Bats and human health

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Bat Matters 2020

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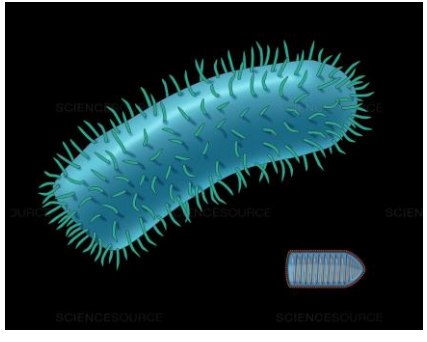
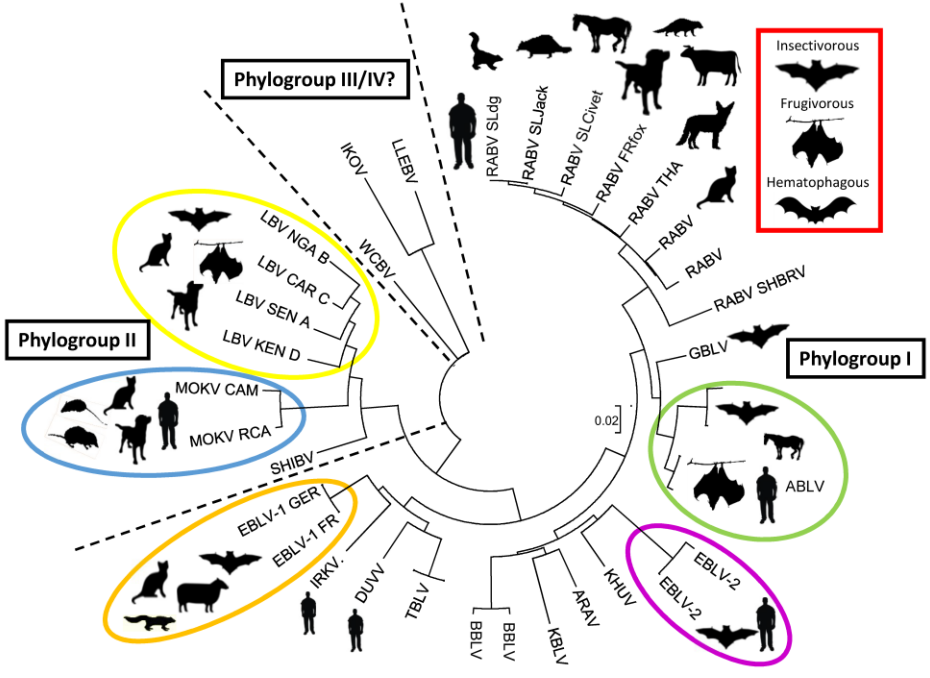
Background

- 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 virus: genus Lyssavirus in the Rhabdovirus family
- Bullet-shaped, enveloped, neurotropic RNA virus





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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

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Burden of illness

- ~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

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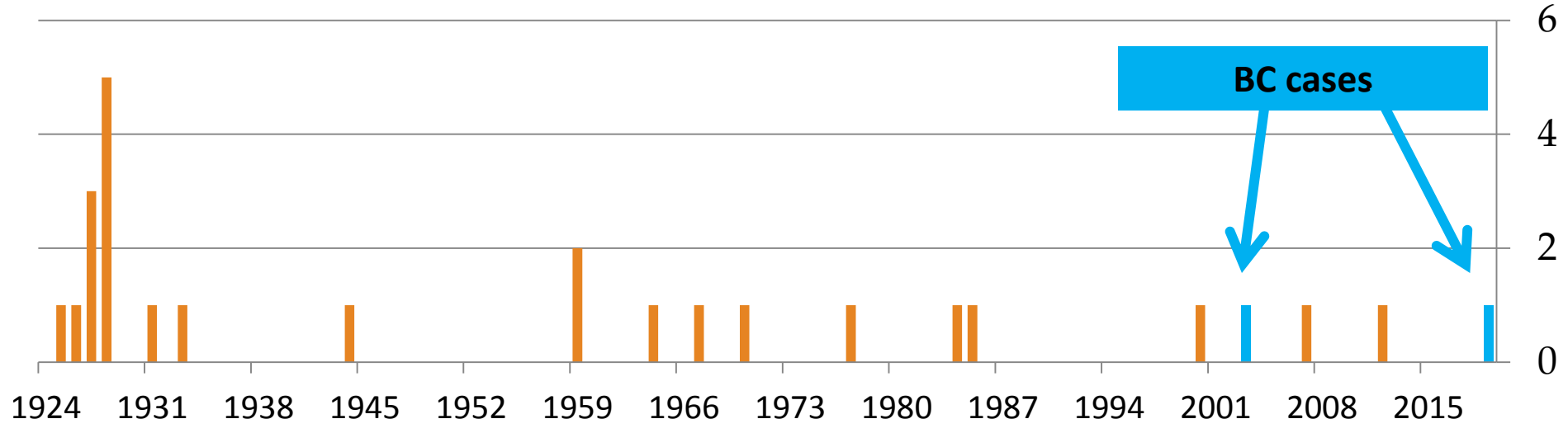
Human rabies in Canada



