Bull Pan Am Health Organ 13(4), 1979.

TEN YEARS OF RABIES SURVEILLANCE IN GRENADA, 1968-1977

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During the period 1968-1977 there were nearly 700 recorded cases of animal rabies on Grenada and one human death. The mongoose is the major reservoir of the disease.

Introduction

There is no doubt that the mongoose is the major reservoir of rabies in Grenada, and that dogs play a secondary role in perpetuating the disease; for although mongooses were not the direct cause of the four human rabies deaths recorded for the island since 1952, they have accounted for over half of the human postexposure treatments. In South America, on the other hand, most of the human rabies cases have resulted from dog-bites, and dogs are still the animals most frequently found rabid (*1,2*).

In North America, particularly the United States, by far the greatest numbers of animal rabies cases since the early 1960s have occurred in wildlife. In 1975 there were 2,241 cases of wildlife rabies reported in the United States. These accounted for 84 per cent of the total reported rabies cases. All but 1 per cent of these wildlife cases (*3*) occurred in skunks (55 per cent), bats (23 per cent), foxes (12 per cent), and raccoons (9 per cent).

Before 1959, reported U.S. rabies cases in dogs, cats, and farm animals considerably exceeded reported wildlife cases. However, between 1958 and 1976 there were 19 cases of human rabies caused by dogs and cats, as compared with 17 cases caused by wild animals—indicating that similar numbers of domestic and wild animals were responsible for human cases in the U.S. during that period.

No direct transmission of rabies from mongooses to man, to domestic animals, or to livestock has been reported in mainland areas of the Americas, but such transmission is known to occur on the islands of Cuba, Grenada, Hispaniola (containing the Dominican Republic and Haiti), and Puerto Rico. (It should be borne in mind that these islands are not comparable in size. Puerto Rico is 29 times as large as Grenada, Hispaniola is 250 times as large, and Cuba is 368 times as large.)

In Puerto Rico, the first confirmed case of human rabies (since two cases were reported in 1896) occurred as a consequence of a dog-bite in 1975 (*4*). The numbers of reported animal rabies cases on the island have ranged from 81 cases in 1971 to 48 (24 in mongooses) in 1975 (*3*).

Unlike Puerto Rico, the Dominican Republic only infrequently reports cases of mongoose rabies. From 1970 to October 1976 anywhere from 74 to 225 cases of animal rabies per year were reported. Of these, 74 to 95 per cent occurred in dogs and 4 to 14 per cent occurred in cats. Mongooses accounted for less than 1 per cent (*5*), but this could reflect the absence of a well-defined wildlife investigation program in that country. Seventy-two cases of human rabies were reported during the

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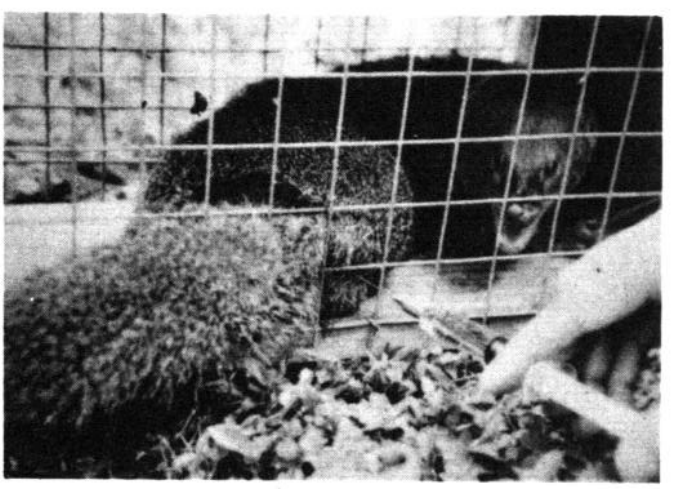
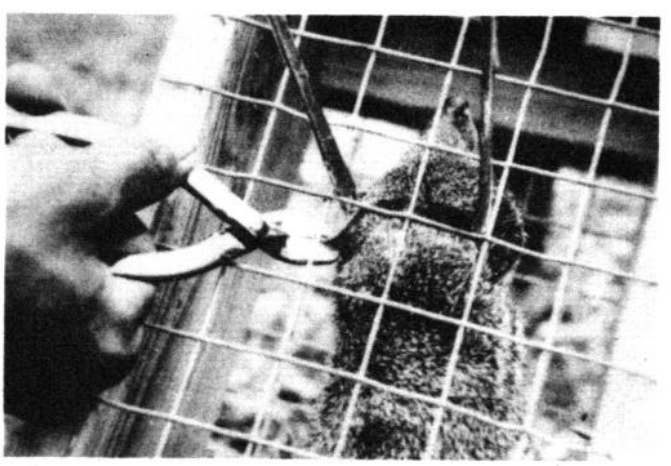
A mongoose trap is set in the field.

