The Rabies Reporter

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FIRST HUMAN DEATH ASSOCIATED WITH RACCOON RABIES — VIRGINIA, 2003

Rabies is an acute, progressive, incurable viral encephalitis, caused by the bite of an infected animal. In March 2003, a previously healthy man aged 25 years from northern Virginia died from a diagnosed illness of meningoencephalitis of unknown etiology after a 3-week illness. Histopathologic review of central nervous system tissues at CDC revealed viral inclusions suggestive of Negri bodies, and subsequent tests confirmed a diagnosis of rabies. Genetic sequencing identified a rabies virus variant associated with raccoons, but how the patient became infected remains unknown. This report summarizes the investigation of the first documented case of human rabies associated with a raccoon rabies virus variant in the United States and highlights the importance of continued education in the prevention and diagnosis of rabies.

In February 2003, the patient visited his physician with head and body aches, nausea, abdominal pain, chills, fever of 99°--100° F (37.2° C--37.7° C), dry cough, and listlessness. Upon retrospective questioning, his wife reported that he had showed mild personality changes during the previous days. Six days later, the patient awoke disoriented with unsteady gait and slurred speech. He was evaluated in a local emergency department and admitted to the hospital. Physical examination revealed mild ataxia and confusion. Laboratory values were substantial for decreased sodium. A lumbar puncture revealed a white blood cell count of 24/μL (normal: 0--5 cells/μL), a red blood cell count of 10/μL (normal: 0--5 cells/μL), a glucose concentration of 58 mg/dL (normal: 40--70 mg/dL), and a protein concentration of 81 mg/dL (normal: 15--45 mg/dL). An electroencephalogram demonstrated generalized slowing. Magnetic resonance imaging of the brain was interpreted with a high T2 signal in the hypothalamus and bilateral mesial temporal lobes.

The patient remained febrile and hyponatremic (range: 119--125 mmol/L) with declining mental status. On the fifth day of hospitalization, the patient was intubated, and twitching on his right side was noted. On day six, he was unresponsive and had near-constant myoclonic activity. On the 11th day, a computerized tomography scan of the head showed sulcal effacement and diffuse cerebral edema. The patient remained comatose and intermittently febrile. Despite aggressive critical care management, the patient died on the 14th hospital day.

At autopsy, histopathologic evaluation showed severe meningoencephalitis involving the cortex and white matter of the cerebral hemispheres, deep gray nuclei, cerebellum, and spinal cord. Brain tissue submitted to a research laboratory was positive by polymerase chain reaction (PCR) for *Naegleria*.

The possibility of rabies was discussed briefly during hospitalization but was discarded from further consideration on the basis of a review of the history and clinical signs and symptoms. A brain biopsy was planned but was canceled because of hemodynamic instability. Initial microscopic examination of brain tissue did not detect any inclusions suggestive of viral

Inside this issue:

The Rabies Reporter, a scientific newsletter about current issues in rabies research and control, is a joint effort of the Rabies Research Unit of the Ontario Ministry of Natural Resources; the Rabies Laboratory at the Animal Diseases Research Institute of the Canadian Food Inspection Agency; the Ontario Ministry of Health; and the Geographic Information Systems Laboratory at Queens University, Kingston. Articles for future issues will be welcomed by the editor. The Rabies Reporter is not refereed, and should not be cited in papers intended for refereed journals. Send contributions, letters and inquiries to:

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infection.

Tissues were forwarded to CDC for pathologic evaluation for *Naegleria*. Immunohistochemical (IHC) assays for various amoebae, including *Naegleria fowleri*, were negative. However, abundant intracytoplasmic inclusions of neurons in several areas of the brain suggested a diagnosis of rabies. The diagnosis was confirmed by IHC stains for rabies virus. Further testing, including both indirect and direct fluorescent antibody tests and reverse transcriptase-PCR of fixed brain tissue, supported the diagnosis of rabies. Nucleotide sequence analysis and antigenic typing with monoclonal antibodies on frozen brain tissue indicated that the specific etiologic agent was a southeastern raccoon rabies virus variant. Genetic sequence analysis indicated 100% homology with a raccoon rabies virus variant from Virginia.

Approximately 125 family members and friends and 173 health-care workers were questioned retrospectively about direct unprotected exposures to the patient's secretions and tissues. After detailed investigation, five family members and three hospital employees received postexposure prophylaxis for potential exposure to patient secretions.

The patient was an office worker who for the previous 6 years had lived, worked, and recreated in areas in which raccoon rabies was endemic. However, extensive interviews with family, friends, and co-workers revealed that he had no specific exposure to terrestrial animals likely to be infected with the raccoon rabies virus variant. The patient did not spend much time outdoors, but the potential existed for encountering a rabid mammal while camping or in a trash can, wood pile, or other outdoor environment.

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Editorial Note:

Approximately 7,000--9,000 cases of animal rabies are diagnosed annually in the United States (1). This report describes the first documented case of human rabies associated with a raccoon rabies virus variant. Of the 37 human rabies cases reported in the United States since 1990, no history of suspicious animal bite exposure was documented for 28 of the 30 cases presumed to be acquired in the United States. With the isolation of raccoon rabies virus from this patient, human cases have been associated with all of the major reservoirs and vectors of the disease in the United States, including dogs, cats, bats, foxes, skunks, coyotes, and bobcats. Human rabies cases without a definitive history of animal exposure are associated commonly with bat rabies viruses (2). Challenges to implicating an animal source readily can include failure to seek medical care for perceived minor lesions, non-recognition of the actual exposure event, communication (i.e., language) barriers, and recall bias from memory loss or impaired speech in encephalitic patients. Incubation periods range typically from 1 to 3 months after exposure but in rare cases can exceed 1 year in duration, further complicating collection of an adequate history.

During the late 1970s, rabid raccoons were identified in Virginia and West Virginia after probable translocation of infected animals from the southeastern United States. Raccoon rabies spread throughout the region, with approximately 50,000 rabid raccoons diagnosed to date. During 2003, Tennessee became the twentieth affected state, and the enzootic area now stretches from eastern Canada to Florida (3).

