

A Descriptive Analysis of Rabies Post- Exposure Prophylaxis Data: 2013, Ontario

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Animal Determinants of Emerging Disease

November 21, 2017

Outline

- Background
- Purpose and Methods
- Why is unnecessary RPEP an issue of concern?
- Key issues to reduce RPEP
 - Unknown / escaped dogs and cats
 - Provocation in risk assessment
 - Bats in the bedroom
- Current animal rabies situation in Ontario
- Assessing the rabies risk



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Background



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Ontario Studies

Human Rabies Post-Exposure Prophylaxis and Animal Rabies in Ontario, Canada, 2001-2012

D. Middleton, K. Johnson, R. Rosette, L. Hobbs, S. Moore, L. Rosella, N. Crowcroft

Zoonoses and Public Health – Vol 52, Issue 5, August 2015 (open access)

- Described the decreasing trend in animal rabies cases over the past three decades, and
- the absence of a decrease in the number of courses of RPEP administered that would have been expected based on the decrease in animal rabies cases.

Ontario Studies

A Descriptive Analysis of Rabies Post-Exposure Prophylaxis Data: 2013, Ontario, Canada

D. Middleton, J. Edwin, K. Johnson, B. Warshawsky

Zoonoses and Public Health

- Open access, Early View, search on title
- The study reviewed 2013 RPEP data in the integrated Public Health Information System (iPHIS).
- Many opportunities were identified for reducing the number of RPEP administered.

Purpose

1. To identify how the assessments of human exposures to animals suspected of having rabies, or rabid animals, could be improved with respect to the decisions regarding whether or not to administer RPEP
 - This includes possible improvements in guidelines that support health care providers in conducting their risk assessments
2. To improve insight into where preventive measures could be implemented, or enhanced, to prevent exposures to animals that may result in the need for RPEP

Methods

- Animal rabies cases (CFIA)
- 2013 RPEP data reported in iPHIS
 - 2013 was purposefully chosen
 - “Comments” used to assess the records
- The health care provider generally makes the decision to administer RPEP, with or without the assistance of the local public health unit

Why is unnecessary RPEP an issue of concern?



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Rabies in Canada and Ontario

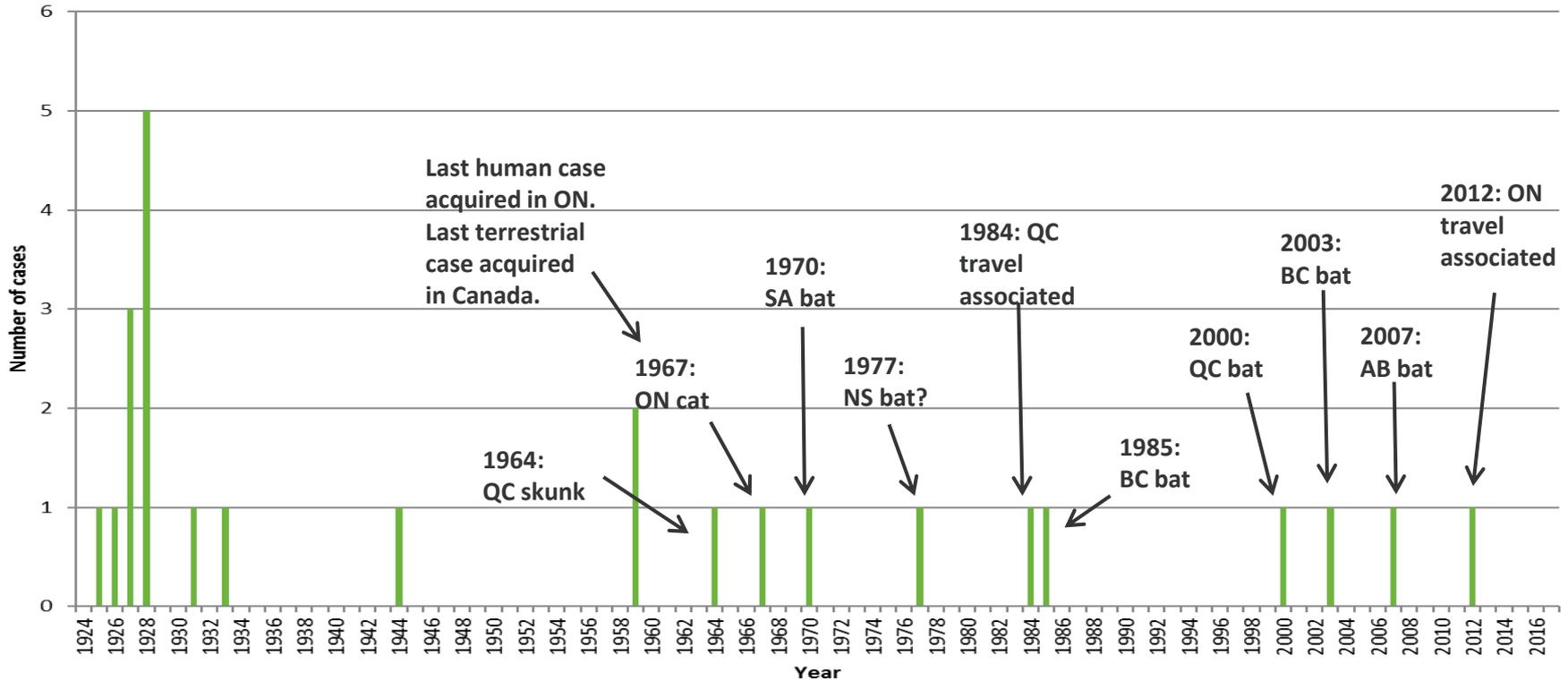
Human rabies

- In Canada, 10 human cases since 1960 (*NACI*, 2012)
- In Ontario, 1 human case occurred in 2012 that was acquired while travelling outside of Ontario
- The last case of human rabies that was acquired in Ontario occurred in 1967

