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SMALL MAMMALS AND WHITE-TAILED DEER AS POSSIBLE RESERVOIR HOSTS OF *Brucella Abortus* IN TEXAS [1]

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Abstract: Four hundred sixty-eight wild mammals were collected from four ranches in Texas where *Brucella*-infected cattle herds are maintained, and examined as possible reservoir hosts for *Brucella abortus*. Seventy-one serums from five species were tested for *Brucella* antibodies. Liver and spleen from 453 mammals (14 species) were cultured for *B. abortus*. Results of the serologic and bacteriologic examination of rodents, opossums *(Didelphis virginiana),* raccoons *(Procyon lotor)* and white-tailed deer *(Odocoileus virginianus)* did not provide evidence of an extrabovine reservoir of *B. abortus*.

INTRODUCTION

In the United States, *Brucella abortus*, *B. canis*, *B. suis*, and *B. neotomae* have been isolated from various wild ungulates,[3,4,15,16,20] carnivores,[4,8,9,10,11] lagomorphs[11,13,14] and rodents.[5,11,13,14]

Cook *et al.*[3] examined serums from 76 white-tailed deer *(Odocoileus virginianus)* from South Texas but did not report evidence of brucellosis. Trainer and Knowlton[12] did not find antibodies to *B. abortus* in 33 coyotes *(Canis latrans)* examined from western Texas, but serologic evidence of *B. canis* has been reported in coyotes, bobcats *(Lynx rufus)*, raccoons *(Procyon lotor)* and opossums *(Didelphis virginiana)* from South Texas.[7,10] This paper reports the results of serologic and bacteriologic testing for *B. abortus* on samples from wildlife species collected from ranches in Texas that maintained cattle herds infected with *B. abortus*.

MATERIALS AND METHODS

Wildlife samples were collected from four ranches. The location of the four ranches is diagramed in Figure 1. Herd 76-1 on 1181 ha in Matagorda County contained 631 beef cattle of which 55 (9%) were brucellosis reactors and *B. abortus* biotype 2 was isolated from 22 cows. Herd 76-3 on 540 ha in Jefferson County was composed of 323 beef cattle of which 66 (20%) were brucellosis reactors and *B. abortus* biotype 1 was isolated from 15 cows and 1 bull. Another beef herd on 360 ha in Caldwell County (central Texas) had 131 cattle of which 12 (9%) were brucellosis reactors and *B. abortus* biotype 1 was isolated from 5 cows. A dairy herd of 866 cattle on 240 ha in Bowie County (northeastern Texas) had 213 (25%) reactors and *B. abortus* biotype 4 was isolated from 96 cows.

Two ranches maintained a herd of brucellosis reactor cattle for other ex-

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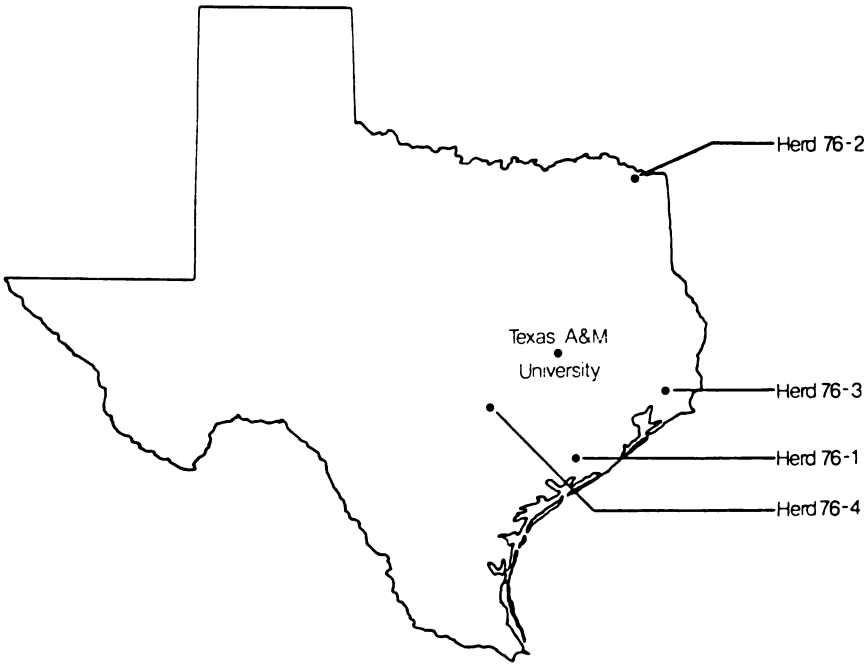

