

Original Research Article

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## Clinico-Pathological Changes in Hepatozoonosis in Dogs

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### ABSTRACT

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The characteristic ellipsoidal shaped gamonts of *Hepatozoon canis* (*H.canis*) in the neutrophils of male Golden retriever dog of 4 month age was noticed. The dog was having history of vomiting and diarrhea since 1 day accompanying clinical signs of fever (108.5°C), pale conjunctival mucous membrane, tensed abdomen with dull -depressed condition suggestive of gastroenteritis. Mild leukocytosis with neutrophilia, eosinopenia, thrombocytopenia was noticed however no abnormality in serum total protein, creatinine and alanine amino transferase was detected. There appears no published report of *H. canis* in down south Gujarat. Hence, this information could be helpful for further diagnostic, preventive and therapeutic care.

### Introduction

Canine hepatozoonosis is a tick-borne infection caused by apicomplexan protozoa from the family Hepatozoidae. More than 300 species of *Hepatozoon* have been reported to infect animals (Smith, 1996). *Hepatozoon* transmission takes place when intermediate host (Dog) eats the definitive host i.e invertebrate (Tick) containing *Hepatozoon* oocysts. Ingestion of a tick (mostly *Rhiphicephalus*, Brown dog tick) containing mature *H. canis* oocysts is followed by release

of sporozoites in the gastrointestinal tract of the dog. Sporozoites penetrate the intestinal wall and are transported haematogenously to haemolymphatic tissues including the spleen, bone marrow and lymph nodes, where meronts are formed. Merogony can also take place in other visceral organs, and is associated with hepatitis, pneumonia and glomerulonephritis Baneth and Weigler, (1997). Upon release from mature meronts, merozoites invade neutrophils in which they develop to gamonts and then circulate in the peripheral blood. Reports of hemoprotozoan

diseases in dogs are at low frequency as compared to large animals due to their strict habitat and diet. Moreover, In the Field, such diseases may go unnoticed due to absence of laboratory diagnosis.

## Materials and Methods

The male Labrador dog of 4 month age was presented with history of vomiting and diarrhea since 4 day. Clinical examination revealed Fever (107.5° C), pale conjunctival mucous membrane, and tucked up belly with lethargic condition. The dog was tentatively diagnosed to have hepatic disorder.

Approx. 2 ml blood was collected in K<sub>3</sub>EDTA anticoagulant Vial and subsequently processed in automated hematological analyzer (Make: Exigo, Vet.) for deriving hemogram. The thin blood smears were made using fresh blood (without anticoagulant) and stained with Field Stain (Eosin-Methylene blue stain) as described by Sandhu and Brar (2000). The rate of parasitemia with *Hepatozoon* gamonts was calculated by light microscopy observation of the number of parasitized neutrophils and monocytes, and by dividing this number by the total number of 200 neutrophils and monocytes observed at the magnification of 1000X. The parasitemia rate was expressed as percent by multiplication by 100. The hematological and biochemical changes in infected dog were described and discussed.

## Results and Discussion

HCI is often reported in seven to ten-weeks-old puppies and, although the life cycles of *H. canis* in the dog are completed within four weeks, (Baneth, G. *et al.*, (2001), Panciera, R.J. *et al.*,(1999), vertical transmission has been reported in HCI (Murata *et al.*, (1993). *Hepatozoon canis* infection (HCI) varies from being asymptomatic in apparently healthy dogs, to a severe and potentially fatal disease that causes extreme lethargy, cachexia and

anaemia (Baneth *et al.*, 2003). The similar clinical findings were also reported by Bitton *et al.*, (2012),

Eight percent of the neutrophils and monocytes were parasitized by *Hepatozoon* sp. gamonts that were morphologically consistent with *H. canis* (Figure 1). The gamonts are large. The gametocyte has displaced the nucleus of the monocytes giving an ellipsoidal shape. The prominent central clear area was indicative of moderate anemic condition.

Moderate to severe normocytic-normochromic anemia with mild anisocytosis, relative leucocytosis, and thrombocytopenia with megathrombocytes was also reported by Bitton *et al.*, (2012). Blood smear evaluation revealed moderate left shift with mild toxicity in the neutrophils, some of the monocytes showed reactive changes.

Serum biochemistry study revealed normal values of total protein, creatinine and alanine amino transferase activity in serum, though other authors informed the hypoproteinemia, hypoalbuminemia, hyperglobulinemia, elevated alkaline phosphatase activity and hypercalcemia (Bitton *et al.*, 2012).

