

# Feral swine exposure to selected viral and bacterial pathogens in southern Texas

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## Summary

Blood samples were obtained from feral swine in Texas to determine the seroprevalence of selected pathogens. Exposures rates were 35%, 1%, and 1% for pseudorabies

virus, *Brucella*, and porcine reproductive and respiratory syndrome virus, respectively. Simple modifications to enclosures may provide adequate biosecurity for swine at risk within this region.

**Keywords:** swine, feral, *Brucella*, porcine reproductive and respiratory syndrome, pseudorabies

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## Resumen - Exposición del cerdo salvaje a patógenos bacterianos y virales en el sur de Texas

Se obtuvieron muestras de sangre de cerdos salvajes en Texas para determinar la seroprevalencia de ciertos patógenos seleccionados. Los índices de exposición fueron de 35%, 1%, y 1% para Pseudorabia, *Brucella*, y síndrome reproductivo y respiratorio del cerdo respectivamente. Modificaciones sencillas en los corrales pueden proveer una bioseguridad adecuada para los cerdos en riesgo dentro de esta región.

## Résumé - Exposition de porcs sauvages à certains virus et bactéries pathogènes dans le sud du Texas

Des prélèvements sanguins ont été obtenus de porc sauvage au Texas afin de déterminer la séro-prévalence d'agents pathogènes spécifiques. Les taux d'exposition étaient respectivement de 35%, 1%, et 1% pour le virus de la pseudo-rage, *Brucella*, et le virus du syndrome reproducteur et respiratoire porcin. Des modifications mineures aux enclos permettraient de fournir une protection bio-sécuritaire adéquate aux porcs à risque dans cette région.

Invasive feral swine (*Sus scrofa*) occur across much of the United States, where they often come into conflict with agricultural and livestock producers.<sup>1</sup> Estimates of feral swine damage to ecosystems and agricultural resources exceed \$200 per animal annually or approximately \$800 million per year.<sup>2</sup> Much of this damage is caused by the aggressive rooting activities of feral swine.<sup>1</sup> Approximately 2 million feral swine exist within Texas alone, where opinions among farmers and ranchers regarding feral swine are largely negative.<sup>3</sup>

An additional source of conflict that is more difficult to quantify involves the role feral swine play in porcine disease ecology. For decades, feral swine have been recognized as reservoirs of swine diseases such as pseudorabies virus (PRV) and swine brucellosis (*Brucella suis*).<sup>4-6</sup> These diseases are presently regarded as significant threats to US agriculture.<sup>7</sup> This is particularly true because of the successful eradication in 2004 of PRV from domestic swine herds, and the potential for feral swine to transmit pathogens back into domestic populations. Consequently, disease surveillance activities involving feral swine have been intensified throughout the country in recent years.<sup>8-11</sup>

Herein, we report findings from a regional pathogen surveillance effort involving feral swine. Our objectives were to determine exposure rates of feral swine to PRV, *Brucella*, and porcine reproductive and respiratory syndrome virus (PRRSV) within nine counties in southern Texas and one county in central Texas. A previous report from counties in southern Texas during 1985 found PRV and *Brucella* exposure rates in feral swine of 0% to 85% and 0% to 31%, respectively.<sup>5</sup> Consequently, we hypothesized that exposure of feral swine to these pathogens also would occur in these and surrounding unstudied counties, particularly given that PRV persists naturally in feral swine populations over long periods ( $\geq 25$  years).<sup>10</sup>

## Materials and methods

From May 2006 to June 2007, we obtained blood samples from feral swine collected as part of routine feral-swine damage-abatement activities in Aransas, Brooks, Cameron, Duval, Jim Wells, Kleberg, McMullen, San Patricio, and Willacy counties in southern Texas, and Coryell County in central Texas (Figure 1). We trapped swine using  $2.5 \times 1.2 \times 1$ -m portable box traps with fermented corn as bait. Upon capture, swine were euthanized using humane methods,<sup>12</sup> and a blood sample was collected from each animal via cardiac puncture. All procedures were approved by the Institutional Animal Care and Use Committee at the National Wildlife Research Center (Permit No. QA-1309).

Serum was separated by centrifugation and samples were stored at  $-20^{\circ}\text{C}$  prior to analysis. We used the Pseudorabies