Animal rabies in Ontario

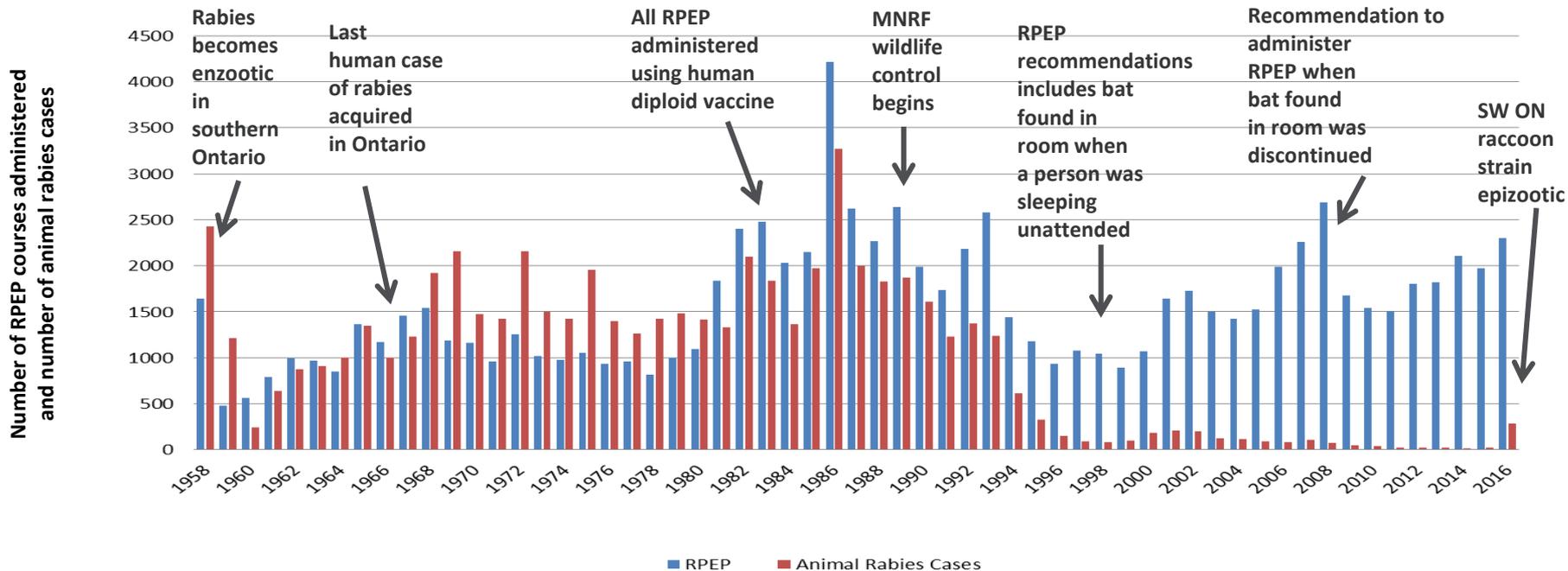
- Historically, skunks, foxes, raccoons and bats are the main reservoirs
- Except perhaps in Central West Ontario, bats currently pose the biggest threat of transmitting the virus to humans

Human Rabies in Canada



Source: MNRF

Animal Rabies Cases and RPEP Data, Ontario, 1958–2016



Ref. for 1958-2000 data: Postexposure Treatment and Animal Rabies, Ontario, 1958-2000. Nunan et.al. *Emerging Infectious Diseases*, 2002.

Ref. for 2001-2012 data: Human Rabies Post-Exposure Prophylaxis and Animal Rabies in Ontario, Canada, 2001-2012. Middleton et. al. *Zoonoses and Public Health*, 2015.

Costs Associated with RPEP Administration

- **Vaccine (4-dose series) and rabies immune globulin for a 70 kg person was approximately \$1,893 CAD (based on 2011 prices)**
- Public health staff and health care provider time



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Quebec Study Findings

The cost of preventing rabies at any cost: Post-exposure prophylaxis for occult bat contact (Huot et al., 2008).

- Estimated \$1,189 to \$1,590 per person for household bat exposures.
- These costs included:
 - nurses', physicians' and veterinarians' time,
 - obtaining the bats for testing,
 - the cost of testing the bats, and
 - vaccine and immune globulin (\$1,000 in 2007).

France Study Findings

Cost-effectiveness of rabies post-exposure prophylaxis in the context of very low rabies risk: A decision-tree model based on the experience of France (Dumas et. al., 2015)

- RPEP strategies were associated with high cost and were ineffective regarding “Life Years Gained” after exposure to unobservable dogs in metropolitan France.
- The risk of rabies in very low-risk settings is smaller than the risk of lethal traffic accidents on the way to an Anti-Rabies Center.



Key Issues to Reduce RPEP: Unknown/Escaped Dogs and Cats

Question 2 (answers)

An unknown/escaped dog bites a person on the hand.

As part of your investigation, you should ...

Check all that apply.

- ✓ **Determine the “circumstances of the exposure” including whether it was provoked or unprovoked.**
- ✗ **Recommend RPEP because it is an unknown/escaped dog.**
- ✓ **Determine if the bite broke the skin.**
- ✓ **Complete a Risk Assessment as described in the Canadian Immunization Guide.**

What do the guidelines say about unknown/escaped dogs and cats?

- The **2010 MOHLTC** “*Guidelines for Management of Suspected Rabies Exposures*” recommended RPEP for unknown or escaped dogs, cats and ferrets,

whereas ...
- The **September 2013 MOHLTC** “*Guidance Document for the Management of Suspected Rabies Exposures*” recommended a **Risk Assessment** for unknown/escaped dogs/cats/ferrets in consultation with public health officials

Risk Assessment

The *Canadian Immunization Guide* describes considerations in a **Risk Assessment** for the exposure that include:

- **Species of animal**
 - including the prevalence of rabies in that species, and the prevalence of rabies in other species in the area.
- **Type of exposure**
 - bite, non-bite, or direct contact with a bat.
- **Circumstances of the exposure**
 - provoked, unprovoked.
- **Vaccination status** and **behaviour** of a domestic animal, if the animal is available
- **Location and severity** of the bite
 - size and number of bites

Ontario Study Findings

1. Using a Risk Assessment for unknown/escaped dogs and cats, rather than automatically administering RPEP, will likely decrease the number of RPEP administered.