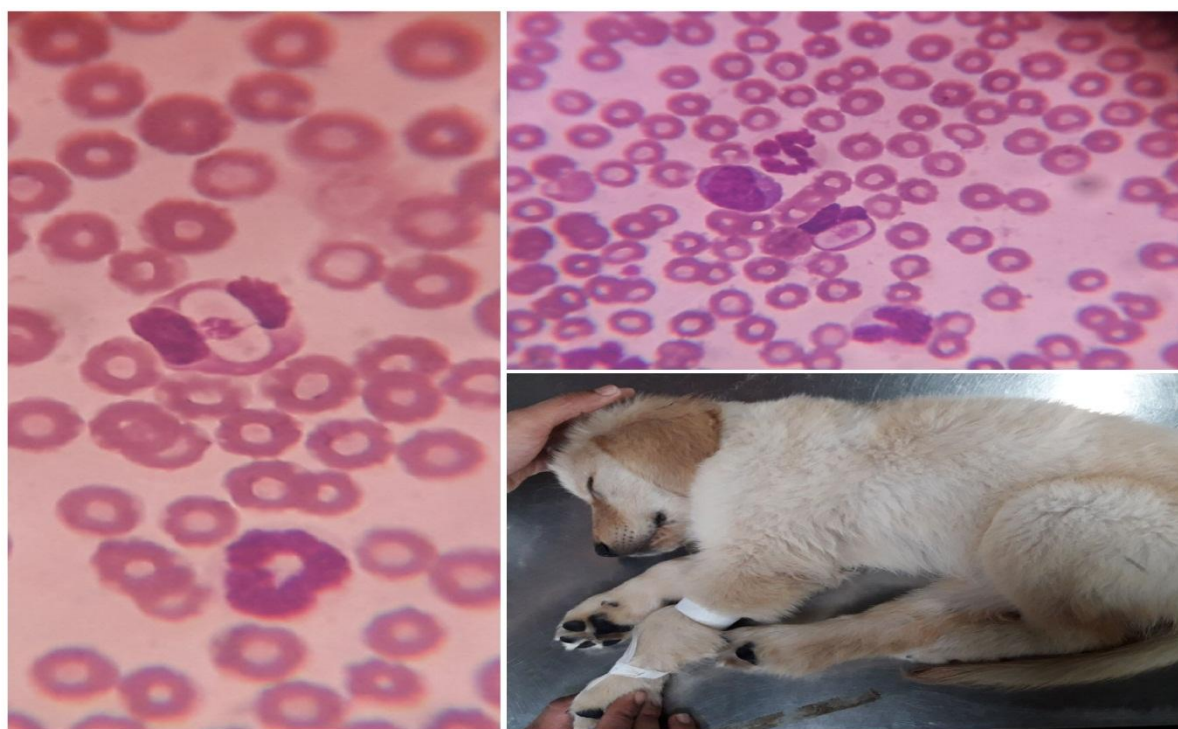
The hematologic and biochemical abnormalities reported in this pup included anemia, thrombocytopenia, Anemia is the most common hematological abnormality in *H. canis* infection (Marchetti *et al.*, 2009) and have been associated it with the chronicity of infection (Chhabra *et al.*, 2013). Though myelo suppressive effects of *H. canis* were reported earlier. The neutrophilia and anemia can be due to effect of inflammatory reaction generated in lung, liver and kidney (Gaunt, 2000). This may be due to chronic inflammation, reduced erythropoiesis is due to bone marrow suppression, or blood loss due to massive infestation with ticks, or to combination of several factors.

Thrombocytopenia may result from a similar interference with production at the bone marrow. The main vector of *H. canis* is the brown dog tick *Rhipicephalus sanguineus*. It is found intropical, sub-tropical and temperate regions all over the world, making the potential distribution of *H. canis*. (Bitton *et al.*, (2012).

South Gujarat being heavy rainfall area and dry sub humid climate having where there is

more chance of vector borne disease. Hence, diagnosis of these diseases is very important for the effective treatment of the affected dogs. Most cases of anemia in canine hepatozoonosis are often characterized as normocytic, normochromic and non-regenerative (Mundim *et al.*, 2008; Baneth and Weigler, 1997); even though the condition can be regenerative (Baneth and Weigler, 1997; Baneth *et al.*, 2003).

**Fig.1** Hepatozooncanis in Monocyte and affected dog



In contrast, to available reports of decreased WBC counts in the majority of dogs infected by *H. canis* (Bitton *et al.*, 2012), our result showed mild leukocytosis. Neutrophilia and leukocytosis can be detected in *H. canis* infection and according to Mundim *et al.* (2008) it may be due to inflammatory response to tissue invasion and multiplication by *H. canis*, which can be exacerbated by secondary bacterial infections concomitant with other hematozoa. In our study, neutrophilic leukocytosis, neutrophilic left

shift, eosinopenia and lymphopenia was observed which was in agreement with the observation made by Melo Junior *et al.*, (2008). A dog naturally infected with *H. canis* that presented regenerative anemia, leukocytosis with marked neutrophil left shift, monocytosis and thrombocytopenia was also reported (Mundim *et al.*, (2008). Aguiar *et al.*, (2004) also described regenerative anemia, leukocytosis with neutrophilia and monocytosis in hematological exams of three naturally infected dogs, together with

lymphopenia and hypergamma globulinemia. Three-out-of-eight cases of canine hepatozoonosis diagnosed by Gondim *et al.*, (1998) had lymphopenia and four had monocytosis. Blood smear evaluation also revealed moderately toxic neutrophils and activated monocytes.

A mild disease is the most common presentation of the infection and it is usually associated with a low level of *H. canis* parasitaemia (1–5% of neutrophils are infected). Severe illness is found in dogs with a high parasitaemia, often approaching 100% of the peripheral blood neutrophils (Baneth *et al.*, 2003). High levels of parasitaemia are frequently accompanied by extreme neutrophilia reaching as high as 150 000 neutrophils per ml of blood.

This massive parasitaemia reflects the large number of tissue meronts and takes its toll on the host by demanding nutrients and causing direct injury to affected tissues, leading to extreme weight loss and loss and cachexia. Immune suppression induced by an infectious agent or chemotherapy might influence the pathogenesis of new *H. canis* infections or the re-activation of pre-existing ones.

The incidences of hemoprotozoan diseases are being reported in the dogs indicates need of rigorous laboratory diagnosis. The prompt and correct laboratory diagnosis could be useful for effective diagnosis and effective treatments and also be useful for prevalence type information to the veterinarians.

However, it is notable that the hematologic alterations detected in these dogs infected by *H. canis* were quite variable, as the literature describes. Similarly, the pathogenicity of the parasite needs to be further elucidated and the clinical signs produced in the infection are also variable. Therefore, veterinarians should make the differential diagnosis in dogs, to avoid the under diagnosis of *H. canis*.

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