

Zoonotic Diseases in Alberta



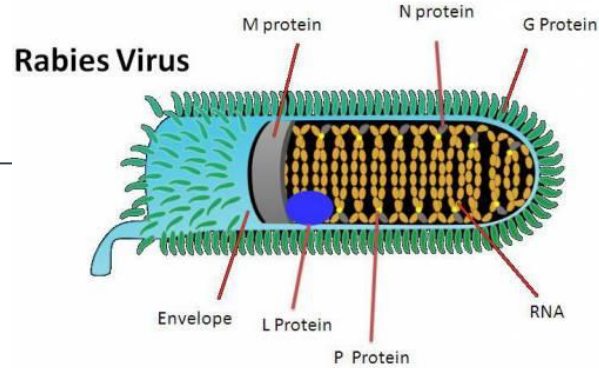
Animals and Human Health

Hussein Keshwani, DVM, MPH, DACVPM
Assistant Chief Provincial Veterinarian & Public Health Veterinarian
Government of Alberta

January 18, 2024

Rabies

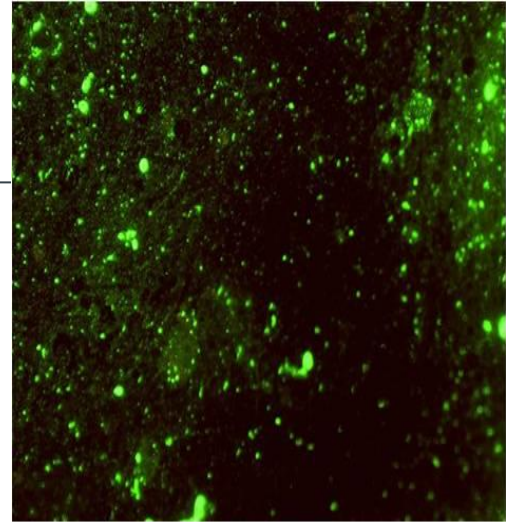
The Virus



- Family *Rhabdoviridae*
- Genus *Lyssavirus*
- Species *Rabies Lyssavirus*
- Subspecies – many species specific ‘variants’ (bat, skunk, fox, raccoon, dog etc.)
- Can infect all mammals
- Transmitted via saliva:
 - Primarily by the bite of a rabid animal
 - Also, through fresh, open cuts or scratches
 - Rarely via saliva contact on mucus membranes
 - Documented transmission through hunter skinning animal

Pathogenesis

- Virus inoculated into tissue from a bite (or other exposure)
 - Can replicate in local tissues (e.g., muscle)
 - Enters peripheral nerves after days to months
 - Retrograde flow in axons to the CNS
 - Dissemination within CNS → clinical signs of disease
-
- ❖ Immunoglobulins effective prior to virus entry into nerves
 - ❖ Distributed by cranial nerves → salivary glands → saliva
 - ❖ Risk from meat, blood, milk, urine, feces extremely low/negligible



Incubation Period – from bite to symptoms

- Highly variable – weeks to months
- 3-12 weeks most common for domestic species
- Influenced by
 - species
 - site of inoculation
 - viral load
 - virus variant
 - vaccination status*
- No transmission during the incubation period – a bite by the animal does not transmit rabies UNTIL the virus appears in the saliva
 - † May appear in saliva a few days prior to clinical signs

Clinical Signs



- Initial signs are subtle
 - Lethargy, fever, vomiting, anorexia
- **Furious rabies**
 - Animals may display extreme excitement and aggression
 - Animals may gnaw and bite their own limbs or body
 - Animals may attack objects or other animals for no apparent reason
- **Paralytic (dumb) rabies**
 - Animals may become depressed and retreat to isolated places
 - Signs of paralysis or paresis (partial paralysis) may be seen
- Progress to ataxia, weakness, paralysis, difficulty breathing, and/or seizures
- *Progressive, and duration of illness <10 days*

Current State of Rabies in Canada and the USA



Canadian Picture

- Five main reservoirs in Canada

- Bats (multiple variants)
- Arctic foxes
- Red foxes
- Raccoons
- Skunks



- Domestic animals in Canada are secondary hosts

- Continuing transmission cycles are uncommon
- Risk of transmission higher from carnivorous species due to dentition and behavior
- Risk of transmission from herbivores generally low

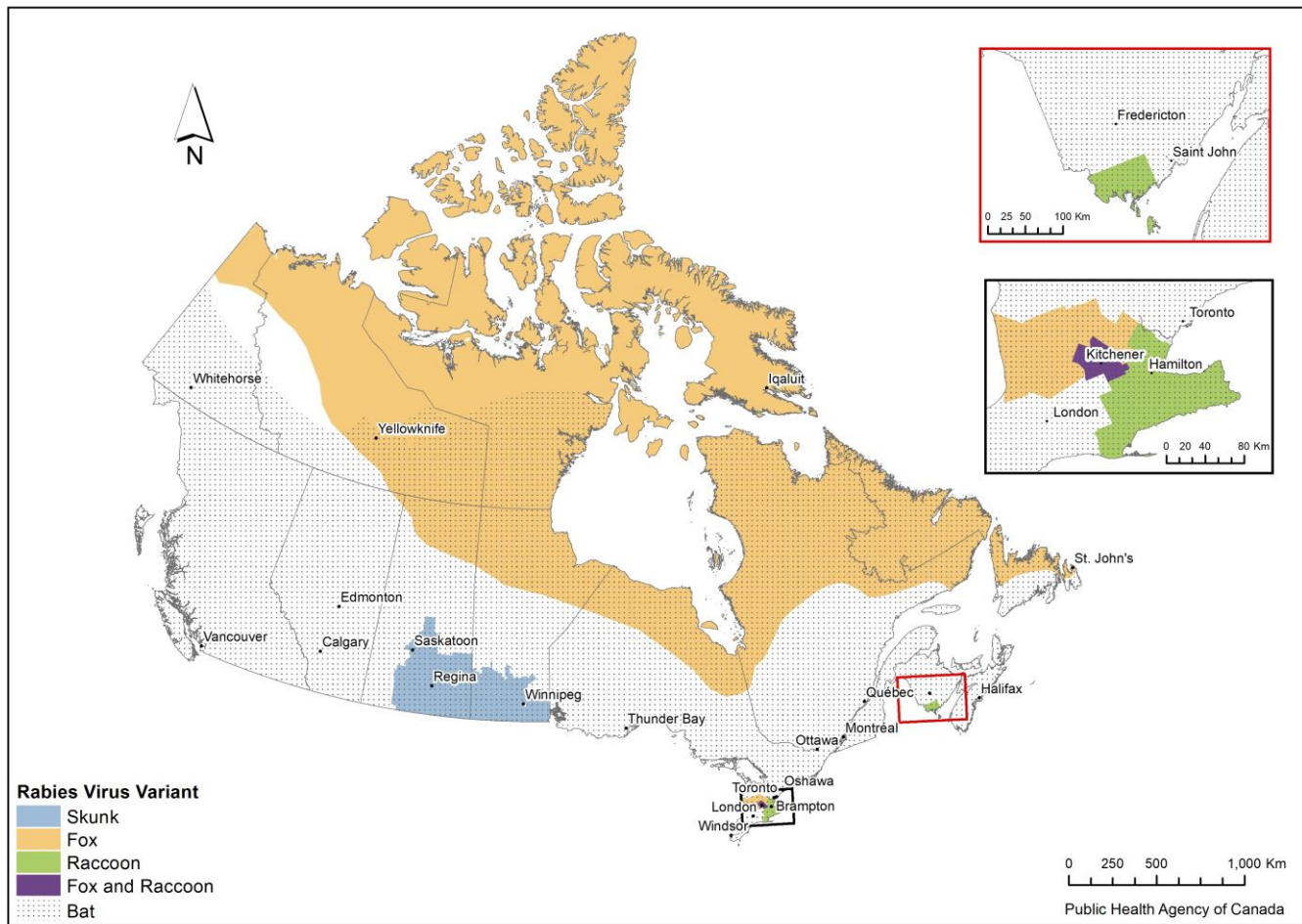
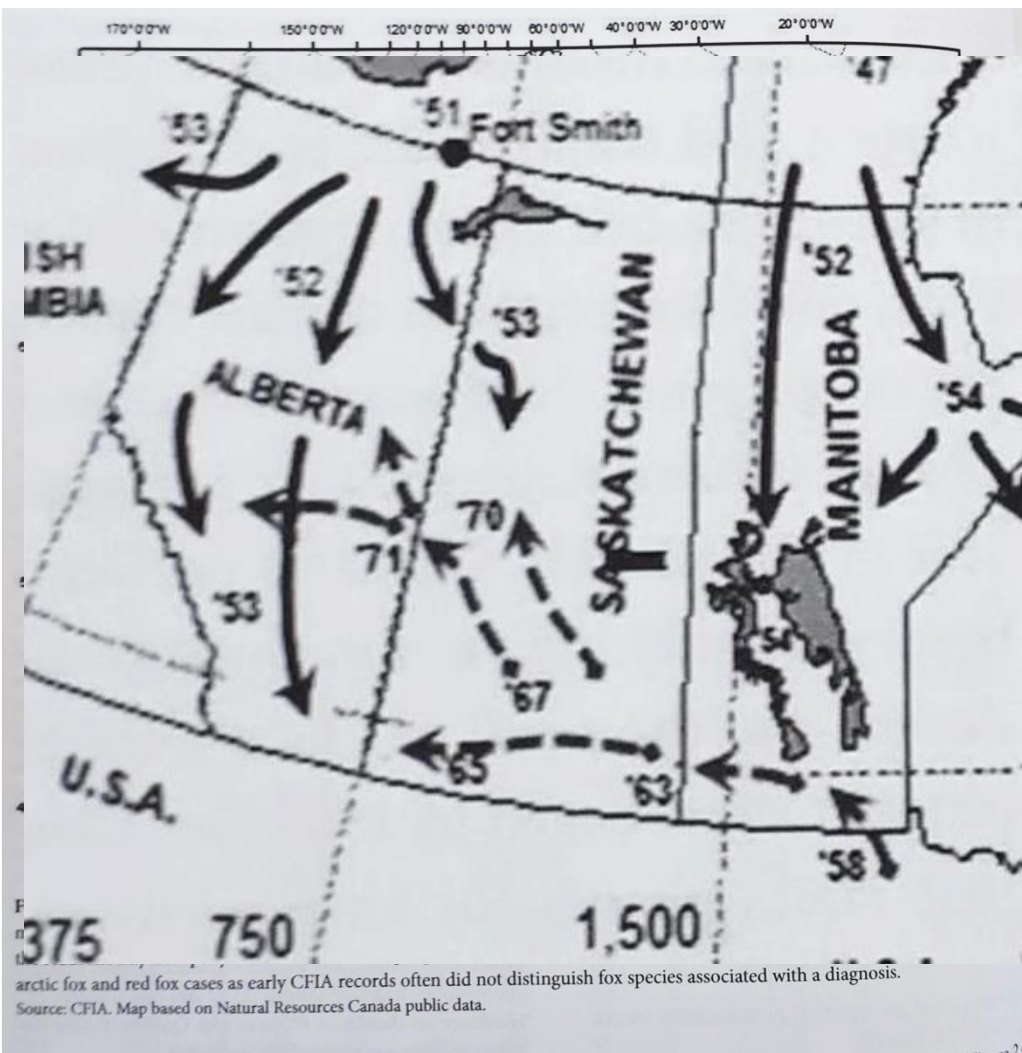