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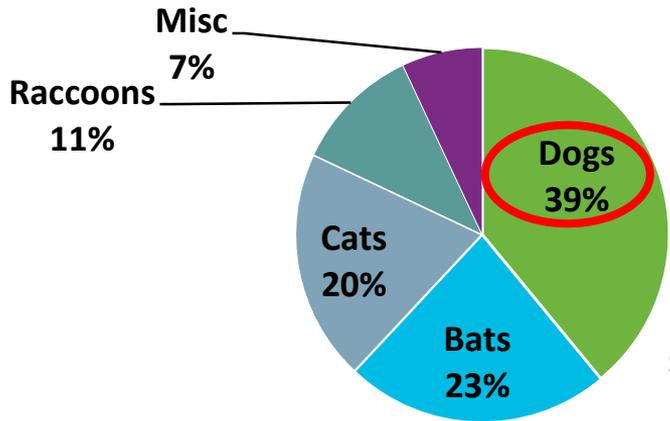


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Dog exposures in Ontario study

- Of the 1,635 Ontario exposures receiving RPEP in 2013
 - 39% were dogs
 - of which 35% had useful comments

Exposures to Suspected Rabid Animals, Ontario, 2013

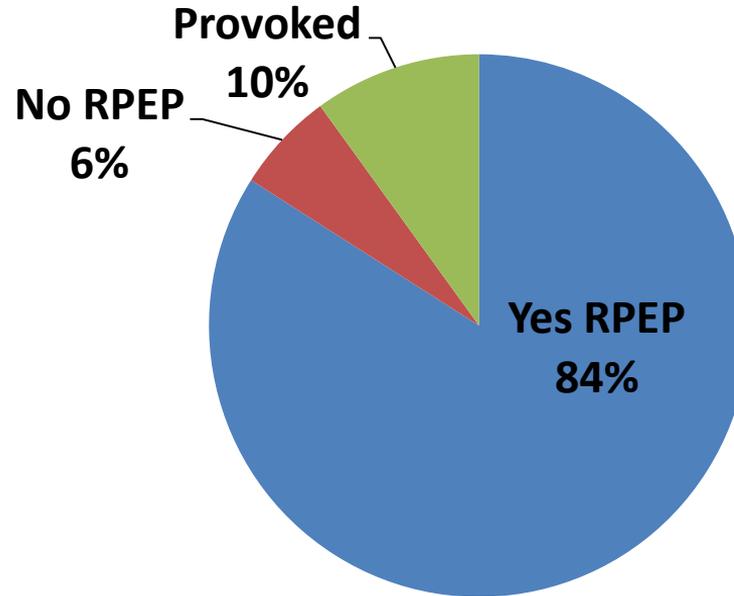


Source: iPHIS data, extracted January 26, 2016.



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Exposure Event Classification for Dogs, Ontario, 2013. N= 228



Source: iPHIS data, extracted January 26, 2016.

Dogs – Unknown/Escaped

- Most dog exposures where RPEP was given were unknown/escaped (in our study, 80% of those that required RPEP)
- According to current guidelines, unknown/escaped animals would require a Risk Assessment

Question 2 (answers)

An unknown/escaped CAT bites a person on the hand.

As part of your investigation, you should ...

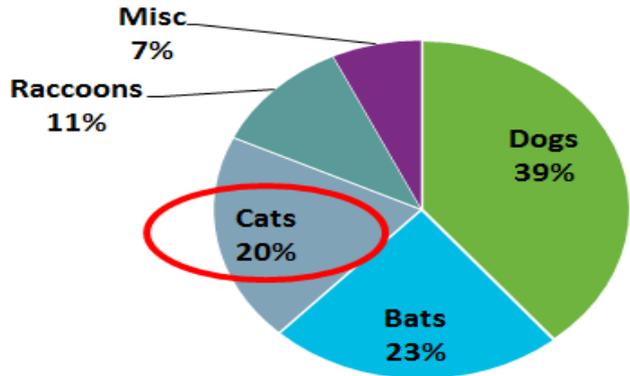
Check all that apply:

- ✓ **Determine the “circumstances of the exposure” including whether it was provoked or unprovoked**
- X **Recommend RPEP because it is an unknown/escaped cat**
- ✓ **Determine if the bite broke the skin**
- ✓ **Complete a risk assessment as described in the Canadian Immunization Guide**

Cat exposures in Ontario study

- Of the 1,635 Ontario exposures receiving RPEP in 2013
 - 20% were cats
 - of which 43% had useful comments

Exposures to Suspect Rabid Animals, Ontario, 2013

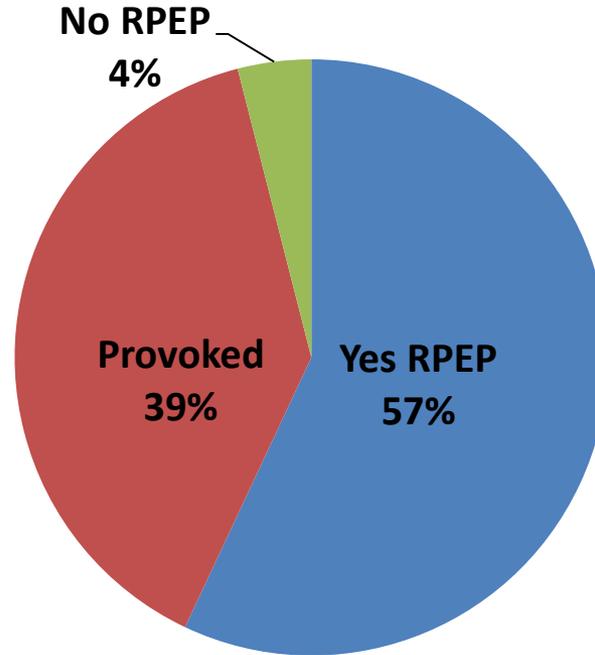


Source: iPHIS data, extracted January 26, 2016.



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Exposure Event Classification for Cats, Ontario, 2013. N = 143



Source: iPHIS data, extracted January 26, 2016.

