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Gary A. Heidt

*University of Arkansas at Little Rock*

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# REPORTED ANIMAL RABIES IN ARKANSAS: 1950-1981

GARY A. HEIDT  
 Department of Biology  
 University of Arkansas at Little Rock  
 Little Rock, Arkansas 72204

### ABSTRACT

Reported animal rabies in Arkansas is reviewed for the years 1950-81. Total cases ranged from 44 in 1969 to 332 in 1979, with a mean of 154. Domestic animals accounted for 72.5% of the total cases until 1961-63 and then declined to 15.8% from 1964-81. This switch from domestic to wildlife rabies corresponded to a similar trend in nationally reported rabies and was probably due to increased public awareness and the vaccination of domestic dogs and cats.

Over the 31 year period a total of 18 species of mammals has been implicated in reported rabies (individual species of foxes, bats and skunks have been grouped together). The four species accounting for the highest incidence are: skunks (34.5%), dogs (27.2%), foxes (15.8%) and cattle (13.9%). Between 1964-81, skunks accounted for 63.5% of total reported rabies; however, in recent years this percentage has increased to 80-90%.

### INTRODUCTION

Rabies, a disease of severe and usually fatal consequences, has been known to man at least since ancient Mesopotamia (1800 B.C.) (Kaplan and Koprowski, 1980). In the United States, rabies was first recorded in Virginia in 1753 followed by a fox rabies epizootic in Massachusetts in 1812. During the past 100 years, wildlife epizootics have been recognized throughout the country (McLean, 1970). In Arkansas, rabies has been known at least since the late 1800's when a human death was recorded in Garland County. Actual statistical data were not compiled in the United States until 1938 (Scholtens and Tierkel, 1963). In Arkansas, recording of rabies began in 1940, however, breakdown by species was not begun until 1946.

Over the previous 30 years, Arkansas has contributed significantly to the annual national total of reported rabies (mean of 3.4% per year, Table), and has experienced skunk rabies epizootics in the late 1970's (Heidt et al., 1982). In spite of this importance, few studies on rabies in Arkansas have been conducted (Arkansas Department of Health [ADH], 1962a; Ferguson and Heidt, 1980, 1981; Heidt et al., 1982).

It has been shown that the number of reported rabies cases can be influenced by several factors, including public awareness, number of animal bites, proximity to health departments, previous experience with

animal rabies and human population densities (Vets and Storm, 1966; Lewis, 1972; Carey et al., 1978). In addition, untold numbers of animal rabies cases go undetected due to the normal secretive or nocturnal habits of most animals, lack of human presence in a given epizootic area, quickness of death once symptoms appear and most rabies cases are expressed in the 'dumb' rather than 'furious' form (McLean, 1970; Kaplan and Koprowski, 1980). Thus, I feel reported rabies is a useful tool for showing trends and epizootics, but its limitations must be kept in mind. This study was done to summarize the reported cases of animal rabies in Arkansas, and compare them to national reported rabies, over the previous 31 years (1950-1981). These data can be used to aid in identifying problem animals and trends in rabies and to provide basic information for further studies.

### METHODS AND MATERIALS

Data for the Arkansas portion of the study were compiled from an Arkansas Department of Health unpublished mimeo summarizing rabies from 1940-1961 (ADH, 1962a) and the yearly Arkansas Department of Health Mortality and Morbidity reports (ADH, 1962b-1981). Supplementary information was obtained through several conversations with Dr. Thomas C. McChesney (Director, Division of Veterinary Public Health, Arkansas Department of Health). National reported rabies data were compiled from several publications of the National Centers for Disease Control (CDC, 1977, 1978, 1979, 1980, 1981a, 1981b, 1981c, 1982).

### RESULTS AND DISCUSSION

#### General Aspects.

Total reported cases of rabies in Arkansas (1950-81) ranged from a low of 44 in 1969 to a high of 332 in 1978, with a mean of 154 cases per year (Table, Fig. 1). During the 31 years there have been 7 transient and 2 major peaks of rabies activity (Fig. 1). This pattern of transient increases and decreases followed by a major outbreak has also been seen in other states (e.g. Illinois, Tennessee, New York and Pennsylvania) (Sanderson et al., 1967; Friend, 1968; Hall, 1978; Wampler and Kirkland, 1981).