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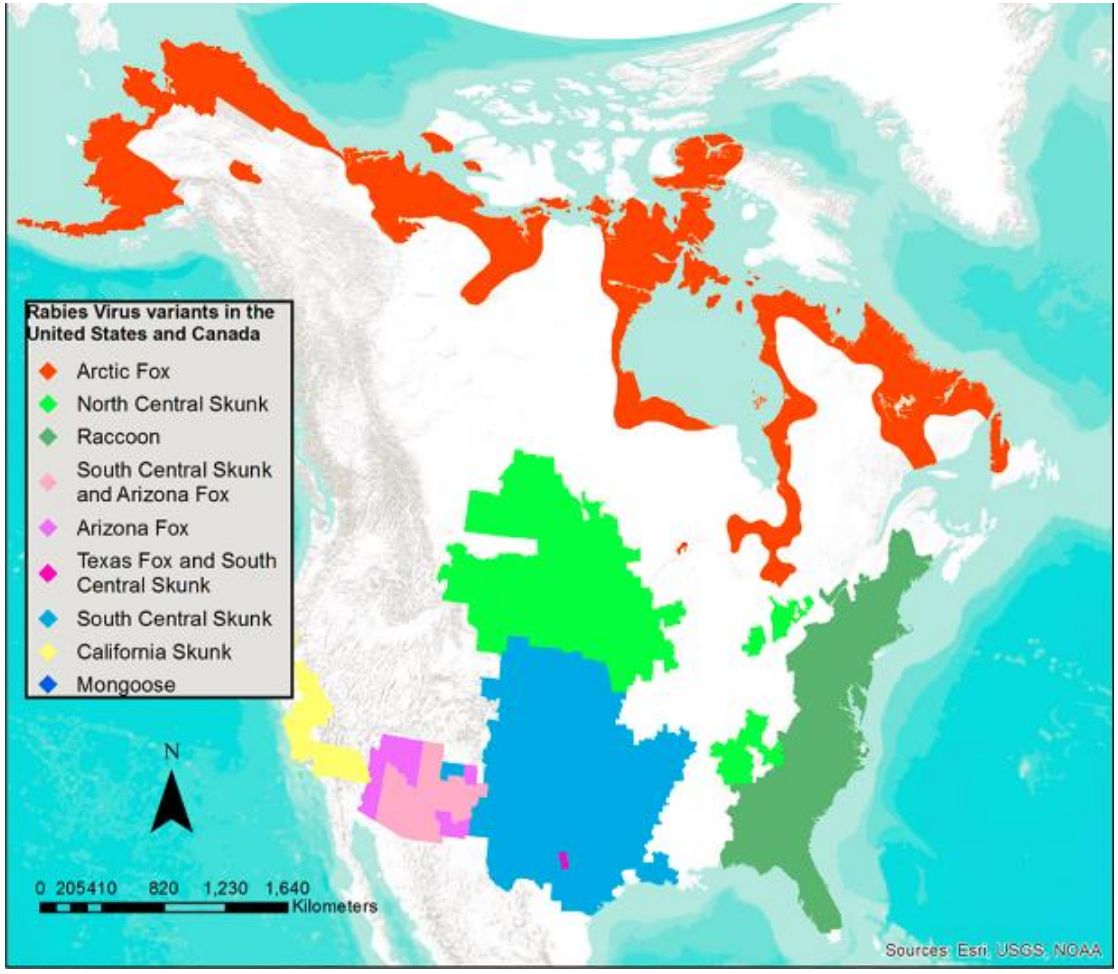
Terrestrial animal rabies

