

The Rabies Reporter

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RABIES IN ONTARIO DURING THE THIRD QUARTER

So far, so good, this year, but the picture is neither very optimistic nor bad enough to cause worry. The favorable side is that the total case load for the year is running at just over half (55%) of last year's record low rate. The down side is that there were scattered cases of rabies all over southern Ontario, except in the east (but see what happened in November).

One very positive feature of the recent quarter is that 17/51 (33%) of all the cases were in bats. Considering that bats have historically made up only 1-2% of all the rabies cases in Ontario, and the numbers of rabid bats in this quarter were not unusually high, this ratio shows how far numbers of fox-strain rabies cases have dropped. One of these bat cases was potentially very serious. Late in the summer we heard that there had been 3-5 bats per week found dead or sick in various buildings of the Kingston General Hospital. One was finally submitted for rabies diagnosis, and came back positive. Now, the KGH includes several heritage buildings in downtown Kingston, so it would not be surprising to find colonies of big brown, and little brown bats, in the complex. Imagine the surprise when the one submitted bat turned out to be a silver-haired bat!! That species is responsible for over half the recent human deaths to rabies in the U.S.A.,

but it is supposedly a solitary, forest-dwelling bat, not expected to live in a downtown hospital.

Among the scattered rabies cases were the first two in several years in any of the Metro Toronto health units, a rabid kitten (fox strain virus) in Scarborough and a rabid fox in Toronto. Of the 13 fox cases, 5 were near Tobermory on the tip of the Bruce Peninsula. We did not drop baits on the peninsula in 1994 or 1995, believing that if we baited across the base, and there was no rabies on the peninsula, baits were unnecessary. We definitely baited the whole peninsula in 1996, including using 30 baits/km² instead of the normal 20 on the northernmost 25 km of the area.

There were two points of concern during the months leading up to the September bait drop. The first was to locate rabies hot spots in southern Ontario, with the possibility of altering baiting plans if needed. That brought good news. You may remember in the last issue there was a cluster of rabid skunks in the vicinity of Havelock, and a rabid fox near Lakefield. That was too close to the eastern Ontario boundary for comfort. However, there were no new cases in Peterborough County during the summer quarter. Unfortunately, two more rabid skunks turned up near Havelock in October.

The second area of concern was in the north. During the second quarter there were several rabid foxes from Moosonee south almost to Cochrane. However, the fox rabies had not reached the agricultural lands around Cochrane. During the summer we learned of a cluster of rabid cattle, plus one fox in farming country in northern Quebec, due east of Cochrane. On the map this farmland was a fairly isolated island surrounded by forest, but there were highways

linking it to other farm areas, including two in Ontario. We debated putting 100,000 baits in northern Quebec, but, with two weeks to go, decided not to. There were two major reasons: First, when I checked with the Agriculture and AgriFood Canada office in Rouyn, I was told that there had been no new cases during the summer. Second, we felt it was too short notice to get all the public advisories in place, in Quebec, before the baits were dropped.

Altogether, it was a good quarter, with rabies cases dropping off at a satisfactory rate.

This issue of Rabies Reporter is late! You can blame a combination of government cutbacks and the Murphy's Law which states "To err is human, too really foul it up takes a computer". The problem started with a new computer system in Ottawa. Our normal contact for the AgCan data was unable to download the data, and his consulting "expert" has been reassigned to other duties as the staff shrinks. We hope to do better for year-end.

*Charlie MacInnes
OMNR Rabies Unit
Maple*

A RABID SKUNK IN EASTERN ONTARIO

On 20 November 1996, a rabid skunk, confirmed to have the fox strain of virus, was encountered near Renfrew, in the upper Ottawa Valley. This is bad news, being the first case of fox-strain rabies in the whole of the eastern Ontario treated area since March 1995, and the first rabid skunk since March, 1994. It is too early to assess the significance: hopefully this is only an isolated case. However,

Renfrew is an area where several of the big eastern Ontario rabies outbreaks began, in past years. Also, the fox rabies cases in Quebec in 1994, which stimulated the baiting operation in Quebec in 1995, were less than 15 km from this rabid skunk. We will certainly watch the area carefully for the next 9 months, and we hope all Ag Can, Health Unit and Natural Resources staff in the Ottawa Valley will be extra vigilant in finding and reporting rabies cases.

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BAITING OPERATIONS IN NEW YORK - 1996

The Ontario Ministry of Natural Resources helped the Cornell University program to combat raccoon rabies again this year. The Cornell program is a cooperative effort, involving funding from New York State, and from at least four County legislatures. In addition to supplying almost 50 hours of flying, Ontario gave \$125,000 to buy baits. This is much in Ontario's best interest, since two of the actual bait areas are designed to stop the progression of raccoon rabies towards our border. Also, we hope that other states will join the program, and we can actually begin the complete elimination of the mid-Atlantic raccoon rabies outbreak.