Figure 2 compares total reported rabies in Arkansas and the United States between 1953-81. With the exception of 1959-62 there is a rough parallel between them. During 1959-62 there was a rabies epizootic in Arkansas while the nation was showing a decline in reported rabies. During the 31 year period, Arkansas contributed an average of 3.4%

Table. Reported animal rabies in Arkansas: 1950-1981.

Year	Dog	Cat	Cattle	Wildlife	Skunk	Possum	Bat	Wildlife	Total	% National
1950	407	1	1	1	1	1	1	1	412	1.0
1951	141	1	1	1	1	1	1	1	146	0.4
1952	176	1	1	1	1	1	1	1	181	0.5
1953	150	1	1	1	1	1	1	1	155	0.4
1954	144	1	1	1	1	1	1	1	149	0.4
1955	140	1	1	1	1	1	1	1	145	0.4
1956	140	1	1	1	1	1	1	1	145	0.4
1957	140	1	1	1	1	1	1	1	145	0.4
1958	140	1	1	1	1	1	1	1	145	0.4
1959	140	1	1	1	1	1	1	1	145	0.4
1960	140	1	1	1	1	1	1	1	145	0.4
1961	140	1	1	1	1	1	1	1	145	0.4
1962	140	1	1	1	1	1	1	1	145	0.4
1963	140	1	1	1	1	1	1	1	145	0.4
1964	140	1	1	1	1	1	1	1	145	0.4
1965	140	1	1	1	1	1	1	1	145	0.4
1966	140	1	1	1	1	1	1	1	145	0.4
1967	140	1	1	1	1	1	1	1	145	0.4
1968	140	1	1	1	1	1	1	1	145	0.4
1969	44	1	1	1	1	1	1	1	50	0.1
1970	140	1	1	1	1	1	1	1	145	0.4
1971	140	1	1	1	1	1	1	1	145	0.4
1972	140	1	1	1	1	1	1	1	145	0.4
1973	140	1	1	1	1	1	1	1	145	0.4
1974	140	1	1	1	1	1	1	1	145	0.4
1975	140	1	1	1	1	1	1	1	145	0.4
1976	140	1	1	1	1	1	1	1	145	0.4
1977	140	1	1	1	1	1	1	1	145	0.4
1978	332	1	1	1	1	1	1	1	337	0.9
1979	140	1	1	1	1	1	1	1	145	0.4
1980	140	1	1	1	1	1	1	1	145	0.4
1981	140	1	1	1	1	1	1	1	145	0.4
TOTAL	140	1	1	1	1	1	1	1	145	0.4

1 - Represents individual specimens  
 2 - Includes: Cat (1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 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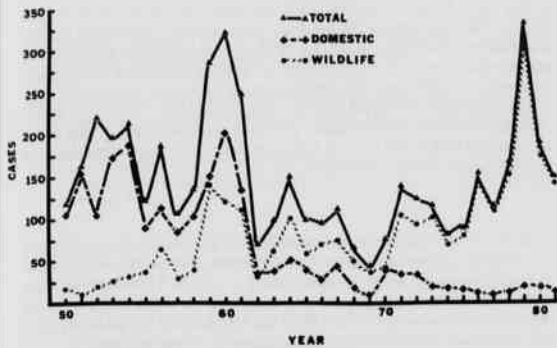


Figure 1. Comparison of total, domestic animal and wildlife reported rabies in Arkansas between 1950-1981.

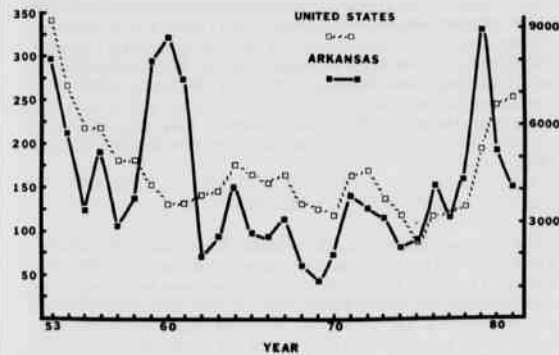


Figure 2. Total reported animal rabies in Arkansas compared to the United States between 1953-1981.

