

Original Research Article

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## Studies on Haemato-Biochemical Changes in Theileria Infected Gir Cows

S.B. Swami\*, J.S. Patel, V.L. Parmar and A.K. Bilwal

Department of Veterinary Medicine, College of Veterinary and A.H., Junagadh,  
Gujarat, India

\*Corresponding author

### ABSTRACT

The study was carried out on total 250 Gir cows which were presented to Teaching Veterinary Clinical Complex, College of Veterinary Science & Animal Husbandry, JAU, Junagadh (Gujarat) for therapeutic measures and some samples collected from Gaushala near to Junagadh region. A total of 250 Gir cows were screened for common haemoprotozoan infection on the basis of blood smear examination to record the infection rate of *Theileria*. Out of that 36 positive cases of *Theileria* infected Gir cows subjected to record the haemato-biochemical alteration in *Theileria* infection. mean values of Hb, PCV, TEC and lymphocyte showed statistically highly significant ( $P < 0.01$ ) decreased in *Theileria* infected animals where as mean values of TLC and neutrophils showed significant increase in *Theileria* infected animals. The mean values of total protein, albumin showed significant decreased where as mean values of BUN, ALT and AST in *Theileria* infected animals showed significant increase as compared to normal healthy animals. The non significant difference was observed in value of platelets count in infected Gir cow as compared to control group.

#### Keywords

Theileria, Hb, PCV, TEC, Lymphocyte, Haemoprotozoan, Morbidity

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### Introduction

Haemoprotozoan diseases are of great economic impact on livestock affecting 80% of the world cattle population and causes economic loss due to morbidity and mortality. Haemoprotozoan diseases are causing devastating losses to the livestock industry and thus pose major constraints to the dairy industry throughout the world. These diseases

in general and theileriosis in particular are considered as a serious economic threat for dairy farmers due to its adverse effects in the form of mortality and low productivity particularly in the tropical and subtropical regions of the world (Sahoo *et al.*, 2017). *Theileria* are obligate intracellular protozoan parasites that infect both wild and domestic Bovidae throughout much of the world. They are transmitted by Ixodid ticks and have

complex life cycles in both vertebrate and invertebrate hosts. There are various species of *Theileria* that infect cattle, *T. parva* and *T. annulata* are two pathogenic and economically important species.

## Materials and Methods

A total of 250 Gir cows were screened for common haemoprotozoan infections which were presented in TVCC of college of Veterinary Science & A. H. Junagadh Agricultural University, Junagadh (Gujarat) and some samples were also collected from Gaushala near to Junagadh region. All animals were screened by microscopic examination of blood smear to record *Theileria* infection. Out of those 36 positive cases of *Theileria* infected Gir cows were used for haematobiochemical study. Blood samples from Gir cows were collected from the jugular vein of the animals in a tube containing an anticoagulant, Tripotassium ethylene diamine tetra acetic acid (K3EDTA). About 5 ml of blood was collected in K3EDTA anticoagulant vacutainer for haemoprotozoan examination and hematological examination. Serum sample collected and stored for biochemical analysis. Blood samples collected from 36 Gir cow infected with theileriosis were analysed for haematological parameters by Auto blood analyzer machine (Abacus ABJ Vet-5 (Junior Vet 5). Serum samples analysed by auto biochemical analyser (Dia-CHEM 240 Plus, Diatek). The study was carried out from May 2018 to April 2019.

## Results and Discussion

In present study, there was statistically highly significant ( $P < 0.01$ ) decrease in Mean  $\pm$  SE values of haemoglobin, Packed cell volume, Total erythrocyte count and lymphocytes in theileriosis infected animals as compared to normal healthy control group. Total leucocytes count and neutrophils count shows significant

( $P < 0.01$ ) increase as compared to normal healthy control group, whereas Platelets, Monocytes, Eosinophils and Basophils counts were showed within normal range in theileriosis (Table 1).

Similar findings of reduced in haemoglobin, Packed cell volume and Total Erythrocyte count were reported by Sarma *et al.*, (2016), Ayadi *et al.*, (2017), Kumar *et al.*, (2018) and Naik and Maiti (2018). Significant decrease in the level of haemoglobin occurs because the infected erythrocytes with parasite were get destroyed by macrophages in the spleen, lymph nodes and other organs of the reticulo-endothelial system (Sandhu *et al.*, 1998). There is an increase in the osmotic fragility of erythrocytes during the disease which leads to decrease in level of PCV (Singh *et al.*, 2001). The decrease in TEC values may be due to increased levels of activated complement products. The oxidised erythrocytes may be destroyed easily by erythrophagocytosis, oxygen radicals may also be involved in the pathogenesis of the resultant anaemia, destruction of erythroblasts, rubricytes and other haematopoietic cells which resulted in anaemia (Mbassa *et al.*, 1994). The removal of piroplasm infected erythrocytes by macrophages in the organs of the reticulo-endothelial system has been suggested as a cause of anaemia (Singh *et al.*, 2001).

