Available online at www.sciencedirect.com
ScienceDirect
Veterinary Parasitology 145 (2007) 146–151
veterinary parasitology
www.elsevier.com/locate/vetpar

Short communication

Hematological changes during the course of canine babesiosis caused by large *Babesia* in domestic dogs in Warsaw (Poland)

Wojciech Zygner [a,*], Olga Gójska [b], Grażyna Rapacka [c], Dorota Jaros [a], Halina Wędrychowicz [a]

[a] *Division of Parasitology and Parasitic Diseases, Department of Preclinical Sciences, Faculty of Veterinary Medicine, Warsaw Agricultural University, Ciszewskiego 8, 02-786 Warsaw, Poland*
[b] *Center of Small Animal Health Clinic Multiwet, Gagarina 5, 00-753 Warsaw, Poland*
[c] *Center of Veterinary Diagnostics Lab-wet, Gagarina 5, 00-753 Warsaw, Poland*

Received 18 July 2006; received in revised form 16 October 2006; accepted 8 November 2006

Abstract

In the presented study we evaluated the hematological changes in samples of blood obtained from 248 dogs naturally infected with large *Babesia*. The evaluation included red blood cell count, hemoglobin concentration, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC), leucocyte counts, thrombocyte counts, mean platelet volume (MPV), morphology of erythrocytes and leucogram. The most common disorders in affected dogs were thrombocytopenia and anisocytosis. The count of erythrocytes below reference values was detected in 26.2% of dogs and 31.4% of affected animals presented hematocrit below the reference values. Hemoglobin concentration below the reference values was noted in 29% of dogs, an increase of MCHC above normal values was detected in 21% of examinated dogs and MCV below normal values was recognized in 2% of dogs. 60.5% of dogs presented anisocytosis, 25% poikilocytosis, 23.8% polychromasia, 19.7% hypochromia and 4.4% erythroblastosis. Thrombocytopenia was detected in 99.5% of dogs, but only 15.3% of examined animals showed increase of MPV, which suggests a response of the bone marrow. 36.3% of dogs had neutropenia, and 21.8% presented a left shift, 14.9% had the lymphocytosis and 7.2% lymphopenia.

Keywords: Dog; *Babesia*; Hematological changes; Anemia; Thrombocytopenia

1. Introduction

Canine babesiosis is a tick-borne disease caused by two species of genus *Babesia* such as *B. canis* and *B. gibsoni* in Europe. There are three subtypes of *B. canis*: *B. canis canis*, *B. canis vogeli* and *B. canis rossi*; among them *B. canis canis* and *B. canis vogeli* have been recognized in European dogs (Irwin, 2005). Only *B. canis canis* has been detected in dogs in Poland (Caccio et al., 2002; Sobczyk et al., 2005).

The immunological response plays the most important role in pathogenesis of canine babesiosis. *Babesia* initiates a mechanism of antibody-mediated cytotoxic destruction of circulating erythrocytes. Autoantibodies are directed against components of the membranes of infected and uninfected erythrocytes. This causes intravascular and extravascular hemolysis which leads to anemia and hemoglobinemia (Pedersen, 1999; Irwin, 2005). Antibody-coated erythrocytes are destroyed by macrophages in the spleen and liver (extravascular hemolysis). Intravascular hemolysis results from com-

* Corresponding author. Tel.: +48 2 2593 60 45; fax: +48 2 2593 60 48.
E-mail address: wojciechzygner@yahoo.pl (W. Zygner).

0304-4017/$ – see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.vetpar.2006.11.008

plement binding to an erythrocytic membrane by surface antigen–antibody reaction (Day, 1999).

Clinical signs of canine babesiosis include: fever, anorexia, depression, oliguria, hemoglobinuria, vomiting, lethargy, dehydration, icterus, pale mucous membranes, splenomegaly and dispnea (Irwin, 2005). The primary hematological abnormalities found in affected dogs are anemia and thrombocytopenia (Furlanello et al., 2005). The most common anemia caused by large form of *Babesia* is normocytic and normochromatic (Furlanello et al., 2005). Both regenerative and non-regenerative anemias have been observed during the course of canine babesiosis (Furlanello et al., 2005). Considering leucocyte abnormalities most dogs show neutropenia and lymphopenia (Furlanello et al., 2005).