Rabies should be considered in the differential diagnosis of any acute, rapidly progressive encephalitis, regardless of documented history of animal bite. Prompt ante- or postmortem diagnosis is necessary for accurate reporting of human rabies to public health officials and implementation of appropriate infection-control measures, including prompt administration of prophylaxis to exposed persons.

The Advisory Committee on Immunization Practices publishes guidelines for human rabies prevention (4), and recommendations have been published for the management of suspected cases (5). Human rabies postexposure prophylaxis is effective when administered promptly and properly. Human-to-human transmission is a concern, but no cases among health-care workers exposed to a rabies patient have been reported (6,7). In the case described in this report, careful risk assessment based on identifiable contact with the patient's secretions limited the number of persons receiving prophylaxis. Emergency medicine physicians, infectious-disease consultants, and state and national public health officials can provide advice on rabies prophylaxis for complicated or unusual exposure scenarios to prevent this fatal disease and aid in its diagnosis.

Acknowledgments

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RABIES IN ONTARIO DURING THE SECOND QUARTER

From April to June 2003, there was little change in the incidence of rabies in any region of Ontario. Fox and raccoon rabies persisted at relatively low levels while bat rabies may be headed for another record year.

The fox strain of rabies was the least common strain with only five rabid skunks and one rabid cow in the entire southwestern region. The five skunk cases were scattered throughout the counties of Grey, Bruce, and Huron while the cow occurred in Dufferin county. There were no cases in northern Ontario during this quarter. It appears that the outbreak which was evident in 2001 and 2002 has subsided with the last case occurring in January 2003.

The clusters of raccoon rabies which existed during the first quarter of 2003 continued throughout the second quarter with nine more rabid raccoons. All of these cases were confined to areas which had been treated with TVR or PIC during 2002. The areas surrounding these cases will be treated during 2003 with either TVR or PIC. Beginning in late August, baits will also be distributed throughout most of eastern Ontario to help contain this cluster of cases.

The number of rabid bats began to escalate during the second quarter with the addition of 14 new cases scattered throughout most of Ontario. This brings the total for 2003 to 19. During the first two quarters of 2002, there were only 11 rabid bats. As you may recall, there were more rabid bats in 2002 (total of 84) than in any other year. Since 1988, when the rabies cases were first typed according to strain, there has been an average of 34 rabid bats per year. Figure 1 illustrates the number of rabid bats per year since strain-typing began.

Normally, the number of rabid bats peaks during the third quarter. With 19 so far in 2003, this could be another record setting year.

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BATS AND RABIES

Human rabies now ranks among North America=s rarest diseases (about two cases annually), thanks primarily to the success of mandatory dog and cat vaccination programs. Unlike the rest of the world, where over 95% of human rabies comes from dog bites, in the United States and Canada, the few remaining cases come mostly from wildlife, especially bats.

While prevention relies primarily on pet vaccination and aerial baiting programs, it is of course appropriate to warn people to consider any animal bite as a potential rabies exposure that requires prompt medical evaluation and possible vaccination. It is also reasonable to exclude bats from entering human living quarters, though this need not imply that bats cannot be valued guests in outer walls, attics, or bat houses. Also, unfamiliar animals, including bats, should never be handled.

There are no grounds for singling

out bats as uniquely dangerous, when overall mortality statistics confirm that more humans die annually from dog attacks, bee stings, or collisions with deer than die in a decade from bat-transmitted rabies. Even rabid bats seldom become aggressive, typically biting only in self defense if handled. Human cases, attributed to bat rabies variants, are often reported as having no known bite history, but this can be highly misleading, since many diagnoses are post-mortem or too late to permit coherent patient interviews. A high proportion appear to have bite histories, as recognized by friends and relatives, but these are included in the Ano confirmed bite history@ category in medical reporting. This, of course, implies that rabid bats are somehow biting humans without detection. Although undetected bites during sleep or intoxication are possible, they are extremely rare, as demonstrated by the rarity of human rabies. Bat researchers agree that the vast majority of bat bites are easily felt and recognized at the time. Most transmission to humans appears to result from failure to seek medical attention for detected bites, not from failure to recognize bites.

Since bats play essential roles in maintaining the balance of nature and human agricultural interests, bat researchers and conservationists are deeply concerned when the public is misled into needlessly exaggerated fear of bats. Most damaging are reports stating that bats are the primary source of human rabies in America without noting the rarity of the disease or putting the risk in perspective. Fears are needlessly exacerbated by claims that most cases have no bite history, implying that bats sneak up and bite undetected, or perhaps even spread the disease through the air.

Common sense says we simply should avoid handling bats, just as we understand not to kick beehives or approach unfamiliar dogs. As demonstrated in Austin, Texas, there is no need to fear bats, and we can benefit greatly from living in harmony with them. The 1.5 million bats that live under Austin=s Congress Avenue Bridge, attract thousands of tourists nightly, eat some 30,000 pounds of insects nightly, bring in eight million tourist dollars annually, and in 20 years of close association have never attacked anyone or caused a single case of human rabies.

For additional information on bats and public health issues or how and when to evict bats from buildings go to: **www.batcon.org**.