There were three baiting areas shown in Figure 1. In Niagara County the area was the same as last year, except for the addition of Grand Island (actually in Erie County). Grand Island did not yet have raccoon rabies, but it was a major part of the unbaited part of the New York side of the Niagara River, and it is excellent raccoon habitat. The area in northeastern New York was larger than last year, but the expansion was in Jefferson and Lewis Counties, and there were no baits

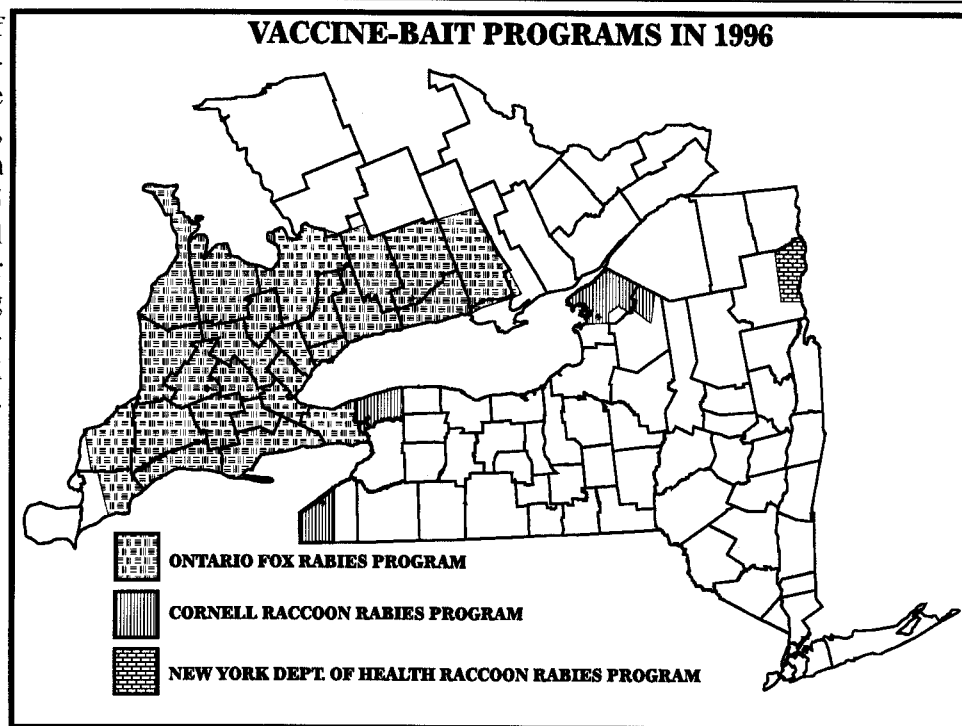


Figure 1. Map of the areas baited in September and October 1996. Note the careful positioning of the Cornell Program areas to offer maximum protection to Ontario. The large gap between the easternmost Cornell area and the NYDH program is occupied by the Adirondack Mountains. Raccoon rabies has so far failed to penetrate the mountain area.

dropped in St. Lawrence County. A new baiting area was added in Chautauqua County. It is easy to see how the first two areas benefit Ontario. The Chautauqua County baiting is the start of an attempt to prevent raccoon rabies from reaching the low-lying Lake Erie plains in Ohio. People familiar with that region feel that raccoon rabies will be able to spread rapidly westward on that plain, thereby threatening Ohio, Indiana, Michigan, and, ultimately, Ontario in the areas of Windsor and Sault Ste. Marie.

The New York drops took place 12-16 September, significantly earlier than last year's efforts. We lost 2.5 days to rain, but the job was completed promptly, except for one hitch. Mis-communication between Rhone-Merieux and Cornell resulted in a shortage of baits for the Watertown area. That drop was completed on 30 September, during the Ontario operations.

Aircraft involved were C-FOPG and C-FOPJ. Pilots were Neil Ayers,

Eldon Germain, Bill Turcotte and Roy Vinall, with engineers Berj Sallian and Bob Everard, and Pat Boudreau on avionics and flightwatch. Rabies Unit crew included Bev Stevenson, Peter Bachmann, Andrew Silver, Kathryn MacDonald and Charlie MacInnes. The Cornell crew almost literally WAS Laura Bigler, who went everywhere and did everything. Then, there were the volunteers, from the Chautauqua, Niagara and Jefferson County Health Departments, the National Guard, and others who heard about the program and wanted to help. Thank you everyone. It went well, despite the rain.

Local participation is very important to the New York program. The various Health Departments handle most of the public relations, and help to collect specimens. In addition, they take charge of putting out baits by hand in built-up areas.

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BAITING OPERATIONS IN ONTARIO - 1996

The Ontario bait drops came off in double-quick time. The teamwork has become very polished over the years, and it really showed this year. The aircraft involved were C-GOGC, C-GOGA AND C-FOPG. We flew from the Stratford and Peterborough municipal airports. I want to thank all the MNR and OFAH staff, plus several volunteers, for all their hard work. The airports staffs at Stratford and Peterborough provided excellent support, and did that cheerfully. Thirty-nine people actually flew, or participated on the ground at the two airports, and several others played essential support roles.