Figure 1. Distribution of Rabies Virus Variants (RVV) in Canada, 2016 - 2020.

RVV ranges mapped by census division except for bat RVV and fox RVV in Northern Canada where host geographic ranges are used.

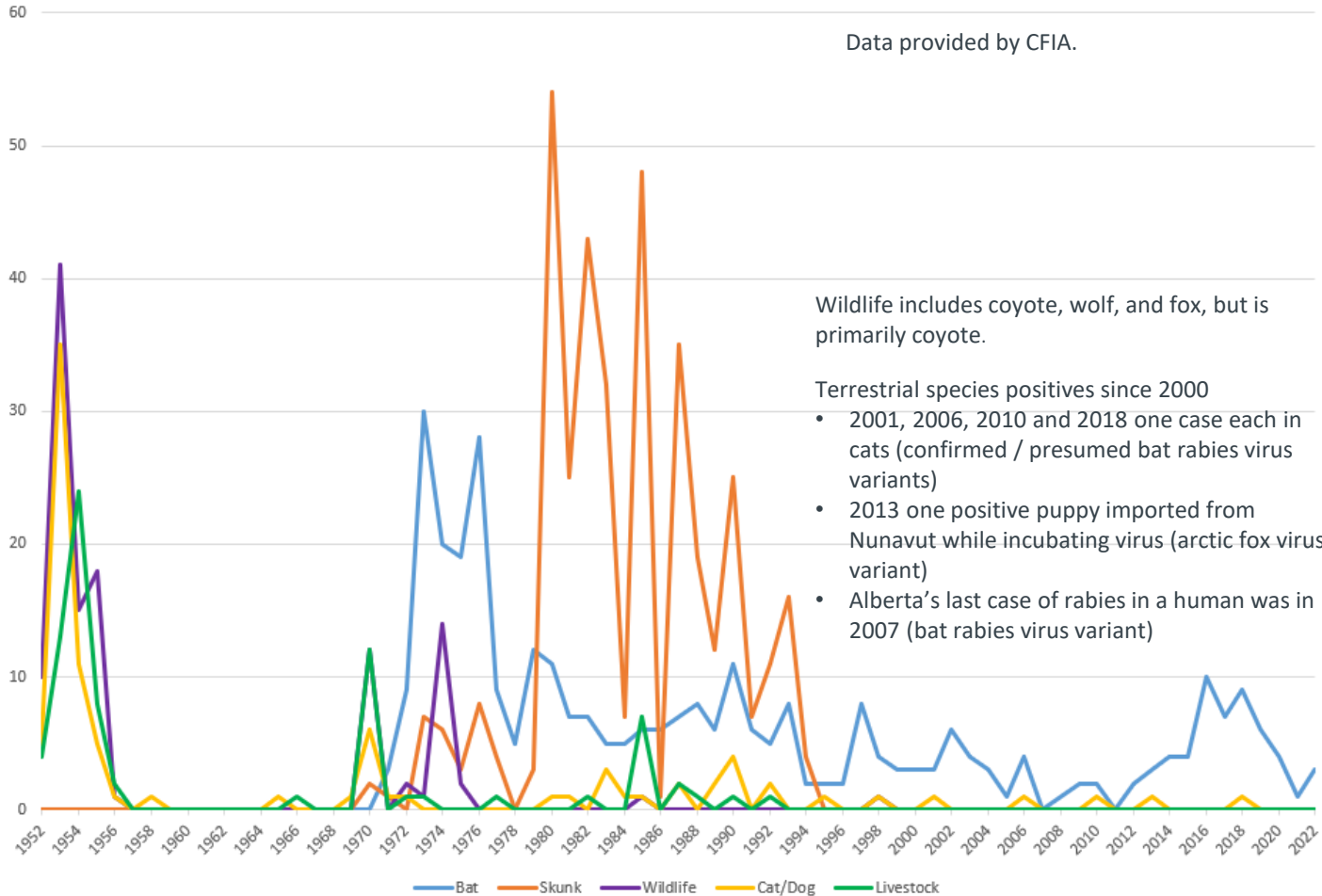


arctic fox and red fox cases as early CFIA records often did not distinguish fox species associated with a diagnosis.
 Source: CFIA. Map based on Natural Resources Canada public data.

Taking a Bite Out of Rabies: The Evolution of Rabies Management in Canada.
 Edited by David J. Gregory and Rowland R. Tinline.
 University of Toronto Press, 2020.

Annual Rabies Positives in Alberta 1952-2022

Data provided by CFIA.



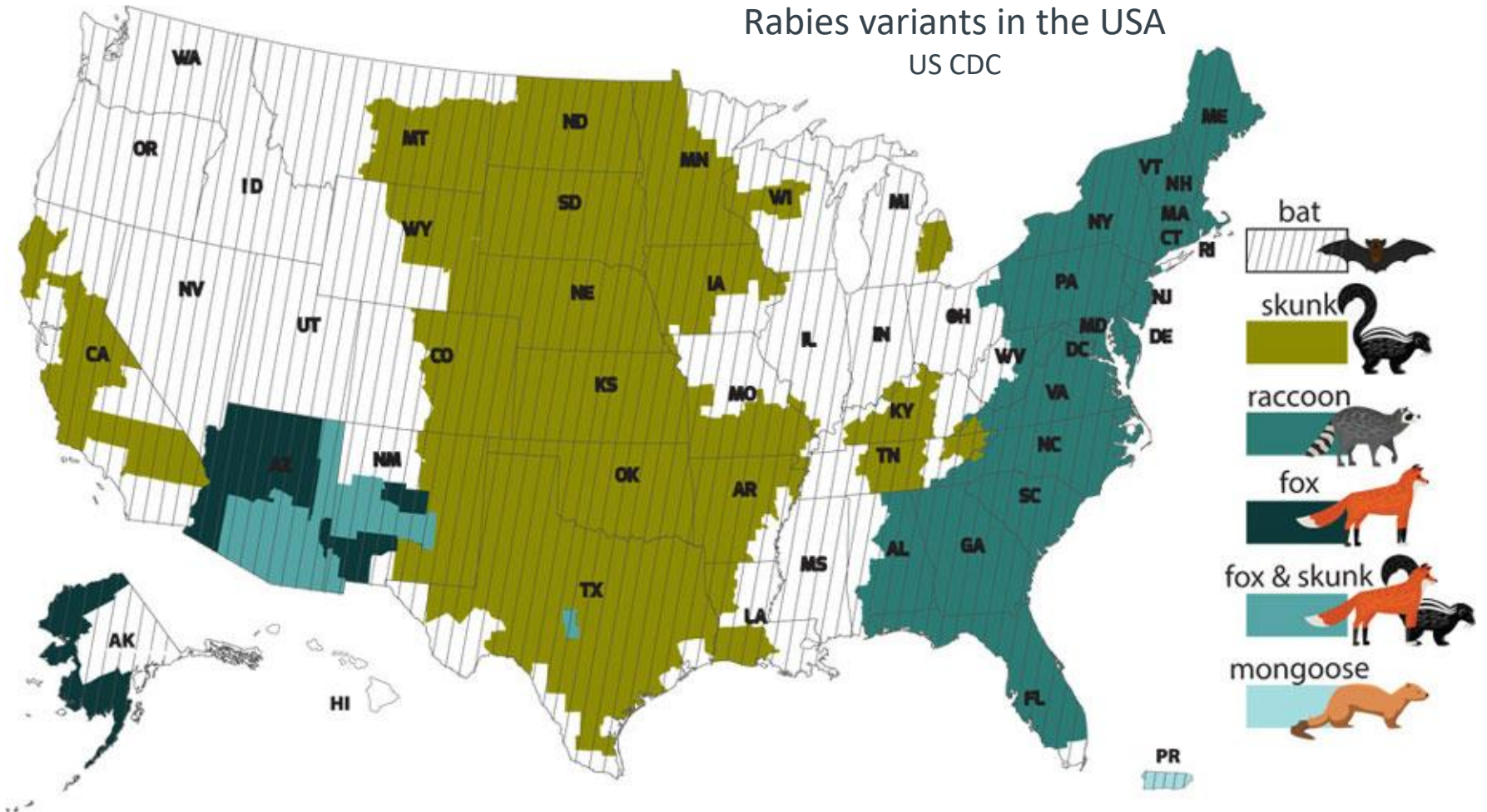
Wildlife includes coyote, wolf, and fox, but is primarily coyote.

