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Communication

[*Comunicação*]

Prevalence, hematology and serum biochemistry in stray dogs naturally infected by *Hepatozoon canis* in São Paulo

[*Prevalência, hematologia e bioquímica sérica em cães de rua naturalmente infectados por* Hepatozoon canis*, em São Paulo*]

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Canine hepatozoonosis is a tick-borne disease caused by protozoan of genus *Hepatozoon*. There are two described species: *Hepatozoon canis* and *Hepatozoon americanum* (Baneth et al., 2003). In Brasil, the species found in dogs is considered to be *H. canis* (O'Dwyer et al., 2001; 2004) and the infection is more common in rural than in urban areas (Massard, 1979; O'Dwyer et al., 2001).

The clinical signs observed in *H. canis*-infected dogs in Brazil were anorexia, pale mucous membranes, weight loss, diarrhoea, gait abnormalities, fever, polyuria and polydipsia. The laboratory findings were anemia, leucocytosis with neutrophilia, lymphopenia, monocytosis, and elevated alkaline phosphatase (Gondim et al., 1998; Paludo et al., 2003; Aguiar et al., 2004). All the animals in these studies had concurrent diseases and the findings could not be exclusively attributed to *H. canis*. The few studies on *H. canis* infection in Brazil show the lack of information about the epidemiology, pathogenicity and genetic characterization of *H. canis* in this country.

The objective of this study was to investigate the prevalence of *H. canis* infection in stray dogs from São Paulo State, and the hematological and serum biochemical results from naturally infected dogs.

A total of 222 dogs, captured on the streets of four cities in São Paulo state, Boituva, Diadema, São Manuel and Botucatu, were examined. Blood smears were taken from the ear margin capillary bed, and smears were air dried, fixed with methanol and stained with Giemsa. The blood smears were examined by light microscopy and *H. canis* was investigated in neutrophils and monocytes. Blood samples were obtained from *H. canis*-infected animals for laboratory tests that included total red blood cells and total white blood cells counts and hemoglobin concentration using an automatic counter[1]. Packed cell volume was determined by the microhematocrit method. Serum biochemical assays were done by spectrophotometric methods and included the determination of urea, creatinine, alkaline phosphatase, alanine aminotransferase, gammaglutamyl transferase, serum protein, albumin and globulin.

From October 2000 to October 2001, 222 street dogs (102 males and 120 females) were examined, being 92 (41.5%) from Boituva, 86 (38.7%) from Diadema, 22 (9.9%) from São Manuel, and 22 (9.9%) from Botucatu.

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[1] Cell Dyn 3500R – Abbott Diagnostics

Hepatozoon canis infection was detected in 13 dogs (5.9%), eight males and five females. Ten dogs were from Boituva and three from Botucatu. In addition to *H. canis*, *Babesia canis* was presented in five dogs and *Ehrlichia canis* was found in two dogs. One dog had concurrent infection with *H. canis* and *E. canis*.

Of 13 experimentally infected dogs, nine, infected only with *H. canis*, had blood samples taken to perform the hematological and biochemical tests. The results are listed in Tables 1 and 2. Only three dogs had anemia and another dog had leucocytosis. The only alteration observed in serum biochemistry was hyperglobulinemia.

Table 1. Hemograms of dogs naturally infected by *Hepatozoon canis* in São Paulo State

Characteristic	Dog									
	1	2	3	4	5	6	7	8	9	N
RBC (x10 ^{6})	4.88	5.27	3.90	5.79	5.17	6.27	3.72	6.69	5.85	5.5-8.5
Hemoglobin (g/l)	10.4	12.2	8.74	12.5	12.6	12.9	9.20	15.1	13.2	12-18
Hematocrit (%)	28.8	33.7	23.4	33.8	34.4	36.0	24.2	40.0	37.0	37-55
MCV (fl)	58.9	63.8	60.0	58.3	66.7	57.4	65.1	59.7	63.8	60-77
MCH (pg)	21.4	23.2	22.4	21.7	24.3	20.6	24.7	22.5	22.7	19-23
MCHC(g/dl)	36.2	36.4	37.4	37.1	36.5	35.8	38.0	37.5	35.7	32-36
WBC (µl)	13400	6830	9360	10200	5920	6980	14700	8700	18200	6000-17000
Neutrophils (µl)	9910	5440	5660	7120	3080	6190	11100	5800	8500	3000-11500
Lymphocytes(µl)	2480	1360	2690	3060	2510	342	3050	3000	1200	1000-4000
Monocytes (µl)	937	250	995	420	322	376	312	300	200	100-1350
Eosinophils (µl)	390	80	110	120	4	15	183	500	100	100-1250

RBC= red blood cells; MCV= mean corpuscular volume; MCH= Mean corpuscular hemoglobin; MCHC= mean corpuscular hemoglobin concentration; WBC= white blood cells; N= normal range (Feldman et al., 2000).