The areas covered are shown on Figure 1, on page 2. Flight lines were 2 km apart, and the target bait density was 20 baits/km². There was no adjustment in bait rates for "off-time", so the achieved density was lower than 20. That left some surplus baits, which were dropped on areas known to have active rabies cases. One such area was the Bruce Peninsula. We have not baited there in 1994 or 1995, reasoning that if we baited across the base of the peninsula, and there were no rabies on the Bruce itself, there was no need to bait. Well, after two years of no rabies cases, there were 5 rabid foxes confirmed in September, all in the vicinity of Tobermory, right up on the north end of the peninsula.

The operations diary read as follows:

September 22 The troops and one aircraft gathered at Stratford for baiter training. The other two aircraft had to overnight in London, because the weather was foul, and London is a full instrument field. The rain poured down on and off all day, really poured!

September 23 First day of operations had superb weather. It was so good that a sick baiter who stretched out on the grass for half an hour came

in with sunburn. Flying went fairly well, barring some bait machine problems. The ARNAV computers, which were supposed to control the bait machines based on input from the GPS system, and log all the data, seemed to be next to useless, and most crews disconnected them. However, despite the teething problems and a couple of aborted flights, we completed eight flights, including most of the experimental areas.

September 24 The day began with falling rain, but the ceiling was high and the visibility looked OK. OGA went out, and completed his flight, but recommended that everyone else stay on the ground. OPG and OGC finally went up at 13:00, but both had to abort their flights because of low ceiling and poor visibility. Finally, at 15:00, everyone got away and completed their flights, but flying was rough because there was strong wind behind the cold front which was the cause of the clearing.

September 25 A fine day, so everyone was ready to go early. By 14:00 third flights were up. The media were happy, too. CKCO (Kitchener) did a live interview in the air during baiting, and the reporter did his signoff in the air, using the aircraft intercom. CFPL (London) flew the second half of that flight, and also were very pleased with what they got.

September 26 A lovely sunrise, and an early start. The forecast was for rain late in the day, but with a little luck we broke the back of Stratford today, and had only one more full day of flying left. No one got to see the lunar eclipse.

The crew worked hard, completing 11 flights, for 8 short of 200,000 baits. The rain held off until after dark.

September 27 A really rainy Friday. No flights at all. Most of the crew went to the matinee of The Music Man.

September 28 The weather was still not great, but we managed to fly six flights after noon. The air cadets from Kitchener came to fly gliders,

but the weather was impossible. One of their instructors gave them all tours of the Twin Otters. Also, the manager off the Festival Inn asked about tundra tires. It turns out he is a radio-controlled model builder, and has a kit for a Twin Otter with 87" wingspan.

September 29 Sunday - last day in Stratford. The weather was excellent, and everything got going early. Six flights to do, of which the last two were to land in Peterborough.

September 30 This was a really fine day. It was so nice that most people were out to the airport at 06:30. By the time I arrived (from home) at 08:10 two planes were in the air, and the third was warming up. Trouble was, my personal computer was the only one still working for uploading flight plans, so the crew had loaded three flights by hand. I was not popular!!

The plan was to work hard in the Peterborough area all day Monday, and then take two planes to Watertown on Tuesday to clean up the remaining flights there. All that changed just before noon when Neil Ayers learned through his connections that Fort Drum had a high level of heavy fire was planned on the base for the rest of the week. A quick change of plans saw three planes in the air for New York at 13:30. That was after all the belts were changed to the rougher surface to handle the fishmeal-polymer baits. There was another surprise in store when we got over there. The new bait shipment was not in trays. The baits were tightly packed, 325 to a small box. It took all of 2 minutes to decide that we could load the belts directly from the boxes. I went up in OPG, with three other Ontario baiters, and Laura Bigler navigating. The four of us in the back sustained rates of 4.0 - 4.8 baits/sec, without ever seeing the belt more than half empty. It can be done! There was a lot of excitement as we competed to see who could load more "sticks" of baits. A stick was the row of 10 baits that ran across the box.

With two hands you could lift them as a unit.

The pilots prudently decided to take two pilots per plane, so we could fly back IFR in the dark. Jean Bilow and her Jefferson County Health crew put on a pizza "snack" when we got back to Watertown, so it was 20:00 before we were back in Peterborough.

October 1 Peter had us up for breakfast at 06:00, and, as predicted, the weather was spectacular. Before noon all coveralls were off, and shorts and short sleeves appeared on most people. This was a big day, with everyone working fast. The only hold-up was OPG waiting for 45 minutes for a news crew to turn up, but even that turned out well.