(ranging from 1.2-9.3%) of the nation's reported rabies (Table). Considering the number of states and the total geographic area involved, I feel that this is highly significant and points out Arkansas' importance in the evaluation of national rabies.

Reported animal rabies for the 31 year period is summarized by species and year in the Table. Eighteen different kinds of mammals (no distinction is made between individual species of skunks, foxes, and bats) have been reported with laboratory confirmed rabies. Seven of these are considered domestic animals, while the other 11 are classified as wildlife. Figure 1 compares domestic, wildlife and total cases. Domestic animal rabies predominated until 1963 when the cases were approximately equal. Since 1963, wildlife rabies has averaged 84% of the total cases (51-95%). This major reversal has been primarily due to large decreases in domestic dog rabies (see Fig. 3). The same trend has been seen nationally (wildlife average 72%), however, the switch from domestic to wildlife rabies occurred in 1960 (McLean, 1970; Winkler, 1972b; CDC, 1981c).

Skunks (34.5%), dogs (27.2%), foxes (15.8%) and cattle (13.9%), accounting for a total of 91.4%, have been the major animals responsible for reported rabies in Arkansas. Each of these, together with bats (which have shown steady increases since first reported in 1961) are discussed in following sections. The remaining 13 species of mammals have each had incidences of less than 6% and most less than 1% of the total (Table). Domestic cats are included in the CDC rabies' summaries as one of the major vectors. In Arkansas, cats have been of minor

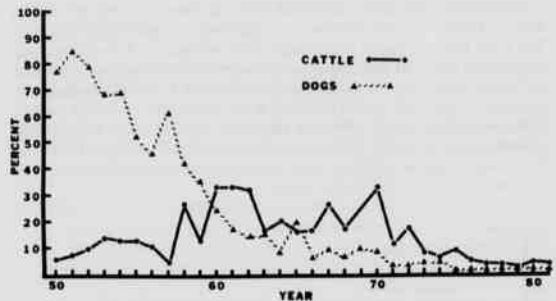


Figure 3. Percent of total reported animal rabies in Arkansas attributable to domestic dogs and cattle between 1950-1981.

importance, accounting for 2.9% of the total reported rabies and at no time have they contributed more than 9% of the total. Rodents have been shown to be a minor source of rabies (Winkler, 1972a) and during the 31 year period in Arkansas they have accounted for only four cases, less than 0.1%. Winkler (1972a) and a CDC report (1977) point out that rodent rabies is not endemic in the United States and that of some 25,000 rodents examined annually only 4-5 are laboratory confirmed positive. Thus, I think it can be safely stated that wild rodent rabies represents a slight threat to humans. Raccoons represent one of the four major wildlife rabies vectors in the United States (CDC, 1977, 1978, 1979, 1980, 1981b, 1982). However, raccoon rabies is almost exclusively confined to the southeastern United States (McLean, 1975) and, as would be expected, is virtually nonexistent in Arkansas at the present time (only 9 cases since 1950 have been reported).

#### Domestic Dog.

In the United States, prior to the mid-1950's, dog rabies was most prevalent, accounting for over 60% of total reported rabies (McLean, 1970). Since then, in spite of a tremendous increase in the overall dog population, dog rabies has steadily decreased until it now accounts for less than 5% of the total (CDC, 1979, 1980, 1981a). The decline of dog rabies has been attributed to increased public awareness, rabies vaccination campaigns and improved vaccines (McLean, 1970; Sikes, 1975).