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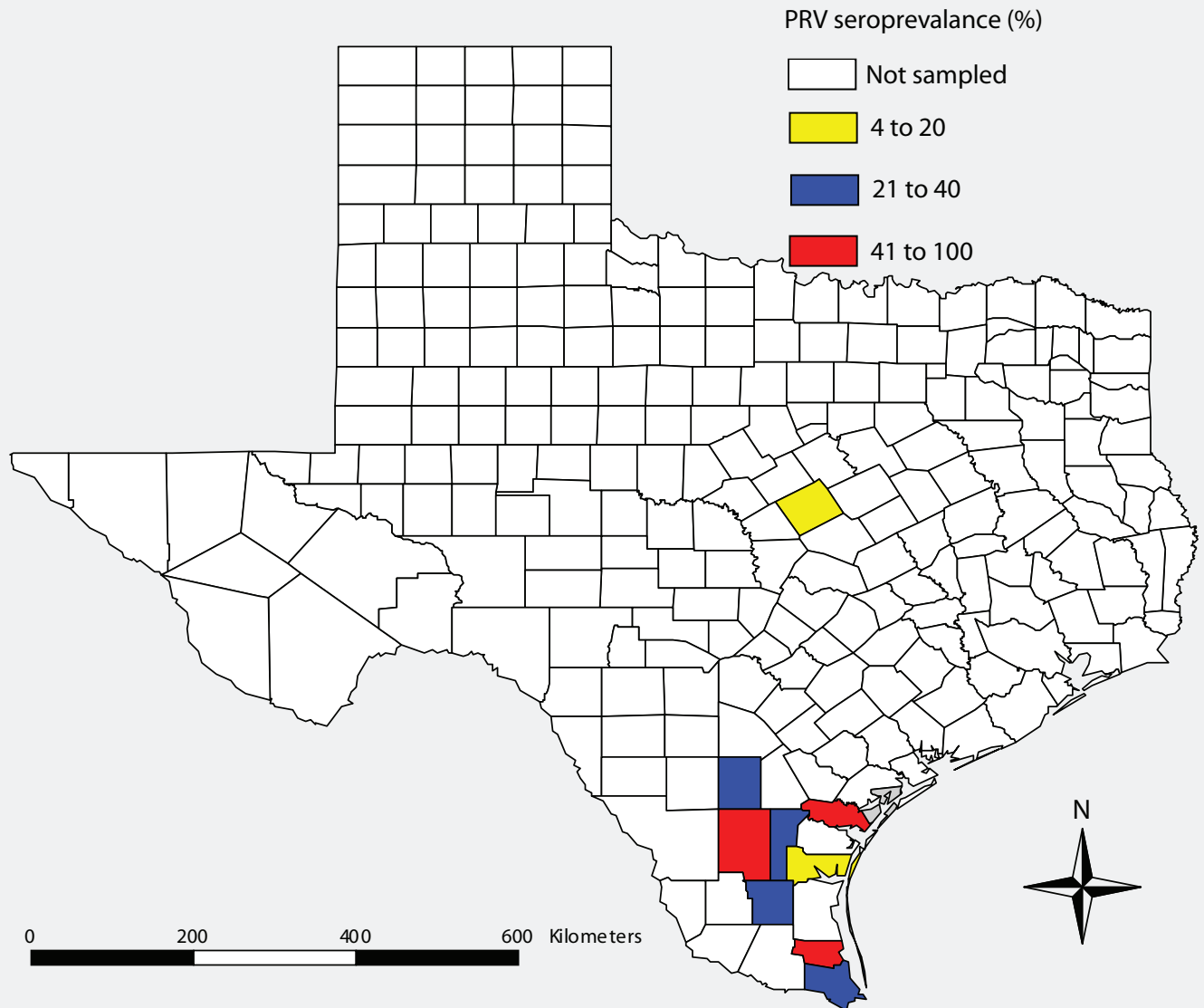
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**Figure 1:** Geographic distribution of pseudorabies virus (PRV) seroprevalence in feral swine from 10 counties in Texas between May 2006 and June 2007.



Virus Antibody Test Kit (Viral Antigens Incorporated, Memphis, Tennessee), which uses latex agglutination, to test for antibodies against PRV; the buffered *Brucella* antigen card test (United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services, Washington, DC) to test for antibodies against *Brucella*; and the Idexx 2XR enzyme-linked immunosorbent assay (HerdCheck PRRS 2XR Antibody Test Kit; Idexx Laboratories, Westbrook, Maine) to test for antibodies against PRRSV. For PRV, results were interpreted as positive or negative at a 1:4 dilution. For *Brucella*, results were interpreted as positive or negative using undiluted sera. For PRRSV, we considered animals positive if the sample:

positive ratio was  $\geq 0.4$ . Pathogen exposure rates were reported at the county level.

## Results

We obtained samples from 387 feral swine from the nine southern Texas counties and 22 samples from feral swine from Coryell County in central Texas (Table 1). We found overall feral swine exposures rates to PRV of 35%, with peak seroprevalence occurring in San Patricio county (33 of 45 positive) and Willacy county (22 of 49 positive). We determined overall exposure rates to *Brucella* and PRRSV of 1% and 1%, respectively, with antibody detection only in feral swine from McMullen and Willacy counties.