Cats – Unknown/Escaped

- Most cat exposure where RPEP was given were unknown/escaped (in our study, 94% of those that required RPEP)
- According to current guidelines, unknown/escaped animals would require a risk assessment
- **As cats tend to be outdoors without their owners, more frequently than dogs, the risk of rabies may be higher in cats than dogs**



Key Issues to Reduce RPEP: Provoked Exposures

Question 3 (answers)

A cat is feeding on food scraps in a garbage can. The person tries to get rid of the cat and is bitten on the hand in the process. The Risk Assessment includes “circumstances of the exposure”.

What are the “circumstances of the exposure”?

- Provoked**
- Unprovoked

There has not been any terrestrial rabies identified in the area for seven years, although a couple of bats were identified with rabies.

What do you recommend?

- RPEP
- No RPEP**

What do the guidelines say about provocation?

The *Canadian Immunization Guide* describes considerations in a **risk assessment** for the exposure that include:

- **Circumstances of the exposure** – provoked, unprovoked.
- *“An unprovoked attack is more likely to indicate that an animal is rabid”.*
- *“Bites inflicted on a person attempting to feed or handle an apparently healthy animal should generally be regarded as provoked”.*

What do the guidelines say about provocation?

Management of patients with suspected rabies exposure: Guidance for health care providers working with your local public health unit (PHO, April 2017)

- Did the exposed person approach the animal, or did the animal approach the person?
- Dogs/cats that are being fed, handled, or approached may bite or scratch; these would be considered provoked incidents.
- If the exposure occurred when the animal was provoked (e.g., the animal was being fed, handled, or approached), the provocation may have incited the exposure.
- If the animal approached the person without any provocation, this is potentially more concerning with respect to the risk of rabies in the animal.

Ontario Study Findings

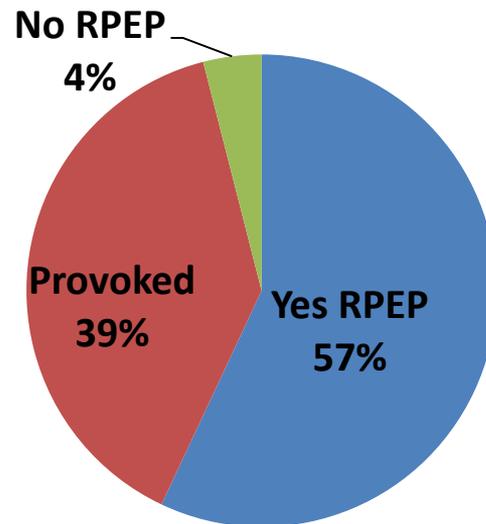
1. Using a Risk Assessment for unknown/escaped dogs and cats, rather than automatically administering RPEP, will likely decrease the number of RPEP administered.
2. **If provoked exposures to dogs and cats are considered more in a Risk Assessment, many of these exposures would likely not require RPEP.**

Exposure Event Classification for Cats, Ontario, 2013.

N = 143

39% Provoked

- Feeding the cat
 - Trying to pet the cat
 - Trying to catch the cat
 - Playing with the cat
 - Trying to assist an injured cat
-
- **A risk assessment considering provoked exposures may reveal that RPEP is not required, especially in areas with low incidence of animal rabies**



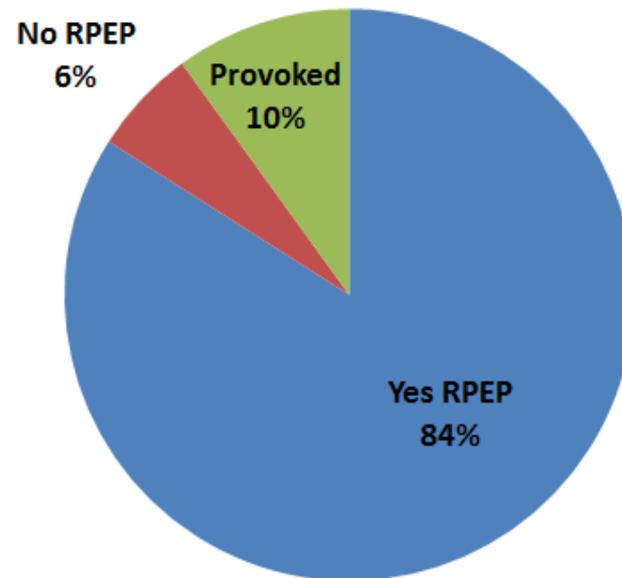
Source: iPHIS data, extracted January 26, 2016.

Exposure Event Classification for Dogs, Ontario, 2013.

N= 228

10% Provoked:

- Trying to pet the dog
- Playing with the dog
- Trying to catch the dog
- Trying to assist an injured dog



- **A Risk Assessment considering provoked exposures may reveal that RPEP is not required, especially in areas with low incidence of animal rabies**

Source: iPHIS data, extracted January 26, 2016.

Provoked Exposures

A good principle to follow is:

- **Did the person approach the animal? (Provoked)**
or
- **Did the animal approach the person? (Unprovoked)**

In general, clearly provoked exposures would not warrant RPEP in areas of low rabies prevalence.

- **Clearly Provoked = trying to feed, pet or play with a dog or cat with normal behaviour**

Considerations Regarding Provocation of Dogs

Other exposures may also have some element of provocation:

- Person bitten who walks near a dog being walked by another person
- Person bitten while roller blading, skateboarding, or riding a bike near the dog
- Person walking their own dog and bitten by another dog

Animal Fights

- 8% of the records analysed indicated that RPEP was administered because of an exposure from breaking up a fight between a dog or cat and another animal
- **If an animal that bit a person was involved in a fight that was initiated by another animal, this should be considered a form of provocation which should be factored into the Risk Assessment**

Provoked Exposures: Wild Animals

1. Wild Animals (raccoons, skunks, foxes, etc.)

- Guidelines: *Regard as rabid unless the geographic area is known to be rabies free.*

As per the “geographic” considerations in the Risk Assessment:

1. How prevalent is rabies in the involved species in the geographic area?
2. How prevalent is rabies in other animal species in the geographic area?

Provoked Exposures: Wild Animals

- **When would you consider not recommending RPEP for a provoked exposure to a wild animal ???**
- A person is bitten by a baby raccoon while feeding it. The geographic area has not experienced a terrestrial rabies case in five years.
- A person is bitten by a raccoon while trying to remove it from a garbage can. The geographic area has only experienced a few rabid bats in the past seven years.

