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SEROLOGIC SURVEY FOR SELECTED INFECTIOUS DISEASES IN FREE-RANGING BRAZILIAN TAPIRS (*TAPIRUS TERRESTRIS*) IN THE CERRADO OF CENTRAL BRAZIL

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Abstract: From September 2000 to January 2002, a serologic survey was conducted in a population of free-ranging Brazilian tapirs (*Tapirus terrestris*) inhabiting Emas National Park and surrounding areas in Goiás state, central Brazil, as part of an ecologic study. Ten tapirs were immobilized with a tiletamine–zolazepam combination, and blood samples were collected. All sera were negative for *Leptospira* spp., *Brucella abortus*, and equine infectious anemia; and one of 10 animals was positive for *Toxoplasma gondii*. This report represents the first serologic survey for selected infectious diseases in a free-ranging population of Brazilians tapirs in central Brazil.

Key words: Brazilian tapir, free-ranging tapir, infectious diseases, *Tapirus terrestris*, *Toxoplasma gondii*, wild mammal.

BRIEF COMMUNICATION

The Brazilian tapir, also known as the lowland tapir (*Tapirus terrestris*), is the largest Brazilian terrestrial mammal, weighing between 150 and 200 kg. It is one of the four species in the tapir family and is currently listed as vulnerable by the 2008 International Union for the Conservation of Nature. The current range of the Brazilian tapir is the northern and central South America, from Colombia until French Guiana, eastern Peru, Bolivia and Paraguay, through northern Argentina and southern Brazil.[1] Throughout its distribution, the species is threatened with local extinction, because of habitat conversion and hunting pressure.[1] As the tapir has a low reproductive output and slow growth, even minimal pressures can decrease their populations.[1] Tapirs play an important role in the stability of their ecosystem, most notably through their role in consuming and dispersing plant seeds.[1]

Information about ecology, management, and health status of the Brazilian tapir population is sparse. Positive serologic responses to bluetongue, infectious bovine rhinotracheitis, leptospirosis, and eastern equine encephalomyelitis have already been reported in wild lowland tapirs in southern Brazil.[10] Most of the available information on diseases in this species was obtained from animals in captivity,[11] and little is known about diseases that affect free-ranging lowland tapirs.[10] The most common medical problems in captive lowland tapirs in Brazil are cutaneous lesions, parasitic infections, and musculoskeletal pathology.[11]

Infectious diseases are considered an important factor in wildlife conservation because they can be devastating if occurring in populations that are already small or in decline. However, epidemiology studies of wildlife in Brazil are still very rare, and the impact of these diseases remains unknown. Considering that the reduction of Brazilian tapir populations is estimated to be approximately 30% in the past 33 yr,[12] a serologic survey in this population is the first step for preventing major disease problems.

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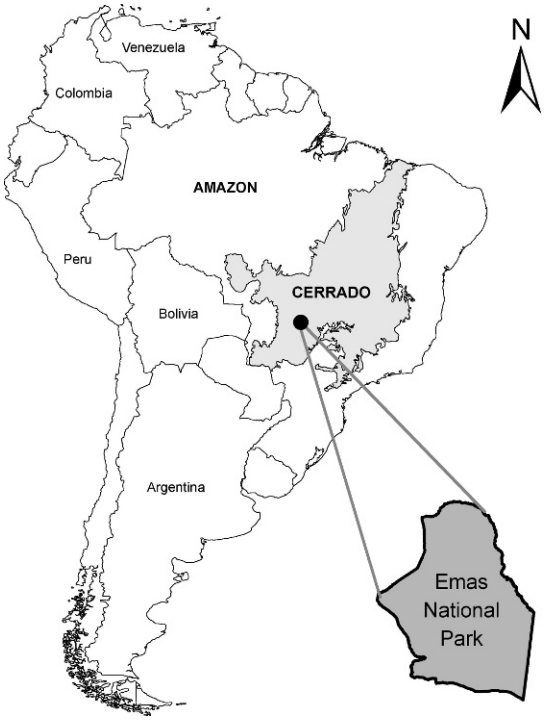

Figure 1. Map of South America showing the localization of Emas National Park, in central Brazil, from which lowland tapirs were sampled.

The Emas National Park (ENP), located in central Brazil, is one of the most representative reserves of the Biome Cerrado (Brazilian savanna; Fig. 1). Conversion of natural habitats into crop fields and exotic pastures in the periphery of the park has reduced and fragmented habitats and increased the interactions between wildlife and domestic animals. In order to establish a baseline of information regarding exposure of wild tapirs to diseases known to affect livestock species, the ENP population of Brazilian tapirs were tested for *Toxoplasma gondii*, *Brucella abortus*, *Leptospira* spp., and equine infectious anemia.

Biologic samples were collected from tapirs in ENP and surrounding areas from September 2000 until September 2002. Tapirs were captured in pitfalls, consisting of a hole 2.5 m deep, 1.5 m wide, and 2.0 m long that were covered and camouflaged with forest debris. The holes were dug in paths frequently visited by tapirs.

