SEROLOGICAL SURVEY OF FERAL RODENTS IN THAILAND FOR EVIDENCE OF RABIES VIRUS INFECTION 1 4

Authors: BROWN, JOHN L., TINGPALAPONG, MARKPOL, and ANDREWS, WILLIAM K.

Source: Journal of Wildlife Diseases, 15(4) : 601-606

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-15.4.601

SEROLOGICAL SURVEY OF FERAL RODENTS IN THAILAND FOR EVIDENCE OF RABIES VIRUS INFECTION [1] [4]

JOHN L. BROWN,[2] MARKPOL TINGPALAPONG and WILLIAM K. ANDREWS [3]

Abstract: Between July, 1977 and January, 1978, serum from 645 feral rodents and 31 other small mammals was examined for presence of rabies serum neutralizing antibody. Results suggest that feral rodents are not involved in the epizootiology of rabies in Thailand.

INTRODUCTION

Naturally occurring rabies infection occasionally has been reported in feral rodents.[3,18] However, the role rodents play in the epizootiology of wildlife rabies is not clear. Rodents are not considered reservoirs of wildlife rabies in North America or Western Europe; in other areas of the world studies are less complete.[19] Mokola virus, a member of the rabies serogroup within the family Rhabdoviridae, is reported to be enzootic in shrews in Africa.[9,11] However, African rodents do not appear to be an enzootic reservoir of either "classical" rabies virus or Mokola virus. Likewise, there appears to be no evidence of enzootic rodent rabies in Central and South America. In recent years, rabies has been reported to be enzootic in feral mice in Eastern and Central Europe and in feral rodents in Southeast Asia.[11,13,15,17]

This study attempted to corroborate reports of rabies in feral rodents in Thailand. Following a survey of 1,036 rodents in 1966, Smith *et al.*, reported that rabies had been identified in six species.[15] The percent infected ranged from 1.9% of 375 *Bandicoota bengalensis (Bandicota savilei)* to 7.9% of 126 *B. indica*. Infection was defined as the finding of virus in brain tissue by both fluorescent antibody (FA) staining and virus isolation. In 1967-68, Smith *et al.*,[16] conducted additional surveys, during which 542 rodents were tested. Rabies was reported in only one rodent, a *Rattus losea*, trapped in 1967.

Two other surveys have been conducted in Thailand since 1968. Procedures used for viral detection and isolation were identical to those employed by Smith *et al.* In 1970-71, Hickman *et al.*, surveyed 513 rodents from nine provinces and found no evidence of rabies virus infection.[7,8] In 1972, the Cholburi and Rayong areas, where Smith *et al.*, obtained a high percentage of positive isolations, were again surveyed.[5,12] A total of 704 rodents, including 520 *B. indica* and 184 *R. rattus*, were studied and reported to be negative for rabies virus.

The basis for determination of rabies virus infection in the previous studies has been by FA staining of brain im-

[1] U.S. Army Medical Component, Armed Forces Research Institute of Medical Sciences, Bangkok, Thailand.

[2] Present address: U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, Frederick, Maryland 21701, USA.

[3] Present address: Walter Reed Army Medical Center, Washington, DC 20012, USA.

[4] In conducting the research described in this report, the investigators adhered to the "Guide for the Care and Use of Laboratory Animals," as promulgated by the Committee on Care and Use of Laboratory Animals of the Institute of Laboratory Animal Resources, National Research Council. The views of the authors do not purport to reflect the positions of the Department of the Army or the Department of Defense.

pressions and subsequent confirmation by inoculation of brain suspension into mice. In the present study, selected feral rodent populations were examined for evidence of rabies infection by testing their serum for rabies neutralizing antibodies.

MATERIALS AND METHODS

Trapping was conducted at seven field sites from July, 1977 through January, 1978 (Fig. 1). Sites at Sakaerat, Saiyok, and Ban Bu Pai were mostly in woods. In the environs of ChidmgmMac, spteshw-drehOODS JND FCRb, jnd wt Rayong and Cha Choeng Sao, sites were rice fields, scrub, and rural in nature. Wire basket traps were used for trapping. They were baited with peeled ripe banana and set along a trail or near a burrow. Each trapped animal was given an accession number and caged separately at the field site. The capture site, date, genus, species, age, and sex were recorded. Animals were transported alive to the laboratory for a more thorough examination and bleeding. Blood was collected via heart puncture or from the medial periorbital sinus. Serum was harvested and stored at -60 C.