Merlin Tuttle
Founder
Bat Conservation International

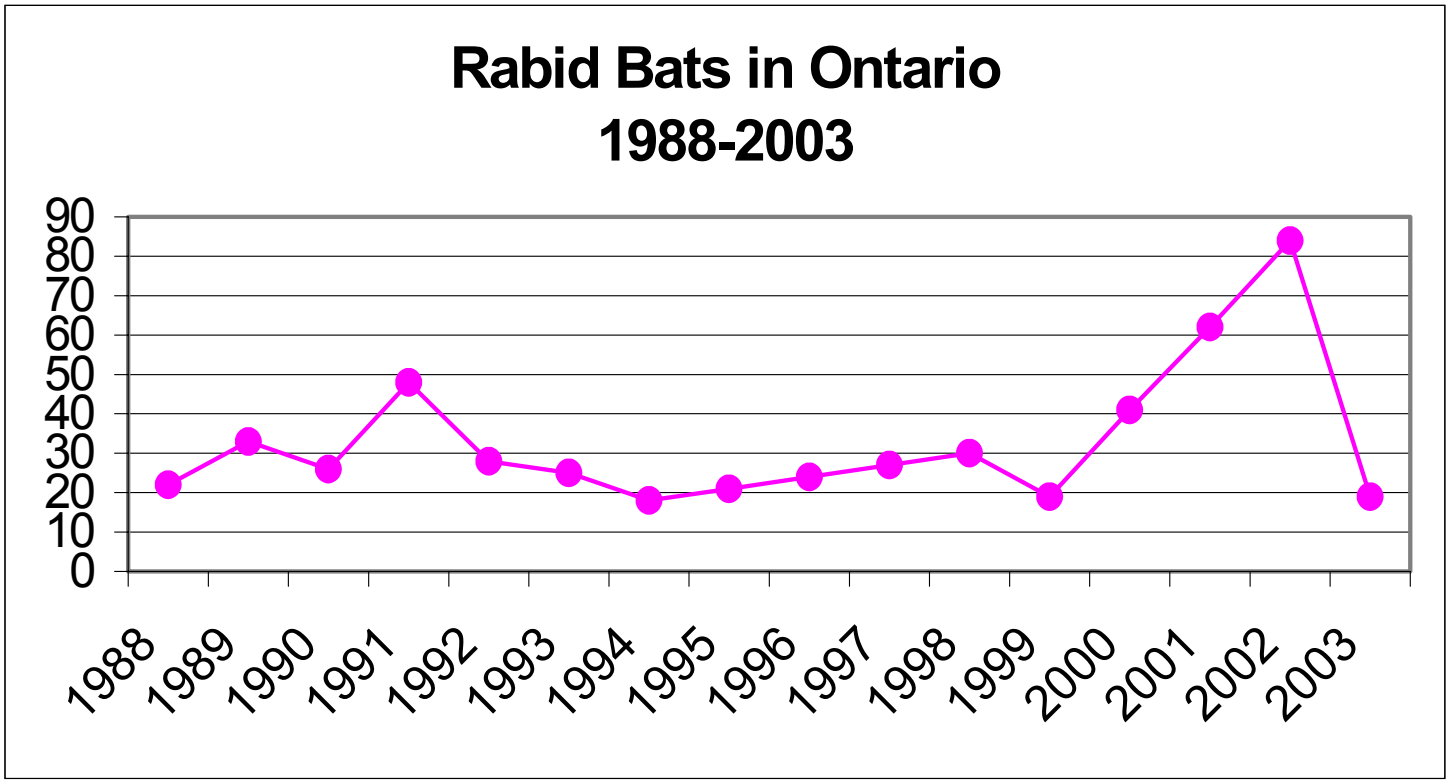

Figure 1. Numbers of rabid bats in Ontario since 1988 when rabies cases were first identified to strain.
** The 2003 data includes cases for the first two quarters only. All other years show yearly totals.*

DECIDING WHEN TO ADMINISTER POST-EXPOSURE RABIES PROPHYLAXIS

Frequently, doctors and medical officers of health are required to decide whether or not it is necessary to administer post-exposure rabies prophylaxis (PEP). This is a very important decision in the patient=s care. If a patient is exposed to a rabid animal and is not given the proper medical treatment, they will die. However, PEP is costly to administer (over $1000/person) so administering it without sufficient cause can be a burden to the healthcare system.

Several factors are used to determine whether or not PEP is necessary. Is the animal available for rabies testing? Was there sufficient contact with the animal to constitute an actual exposure to the animal? Is the patient able to tell you whether there was an exposure?

Figure 2 shows the number of people who have received PEP compared to the numbers of rabies cases in Ontario since 1958. Although the number of rabies cases per year has significantly decreased since the implementation of aerial baiting, the number of people receiving PEP has not decreased correspondingly. Some important factors contributing to this are media, public education, and animals which are not available