A similar, but more dramatic, trend in domestic dog rabies has been seen in Arkansas. From a high of 85.5% of total reported cases in 1951, dog rabies has dropped to less than 1% over the last six years (Fig. 3). This decrease is due, in part, to the same factors which have operated nationally; however, in addition to these factors, Arkansas has a Rabies Control Act (Amended, 1975) that requires all dogs and cats to be vaccinated annually (by a licensed veterinarian) against rabies. This law, however, does not ban the sale of rabies vaccines over the counter. Thus 'home vaccinations', which may or may not be adequate due to the use of vaccine which has lost potency due to improper storage, improper administration or using the wrong vaccine, are often done by private individuals. Arkansas Department of Health personnel estimate that roughly 50% of the some 275,000 + dogs in Arkansas are vaccinated against rabies. This figure compares favorably with Texas, Oklahoma and Missouri where no rabies control laws probably result in less than 20% of the dog population being vaccinated. The Communicable Disease Center has indicated that most areas in the United States have about a 30% vaccination rate (Dr. T. McChesney, *pers. comm.*).

#### Cattle.

Cattle rabies is of concern due to the economic loss sustained by the owners of infected animals. The reporting of cattle rabies may be somewhat misleading because of the difficulty in transporting the brain to the health department (Dr. T. McChesney, *pers. comm.*). In spite of this, cattle rabies has ranked fourth in overall incidence (Table), placing cattle rabies in Arkansas higher than that nationally where it seldom accounts for more than 5-8% of the total reported rabies.

## Reported Animal Rabies in Arkansas: 1950-1981

Percentage-wise, cattle rabies was more significant during the 1960's; and in recent years has declined to a relatively low percentage (Fig. 3). The CDC (1981c) reports that a high rabies incidence in domestic animals is generally reported from areas where rabies is highly endemic in skunks or foxes, reflecting the usual transmission from wildlife to domestic animals. Compared to the national level, this seems to be the case in Arkansas where cattle rabies is relatively high coupled with a high endemic level of skunk rabies. However, examination of the Table and Fig. 3 and 4 indicates little, if any, correlation in concomitant increases in reported skunk and cattle rabies.

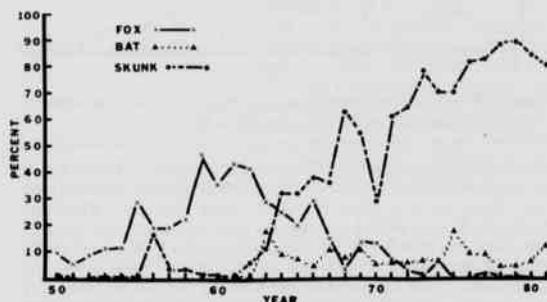


Figure 4. Percent of total reported animal rabies in Arkansas attributable to skunks, foxes and bats (all species of each have been combined) between 1950-1981.

#### Skunk.

There are six species of skunks (eastern spotted, *Spilogale putorius*; western spotted, *S. gracilis*; striped, *Mephitis mephitis*; hooded, *M. macroura*; hog-nose, *Conepatus mesoleucus*; and eastern hog-nose, *C. leuconotus*) in the United States, all of which have been involved in reported cases of rabies (Verts, 1967; Parker, 1975). The two species of spotted skunks together with the striped skunk are the major vectors, however, in most reporting cases all six species are combined. Since the late 1950's and early 1960's, when they replaced foxes, skunks have been the most prevalent wildlife vectors (McLean, 1970; Parker, 1975). In recent years skunk rabies has accounted for 40-50% of the total reported rabies in the United States, reaching 65% in 1980 (CDC, 1977, 1978, 1981a, 1981b, 1981c). The vast majority of skunk rabies is reported from a skunk rabies belt extending from southern Texas and Louisiana north into Canada (Parker, 1975). Furthermore, due to large number of reported skunk rabies in recent years, several of these states (Arkansas, Texas, Oklahoma, Missouri, Iowa) have experienced skunk rabies epizootics (Parker, 1975; CDC, 1981a, 1981c; Heidt et al., 1982).