Rabies serum neutralizing (SN) antibodies were assayed by the standard mouse neutralization test.[1] CVS-31 [5] was used for challenge at 20-100 $ICLD_{50}$. Reference serum, diluted to 2 I.U./ml, was included with each set of tests. Test serum was screened at both 1:5 and 1:25 dilutions. Any test in which serum tested positive at a 1:5 dilution was to be retested at least once.

RESULTS

One mongoose, 30 tree shrews and 645 rodents were trapped (Table 1). All were from forested and rural regions. Except for 13 animals trapped in northern Thailand around Chieng Mai, they were from either central or southeastern Thailand, near Bangkok.

During performance of SN tests, the reference serum ranged in titer from 1:56 to 1:282. With one exception, the rabies SN antibody titer of all animals was less than 1:5. The single exception was an adult *Rattus surifer* caught at Ban Bu Pai. A serum sample collected shortly after capture on 22 December and a second serum sample collected on 24 January were tested. In two separate tests, the first serum collected had a titer of 1:5 and 1:8, respectively, and the later serum had a titer of 1:8 (0.09 I.U./ml) on both tests. On the basis of FA testing and mouse inoculation, rabies virus could not be demonstrated in brain tissue of this *R. surifer*.

DISCUSSION

Other investigators have used the SN test to detect rabies infection in wildlife populations, and a titer of 1:5 or greater is generally considered to be indicative of prior rabies virus infection.[2,6,10] With the results reported here it is reasonable to conclude that at the time of the survey there was little evidence of enzootic rabies in feral rodents.

The sustained titer of 1:8 in a single *R. surifer* is probably due to factors such as serum toxicity or nonspecific inhibitory factors. It is possible that the titer is evidence of rabies infection. Rabies in feral rodents could occur cyclically, and only the surveys by Smith *et al.* in 1966-1968 coincided with a peak in the cycle of infection.[15,16] At present, however, a low titer in a single rodent, is insufficient evidence to support a conclusion that feral rodents are a reservoir of wildlife rabies.

[5] Challenge Virus Standard, Bureau of Biologics, FDA, Bethesda, Maryland 20014, USA.

[6] U.S. Standard Antirabies Serum, Lot No. 4, Bureau of Biologics, Food and Drug Administration, Bethesda, Maryland 20014, USA.

