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## LEPROSY IN ARMADILLOS (*DASYPUS NOVEMCINCTUS*) FROM TEXAS

Keith A. Clark,<sup>1</sup> Seung H. Kim,<sup>2</sup> Louis F. Boening,<sup>3</sup> Michael J. Taylor,<sup>4</sup>  
Thomas G. Betz,<sup>1</sup> and Foy V. McCasland<sup>1</sup>

<sup>1</sup> Texas Department of Health, Austin, Texas 78756, USA

<sup>2</sup> Brooke Army Medical Center, Fort Sam Houston, Texas 78209, USA

<sup>3</sup> Texas Department of Health, Yoakum, Texas 77995, USA

<sup>4</sup> Texas Department of Health, Temple, Texas 76503, USA

**ABSTRACT:** Tissue sections from 237 nine-banded armadillos (*Dasypus novemcinctus*) from 51 central Texas counties were examined microscopically for acid-fast bacilli and/or lesions of leprosy. Neither were found. A review of the literature relative to the incidence of leprosy from armadillos in Texas indicates that residents of counties along the Texas Gulf Coast may be at risk of contracting leprosy by handling infected armadillos or their tissues.

**Key words:** Leprosy, *Mycobacterium leprae*, nine-banded armadillo, *Dasypus novemcinctus*, central Texas, survey, acid-fast bacilli.

### INTRODUCTION

The nine-banded armadillo (*Dasypus novemcinctus*) is the only animal from North America shown to be susceptible to systemic infection by the leprosy bacillus, *Mycobacterium leprae*. Leprosy in armadillos, unlike the localized infection which can be induced in mouse footpads, duplicates the lesions of lepromatous (disseminated) leprosy in man. The prevalence of leprosy in wild armadillos along the Texas Gulf Coast has been described (Smith et al., 1983). This report presents the findings from wild armadillos collected in central Texas.

### MATERIALS AND METHODS

Two hundred thirteen samples were obtained from automobile-killed armadillos along highways by personnel who frequently drive early in the morning. Only those judged to be less than 12 hr postmortem were collected. Twelve samples were obtained from captive armadillos by auricular biopsy, and 12 wild armadillos were shot. Armadillos collected by shooting were subjected to more extensive postmortem examinations, and a variety of tissues were collected and examined grossly and microscopically.

Six mm cross-sections of tissue from the base of one ear were collected from all armadillos sampled. These were fixed in 10% neutral formalin, embedded in paraffin, sectioned, stained by the hematoxylin-eosin and Fite-Farraco (acid-fast) methods. Sections were examined microscopically for granulomatous lesions containing

acid-fast bacilli. Each sample was identified by individual number and by county of collection.

### RESULTS AND DISCUSSION

Armadillos from 51 Texas counties, primarily in the central part of the state, were included in this study (Fig. 1). Tissue sections from 237 armadillos were examined microscopically. Neither acid-fast bacilli nor lesions compatible with leprosy were detected in any of the sections.

Kirchheimer and Storrs (1971) first reported disseminated leprosy in experimentally infected armadillos. This was a significant accomplishment because it provided a badly needed source of *M. leprae* in sufficient quantities for microbiological studies, and because it identified an animal model for studies of pathogenesis and therapeutics. Subsequently, a disease which was indistinguishable from experimental leprosy was reported in wild-caught armadillos from southern Louisiana. Identical lesions, including large numbers of acid-fast bacilli, were present (Walsh et al., 1975).

The first reported leprosy in Texas armadillos was detected by examining tissue smears from the ears of 88 armadillos from 14 Texas counties. One of 61 armadillos from Anderson County was infected. The results of that study, which included 691

