**Leptospira** spp. ANTIBODIES IN CAPTIVE COATIS (*Nasua nasua* STORR, 1780)  
(Carnivora: Procyonidae)

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**ABSTRACT:** Leptospirosis is a worldwide infection that affects many species, including wild animals. The present study aimed to detect *Leptospira* spp. antibodies in 17 captive coatis (*Nasua nasua*) by the microscopic agglutination test (MAT). Nine (52.94%) animals tested positive and the following serovars were identified: Copenhageni (22.22%), Shermani (22.22%), Andamana (11.11%), Wolfii (11.11%) and Pyrogenes (11.11%). Two samples presented coagglutination, one (11.11%) for Hebdomadis and Wolfii, and another (11.11%) for Hebdomadis, Hardjo and Wolfii. The current study revealed the presence of the infection even in animals without any clinical signs, reinforcing the possibility that wild animals in captivity may be infected by leptospire serovars, thus enabling reservoirs.

**KEY WORDS:** *Nasua nasua*, *Leptospira* spp., captive coatis, antibodies, microscopic agglutination test.

**CONFLICTS OF INTEREST:** There is no conflict.

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INTRODUCTION

In South America, the family Procyonidae, order Carnivora, is represented by 18 species distributed among six genera, including *Nasua* spp. In the rest of the world, coatis thrive in different environments, such as deciduous and tropical forests, deserts and chaparral regions. Although these animals are classified as carnivores, they may also feed on fruits (1).

Leptospirosis, a zoonosis present throughout the globe, is naturally transmitted between humans and other animals (2). The etiologic agent responsible for the disease is a spirochete, Sphirochaetales order, Leptospiraceae family, that presents three genera: *Leptospira*, *Leptonema* and *Turneria*. Currently, leptospires are classified into more than 250 serovars. This disease assumes an important epidemiological role because it affects domestic and wild species. Some of them develop subclinical infection and maintain the agent in their kidneys with intermittent elimination through urine, constituting a serious public health problem (3).

Serological studies based on leptospirosis had been performed in many wild species, including coatis (*Nasua nasua*) (4). In some places, such as zoos and parks, several species must live in restricted areas. This condition can disseminate numerous infectious agents that may cause a wide variety of zoonotic diseases (5).

In order to ascertain important epidemiological aspects of the disease in wild animals, this study aimed to verify the occurrence of *Leptospira* spp. antibodies in captive coatis and to establish sanitary measures for its control.

Serum samples were collected from 17 captive coatis (*Nasua nasua* Storr, 1780) in three cities of São Paulo state, Brazil, namely Sorocaba (23°30′06″S, 47°27′29″W), Botucatu (22°53′09″S, 48°26′42″W) and São José dos Campos (23°10′46″S, 45°53′13″W). The study was approved by the Ethics Committee on Animal Experimentation of the Veterinary Medicine and Animal Husbandry School, UNESP, Botucatu, SP, Brazil. They were randomly selected, regardless of age or gender, since they were all healthy. Animals were anesthetized in their enclosures by means of an intramuscular injection with tiletamine-zolazepam (7 mg/kg Zoletil®, Virbac, Brazil) and xylazine (0.5 mg/kg Sedazine®, Fort Dodge, Brazil) employed in pre-anesthesia and induction of anesthesia, respectively.

Subsequently, 3-mL samples of intracardiac blood were collected from each animal and placed in a test tube without anticoagulant. Samples were centrifuged at 1,200 X g for ten minutes and then stored at −80°C. Afterward, they were submitted to the

Microscopic agglutination test (MAT), using the following serovars as antigens: Australis, Bratislava, Autumnalis, Butembo, Castellonis, Bataviae, Canicola, Whitcombi, Cynopteri, Djasiman, Sentot, Gryppotyphosa, Hebdomadis, Copenhageni, Icterohaemorrhagiae, Javanica, Panama, Pomona, Pyrogenes, Hardjo, Hardjo-prajitno, Hardjo-miniswajezak, Hardjo-C.T.G., Hardjo-bovis, Wolffi, Shermani, Tarassovi, Andamana and Patoc (6, 7). Agglutination of more than 50% leptospires per field was considered to be positive reaction.