Table 2. Serum biochemistries of dogs naturally infected by *Hepatozoon canis* in São Paulo State

Characteristic	Dog									
	1	2	3	4	5	6	7	8	9	N
Urea (mg/dl)	49.2	33.6	60.0	25.2	48.0	34.8	38.4	42.0	45.6	21.4-59.92
Creatinine (mg/dl)	0.8	1.0	1.6	0.8	0.7	0.8	1.1	1.1	1.1	0.5-1.5
AP (IU/l)	113.0	109.0	78.6	234.0	104.8	37.7	131.0	68.8	135.1	20-156
ALT (IU/l)	6.8	6.3	25.0	14.7	15.2	13.1	34.0	24.6	9.4	4.8-24
AST (IU/l)	6.0	8.0	13.0	7.0	3.0	2.0	2.0	11.0	10.0	6.2±13.0
GGT (IU/l)	2.0	3.1	4.2	2.0	6.0	2.0	4.1	4.1	5.1	1.2-6.4
PTN (g/dl)	12.0	12.4	12.2	15.0	11.6	11.6	15.2	11.6	9.2	5.4-7.1
Albumin (g/dl)	1.4	3.4	2.9	3.3	3.3	2.3	3.1	3.0	3.1	2.6-3.3
Globulin (g/dl)	10.6	9.0	9.3	11.7	8,3	9.3	12.1	8.6	6.1	2.7-4.4
CK (IU/l)	9.7	2.4	2.4	4.9	7.3	2.4	4.0	2.4	2.4	1.15-28.40

AP= alkaline phosphatase; PTN= serum protein; CK= creatine kinase; N= normal range (Kaneko et al., 1997).

H. canis infection rate was low (5.9%), similar to the results found on urban dogs in other cities of Brazil (Massard, 1979; Gondim et al., 1998). A study performed in rural areas of Rio de Janeiro State revealed a very high prevalence (39.2%) reaching 60% of *H. canis*-infected dogs in some regions (O'Dwyer et al., 2001).

In this study, the real origin of the animals could not be established but most probably came from urban areas, where the captures took place, explaining the low number of infected dogs detected. The dogs from Boituva, a county with a large rural area, showed the highest occurrence of infected dogs (76.9% — 10 of 13 infected dogs). In Diadema, which is the most urban of all studied cities, no infected dogs were detected.

The *H. canis*-infected animals did not show important changes in blood characteristics, as detected by hematology and serum biochemistry. Three dogs had anemia, which is a common finding of *H. canis* infection (Baneth et al., 1995; Gondim et al., 1998), although it is also frequent

sign for other diseases. Only one dog, with the highest parasitemia (0.5%), had leucocytosis, which is also a hematological manifestation described for canine hepatozoonosis (Baneth et al., 1995; Gondim et al., 1998).

The only alteration revealed by serum biochemistry, in all animals, was hyperglobulinemia, but this result could be explained by the fact that the dogs had been recently vaccinated or might had concurrent diseases as already mentioned.

Although the *H. canis*-infected dogs were stray dogs and might had concurrent diseases, they did not show important blood serum abnormalities in laboratory. The parasitemia of the infected dogs was very low (lower than 0.1%) and this could be the lack of clinical manifestations. Baneth and Weigler (1997) found that animals with high parasitemia had more severe systemic manifestation of the infection than dogs with low parasitemia.

The results indicate that the *H. canis* is one species found in these cities of São Paulo causing mild canine hepatozoonosis.

Keywords: dog, *Hepatozoon canis*, hematology, prevalence

RESUMO

Cães capturados nas ruas de quatro municípios do estado de São Paulo foram examinados para estudar a prevalência de Hepatozoon canis*. Dos 222 animais, 13 (5.9%) encontravam-se infectados. Exames hematológicos realizados em nove animais evidenciaram três com anemia e um com leucocitose. A única alteração encontrada nos exames bioquímicos foi hiperglobulinemia.*

Palavras-chave: cão, Hepatozoon canis*, hematologia, prevalência*

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