Rabies

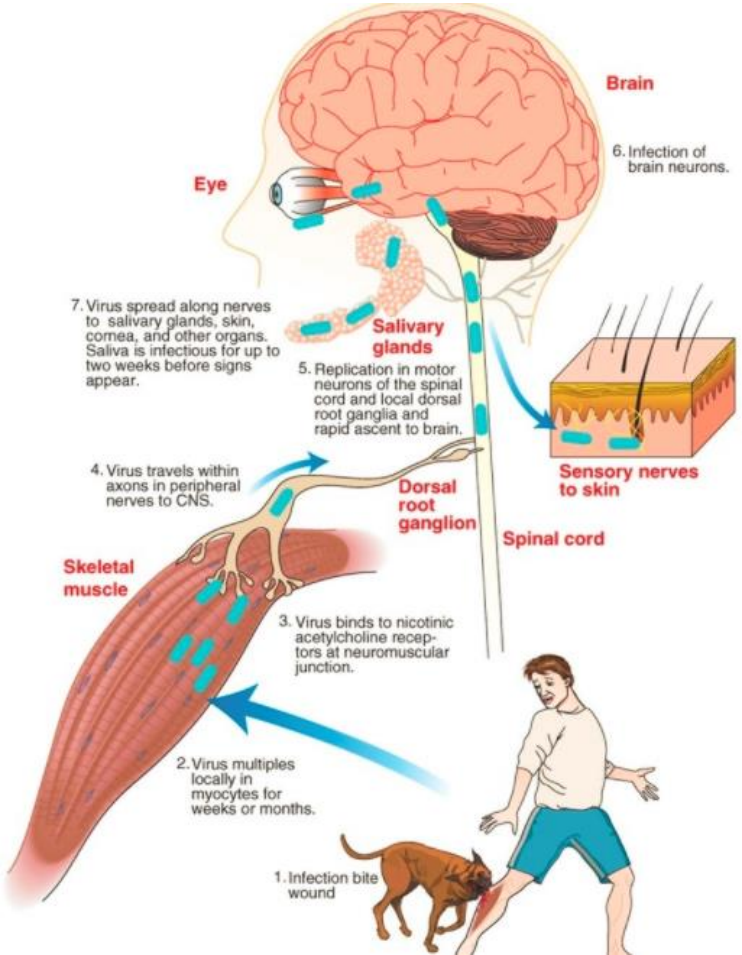


Bats are the only rabies reservoir in British Columbia (<0.5% positive)

Photo credit: D. Burles

Transmission

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



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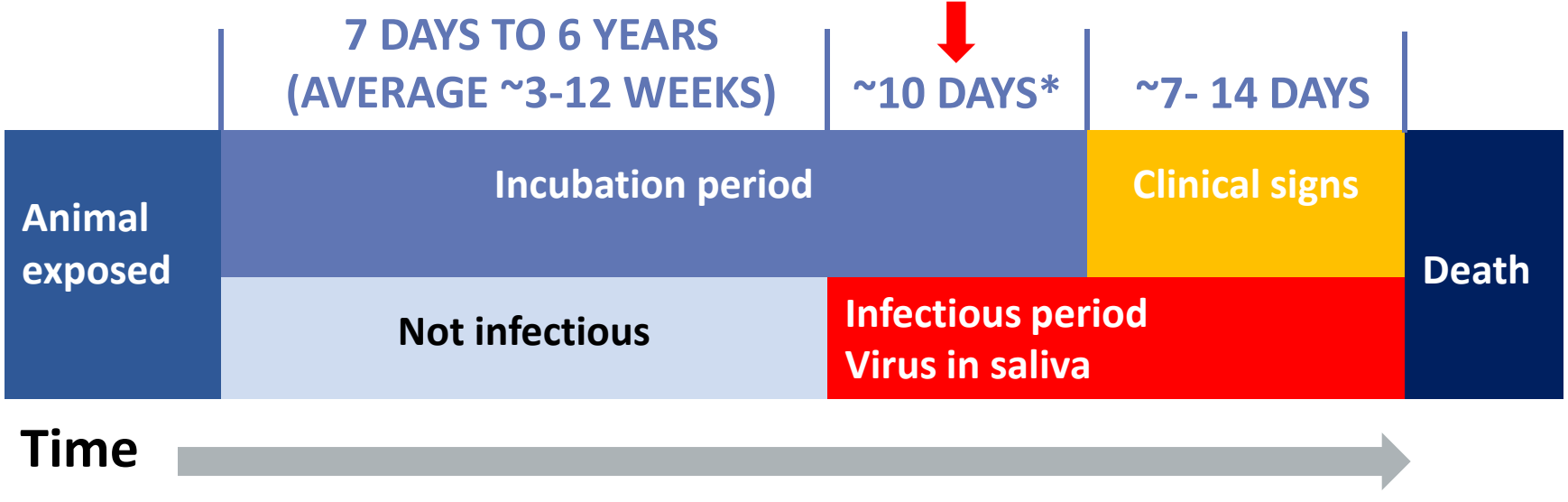
Incubation period

Rabies

*time only known for dogs, cats, and ferrets



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Clinical signs in animals

Rabies

- Highly variable, initial presentation 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
- Signs in bats difficult to detect