Traps are unloaded from vehicle and trailer.

Mongooses are collected at the Rabies Laboratory.



A trapped mongoose is narcotized.



A trapped mongoose undergoes ear-tagging.

A captive mongoose shows wariness by it fluffed-out tail. (Photos courtesy of the author.)

15-year period 1962-October 1976, the number of cases in any given year ranging from 1 to 14. The number of persons bitten per year ranged between 526 and 7,689, the average per year being 4,475; and 175 to 1,649 people were vaccinated per year (an average of 828 per annum) over the 15-year period. Dog vaccinations averaged 8,802 per year, the highest annual total being 54,713 in 1976 (*6*).

Though Haiti shares the island of Hispaniola with the Dominican Republic, mongoose rabies has not been officially reported there. Also, though 419 cases of animal rabies were reported between 1969 and August 1976, there has been a considerable decline in recent years (*7*). Nearly all the animal cases reported occurred in dogs but only 5 per cent of these were laboratory-confirmed. Six cases of human rabies were recorded in Haiti during the same period.

In Cuba, of the 392 cases of animal rabies reported in 1974 and 1975 combined, 204 (52 per cent) were in dogs and 56 (14 per cent) were in mongooses. Cats accounted for 20 per cent of the total, and other animals accounted for nearly 14 per cent. There were two human deaths from rabies in each of the years 1973, 1974, and 1975, all of them resulting from dog-bites (*8, 9*).

History of Rabies in Grenada

The history of rabies in Grenada has been described elsewhere (*10-12*). Briefly, although the disease was suspected on the island as far back as 1902, its presence was not confirmed in the laboratory until 1952, when it was found to have occurred in a cow. In 1953 another cow died of rabies, and though this animal was known to have been bitten by a mongoose (*Herpestes auropunctatus*), rabies was not laboratory-confirmed in a mongoose until 1956, six years after the first reported outbreak of mongoose rabies in the Western Hemisphere occurred in Puerto Rico (*13*).

Vampire bats (of the genera *Desmodus* and *Diaemus*) have not been recorded in Grenada, and the examination of over 2,800 cattle in 1946 and 1952 showed no evidence that any had been fed upon by vampires (*10*). Furthermore, no cases of rabies were found in 100 specimens of *Artibeus* and *Glossophaga* bats examined by the Pan American Health Organization investigative team sent to Grenada in 1955 (*14*).

Although six cases of rabies in cattle were discovered between November 1952 and August 1955, until then no wildlife species except the mongoose had been associated with the disease (*14*). However, Negri bodies confirming the presence of rabies were found in an insectivorous bat (*Molossus major*) that bit a woman in 1961 (*10*), and in 1974 Price and Everard (*15*) found evidence of rabies and rabies serum neutralizing antibody (SNA) in other fruit-eating and insectivorous bats of Grenada. Nevertheless, although the disease may be present in different bat species in some localities, the available data give little reason to believe that transmission occurs outside these sequestered bat populations.

Rabies Surveillance

Cases of rabies were reported sporadically in Grenada after 1952, on the basis of work assisted by the Trinidad Department of Agriculture. Between 1965 and 1968 laboratory confirmation was undertaken at the Trinidad Regional Virus Laboratory (now the Caribbean Epidemiology Center, CAREC) by Jonkers et al. (*16*). The available records for the 16-year period 1952-1967 make note of 358 rabies cases—involving 3 humans (in 1962 and 1963), 1 bat (*Molossus major* in 1961), 88 dogs, 3 cats, 70 bovine animals, 9 sheep, 7

goats, 4 pigs, 10 equine animals, 142 mongooses, and 21 unknowns.