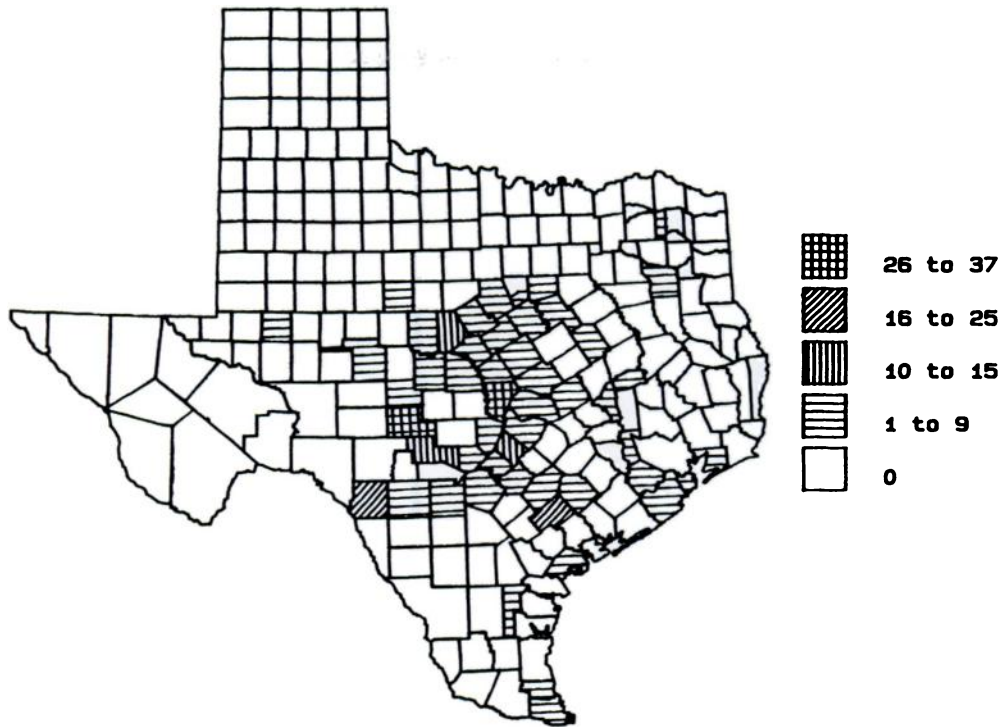


FIGURE 1. Number of armadillos sampled by county; Texas Department of Health Leprosy Surveillance, 1981–1983.

armadillos from Louisiana and 178 from Mississippi, also indicated that study of histopathologic sections was as reliable as examination of smears, and that ear tissue approximated spleen and lymph node in usefulness for the diagnosis of leprosy (Walsh et al., 1977).

Subsequently, investigators from the Centers for Disease Control and the Texas Department of Health detected acid-fast bacilli in skin lesions from an armadillo from Brazos County, Texas (Centers for Disease Control, 1978). Smith et al. (1983) reported that 21 of 451 armadillos captured on the Texas Gulf Coast were lepromatous. Base ratios and DNA homology studies indicated that the organism was *M. leprae*. Among coastal counties, the prevalence of armadillo leprosy increased progressively from northeast (1.5% in Brazoria County) to southwest (12.2% in Willacy County). Furthermore, histologic examination was the best “screening” procedure

and had no false positives or known false negatives. Wilson et al. (1984) reported that 30 armadillos from an eight county area in north central Texas were negative for acid-fast organisms both by impression smears from ear slits and by histological examination of selected tissues. Figure 2 is a compilation of all reported leprosy surveillance involving Texas armadillos, depicting the total numbers of armadillos sampled by county.

Figures 3 and 4 show the distribution of indigenous human cases of Hansen’s disease (leprosy) reported to the Texas Department of Health during the 5-yr period 1978–1982. An indigenous human case is defined as a person with Hansen’s disease who has resided in that county for at least 5 yr prior to the onset of symptoms or date of initial diagnosis. Most cases of indigenous Hansen’s disease in humans are confined to the Gulf coastal areas, consistent with the distribution of leprosy among ar-

