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REPORTED ANIMAL RABIES IN ARKANSAS: 1950-1981

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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 1981-83 and then declined to 15.8% from 1964-81. This switch from domestic to wildlife rabies corresponded to a similar trend in nationally reported rabbits 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 83.5% of total reported rabbits; 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 epizootie 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 rabbits 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 rabbits (mean of 3.4% per year, Table), and has experienced skunk rabies epizooties in the late 1970's (Heidt et al., 1982). In spite of this importance, few studies on rabbits 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 rabbits 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 (Verts and Storm, 1966; Lewis, 1972; Carey et al., 1978). In addition, untold numbers of animal 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 rabbits cases are expressed in the 'dumb' rather than 'furious' form (McLean, 1970; Kaplan and Koprowski, 1980). Thus, I feel reported rabbits 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 rabbits, over the previous 31 years (1950-1981). These data can be used to aid in identifying problem animals and trends in rabbits 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 meeting summarizing rabbits 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 rabbits 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 rabbits 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 rabbits 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 rabbits 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 rabbits. During the 31 year period, Arkansas contributed an average of 3.4%
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, 1981a). 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; Silkes, 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. 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.

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.

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

![Graph showing percentages of skunks, foxes, and bats from 1950 to 1980.](image)

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. gracill; 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, 1975; 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, 1976; 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 a 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 1965) (Table, Fig. 4). Skunk rabies reached epidemic 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 Loma 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 few 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 (Mc Ardle, 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; Mc Lean, 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. Mc Chesney, 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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