In 1968 a comprehensive rabies surveillance and mongoose research program was implemented by the Public Health Department of the Grenada Ministry of Health in conjunction with the United Kingdom Medical Research Council (MRC). Under this program the Government built a small laboratory for rabies diagnosis (PAHO had previously provided a fluorescent antibody microscope and technical training for two staff members). The MRC provided vehicles, refrigeration apparatus, all other supplies needed for the day-to-day functioning of the laboratory, and the salaries of assisting laboratory staff members. A normal staff complement of trappers, drivers, handymen, and technicians was employed by the Government. Animal vaccination and mongoose poisoning campaigns were conducted using the equipment and personnel of the Government/MRC/PAHO pool of resources, with PAHO providing vaccine and the services of a veterinarian.

Rabies Eradication

Since the first mongoose control and rabies eradication program was jointly instituted by the Government of Grenada and PAHO in 1955-1956 (*17*), there have been several others, notably those of 1959, 1965, 1968-1969, and 1973 reported by Murray (*10*), Presnall (*18-20*), Sikes et al. (*21*), Winkler (*22*), and Everard et al. (*11*). The present rabies control effort is concentrating on pre-exposure treatment of domestic animals and livestock, and postexposure treatment of humans.

Materials and Methods

The postexposure procedure of treating all people on Grenada exposed to rabies virus with duck embryo vaccine has previously been described (*11*). Hyperimmune serum is still used, as recommended by the WHO Expert Committee on Rabies (*23*), but 14 daily doses, each containing 2 ml of suckling mouse brain vaccine (1 per cent brain suspension), from Colombia[4] are now given on consecutive days. Individual sensitivity to the heterologous serum is always tested first, and the primary doses of vaccine and serum are given at the same time but at different places on the body. Booster doses of vaccine are provided on days 24 and 34 following commencement of treatment, to ensure maintenance of SNA at a high level. Initial treatments are usually given at the General Hospital in St. George's, subsequent daily doses being administered at a health center in the patient's area. The patient is kept under observation.

Vaccination Campaigns

Before commencing animal vaccination programs, the news media inform the public of the intended campaign. A public address system mounted on a Land Rover is used later to announce the day and time that specific areas will be visited by vaccination teams. In recent years, Convac® ERA rabies vaccine (a modified live virus of porcine tissue-culture origin) manufactured by the Connaught Laboratories in Willowdale, Ontario, Canada, has replaced the LEP/CEO vaccine used earlier (*11*). In 1976 the animal vaccination campaign was carried out using *vacuna antirrábica canina* C.R.L. (canine antirabies vaccine) manufactured by the Venezuelan National Institute of Hygiene in Caracas. The vaccine was administered as a 2-ml intramuscular dose.

Mongoose Trapping and Surveillance

Wildlife rabies surveillance was monitored over the 10-year period by maintain-

[4]Produced as *vacuna antirrábica humana* (human antirabies vaccine) by the Samper Martínez National Institute of Health, Ministry of Health, Bogotá, Colombia.

ing a mongoose trapping program for (usually) five days a week at least 45 weeks each year. The mongoose traps were made locally of wood and weld-mesh (strong 2-mm wire welded into a mesh of 1-inch squares); chicken heads were the principal bait (*12*). Nearly all the trapped mongooses were killed on the day of capture or the day after with a 1-ml intramuscular or intraspinal injection of 5 to 10 mg succinylcholine chloride. The mongoose brains were then removed for microscopic examination.

Cases of mongooses attacking humans, domestic animals, or livestock without provocation were usually reported directly to the Rabies Laboratory, and the animals killed during such incidents were either brought to or collected by the laboratory staff; buried or discarded mongoose bodies were recovered where possible. Brain material from all such mongooses, as well as from livestock or domestic animals that died under suspicious circumstances, was removed and processed for examination. Rabies fluorescent antibody diagnosis was performed on neural tissue according to standard laboratory techniques (*24*), the conjugated rabies immune horse globulin labelled with fluorescein isothiocyanate (FITC) being provided by the Lawrenceville (rabies) Facility of the United States Center for Disease Control (CDC). Where confirmation was required in a specific important case, frozen brain or salivary gland material was sent to CAREC for further analysis by the mouse inoculation/neutralization test (*25*). Sera from some domestic animals were examined at the CDC for the presence of SNA by the rapid fluorescent focus inhibition test (*26*).

Results

Human Rabies

One human death due to rabies occurred in Grenada on 14 November 1970. The victim was a boy 7 years of age. Neither the child nor his parents could recall a biting incident or explain how the exposure to rabies virus occurred. Though this was the only known fatality in the 10-year period, the number of exposures was relatively high; in all, 208 individuals out of a population of approximately 100,000 were treated. Over half the human treatments (57.2 per cent) were performed as a direct consequence of mongoose bites. As Table 1

Table 1. Antirabies treatment in humans in Grenada, 1968–1977.

