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### Haematological Alterations in Cattle Infected with *Trypanosoma evansi*

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#### Abstract

This study was performed to unmask the haematological alterations in *Trypanosoma evansi* infected cattles. Blood samples from 50 *Trypanosoma* infected and 50 non-infected from Anand and Mahisagar districts were collected for the present study. Animals were bled from the jugular vein into 10 ml vacutainers containing EDTA for the estimation of various haematological parameters. The haematological parameters of cattle infected with *T. evansi* revealed decreased Hb, PCV, TEC, MCV, MCH and blood glucose level also ( $40.67 \pm 1.71$  vs.  $70.76 \pm 1.73$  mg/dl), and increased TLC and MCHC than those of non-infected healthy cattle. The neutrophil and eosinophil counts were significantly increased ( $P < 0.01$ ) from  $37.06 \pm 0.95$  to  $41.44 \pm 1.03$ ,  $4.47 \pm 0.25$  to  $7.97 \pm 0.24$  % indicating eosinophilia and neutrophilia in infected cattle. Lymphocyte count was significantly ( $P < 0.01$ ) reduced from  $54.55 \pm 1.01$  to  $46.96 \pm 0.65$  % indicating lymphocytopenia, while monocytes level increased non-significantly and basophils level increased significantly in infected cattle over healthy ones.

**Key Words:** Blood, Cattle, Trypanosomiasis, Haematological alterations.

#### Introduction

Haemoprotozoan disease like Trypanosomosis is economically important vector borne disease of tropical and subtropical regions of the world including India. It is a mechanically transmitted arthropod borne disease and *Tabanus* spp. has been implicated as the main vector. In Africa, South and Central America and Asia it is the geographically most widely distributed pathogenic trypanosome (Luckins, 1988; Pathak and Khanna, 1995). *Trypanosoma evansi*, is a major constraint on the health and productivity of domestic animals throughout the tropics and subtropics (Gill, 1991; Singla *et al.*, 2004). The disease is characterized by anaemia, nervous complications, emaciation and death. It causes severe loss to the farmers by the way of poor milk production, reduced ability to work and high mortality (Sivajothi *et al.*, 2014). The present study was conducted to evaluate the haematological changes in cattle affected with natural infection of *T. evansi*.

#### Materials and Methods

The work primarily included evaluation of alterations in blood of cattle suspected for having *Trypanosoma evansi* infection in relation to healthy control ones. The blood samples were collected from animals of Anand and Mahisagar districts of Gujarat with the help of field veterinarians. Blood

samples from 50 infected and 50 non-infected cattle were collected during the clinico-diagnostic approach of animals. The animals were bled from the jugular vein into vacutainers containing EDTA for the estimation of various haematological parameters, viz., haemoglobin (Hb), packed cell volume (PCV), total erythrocyte count (TEC), total leukocyte count (TLC), differential leukocyte count (DLC) using Automatic Whole Blood Analyzer (Mindray BC - 2800 Vet). The blood glucose was estimated using Glucometer in the blood samples collected in vacutainers containing sodium fluoride. The findings between healthy and infected groups were compared by employing paired 't' test.

## Results and Discussion

The findings of haematological parameters and blood glucose levels studied from *Trypanosoma evansi* infected and non-infected cattle are presented in Table 1.

**Table 1: Haematological and blood glucose value in *Trypanosoma evansi* infected cattle of Anand and Mahisagar districts of Gujarat (Mean±SE)**