Ontario Study Findings

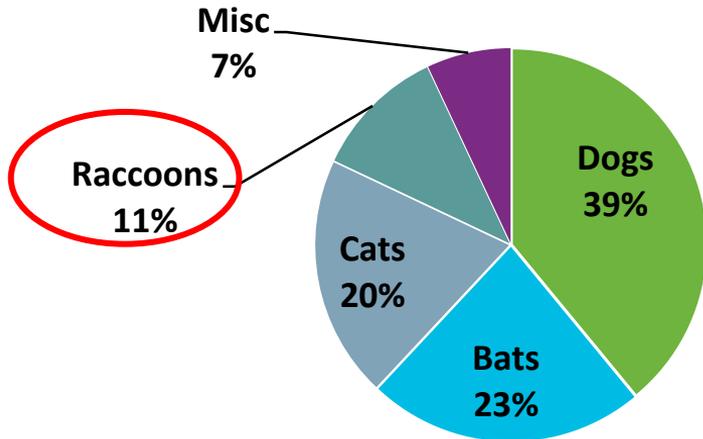
1. Using a Risk Assessment for unknown/escaped dogs and cats, rather than automatically administering RPEP, will likely decrease the number of RPEP administered.
2. If provoked exposures to dogs and cats are considered more in a Risk Assessment, many of these exposures would likely not require RPEP.
3. **A Risk Assessment considering provoked exposures for wild animals may reveal that RPEP is not required, especially in areas with low incidence of animal rabies.**

Raccoon Exposures in Ontario study

Of the 1,635 Ontario exposures

- 11% were raccoons,
 - of which 26% had useful comments

Exposures to Suspect Rabid Animals, Ontario, 2013



Source: iPHIS data, extracted January 26, 2016.



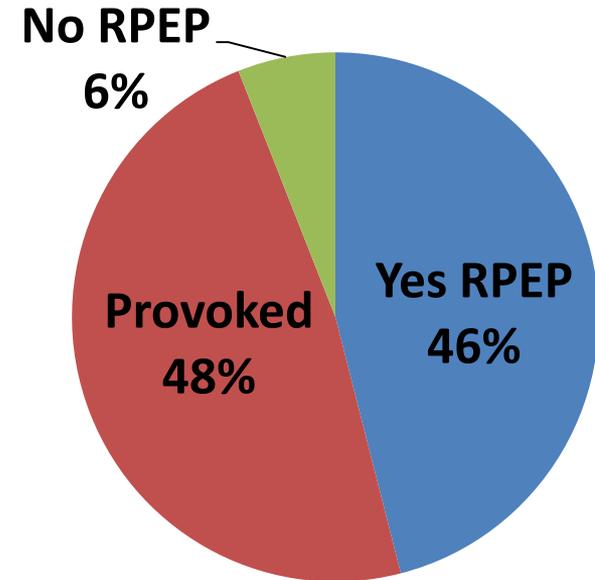
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Exposure Event Classification for Raccoons, Ontario, 2013.

N = 46

48% Provoked

- Trapped raccoon
- Tried to remove raccoon
- Played with raccoon
- Fed raccoon
- Pet raccoon
- **A Risk Assessment considering provoked exposures may reveal that RPEP is not required, especially in areas with low incidence of animal rabies**



Source: iPHIS data, extracted January 26, 2016

Rodents - Provoked

Small Rodents (mice, rats, squirrels, chipmunks)

*“would only warrant RPEP if the behaviour of the biting animal was highly unusual”
(2013 Ontario Guidance Document)*

- Close to 100% Provoked

Large Rodents (groundhogs/woodchucks, beavers)

“larger rodents can potentially carry rabies, although this is rare in Canada” (2013 Ontario Guidance Document)

- Close to 100% Provoked

Biting is not an unusual activity for these animals when they are provoked by humans.

Provoked Exposures: Bats

Provocation is considered differently in bats.

- The prevalence of rabies in bats is unknown, but in captured, tested bats, it is suggested to be between <1 to 4% (*PHAC, CIG, 2012*)
- **Because of the prevalence of rabies in bats, RPEP should be recommended for a provoked exposure to a bat**



Key Issues to Reduce RPEP: Bats in the Bedroom

Question 4.1 (answers)

An adult wakes up with a bat in their bedroom and reports this to their local public health unit.

Check all that will influence your Risk Assessment with regard to the need for RPEP:

- ✓ **Has there been direct contact with a bat?**
- ? **Can a bite, scratch, or saliva exposure into a wound or mucous membrane be ruled out?**
- X **Was the exposure provoked?**
- ✓ **Is the person able to give a reliable history?**

Question 4.2 (answers)

You determine that the person is able to give a reliable history and that the person is not aware of any contact with the bat.

What do you recommend?

- RPEP
- No RPEP



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What do the guidelines say about bat exposures?

Guidance Document for the Management of Suspected Rabies Exposures (MOHLTC)

***Bat exposures:** Post-exposure rabies prophylaxis following bat contact is recommended when **both** the following conditions apply:*

- *There has been direct contact with a bat; **AND***
- *A bite, scratch, or saliva exposure into a wound or mucous membrane cannot be ruled out.*

Quebec Study Findings

Bats in the Bedroom, Bats in the Belfry: Reanalysis of the Rationale for Rabies Post-exposure Prophylaxis (DeSerres et. al., 2008).

- Estimated that <5% of eligible persons with bedroom exposure received RPEP
- Incidence of human rabies due to bedroom bat exposure without recognized contact was **1 case per 2.7 billion person-years**.
- The “**Number Needed to Treat**” to prevent a single case of human rabies ranged from 314,000 to 2,700,000 persons.
- **293-2,500 health care professionals working full-time for a full year** would be required to prevent a single case of bedroom exposure without recognized contact. In addition, **\$228 million to \$2 billion** are required for material costs.

