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RABIES IN AN EASTERN FOX SQUIRREL

D. T. CAPPUCCI, JR.,* R. W. EMMONS,** and W. W. SAMPSON***

Abstract: Rabies was confirmed by specific laboratory tests in an Eastern fox squirrel (*Sciurus niger*) which was shot in San Leandro, Alameda County, California, in August, 1971. The rabid animal had displayed aggressive, furious behavior. The one person who had been exposed, during an unprovoked attack, subsequently underwent antirabies treatment. Except in aberrant, isolated cases, such as described herein, rabies is only rarely diagnosed in rodents in the United States. Antirabies treatment for rodent bites is seldom justified, unless rabies has been demonstrated by reliable laboratory tests.

INTRODUCTION

About one-third of the animals examined annually for rabies in the United States are rodents (W. G. Winkler and K. D. Kappus, personal communication). Although rabies has been reported on rare occasions in various rodent species, there is no evidence that rodents play a role in propagation of the disease in this country.^{3,4,12} The diagnosis of rabies was sometimes based solely on clinical signs or laboratory tests that were nonspecific for rabies virus. Examples of inconclusive laboratory evidence include the finding of nonspecific inclusion bodies thought to resemble Negri bodies and fluorescent antibody staining unconfirmed by specificity controls or virus isolation. Reports of the demonstration of rabies or rabies-like viruses in various rodent species in Europe, Africa, Asia, and elsewhere outside the United States have also appeared in the literature and are too numerous to review here. Some of these reports were later retracted as erroneous, and others are subject to the same criticisms of inadequate documentation as above. While sporadic instances of natural rabies infection in rodents are possible, the importance of rodents in the natural history of rabies is unproven. The subject re-

mains controversial and under active study.

Rabies in squirrels has apparently been reliably documented once in Maryland,² once in Florida,¹¹ and twice in New York State (D. Axelrod, personal communication).¹ Winkler *et al.* have recently reported the susceptibility of the Eastern gray squirrel (*Sciurus carolinensis*) and other rodents to experimental rabies infection.¹³ Rabid squirrels sometimes exhibited aggressive, furious behavior and had virus in the salivary glands as well as in the brain at necropsy.¹³ We report herein a case of rabies in an Eastern fox squirrel (*Sciurus niger*) to emphasize the rarity of the event and the need for careful laboratory documentation. This is the first case of rabies in a rodent in California, verified by reliable laboratory methods, out of more than 4,000 squirrels and 20,000 other rodents and lagomorphs examined since 1950 (California State Department of Public Health, epidemiologic and laboratory records).

CASE REPORT

On August 24, 1971, a 72-year-old woman, a resident of San Leandro, Alameda County, California, was attacked

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by a squirrel while in her backyard and was scratched on the right hand. The attack was completely unprovoked. The squirrel remained in the yard, and exhibited aggressive, abnormal behavior and obvious signs of illness. It was shot and submitted for laboratory tests. The animal was identified as an Eastern fox squirrel (*Sciurus niger*). Tests in the Alameda County Health Care Services Agency Laboratory and the Viral and Rickettsial Disease Laboratory of the California State Department of Public Health confirmed the presence of rabies virus in squirrel brain by Negri body test, fluorescent rabies antibody (FRA) test (including specificity tests), and mouse inoculation tests.^{5,6} Reisolation of the virus was successful, and it was further confirmed as rabies virus by a neutralization test in mice using specific rabies immune serum. To rule out the possibility of laboratory error, such as interchange with another specimen, the positive brain was identified as squirrel brain by modified precipitin and agar gel diffusion tests, using specific precipitating antiserum.^{7,10}

It was thought that exposure to rabies virus might have occurred via the scratch wound, although no actual bite had taken place. The patient was therefore treated with duck embryo-origin rabies vaccine and equine-origin, antirabies hyperimmune serum. Tetanus toxoid and diphenhydramine hydrochloride[†] were also administered. A generalized, vesicular rash, of undetermined origin, was observed subsequent to the completion of treatment; however, the rash soon subsided without medical intervention. As of June, 1972, the patient remained healthy.

DISCUSSION

Investigation of this episode suggested that the squirrel may have been exposed to rabies by a chance encounter with either a rabid skunk or bat. During 1971, in Alameda County, there were 27 reported cases of animal rabies: skunk (*Mephitis mephitis*), 24 cases; bat (*Tadarida brasiliensis*), two cases; and the fox squirrel reported herein, one case, respectively

(California State Department of Public Health, epidemiologic and laboratory records). Skunk rabies is particularly prominent in California, including Alameda County, at the present time. Four of the rabid skunks in Alameda County, during summer months of 1971, were found within less than 1.6 km of the location where the rabid squirrel episode occurred. None of the veterinary practitioners in the general area could recall treating or vaccinating pet squirrels. There have been no previous or subsequent reports to local animal control authorities of unusual squirrel populations, behavior, or squirrel bites in man.

The Eastern fox squirrel, introduced into California from other areas of the United States at the turn of the century, is well established in several locations.¹¹ The fox squirrel is a borderland species that prefers open timber and small groves.^{8,9} On occasion the species has caused damage to agricultural crops and telephone cables within the state.^{8,14}

The aforementioned episode will most likely remain a rare, isolated incident. No human case of rabies in the United States has ever been proved to result from rodent exposure.¹² Rodents are considered "low-risk" species, and bites from these animals very rarely should necessitate antirabies treatment (W. G. Winkler and K. D. Kappus, personal communication).¹² Possible exceptions include rodents proved to be rabid by reliable laboratory techniques, or rodents which escape and cannot be examined but have shown aggressive behavior consistent with furious rabies. It therefore remains unjustified in most instances in the United States to treat rodent bites as rabies exposures, even if the animal escapes and cannot be tested. Routine testing of rodents for rabies is unjustified, except where clinically suspicious animals have bitten someone. Specimens thought to be positive for rabies by screening tests should be carefully verified by virus isolation and identification, specific FRA staining, and submission of original brain tissue to a reference laboratory.

[†] Benadryl ® hydrochloride. Parke, Davis & Company, Detroit, Michigan.

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