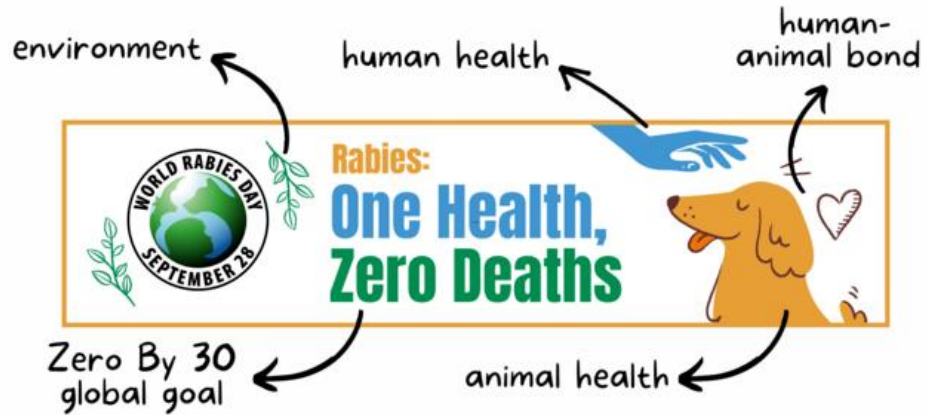
Terrestrial species positives since 2000

- 2001, 2006, 2010 and 2018 one case each in cats (confirmed / presumed bat rabies virus variants)
- 2013 one positive puppy imported from Nunavut while incubating virus (arctic fox virus variant)
- Alberta's last case of rabies in a human was in 2007 (bat rabies virus variant)

Rabies variants in the USA

US CDC







Rabies in an imported dog, Ontario, Canada, 2022

Paul Di Salvo^{1*}, Maureen Anderson², Christine Fehlner-Gardiner³, Francesca Di Mauro⁴, Howard Shapiro¹, Anna Miranda¹, Heather McClinchey⁵

Abstract

Importation of rabies-infected dogs results in significant and costly public and animal health risks. In January 2022, a dog in Ontario, Canada, which was imported from Iran in June 2021, developed rabies, leading to an extensive public health investigation and administration of rabies post-exposure prophylaxis to 37 individuals. The dog was infected with a rabies virus variant known to circulate in Iran. This is the second reported case of a rabies-infected dog imported into Canada in 2021 from a high-risk country for canine mediated rabies. This case emphasizes the need for public education regarding the risks associated with importing dogs from high-risk countries for canine-mediated rabies and the benefits of establishing a public health team specializing in rabies exposure investigations.

Suggested citation: Di Salvo P, Anderson MEC, Fehlner-Gardiner C, Di Mauro F, Shapiro H, Miranda A, McClinchey H. Rabies in an imported dog, Ontario, Canada, 2022. *Can Commun Dis Rep* 2023;49(1):1–4. <https://doi.org/10.14745/ccdr.v49i01a01>

Keywords: imported dog, rabies, canine-mediated, risk assessment, animal importation, zoonoses

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Affiliations

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³ Canadian Food Inspection Agency, Ottawa, ON

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⁵ Ontario Ministry of Health, Toronto, ON

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Potential Rabies Disease



Domestic and wild animals

Rabies in Domestic Animals

- Rabies is provincially reportable (*Animal Health Act*)
- Report suspected cases of rabies to the Alberta Rabies Program
 - Phone: 1-844-427-6847
(7 days a week, 8:15 am to 4:30 pm)
 - Email: AlbertaRabiesProgram@gov.ab.ca
(monitored intermittently Monday to Friday, excluding holidays)

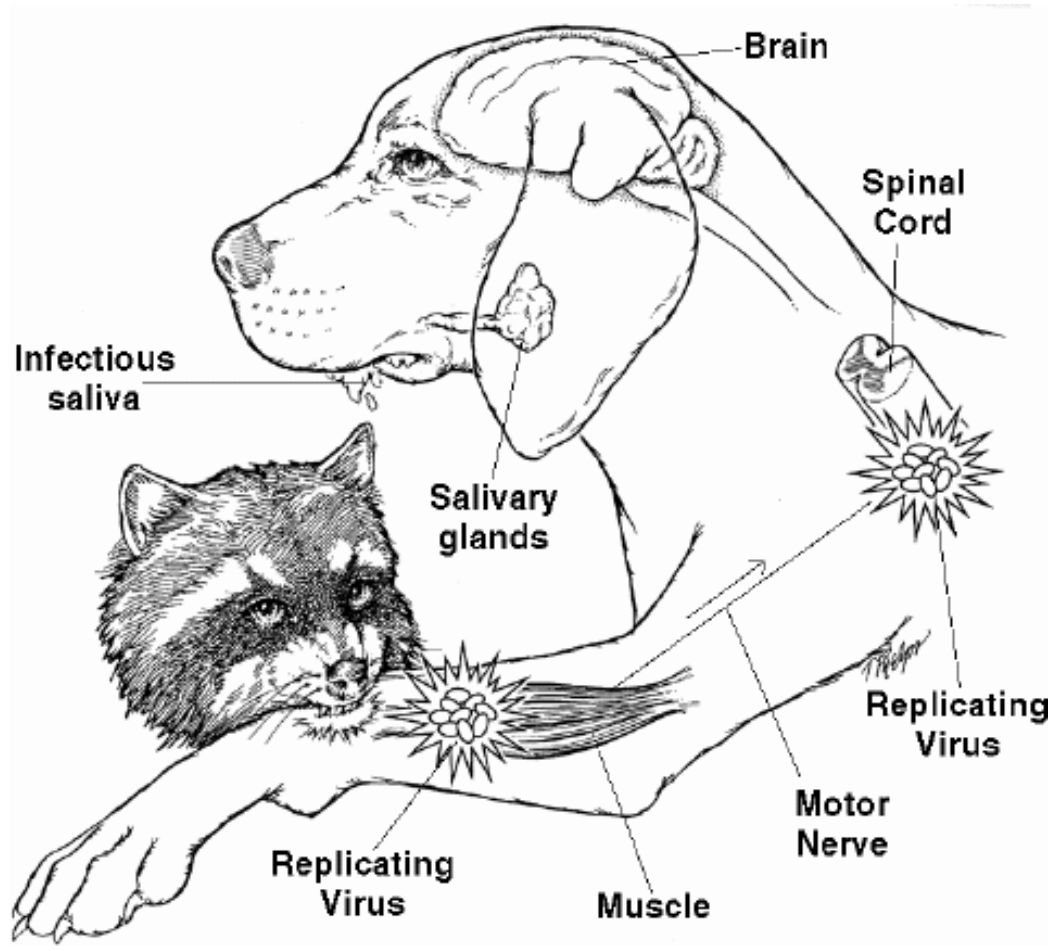
Rabies in Wild Animals

- Rabies is provincially notifiable (*Animal Health Act*)
- In live free-roaming animals, report to:
 - **National park** or any lands under federal jurisdiction, contact the RCMP or one of the following:
 - Banff and Waterton Lakes National Parks – contact the dispatch center at [403-762-1470](tel:403-762-1470)
 - Jasper, Elk Island and Wood Buffalo National Park – contact the dispatch center at [780-852-6155](tel:780-852-6155)
 - **Provincial park, recreation area or reserve** – contact [Parks Alberta](#)
 - **Unoccupied crown land** – contact [Fish and Wildlife](#)
 - **Urgent wildlife situations** (involving a large carnivore including a bear, wolf or cougar) – contact [Fish and Wildlife](#)
 - **Urban or rural municipality** – contact the municipality

Post-Exposure Management



Animal Exposure



Role of Alberta Rabies Program



- Consult on animal domestic exposures and take action when necessary (e.g., quarantine)
- Provide consults to PH with respect to human exposures
- Coordinates all animal testing submitted to CFIA
 - Program coordinated by public health vet
 - Run by Alberta Agriculture and Irrigation RVTs
- Alberta Rabies Program Line 1-844-427-6847
- AlbertaRabiesProgram@gov.ab.ca

Questions?





Avian Influenza

Avian Influenza

- Commonly present in waterfowl and shorebirds
 - Typically low path viruses, minimal disease in wildlife
 - H5 and H7 more likely to become high path in poultry
- Zoonotic cases are relatively rare and typically associated with contact with infected poultry
- H5N1 panzootic entered North America in late 2021
 - Currently circulating viruses are reassortments of Eurasian lineages and North American lineage viruses
 - High path virus causing disease in wild birds and broader species range of species than is typical



Avian Influenza H5N1 clade 2.3.4.4b

- Transmission to non-human mammals
 - Many species (skunk, fox, mink, bear, seal, dog, cat)
 - Primarily via scavenging
 - Limited instances of likely mammal-to-mammal transmission
- Zoonotic risk appears to be low
 - 11 human cases detected globally (asymptomatic → death)
 - 1 detection in a human in North America (US, 2022)
 - Risk is increased with direct contact with infected animals (esp. infected domestic poultry flocks)

Avian Influenza – Reporting

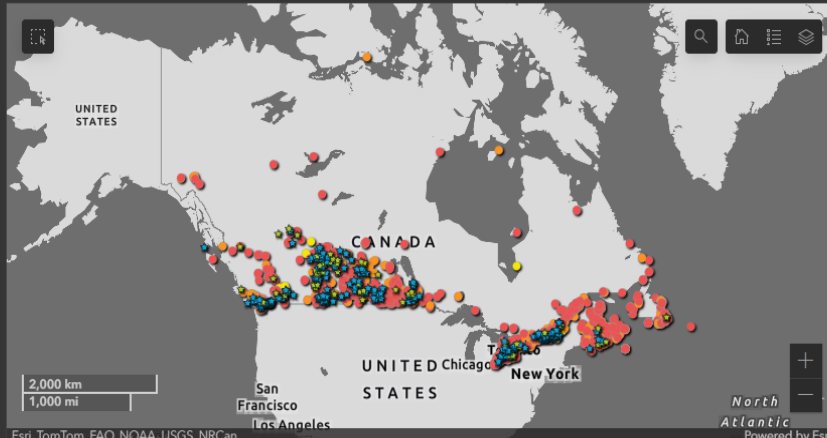
- Sick or dead wildlife
 - Alberta Environment and Protected Areas: 310-0000
 - Canadian Wildlife Health Cooperative (UCVM Calgary)
- Potential cases in domestic poultry
 - Office of the Chief Provincial Veterinarian (780-427-3448)
 - Canadian Food Inspection Agency (403-338-5225)
 - Private veterinarian