Year	Contact											
	Mongoose	Dog	Cat	Bovine animal	Human	Donkey	Goat	Rat	Bat	Subtotal	Unknown contact	Total No. people treated
1968	12	3	—	2	—	—	—	1	—	18	11	29
1969	11	8	3	—	—	—	—	—	—	22	—	22
1970	22	15	4	2	2	—	—	—	—	45	—	45
1971	18	6	1	—	—	—	—	—	—	25	—	25
1972	15	1	1	—	—	—	1	—	—	18	—	18
1973	7	4	4	6	—	1	—	—	—	22	—	22
1974	12	—	1	—	1	1	—	—	1	16	—	16
1975	5	—	—	—	—	—	—	—	—	5	—	5
1976	8	4	—	1	—	—	—	—	—	13	—	13
1977	9	4	—	—	—	—	—	—	—	13	—	13
Total	119	45	14	11	3	2	1	1	1	197	11	208
Per cent	57%	22%	7%	5%	1%	1%	<1%	<1%	<1%	95%	5%	100%

Table 2. Recorded cases of domestic animal and livestock rabies in Grenada, 1968-1977.

Year	Dog	Cat	Bovine animal	Goat	Sheep	Pig	Equine	Sub-total	Animal type unknown	Total No. of cases
1968	7	—	9	2	—	1	—	19	—	19
1969	2	3	2	2	—	3	—	12	1	13
1970	5	4	6	—	—	—	1	16	—	16
1971	4	1	7	2	4	2	—	20	—	20
1972	1	1	4	2	3	—	—	11	—	11
1973	2	2	13	8	4	—	5	34	—	34
1974	—	1	3	1	1	—	1	7	—	7
1975	1	—	8	—	—	1	1	11	—	11
1976	5	—	5	1	2	3	—	16	—	16
1977	2	—	3	1	—	1	—	7	—	7
Total	29	12	60	19	14	11	8	153	1	154
Per cent	19%	8%	39%	12%	9%	7%	5%	99%	1%	100%

shows, treatments prompted by domestic dog and cat bites constituted the next largest categories, accounting, respectively, for 21.6 and 6.7 per cent of the total. There have been no reported cases of treatment failure, nor have any of the treated individuals shown neurologic complications or severe adverse reactions.

Dog and Cat Rabies

An annual breakdown of the 41 cases of dog and cat rabies recorded in Grenada during the 10-year surveillance period is shown in Table 2. As these figures indicate, a decline in dog rabies was noted in the years 1972-1975, probably as a consequence of many dogs being vaccinated in 1971. Table 3 shows the numbers of animals immunized in major dog vaccination campaigns. In addition to dogs, 339 cats were immunized in 1976.

Table 3. Antirabies immunization of dogs in Grenada, 1965-1977.

Year	No. of dogs vaccinated
1965	8,963
1967	1,371
1968	8,087
1969	3,598
1971	11,184 200 (privately)
1973	7,350*
1975	1,001
1976	3,240

*The dog population in 1973 was estimated at 35,000.

Livestock Rabies

Over the 10-year period, rabies afflicted 113 animals in Grenada. Of these reported cases, 60 (53 per cent) occurred in bovine animals, 19 (17 per cent) occurred in goats, and 14 (12 per cent) occurred in sheep (see Table 2). There were four substantiated reports of livestock being bitten by mongooses on a known day and subsequently dying of rabies. The following data show the duration of the disease—from the time of infection until the animal died or reached a state very near death and was destroyed:

Animal	Date bitten	Date of death	No. of days between exposure and death
Goat	10 February 1971	2 March 1971	20
Goat	19 February 1973	19 March 1973	28
Sheep	29 October 1973	8 December 1973	40
Donkey	2 November 1975	12 December 1975	40

Where no firm dates were available, casual reports indicated that the biting incident usually took place three to four weeks before death of the animal. Clinical symptoms of the disease in livestock were usually observed at least five days before death.

One recorded failure of pre-exposure vaccination occurred in a bull that had been vaccinated when 3 months old. The animal, which was reported sick on 14 November 1975, died of rabies four days later at the age of 1 year 7 months.

