The Raccoon an Emerging Rabies Host

Authors: KAPPUS, KARL D., BIGLER, WILLIAM J., McLEAN, ROBERT G., and TREVINO, HERIBERTO A.

Source: Journal of Wildlife Diseases, 6(4) : 507-509

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-6.4.507

The Raccoon an Emerging Rabies Host

KARL D. KAPPUS, WILLIAM J. BIGLER, ROBERT G. McLEAN, HERIBERTO A. TREVINO

National Communicable Disease Center, Atlanta, Georgia

Summary

The geographic distribution of enzootic rabies in raccoons is currently limited to Florida and Georgia. The enzootic area has steadily expanded northward into Georgia during the 1960's. An epizootic in a population of raccoons closely associated with the human residents of a small, off-shore island was investigated. Forty-seven raccoons from the island were confirmed rabies positive by the State Laboratory from January 22 to May 20, 1969. About 10 percent of the raccoons trapped during the peak of the epizootic were positive and all of these had high titers of virus in their salivary glands but were asymptomatic in behavior. Human exposure typically resulted from close approach to a "sick" raccoon. Similar outbreaks may occur elsewhere when humans live in close contact with a semi-domesticated raccoon population. Rabies vaccination of raccoons should be considered as an alternative to population reduction in such situations.

For the past several years an increase in cases of rabies in raccoons, *Procyon lotor*, has been reported from the southeast corner of the United States. Cases of rabies in raccoons continue to be reported from the rest of the United States wherever raccoon populations are established or where raccoons are kept. The cases from the remaining states represent only about 6 percent (16 of 255) of the total number of raccoon rabies reported for 1969 (Table 1), and are probably all caused by spillover of infection transmitted by other rabies host species. The increased reports of rabies in raccoons are associated with the gradual expansion of the geographic area where most infected raccoons acquire their infection from other raccoons (Table 1). This raccoon enzootic area is now clearly confined to Florida and Georgia, with a well defined front extending across central Georgia, according to reported data for 1969.

TABLE 1. *Number of laboratory-confirmed cases of rabies in raccoons from the states of Florida, Georgia, and the rest of the United States by year, 1960-1969.*

Year	Fla.	Ga.	Remaining States
1960	22	0	25
1961	44	0	14
1962	39	1	22
1963	58	70	34
1964	47	107	19
1965	32	45	22
1966	37	77	19
1967	50	70	23
1968	82	59	12
1969	136	103	16

It is not known when the raccoon enzootic was established, but Scatterday *et al.*[1] investigated the 83 raccoon cases reported in Florida in 1951 through 1958 and found apparent enzootic raccoon rabies throughout peninsular Florida during that period. The earliest report from Florida was from Brevard County in 1947. Although the reported cases were sporadic and widespread during the 1950's, six of 28 raccoons collected by J. E. Held[2] from Palm Beach County in 1956 were rabid, indicating that at least one otherwise unnoted epizootic may have occurred in Florida before 1960. Because of the typically unaggressive behavior of rabid raccoons, one cannot exclude the possibility that unobserved enzootic rabies in raccoons was well established in the populations of central Florida before the mid 1950's.

In 1961, 26 cases of raccoon rabies were reported in north Florida, with seven of these reports from four counties bordering on Georgia. The only other wildlife rabies reported from north Florida in 1961 was in a bat. In 1962, the Florida reports were similar to those in 1961, but the first case was reported from the Georgia side of the state line. From this point on, the enzootic cycle established itself in Georgia and continued to spread northward. The geographic limits of raccoon rabies shown by the reported data agree with the results of rabies antibody tests on raccoon serums. Serum samples collected from Illinois, Texas, and South Carolina during the last 2 years have either been completely negative or have shown a very low rate of positives. On the other hand, raccoon serum samples recently collected from various locations in Florida have rabies neutralizing antibody rates of 2-20 percent.

The level of reported cases within the enzootic area varies greatly from county to county and from year to year. Reported data for enzootic rabies in wildlife are a very imprecise index of enzootic prevalence. Because of the typically inconspicuous behavior of rabid raccoons, probably a smaller percentage of rabid raccoons are reported than the percentage of skunks and foxes.

McLean *et al.*[5] found an equally high level of enzootic raccoon rabies in the coastal regions of Manatee and Sarasota Counties in 1968 although the counties reported dissimilar numbers of rabies cases in raccoons.

In January 1969 there was a sudden increase in the number of rabid raccoons sent to the Florida State Board of Health for confirmation. The raccoons came from an island off the coast of Manatee and Sarasota counties.

The island is Long Boat Key (L.B.K.) and, although many of the details of this setting are unusual, the epizootic that occurred there will illustrate features of a raccoon rabies epizootic that could be characteristic of future outbreaks in residential areas. The island is about 10 miles long and approximately 4 square miles in area with a human population of about 4,000 permanent residents and 3,000 seasonal residents. Most of the key is developed with residential neighborhoods, beach motels, and apartment complexes, although there are sizable tracts of undeveloped land. Retrospective estimates of the size of the raccoon population range from a conservative 1,000 to a high of 3,000 animals. Between January 22 and May 20, 1969, 47 raccoons sent to the state laboratory from L.B.K. were confirmed positive for rabies. Representatives of the Manatee and Sarasota County Health Departments, the Florida State Division of Health, U.S. Fish and Wildlife Service, and the Rabies Control Unit, NCDC, collected raccoons from L.B.K. during the peak of the epizootic and during its decline.