OK, OK, OGA could have done one more flight, but they had a major maintenance check pending, so they needed to save enough time to get home to Thunder Bay. All the same, it was a great day, with 194,000 baits put out. By the end of the day we could see the end, and we planned for effective use of the surplus baits.

I navigated first flight on OGC, up to Camp Borden and the Barrie area. The arrangements with Borden worked smoothly, and we held up their firing range for less than half an hour. Lake Simcoe was beautiful, and the flying was relatively smooth. Later in the day, as the land heated up, flying got bumpier.

The rest of the day was spent dealing with media. The New VR was out, and both camera and reporter rode on a 1-hour flight. Then The Weather Network came to do a story on the wrap-up of another successful year. They wanted to know if the weather has much influence on us!!

October 2 Gloom at breakfast, it had rained all night. However, when we got out to the motel parking lot in the half-light, the ceiling was high, and there was lots of blue showing. Out at the airport there were some delays, because the Queen's ThinkPad would not turn on, and the two extra flights were not on my computer. When Dave Ball arrived, he managed

to get the computer going, by unplugging the charger. By 08:00 both planes were away, and the last day had begun. The last bait flight was down by 13:00, and the two planes were off to Sudbury, and home, before 15:00, all cleaned up.

A good operation, about 1.2 million baits were put out in Ontario in 10 days, including weather delays and the excursion to New York. Thanks to all members of the team, from grizzled veterans to entirely new members and volunteers. Everyone pulled their weight.

*Charlie MacInnes
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RABIES IN THE AMERICAS: SYNOPSIS OF THE 1996 CONFERENCE

This year's Rabies in the Americas produced some significant new data and new thinking. Actually, there were two conferences, back-to-back. The first was a 2-day symposium entitled "Symposium on Strategy for Oral Rabies Vaccination for Wildlife" held at the Georgia Center for Continuing Education at the University of Georgia in Athens. This meeting was organized by Dr. Victor Nettles, head of the Southeastern Cooperative Wildlife Disease Unit at the university, and Dr. Kent Van Kampen, representing Rhone-Merieux, the company which makes Raboral, the V-RG vaccine for wildlife (in Athens). One major purpose of this meeting was to expose personnel from state wildlife agencies to the pros and cons of oral vaccination.

Dr. Brochier from Belgium gave a summary of the situation in western Europe. By late summer there were only four small foci of fox rabies left, one in Belgium, Luxembourg and A bit of Germany, one in Germany, one along the French-Swiss border, and one in the Tyrol in Austria.

The meeting then heard summaries of all the efforts underway in North America to control rabies, as well as reviews of past and present experimental studies. New to me was a clear description of the bait program in Pinellas County, Florida. This county contains the city of Orlando, plus beaches and about 7,000 acres of wildlife reserves. Most baits were placed by hand in urban settings, while a few were dropped by helicopter where that was practical. rabies is going down, but it is still too early to tell if that is due to the bait program.

Baiting was not the only rabies control measure taken: extensive public awareness campaigns were undertaken to inform the public of the dangers of raccoon rabies, and, of course, to tell them about the bait program. There was also a lot of effort spent on free vaccination clinics for dogs and cats. The barrier trial in Cape Cod is still successful, and the group there have obtained some very interesting experimental results relating to different ways to put out baits according to the suitability of habitat for raccoons. Results of the Texas programs remain very encouraging, with not much new information since the last Rabies reporter.

After the reports of ongoing vaccination programs, there were a series of presentations on the perspectives of a variety of agencies. Finally, there were three workshops which discussed various aspects of organizing, and funding state programs, and the possibilities for a national or international program. Throughout the conference there were repeated references to the fact that states which do not yet have rabies still should be concerned with possible future threats. The prime examples cited were the coyote rabies outbreak in Texas, which might, if unchecked, make its way all the way to Canada in the next 15-20 years, and the problems of dealing with coyote rabies in the mid-Atlantic and north-eastern states. Don't we all wish that could have been dealt with in 1979, before the original focus spread!

There was useful discussion about whether there is public support for rabies control. On the one hand, citizens are wary of high-cost government programs, but in regions affected by rabies, there is strong desire to do something. The irony of this is that the cheapest use of baiting is to prevent rabies from coming in, but that requires support in areas which are not yet affected.

One area of discussion concerned me greatly. There were several people advocating local baiting programs at the county level. That seems a doomed route, based on the experience in Germany. Unless large areas are treated in a coordinated manner, the chances of rabies surviving and re-invading are considerable. That leads me to predict that local programs would have to continue almost forever, and eventually the expense would turn off the whole effort. I am not saying that efforts favored by local geography, such as covered by the Cape Cod (MA) and Pinellas County (FL) programs, will not succeed, but fighting raccoon rabies at the local level all over the eastern U.S. would probably be discouraging.