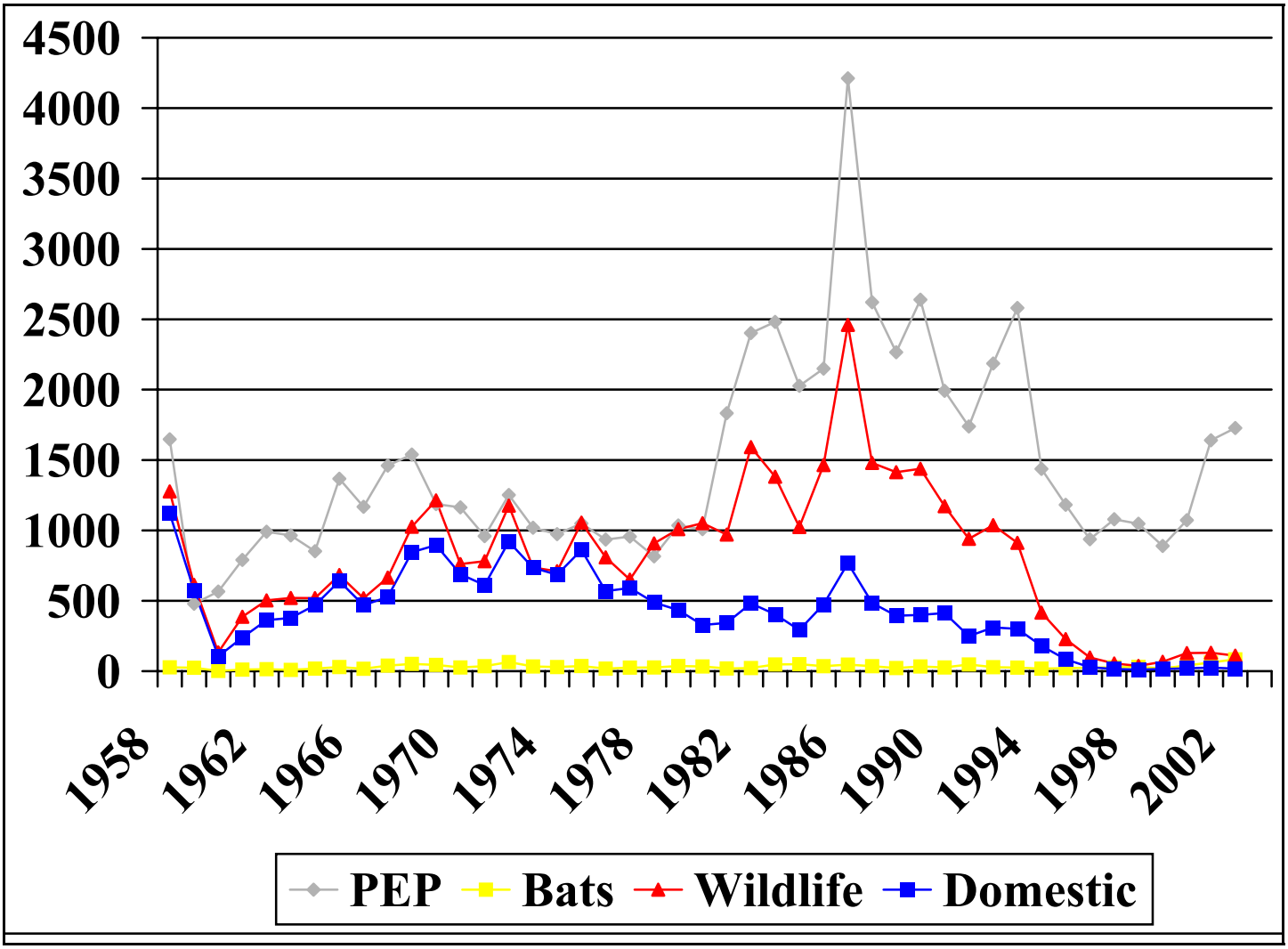

Figure 2. Number of post-exposure prophylaxis (PEP) in Ontario compared to the numbers of rabies cases.

for testing.

Before aerial baiting, rabies was very common throughout Ontario and received minimal media coverage. As the incidence of rabies has decreased, the amount of media coverage for each new case has increased. A single rabid bat can now be responsible for headline news!

In conjunction with the aerial baiting program, there has been increased efforts to educate the public to seek medical attention when exposed to wild animals or animals which are behaving abnormally (which can be indicative of rabies). Even though rabies levels are now very low, if a person is exposed to an animal which flees after the exposure, doctors frequently have to assume that the animal could have been rabid. Bats, stray animals, and wild animals frequently escape without being captured.

The chart on the following page provides a guideline on when PEP should or should not be administered. There are also several other factors which must be considered when deciding whether or not to administer PEP.

In many cases, domestic animals and livestock can be quarantined for 10 days. If the animal does not develop symptoms of rabies during this time, PET is not necessary. (The rabies virus can only be transmitted for a very short period of time before the animal develops symptoms of rabies.) In some cases, the owner may be willing to sacrifice the animal to have it tested for rabies. If the fluorescent antibody test (FAT) result is negative, PEP is not necessary.

The type of contact with a potentially rabid animal is also important. The saliva of a rabid animal must come into contact with you through lesions (such as bites or scratches) or mucous membranes. Exposure to the blood, urine or feces of a rabid animal does not constitute exposure to the animal. Petting an animal also does not constitute exposure unless the fur has wet saliva on it and you have an open wound on your hand. The rabies virus is quickly killed when saliva has dried or a carcass has become dehydrated. However, if handling a dehydrated carcass, you should still wear gloves as it may be possible to acquire other diseases or parasites from it.

With continued public education and rabies control programs, the need for PEP will hopefully decline.

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RACCOON RABIES COLLOQUIUM SUMMARY - JUNE 2003