Tests were run on 182 raccoons; about 10 percent of the raccoons collected during the peak of the epizootic were positive, but no rabies was found in those collected later. A total of nine of the tested raccoon were infected, and all of these had a high titer of virus in their salivary glands. The salivary gland titers ranged from $10^{2.8}$ MICLD 50/0.03 ml to $10^{5.5}$ MICLD 50/0.03 ml, with an average titer of more than 10^4 mouse lethal units per 0.03 ml. Sikes and Tierkel[3] found that only seven of 11 raccoons experimentally infected with rabies virus of fox origin excreted virus in their saliva. Most of these appear to have had lower titers than the infected raccoons from L.B.K. The uniform occurrence of salivary infection and its high titer in raccoons from L.B.K. indicate a highly infective transmission of rabies by their bite.

The behavior of the suspect raccoons which were collected by local officials for rabies confirmation ranged from frankly aggressive to sick and paralyzed. Enough information to characterize the behavior of 31 of the rabid raccoons was found in police reports from L.B.K. In only one of these cases was both a bite and attack reported. There were seven other reports of attacks on humans, four raccoons had fought with dogs, and the other 18 reports described sick or peculiar behavior. These reports are in agreement with the usual observation that furious behavior is far less common in infected raccoons than in foxes. Human exposure to raccoon bites often followed

close approaches to unusually tame animals. No behavioral signs of rabies were detected in the trapped animals which were found rabid on laboratory testing.

Obviously, the raccoon epizootic on L.B.K. was a grave threat to the health of the people in the community. The key factor which made the outbreak dangerous and could make similar future incidents equally so is the presence of a large and dense raccoon population in close contact with a residential community. The raccoon population was maintained at a level far above the "natural" carrying capacity of the island by easy access to food and the tolerance of the residents. One L.B.K. resident fed an average of 400 pounds of dog meal a month to raccoons visiting his restaurant. While most members of the community tolerated the raccoons as friendly nuisances, many individuals considered them community pets.

If one understands the "domesticated" status of this animal population, the emotional response that the rabies outbreak elicited from the community is quite understandable. Rabies control measures, the investigations of the epizootic, and even the existence of a rabies outbreak in the raccoons became controversial. One of the larger newspapers in the area took a special interest and began to report provocative and often misleading accounts of the "raccoon killing." A lead editorial lectured on the ecology of the situation based on the assumption that the 10 percent prevalence of rabies in the raccoons was "about normal for any wildlife population" and darkly predicted a plague of rats and rattlesnakes following the loss of the raccoon population. Feature stories lamented the loss of the animals to medical research and questioned the motives of the health department officials concerned. Unfortunately, the sensational nature of the press coverage obscured the outstanding efforts of the county and state health officials to protect the people from rabies and often ignored the effective control of symptomatic raccoons by the L.B.K. police.

The features of the L.B.K. epizootic may be repeated anywhere within the raccoon enzootic area where a community lives in close contact with a dense raccoon population. Ivan Sanderson[4] notes that the species "is thriving in the most highly industrialized areas of our country and has even become a nuisance on the island of Manhattan which it invades via the few bridges from the mainland, intent upon the contents of garbage cans." A rabies epizootic in such semi-domesticated populations threatens the health of the associated human community, but population reduction of the animals is likely to be unpopular.

Human exposure to rabies is limited by vaccination of domestic animals and this technique has been very successful. Rabies vaccination should also be considered for populations of raccoons in close contact with urban or suburban human populations. The effort to vaccinate such animal populations would be expensive but little more so than present control methods of population reduction by trapping.

Acknowledgment

We express our appreciation to Doctors James B. Nichols, George Dame, and David Crane for their continuing guidance and support. The efforts of Messrs. Cecil Cowart, Hardrick Gay, David Peterson, and L. P. Stalling in collecting raccoons were invaluable.

Literature Cited

1. SCATTERDAY, J. E., N. J. SCHNEIDER, W. L. JENNINGS, and A. L. LEWIS. 1960. Sporadic animal rabies in Florida. Public Health Reports: 75 (1) 945-953.
2. HELD, J. E. 1970. Personal communication.
3. SIKES, R. K., and E. TIERKEL. 1960. Wildlife rabies studies in the southeast. 65th Annual Proc. U.S. Livestock Sanitary Assoc. pp. 1-5.
4. SANDERSON, I. T. 1965. *Living Mammals of the World.* Doubleday and Company, Inc. 303 pp.
5. McLEAN, R. G., K. D. KAPPUS, and H. A. TREVINO. Comparison of reported rabies with wildlife serology in two Florida counties. To be published.