There are no studies about hematological abnormalities in dogs naturally infected with large *Babesia* in Poland and there are a few studies in Europe. In this research we have investigated hematological changes in 248 dogs naturally infected with large form of *Babesia*. Laboratory abnormalities of erythrocytes, leucocytes and thrombocytes in the population of affected dogs have been evaluated and changes have been statistically estimated.

2. Materials and methods

Samples of blood were collected from dogs naturally infected with large *Babesia* from March 2005 to April 2006. The presence of a large *Babesia* was confirmed in 2483 samples from among 5334 ordered examinations of the blood smears of dogs suspected of babesiosis. Samples were obtained from 61 veterinary clinics in Warsaw. Among the positive samples, 248 were randomly selected. Selected samples of blood were not examinated for other infections. In these samples a complete blood count was performed. We assessed the complete blood count with an automatic hematologic analyser (Diatron®, Abacus). Ethylenediamine tetraacetic acid (EDTA) was used as an anticoagulant. The erythrocyte count, concentration of hemoglobin, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC, proportion of concentration of hemoglobin to hematocrit), leukocyte count, thrombocyte count and mean platelet volume (MPV) were evaluated. Red blood cell morphology and leukocyte count were performed with a microscope using peripheral blood smears stained with Giemsa. The median, arithmetical mean, minimum and maximum values and standard deviations were calculated for all parameters except for the red blood cell morphology. The values were calculated using ordinary mathematical formulae for these statistics. Particular changes of erythrocyte morphology and evaluated hematological parameters were presented as percentage of examined dogs.

3. Results

3.1. Evaluation of the erythrocyte parameters

Sixty-five out of 248 dogs (26.2%) had the red blood cell count below the reference values, and 7 out of 248 dogs (2.8%) presented erythrocyte count above the standard values (Fig. 1). The red blood cell count within the normal reference values was present in 71% of dogs (176/248) (Mahaffey, 2003). Hematocrit below the reference values occurred in 78 out of 248 dogs (31.4%) (Fig. 2). One hundred and sixty-nine out of 248 dogs (68.1%) had the packed cell volume within the reference ranges. In one case (less than 0.5%) hematocrit was above the normal values. The concentration of hemoglobin was below the normal values in 72 out of 248 dogs (29%) (Fig. 3). In three cases

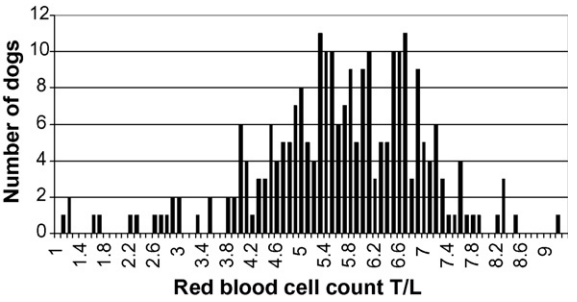

Fig. 1. Red blood cell count (T/L = 10^{12}/L). M_{med} = 5.7; μ = 5.63; S.D. = 1.35; reference interval 4.95–7.87 T/L (M_{med}, median; μ, arithmetical mean; S.D., standard deviation).

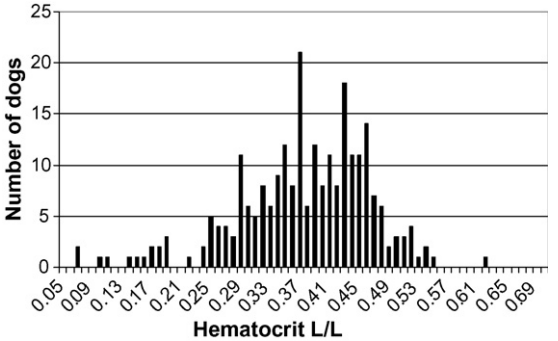

Fig. 2. Hematocrit (L/L). M_{med} = 0.38; μ = 0.375; S.D. = 0.09; reference interval 0.35–0.57 L/L (M_{med}, median; μ, arithmetical mean; S.D., standard deviation).