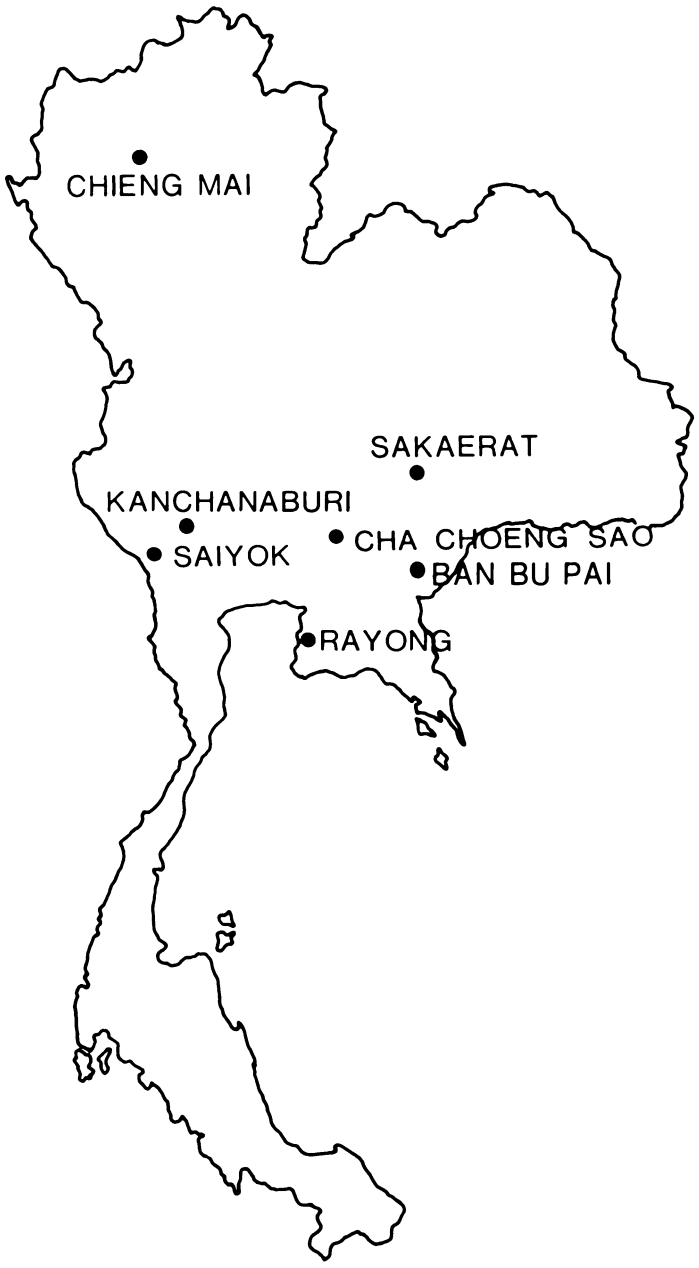

FIGURE 1. Map of Thailand showing sites rodents and small mammals were trapped.

TABLE 1. List of animals and the numbers of each trapped for serologic survey for rabies in 1977-1978.

Trapping Site	Sakaerat	Chieng Mai	Saiyok	Rayong	Kanchanaburi	Ban Bu Pai	Cha Choeng Sao	Total
Month Year	July-Aug 1977	Sept 1977	Oct 1977	Nov 1977	Nov 1977	Dec 1977	Jan 1978	
Rattus rattus	24	-	8	26	10	16	55	139
Rattus koratensis	1	-	-	-	-	-	-	1
Rattus sabanus	6	-	-	-	-	17	-	23
Rattus surifer	77	-	6	-	4	63	-	150
Rattus exulans	-	1	-	-	-	-	-	1
Rattus berdmorei	-	-	-	2	1	-	-	3
Rattus rapit	8	-	1	-	-	1	-	10
Rattus norvegicus	-	-	-	1	-	-	-	1
Rattus losea	-	-	-	-	-	4	-	4
Rattus bukit	-	1	-	-	-	-	-	1
Bandicota indica	-	5	-	51	1	-	219	276
Bandicota savilei	-	-	7	-	10	-	-	17
Menetes berdmorei	1	4	8	-	5	1	-	19
Mongoose *(Herpestes javanicus)*	1	-	-	-	-	-	-	1
Tupaia glis	18	1	4	-	2	5	-	30
TOTAL	135	13	34	80	33	107	274	676

It should be stressed that, since 1968, three separate investigative teams have conducted surveys in which the primary objective was to corroborate the findings of Smith *et. al.*[5,7,8,12] With completion of the present serologic survey, a total of 1,862 rodents have been tested. The results have consistently failed to yield any concrete evidence of enzootic rabies. Based upon this evidence accumulated during the past 10 years we must conclude that rabies is not enzootic in feral rodents in Thailand.

From a practical standpoint, the survey results are useful to the physician charged with treating animal bite cases. In Southeast Asia dogs and cats are known to be the primary host vectors of urban rabies, but wildlife host vectors are poorly identified.[18] Based upon the report in 1967 of a high prevalence of enzootic rodent rabies in Thailand, many individuals considered that a person bitten by a rodent in Southeast Asia has been potentially exposed to rabies. Usually the rodent is unavailable for laboratory testing, and the physician will often opt for administration of postexposure rabies vaccination. Since the surveys conducted after 1968 have neither corroborated the high prevalence of enzootic rodent rabies, nor yielded any convincing evidence of its existence, postexposure treatment guidelines for patients bitten by rodents in Thailand and Southeast Asia should be reevaluated. In most countries in which rabies is enzootic in wildlife an individual who has been bitten by a rodent is not considered at risk except under very unusual circumstances, such as an unprovoked rodent attack.[4]

Acknowledgements

Appreciation is expressed to Vandee Nongngork, Department of Entomology, for assistance with animal trapping, and to Chalerm Jeckseang, Department of Veterinary Medicine, for assistance with serological testing. We are also indebted to Dr. Illar Muul for assistance with species identification and review of this manuscript.