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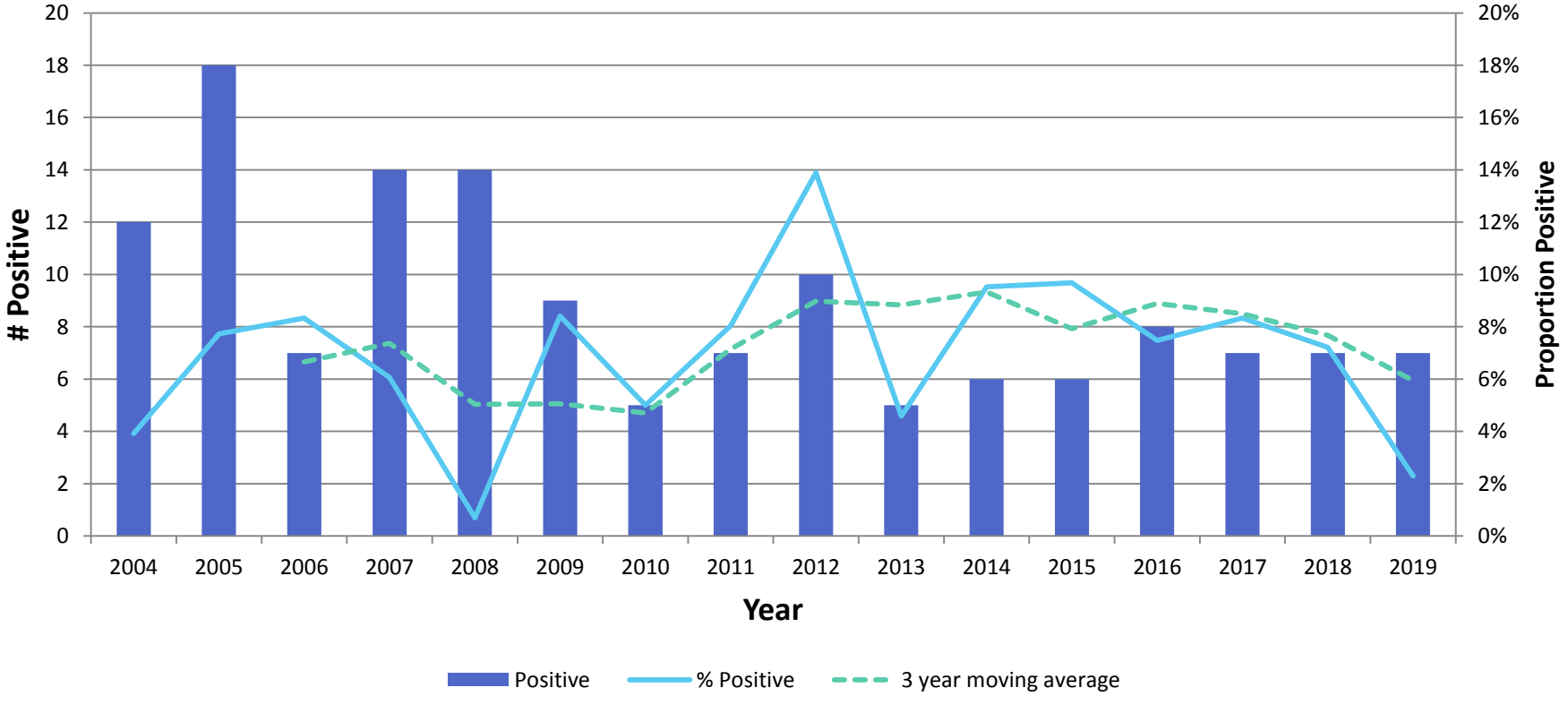
Rabies cases in BC



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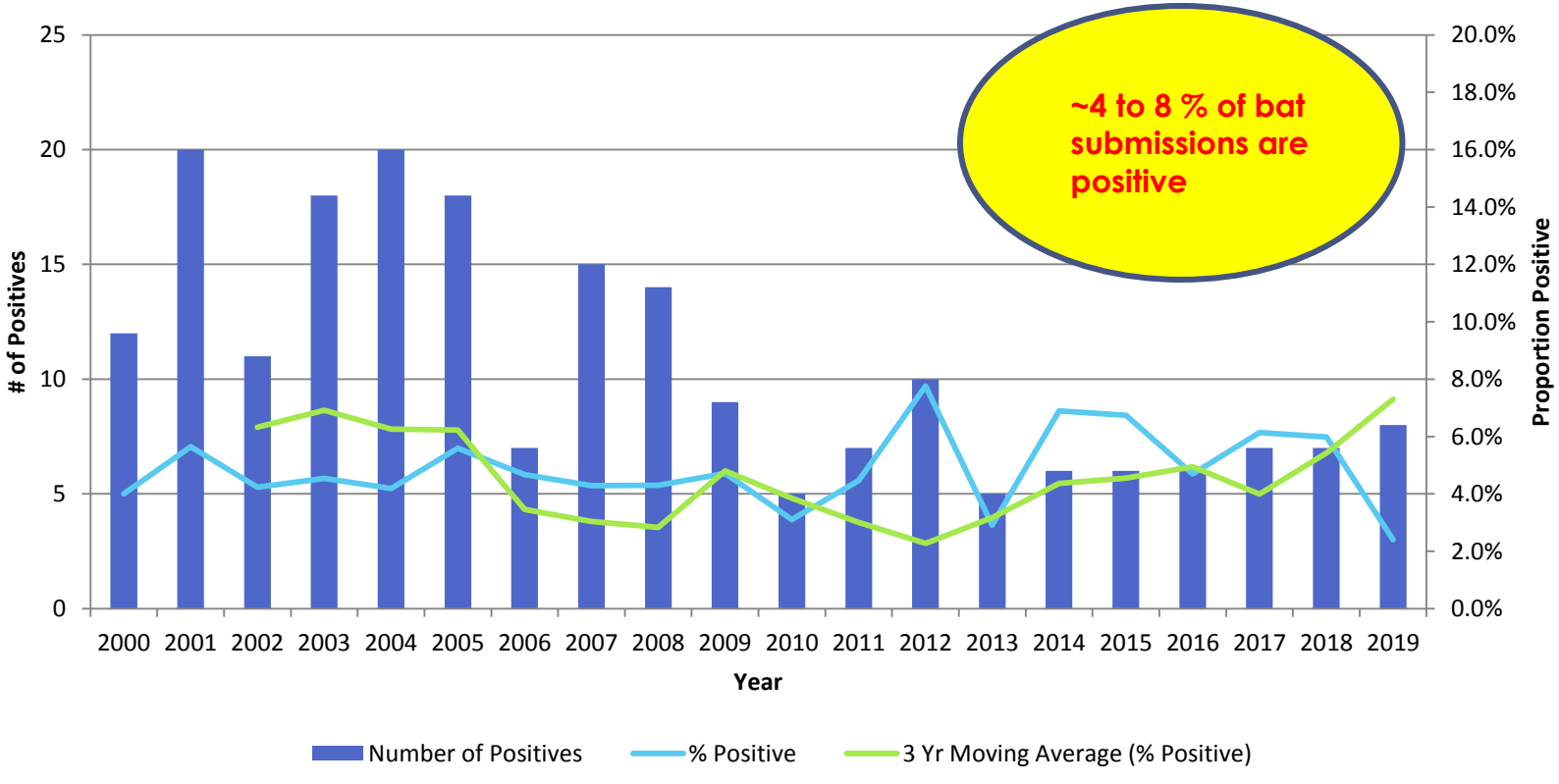
Rabies cases in bats in BC