Opinions were divided on whether it is practical, or even achievable, to try to eliminate the whole raccoon rabies outbreak. A preliminary estimate of \$500,000,000US for elimination was certainly enough to make everyone stop and think! There is no doubt that efforts to prevent further spread will have priority, because the costs are much lower. I believe the costs can be reduced substantially, but we will still be talking of hundreds of millions of dollars. There will be a national framework for wildlife rabies control in the U.S.A. in the near future, as the result of a Task Force headed by CDC. That will be chiefly a policy and responsibility paper. It will not contain detailed plans for rabies control, but rather suggest how such plans might be formed, etc..

The workshops were very useful. The first dealt with organizing programs at the state level, and produced

a useful sharing of ideas from existing efforts. It should be a major stimulus for states thinking of getting into rabies control. The second workshop discussed how to raise the money to support such programs. Again, experiences from existing projects are good lessons for the future. The third session looked at the prospects for national and international programs. Which would be best for the U.S.A., a national, coordinated program, or independent cooperative efforts aimed at each of the major terrestrial rabies situations? Would a national program be obligated to attack every rabies situation, regardless of expert opinions on whether every outbreak could be contained and eliminated? On the other hand, a national set of priorities would be very constructive. Need was identified to name one agency to lead the federal efforts. Just the fact that these subjects were debated represents a major step forward in the U.S.A. Thinking at the national level will be important.

The conference "Advances Towards Rabies Control in the Americas" occupied Monday to Friday, 9-13 December, in the auditorium of the Centers for Disease Control in Atlanta. After the meeting in Mexico a year ago, I had the feeling that perhaps these meetings should occur only every second year, because there was not that much new material presented. This year's conference broke that pattern, as there were several significant advances described.

The first really novel findings were presented by Dr. Bernhard Dietzschold on behalf of several members of the group at Thomas Jefferson University. The subject was a comparison of growth in cell cultures of two variants of rabies isolated from human cases in the U.S.A., plus other forms isolated from mammals. The human isolates were identified as coming from silver-haired bats (SHBRV) and coyote (COSRV), and virus from Thailand dogs (TLDRV) and big brown bats (BRV) was also studied. In neuroblastoma cells,

derived from the nervous system, where rabies virus is best known to occur in infected mammals, all the variants grew similarly. In other cells, including epithelial and fibroblasts, SHBRV grew better, and better at lower temperature than the others. That was even true comparing SHBRV to BRV. That indicates that the greater infectivity of SHBRV has a recognizable basis in its growth characteristics. In conversation after the paper, Dr. Dietzschold indicated that the long-term goal of the work is to produce a scale of comparative infectivity to humans. There is a very long way to go, but this paper represented a good start.

The next two papers after Dietzschold's concerned the discovery and characterization of a new lyssavirus found in Australia in 1996. The whole story is fascinating. It began in southern Queensland in 1995 when several horses and two humans died of a mysterious virus infection. The virus was identified as a new morbillivirus, related to canine distemper. The search began for the normal host of the virus, which was most likely some kind of wild animal. Extensive virus surveys were conducted in a wide variety of species which would not normally be examined. The morbillivirus was found in fruit bats of the family *Pteropidae*. During these surveys, four sick fruit bats were found to have a new encephalitis, which was soon shown to be closely related to rabies. These came from a large area, including New South Wales and Queensland. The virus was first recognized in May, 1966. In November, 1996 a woman who had handled several fruit bats died of an encephalitis which proved to be caused by this same virus. The new virus is close enough to "classic" rabies virus that conventional rabies vaccines protect mice against it. By molecular systematics it lies outside the main cluster of classic rabies viruses, but closer to those than to any of the rabies-related viruses, including the two European Bat Lyssaviruses.

Thus, Australia, which has considered itself rabies-free, found that it had a native virus closely related to rabies. By the way, fruit bats are commonly kept as pets in Australia. They are reported to be very intelligent and friendly. There is a major fruit bat roost in downtown Brisbane, on an island in the river which runs through the city. Also, some of the Australian fruit bats migrate into southeast Asia during the cold season in Australia. This newly discovered virus has probably been in Australia for a long time. Obviously it is not particularly infectious to terrestrial mammals or man, or it would have been recognized before 1996.

Dr. Brochier had already reported in Athens another significant event of 1996.. The first case of rabies in a bat was encountered in Britain. Since some British bats migrate to Europe, it has been surprising that rabies in bats has not been found in Britain until 1996, since cases have occurred regularly in neighboring continental countries.

Dr. Michel Aubert gave a very clear summary of the successful French efforts to eliminate fox rabies. Rabies overall has been reduced by 99.6%, and the only remaining problems are in border areas. One point was of especial interest. In more recent years, the modified-live-virus SAG2 vaccine has been more effective in dealing with the last few rabies cases. Dr. Aubert speculated that this might be because foxes had developed antibody to the vaccinia part of V-RG, and were thus prevented from being boosted against rabies by later bait programs.

