new human cases and animal detections are reported (last updated on **January 05, 2026**).

Key Messages

- The risk of acquiring WNV in BC is low.
- No WNV detections have been reported in 2026 to date.
- In 2025, three human cases (one locally acquired and two travel-related) and two locally-acquired horse cases of WNV were reported.
- There have been no reported detections of WNV in birds in BC since 2019.
- Most WNV detections have been reported in the southeastern region of the province. All locally-acquired human cases of WNV reported so far have been residents of the Okanagan Valley.

West Nile Virus

West Nile virus (WNV) spreads through the bite of an infected mosquito and can cause illness in both people and animals. Birds are most affected, especially crows, ravens, jays, and magpies, which often die once infected with the virus. WNV is monitored by testing horses, sick or dead birds, and people with symptoms of the virus. Blood and organ donations are also tested for WNV.

WNV detections this year:

0	0	0
Human cases	Positive horse	Positive birds

Public Health Agency of Canada

Canada

Canadian Animal Health Surveillance System

CAHSS
DIVISION OF ANIMAL HEALTH CANADA

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Search

Home > CAHSS Networks > Vector-Borne Diseases

CAHSS Vector-Borne Diseases Network

Mosquitoes, ticks, flies and fleas are more than annoying pests. These insects, amongst others, are vectors that can spread disease with a single bite. Working together with our partners and collaborators, CAHSS is looking closely at changing vector ranges and disease transmission risks across North America, developing an understanding on how climate change is affecting species ranges and survival, studying animal-vector interactions and sentinel patterns, and planning protection of unsuspecting animals from infection and outbreaks.

Summary

1. Reportable and notifiable diseases
2. Emerging vectors and pathogens
3. Climate change and vector-borne diseases

Thank You

Erin Fraser, Public Health Vet
BC Centre for Disease Control
Erin.fraser@bccdc.ca