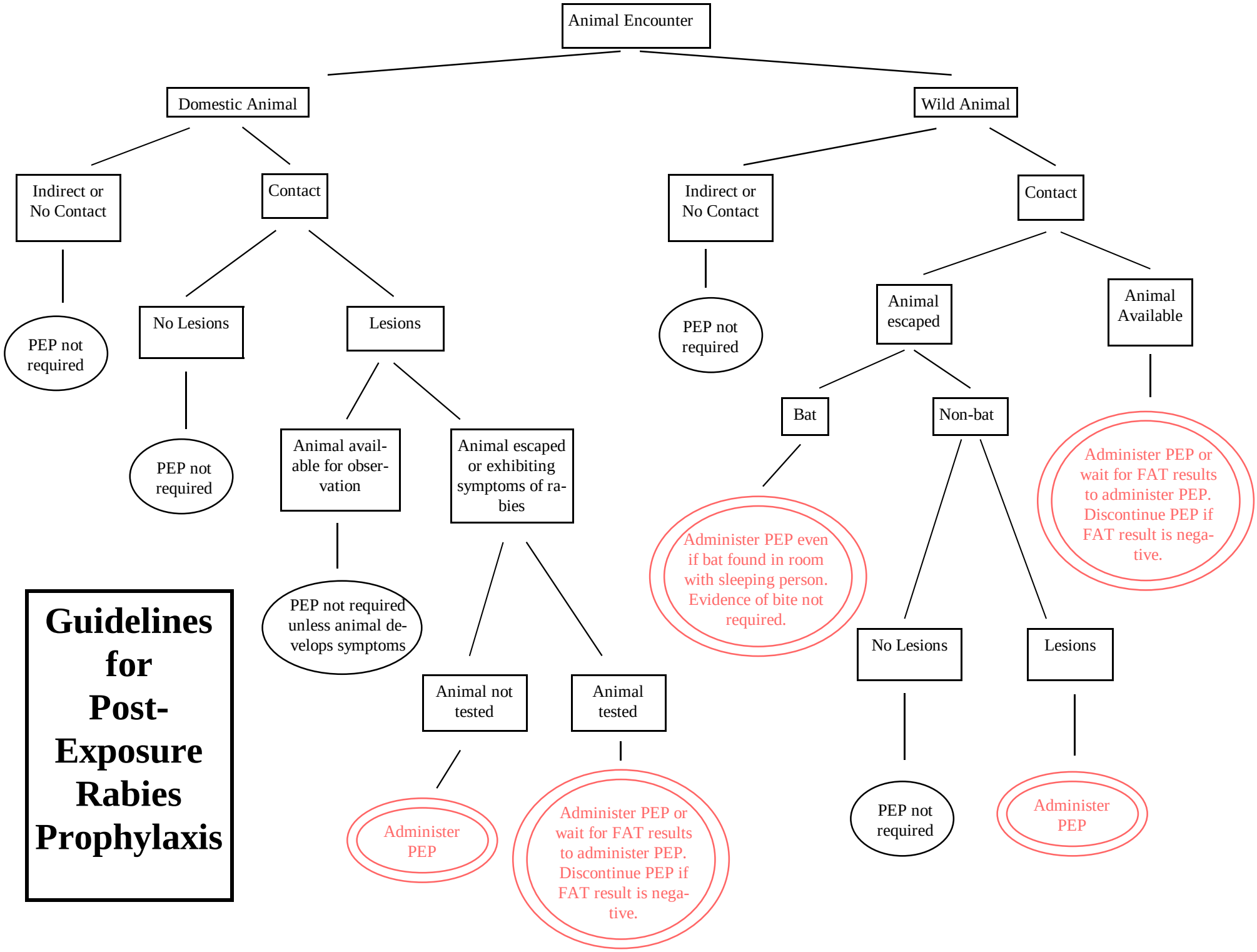
First, I would like to thank the Ministry of Natural Resources and in particular Dennis Donovan and the Rabies Research and Development Unit for bringing us all together for this fascinating review of raccoon rabies. This has been an excellent program.

In the morning, we focused first on the history of raccoon rabies and control and rehabilitation issues. We then looked at the implications for the province from not only the federal perspective, but that of the first nations and the municipalities as well.

After lunch, we heard about the science of new epidemiological approaches, of modelling and vaccine development. The day was a stimulating experience which will allow those of us involved in raccoon rabies control to focus more clearly on reaching the goals we have set for that control and give a wider knowledge of raccoon rabies control to all interested parties. Certainly I know that RAC, the Rabies Advisory Committee, will have gained much from this colloquium.

We started the morning with a wonderful summary of the history of raccoon rabies from Dave Johnston. His long time knowledge and experience with rabies has provided a fount of knowledge for us and today, he showed us the route of spread of raccoon rabies from its origins in Florida in the 1940s. The role of humans, who have built bridges and other urban development facilitating raccoon movement as well as relocating animals for hunting or "humane" reasons, has been a major factor in the spread northward. Dave also summarized early bait development and the initial control efforts in the U.S. Had officials not dithered over some of the proposed control measures, raccoon rabies might still have not reached Ontario. His talk highlighted the importance of launching control programs early and on the crucial role diagnostics plays in determining where control efforts should be focused.

Dr. Rick Rosatte has been a stalwart in strategies to control rabies, especially his experiments with TVR - the famous trap, vaccinate and release program which he first initiated in Scarborough. Today, he presented a masterly summary of the development of Ontario control programs for raccoon rabies. All of the data from trapping and telemetry for raccoons which allow calculation of density, age and travelling extent and direction are used for program development. Over the years, bait distribution techniques have been refined as


Guidelines for Post-Exposure Rabies Prophylaxis
Animal Encounter
Domestic Animal
Wild Animal
Indirect or No Contact
Contact
Indirect or No Contact
Contact
PEP not required
No Lesions
Lesions
PEP not required
Animal escaped
Animal Available
PEP not required
Bat
Non-bat
Administer PEP or wait for FAT results to administer PEP. Discontinue PEP if FAT result is negative.
Animal available for observation
Animal escaped or exhibiting symptoms of rabies
Administer PEP even if bat found in room with sleeping person. Evidence of bite not required.
No Lesions
Lesions
PEP not required unless animal develops symptoms
Animal not tested
Animal tested
PEP not required
Administer PEP
Administer PEP or wait for FAT results to administer PEP. Discontinue PEP if FAT result is negative.
Administer PEP

data are acquired. Rick described the point infection control (PIC) program which was developed in the early 90s with the help of the raccoon rabies task force and put into action four years ago when the first case of raccoon rabies was identified in Ontario. Using TVR, buffers were placed at Niagara where there has been no penetration and along the St. Lawrence River where raccoon rabies, unfortunately, was first detected. One single effective vaccine for all vector species is Rick's hope for ongoing and effective control programs.

It has been a delight to hear and to meet Mary-Catherine Kuruziak who has provided us with insights into wildlife rehabilitation, an area which many of us, who work from a very different point of view certainly needed to learn about. Her comments on the evolution of wildlife rehabilitation, with the establishment of an organization which became OWREN in the 1980s were fascinating. It was reassuring to hear of the legal requirements in place since 1999. Mary-Catherine's talk enlarged our minds and clarified many of the issues related to rehabilitators and the role they play. She has a vast breadth of knowledge and she and her coworkers are an amazing resource for Ontario. However, as a previous member of the Ministry of Health, I was distressed and saddened to hear of the relative lack of communication between reahabilitators and that ministry. I trust that interaction will be improved in the future. Mary-Catherine indeed gave us an all round understanding of many of the issues she encounters.