Sr. No.	Parameters	Infected (n=50)	Non-infected (n=50)	P value	Stat. Sign.
1	Haemoglobin (Hb) g/dl	7.50 ± 0.20	12.75 ± 0.61	0.00	**
2	Packed cell volume (PCV) %	24.02 ± 0.74	35.37 ± 0.32	0.00	**
3	Total erythrocyte count (TEC) x10 <sup>6</sup> /μl	4.47 ± 0.17	9.82 ± 0.18	0.00	**
4	MCV (fl)	38.11 ± 0.19	53.75 ± 5.04	0.00	**
5	MCH (pg)	13.73 ± 0.19	16.78 ± 1.20	0.00	**
6	MCHC (g/dl)	36.03 ± 0.19	31.22 ± 1.21	0.01	*
7	Total leukocyte count (TLC) x10 <sup>3</sup> /μl	12.78 ± 0.36	10.25 ± 0.39	0.00	**
8	Differential Leukocytes Count (%)				
	a, Neutrophils (%)	41.44 ± 1.03	37.06 ± 0.95	0.00	**
	b, Lymphocyte (%)	45.96 ± 0.65	54.55 ± 1.01	0.00	**
	c, Monocytes (%)	3.87 ± 0.21	2.96 ± 0.21	0.78	NS
	d, Eosinophils (%)	7.97 ± 0.24	4.47 ± 0.25	0.00	**
	e, Basophils (%)	0.38 ± 0.05	0.21 ± 0.05	0.01	*
9	Blood Glucose (mg/dl)	40.67 ± 1.71	70.76 ± 1.73	0.00	**

\*P<0.05, \*\*P<0.01.

The infected cattle showed a significantly (P<0.01) reduced mean haemoglobin (Hb) value when compared with non-infected cattle (7.50 ± 0.20 vs. 12.75 ± 0.61 g/dl). The average packed cell volume (PCV) was reduced significantly (P<0.01) from 35.37 ± 0.32% in healthy cattle to 24.02 ± 0.74 % in infected cattle. The mean total erythrocytes count (TEC) was also reduced significantly (P<0.01) (4.47 ± 0.17 vs. 9.82 ± 0.18 x 10<sup>6</sup>/μl) in infected than non-infected cattle. The mean corpuscular volume (MCV, fl) was reduced significantly (P<0.01) in infected than in non-infected cattle (38.11 ± 0.19 vs. 53.75 ± 5.04) suggesting presence of microcytic anaemia in infected animals. The mean corpuscular haemoglobin (MCH, pg) was reduced significantly (P<0.01) from 16.78 ± 1.20 in non-infected to 13.73 ± 0.19 in infected cattle, and suggested hypochromic anaemia. The mean corpuscular haemoglobin concentration (MCHC, g/dl) was increased significantly (P<0.01) from 31.22 ± 1.21 to 36.03 ± 0.19 in infected cattle.

The mean value of total leukocytes count (TLC) was significantly increased (P<0.01) in infected than non-infected cattle (12.78 ± 0.36 vs. 10.25 ± 0.39 x 10<sup>3</sup>/ μl). In differential leukocyte count, the infected cattle showed neutrophilia and eosinophilia with significantly increased (P<0.01) neutrophil and eosinophil counts from 37.06 ± 0.95 to 41.44 ± 1.03 and 4.47 ± 0.25 to 7.97 ± 0.24

% when compared with non-infected/healthy cattle. Lymphocyte count was significantly ( $P < 0.01$ ) reduced from  $54.55 \pm 1.01$  to  $46.96 \pm 0.65$  % in infected animals indicating lymphocytopenia. The monocytes level increased non-significantly and basophils level also increased significantly in infected animals (Table 1).

The present findings of anaemia, eosinophilia, increased TLC and decreased PCV confirms the earlier reports of Silva *et al.* (1999) in natural bovine Trypanosomosis. The leukocyte changes were characterized by relative monocytosis ( $11.87 \pm 4.61\%$ ) and eosinophilia ( $7.50 \pm 4.58$ ), but lymphocytosis ( $44.43 \pm 10.85\%$ ) did not support our findings. Sharma *et al.* (2000) recorded anaemia with decreased PCV, Hb and RBCs in experimentally infected goats, in line with the present study, except decreased lymphocyte counts. Lymphocytes are second line of defence in immune system of host body. Increased number of eosinophils in the blood might be an indication of parasitic infection. Increase in the total leukocytes count may also be due to the increase in neutrophils and eosinophils. PCV might decrease due to lower concentration of erythrocytes per unit volume of blood. Similar haematological findings were recorded by Singh and Gaur (1983) in *T. evansi* infected buffalo calves. Katunguka- Rwakishaya *et al.* (1992) in ovine trypanosomosis found fluctuating parasitaemia, macrocytic normochromic anaemia and leucocytosis, which was principally a lymphocytosis, with a significant decrease in PCV, RBC, Hb and increased in WBC. In contrast to this, lymphocytopenia was noticed in present study and anaemia recorded was microcytic hypochromic means Hb concentration and cell size were reduced in infected cattle. The reduced lymphocyte count may be due to the chronic infection and insufficient production of cells.