There were a number of ideas for new rabies vaccines. The most intriguing of these was the use of DNA as a vaccine. The pioneering work on this was directed at AIDS, but there are also encouraging results with respect to protection against rabies.

One of the highlights of the conference for me was the session on cost-benefit analysis of rabies control. This was organized by Dr. Martin

Meltzer, an economist on the staff of CDC. He presented a first try at an economic model for the control of raccoon rabies, which predicted that such control would not become cost-effective until the cost of baits dropped to about \$1.00US. Some of the inputs to his model need better data, especially on the costs of distributing baits, but the approach, and general structure of the model are intriguing, and should help substantially in the difficult decisions on whether, and how, to control or eliminate raccoon rabies. There were also a few local studies presented which showed the rise in post-exposure treatments levels as raccoon rabies moved in. Real data on this point are finally emerging, but it is much more difficult to assess the frequency and cost of post-exposure treatment in the U.S., because some is done through private insurance, and probably a minority is paid for by governments.

There was also a session on how to reduce the costs of rabies to public health agencies and insurers. Jean Smith of CDC gave an interesting analysis of rabies exposure in the U.S.A., which emphasized the evidence that treatment is probably not warranted in cases of indirect exposure. In fact, during her paper I wrote a note on the margin of my pad to write an article - the one which follows this.

There was a whole session on rabies in bats, included presentations by two bat biologists. The most spectacular of these was an after-dinner presentation by Dr. Merlin Tuttle of Bat Conservation International, entitled "The Wonderful World of Bats". This gave several perspectives on the importance of bats ecologically, the vulnerability of bats to human interference, and the role of BCI as an advocate for bats. There were spectacular low-level radar pictures showing Mexican free-tailed bats moving out from Bracken Cave, near San Antonio, to cover an area of several counties for foraging. Joint studies by bat biologists and economic entomologists showed that this one swarm of

bats consumed major numbers (measured in hundreds of tons!) of migrating moths, which in this case were adults of the major agricultural pest called corn root worm.

Dr. Tuttle also gave a paper in the regular conference, in which he tried to present bats and rabies in perspective. Bats certainly do carry rabies, yet rabies is surprisingly hard to find in bat populations. He made one very telling point. In the northern U.S.A., big brown and little brown bats, both colonial species, commonly live in buildings. The silver-haired bat, which carries what seems to be the most dangerous-to-humans variant of rabies, is a direct ecological competitor of big and little brown bats, but it rarely lives in buildings. When there is a scare about rabies in bats, the easy-to-see colonies of big and little brown bats are attacked. This may, said Dr. Tuttle, make living conditions more favorable for silver-haired bats, which are much harder to find. Thus, control of bat numbers because of rabies might actually increase the risk of rabies to humans.

Charles Trimarchi presented an interesting result. He allowed rabid big brown bats to bite each of 4 anesthetized cats on the lips and face. None of the cats came down with rabies. There is need for more work of this sort, to complement what Dr. Dietzschold's group are doing. It is clear that not all bat rabies strains are as infective to other species as that from the silver-haired bat. In fact, maybe I should have restricted the last sentence to man, since there is very little evidence about infection of cats or dogs by the silver-haired bat strain. The more we learn, the more we need to learn!

Jean Smith gave a very detailed talk on the relationships of North American bat rabies virus to each other, and to strains in terrestrial species. One highlight was the comment that there are 4 virus isolates from the eastern pipistrelle, which are similar at the molecular level to isolates from human cases. However, this appears

to be either the silver-haired bat virus (SHBRV), or a form very closely related to it. There are also variations in nucleic acid sequence between different isolates of SHBRV. For example, the two recent human cases from New York and Connecticut show some differences.

After Jean Smith's paper there was a brief discussion which I found very interesting. The bat rabies strains in the New World all fall in with terrestrial rabies by sequencing analysis, whereas in Europe and Africa, bat viruses are much more divergent. A couple of questioners asked whether this was evidence that rabies is a new arrival in the New World, possibly brought over by the conquistadors. Dr Noel Tordo, the dominant man in this field in France, was much more cautious. He feels that we should consider classical rabies and all its variants, bat as well as terrestrial, as a cosmopolitan group. Patterns of relationship are not so clear that we can even say that all rabies in North America developed from a single virus form arriving from the old world, nor can we say which forms are older.

There was also some debate about whether bat houses are a good or bad idea, in reference to rabies. One county in Pennsylvania considered a bylaw to ban bat houses because of the risk of rabies. On the other hand, Dr Steve Franz (NY) showed how he had been able to shift bat colonies out of, and eventually away from, buildings by providing bat houses, excluding bats from the building, then moving the bat house when the bats had established themselves in it. The consensus was that bat houses are good, not dangerous, but care should be taken to locate them where humans will not contact them easily. Bats are useful animals, despite rabies, and can be encouraged safely, with careful thought and public education. Education of public health workers about bats will be a key.