The present study reveals lymphocytopenia which indicates presence of autoimmune disorder and bone marrow damage while leucocytosis and neutrophilia is indicative of inflammatory condition.

These occur due to the toxic metabolites of *Theileria* spp. which results into harmful effect on bone marrow and interfere with the process of erythropoiesis. The Platelets, Monocyte, Basophils and Eosinophils count does not showed any changes in theileriosis. The total protein and Albumin values of cattle

infected with *Theileria* were significantly decreased as compared to the control healthy group of animals. Where as mean values of Blood urea nitrogen, ALT and AST of cattle infected with *Theileria* were significantly higher as compared to the non-infected animals. Mean Creatine values does not showed significant changes in Theileriosis (Table 2).

Similar finding of decrease in total protein is recorded by many workers; Singh *et al.*, (2017), Goyal *et al.*, (2018), Kumar *et al.*, (2018) and Naik and Maiti (2018). Hussein *et al.*, (2007) reported that decrease in total protein may be due to toxic effect of metabolite of *Theileria* spp. on liver cells. Decrease in the level of total protein may occur due to excretion through renal system or impairment in synthesis of protein and degradation of protein because of prolonged fever or liver insufficiency (Singh *et al.*, 2001). Col and Uslu, (2007) stated that

decrease in total protein occurs due to accumulation of proteineous fluid resulting into oedma and body cavity effusions.

Yurtseven and Uysal (2009) stated that levels of serum proteins are usually decreased significantly in tropical theileriosis, which may be the result of liver damage. Decrease in level of albumin may result from increase in excretion of albumin due to renal failure, impairment in its synthesis and extensive protein degradation during prolonged fever or may be due to liver failure or insufficiency (Singh *et al.*, 2001). Dede *et al.*, (2014) reported that liver and kidney failure occurs during theileriosis leading to a generalized protein deficiency. Increase in the level of blood urea nitrogen and uric acid in theileriosis is due to diffuse coagulative necrosis, severe damage to collecting tubules, haemorrhages and lymphoid aggregation in interstitial spaces of kidney (Sandhu *et al.*, 1998).

**Table.1** Haematological values (Mean ± S.E) in *Theileria* infected animals and control healthy group

Parameter	<i>Theileria</i> infected animals (n=36)	Control healthy group (n=6)
Hb (g/dL)	6.38±0.13**	10.23±0.13
PCV (%)	19.59±0.3**	28.28±0.76
TEC (10 <sup>6</sup> /μL)	4.21±0.06*	6.63±0.14
TLC (10 <sup>3</sup> /μL)	12.36±0.50**	8.96±0.55
Platelets (10 <sup>5</sup> /μL)	2.50±0.07	2.84±0.12
Neutrophils (%)	53.08±0.35**	34.33±0.88
Lymphocytes (%)	42.75±0.3**	60.83±0.98
Monocytes (%)	3.72±0.16	4.33±0.33
Eosinophils (%)	0.25±0.07	0.33±0.21
Basophils (%)	0.19±0.06	0.16±0.16

**Table.2** Biochemical values (Mean ± S.E) in *Theileria* infected animals and control healthy group

Parameter	<i>Theileria</i> infected animals (n=36)	Control healthy group (n=6)
TP (g/dL)	5.38±0.05**	6.82±0.06
Albumin (g/dL)	2.57±0.03**	3.45±0.05
BUN (mg/dL)	13.07±0.14**	11.31±0.13
Creatinine (mg/dL)	1.50±0.03	1.48±0.23
ALT(IU/L)	43.63±0.52**	30.41±0.32
AST (IU/L)	130.64±1.62**	101.39±1.09

Superscript indicate statistically significant \*\* p<0.01

The ALT and AST level of cattle infected with *Theileria* was significantly higher as compared to the non-infected animals. Increase in ALT level in infected animals as compared to healthy animals might indicate hepatic dysfunction in positive cases. Col and Uslu (2007) stated that increase in ALT level may be due to muscular trauma as a result of prolonged recumbency due to theileriosis. Modi *et al.*, (2015) stated that increase in ALT in affected animals hinting either hepatic necrosis or an alteration in cell membrane permeability leading to leakage of these cytoplasmic enzymes in the blood. Increase in AST level of theileriosis infected animals indicates the hepatic tissue damage including coagulation necrosis and distortion of hepatic cords with heavy infiltration of lymphocytes in the periportal areas. This indicates severe damage to hepatobiliary system due to hypoxia resulting from anemia and jaundice (Sandhu *et al.*, 1998 and Modi *et al.*, 2015).

It is concluded that mean values of Hb, PCV, TEC and lymphocyte showed statistically highly significant (P<0.01) decreased in *Theileria* infected animals where as mean values of TLC and neutrophils showed significant increase in *Theileria* infected animals. The mean values of total protein, albumin showed significant decreased where as mean values of BUN, ALT and AST in

*Theileria* infected animals showed significant increase as compared to normal healthy animals. The non significant difference was observed in value of platelets count in infected Gir cow as compared to control group.

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