

## Short Communication

# Serosurvey of anti-*Leptospira* sp. and anti-*Toxoplasma gondii* antibodies in capybaras and collared and white-lipped peccaries

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### Abstract

**Introduction:** Brazilian native species are reemerging as increasingly free-ranging populations. **Methods:** Sera from 31 capybaras (*Hydrochoerus hydrochaeris*) and 28 peccaries (*Pecari tajacu* and *Tayassu pecari*) were tested for anti-*Leptospira* and anti-*Toxoplasma gondii* antibodies using microscopic seroagglutination test. **Results:** Nineteen percent of free-ranging and 10.0% of captive capybaras, along with 31.8% of collared peccaries, were seropositive for *T. gondii*. None was seropositive for *Leptospira* sp. **Conclusions:** The present findings indicated low risk of disease, particularly among capybaras and white-lipped peccaries; however, active surveillance programs are important for monitoring wildlife health and public health once they are in public parks around cities.

**Key words:** Leptospirosis. Toxoplasmosis. Captive. Free-ranging.

Wild animals play an important role in the epidemiology of zoonotic diseases such as infections of *Leptospira* sp. and *Toxoplasma gondii*<sup>1,2</sup>. Capybaras (*Hydrochoerus hydrochaeris*), collared peccaries (*Pecari tajacu*), and white-lipped peccaries (*Tayassu pecari*) are very valuable, for their meat and leather, when commercially raised, in both national and international markets<sup>2</sup>. Furthermore, these animals may play an important role in zoonotic pathogen cycles by serving as sentinels with active surveillance in both captive and free-ranging populations.

Leptospirosis is caused by bacteria of the genus *Leptospira*<sup>1</sup> considered the most widespread zoonotic disease worldwide<sup>3</sup>, and the unsanitary conditions maintained in urban areas using sewer rats as reservoirs<sup>4</sup>. Several domestic and wild animals, including the species studied here, are considered as potential reservoirs and may shed leptospires in their urine, spreading infection directly or indirectly, through urine or contaminated water, respectively<sup>1</sup>.

Toxoplasmosis, caused by the protozoon, *Toxoplasma gondii*, is another important zoonotic disease. It mostly occurs

through the ingestion of sporulated oocysts present in soil, food, water, or the musculature of intermediate hosts<sup>5</sup>. Both captive and free-ranging wild animals may be infected and act as reservoirs for spreading infection to other animals and humans. The aim of this study was to perform a serosurvey of anti-*Leptospira* sp. and anti-*T. gondii* antibodies among wild animals in different free-ranging and captive settings in southern Brazil.

Serum samples that had previously been surveyed for other pathogens were used in the present study. Sera from 31 capybaras (10 captive and 21 free-ranging) and six captive collared peccaries from the Bela Vista Sanctuary, Foz do Iguaçu and 22 captive peccaries (6 white-lipped and 16 collared peccaries) from Curitiba Zoo, Curitiba, both located in the Paraná State of Southern Brazil, were tested.

All serum samples were initially tested for anti-*Leptospira* sp. antibodies by the microscopic seroagglutination test (MAT), as described in a previous study<sup>6</sup>. All samples were tested against 28 serovars: Andamana, Australis, Autumnalis, Bataviae, Bratislava, Butembo, Canicola, Castellonis, Copenhageni, Cynopteri, Djasiman, Grippotyphosa, Hardjo (Bovis), Hardjo (Prajitno), Hebdomadis, Icterohaemorrhagiae, Javanica, Mini (Ctg), Panama, Patoc, Pomona, Pyrogenes, Sentot, Shermani, Szwajisak, Tarassovi, Whitcombi, and Wolffi. Samples were

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**Received** 4 August 2016

**Accepted** 20 December 2016

TABLE 1

Distribution and frequency of presence of anti-*Toxoplasma* antibodies in free-ranging and captive capybaras from Bela Vista Sanctuary and collared peccaries and white-lipped peccaries from Curitiba Zoo, Parana State, Brazil.