Ahmad *et al.* (2004) and Cadioli *et al.* (2006) recorded markedly low PCV, RBC and TLC count with decreased lymphocyte and increased neutrophils in camels and donkeys, but monocyte count remained unaltered. Similarly, Hilali *et al.* (2006) observed decreased Hb concentration, PCV and RBCs, and increased TLC, lymphocytes and monocytes count in buffalo calves infected with *Trypanosoma evansi*. Kumar *et al.* (2012) documented an outbreak of acute *Trypanosoma evansi* infection in crossbred cattle farm comprising 78 adults (lactating and dry) and 27 calves in Punjab. The findings revealed slight anaemia as indicated by mild decrease in haemoglobin ( $9.19 \pm 0.17$  g/dl) and lymphocytosis (67%,  $5.02 \times 10^3$  cell/ $\mu$ l) in infected cows. Similar findings were also recorded by Gunaseelan *et al.* (2009) in canine trypanosomiasis. Enwezor *et al.* (2012) observed decreased mean PCV ( $23.40 \pm 3.63\%$ ) in trypanosome positive cattle of Nigeria. Chaudhri *et al.* (2013) in pyretic dairy animals of eastern Haryana obtained lower values of haemoglobin, packed cell volume and total erythrocytic counts in haemoprotozoan infected crossbred cows indicating anaemia.

Bal *et al.* (2014) revealed normocytic normochromic type of anaemia in *T. evansi* infected cattle herd showing decreased RBC, Hb and PCV, while Gudewar *et al.* (2014) revealed subnormal erythrocytic count and haemoglobin with leukocytosis in 70.58% of bubaline Trypanosomosis cases in Mumbai region. Blood glucose level of 15 hypoglycaemic buffaloes ranged between 27 to 49.05 gm/dl with an average of 39.35 gm/dl. The comparative analysis of the degree of hypoglycaemia with parasitaemia revealed positive correlation between two parameters. In the present study, the blood glucose level was significantly decreased ( $P < 0.01$ ) from  $70.76 \pm 1.73$  to  $40.67 \pm 1.71$  mg/dl in *Trypanosoma* infected cattle. Anorexia and decreased intestinal glucose absorption might be considered as attributing factors causing hypoglycemia. It is also likely that the parasites utilize blood glucose of host for their growth. Possibly there may be reduction in the rate of glycolysis and gluconeogenesis, due to disease stress conditions. Endocrine disturbances due to stress conditions may also lead to hypoglycemia.

Sivajothi *et al.* (2014) found decreased TEC ( $4.76 \pm 0.80 \times 10^6$ / $\mu$ l), PCV ( $28.71 \pm 5.7\%$ ), Hb. ( $8.37 \pm 0.31$  gm/dl) and TLC ( $7.32 \pm 0.70 \times 10^3$ / $\mu$ l) values in *Trypanosoma evansi* infected cattle. The leucopenia was characterized by neutrophilia (31.52% from 25.28%), eosinophilia (4.43% from 3.23%) and lymphocytopenia (65.28% from 68.17%). The decreased TEC count may be due to injury to RBCs caused by lashing action of the trypanosomes. It may be due to release of potentially

pathogenic biological and chemical toxins by trypanosomes which are responsible for lysis of erythrocytes or due to the inhibition of haemopoietic system. Neutrophils are actively amoeboid and phagocytic in nature. The phagocytic action of neutrophils may thus correlate with their increased number as a first line of defence of the host in the present study. The lymphocytes are the second line of cellular defence and in chronic infection there is high demand. The metabolic products and toxins liberated may also be the reason for low blood glucose and glycogen reserve due to hepatic changes in infected animals.

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**Conflict of Interest:** All authors declare no conflict of interest.

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