There were three recorded cases where farmers refused to slaughter unvaccinated animals after they had been bitten by mongooses and where death did not result. Blood samples collected a month or more after the biting incidents were examined at the CDC for presence of SNA. The SNA titers found were as follows:

Animal	Date bitten	No. of days between biting incident and serum collection	Rabies serum neutralizing antibody titers
Donkey	18 December 1972	43	1:15
Goat	3 November 1975	30	1:14
Goat	23 October 1974	54	1:32

In the case of the donkey that died on 12 December 1975, the SNA titer after 31 days was $< 1:5$.

In 1976 a major livestock vaccination program was run concurrently with that year's dog and cat vaccination campaign. A total of 2,311 animals (575 bovine animals, 828 goats, 721 sheep, 182 donkeys, 3 horses, and 2 mules) were immunized.

Mongoose Rabies

Table 4 provides data on rabies in suspect mongooses. The "attacking" mongooses listed are all those known to have attacked humans, domestic animals, or livestock, whether rabies infection was confirmed in the laboratory or not. It was not always possible to recover the attacking mongoose, but since a close correlation has been shown (*11, 16*) between unprovoked attack and laboratory confirmation, rabies can be presumed with a high degree of certainty.

Because mongooses are normally quick and furtive in their movements, rabies should also be suspected in those found run over on the roads. Of the run-over mongooses recovered during the period in question, only those with laboratory-confirmed rabies are listed in Table 4. The total number of rabid mongooses in all three categories over the 10-year period was 385.

The behavior of rabid mongooses in Grenada has been described previously by Everard et al. (*27*), but a few brief case histories from the island are recounted here to

Table 4. Cases of rabies or presumed rabies in attacking mongooses and cases of rabies in mongooses found dead on the road in Grenada, 1968-1977.*

Year	Attacking mongooses with rabies (laboratory-confirmed cases)	Attacking mongooses presumed rabid	Rabies positive mongooses found dead on the road	Total
1968	22	12	1	35
1969	18	11	0	29
1970	14	17	2	33
1971	30	15	1	46
1972	18	11	1	30
1973	39	24	0	63
1974	26	13	0	39
1975	20	25	0	45
1976	16	13	0	29
1977	17	19	0	36
Total	220	160	5	385*

*These figures do not include rabid mongooses caught and tested by the surveillance trapping program (Table 5).

illustrate both usual types of incidents and more bizarre encounters:

• *23 January 1973, Mt. Horn, St. Andrew's.* A mongoose bit a pig in the yard of a house and subsequently ran into the yard next door, where it bit a sheep. It then escaped.

• *14 May 1973, Annandale, St. George's.* A mongoose attacked a sheep, which ran approximately a mile with the creature clinging to its nose. Eventually the mongoose was killed and the body thrown away. The sheep was slaughtered by its owner.

• *20 February 1973, St. George's Estate, St. George's.* A mongoose went into a house and was followed by a dog. It thereupon bit the dog on the leg and hung on. Eventually it was removed, pushed into a box, and taken to the laboratory alive. This animal was confirmed rabid.

• *24 November 1973, Clozier, St. John's.* A woman 22 years of age was taking clothes from the line in her yard when she suddenly felt a bite on the right side of her right foot. Unable to kill the mongoose that bit her, she ran inside the house, from where she observed the animal frantically attacking a tania bush (*Xanthosoma*). The mongoose escaped.

• *26 January 1974, Maran, St. John's.* At 7 p.m. a distraught 1-year-old girl was found indoors with a mongoose attached to her nose. The animal was killed. The child was taken to a hospital, where the bite was treated and antirabies treatment was administered. The mongoose was recovered and found rabid.

• *5 February 1974, Tempe, St. George's.* A woman was bitten on the back of her right hand by a mongoose that was later found to be rabid. Her son "rendered first aid" by sucking at the bleeding wound in an attempt to remove rabies virus. Both the mother and son were given antirabies treatment.

As indicated in Table 5, of nearly 12,000 mongooses caught during the course of the surveillance trapping program between 1968 and 1977, 156 were confirmed rabid; this amounted to 1.3 per cent of the population sampled. The proportion of rabid mongooses found in any given year ranged from a maximum of 3.7 per cent (in 1968) to a minimum of 0.14 per cent (in 1977). In addition, sera collected between 1971 and 1974 from 1,675 mongooses were tested, mainly at the CDC, for the presence of rabies SNA. The results of this work are to be reported elsewhere, but, briefly, 498 (30 per cent) of the sera tested were found to have rabies SNA titers greater than 1:5; during the four-year period, each year hav-

Table 5. Rabies in trapped mongooses in Grenada, 1968-1977.