Elliot Salsberg, a long time member of RAC and always a great support in the Canadian Food Inspection Agency (CFIA) for the province provided a review of the role of CFIA. This agency is responsible for managing wildlife populations in the province with collaboration from Parks Canada for federal parks and the Ministry of Health for rabies in the human population. Elliot discussed the relevant sections of the Health of Animals Act and outlined the role of the lab, summarizing the diagnostic tests done by CFIA as well as the work done for OMNR on rabies control projects.

Questions from the audience focused on the need for continuing support from CFIA for rabies in the future, an essential for control.

I was thrilled to know that we would have Henry Lickers with us to provide much needed insights into the way First Nations deal with the issues. His commentary has given us a firmer basis for understanding some of the relationships between each of the players and the first nations in control of rabies and environmental issues generally. He presented some of the issues related to the location of Akwesasne which borders on three jurisdictions. There are distinctions in animal control depending on whether an animal is on reserve land (federal) or off (provincial). The public tends to think that releases of wildlife on reserve land is somehow beneficial, magically, to the animals. In this context, there is a need for vigilance and understanding within the reserve to prevent disasters. Henry spoke of the long-time work at Akwesasne where there has been a Department of the Environment for 25 years. He issued a plea that there should be more recognition of the work done within rabies control on reserves. Henry then introduced Mike Francis, conservation officer on the reserve. Mike showed us much of the work being done on the reserve, including TVR programs and aerial baiting. Together Henry and Mike opened the boundaries to an area which, sadly, we often seem to neglect.

In Ontario, we have not yet had to deal with the major municipal impacts of an outbreak of raccoon rabies. "What will happen if ..." is a frequent thought for comment and discussion when we suspect that rabies is spreading. Dan Parmer provided some fascinating insights into how the legislation now used in Cook County, Illinois, would be of major benefit in the event of an urban outbreak of raccoon rabies. Their model includes a tag requirement for all domestic animals vaccinated against rabies, a certificate showing this is required to be entered into a central data base. Would that we had such a database in Ontario! In Cook County, some of the jurisdictional problems are dealt with by separation of animal health and rabies control from public health for humans. The program in Cook County generates its own funds for administration, research, and neuter/spay programs. We, in Ontario, would do well to look at their programs for cities like Toronto with its raccoon population which wanders not only at night but also in the day.

When we heard that Chris Kyle would be involved in DNA research on raccoons, RAC members were delighted. The scientific information that he has presented this afternoon should thrill each one of us as we begin to expand the epidemiological boundaries even further. A new project was funded last November which will ask a number of questions. This collaborative project will attempt to fill many knowledge gaps and luckily Ontario provides a good model system. Questions include: is the virus spread based on gene flow in populations? - are there different raccoon strains in different populations? - where are the rabies cases coming from? - do the migrants come from New York (into the St. Lawrence area) or are they coming from other areas? - is there a genetic predisposition to disease?

Currently, samples are being obtained from across North America. They will be submitted to many different types of genotyping and sequencing including the new

"TaqMan" technology. There will be many partnerships in this major and exciting project. More samples are needed but processing of 15,000 samples has already started. The project will help us refine control techniques and we look forward to results which will lead to major advances.

As we have looked at the scientific considerations, Kim Knowles has just brought us up to date on major developments in this very important field. She has clearly and succinctly described old and new rabies vaccines and the basis for immunizing wildlife against rabies - this is to reduce both livestock and human rabies exposure. Kim then described what vaccines are, how they protect both animals and humans and the desirable characteristics of the ideal vaccine for wildlife. Today we use traditional live attenuated vaccines in oral baits and inactivated virus vaccines for domestic animals. Kim then discussed different vectors used to present the rabies glycoprotein to the immune system and their advantages. Finally, Kim showed us the factors influencing success of wildlife vaccination programs and introduced potential vaccines for the future and the research need for their development and improvement.

Finally in the afternoon session, we looked at modelling and GIS. These have been crucial as the rabies control program has developed. We are very grateful to Dave Ball and to Queen's University for all the work they have done. We certainly appreciate Dave's approach today with an overall look at rabies control programs and for which ones geographical spatial programs can be used. First, he looked at flight planning, control and management - flight lines are described as tooth brushes or hockey sticks! New software has improved flight control and documentation and analysis. Dave showed some of the monitoring data which are available on the website. Looking at the modelling programs, data from disease outbreak behaviour have been correlated to identify different areas or rabies units where the disease acts similarly. These are particularly for fox rabies so far. For raccoon rabies, a recent study has shown that the typical incubation period is about five weeks but could be much longer, and the rate of spread is about five kilometres for each case. Dave then described studies in bait density. Costs of baits exceed the cost of flying the plane so reducing the number of baits will provide significant savings. He showed the fallacy of looking just at average numbers for baits eaten. Finally, he discussed the Ontario rabies raccoon model and its major characteristics. Three major parameters for control are isolation, the contact rate and a reduction in the numbers of potentially exposed animals. Again, average numbers can fail to reveal the true picture and we will need a watching brief on these data as raccoon rabies control proceeds. Overall, Dave's presentation showed the amazing amount of work being done within the Queen's University GIS lab to support rabies control programs in Ontario.

We had an amazing day, filled with wonderful information, anecdotes, facts which will help us as we continue to work to control rabies, in particular in raccoons. But of especial interest were presentations made to Chris Nunan as he retires from his long and very productive work with MNR.

As chair of RAC, I would like at this time to thank Chris for all the organization, support and general encouragement he has provided to RAC over the years. Thank you, Chris.

Finally - that's not all - we still had the two key note speakers to come, Peter Buck and Dennis Slate. They expanded our horizons to include not only national issues but the world beyond Canada.

Peter Buck who works for the Bureau of Infectious Diseases in the Population and Public Health Branch at Health Canada talked about the Canadian Rabies Working Group - Raccoon Variant. This group brings together those working in the area of rabies from across the country. Peter talked about some of the funding pressures the working group is experiencing and the importance of developing a national rabies contingency plan as soon as possible. The national perspective is crucial in containing the spread of raccoon rabies.