Once in the pitfall, tapirs were immobilized with a tiletamine–zolazepam combination, 6 mg/kg (Zoletil®,Virbac S.A., 06516 Carros cedex, France). During immobilization, the following parameters were recorded: heart rate, respiratory rate, and rectal temperature.

The tapirs were weighed using a hanging scale with a capacity of up to 300 kg attached to a rope slung over a tree. Morphometric measurements were taken, and blood samples were collected from the medial saphenous vein into vacuum blood collection tubes of 10 ml without anticoagulant. Tapirs were classified according to age as adults (>2 yr old), subadults (between 1 and 2 yr old), or juvenile (<1 yr old) based on body mass, dentition, and morphometric measurements. Clinical examinations of the physical condition and visible external injuries were noted. All animals were fitted with a radiocollar for an ecologic study. When fully recovered from anesthesia, tapirs were released at the same point of capture.

The blood samples were immediately transported from the sampling site to the biologic station, where blood was centrifuged at 1,200 *g* for 3 min. The serum was removed from the clot tube and transfered into a separate tube. All serum samples were stored in a −20°C freezer until processing. Blood samples were sent to the laboratory in freezer packs in an insulated container and transported for 12 hr to be processed by the Department of Preventive Veterinary Medicine and Animal Health of the Faculty of Veterinary Medicine and Zootechnist, University of São Paulo, Brazil. Serologic tests were performed for *T. gondii*, *Brucella abortus*, *Leptospira* spp., and equine infectious anemia in all animals. Tapirs were tested for *B. abortus* and *Leptospira* spp. because of their potential interaction with livestock in the surrounding areas. Because of the close phylogenetic relationship between tapirs and horses, the animals were tested for equine infectious anemia.

Sera were analyzed for antibodies to *T. gondii* by the modified agglutination test (MAT) using formalin-fixed whole tachyzoites and 2-mercapthoethanol. A titer of >25 was considered indicative of previous *T. gondii* infection.[4] The MAT is widely used in wildlife. While the indirect fluorescent antibody test requires a species-specific conjugate and special equipment, MAT is simple to perform and does not requires species-specific conjugate.[7] Positive controls were included in each test. The occurrence of antibody titers against *Brucella abortus* was investigated by the Rose Bengal test using as antigen the *Brucella abortus* strain 1119-3.[6] Sera were tested for *Leptospira* spp. by microscopic seroagglutination microtechnic (MAT) using 24 live serovars cultures in modified Ellinghause-McCullough-Johnson-Harris.[3] An antibody titer ≥100 was

considered positive. Serovars tested were as follows: *Australis*, *Bratislava*, *Autumnalis*, *Butembo*, *Castellonis*, *Bataviae*, *Canicola*, *Javanica*, *Panama*, *Pomona*, *Pyrogenes*, *Hardjo*, *Wolffi*, *Whitcombi*, *Cynopteri*, *Grippotyphosa*, *Hebdomadis*, *Copenhageni*, *Icterohaemorrhagiae*, *Shermani*, *Tarassovi*, *Sentot*, *Andamana*, and *Patoc*. For equine infectious anemia, sera were tested using the gel immunodiffusion test, Coggins test.[2]

Ten tapirs (five males and five females) were captured during the study. Eight tapirs were classified as adults with mean body weight of 198 kg (range, 110–250 kg), one as subadult weighting 180 kg and one juvenile weighting 35 kg. Out of these, eight were captured inside the park and two on neighboring farms. All tapirs captured were in good physical condition.

All animals ($n = 10$) tested were negative for *B. abortus*, *Leptospira* spp., and equine infectious anemia. One of the 10 animals (10%) had antibodies to *T. gondii* (titer, 50). This is the first report of the occurrence of antibodies to *T. gondii* in *T. terrestris*. These results should be interpreted with caution when applied to wild animals as most of the diagnostic tests have been designed and tested for domestic animals. Although there is no information on the sensitivity and specificity of MAT for diagnosis of toxoplasmosis in tapir, it is reasonable to believe that the results of this study are accurate because MAT has been accepted as a reliable assay for *Toxoplasma* infection in several animals species.[4,7,9]

During the ecologic study, the captured tapirs were monitored using radiotelemetry. The tapirs were not restricted to ENP, often occupying agriculture fields and natural fragmented areas of the farmlands around the park. From 1,847 localities obtained by the radiotelemetry, 40% were inside the park and 60% were outside the park.