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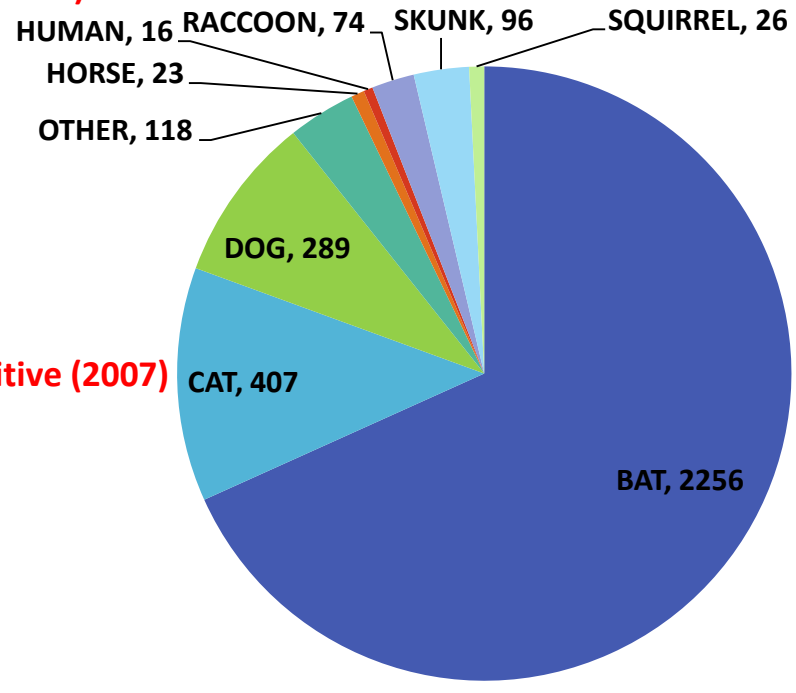
Rabies testing in BC, 2014-2019

1 human positive (2019)



8 skunks positive (2004)

1 cat positive (2007)

