Rickettsia in Synanthropic and Domestic Animals and Their Hosts from Two Areas of Low Endemicity for Brazilian Spotted Fever in the Eastern Region of Minas Gerais, Brazil


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Abstract. The aim of this study was to understand the current epidemiology of rickettsial diseases in two rickettsial-endemic regions in Brazil. In the municipalities of Pingo D’Água and Santa Cruz do Escalvado, among serum samples obtained from horses and dogs, reactivity by immunofluorescent assay against spotted fever group rickettsiae was verified. In some serum samples from opossums (Didelphis aurita) captured in Santa Cruz do Escalvado, serologic response against rickettsiae was also verified. Polymerase chain reaction identified rickettsiae only in ticks and fleas obtained in Santa Cruz do Escalvado. Rickettsiae in samples had 100% sequence homology with Rickettsia felis. These results highlight the importance of marsupials in maintenance of the sylvatic cycle of rickettsial disease and potential integration with the domestic cycle. Our data also support the importance of horses and dogs as sentinels in monitoring circulation of rickettsiae in an urban area.

INTRODUCTION

The rickettsial diseases are a group of diseases of worldwide importance that are caused by obligatory intracellular, Gram-negative bacteria of the genus Rickettsia. Most rickettsial species that are pathogenic to humans, and non-pathogenic rickettsiae, have arthropods (fleas, ticks, and lice) as vectors and reservoirs. In Brazil, the most prevalent rickettsiosis is Brazilian spotted fever (BSF), which is caused by Rickettsia rickettsii. Studies have shown that BSF is transmitted to humans by Amblyomma cajennense and A. aureolatum ticks. Several species of wild animals, including tapirs, rodents, birds, capybaras, snakes, bats, fish, and opossums, have been incriminated as hosts of rickettsial diseases. Pets such as dogs, cats, horses, and birds have also been considered as potential sources of infection.

Two counties in Minas Gerais, Brazil have had a history of rickettsial diseases. The municipality of Pingo D’Água, located in Vale do Rio Doce, is characterized by recent cases of BSF. The municipality of Santa Cruz do Escalvado, located in Vale do Piranga, Zona da Mata Mineira, has a history of rickettsial diseases. The municipality of Pingo D’Água, located in Vale do Rio Doce, is characterized by recent cases of BSF. The municipality of Santa Cruz do Escalvado, located in Vale do Piranga, Zona da Mata Mineira, has a history of rickettsial diseases.

RESULTS

Identification of ticks and fleas obtained from animals in Santa Cruz do Escalvado was performed by using standard taxonomic keys. Species obtained were identified as Amblyomma cajennense (n = 96), Rhizophalus sanguineus (n = 55), Rh. (Boophilus) microplus (n = 180), Dermacentor nitens (n = 11), Amblyomma brasiliensis (n = 1), Ctenocephalides canis (n = 209), C. felis (n = 45), Xenopsylla cheopis (n = 3), and Rhopalopsyllus sp. (n = 22). Ticks and fleas obtained from dogs, horses, and rodents in Pingo D’Água were identified as A. cajennense (n = 35), Rh. sanguineus (n = 5), Rh. (B).
mics (n = 5), A. brasiiliensis (n = 5), A. dubitatum (n = 1),
C. canis (n = 24), C. felis (n = 26), and X. cheopis (n = 11).  
Of 42 serum samples from horses and 24 serum samples from
dogs obtained in Pingo D’Água and analyzed by IFA against
spotted fever group rickettsiae by using antigens from R. rick-
ettsii, R. amblyomnii, R. rhipicephali, and R. belli, seroreac-
tivity was observed in 16 (38.09%) samples from horses and
2 (8.33%) samples from dogs in Santa Cruz do Escalvado, of
66 serum samples from horses and 67 serum samples from dogs,
seroreactivity was identified in 10 (15.2%) and 14 (20.9%) samples,
respectively.
Of 38 serum samples from opossums, 16 showed reactivity
against Rickettsia-specific antigen and 42.1% of these animals
showed reactivity against antigens from Rickettsia organisms (Table 1).
In addition to reactivity against R. rickettsi antigen, we also
observed reactivity against R. parkeri (n = 15, 39.5%), R. am-
ablyomnii (n = 7, 18.4%), and R. felis (n = 1, 2.6%). We did not iden-
tify seropositive animals by IFA with antigens from R. belli.
Rickettsia species DNA was identified in 8 (1.2%) of 646
samples obtained from ectoparasites, anal swab specimens,
and blood of captured animals in Santa Cruz do Escalvado.
Sequence analysis showed that all positive samples had 100%
identity with R. felis (CP000053.1).