Dennis Slate represented the United States Department of Agriculture (USDA), APHIS Wildlife Services. He gave a masterly summary of the containment programs underway in the US and the possibilities for the future. Of concern and importance was the recent recognition of a fatal case of rabies in a person from Virginia due to the raccoon variant. Dennis stressed the importance of oral vaccination of wildlife as the only method available where rabies can be controlled in a geographic area.

Together these two last speakers rounded out a superb day.

Dr. Jacqueline Carlson
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Animal Rabies Report: April to June 2003

Animal Type	Fox			Raccoon			Skunk			Other Wildlife			Bat			Dog			Cat			Livestock			Totals		
County or Region	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		03	02		03	02		03	02		03	02		03	02		03	02		03	02		03	02		03	02
Eastern																											
Stormont, Dundas & Glengarry																									0	0	0
Prescott																									0	0	0
Russell																									0	0	0
Ottawa-Carleton													3	3	1										3	3	1
Renfrew															1										0	0	1
Lanark																									0	0	0
Leeds and Grenville				9	16	9							2	2											11	18	9
Frontenac														1	1										0	1	1
Lennox & Addington													1	1											1	1	0
Central																											
Hastings													1	1											1	1	0
Prince Edward																									0	0	0
Northumberland																									0	0	0
Victoria																									0	0	0
Haliburton																									0	0	0
Peterborough														1	1										0	1	1
Durham															2										0	0	2
York Region													1	1	1										1	1	1
Toronto																									0	0	0
Simcoe															1										0	0	1

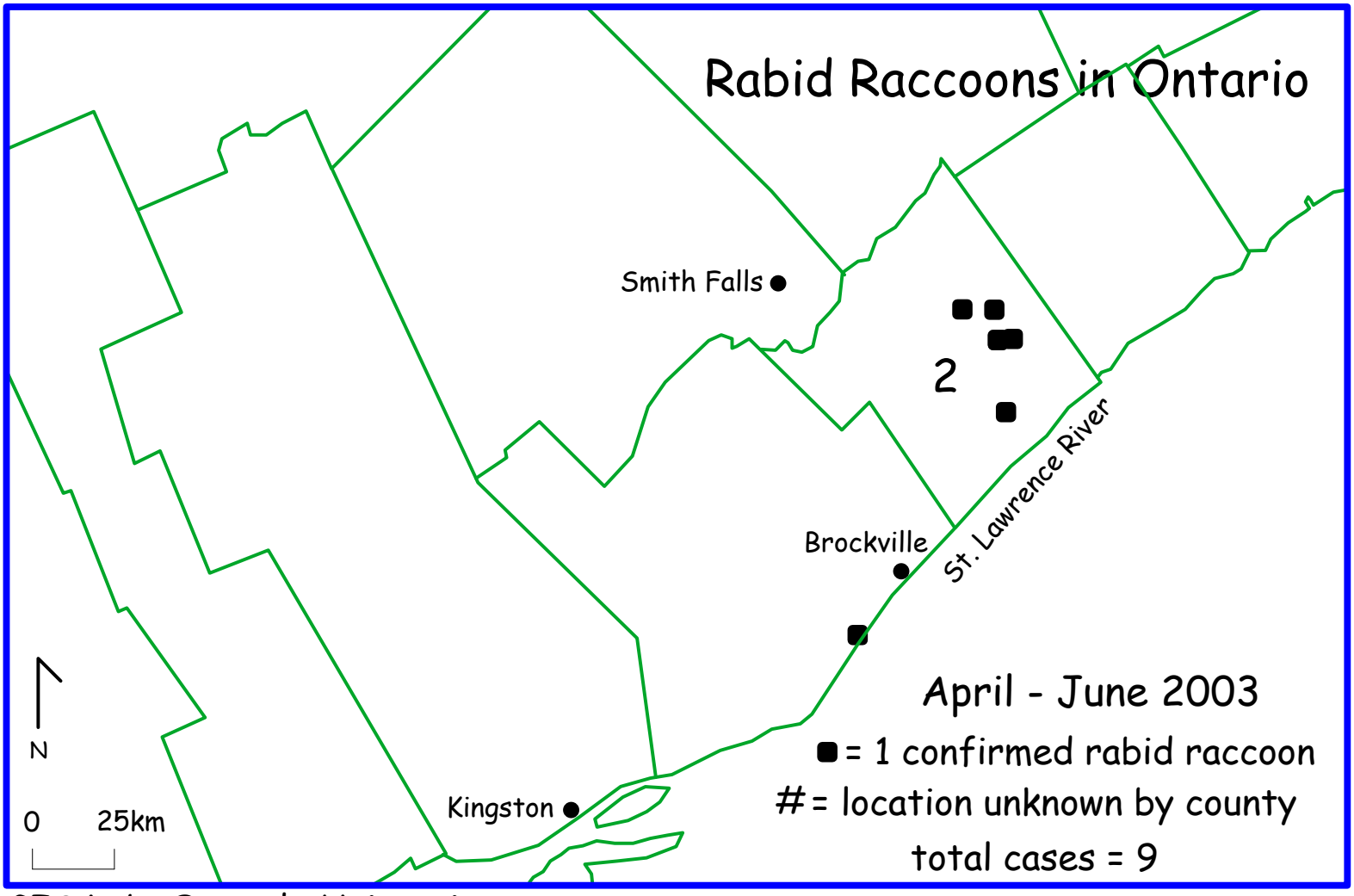
Animal Rabies Report: April to June 2003

Animal Type	Fox			Raccoon			Skunk			Other Wildlife			Bat			Dog			Cat			Livestock			Totals		
County or Region	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		03	02		03	02		03	02		03	02		03	02		03	02		03	02		03	02		03	02
Western																											
Peel																									0	0	0
Halton																									0	0	0
Dufferin									2													1	1		1	1	2
Wellington									6				2	4	2						1		1	1	2	5	10
Waterloo									1				1	1											1	1	1
Perth																					1				0	0	1
Grey							2	3	4														1		2	4	4
Bruce							2	3	10														2		2	5	10
Huron							1	2	4																1	2	4
Southern																											
Wentworth																									0	0	0
Haldimand-Norfolk																									0	0	0
Brant																									0	0	0
Niagara																									0	0	0
Elgin															1										0	0	1
Oxford																									0	0	0
Middlesex																									0	0	0
Lambton													2	2											2	2	0
Kent													1	2											1	2	0
Essex																									0	0	0