Ontario Study Findings

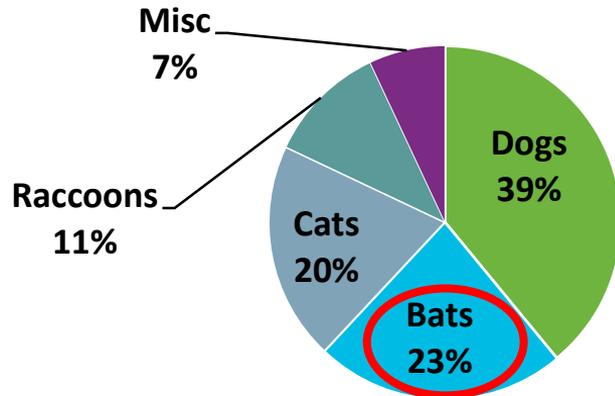
1. Using a Risk Assessment for unknown/escaped dogs and cats, rather than automatically administering RPEP, will likely decrease the number of RPEP administered.
2. If provoked exposures to dogs and cats are considered more in a Risk Assessment, many of these exposures would likely not require RPEP.
3. A Risk Assessment for provoked exposures for wild animals may reveal that RPEP is not required, especially in areas with low incidence of animal rabies.
4. **RPEP was still being administered for “a bat in a bedroom”, despite no longer being recommended.**

Bats Exposures in Ontario Study

Of the 1,635 Ontario exposures,

- 23% were bats,
 - of which 45% had useful comments

Exposures to Suspect Rabid Animals, Ontario, 2013



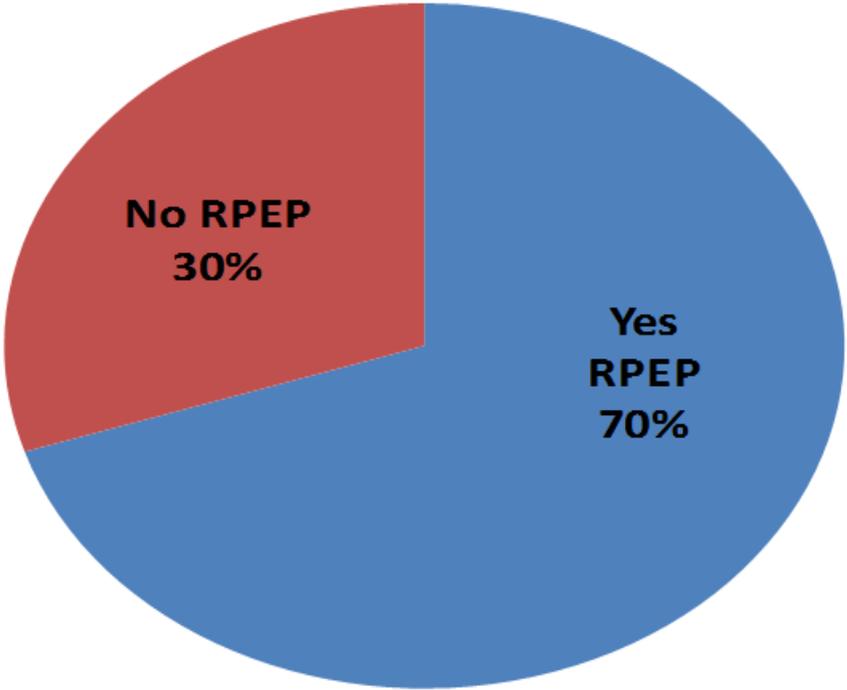
Source: iPHIS data, extracted January 26, 2016.



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Exposure Event Classification for Bats, Ontario, 2013.

N = 166



Source: iPHIS data, extracted January 26, 2017

Bats – No RPEP for Bat in the Bedroom

- 30% were classified to not require RPEP
 - Of these, 76% were based on a bat in a room/house, with no mention of direct contact with the bat
- RPEP for a bat in a room where a person was sleeping or unattended was recommended between 1998 and 2008
- In 2013 (when our study was done), a “bat in a bedroom” was not a reason for RPEP unless there was direct contact or evidence of direct contact