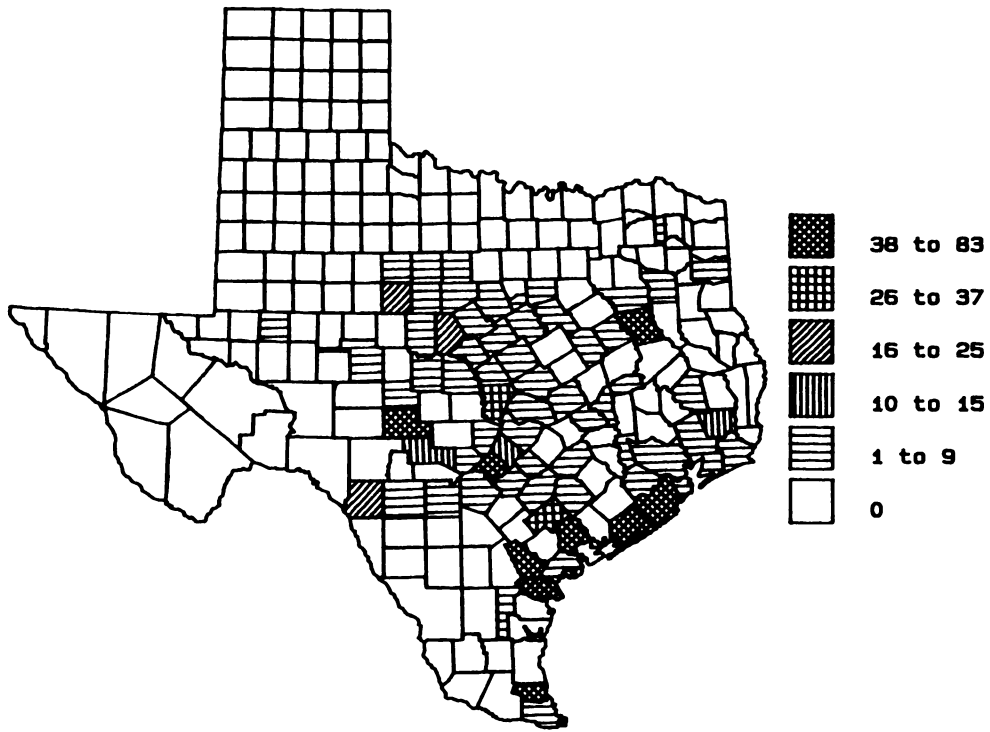


FIGURE 2. Cumulative number of armadillos sampled by county; all reports, all sources, 1977-1983.

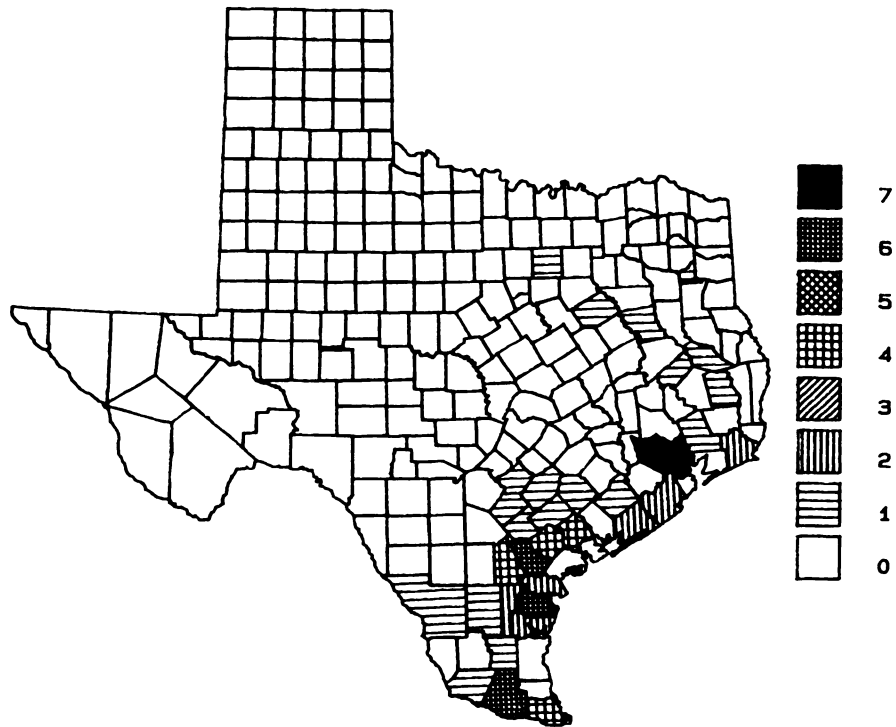


FIGURE 3. Number of indigenous cases of Hansen's disease reported in Texas by county where acquired, 1978-1982.