1 of 2695

Most Recent Positive

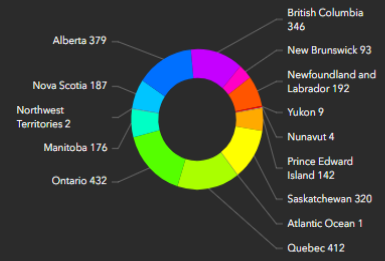
Bird Group	Raptor
Collection_Date	12/13/2023
Common_Name	Red-Tailed Hawk
Province	Ontario
Result	Pending
Result Authorised Date	12/20/2023
Scientific_Name	Buteo jamaicensis

Last update: 6 seconds ago



Collecti...	Result_A...	Commo...	Province	Status	Strain	Result	Lineage	Cluster
12/13/2...	12/20/2...	Red-Tail...	Ontario	Dead		Pending		
12/10/2...	12/20/2...	Tundra S...	Ontario	Dead		Pending		
12/7/2023	12/19/2...	Canada ...	Ontario	Dead		Pending		
12/5/2023	12/19/2...	Canada ...	Ontario	Dead		Pending		
12/4/2023	12/19/2...	Canada ...	Ontario	Dead		Pending		
12/3/2023	12/14/2...	Snow G...	Ontario	Dead		Pending		

Positives by Province



Last update: 6 seconds ago

Total Number of Positive Samples - Suspect and Confirmed

2,695

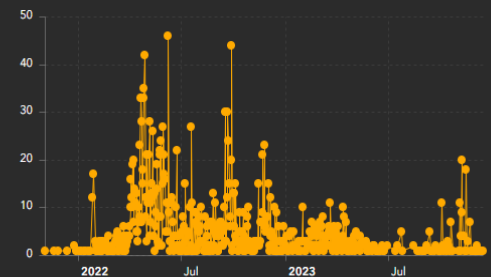


Highly pathogenic avian influenza (HPAI):

- Pending: Confirmatory testing pending
- Suspect: Sample positive for avian influenza but unconfirmed as high pathogenicity
- Confirmed: Sample confirmed with high pathogenicity avian influenza by CFIA

Last update: 6 seconds ago

Number of Positives Over Time



Last update: 6 seconds ago

Environment and Climate Change Canada



Canadian Food Inspection Agency



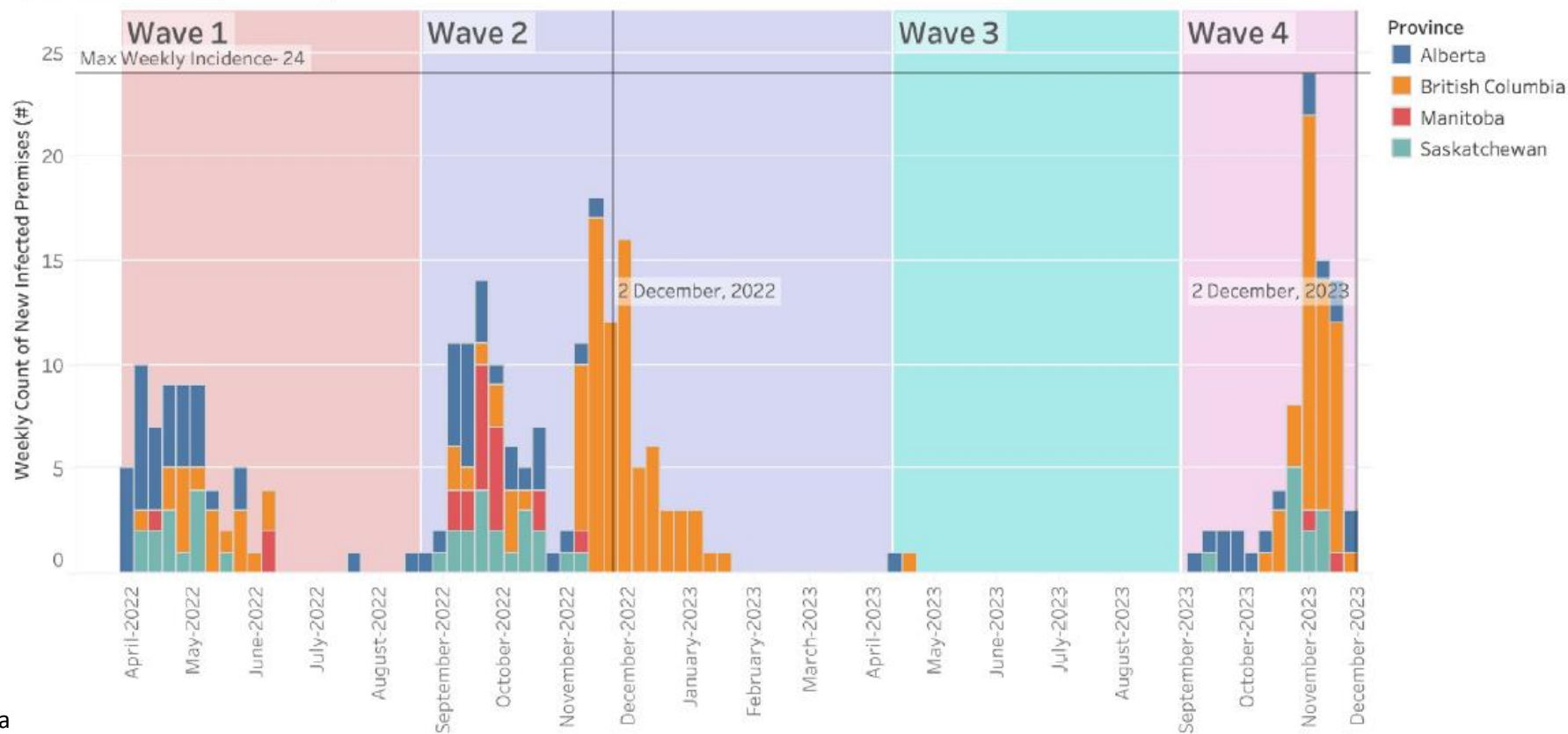
H5N1 West 2022/2023 Epi Curve by Province

Operational Period Update: November 26th-December 2nd, 2023

Data source: <https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/reportable/avian-influenza/hpai-in-canada/status-of-ongoing-avian-influenza-response/eng/1640207916497/1640207916934>

Date type: Date of CFIA detection

Updated: December 5, 2023 2:15pm



Avian Influenza – prevention/food safety

- Avoid handling sick or found dead birds and other wildlife, if possible
- When handling/cleaning wild birds/eggs – hand hygiene, ventilation, don't feed offal to pets, thorough cooking, avoid cross contamination
- [Wildlife and avian influenza – Handling guidelines to protect your health \(PHAC\)](#)
- [Avian influenza in Canada \(Polar Knowledge Canada\)](#)

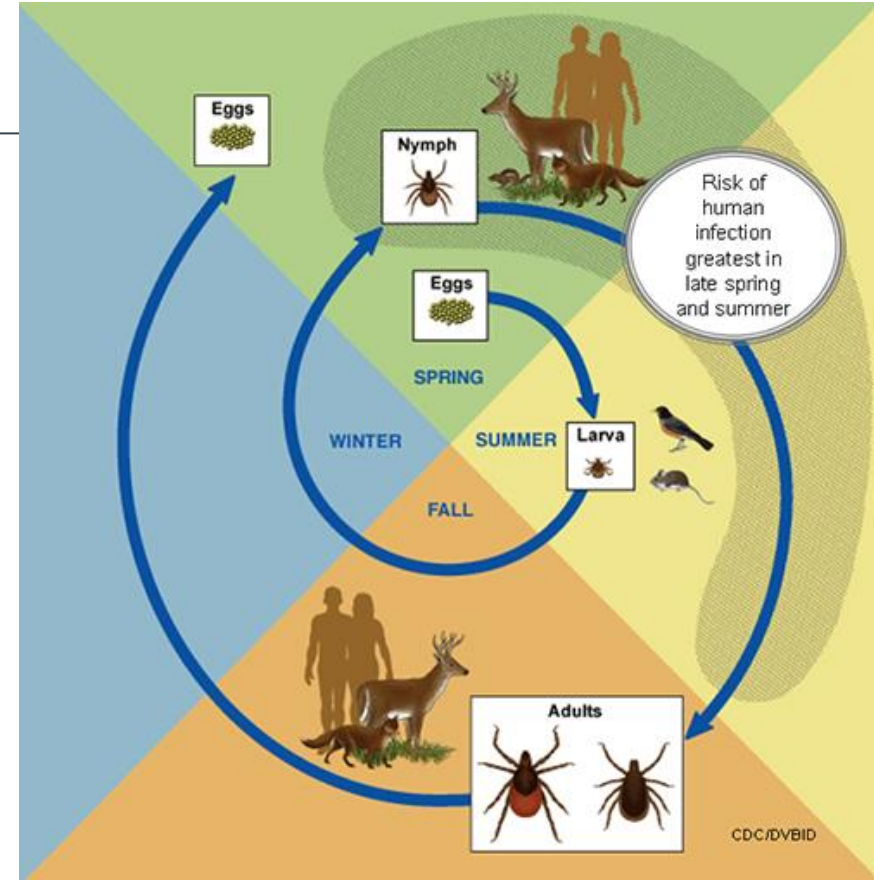
A scanning electron micrograph (SEM) of a tick, showing its body and legs in detail. The tick is colored in shades of green and blue, with a textured, segmented appearance. The central body is prominent, and the legs are spread out. The background is dark, making the tick stand out.

