

HEMATOLOGIC CHANGES IN DOGS NATURALLY INFECTED WITH BABESIA

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Abstract

Canine babesiosis caused by tick-borne organisms of the genus *Babesia*, is one of the most significant disease worldwide. The aims of this study were to determine the hematological changes in six dogs naturally infected with *Babesia canis*. The hematological evaluation included Hemoglobin (Hb), Red Blood Cell (RBC), Platelet, Packet Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC) and Reticulocyte counts. They were estimated using an autonomic hematologic analyzer. The animal had hypocytic hypochromic anemia and 20% of the cases had a packed cell volume (PCV) less of 24%. All the animal had thrombocytopenia and platelets counts was lower than 50×10^3 cell/ μ l The results of this study show that *Babesia* infection in dogs caused anemia and thrombocytopenia.

Keywords Canine babesiosis, hematology, changes, anemia

1. Introduction

Canine babesiosis is an important world-wide disease caused by tick-born organisms. *B. canis* and *B. gibsoni* are the two predominant species that cause canine babesiosis and strains of these organisms are found worldwide. The geographical distribution of canine piroplasms is largely determined by the ecological ranges of their vector arthropods and babesias are transmitted through the bite of infected Ixodid tick. In our country canine babesiosis is caused by large piroplasmas *B. canis canis*. The tick must feed a minimum of two or three days for transmission of *B. canis* to occur. Transplacental transmission is possible and may result in the birth of fading puppies. The life cycle involves three phases of reproduction: gamogony, sporogony and schizogony [4]. Schizogony occurs within the vertebrate host and the stages gamogony and sporogony occur within the tick vector. Once inside the host babesia organisms are attached to the erythrocyte by endocytosis. *B. canis* multiplies within the erythrocytes by repeated binary fission creating merozoites, which may be seen most commonly exist single or in pairs form. By the parasites invading and replicating in the erythrocyte, babesiosis results in destruction of the erythrocyte. Pathogenesis involves immunologic factors, increased lipid peroxidation and activation of the coagulation cascade. The destruction of the erythrocyte is multi-factorial, including direct parasite damage to the infected erythrocyte. Babesia initials a mechanism of antibody-mediated cytotoxic destruction of erythrocytes. This auto antibodies are directed against

components of the membranes of infected and uninfected erythrocytes which cause intravascular and extra vascular hemolytic. The clinical sign of babesiosis are classified as hyper acute, acute, chronic or subclinical. The various clinical symptoms regularly depend on the severity of the strain involved and host factors, such as age and immunologic response generated against the parasite. Anorexia, lethargy, fever and vomiting are common. Hematuria and icterus may be noted in *B. canis* infected dogs. Acute disease is characterized by anorexia; splenomegaly, thrombocytopenia and hemolytic anemia are the typical clinical sign in animals with babesiosis [3]. In some cases many atypical signs are observed and they cannot be directly explain from hemolysis but appear to be the result of the host immune response. After infection, a significant host immune response usually is generated and the immune system is not able to eliminate the infection. As a result the animal is usually chronic carrier of the parasite. The purpose of this study is to determine the hematologic changes in 6 dogs naturally infected with canine babesiosis presented in the clinic of Small Animal at the Veterinary Faculty of Tirana.

2. Materials and methods

Samples of blood were collected from dogs naturally infected with *Babesia* during the period February 2011-February 2012. The diagnosis of babesiosis was confirmed by observed parasites inside infected erythrocytes in Wright-Gyms stained blood smears

[7]. As anticoagulant was used Ethylenediamine Tetraacetic Acid (EDTA). In these samples a complete blood count was performed by an automatic hematologic analyzer (Mindray BC-2800Vet). The erythrocyte count included: Hemoglobin (Hb), Red Blood Cell (RBC), Platelet, Packet Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC) and Lymphocytes counts. The animals were treated with one dose of Diminazene aceturate (Imizol), 5-6.6mg/kg intra-muscular way. After two weeks we measured the values of Hemoglobin (Hb), Red Blood Cell (RBC), Platelet, Packet Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC) and Lymphocytes counts. These values were compared

with the values obtained two weeks before. Blood smears were examined to see the present of parasites inside infected erythrocytes. At the same time data regarding body temperature and clinical signs were collected. Means and the observation data of the patients were compared with reference data.

3. Results and discussions

Six cases of canine babesiosis were diagnosed during the period of the study by the microscopic examination of the stained blood smear. All the six cases were positive with *B. canis* pyriform shape within the red blood cell. Also there presents free babesia forms which result from rupture of the RBC with the severe infection.

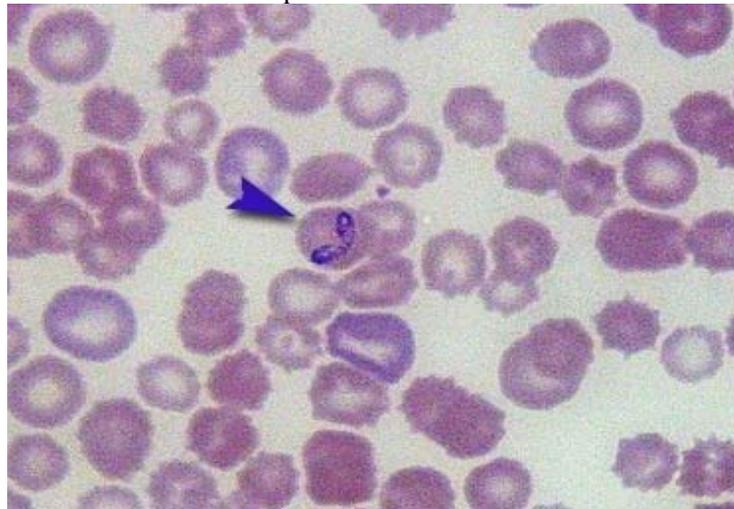


Figure 1: *Babesia canis* within the erythrocyte in peripheral blood smear, Wright- Giemsa x 1000.

