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CHIROPTERAN RABIES IN MINNESOTA: 1976-1980

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Although bat rabies was first detected in the United States in 1953, the problem may not have been new. Numbers of infected bats reported increased from eight in 1953 to 484 in 1966, but the percentage of rabies-positive bats did not change significantly (Constantine, 1967, Public Health Rep. 82: 867-888). The greater number of rabies-positive bats seems to reflect a higher degree of human interest in the problem.

By June 1967, every state except Hawaii and Alaska had found bats positive for rabies within its confines (Sulkin and Allen, 1974, Monogr. Virol. 8: 1-103). Furthermore, the virus had been found in every species of North American bat that had been sampled adequately. Thirty of the 39 species of bats considered residents of the continental United States and Canada had been reported infected (Constantine, 1979, J. Wildl. Dis. 15: 347-349).

Only seven of these 39 species of bats occur in Minnesota. A study to determine the extent of bat rabies in Minnesota has revealed infections in four of these species. Of the seven species of bats the state laboratory has only received six of these for rabies examination.

Bats received by the Minnesota Department of Health were submitted by various individuals and agencies, but all bats were required to have had some type of human exposure as criteria for testing. Bats were also obtained from the University Diagnostic Laboratory, University of Minnesota, after testing for rabies, and were included in this study.

All bats were identified at the Minnesota Department of Health and confirmed by mammalogists at the University of Minnesota. The scientific names of the species follow the terminology and classification of Barbour and Davis (1969, *Bats of America*. University Press of Kentucky, Lexington, Kentucky, 286 pp.).

Brain tissue was removed and multiple impression smears were prepared. The slides were examined using the fluorescent rabies antibody technique (Johnson, 1969, In: *Diagnostic Procedures for Viral and Rickettsial Diseases*, Lennette and Schmidt (eds.). Am. Public Health Assoc., New York, pp. 321-353). Suspensions of brain tissue were inoculated intracerebrally into four weanling mice that were kept for 30 days and then discarded if asymptomatic. Any mouse dying after 3 days post-inoculation was examined for rabies. After all testing was complete, the bats were tentatively identified and placed in 10% formalin and held for confirmation of species.

Between July 1976 and September 1980, a total of 614 bats were examined, with 19 cases of rabies diagnosed (Table 1). The big brown bat, *Eptesicus fuscus*, accounted for most of the cases (68%). During this interval there were yearly fluctuations of rabid bats, but there were no significant differences (Chi square, $P < 0.05$) between years.

When the county of origin was plotted for rabid bats, there appeared to be a higher prevalence of reported chiropteran rabies in the east central counties.

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TABLE 1. Species of bats found positive for rabies in Minnesota, 1976-1980.

Species	No. examined	No. positive
Colonial		
<i>Eptesicus fuscus</i>	408	13
<i>Myotis lucifugus</i>	182	2
<i>Myotis keenii</i>	2	0
Total	592	15
Non colonial		
<i>Lasiurus cinereus</i>	10	2
<i>Lasionycteris noctivagans</i>	4	2
<i>Lasiurus borealis</i>	6	0
Total	20	4
Grand Total	612	19

When the number of bats submitted for examination from each county is also considered, however, it becomes evident that this higher reported prevalence is in actuality an artifact of the reporting system. Many more bats are submitted from the east central counties (higher population centers), and therefore more rabid bats are found.

There were no apparent differences in the distribution of rabies by sex of the bats.

In the United States and Canada, chiropteran rabies has been reported more often in species of colonial bats than in noncolonial species (Baer and Adams, 1970, Public Health Rep. 85: 637-645). Among colonial species, the big brown bat, *Eptesicus fuscus*, the Mexican freetailed bat, *Tadarida brasiliensis mexicana*, and various species of the genus *Myotis* are among the most commonly infected. Rabies in noncolonial bats has been found almost entirely among members of the genus *Lasiurus*, especially the red bat, *L. borealis*, and the hoary bat, *L. cinereus*. In Minnesota, the colonial big brown bat, *E. fuscus*, accounted for 68% and the little brown bat, *M. lucifugus*, for 11% of the bat rabies cases. The noncolonial silver-haired bat, *L. noctivagans*, accounted for 11% and the hoary bat, *L. cinereus*, for 11% of the bat rabies cases.

The peak of diagnosed chiropteran rabies cases in the United States and in Canada has been reported to occur in August and September (Baer and Adams, op.cit.). Records in Minnesota support these data, with 53% of the cases detected in our study occurring in August and September. This summer peak is most likely related to the increased probability of bats being found, due to their higher activity and the larger number of yearlings present. The absence of rabies-positive bats during December, January, February, and May is no doubt due to the lower number tested during this time period.

Interspecific transmission of rabies from insectivorous bats to terrestrial animals and man has not been documented in Minnesota but has been recorded as occurring elsewhere (Sikes, 1970, In: *Infectious Diseases in Wild Mammals*, Davis, Karstad and Trainer (eds.), Iowa State Univ. Press, Ames, Iowa, pp. 3-19). Almost all human contacts with both rabid and non-rabid bats in Minnesota have been the result of people handling partially paralyzed or sick bats rather than from direct attack.

Because of the presence of rabies in bats, there exists a real public health need to continue with studies to better understand the role that bats play in the maintenance and transmission of sylvatic rabies.

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