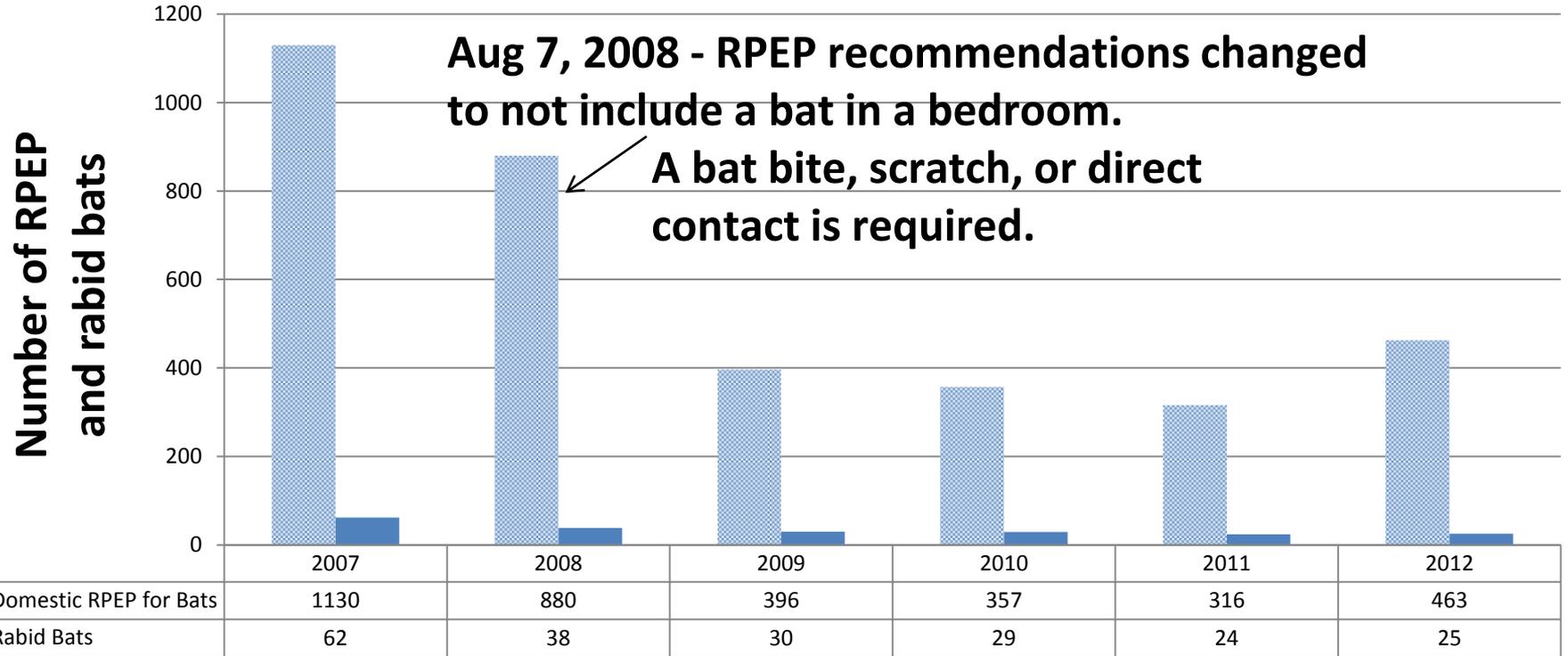
Bats – Multiple People Exposed

- **Bats in the house may result in multiple people receiving RPEP:**
 - 1 exposure for which 8 people received RPEP
 - 2 exposures for which 5 people received RPEP
 - 2 exposures for which 4 people received RPEP
 - 3 exposures for which 3 people received RPEP
- In only one exposure did it indicate that the 3 exposed people were scratched, warranting RPEP
- All others did not indicate contact with the bat and thus, these were classified to not require RPEP

Bats - Provoked

- Recall that provocation is not considered in the Risk Assessment for bats
- 13% of bat records considered provoked. These were classified as warranting RPEP
- Frequent example was bitten while trying to remove the bat from the house
- Emphasizes the need for safe bat removal, which is best done by a trained professional

Effect of recommendations on RPEP associated with bat exposures



Miscellaneous Ontario Study Findings



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Dogs – RPEP not indicated

6% were classified to not require RPEP, e.g.,

- Dog was observed for the 10-day period and there was no indication that the bite was to the head or neck
- Dog should have been available for observation
 - Person rang the doorbell, and was bitten by the dog when the door opened
 - Bitten by dog that was provoked by another person while attending a party at the dog owner's house
- Euthanizing dog suspected of having rabies. The IV needle came out and punctured the person.

Cats – RPEP not indicated

4% were classified to not require RPEP, e.g.,

- Cat should have been available for the 10-day observation period and there was no indication that the bite was to the head or neck
 - Bitten by own cat
 - Bitten by a fostered cat
 - Bitten by an adopted cat



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Current animal rabies situation in Ontario



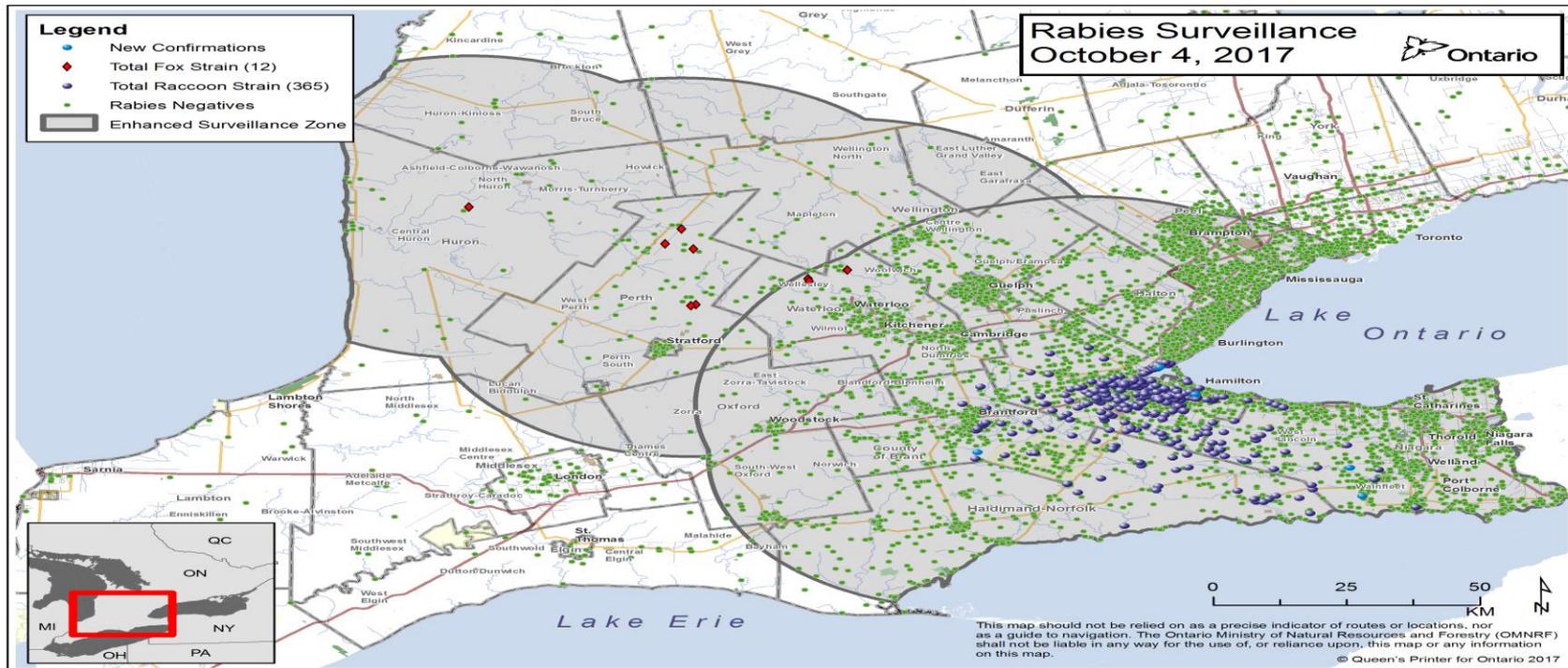
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Rabies in South West and Central West Ontario

1. Since the beginning of the outbreak in Dec 2015, there have been 365 raccoon strain and 12 fox strain rabies (as of October 4, 2017).
2. Animal surveillance likely the most intense in history of Ontario.
3. The raccoon rabies outbreak is limited to an approximate 50 km radius.