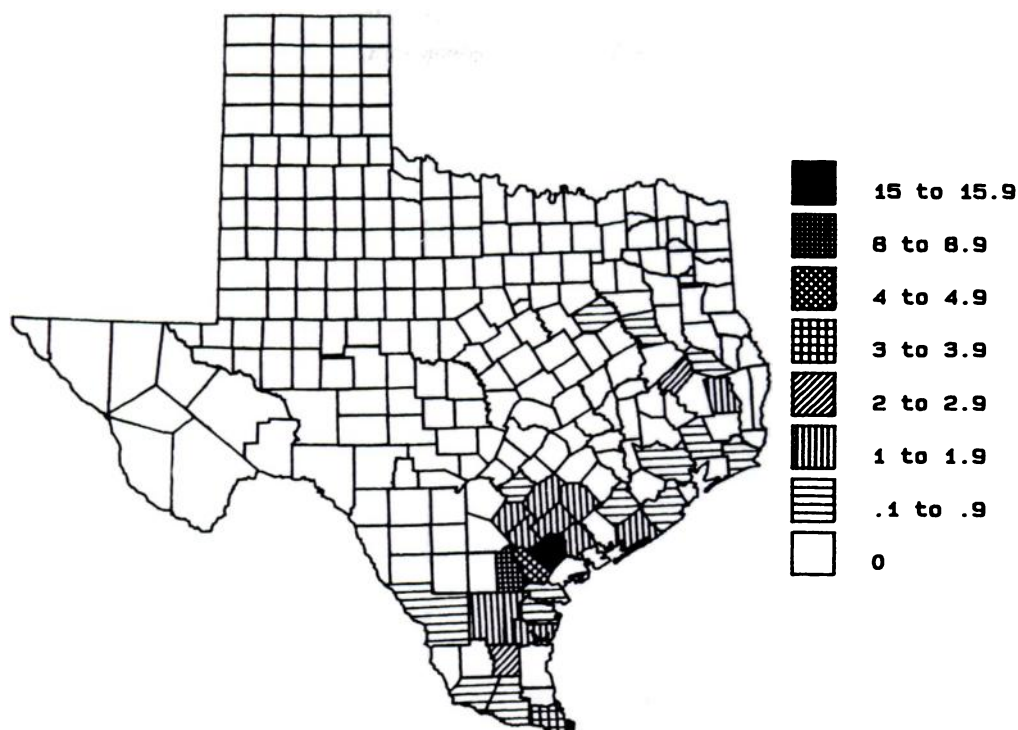


FIGURE 4. Indigenous cases of Hansen's disease reported in Texas by county where acquired, 1978–1982; annual rate per 10,000 population.

madillos reported by Smith et al. (1983). Very few indigenous human cases have been reported from central Texas. Therefore, the lack of *M. leprae* in the central Texas armadillos which we studied parallels the low incidence of reported cases among humans. However, the significance of this finding and any association remains conjectural.

Although Lumpkin et al. (1983) reported five cases of leprosy in men who had extensive and chronic contact with armadillos, it is unlikely that a significant number of indigenous cases of leprosy in man is acquired from armadillos. However, this report and the demonstration that the organism responsible for leprosy in armadillos is *M. leprae* (Smith et al., 1983) suggests that people who handle armadillos (or their tissues) from counties on the Texas Gulf Coast may unknowingly contact infected armadillos and therefore may be at risk of contracting leprosy from them.