LITERATURE CITED

1. ATANASIU, P. 1973. Quantitative assay and potency test of antirabies serum and immunoglobulin. pp. 314-318. In: *Laboratory Techniques in Rabies,* Monograph Series No. 23, M.M. Kaplan and H. Koprowski, Eds. 3d ed. World Health Organization, Geneva, Switzerland.
2. BIGLER, W.J., R.G., McLEAN and H.A. TREVINO. 1973. Epizootiologic aspects of raccoon rabies in Florida. Am J. Epidemiol. 98: 326-335.
3. CAPPUCCI, D.T., Jr., R.W. EMMONS and W.W. SAMPSON. 1972. Rabies in an Eastern fox squirrel. J. Wildl. Dis. 8: 340-342.
4. COREY, L. and M.A.W. HATTWICK. 1975. Treatment of persons exposed to rabies. J. Am. Med. Ass. 232: 272-276.
5. DILL, G.S., K. LAWHASWASDI and D.E. DAVIDSON. 1974. Animal rabies in Thailand. pp. 88-89. In: *The Annual Progress Report of the SEATO Medical Research Laboratory,* Bangkok, Thailand.
6. EVERARD, C.O.R., G.M. BAER and A. JAMES. 1974. Epidemiology of mongoose rabies in Grenada. J. Wildl. Dis. 10: 190-196.
7. HICKMAN, R.L., K. LAWHASWASDI and W.A. NEILL. 1970. Surveys of domestic and sylvatic animals for rabies virus infections. p. 55. In: *The Annual Progress Report of the SEATO Medical Research Laboratory,* Bangkok, Thailand.

8. —— and ——. 1971. Reservoirs of rabies virus in Thailand. pp. 104-105. In: *The Annual Progress Report of the SEATO Medical Research Laboratory,* Bangkok, Thailand.
9. KEMP, G.E., D.L. MOORE, T.T. ISOUN and A. FABIYI. 1973. Mokola virus: experimental infection and transmission studies with the shrew, a natural host. Arch. ges. Virusforsch. 43: 242-250.
10. LORD, R.D., H. DELPIETRO, E. FUENZALIDA, A.M.O. DE DIAZ and L. LAZARO. 1975. Presence of rabies neutralizing antibodies in wild carnivores following an outbreak of bovine rabies. J. Wildl. Dis. 11: 210-213.
11. PHUANGSAB, A., K. PANAS-AMPOL, K. LAWHASWASDI and L.J. LE BEAU. 1967. Rats as a reservoir of rabies in Chiengmai. J. med. Ass. Thailand. 50: 26-35.
12. SGARTZ, J.W., K. LAWHASWASDI and D.E. DAVIDSON. 1973. Reservoirs of rabies in Thailand. pp. 62-63. In: *The Annual Progress Report of the SEATO Medical Research Laboratory,* Bangkok, Thailand.
13. SCHNEIDER, L.G. and SCHOOP, U. 1972. Pathogenesis of rabies and rabies-like viruses. Ann. Inst. Pasteur. 123: 469-476.
14. SHOPE, R.E., F.A. MURPHY, A.K. HARRISON, O.R. CAUSEY, G.E. KEMP, D.I.H. SIMPSON and D.L. MOCRE. 1970. Two African viruses serologically and morphologically related to rabies virus. J. Virol. 6: 690-692.
15. SMITH, P.C., K. LAWHASWASDI, W.E. VICK and J.S. STANTON. 1968. Enzootic rabies in rodents in Thailand. Nature (Lond.) 217: 954-955.
16. ——, W.E. VICK and K. LAWHASWASDI. 1968. Surveys of domestic and sylvatic animals for rabies virus infections. pp. 416-417. In: *The Annual Progress Report of the SEATO Medical Research Laboratory,* Bangkok, Thailand.
17. SODJA, I., D. LIM and O. MATOUCH. 1971. Isolation of rabies virus from small wild rodents. J. Hyg. Epidemiol. Microbiol. Immunol. 15: 271-277.
18. STEELE, J.H. 1971. What is the current status of the viral zoonoses? Arch. Environ. Health 22: 155-162.
19. WINKLER, W.G. 1972. Rodent rabies in the United States. J. Infect. Dis. 126: 565-567.

Received for publication 8 February 1979