Year	No. of mongooses examined	No. of mongooses positive	% positive
1968	705	26	3.7
1969	1,019	11	1.1
1970	1,727	9	0.5
1971	1,742	61	3.5
1972	1,404	28	2.0
1973	780	6	0.8
1974	828	5	0.6
1975	1,140	6	0.5
1976	1,108	2	0.2
1977	1,464	2	0.1
Total	11,917	156	1.3

ing been tested separately, the percentage of mongooses considered to be antibody-positive ranged between 21 and 43.

Other Wildlife Rabies

Other reported instances of wildlife rabies in 1968-1977 included two cases in bats, one of which (in *Artibeus jamaicensis*) was laboratory-confirmed (*15*). A possibly spurious 1969 case in a *Didelphis* opossum was also reported (*11*).

Rabies Cases, 1952-1977

In summary, reported rabies activity in Grenada during 1968-1977 involved 699 disease cases. These afflicted 1 human, 541 mongooses, 2 bats, 1 opossum, and 154 domestic and livestock animals. Mongooses alone accounted for an average of 54 cases per year, or over 77 per cent of the total. As noted earlier, the somewhat scant records kept between 1952 and 1967 (*10,11,16*) indicate there were at least 358 rabies cases in that 16-year period. Thus, the cumulative record shows that at least 1,057 (358 plus 699) rabies cases were reported on the 120-square mile island in the 26 years spanning the period 1952-1977.

Discussion

Domestic Animals

There was an encouraging decline in dog rabies over the four-year period 1972-1975, only four cases being noted, and a corresponding reduction in human treatments (five in all) following dog-bites in the same period. It has already been suggested that these reductions can be directly attributed to the large number of dogs treated in 1971 with ERA vaccine, which has a known four-year period of conferred immunity, and the follow-up immunization of 7,350 dogs in 1973.

The overall effectiveness of dog vaccination campaigns on the island can be deduced from the fact that there were 39 cases of dog rabies (an average of 3.0 per cent) in the 13-year period 1965-1977. This contrasts with 78 cases of dog rabies (an average of 7.8 per year) in the earlier 10-year period 1955-1964 (*11*). From the reports we have received, it is clear that many of the potential cases of dog rabies arise from fights between dogs and rabid mongooses, rather than from intraspecific contact between dogs as is the case in most of Central and South America (*1*).

However, more recently recorded cases of canine rabies (five in 1976 and two in 1977), which occurred despite the 1975 and 1976 vaccination campaigns, show that too small a proportion of dogs is being immunized. This point is emphasized by the fact that four people received postexposure treatment after dog-bites in 1976 (although three were bitten by the same dog) and another four people were treated following dog-bites in 1977. In general, dog and cat vaccination campaigns should be undertaken at least every two years, simply to maintain the existing level of immunity in the dog population and to reduce the 10-year average of 4.5 human antirabies treatments per year resulting from exposure to rabid dogs.

Livestock

The comparatively high cattle losses recorded can probably be attributed to the almost invariable practice of tethering cows in pastures or scrub woodland, where they are easily bitten and unable to avoid persistently attacking rabid mongooses. Sheep and goats are also normally tethered, but these are more usually kept by roadsides or in back gardens; hence they are not challenged so often.

At current prices (1977) a heifer may sell for EC$550.00[5] (US$200.00), while a fully grown animal would fetch EC$900.00 (US$330.00). Because animal owners are not prepared to accept such a financial loss unless their animals are known to have actually died of rabies, it has been recommended that farmers slaughter all unvaccinated livestock seen to have been bitten by a mongoose within three or four days (no more than five) of the incident, and that bite sites be excised before selling the carcass for meat.[6] Even then, some owners have refused to kill their unvaccinated animals and have kept them alive to await developments.

Livestock vaccination programs during the past decade have been limited, being performed mainly on a demand basis. Before 1976 the charging of a nominal fee to help pay for the vaccine resulted in a poor response. In 1976 the livestock vaccination program was especially well publicized, and the vaccination itself was made entirely free. Presumably as a result, more animals were immunized than on any previous occasion; it is hoped that this trend will continue in future years.