It has been suggested also that laboratory-infected armadillos escaped from Louisiana and were a source of infection in wild armadillos. However, if this were the case, the *M. leprae* infection rates would be expected to be higher among Texas armadillos found closest to Louisiana. The study of Smith et al. (1983) documented higher prevalence in wild Texas armadillos most distant from Louisiana, supporting the hypothesis that they were infected by natural means. Furthermore, studies by Truman et al. (1985, 1986) revealed antibodies to a *M. leprae* specific antigen in the sera of armadillos captured at least 8 yr before the first armadillos were experimentally infected with *M. leprae*. This demonstrated that the disease could not have been introduced into the wild armadillo population from escaped experimentally-infected laboratory armadillos.

The source of infection in wild armadillos remains undetermined. One possi-

bility is that the infection became established in certain populations after a few armadillos initially became infected through contact with fomites derived from leptotic people. A source of infection common to both armadillo and man, such as soil or infected arthropods, also seems to afford a plausible explanation. Armadillo habitat requirements, feeding patterns, and diets place them in close contact with soil and a variety of arthropods.

This study was intended to assist in assessing the risk to Central Texas residents of contracting leprosy from handling armadillos. Also, it complements other surveys in defining the incidence of sylvatic leprosy in Texas.

#### ACKNOWLEDGMENTS

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#### LITERATURE CITED

- CENTERS FOR DISEASE CONTROL. 1978. Leprosy-like disease in armadillos. CDC Veterinary Public Health Notes. U.S. Department of Health, Education, and Welfare, Public Health Service, Atlanta, Georgia, pp. 1-2.
- KIRCHHEIMER, W. F., AND E. E. STORRS. 1971. Attempts to establish the armadillo (*Dasypus novemcinctus* Linn.) as a model for the study of leprosy. I. Report of lepromatous leprosy in an experimentally infected armadillo. *International Journal of Leprosy* 39: 693-702.
- , ———, AND C. H. BINFORD. 1972. Attempts to establish the armadillo (*Dasypus novemcinctus* Linn.) as a model for the study of leprosy. II. Histopathologic and bacteriologic postmortem findings in lepromatoid leprosy in the armadillo. *International Journal of Leprosy* 40: 229-242.
- LUMPKIN, L. R., G. F. COX, AND J. E. WOLF. 1983. Leprosy in five armadillo handlers. *Journal of the American Academy of Dermatology* 9: 899-903.
- SMITH, J. H., D. S. FOLSE, E. G. LONG, J. D. CHRISTIE, D. T. CROUSE, M. E. TEWES, A. M. GATSON, R. L. EHRHARDT, S. K. FILE, AND M. T. KELLY. 1983. Leprosy in wild armadillos (*Dasypus novemcinctus*) of the Texas Gulf Coast: Epidemiology and mycobacteriology. *Journal of the Reticuloendothelial Society* 34: 75-88.
- TRUMAN, R. W., E. J. SHANNON, M. E. HUGH-JONES, H. V. HAGSTAD, AND R. C. HASTINGS. 1985. Detection of IgM class antibodies in armadillos to the phenolic glycolipid-I antigen of *M. leprae*. *International Journal of Leprosy* 53: 155.
- , ———, H. V. HAGSTAD, M. E. HUGH-JONES, A. WOLFF, AND R. C. HASTINGS. 1986. Evaluation of the origin of *Mycobacterium leprae* infections in the wild armadillos, *Dasypus novemcinctus*. *American Journal of Tropical Medicine and Hygiene* 35: 588.
- WALSH, G. P., E. E. STORRS, H. P. BURCHFIELD, M. F. VIDRINE, C. H. BINFORD, AND E. H. COTTRELL. 1975. Leprosy-like disease occurring naturally in armadillos. *Journal of the Reticuloendothelial Society* 18: 347-351.
- , ———, W. MEYERS, AND C. H. BINFORD. 1977. Naturally acquired leprosy-like disease in the nine-banded armadillo (*Dasypus novemcinctus*): Recent epizootiologic findings. *Journal of the Reticuloendothelial Society* 22: 363-376.
- WILSON, G. T., P. HORTON, W. C. STEVENS, AND R. E. SHAKE. 1984. Absence of leprosy-like disease in the nine-banded armadillo (*Dasypus novemcinctus*) in and around Taylor County, Texas. *Texas Journal of Science* 34: 73-79.

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