Lyme Disease and Tick Surveillance

*Some slides modified from Dr. Kinga T. Kowalewska-Grochowska, MD, FRCP(C)

Lyme disease lifecycle

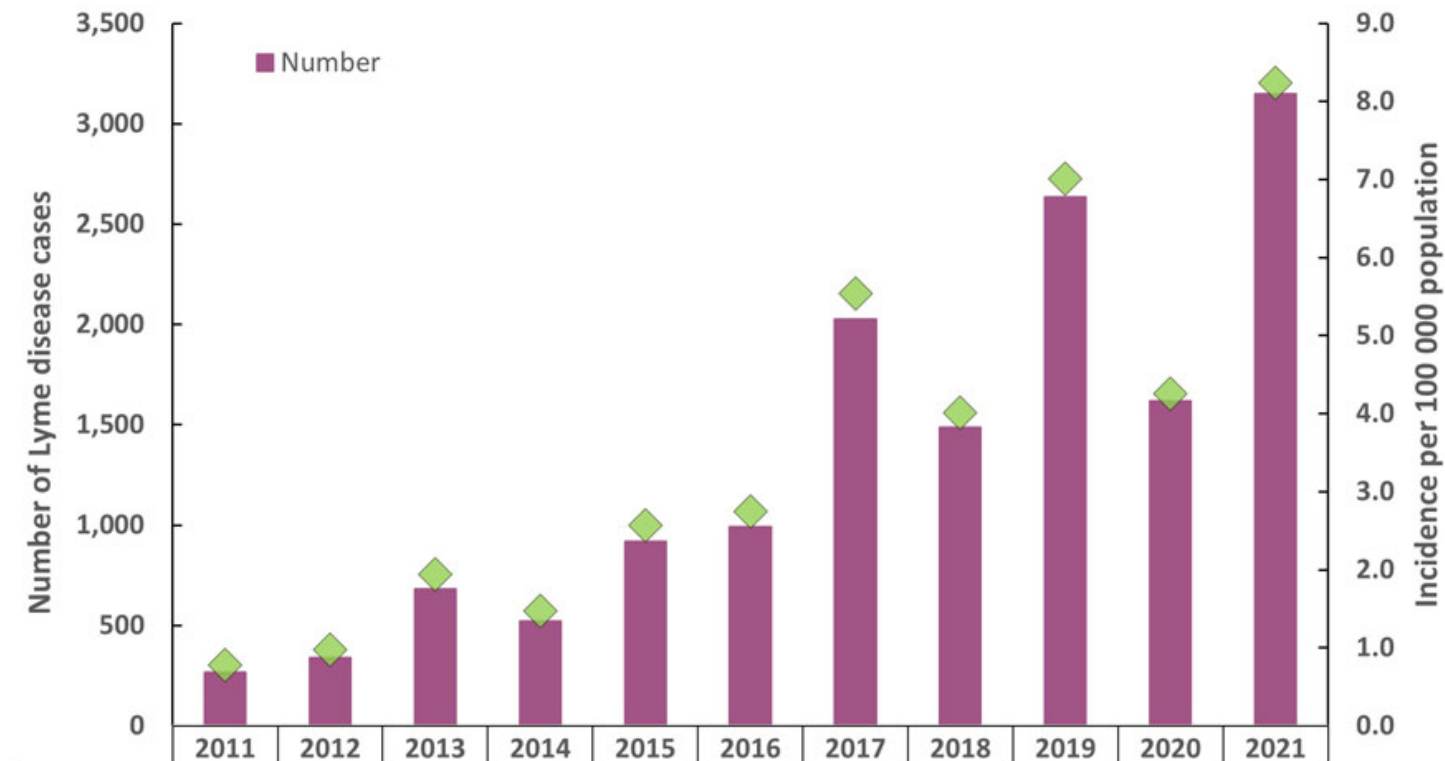
- Ixodes ticks ~2 year, 3 host lifecycle
- Trans-stadial transmission
 - *Not* transovarial
- Reservoir species
 - White-footed mouse, eastern chipmunks, shrews
 - Deer mice (BC)



Lyme disease risk areas, 2022



Figure 1. The number and incidence per 100 000 population of all reported Lyme disease cases in Canada per year from 2011 to 2021

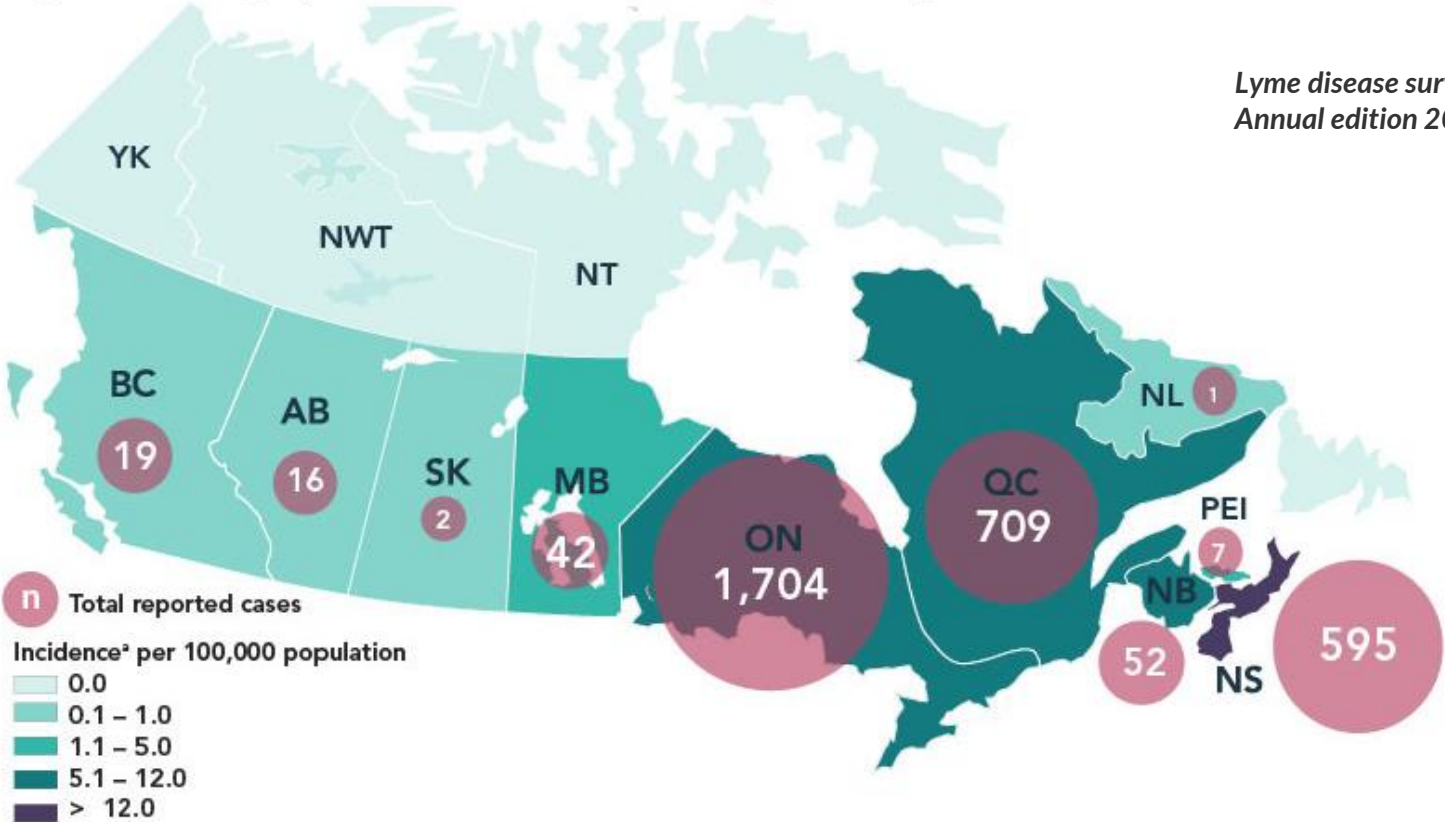


■ Number	266	338	682	522	917	992	2,025	1,487	2,634	1,617	3,147
◆ Incidence	0.8	1.0	1.9	1.5	2.6	2.7	5.5	4.0	7.0	4.3	8.2

*Lyme disease surveillance in Canada:
Annual edition 2021*

Figure 3. Geographic distribution of all reported Lyme disease cases, 2021

*Lyme disease surveillance in Canada:
Annual edition 2021*



*Cases reported by AB, SK, and PE were travel-related only

Canada's surveillance of ticks and Lyme disease

- Canadian surveillance through partnerships
- Tick/Lyme surveillance includes
 - Case reporting (human) by provincial and territorial public health organizations
 - Surveillance to identify areas of greatest risk by:
 - **Passive tick surveillance:**
 - voluntary submissions of ticks from people, pets and environment
 - **Active tick surveillance:**
 - field studies to collect ticks from the environment
 - live animal trapping (rarely)





The Growth of a
feeding Tick



Unfed

jeyrock.com

- eTick program, an initiative funded by the Public Health Agency of Canada and run through Bishop's University in Quebec
- Ticks from all sources (people, pets, environment) can be identified through eTick
 - Submit digital photo
 - Species identification ~24h
 - Ixodes ticks submitted to APL (w/ eTick ID and testing request form) for Borellia PCR

Tick surveillance logistics



Provincial Laboratory for Public Health (ProvLab)

**ALBERTA PRECISION
LABORATORIES**

Leaders in Laboratory Medicine

Tick Surveillance Collection Guide
Item Label: OP 0447 Original ID: 60453

Version: 1.1

Organization Entity: Parasitology
Effective Date: 7/14/2021

Tick Surveillance Collection Guide

Specific instructions for submitters

If you are asked to send the actual tick to the laboratory for further testing, this can be done by mailing it in or dropping off at specified locations. Please follow the instructions below:

Handling Instructions:

- Place the tick in a small hard plastic container with a tight fitting lid such as clean empty pill bottle. DO NOT USE GLASS CONTAINERS OR STRAWS
- Label the container with the **e-Tick identification number** provided to you in your e-Tick notification.
- Place the container in a clean plastic bag and close securely
- Complete the Tick Testing Request form (click here <https://www.albertahealthservices.ca/frm-21813.pdf> for downloadable document)
- Package sealed plastic bag and completed APL Tick Testing Request form in an envelope or box suitable for mailing.
- Mail to:
Specimen Receiving
Public Health Lab (ProvLab) North
University of Alberta Hospital
WMC 2B4.04, 8440-112 Street
Edmonton, AB T6G 2J2

Drop off in person:

- Follow the same instruction outlined for mailing in the tick (steps 1 – 4) for tick submission Drop off plastic bag with labelled container and the completed Tick Testing Request form to any of the following locations (click on the link below)
<https://informalberta.ca/public/service/serviceProfileStyled.do?serviceQueryId=4245>

*****PLEASE NOTE ACUTE CARE/HOSPITAL LABS DO NOT ACCEPT TICK SUBMISSIONS****

Important to Note:

- Please note that a completed Tick Testing Request form **MUST** accompany ticks that are mailed-in or dropped off, and each tick container **MUST** be labelled with the **e-tick identification number**, otherwise the lab will not be able to provide results.
- If you haven't submitted your tick for photo identification through e-tick platform, you need to do this **before** forwarding the specimen to Prov Lab. Click here [eTick](#) for instructions and more information
- The tick species will be confirmed at the laboratory and may be tested for the bacteria that causes Lyme disease.
- Your results will be mailed to you within 2 weeks. For more information on Ticks and Lyme disease, click here [Lyme disease and tick surveillance | Alberta.ca](#)



Leaders in Laboratory Medicine

Scanning Label or Accession # (lab only)

Tick Testing Request (for tick surveillance purposes only)

- Place the tick in a small hard plastic container with a tight fitting lid, such as a clean empty pill bottle.
Do not use glass containers or straws.
- Label the container with the **e-Tick identification number** provided in your e-Tick notification. The completed Tick Testing Request **must accompany** the labelled container.
- Submit your tick for photo identification through e-tick platform **before forwarding specimen to ProvLab**. For instructions and more information, visit: [eTick](#)
- Place labelled container in a sealed plastic bag, close securely, and send with completed Tick Testing Request to:

By Mail

Specimen Receiving
Public Health Lab (ProvLab) North
University of Alberta Hospital
WMC 2B4.04, 8440-112 Street
Edmonton, AB T6G 2J2

OR

Drop off in person to any of the following
[Drop-Off Locations](#)

Please note acute care/hospital labs DO NOT accept tick submissions.

- The tick species will be confirmed at the laboratory and may be tested for the bacteria that causes Lyme disease. Results will be mailed to you within 2 weeks.

Requester Information

- Veterinary Office
Provide Veterinary Submitter ID (if available)
(Address below must match Submitter ID Address)
- Public Individual
(Complete your information in the address section below)
Alberta Tick Surveillance Program
Public Submitter ID 14525

Name			
Address		City	
Province	Postal Code	Phone	Fax

Authorizing Provider (for APL Use Only)

Kinga Kowalewska-Grochowska
University of Alberta Hospital
Walter C. Mackenzie Health Sciences Centre
8440 - 112 St NW
Edmonton, AB T6G 2B7

Connect Care Provider ID
151612

Collection Information

Date Tick Collected/Found (dd-Mon-yyyy)	Time Collected (24 hr)	E-tick ID Number
---	------------------------	------------------

Tick collected from (choose one)

- Pet
Type of Pet Dog Cat Other (specify) _____
Pet Name _____
- Environment
Specify (e.g. grass, wood post, etc.) _____
- Human (self submission only - not for veterinary or clinical diagnostic use)

21813(Rev2022-08)

Websites: [Tick Surveillance Collection Guide \(albertahealthservices.ca\)](#)

[Tick Testing Request, 21813 \(albertahealthservices.ca\)](#)

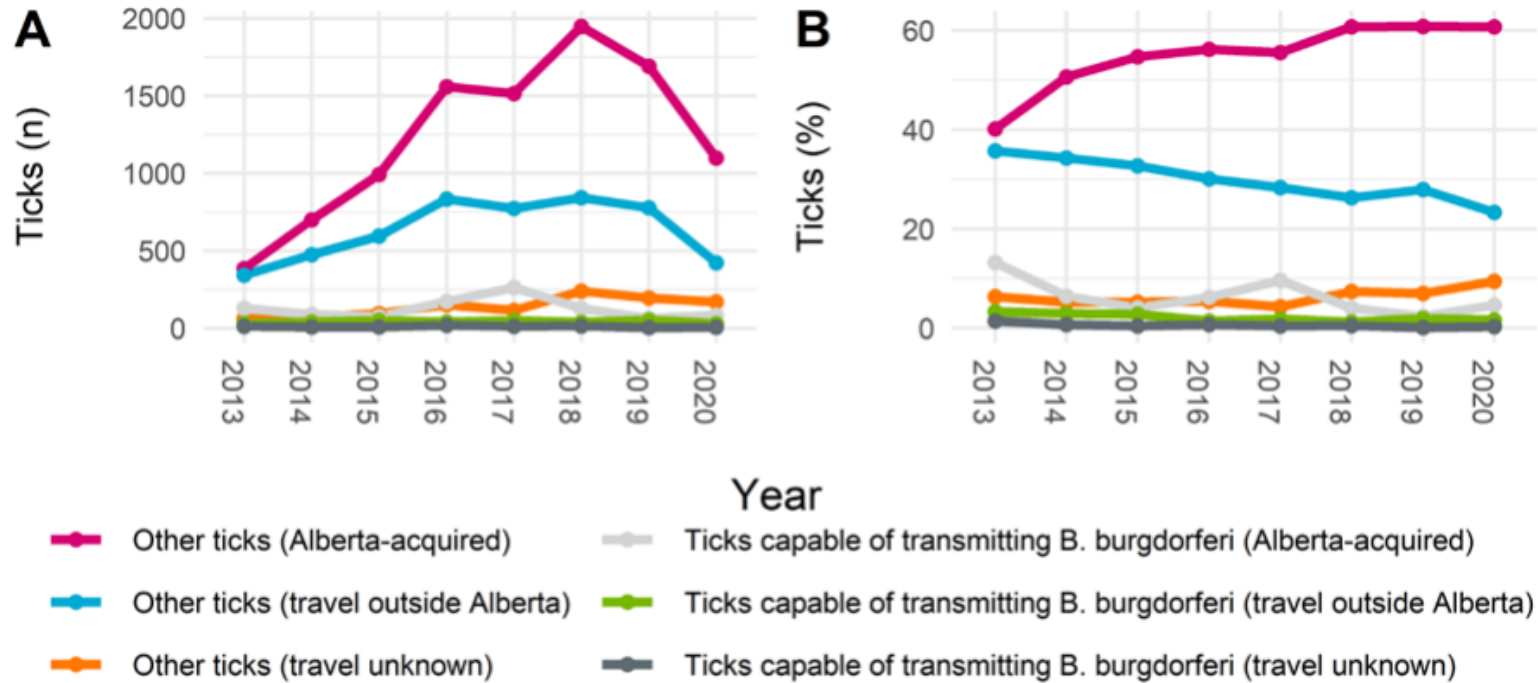
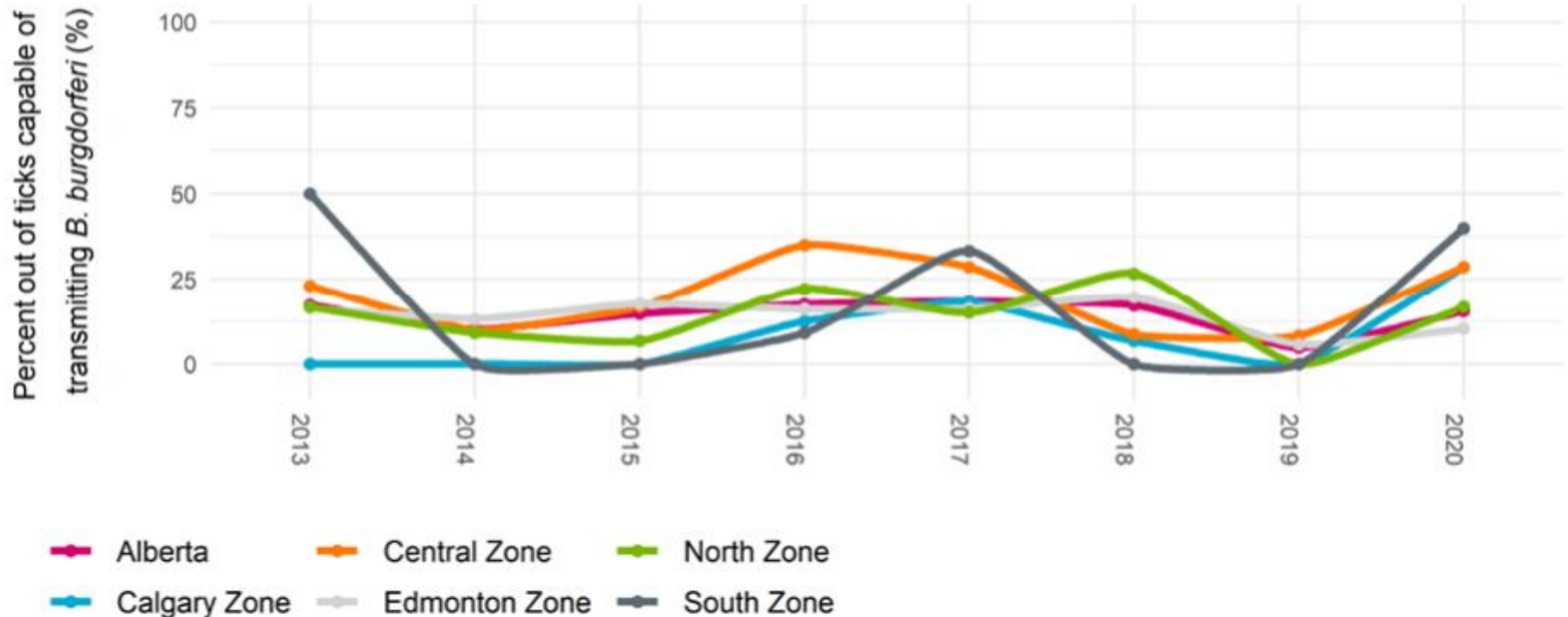