Dr. Tuttle related the very interesting case of an abandoned mine shaft in Iron Mountain, Michigan,

which was due to be filled in. Just before filling, it was discovered to contain a roost of over a million bats, one of the biggest in the U.S.A., and much larger than any roost previously found that far north.. Dr. Tuttle and BCI made a major effort to save this colony. However, the BCI philosophy is different from many environmental advocacy groups. Rather than confronting the "opposition", they try to persuade. In this case, appeal through school children swung public opinion in favor of bats. First the town, and then local mining companies come on board, and joined in a very constructive search for mutually beneficial solutions.

This report covers only the highlights of the conference, in the interests of space and time!

Charlie MacInnes

RETHINKING POST-EXPOSURE TREATMENT RESULTING FROM NON-BITE CONTACT

It is still hard to estimate how far the revolution in thinking about rabies will extend. The turning point came about 1980, when monoclonal antibodies were first used to identify variants of rabies virus. Before 1980, classical immunology demonstrated that rabies was caused by a single virus which did not have variants. There were some rabies-related viruses in Africa which exhibited different enough antibody reactions to be separated out from rabies, but in the rest of the world, there was only one form of rabies. That classical rabies seemed able to infect any mammal species, including man. Over a century ago, Pasteur and his peers showed that rabies was transmitted via the saliva of rabid animals. The most common mode of transmission was by biting. The infectious agent was eventually identified as a virus carried in the saliva of clinically rabid mammals. The virus cannot penetrate unbroken skin, but bringing it into

contact with moist surfaces such as the cornea of the eye or the mucous tissues inside the mouth or nose might allow it to enter the mammalian body. Since viruses reproduce by causing cells of the host to produce copies of the virus, in theory only a single virion is enough to start a rabies infection.

Indirect exposure is the term applied to possible transmission of rabies by exposure to saliva which did not come directly from the rabid animal, and was not driven in by a bite. One classic scenario is when the farm dog attacks or fights off a rabid fox, and then is handled by its grateful family. There is very likely saliva from the fox on the dog's coat, and anyone getting that into a cut or scrape is thought to be at risk for contracting rabies. That is the theory.

Bert Carswell, in The Rabies Reporter volume 4, #2, presented evidence that, however possible the above may seem, it does not happen that way. The evidence is overwhelming that a bite is necessary. Just a minute, you say, there have always been a few humans who contracted rabies with little or no known contact with a rabid animal, and certainly no known bite. Back in the pre-1980 period, the most plausible explanation of such an occurrence was indirect or secondary exposure, the saliva in the cut or rubbed into an eye, etc., route.

What we have learned since 1980 should stimulate a major re-examination of secondary exposure. The first consequence of the discovery of several variants of rabies is that most mammals are quite resistant to forms of the virus other than that spread by their own species. Raccoons rarely get fox-strain rabies, and foxes only occasionally come down with raccoon strain. If that reasoning extends to humans, then we should be unlikely to contract most forms of rabies. Dr. Carswell showed that all of the human infections traced to fox-strain virus resulted from actual bites. Among fox carcasses which the Rabies Unit has collected from trappers

over the years, from 0.5 to 4.5% were positive for rabies. While trappers are careful when killing and skinning foxes because they know there is a risk of rabies, it is difficult to say whether a trapped fox has rabies. Over the past 40 years, trappers have taken 10,000 to 50,000 foxes a year within the rabies zone in southern Ontario. Thus, the chances of contact with saliva from a rabid fox seem real, yet not one trapper has contracted rabies.

There has not yet been a single human fatality from the raccoon strain. Is that entirely a result thorough application of post-exposure treatment, or is it an indication that humans are quite resistant to the raccoon virus? The number of post-exposure treatments due to exposure to this variant must range between 10,000 and 20,000 per year in the mid-Atlantic states. Consider that up to 2,700 people have been treated in New York State each year since the raccoon strain invaded. One of the most frequent causes of post exposure treatment in the case of raccoon rabies is indirect or unknown contact. The dog fought with the raccoon and people handled the dog. Consider that over 600 people were treated after a kitten which had been allowed to roam free in a pet store died of raccoon rabies. Not a single person was actually bitten. Similar problems happened late in the summer of 1996, when a goat which had been exhibited at a fair in New York died of rabies shortly afterwards. Everyone who might have touched the goat was treated.

On the other end of the spectrum, over half of the human fatalities to rabies in the U.S.A. since 1980 have involved non-bite contacts. However, every one of these cases was shown to involve a virus variant of bat origin. Thus, we need to be very cautious about potential exposure to bats. However, is it possible that, in the days before 1980, when rabies was still thought to be one virus, the "mysterious" cases of rabies, where no contact was known, were of bat origin.

There is no way to prove this, of course, just as it is impossible to prove that non-bite contact with the saliva of a rabid terrestrial (*i.e.* non-bat) mammal could not possibly cause rabies in a human. The gap between what is theoretically possible and what actually happens out there in the real world seems quite large, but the relevant numbers are unknown!