There was no serologic evidence that tapirs had been exposed to *Brucella abortus*, *Leptospira* spp., and equine infectious anemia at ENP. In a health evaluation of free-ranging lowland tapirs in southern Brazil, tapirs were positive to *Leptospira* spp.[10] In Costa Rica, Baird's tapirs (*Tapirus bairdii*) were positive for *Leptospira interrogans* serovar Bratislava and negative for *Brucella abortus*.[5]

The positive *T. gondii* antibody titer suggests that the tapir had been exposed to Toxoplasma. *T. gondii* is an apicomplexan protozoa with worldwide distribution and the presence of domestic cats in the Park's surroundings and wild felids can suggest that a sylvatic cycle of *T. gondii*, mediated by the definitive hosts, might be present.[4] The main mode of transmission to herbivores is ingestion of sporulated oocystis.[4] Serologic antibody titers against *T. gondii* have been reported in captive white rhinos from Zimbabwe in absence of clinical signs[9] and causing subclinical infections in horses.[7]

Agricultural areas occupied by the tapirs in this study are important because they form part of their home ranges, which means that there is a potential for contact with livestock and humans. In populations where these frequent interactions between wild and domestic animals exist, disease investigations to detect specific pathogen antibodies is an important evaluation.[8]

Although the studied tapir population seemed relatively free of infectious disease, they were not tested for all diseases reported to affect tapirs. The four diseases were chosen due to the regional importance. Because the park is surrounded by agricultural land, the health of its tapir population can be at risk. Additional studies should be conducted on tapirs to determine their susceptibility to livestock diseases and to understand more about the role of wildlife in the transmission of diseases.

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LITERATURE CITED

1. Bodmer, R. E., and D. M. Brooks. 1997. Status and action plan of the lowland tapir (*Tapirus terrestris*). *In:* Brooks, D. M., R. E. Bodmer, and S. Matola (eds.). Tapirs–Status survey and Conservation Action Plan. IUCN/SSC Tapir Specialist Group. IUCN Gland, Switzerland and Cambridge, United Kingdom. Pp. 46–56.

2. Carrier, S. P., P. Boulanger, and G. L. Bannister. 1973. Equine infectious anemia: sensitivity of the agar-gel immunodiffusion test, and the direct and the indirect complement-fixation tests for the detection of antibodies in equine serum. Can. J. Comp. Med. 37: 171–176.

3. Alves, C. J., S. A. Vasconcellos, C. R. A. Camargo, and Z. M. Morais. 1996. Environmental factors influence in the proportion of goats serum-reagent for leptospirosis in five captive breeding of Paraiba State. Arquivo do Instituto Biológico de São Paulo 63: 11–18.

4. Dubey, J. P., and G. Desmonts. 1987. Serologic responses of equids fed *Toxoplasma gondii* oocysts. Equine Vet. J. 19: 337–339.

5. Hernandez-Divers, S. M., R. Aguilar, D. Leandro-Loria, and C. R. Foerster. 2005. Health evaluation of a radiocollared population of free-ranging baird's tapirs (*Tapirus bairdii*) in Costa Rica. J. Zoo Wildl. Med. 36: 176–187.

6. Kruze, M. V. 1975. Diagnostic methods in the control of cattle brucelosis. II. Serologic methods. Arch. Med. Vet. 7: 52–64.

7. Langoni, H., A. V. Silva, S. B. Pezerico, and Y. V. Lima. 2007. Utilization of modified agglutination test and indirect immunofluorescent antibody test for the detection of *Toxoplasma gondii* antibodies in naturally exposed horses. Braz. J. Vet. Res. Anim. Sci. 44: 27–32.

8. Hernandéz-Divers, S., V. Quse, J. A. May Jr., B. Thoisy, R. E. T. Vanstreels, P. A. B. Marquez, and I. L. Torres. 2007. Immunological screening (serology). *In:* Medici, P., P. R. Mangini, and J. A. S. Perea. Tapir field veterinary manual. Pp. 36–38. http://www.tapirs.org/downloads/standards/TSG-tapirs-vet-manual-eng.pdf. Accessed 10 February 2009.

9. Hove, T., and J. P. Dubey. 1999. Prevalence of *Toxoplama gondii* antibodies in sera of domestic pigs and some species from Zimbabwe. J. Parasitol. 85: 372–373.

10. Mangini, P. R., and E. P. Medici. 2001. Sanitary evaluation of wild populations of *Tapirus terrestris* at the Pontal do Paranapanema region, São Paulo State, Brazil. *In:* Book of Abstracts of the First International Tapir Symposium. IUCN/SSC Tapir Specialist Group (TSG), American Zoo and Aquarium Association (AZA) Tapir Taxon Advisory Group (TAG), and Tapir Preservation Fund (TPF). San Jose, Costa Rica.

11. Mangini, P. R., W. Morais, and L. C. Santos. 2002. Diseases in captive *Tapirus terrestris* in Foz do Iguaçu, Paraná. Arquivo Ciência Veterinária e Zootecnia UNIPAR 5: 93–102.

12. Naveda, A., B. de Thoisy, C. Richard-Hansen, D. A. Torres, L. Salas, R. Wallance, S. Chalukian, and S. de Bustos. 2008. *Tapirus terrestris*. *In:* IUCN 2008. 2008 IUCN Red List of Threatened Species. <www.iucnredlist.org>.

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