International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2024; SP-9(4): 78-80

www.veterinarypaper.com
Received: 05-05-2024
Accepted: 11-06-2024

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A case report on a husky pup with theileriosis and its clinical & hemato-biochemical changes

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Abstract
In this case study a seven months old female dog was admitted for disease investigation. The clinical examination of the dog showed the presence of *Rhipicephalus sanguineous* ticks and the clinical signs were anorexia (for two months), dehydration, congested mucus membrane, transient fever, and enlarged popliteal lymph node. Peripheral blood smear examination revealed infection of *Theileria species.* The hematological parameters such as Hb, WBC, hematocrit, MCH, MCHC, & platelets were significantly reduced which shows the damage to the hematopoietic system in general. The increased SGOT& SGPT levels show the liver damage and the kidney function was normal.

Keywords: Theileria infection-canine -clinico-hemato-biochemical

Introduction
Vector borne diseases of dogs are prevailing throughout the world and their prevalence is high in India due to favorable climatic conditions. The prevalence of tick-borne pathogens in dogs is increasing around the globe and is of significant importance in both veterinary and human health. (Beall M.J *et al.* 2008: Baneth G *et al.* 1998) [4]. Rosa, *et al.* (2014) [21] identified *Theileria equi* and *Theileria* species in dogs in Pretoria, South Africa both in diseased and sub clinically infected dogs. Beck *et al.* (2009) [5] reported diversity of Babesia and Theileria species in symptomatic and asymptomatic dogs in Croatia. Bigdeli M *et al.* (2012) [6] reported *Theileria annulata* and *Babesia canis* infections in dogs. Kursat Atlay *et al.* (2023) reported the prevalence of T.ovis in dogs from Kyrgyzstan. Dogs, foxes and jackals are the reservoirs of infection (Neer, 1998) [20] and its distribution is on the basis of vector population, the brown dog tick *Rhipicephalus sanguineous*. Tick borne diseases are important causes of morbidity and mortality in dogs worldwide, and the *Rhipicephalus sanguineous* has been implicated as vectors of several pathogens (Dantas-Torres, 2008) [10].

Case history
In this case report, a seven months old Husky female pup was presented with the clinical signs of anorexia (for two months), congested mucus membrane, vomiting, dehydration, transient fever. The dog was affected with parvo-viral infections after vaccination against parvo viral infections and dewormed. On clinical examination of the body the *Rhipicephalus sanguineous* ticks infestations were identified. The blood smear, hematological and the biochemical parameters were analyzed for the changes occurred in this infected pup.

Material and methods
Blood parasites identification was carried out as suggested by Amira. A *et al.* (2015) for *T. annulata* by demonstrating intracellular trophozoite signet ring of *T. annulata* in the infected dog's blood smear by giemsa staining. (Fig. 1, 2 & 3).

Results and Discussion

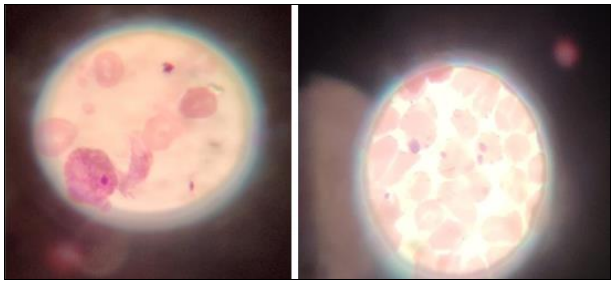

Fig 1 & 2: Pleomorphic *Theileria annulata* in erythrocytes

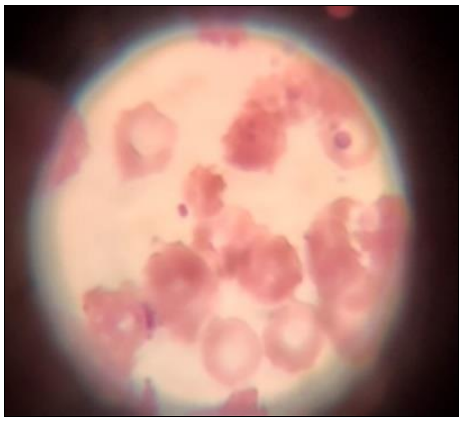

Fig 3: Signet ring shape.

Table 1: Hematology of the Theileria infected dog

Hemogram	Infected	Normal
Hemoglobin(g/dl)	10.2	12-18
Hematocrit (%)	32.1	37-55
TEC(million/mm)	5.10	5.5-8.5
MCV (fl)	64.0	60-77
MCH (pg)	17.3	19.5-24.5
MCHC (g/dl)	31.0	32-36
Platelets(thou/mm3)	2,35,000	211-900
TLC (thou/mm3)	57000	6-17
Neutrophils (%)	66	60-70
Lymphocytes (%)	24	12-30
Monocytes (%)	06	3-10
Eosinophil (%)	04	2-12
Basophils (%)	00	0-1

Table 2: Biochemical - Liver function tests

Total protein(g/dl)	6.11	5.4-7.5
Albumin(g/dl)	3.04	2.6-4.0
Globulin(g/dl)	2.01	2.2-3.7
A/G ratio	0.97	0.5-2.2
AST (ul)	73.26	9-49
ALT (ul)	60.14	8-57
Alk.phos	142.30	12-100
Bilirubin (total)	0.23	0.1-0.4
Bilirubin (direct)	0.10	0.1-0.2
Bilirubin (indirect)	0.13	0-0.3