Figure 4. A) Number and B) percent of ticks submitted to the Alberta Passive Tick Surveillance Program by tick category and probable location of acquisition, 2013-2020

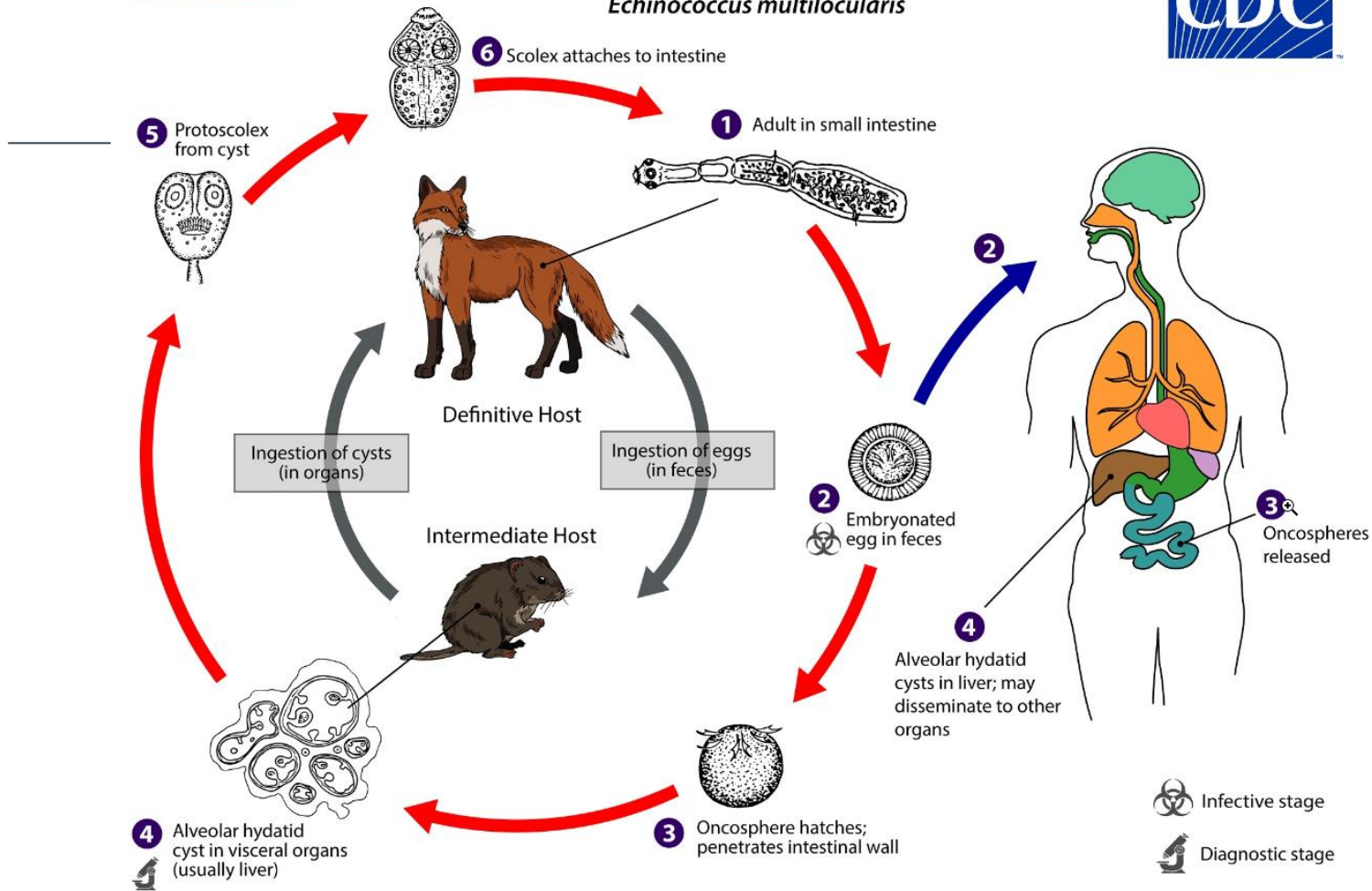
Alberta-acquired ticks capable of transmitting *Borrelia burgdorferi*

B. *B. burgdorferi*-positivity rates among ticks capable of transmitting *B. burgdorferi*



A scenic landscape featuring a bison grazing in the foreground on a grassy hillside. In the middle ground, there is a calm blue lake. The background is dominated by a range of rugged, rocky mountains under a clear blue sky with some light clouds. The text "Select other topics" is overlaid in the center of the image.

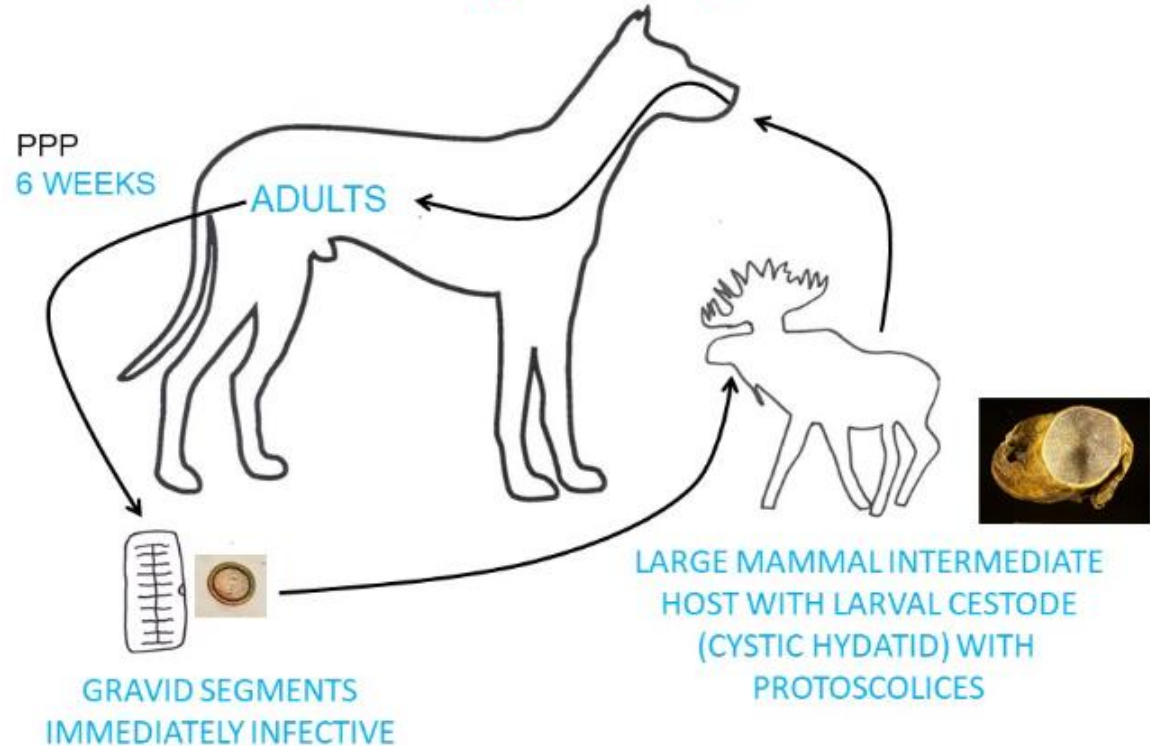
Select other topics



Echinococcus

LIFE CYCLE

Echinococcus canadensis (granulosus)



Echinococcus prevention

- Preventing intestinal infection in dogs
 - Don't feed raw offal
 - Prevent consumption of infected animals (e.g., rodents)
 - Test and/or treat dogs for tape worms
- Prevent human exposure
 - Hand hygiene
 - Washing foods during preparation

Brucellosis and Bovine Tuberculosis

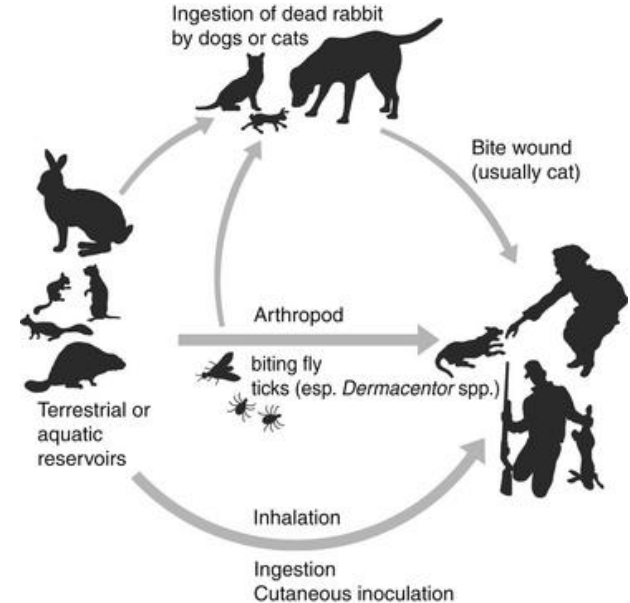
- Domestic livestock herd considered 'free'
- Stamping out when detected
 - TB detected in cattle BC 2018 & 2011, AB 2016, SK 2023
- *B. abortus* and TB in free-ranging bison in/around WBNP
- *B. suis* biovar 4 in free-ranging caribou/reindeer in the territories
- *B. canis* detected periodically in dogs