Source: MNRF

Rabies in South West and Central West Ontario

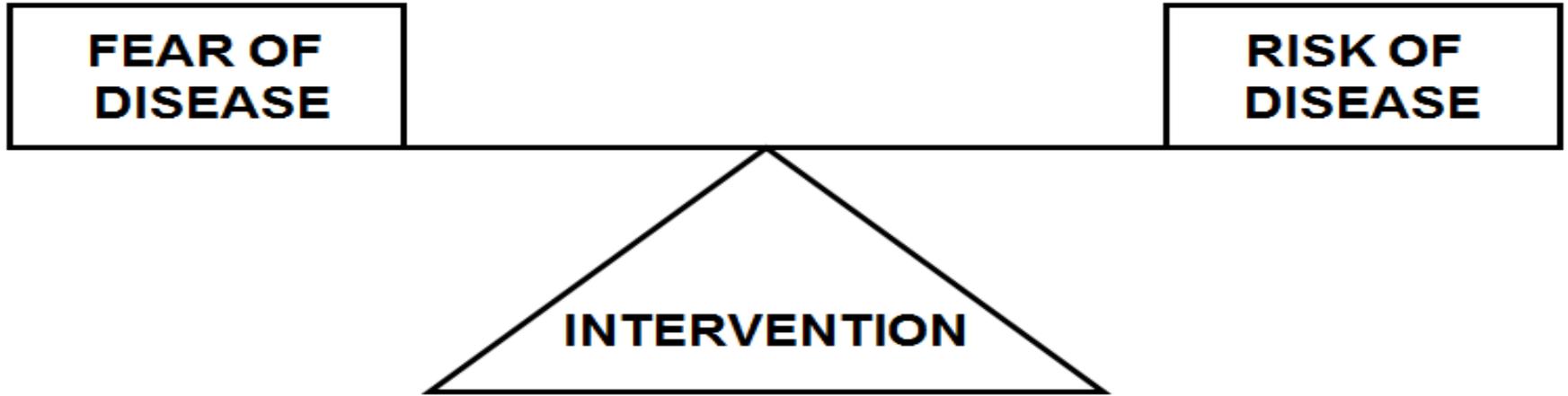


Assessing the rabies risk

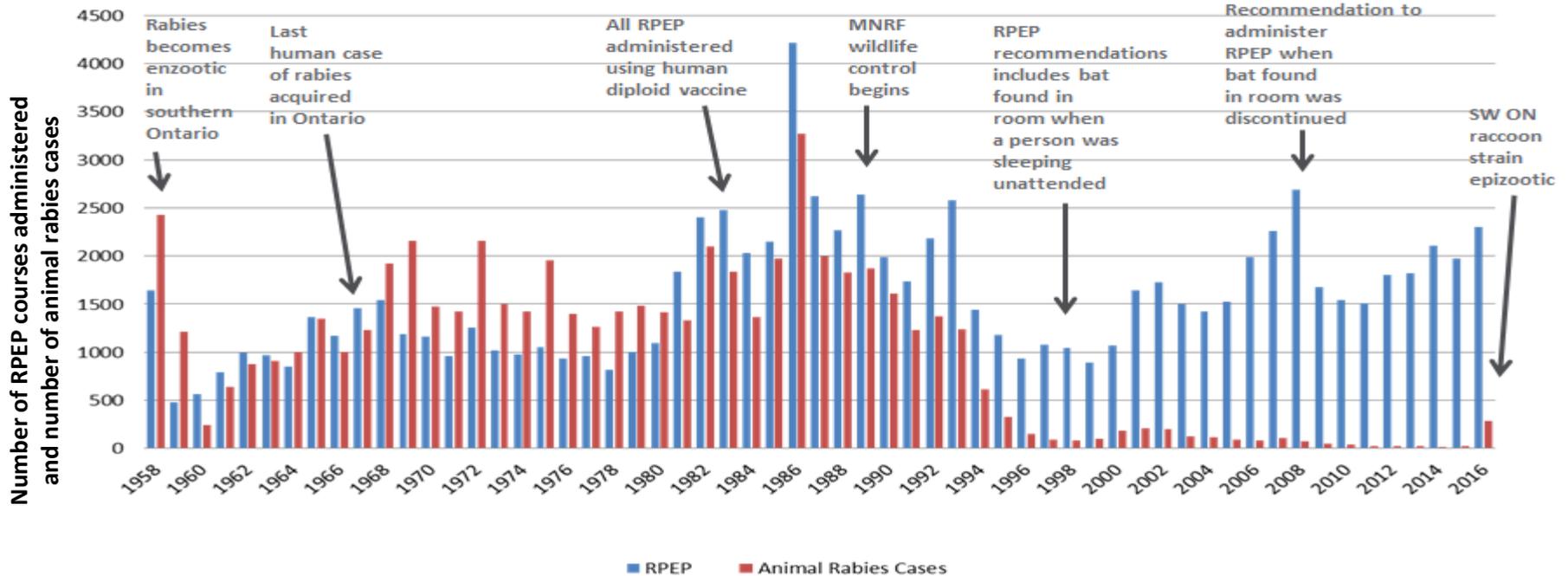


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Assessing rabies risk



Animal Rabies Cases and RPEP Data, Ontario, 1958–2016



Ref. for 1958-2000 data: Postexposure Treatment and Animal Rabies, Ontario, 1958-2000. Nunan et.al. *Emerging Infectious Diseases*, 2002.

Ref. for 2001-2012 data: Human Rabies Post-Exposure Prophylaxis and Animal Rabies in Ontario, Canada, 2001-2012. Middleton et. al. *Zoonoses and Public Health*, 2015.

Acknowledgements

- Staff in Ontario health units for providing the RPEP data
- Jonathan Edwin, Karen Johnson, Bryna Warshawsky
 - Authors on the paper
- Beverly Stevenson and Kevin Middel (Ontario Ministry of Natural Resources and Forestry)
 - References for the manuscript
- Leigh Hobbs and Kelsie Jagt
 - iPHIS data extraction

Thank you for attending ADED rounds!!



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