142 bats positive

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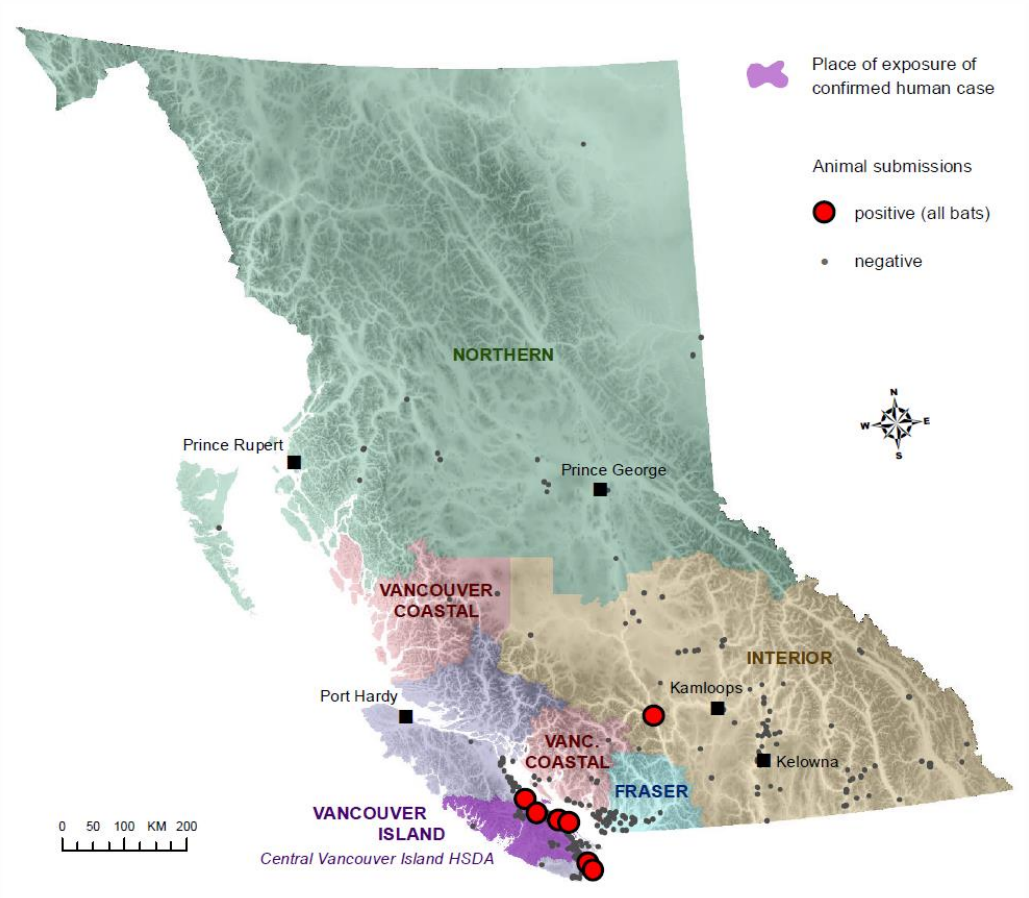
2019 rabies results

Rabies



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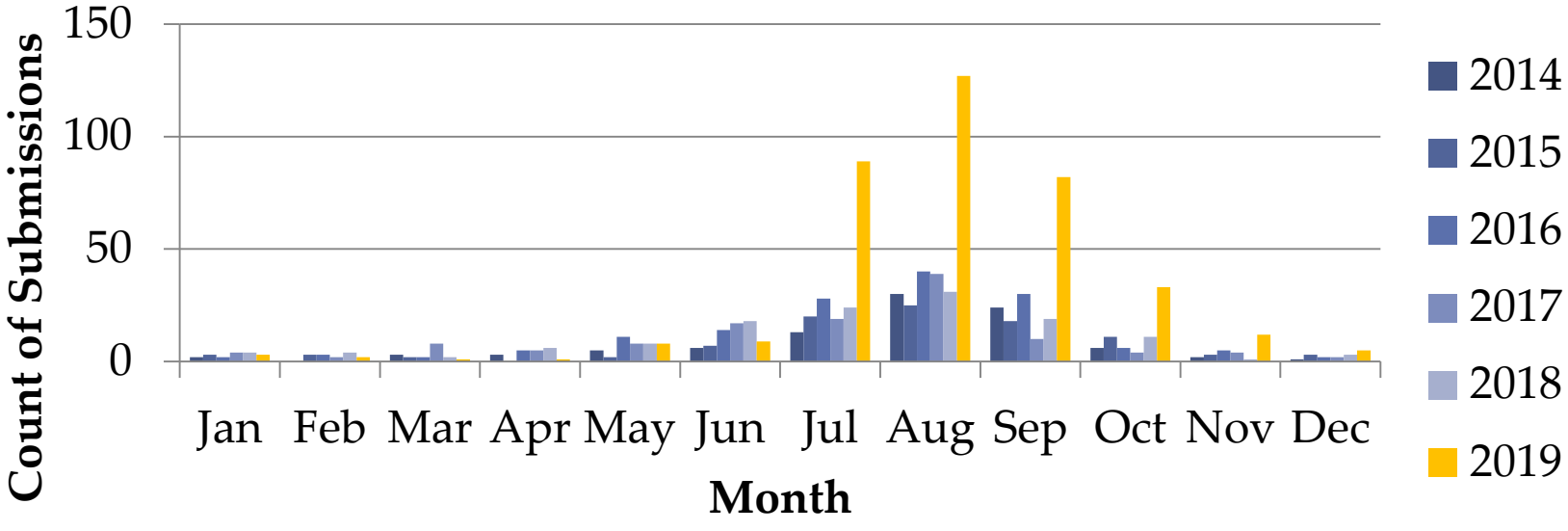
Rabies testing, BC