FIGURE 1. Location of four ranches selected for study of small mammals and white-tailed deer as possible reservoir hosts of *Brucella abortus*.

periments, providing an opportunity to examine wild mammals from pastures where bovine brucellosis was concentrated. Ranch 76-3 had 31 reactor cows on a 41 ha pasture (1.3 ha/reactor) and Ranch 76-1 had 14 reactor cows on a 109 ha pasture (7.8 ha/reactor). Two of these 45 cows were virgin heifers and the other 43 were pregnant and parturition occurred in the pasture just prior to or during the period wildlife were being sampled.

Wild mammals were trapped on each ranch every 4 weeks from January through July, 1977. A grid pattern was employed using 50 Sherman[4] live traps (5 rows and 10 columns) to capture small rodents. Six Tomahawk[5] live traps were also used to capture larger animals such as raccoons, opossums and rabbits. The traps used for the non-rodent mammals were placed near animal signs and not in a prescribed pattern. A trapping period consisted of three consecutive nights. The species, sex and age of captured animals were recorded. The animals were transported live to College Station and, following euthanasia, the liver and spleen were removed for bacteriologic examination. A blood sample was also collected by cardiac puncture from some animals.

White-tailed deer were sampled on three occasions on one ranch (76-1).

[4] H. B. Sherman Traps, Tallahassee, Florida.

[5] No. 207, Tomahawk Line Trap Co., Tomahawk, Wisconsin.

Twelve deer were captured with a net, bled and released in December, 1976. Two bucks and one doe were killed in March, 1977, and 22 deer (8 bucks and 14 does) were killed in December, 1977. Blood was collected from 35 deer; samples of liver and spleen were collected from 22 deer. In addition, the testes from 6 bucks, supramammary lymph nodes from 15 does, and fetuses from 9 does also were collected.

Serum samples were examined for *Brucella* antibodies by the serum agglutination tube (SAT),[17] the buffered brucella antigen (card)[18] and the complement fixation (CF)[1] tests. All tissues for bacteriologic examination were frozen at -20 C, then thawed and cultured. The tissues were cultured on Brucella Agar Medium[a] supplemented with bovine serum (5%) and antibiotics (6,000 units of Polymyxin-B, 25,000 units of Bacitracin, and 100 mg of Cycloheximide per liter). Forceps were used to smear the cut surface of the tissues across the agar plates. The plates were incubated at 37 C in 10% CO_2 for a minimum of 5 days.[19] Cultures of bacterial isolates suspected as *Brucella* were sent to the Veterinary Services Diagnostic Laboratory, USDA, APHIS, in Ames, Iowa for identification.

RESULTS

Table 1 lists the age and sex of the 468 wild mammals that were examined for evidence of *B. abortus*. The majority of the wild animals were adults (77%) although subadults (18%) and juvenile (5%) were also examined. Males (51%) and females (49%) were about equal.

Samples of the liver and spleen from 453 animals (14 species), the testes from 6 white-tailed bucks, supramammary lymph nodes from 15 does, and fetuses from 9 does were negative for *B. abortus* (Table 2). Serum samples from 35 white-tailed deer, 7 opossums, 3 raccoons, 1 cottontail rabbit and 25 hispid cotton rats were negative by SAT, card, and CF tests. Serum samples from 1 buck and 1 doe had CF titers of 1:10 which are interpreted as negative tests.

TABLE 1. Age and sex of wildlife species sampled for *Brucella abortus* from four Texas ranches.