Species	Population (n)	Titer	Frequency (%)
Capybara	Free-ranging (21)	0	17/21 (80.9)
		16	1/21 (4.8)
		64	3/21 (14.3)
	Captive (10)	0	9/10 (90.0)
		16	1/10 (10.0)
Collared peccary	Captive (22)	0	15/22 (68.2)
		16	1/22 (4.5)
		64	1/22 (4.5)
		256	2/22 (9.1)
		1,024	3/22 (13.7)
White-lipped peccary	Captive (6)	0	0/6 (0)

considered positive if reactions were observed at dilutions > 1:100.

Anti-*T. gondii* antibodies were detected using the MAT, as previously described. Samples were considered if reactions were observed at dilutions > 1:16. The 95% confidence interval and *p* values were calculated separately for each variable, and the results were considered significantly different when *p* < 0.05.

All the free-ranging and captive capybaras, as well as the collared peccaries and white-lipped peccaries, were non-reactive to anti-*Leptospira* antibodies. Five out of the 31 capybaras (16.1%; 95% CI: 5.4-33.7%), four out of the 21 free-ranging (19.0%; 95% CI: 5.4-41.9%) and one out of the 10 captive (10.0%; 95% CI: 0.2-44.5%), were seroreactive with *T. gondii* at antibody titers of 16 and 64, respectively. Although all the white-lipped peccaries were seronegative for *T. gondii*, seven out of the 22 collared peccaries (31.8%; 95% CI: 13.7-54.9%) were seropositive for this protozoon, with antibody titers ranging from 16 to 1,024 (Table 1).

The prevalence of anti-*Leptospira* antibodies reported in previous studies is highly variable: from 10.4%<sup>7</sup> to 25.8%<sup>2</sup> using MAT and 71.4%<sup>1</sup> to 100%<sup>3</sup> using polymerase chain reaction (PCR) among free-ranging capybaras; from 9.8%<sup>8</sup> to 64.6%<sup>4</sup> among captive collared peccaries; and 70.4%<sup>9</sup> in free-ranging white-lipped peccaries. However, in the present study, all the animals were found to be unreactive to all 28 serovars, using MAT. These unexpected findings may be attributed to low environmental contamination in both free-ranging and captive settings, since rodents have been considered the reservoirs responsible for leptospirosis transmission<sup>2</sup>. Nonetheless, wild species in urban areas and in captivity should be always screened as potential reservoirs of environmental contamination, and further studies should be conducted to fully establish the role of each of these species in the disease cycle.

Toxoplasmosis has been reported in capybaras and peccaries, and wild rodents have been reported to be positive for *T. gondii* antigens<sup>9</sup>, with prevalence rates ranging from 0%<sup>2</sup> to 76.6%<sup>10</sup> among free-ranging and captive capybaras, and from 29.1%<sup>11</sup> to 61.5%<sup>12</sup> among hunted or free-ranging collared peccaries.

These reports differed from the results of the present study, which evaluated majority captive animals. When prevalence rates were calculated for free-ranging white-lipped peccaries using different diagnostic methods, they were found to be 60% to 100%<sup>12,13,14</sup>. Although the indirect immunofluorescence assay (IFA) has been considered the gold-standard test for toxoplasmosis, IFA and MAT have been shown to share a correlation of more than 80%<sup>10</sup>. Furthermore, MAT is an easy-to-run, non-species specific test; in contrast, IFA has prerequisites of species-specific anti-antibodies, which may be hard to obtain and not always available for wild species.

Both leptospirosis and toxoplasmosis are water-borne diseases. Although the animals assessed in the present study were found to be negative for *Leptospira* sp., these wild mammals might act as environmental sentinels and/or infection disseminators, particularly for toxoplasmosis, and pose a risk of human contamination through meat consumption. In addition, vertical transmission of *T. gondii* through gestation and horizontal transmission through oocyst ingestion from contaminated soil, food, or water might occur among humans or animal species<sup>4,15</sup>. More free-ranging capybaras were found to be positive for *T. gondii* than captive capybaras in the present study, indicating that the captive environment was more controlled, thereby impeding pathogen transmission between wild and domestic felids (definitive hosts), capybaras, and peccaries.

In summary, the results of the study indicate low risk of leptospirosis and toxoplasmosis, particularly among capybaras and white-lipped peccaries. However, active surveillance programs are important for monitoring wildlife health status and public health risks, as these species might act as sentinels.

#### Conflict of interests

The authors declare that there is no conflict of interest.

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