The body temperature was recorded and this elevated temperature could have contributory effect on thrombocytopenia [8]. The decrease of hemoglobin concentration below the reference value in all the cases resulted from extra vascular hemolysis [1]. The 100% of the animal had thrombocytopenia and 57% had platelet count lower than 50×10^3 cells/ μ l. The white blood cells (WBC) decrease after infection and the counts ranged from 5.7- 35.48×10^3 cells/ μ l.

This study observed the clinical hematology in dogs infected with *Babesia* in dog's population in the city of Tirana. Of the six cases four cases was male and two were female and the age ranged from eight months to 10 years. Ticks were detected in two cases and there identification shows that were infected by *Ixodes* spp. Also the most represented breeds were

German shepherd with two cases. The mean of hematological values before and after treatment are shown in Tables 1 and 2 respectively. The animals affected with babesiosis had normocytic and normochromotic anemia. The hematological parameters in the most of the patients showed anemia and thrombocytopenia which is a common clinical sign in infected dogs [2]. Direct parasitic damage contributes to the anemia, which resulted from an increased osmotic fragility of erythrocytes [6] and immune-mediated platelet destruction. The destruction of the erythrocyte is multi-factorial, including direct parasite damage to the erythrocyte membrane and the presence of the anti-erythrocyte antibodies which result in a secondary immune-mediated hemolytic anemia.

Table 1: Hematological findings (Mean±Se) in canine babesiosis (n=6)

Parameter	Units	Mean±Se	Observation range	Reference range
Hemoglobin	g/dl	6.5±.72	2.0-9.0	12.0-18.0
PCV	%	3.5±00.44	12.5-28	37.0-55.0
MCV	Fl	56.36±.06.36	45.5-65	60.0-77.0
MCH	Pg	16.5 ±.00.81	14.2-19.8	19.5-24.5
MCHC	%	29.10±.02.78	24.8-34.2	32.0-36.0
WBC	x10 ³ /μl	5.7 ±.35.48	3.8-9.8	6.0-17.0
Platelets	x10 ³ /μl	90.00 ±.15.05	60.00-180	200.0-500.0

(Hb) Hemoglobin, (RBC) Red Blood Cell, (PCV) Packet Cell Volume, (MCV) Mean Corpuscular Volume, (MCHC) Mean Corpuscular Hemoglobin Concentration, Platelet.

Table 2: Hematological findings (Mean±Se) in canine babesiosis (n=6) after two weeks

Parameter	Units	Mean±Se	Observation range	Reference range
Hemoglobin	g/dl	14±0.75	12.0-17.5	12.0-18.0
PCV	%	45±2.5	39.5-52	37.0-55.0
MCV	Fl	65±.3.25	63.5-69.0	60.0-77.0
MCH	Pg	21 ± 0.75	19.8.-22.5	19.5-24.5
MCHC	%	33.00±1.15	32-34.2	32.0-36.0
WBC	x10 ³ /μl	11.5 ±2.5	6.4-16.5	6.0-17.0
Lymphocytes	%	34.00±0.5	31.2-37.4	30-40.0
Platelets	x10 ³ /μl	340 ±20.25	220-460	200.0-500.0

(Hb) Hemoglobin, (RBC) Red Blood Cell, (PCV) Packet Cell Volume, (MCV) Mean Corpuscular Volume, (MCHC) Mean Corpuscular Hemoglobin Concentration, Lymphocytes and Platelet.

Thrombocytopenia is common in many cases of dogs infected with *B. canis*. The mechanisms of the thrombocytopenia are not yet fully understood in babesiosis and may relate to immune mediated platelet destruction and development of disseminated intravascular coagulation or sequestration of the platelet in the spleen. The contributory effect on the thrombocytopenia could have elevated body temperature. Additionally oxidative stress in babesiosis may cause damage to erythrocyte that result in their increased susceptibility to phagocytosis [9]. In this study, leucocytes abnormalities were non-specific and were observed both leukopenia and leucocytosis. Lymphocytopenia was found in all the cases and may be due to concurrent viral infection associated with babesiosis [10]. Blood smears were examined after two weeks to see the present of the parasites inside infected erythrocytes. Although in some case animals remained infected with the chronic or sub chronic carrier, after treatment in none of the cases we haven't notice the present of the parasites inside infected erythrocytes. At the same time all the hematological values that we measured were within normal ranged after two weeks. The improvement of

the clinical status as a response to antibabesial treatment resulted in a gradual increase in the lymphocyte percentage [5]. These changes in leukocyte count may occur in severely affected patients. Changes in platelet count and its association with platelet indices may reflect changes in platelet production and reactivity [11], and platelet indices may be use for the diagnosis of the dogs with endotoxemia. In conclusion, the hematologic values in the study are similar to the results observed in other reports and anemia and thrombocytopenia were found in all the cases.

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6. References

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