	AGE			SEX	
SPECIES	Juvenile	Subadult	Adult	Male	Female
Opossum	1	1	5	3	4
Raccoon	0	0	3	2	1
Eastern Cottontail	1	0	0	0	1
Hispid Pocket Mouse	0	0	1	1	0
Pygmy Mouse	0	0	22	9	13
Fulvous Harvest Mouse	1	22	106	70	59
Deer Mouse	0	0	2	2	0
White-footed Mouse	0	3	21	12	12
Marsh Rice Rat	1	9	29	21	18
Hispid Cotton Rat	15	38	138	92	99
Florida Wood Rat	0	0	3	2	1
Roof Rat	1	2	1	2	2
House Mouse	0	0	5	4	1
White-tailed Deer	2	11	24	17	20
Totals - 468 Animals	22	86	360	237	231

[a] Difco Laboratories, Detroit, Michigan.

TABLE 2. Wildlife species cultured for *Brucella abortus* from Texas ranches with bovine brucellosis.

	Herd 76-1	Herd 76-2	Herd 76-3	Herd 76-4	Total
Opossum *(Didelphis virginiana)*	1	5*	1	0	7
Raccoon *(Procyon lotor)*	1	1	0	1	3
Eastern Cottontail *(Sylvilagus floridanus)*	0	0	0	1	1
Hispid Pocket Mouse *(Perognathus hispidus)*	0	0	0	1	1
Pygmy Mouse *(Baiomys taylori)*	19	0	0	3*	22
Fulvous Harvest Mouse *(Reithrodontomys fulvescens)*	108	10	6	5	129
Deer Mouse *(Peromyscus maniculatus)*	0	0	0	2	2
White-footed Mouse *(peromyscus leucopus)*	23	0	0	1*	24
Marsh Rice Rat *(Oryzomys palustris)*	33	0	6	0	39
Hispid Cotton Rat *(Sigmodon hispidus)*	129*	52	3	7	191
Florida Wood Rat *(Neotoma floridana)*	0	0	0	3	3
Roof Rat *(Rattus rattus)*	1	2	1	0	4
House Mouse *(Mus musculus)*	2	3	0	0	5
White-tailed Deer *(Odocoileus virginianus)*	22*	0	0	0	22
Total	339	73	17	24	453

*An isolation of a Brucella-like bacteria was made but was not *Brucella abortus*.

DISCUSSION

It is evident from Table 2 that there were great differences in the density of rodents on the four ranches. The density was related to pasture management and the presence or absence of favorable habitat. The age distribution of each of the species sampled favored adults, but the sex ratios were evenly distributed.

Bacteria resembling *Brucella* were isolated from the liver of an opossum, three rodents, and a deer. These bacteria were agglutinated by *Brucella* antiserum. Cultures of two of the isolates from rodents and 1 from deer were examined by a *Brucella* reference laboratory but were not confirmed as *Brucella*. The other 2 isolates were not available for testing by the reference laboratory. Classification of the bacteria has been requested, but at the present time, has not been completed.

Studies in the United States have shown that brucellosis rarely occurs in white-tailed deer.[3,4,5] The serology on 35 blood samples and the cultures of 74 tissues collected from 22 deer during this study support these previous observations. The deer were collected from pastures where *B. abortus* infected cows grazed. These data indicate that *B. abortus* from cattle is not likely to be

transmitted to deer under these range conditions and the deer were not reservoir hosts of *Brucella* on ranch 76-1.

Serologic or bacteriologic evidence of *B. abortus* was not observed in the samples from opossums, raccoons, or the cottontail rabbit examined during this study. The small sample size of these animals precludes making any definitive statements about their importance as reservoir hosts of *B. abortus* in Texas.

Although it has been shown that rodents can be experimentally infected with *B. abortus,*[2,13] the occurrence of *B. abortus* in natural populations is extremely low.[11,14] Results of this study indicate that rodents were not reservoir hosts of *B. abortus* on the 4 ranches studied.

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