Table 3: Bio-chemical -Kidney function tests

Blood urea(mg/dl)	0.79	0-2
BUN (mg/dl)	23.01	8-26
Creatinine(mg/dl)	1.22	0.5-1.6
Phosphorus(mg/dl)	5.10	2.9-6.2
Sodium (mmol/L)	150.0	140-153.2
Potassium (mmol/L)	4.12	3.5-5.5
Chloride (mmol/L)	109.1	107-117

Clinical manifestations in Theileria infected dogs

Nawab Y, *et al.* (2023) [19] reported the prevalence of *Theileria annulata* infection in dogs in Pakistan with the clinical signs of pyrexia, pale mucus membrane, jaundice, anemia and anorexia. Rosa *et al.*, (2014) [21] reported pale mucus membrane, bleeding tendencies and lethargy, hematuria. Clinical disease of different severities in dogs was reported by Garcia 2006; Matjila *et al.* (2008) [13, 18]. Jacobson *et al.* (2006) [16] reported differed clinico-pathological abnormalities *i.e* weight loss, chronic nephropathy, glomerulo-nephritis, jaundice due to liver disease, shock, respiratory acidosis/alkalosis, pancreatitis, vomiting, diarrhea, ocular lesions & myalgia in dogs. In this case also the age of the dog was seven months old, infested with *Rhipicephalus sanguineous* and the dog infected with *Theileria annulata.*

Clinical disease of different severities in dogs was reported by Garcia 2006 [13]; Matjila *et al.* (2008) [18]. Dixit *et al.* 2010 [11]; Solano-Gallego & Beneth (2011) [24] reported Theileria species in dogs with poor pathophysiology. Rosa *et al.* (2014) [21] reported poorly described information on the specific pathogenic species, treatment and outcomes of canine Theileriosis. Criado-Fornelio *et al.* 2003 [9]; Matjila *et al.* (2008) [18] opined that certain Theileria species might be associated with either non-clinical state related to a commensal relationship, or a less virulent parasite-host relationship. The clinical signs of the seven months old Husky female dog infested with *Rhipicephalus sanguineous* suffered with anorexia, congested mucus membrane, fever, vomiting, lethargy, dehydration, ticks infestation and enlarged popliteal lymph node, which could be attributed to hemolysis due to parasite caused injury and ruptures of red blood cells, increased osmotic fragility and due to the activity of secondary immune–mediated processes as suggested by Solano-Gallego *et al.* (2016) [25].

Hemato-biochemical studies of the *Theileria* infected dog

Giemsa stained blood smear revealed infection of *Theileria annulata spp*. The hemogram study revealed severe anemia and reduction of all blood values, *i.e* hemoglobin (10.2g/dl), total RBC count (5.10 million/mm), hematocrit (32.1%), MCH (17.3 fl), MCHC (31.0 g/dl) & elevated total leucocytes count (57,000 thou/mm3).The biochemical studies on renal functions showed normal levels of serum BUN, creatinine, uric acid, chloride, sodium, potassium, phosphorus levels. The liver function tests revealed elevated SGOT (73.26U/L), SGPT (60.14U/L), & Alkaline phosphatase (142.30 IU/L) levels (Table). Rosa, *et al.* (2014) [21] reported anemia, thrombocytopenia, and elevated hematocrit values in dogs infected with Theileria species. Nawab Y, *et al.* (2023) [19] reported decreased values of RBCs, PCV, Hb, and thrombocytes which are indicators for anemia. WBCs showed non–significant decrease and leukocytosis were observed in this case. Dixit *et al.* 2010 [11]; & Solano-Gallego & Baneth (2011) [24] reported poor understanding of the pathophysiology of theileria species infection in dogs. Comocho *et al.* 2003; Fritz 2010 [12]; Garcia 2006 [13]; Matjila *et al.* 2008 [18]; Simoes *et al.* (2011) [22] reported hemolytic anemia, splenomegaly and an immune mediated syndrome as associated clinical signs with this organisms. Garcia 2006 [13]; Harrus & Waner 2011 [14]; Solano-Gallego & Baneth (2011) [24] reported that the Theileriosis in dogs shares common features i.e anemia and or thromphocytopenia with other hemoparasites such as Babesiosis and Ehrlichiosis. Thrombocytopenia was observed by Solano-Gallego *et al.* 2011 [24]. Irwin *et al.* (2009) [15] reported thrombocytopenia in all infected dogs frequently and

it varies from mild to moderate as does anemia. Solano-Gallego *et al.* (2008) [23] reported that anemia can be regenerative or non -regenerative which depends on the infective species and the course of infection. Solano-Gallego L *et al.* 2011 [24] reported that the varying hematological / biochemical parameter changes could be due to the abatement of the immune system which are in confirmation of the present study.

Conclusion

In this case study the seven months old female, Husky dog infested with *Rhipicephalus sanguineous* was diagnosed for *Theileria annulata* infection by blood smear examination. Detailed studies needed on the patho-physiology of the infected dogs for *Theileria* species infection status for better management of canine population.

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How to Cite This Article
Ganesan PI, Shekhawat S. A case report on a husky pup with theileriosis and its clinical & hemato-biochemical changes. International Journal of Veterinary Sciences and Animal Husbandry. 2024;SP9(4):78-80.