DISCUSSION
Our results indicate that opossums, horses, and dogs play
an important role in the epidemiologic cycle of BSF and other
rickettsial diseases in the study areas. Opossums are among
the most important genera serving as hosts for fleas and ticks
and are useful animals in acarologic studies. At the ecologic
level, we observed extensive use of horses for transport-
ning humans and material in urban and rural areas of Santa
Cruz do Escalvado and Pingo D’Água. These animals, which
can be heavily infested with ticks, can serve as an effective
mechanism for dispersal of infected ticks and result in emerg-
ence of new disease foci.  

The distribution pattern of ectoparasites found in this study,
in which there is a predominance of A. cajennense, was similar
to that of reports from BSF-endemic areas in São Paulo and
Minas Gerais. These findings indicate that there may be a
higher prevalence of this tick species in areas endemic for
spotted fever in southeastern Brazil. Dogs, similar to horses,
which have easy accessibility to humans, may also play an
important role in the epidemiology of BSF, especially if one
considers positive serologic results in dogs with high levels
of rickettsial infections. Dogs may serve as senti-
nels for BSF: Despite low levels of seroreactivity in dogs and
horses in Santa Cruz do Escalvado and the Pingo D’Água,
sequencing results for A. cajennense obtained from dogs and
horses in southeastern Brazil indicate that these ticks har-
bor a bacteria of the genus Rickettsia that needs to be further
characterized.

The highest percentage of fleas obtained in this study
belonged to the genus Ctenocephalides, which is a parasite
for dogs, rodents, and opossums. This genus has a world-
wide distribution and wide host range and is one of the most
common parasites of dogs, cats, and humans. These findings
indicate that these fleas may transmit rickettsial infections
to domestic and wild animals because of the proximity of
their habitats to suburban environments. Although R. felis
in fleas of the genus Ctenocephalides has been observed in
areas endemic for spotted fever in São Paulo and Minas
Gerais, our findings shows a correlation between R. felis-
infected fleas on dogs and opossums and areas with con-
firmied cases of BSF.

Additional studies on vector competence and capacity of
these arthropods to transmit rickettsial agents to vertebrates
are needed to confirm their role in transmission. Absence of
a specific diagnostic test for rickettsial disease caused by R. felis
makes the study of this disease difficult because factors that
provide useful data on morbidity and mortality of this disease
are absent or indistinguishable from factors for other rickettsi-
osis in many regions.

There is no commercially available diagnostic test that is
species specific for Rickettsia. However, results of our study
indicate that rickettsiae are currently circulating in Pingo
D’Água and Santa Cruz do Escalvado. Although there is no
systematic reporting of cases of BSF in these regions, serologic
results indicate the presence of spotted fever group rickettsiae
in these municipalities. Our findings also indicate the presence
of R. felis in fleas and ticks and R. rickettsii in ticks in Santa
Cruz do Escalvado.

Our findings provide useful epidemiologic data on the pos-
possible role of more than one species of Rickettsia in the etio-
ology of BSF. Serologic and molecular biologic findings suggest
the need for establishment and maintenance of effective
epidemiological surveillance in the cities studied and in sur-
rounding areas. Additional studies of circulation of emerging
diseases in surrounding regions, which are subjected to high
anthropogenic effects on the environment, are also needed.
Information from these studies may provide useful epidemi-
ologic data and assist in development of strategies to prevent
and control these diseases.

Received April 26, 2010. Accepted for publication August 16, 2010.

Acknowledgments: Bruno S. Milagres was awarded a PhD degree
from the Federal University of Ouro Preto for his investigation of
rickettsiosis under the direction of Dr. C. L. Mafra and Dr. M. A. M.
Galvao.

Financial support: This study was supported by Conselho Nacional
de Desenvolvimento Científico e Tecnológico/Brazil (Edital
Universal/2005-6) and Fundação de Amparo à Pesquisa do Estado de
Minas Gerais/Brazil (Pesquisador Mineiro/2007-9).

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Table 1

<table>
<thead>
<tr>
<th>Animal</th>
<th>Municipality</th>
<th>No. tested</th>
<th>No. IFA positive</th>
<th>% Positive</th>
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<tbody>
<tr>
<td>Dogs</td>
<td>Santa Cruz do Escalvado</td>
<td>67</td>
<td>14</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Pingo D’Água</td>
<td>24</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Horses</td>
<td>Santa Cruz do Escalvado</td>
<td>66</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Pingo D’Água</td>
<td>42</td>
<td>16</td>
<td>38</td>
</tr>
<tr>
<td>Opossums</td>
<td>Santa Cruz do Escalvado</td>
<td>38</td>
<td>16</td>
<td>42</td>
</tr>
</tbody>
</table>

* IFA = immunofluorescent assay.
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REFERENCES