Arkansas is in the geographic range of two species of skunks, the eastern spotted and the striped. While both species have been found positive for rabies, they have been combined for reporting purposes. Lower densities and more secretive habits of the spotted skunk, however, have made the striped skunk the principle vector. Skunk rabies in Arkansas became important in 1963-64, and since that time has accounted for 63.5% of the total reported rabies in the state (80% or more in each of the years since 1976) (Table, Fig. 4). Skunk rabies reached epizootic conditions in 1979 when a total of 301 cases was reported and Arkansas ranked first in the United States in the number of laboratory confirmed cases per square mile (Heidt et al., 1982). Since 1979, reported cases of skunk rabies have declined (Table, Fig. 4), however, it remains a serious problem in the state.

Ferguson and Heidt (1980) and Heidt et al. (1982) conducted detailed studies into the characteristics and epidemiology of reported skunk rabies and human contact with rabid skunks for the years 1977-79. They found that March, April and May had the highest reported incidences and that skunk rabies seemed confined to the highland areas

of the state. More recent, unpublished data, have shown that in 1981 skunk rabies was reported in the delta from Lonoke, Prairie and Arkansas counties. They also found that 16 density-independent variables had no correlation with the distribution of rabies, indicating the primary determinants affecting the distribution to be biotic. With respect to human contacts with rabid skunks, they found that, "the rabid skunk coming in contact with humans generally will be solitary, aggressive or unafraid and found around buildings in the country during daylight hours (usually in the morning)".

#### Fox.

Three of the five species of foxes (arctic fox, *Alopex lagopus*; red fox, *Vulpes vulpes*; and gray fox, *Urocyon cinereoargenteus*) in the United States have an important history of rabies. However, only the latter two species are important in the contiguous states and combined reporting is standard practice (Winkler, 1975). Over the past 30 years, fox rabies has primarily centered in Kentucky, Tennessee and the New England states (Winkler, 1975; Hall, 1978). As previously mentioned, foxes were replaced by skunks as the major wildlife vector in the late 1950's and early 1960's and over the past five years, foxes have accounted for only about 4% of the total reported rabies in the United States.

In Arkansas, foxes (red and gray combined) were the major wildlife vector until 1964 when skunks displaced them (Table, Fig. 4). With only 3 reported cases in the last 5 years, fox rabies in Arkansas is negligible. Over the past several years, populations of red and possibly gray fox have reportedly been declining in the state (McArdle, 1979). These population declines could be a major reason for the lack of fox rabies in the state; particularly if, as several authors have suggested, rabies is density-dependent (Rausch, 1958; Marx and Swink, 1963; McLean, 1970).

#### Bat.

Bat rabies was not reported in the United States until 1953, however, it may have been present in bats long before it was reported (Baer, 1975). Since first reported, the number of bat rabies' cases has steadily risen culminating, in the United States, with 756 and 738 cases in 1979 and 1980 respectively (CDC, 1981c). Bat rabies also appears to be more widely distributed geographically than that of any other wildlife host (e.g., in 1979, bat rabies was reported from 46 states) (CDC, 1981c).

In Arkansas, bat rabies was not reported until 1961 (Table, Fig. 4). Since then it has averaged a little over 9 cases per year and has accounted for 6.7% of the total reported rabies. It appears that reported bat rabies has increased slightly over the past few years and may potentially represent an important future reservoir in the state.

There are 16 species of bats in Arkansas, all of which have been reported in the literature to have carried rabies (Baer, 1975; Constantine, 1979). Until 1979 no attempt was made to determine which species of bats were tested or reported rabid and because of the lack of expertise in the State Health Department Diagnostic Laboratory, present identifications may also be subject to error (Dr. T. McChesney, pers. comm.). In spite of this, I feel that identification of the following species are clear enough to warrant inclusion as definite bat vectors in Arkansas: little brown bat, *Myotis lucifugus*; big brown bat, *Eptesicus fuscus*; evening bat, *Nycticeius humeralis*; red bat, *Lasiurus borealis*; and the eastern pipistrelle, *Pipistrellus subflavus*. In order to present a clear representation of bat rabies in Arkansas further efforts should be made to clearly identify bats sent to the state health department for testing. The various habits and habitats of the different species of bats may well reflect differences in the epidemiology of rabies in the state.

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Gary A. Heidt

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