We simply do not know how much virus may be in the saliva of a rabid animal, nor whether there is less virus in the saliva of a species which does not normally spread the particular virus variant involved. Nor do we know what is the minimum amount of virus needed to cause infection, either by bite or by indirect routes. The few papers available suggest this is a very complex subject. Much of the work was done before 1980, so the virus variant is hard to identify. The reactions of each rabies variant on a variety of non-host species would be such a huge and complex undertaking that it is not likely to be worth the expense.

One worrisome feature of this subject is that many of our doctors and veterinarians were through training and in practice before 1980. The knowledge summarized above is available in papers scattered through a variety of sources, but not, I think, summarized anywhere that a general practitioner could readily encounter it. Those of us directly involved with rabies scour the journals for such papers, but I sympathize with the G.P's: there is a huge amount of new literature coming out each year. They deal with many conditions which are much more common than rabies. How much can an individual doctor absorb, much less find, while keeping up with a busy practice?

It is also true that assessing a rabies exposure involves educated guess-work, and one wrong guess might result in a dead patient.

I think the modern knowledge should stimulate us to re-think the necessity for post-exposure treatment in cases of non-bite contact with a rabid

terrestrial animal, but there is no conclusive proof to support that recommendation.

Charlie MacInnes

THE RABIES UNIT AND THE RABIES REPORTER ARE MOVING !

We don't know when, and we only know roughly where! The Maple station will close sometime in February, depending on when space for most of the staff to move into is going to be ready. Most Wildlife and Fisheries Research staff will be housed in the government office building at 300 Water Street in downtown Peterborough. The Rabies Unit will most likely be moving into space at Trent University. We have insisted that all RRU staff be in one facility, and close to our labs and necropsy facilities. The actual space is still under negotiation, so even our mailing address is uncertain. Hopefully, though, we won't lose the computer with the mailing list, so at least we will know where you are, even if the obverse is not true.

Hopefully when the next issue appears, I will be able to give you definite information. Until then, the Maple address will remain valid.

The Rabies Reporter, a scientific newsletter about current issues in rabies research and control, is a joint effort of the Rabies Research Unit, Ontario Ministry of Natural Resources; the Food Production and Inspection Branch of Agriculture Canada; The Ontario Ministry of Health and the Department of Geography, Queens University, Kingston.. Articles for future issues will be welcomed by the editor. Comments, letters, submissions and enquiries should be sent to:

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Animal Rabies Report: July to September 1996

Animal Type		Fox		Skunk		Other Wildlife		Dog		Cat		Livestock			Total	
County or Area	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	96	95	Cumulative
		96	95		96	95		96	95		96	95				
Eastern																
Stormont														0	0	0
Dundas													1	0	0	1
Glengarry														0	0	0
Prescott														0	0	0
Russell							1	1	1					1	1	1
Carleton						5	7	2		1				5	7	3
Renfrew														0	0	0
Lanark														0	0	0
Grenville								1						0	0	1
Leeds														0	0	0
Frontenac						3	3							3	3	0
Lennox-Addington														0	0	0
Central																
Hastings			1		3		1	1						0	4	2
Prince Edward														0	0	0
Northumberland		1					1							0	1	1
Victoria					1	2								0	1	2
Haliburton														0	0	0
Peterborough		1	1		11	5	1	2	2		1			1	14	9
Durham	1	1				1						1		1	1	2
York Region						3	2	2	2					2	2	5
Scarborough										1	1			1	1	0
East York														0	0	0
City of Toronto	1	1												1	1	0
City of York														0	0	0
North York														0	0	0
Etobicoke														0	0	0
Simcoe							1	1						0	1	1

Animal Rabies Report: July to September 1996

[illegible]

Animal Rabies Report: July to September 1996

Animal Type	Fox			Skunk			Other Wildlife			Dog			Cat			Livestock			Total		
County or Area	#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative		#	Cumulative	
		96	95		96	95		96	95		96	95		96	95		96	95			96
Northern (continued)																					
Thunder Bay																			0	0	
Rainy River																			0	0	
Kenora							1												0	1	
Subtotals																					
Eastern							9	11	4				1						1	9	
Central	2	3	3		15	11	3	7	6			1	1	1					1	6	
Western	9	12	47	11	27	37	1	1	1			1	3	4	3	12	22	25	55	111	
Southern	2	4	50	4	11	13	4	6	2			1	3	5	1	3	10	11	25	83	
Northern		9							1										0	9	
Totals	13	28	100	15	53	61	17	25	14	0	1	4	2	4	10	4	15	34	51	126	
																					223

Livestock this quarter: 4 cows

Other wildlife this quarter: 14 big brown bats, 1 hoary bat, 1 Keen's myotis (bat), 1 silver-haired bat.