## Discussion

The exposure rates of feral swine to PRV in this study were similar to others reported from across the United States. For example, feral swine PRV exposure rates were 35% in Florida,<sup>13</sup> 29% among adult swine on Ossabaw Island, Georgia,<sup>14</sup> and 61% among adult swine in coastal South Carolina.<sup>9</sup> Additionally, feral swine exposure rates to PRRSV in this study were also consistent with others reported from the United States. For example, exposure rates to PRRSV were 1% and 2% in Texas and Oklahoma, respectively.<sup>8,15</sup> Additionally, antibodies against PRRSV have been detected in feral swine in Texas (3% prevalence)<sup>16</sup> and Mississippi (1% prevalence).<sup>17</sup> However, exposure rates for *Brucella* in

**Table 1:** Summary of feral swine survey data for exposure to selected pathogens\* in nine southern Texas counties and Coryell County in central Texas between May 2006 and June 2007

County	PRV		<i>Brucella</i>		PRRSV	
	No. positive/ No. tested	Prevalence (%)	No. positive/ No. tested	Prevalence (%)	No. positive/ No. tested	Prevalence (%)
Aransas	2/27	7	0/27	0	0/27	0
Brooks	18/60	30	0/60	0	0/60	0
Cameron	22/72	31	0/72	0	0/72	0
Coryell	1/22	5	0/22	0	0/22	0
Duval	1/1	100	0/1	0	0/1	0
Jim Wells	2/7	29	0/7	0	0/7	0
Kleberg	1/5	20	0/5	0	0/5	0
McMullen	43/121	36	1/121	1	2/121	2
San Patricio	33/45	73	0/45	0	0/45	0
Willacy	22/49	45	4/49	8	1/49	2
<b>Total</b>	<b>145/409</b>	<b>35</b>	<b>5/409</b>	<b>1</b>	<b>3/409</b>	<b>1</b>

\* Pseudorabies Virus Antibody Test Kit (Viral Antigens Incorporated, Memphis, Tennessee), using latex agglutination, was used to test for antibodies against pseudorabies virus (PRV); the buffered *Brucella* antigen card test (United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services, Washington, DC) was used to test for antibodies against *Brucella*; and the Idexx 2XR enzyme-linked immunosorbent assay (HerdChek PRRS 2XR Antibody Test Kit; Idexx Laboratories, Westbrook, Maine) was used to test for antibodies against porcine reproductive and respiratory syndrome virus (PRRSV). For PRV, results were interpreted as positive or negative at a 1:4 dilution. For *Brucella*, results were interpreted as positive or negative using undiluted sera. For PRRSV, animals were considered positive if the sample:positive ratio was  $\geq 0.4$ .

this study were inconsistent with others reported from the United States. For example, feral swine exposure rates to *Brucella* were 18% in coastal South Carolina<sup>4</sup> and 4% in California.<sup>18</sup> Additionally, we found variability at the county level in exposure rates to all three pathogens. However, we detected antibodies against PRV in all counties sampled, with seroprevalence rates ranging from 5% to 100%. Interestingly, previous reports from Aransas and Cameron counties did not identify antibodies against PRV within feral swine populations,<sup>5</sup> whereas we found exposure rates to be 7% and 31%, respectively. It is unclear if this increase in PRV seroprevalence is due to inadequate sampling in 1985 (13 and 11 samples were evaluated in Aransas and Cameron counties, respectively)<sup>5</sup> or is indicative of PRV dissemination in this region. Likely modes of PRV spread include natural dispersal and artificial dispersal (eg, unauthorized releases) of PRV-positive feral swine. The Texas Animal Health Commission has strict regulations for the trapping, movement, and release of feral swine for hunting purposes, but clandestine releases are known to occur.

We detected antibodies against *Brucella* and PRRSV only in McMullen and Willacy counties, two counties from which feral swine exposure rates have not previously been reported. A prior study did not detect antibodies against *Brucella* with feral swine from Aransas and Cameron counties.<sup>5</sup> Although we found antibodies against *Brucella* at comparatively low seroprevalence, we caution hunters to wear gloves when handling and processing carcasses to reduce the possibility of exposure to this debilitating zoonosis. Given that the population of feral swine in Texas is estimated at approximately 2 million animals, we acknowledge that we sampled only a small fraction of animals occurring in any one county and that we likely missed some *Brucella*- and PRRSV-positive swine because the proportion of animals sampled was small. Furthermore, because there are no reliable means of accurately determining feral-swine numbers, it is not possible to know the proportions of the feral-swine populations sampled within counties.

In Texas, there are approximately two times more feral swine than domestic swine. However, many of the domestic swine herds are

transitional, small-scale operations, where domestic swine regularly come in direct contact with feral swine.<sup>16</sup> In these situations, improved biosecurity measures may be needed to reduce the risk of pathogen transmission to domestic swine herds.<sup>19</sup> Our pathogen exposure rates suggest that, in southern Texas, the greatest feral swine disease threat may be from PRV, though we also detected antibodies against *Brucella* and PRRSV. Feral swine are believed to transmit PRV to both feral and domestic swine venereally.<sup>20</sup> Therefore, simple modifications to existing swine enclosures, such as adding two strands of electrified polywire<sup>21</sup> or double fencing,<sup>20</sup> may provide an adequate barrier to many domestic swine facilities at risk within this region.

## Implications

- In southern Texas, exposure rates of feral swine to PRV are greater than exposure rates to *Brucella* or PRRSV, suggesting that PRV is a more common threat to domestic swine.
- Simple changes to domestic swine facilities could make them adequately secure against the threat of PRV transmission from feral swine.

- As feral swine now occur across North America, it is important that disease surveillance activities continue, particularly in areas near domestic swine facilities or within recently discovered feral populations with unknown histories of disease exposure.

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