SURVEY OF VECTOR-BORNE COMORBIDITIES IN A LEISHMANIA-ENDEMIC CANINE POPULATION FROM PARAGUAY

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1 Background
Canine Visceral Leishmaniasis (CVL) is an endemic parasitic disease in Paraguay with a majority of seropositive dogs observed to be asymptomatic for clinical signs consistent with CVL. Little is known about the full landscape of canine vector-borne diseases (CVBD) infecting dogs in Paraguay and the role concurrent infections may play in the onset of CVL. The objective of this study was to assess the incidence of Leishmania and other CVBD agents in a population of pet dogs from Leishmania-endemic areas of Paraguay.

2 Methods
A total of 100 serum samples and 400 whole blood samples were collected. The samples originated from 32 unique postal codes distributed across the eastern region of Paraguay. Nucleic acid was extracted from the whole blood samples and real-time PCR was run to detect the following pathogens: Leishmania; Ehrlichia canis; Ehrlichia chaffeensis; Anaplasma platys; Anaplasma phagocytophilum; Babesia vogeli; Babesia gibsoni; Rickettsia spp.; Bartonella spp.; Mycoplasma haemocanis; Candidatus Mycoplasma haemotaparvum; Hepatozoon canis; Hepatozoon americanum; Dirofilaria immitis; and Trypanosoma cruzi. ELISAs were performed on serum to detect the presence of antibodies to Leishmania, Ehrlichia spp., Babesia spp., Anaplasma spp., A. platys, A. phagocytophilum, Babesia spp., and Borrelia burgdorferi, as well as antigen from D. immitis and Anaplasma phagocytophilum.

3 Results
Real-time PCR detected Leishmania infections in this population at a rate of 18%. Additional CVBD pathogens detected by PCR included E. canis (28%), A. platys (11%), B. vogeli (9%), M. haemocanis (4%), and E. chaffeensis (3%). All of these pathogens are known to be transmitted by Rhipicephalus sanguineus ticks. Overall, 7% of samples were PCR positive for Leishmania and at least one other CVBD pathogen with E. canis being the most common co-infecting agent. Of the serum samples tested by ELISA, 46% were seropositive for Leishmania. High seropositive rates were also observed for Ehrlichia spp. (51%), E. canis (51%), Anaplasma spp. (46%), A. platys (23%), and Babesia spp. (26%). Overall, 37% of samples were seropositive to Leishmania and at least one additional CVBD pathogen.

4 Conclusions
These findings indicate that co-infections with Leishmania and other CVBD pathogens, particularly those transmitted by Rhipicephalus sanguineus ticks, are relatively common in Paraguayan dogs and should be taken into consideration when diagnosing and treating CVL.