Submissions of animals to CFIA, 2014-2019



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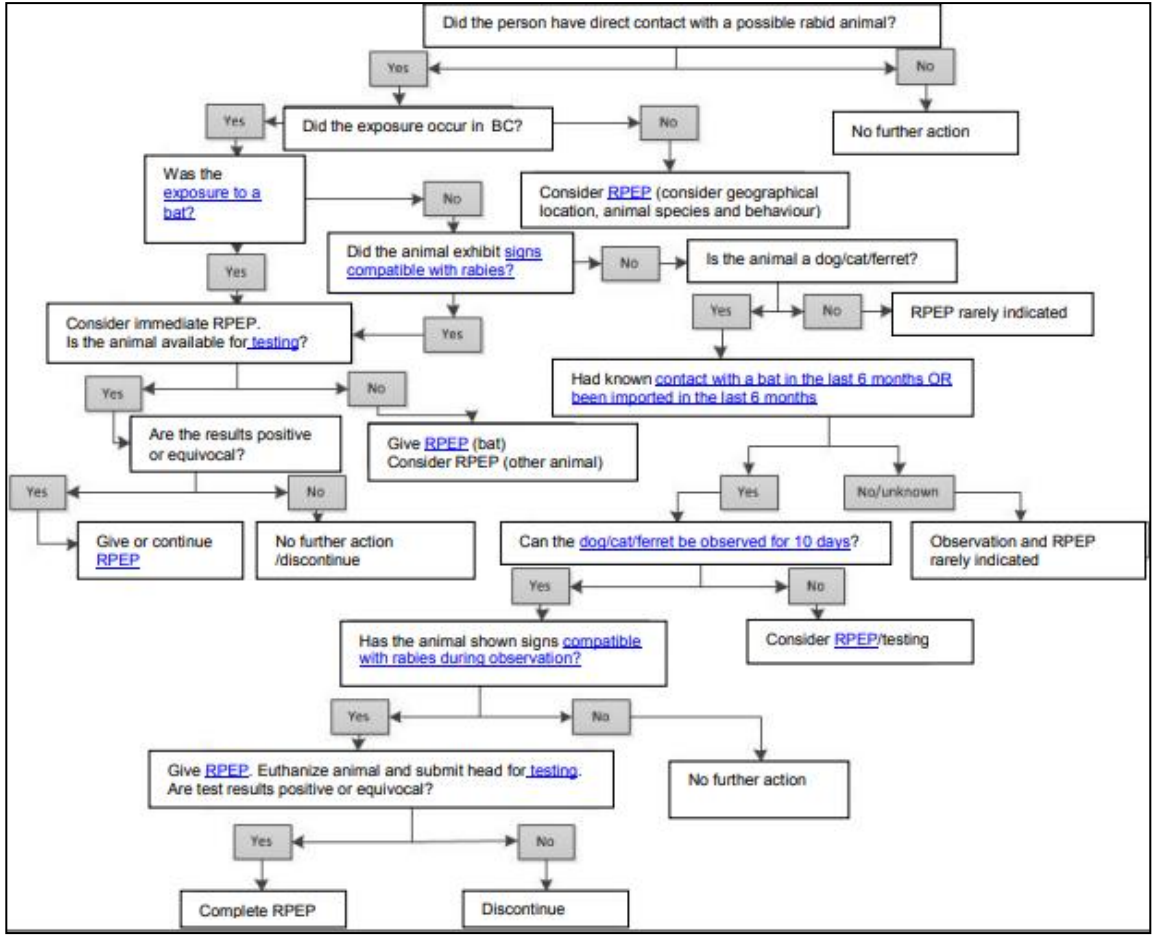
Rabies resources



BCCDC's *'Communicable Disease Control Manual'*

- Risk assessment
- Risk management (RPEP)
- Pre-exposure prophylaxis
- Ordering biologicals
- Reporting exposures

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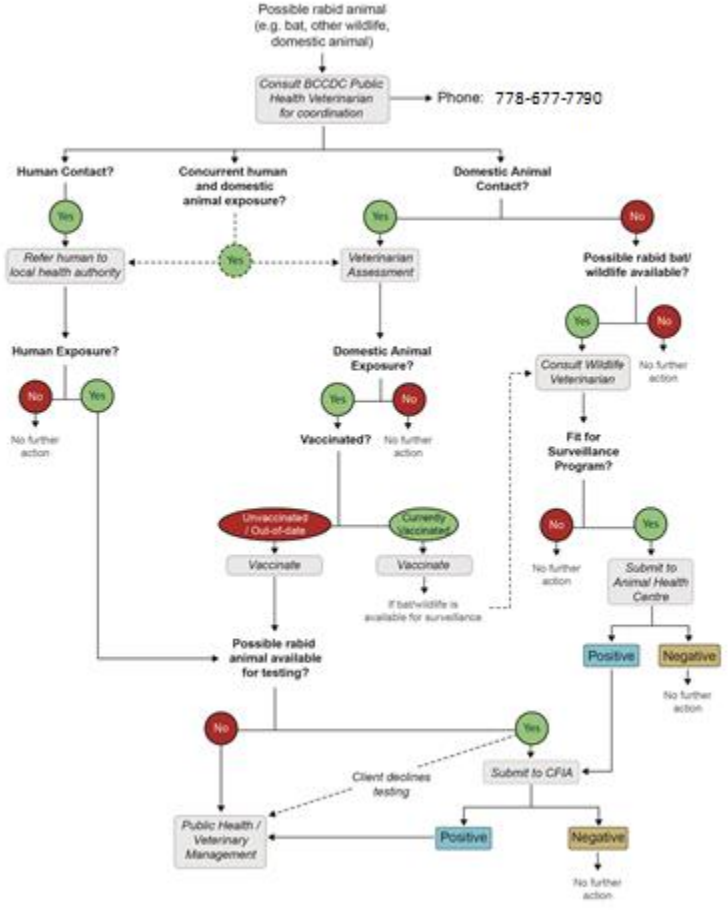
Rabies resources