Antibodies were detected in nine of 17 (52.94%) serum samples; the results, presented in Table 1, show their identification and the specific serovars with the respective final titer. Serovar titers varied from 100 to more than 3,200.

**Table 1.** MAT results for *Leptospira* spp. antibodies and respective titers in captive coati serum samples

<table>
<thead>
<tr>
<th>Zoo Identification</th>
<th>Place</th>
<th>Leptospira Serovar</th>
<th>Titer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sorocaba</td>
<td>Copenhageni</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Sorocaba</td>
<td>Andamana</td>
<td>200</td>
</tr>
<tr>
<td>3</td>
<td>Sorocaba</td>
<td>Copenhageni</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>Sorocaba</td>
<td>Shermani</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Sorocaba</td>
<td>Shermani</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>Sorocaba</td>
<td>Wolfii</td>
<td>1,600</td>
</tr>
<tr>
<td>7</td>
<td>Sorocaba</td>
<td>Wolfii</td>
<td>&gt; 3,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hebdomadis</td>
<td>400</td>
</tr>
<tr>
<td>8</td>
<td>Sorocaba</td>
<td>Wolfii</td>
<td>&gt; 3,200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hebdomadis</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hardjo</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>São José dos Campos</td>
<td>Pyrogenes</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2 presents the relation among the number of samples from each zoo, seropositive samples and the prevalence of each serovar. There were eight out of 17 (61.54%) positive results from Sorocaba that reacted against six different serovars. Only one sample from São José dos Campos tested positive. From Botucatu, none of the three samples reacted.

Wolfii serovar was most frequently detected and with higher titers than the other serovars, ranging from 1,600 to more than 3,200. This serovar most commonly affects humans and other animals in urban areas of Brazil (8).
Table 2. MAT seropositivity for *Leptospira* spp. antibodies in captive coati serum samples and percentage of coagglutination

<table>
<thead>
<tr>
<th>Place</th>
<th>Samples (N)</th>
<th>Results (P; %)</th>
<th>Coagglutination of Serovars (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Sorocaba</td>
<td>13</td>
<td>8; 61.54</td>
<td>25</td>
</tr>
<tr>
<td>São José dos Campos</td>
<td>1</td>
<td>1; 100.00</td>
<td>–</td>
</tr>
<tr>
<td>Botucatu</td>
<td>3</td>
<td>0</td>
<td>–</td>
</tr>
</tbody>
</table>

N: number of tested samples; P: number of reactive samples; %: percentage.

Although some studies on leptospirosis in feral animals have been carried out in the Americas, Brazil has produced few works on this topic. Therefore, more epidemiological leptospirosis analyses should be performed to develop strategies to control the disease in regions with high density of animals, forest and rivers.

There is little information about the prevalence of leptospirosis in captured animals (9, 10). In captivity, animals of different ecological origins and epidemiological backgrounds are forced to live in close proximity. This may create an opportunity for the dissemination of infectious agents. Hence, zoological gardens and parks can potentially be sources of a wide range of zoonotic diseases (5).

Lins and Lopes (11) reported a leptospiral isolate from a coati (*N. nasua*) whereas Roth (12) found many serovars present in a racoon (*Procyon lotor*) in the USA, reinforcing the importance of these species in the leptospirosis transmission chain.

A study involving seven coatis from a Rio de Janeiro zoo, Rio de Janeiro state, was performed using MAT for antibodies against *Leptospira* spp. Three of them reacted with Icterohemorrhagiae serovar, which characterizes the high susceptibility of captive animals, compared with free-living wild animals, to infection by any serovar of *Leptospira* spp. This corroborates the findings of Girio *et al.* (4), who did not find any reactive animal among nine Brazilian free-living coatis (13). However, these animals could be infected without any humoral immune response, rendering them reservoirs of the bacterium.

*Leptospira* spp. infection may occur in Brazilian captive coatis without clinical signs, but with measurable antibodies. Most of the studied animals can be reservoirs of this.
bacterium and thus require serological tests for leptospirosis and other zoonoses to ascertain the risks to the environment, park visitors and workers, and its impact on the public health.

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REFERENCES