Wildlife

Although mongoose poisoning campaigns in Grenada have been partially successful, it has become increasingly clear that wildlife rabies on the island will not be eradicated solely by trapping and/or poisoning mongooses. At best, marked reductions in the mongoose population density and a concomitant reduction in mongoose-transmitted rabies have been achieved in some areas of the island; but these gains have been temporary, and further control programs have been needed following resurgence of the disease.

In order to be effective, poisoning campaigns should be continuous and thorough, taking advantage of natural barriers, so that invasion from areas not yet reached by the poisoning teams will be limited. Adjacent areas should be treated in succession, and each area should be baited at least twice, a process that would take a minimum of three years in Grenada. Given the island's limited financial and material resources, it is difficult to implement and sustain a campaign on this scale; and to date all the campaigns initiated have been terminated prematurely.

There is a significant difference ($p < 0.01$) in the annual numbers of attacking mongooses, but most of this change can be attributed to the unusually large number of such animals recorded in 1973. However, there was a trend toward a marked reduction in both the numbers of mongooses that bit humans and the numbers of trapped rabid mongooses during the second half of the 10-year surveillance period.

Despite the fluctuations in 1968-1972 (during which the annual proportion of trapped mongooses found rabid averaged 2.0 per cent and ranged from 0.5 to 3.7 per cent), there appears to have been a steady decline in rabies among trapped mongooses since 1973. As a consequence, in 1973-1977 the percentage of trapped mongooses found rabid averaged only 0.4 per cent, ranging

[5] 550 East Caribbean dollars.

[6] These recommendations were made after careful consideration of all the local circumstances; the author does not intend to suggest that this course of action is uniformly applicable.

from 0.8 per cent in 1973 to 0.14 per cent in 1977.

Although there is no obvious relationship between the numbers of rabid mongooses in the suspect category (Table 4) and reduction in the numbers of rabid mongooses trapped over the same 10-year period (Table 5), it is nevertheless suggested that there has been a decline in the total number of rabid mongooses, a decline that may be related to (1) the natural increase in the number of mongooses with protective rabies SNA in the population and (2) the effects of the mongoose control campaign of 1973. However, the fluctuation in wildlife rabies—inherent in the natural cycle of virus transmission, antibody development, build-up of an immune population, population turnover, and recruitment of young susceptibles—may well result in an eventual resurgence of rabies activity.

ACKNOWLEDGMENTS

This work was supported by the Government of Grenada, the United Kingdom Medical Research Council, and the Pan American Health Organization, and was undertaken at the Rabies Laboratory in Grenada and the Caribbean Epidemiology Center (formerly the Trinidad Regional Virus Laboratory). In addition, we are grateful to the Government of Trinidad and Tobago for its support. Special thanks are expressed to the Chief Medical Officers and Chief Technical Officers of the Public Health Department of Grenada for their invaluable assistance. The cooperation of Drs. S. N. Watson and D. W. Dreesen (both formerly of the Pan American Health Organization) and Drs. B. Rapier and A. Budhlall (both of the General Hospital, St. George's, Grenada) is also gratefully acknowledged.

SUMMARY

Between 1968 and 1977 one person died of rabies in Grenada and 208 people received post-exposure antirabies treatment, 57 per cent of them following mongoose bites. The source of the one fatal case is unknown. There were also 41 cases of dog and cat rabies, but dog cases decreased following vaccination campaigns. Of 113 cases of livestock rabies, 53 per cent occurred in bovine animals. This loss could be reduced by immunization and by not tethering the animals.

Four unvaccinated animals bitten by rabid mongooses on known days died between 20 and 40 days after the biting incident. Three unvaccinated animals that did not die after being bitten by mongooses showed rabies serum neutralizing antibody titers ranging from 1:14 to 1:32 a month or more after being bitten.

There were 380 attacking (rabid) mongooses reported in the 10-year period, and another five rabies-positive mongooses were found run over on the roads. Of nearly 12,000 mongooses caught during surveillance trapping, 156 (1.3 per cent) were rabies-positive. Rabies in mongooses accounted for an average of 54 cases per year, or over 77 per cent of the total reported 699 rabies cases. In recent years there has been a decline in the proportion of trapped mongooses found to have rabies.

Only three other cases of rabies in wildlife were reported during the 10-year period, two of them in nonvampire bat species and one in an opossum.

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