BCCDC's

'Rabies Guidance for Veterinarians'

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Consult BCCDC Public Health Vet

Possible rabid animal (bat, other wildlife, domestic animal)

Human contact?

Yes

Refer human to health authority

Human *and* animal contact?

Veterinary Assessment

Domestic animal contact

Yes

NO

If bat/wildlife available, consult wildlife vet

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Exposures within in BC

Rabies

Table 1A. Summary of rabies risk assessment and management for exposures occurring 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** •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	Consider immediate RPEP. May be discontinued if animal tested and shown to be negative.		For a dog, cat, ferret: Consider observing/ confining if possible; give RPEP if animal exhibits signs compatible with rabies.[1] If no observation possible and for other species: RPEP rarely indicated.	RPEP rarely indicated	RPEP almost never indicated

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Exposures outside of BC

Rabies

Table 1B. Summary of rabies risk assessment and management for exposures occurring 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 or domestic mammal** with no known risk factors		**Rodents and lagomorphs** with no known risk factors
Action following direct contact	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[2]		RPEP almost never indicated

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Risk assessment, human exposure

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 often difficult to detect

Risk assessment, human exposure

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**

Case: 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 euthanized and placed in the freezer
- Woman noticed a small mark on her cheek
- Vaccination status of cats was unknown
- Husband called public health vet around 2PM
  - By this time owner and cat's were on the ferry heading home and had the bat with them in a cooler

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Case #1: Bat/cat/person

Rabies

Confirmed direct contact with a suspect animal

Then assess the following:

- **Animal species: Bat = high risk**
- **Geographic location: BC = presence of bat rabies**
- **Animal behaviour: Abnormal, bat could not fly**
- **Animal rabies vaccination status: n/a bat not vx**
- **Type of exposure (bite vs other): Bite**
- **Body part exposed: Face**

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Case #1: Bat/cat/person

Risk Management

- **Level of risk: Very high**
- Send bat for rabies testing
- Consider immediate RPEP. May be discontinued if bat tested and shown to be negative.
- Recommend immediate vaccination of cats

Risk management, human

- **Wound care:**
  - Wash with a mild soap and flush the wound with copious amounts of water. At least 15 minutes.
  - Iodine-containing or alcohol solution or other topical virucidal disinfectant to further decrease the viral load
- **Health assessment:**
  - Decision by medical health officer at health authority to:
    - send bat for rabies testing
    - provide Rabies post-exposure prophylaxis (RPEP)

Risk Management

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

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Pre-exposure immunization

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

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Pre-exposure immunization

Personal Risk Category	Nature of Risk	Typical Populations	Pre-exposure Immunization
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

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Key messages, bat workers

- **Understand BC sick or dead bat protocol**
- **Pre-exposure immunization**
  - Bat workers are considered high risk. pre-exposure immunization is recommended with regular serological monitoring and booster as necessary
- **Protect yourself from being bitten or scratched**
  - E.g. protective clothing, bite-proof gloves
- **If bitten or scratched by a bat**
  - Wash with a mild soap and flush the wound with copious amounts of water for least 15 minutes
  - **Seek medical attention**

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Bat bugs

Cimicidae Family

- 24 genera and 110 species
- 2/3 of species associated with bats

Bed bugs *Cimex pilosellus*

Photo credit: Juan Cruzado Cortes

Bed bugs *Cimex lectularius*

Photo credit: Oregon Dept of Agriculture

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Bat bugs

- *Cimex pilosellus* easy to confuse with bed bugs
- Rarely feed on humans
- Not disease transmitting
- Lab studies – potential to transmit Chagas disease (*Trypanosoma cruzi*)

- Differentiating between bat and bed bugs
  - Difficult to find
  - Low number of bites on humans
  - Location in household, higher floors and closer to walls where roosts located
  - Recently abandoned roosts
- Management
  - Exclusion of bats from human living quarters

Bat bugs

- *Bat bug bites:*
  - Insert mouthparts into skin
  - Inject saliva while they feed on blood
  - Causes local irritation (redness, itchiness)
  - Short duration of feeding
  - Infrequently biting compared to bed bugs

Photo credit: CDC

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Contact

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- BC Bat Action Team
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