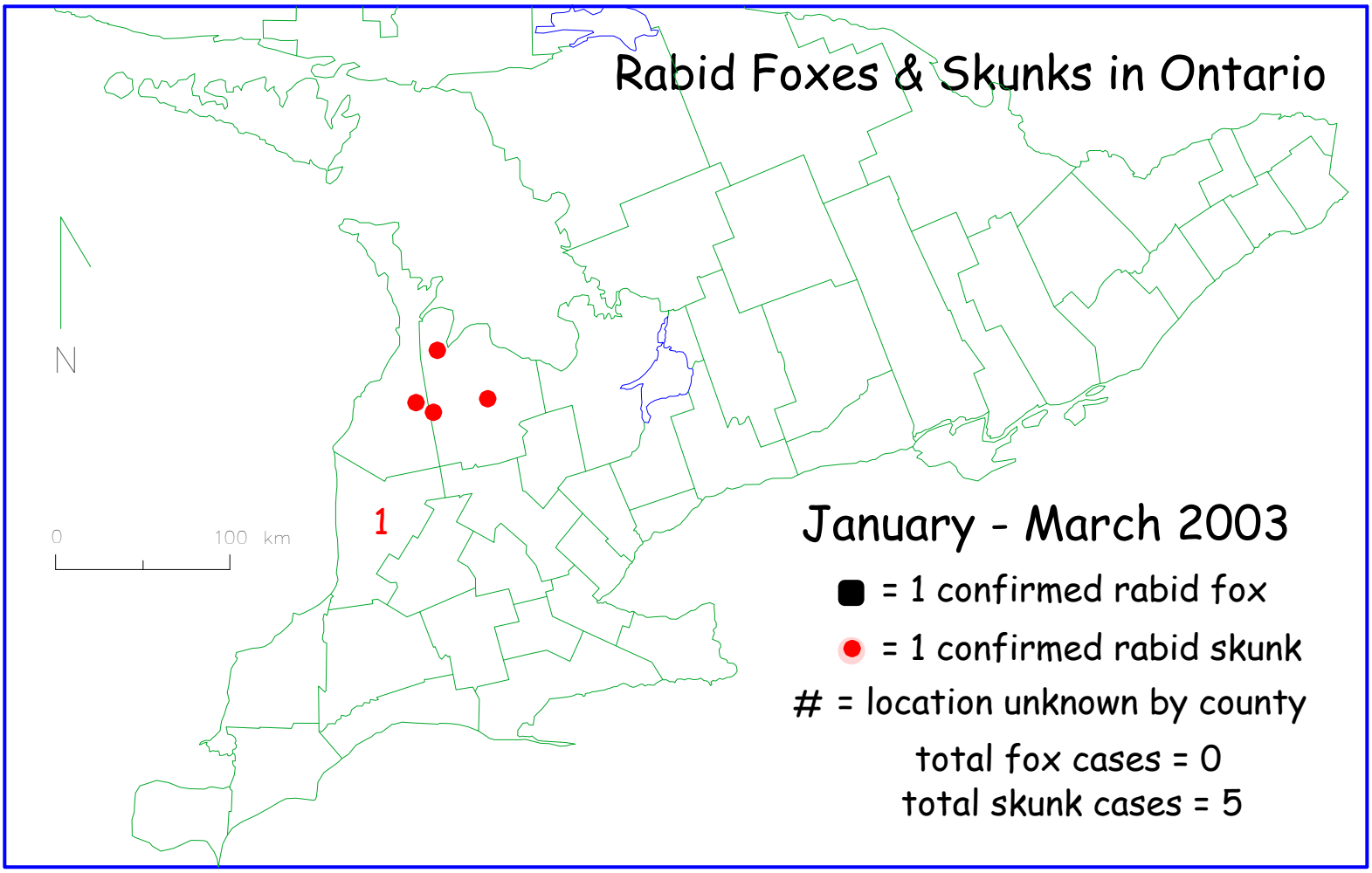
Animal Rabies Report: April to June 2003

Animal Type	Fox			Raccoon			Skunk			Other Wildlife			Bat			Dog			Cat			Livestock			Totals		
County or Region	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		03	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**		**03**	**02**
Northern																											
Muskoka																									0	0	0
Parry Sound																									0	0	0
Nipissing			1																						0	0	1
Sudbury			32			2					1	2						2						3	0	1	41
Cochrane			1																						0	0	1
Timiskaming			3																					1	0	0	4
Algoma																								1	0	0	1
Thunder Bay		1																							0	1	0
Rainy River																									0	0	0
Kenora																									0	0	0
Regional Totals																											
Eastern				9	16	9							6	7	3										**15**	**23**	**12**
Central													2	3	5										**2**	**3**	**5**
Western							5	8	27				3	5	2						2	1	5	1	**9**	**18**	**32**
Southern													3	4	1										**3**	**4**	**1**
Northern		1	37			2					1	2						2						5	**0**	**2**	**48**
TOTALS	**0**	**1**	**37**	**9**	**16**	**11**	**5**	**8**	**27**	**0**	**1**	**2**	**14**	**19**	**11**	**0**	**0**	**2**	**0**	**0**	**2**	**1**	**5**	**6**	**29**	**50**	**98**

Notes for this quarter: All bats were big brown bats.
The livestock in Dufferin was a bovine.



GIS Lab, Queen's University
Data Source: Ontario Laboratory - Fallowfield (CFIA)



GIS Lab, Queen's University

Data Source: Ontario Laboratory-Fallowfield (CFIA)