Anthrax

- Persistent in soil in specific areas
 - Wood Buffalo National Park
 - Mackenzie County (High Level → WBNP)
 - RM of Wood Buffalo, north of Fort McMurray
- Reportable to CFIA, notifiable to CPV
- Chief Provincial Veterinarian supports rapid ‘field testing’
- Response managed by producer/private vets
 - carcass disposal
 - vaccination

Tularemia

- Present in Alberta wildlife: aquatic vs non-aquatic
 - Beavers, muskrat, (rabbits), hares, wild rodents
 - Arthropods: ticks, biting flies
- Primary routes of transmission:
 - Bites or scratches from infected wildlife
 - Contact with meat, water, feces, urine or body parts of infected animals
 - Breathing in dust from pelts and paws
- Human and domestic animal cases uncommon (1-2/yr in Alberta public)



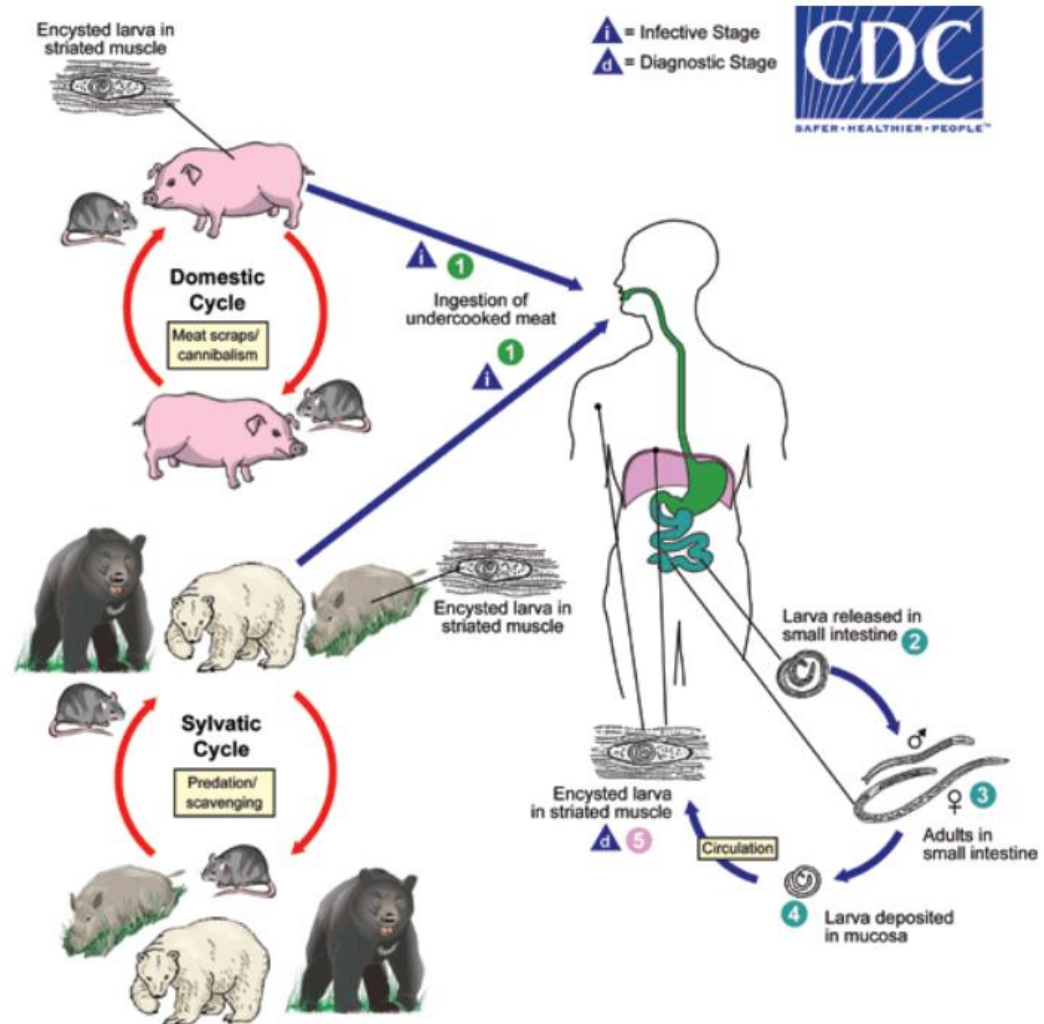
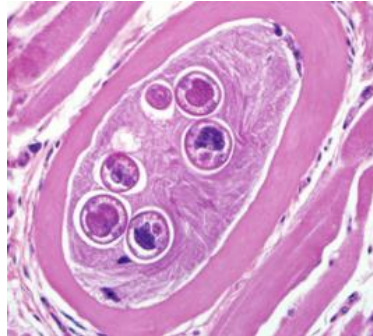
veteriankey.com/tularemia/

Hantavirus – Sin Nombre virus

- Deer mice – shed in feces, urine, saliva
- Hantavirus pulmonary syndrome (as opposed to haemorrhagic fever and renal syndrome)
- Prevention:
 - prevent rodent infestations (e.g., wood piles, feed rooms)
 - proper cleaning and disinfection areas contaminated by rodent droppings

Trichinella

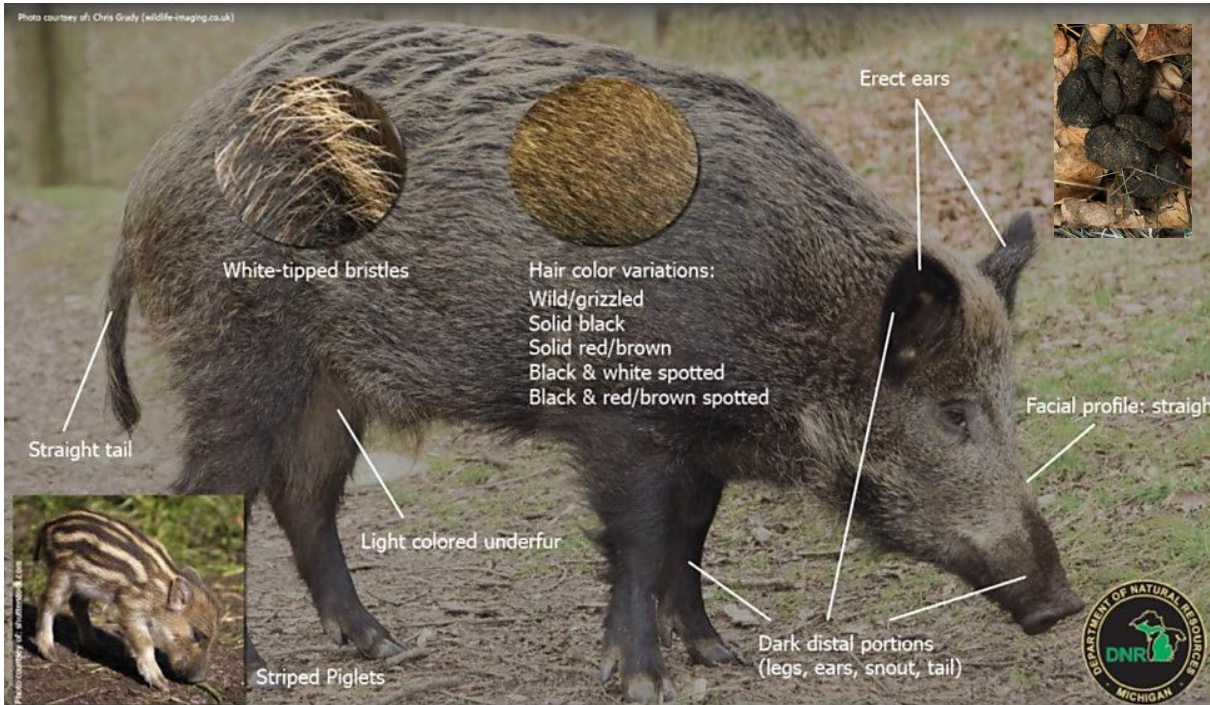
- raw or undercooked meat
 - bear
 - cougar
 - wild boar



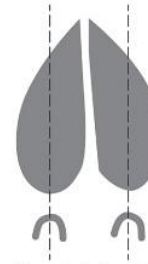
Wild boar – a One Health Issue

Slides courtesy of Hannah McKenzie,
wild boar program specialist, Alberta
Agriculture and Forestry

How to recognize wild boar and their sign

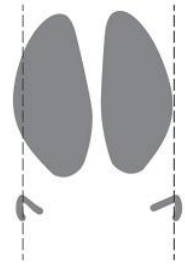


Deer tracks are more heart shaped. When dew claws are visible, they are usually in line with the hoof print.



Source: Alberta Agriculture | WP GRAPHIC

Wild pig tracks are rounder. When dew claws are visible, they usually appear off to the side of the hoof print.



Wild boar are **widespread** in parts of Alberta.



Wild boar at large are one of the most damaging invasive species in North America

1. Their rooting and wallowing damages habitat, destroys crops and degrades water.



2. They compete with and eat our native wildlife.



3. They can carry over diseases, parasites, and transmit foodborne illnesses that affect people and animals.

Protect Alberta. Report Wild Boar.

Hunting is **not** an effective control option.
To stop wild boar, please **report** instead!

To report wild boar sign or sightings, or to get more information:

- Email wildboar@gov.ab.ca
- Call 310-FARM
- Visit alberta.ca/wild-boar-in-alberta or abinvasives.ca/squeal-on-pigs



We **follow up on all reports** and are **always happy** to talk to anyone about wild boar.

A close-up photograph of a raccoon lying on a weathered log. The raccoon's face is the central focus, showing its characteristic black and grey fur, a white mask around its eyes, and its black nose. The background is a soft-focus green, suggesting a natural outdoor setting.

Questions?

Hussein Keshwani, DVM, MPH, DACVPM
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Alberta