



*Original Research*

## Clinical and Haematobiochemical Changes in Cattle with *Theileria orientalis* Infection

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### Abstract

Out of 110 animals suspected for theileriosis, 100 cattle were positive for *T. orientalis* infection. The predominant clinical signs were tick infestation (45%), anorexia (80%), pyrexia (22%), swollen lymph node (83%), pale conjunctival mucous membrane (73%), nasal discharge (65%), bruxism (43%), dyspnoea (67%), tachycardia (71%), reduced milk yield (62.35%) and lameness (12%). Haematological analysis revealed significant ( $P < 0.05$ ) decrease in haemoglobin (Hb), haematocrit (PCV), red blood cells (RBC) and platelets and significant ( $P < 0.05$ ) increase in mean corpuscular volume and eosinophil count. Serum biochemistry revealed significant ( $P < 0.05$ ) reduction in mean serum albumin and albumin: globulin ratio and significant ( $P < 0.01$ ) increase in mean total protein and globulin was observed in *Theileria* infected cattle to the control.

**Key words:** Cattle, Clinical Signs, Haemato-biochemical, *Theileria orientalis*

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### Introduction

Theileriosis is a tick borne protozoan disease of cattle, sheep and goats caused by *Theileria* spp. Benign tropical theileriosis found worldwide is caused by *T. buffeli*/*T. orientalis* and *T. sergenti* and transmitted by the tick, *Haemaphysalis* spp. (Radostits *et al.*, 2010). *Theileria orientalis* classified into eight genotypes (chitose = type 1, ikeda = type 2, buffeli = type 3 and types 4–8), based on DNA sequencing of PCR-amplified regions of the major piroplasm surface protein (MPSP) and/or small subunit of nuclear ribosomal RNA (SSU) genes. Ikeda and chitose genotypes were associated with pathogenic form, whereas other genotypes appear to relate to benign infections in cattle (Kakuda *et al.*, 1998; Gubbels *et al.*, 2000). The





present study describes the clinical signs and haemato-biochemical alterations in cattle naturally infected with *T. orientalis* in the Puducherry state.

### Materials and Methods

A total of one hundred and ten animals during a period from January to August 2014 comprising sixty two crossbred cattle, twenty five Holstein Friesian cross, fifteen Hallikar and remaining non-descript suspected for theileriosis were included in the study. Theileriosis was diagnosed based on the clinical signs (fever and enlarged lymph nodes), detection of parasites and polymerase chain reaction. Five milliliter of venous blood samples were collected aseptically in clean glass vials contain EDTA (1mg/ml of blood) for complete haemogram and were estimated as per standard methods. Five millilitre of the blood was collected and allowed to clot and the serum was separated by centrifugation (Hemi Pvt. Lt) (Col and Uslu, 2007). Serum was used for estimation of total protein, albumin by modified Biuret and Doumas method, creatinine, AST and ALT (Tietz, 1986) using semi autoanalyser (Secoman). A group of ten cattle which were apparently healthy and negative for theileriosis infections constituted control group.

### Statistical Analysis

Data recorded in this study were subjected to statistical analysis using Graph Pad Prism 6. Student's t-test was used to analyse haematological and biochemical values between healthy and diseased animals.

### Result and Discussion

The incidence of theileriosis among cattle presented to Large Animal Medical Unit, Teaching Veterinary Clinical Complex, Rajiv Gandhi Institute of Veterinary Education and Research, Puducherry was 24.21 per cent (n=413). Out of 110 cattle with clinical manifestations suggestive of theileriosis, 100 cattle were found positive for *Theileria* infection which is in agreement with Keles *et al.* (2001) and Kamau *et al.* (2011) who reported that theileriosis in cattle was endemic in tropical regions, parts of Australia and north east China, whereas Chaisi *et al.* (2013) reported an incidence of *Theileria orientalis* was 5.8% in South Africa. The incidence of theileriosis was highest in cross breed Jersey (59%), followed by Holstein Friesian cross (23%) and Hallikar (13%) which is in concurrence with the report of Kachani *et al.* (1992), Radostits *et al.* (2010) opined that indigenous cattle breeds were less clinically affected than exotic breeds of cattle. The predominant clinical signs in these animals were swollen lymph node (83%), anorexia (80%), pale conjunctival mucus membrane (73%), tachycardia (71%), dyspnoea (67%), nasal discharge (65%), reduced milk yield (62.35%), tick infestation (45%), bruxism (43%), diarrhoea (37%), pyrexia (22%) and lacrimation & lameness (12%) which is in agreement with the reports of Col and Uslu (2006) and Ugalmugle *et al.* (2010) (Table 1). Hussein *et al.* (2007) observed corneal opacity as a result of white blood cells infiltration; anorexia could be attributed to persistent fever, enlargement of lymph nodes to lymphoid

hyperplasia. In the present study, corneal opacity was reported in 3 percent of cases in cattle with theileriosis. In the present study in addition to the above said clinical manifestations, bruxism was reported in 43 per cent of cases.

**Table 1:** Clinical manifestations in cattle with theileriosis

| S. No. | Clinical Manifestation | Percentage (%) (n=100) |
|--------|------------------------|------------------------|
| 1      | Opacity of eye         | 3                      |
| 2      | Diarrhoea              | 37                     |
| 3      | Nasal discharge        | 65                     |
| 4      | Lacrimation            | 12                     |
| 5      | Dyspnoea               | 67                     |
| 6      | Bruxism                | 43                     |
| 7      | Skin lesions           | 2                      |
| 8      | Tachycardia            | 71                     |
| 9      | Nervous signs          | 4                      |
| 10     | Lameness               | 12                     |
| 11     | Tick infestation       | 45                     |
| 12     | Anorexia               | 80                     |
| 13     | Pyrexia                | 22                     |
| 14     | Swollen lymph node     | 83                     |
| 15     | Pale mucus membrane    | 73                     |



**Fig. 1:** Corneal opacity in cattle with *T.orientalis* infection



**Fig. 2:** Severe tick infestation in cattle with *T.orientalis* infection



**Fig. 3:** Enlarged pre-scapular lymph node in cattle with theileriosis

The haematological values of apparently healthy cattle and cattle with theileriosis were given in Table 2. Haematological values revealed significant ( $P<0.05$ ) decrease in mean Hb ( $8.8\pm1.95\text{g/dl}$ ), PCV ( $27.5\pm0.5\%$ ), RBC ( $4.8\pm0.93\times10^6\text{cells/mm}^3$ ) and mean platelet count ( $1.25\pm0.58\times10^5\text{cells/mm}^3$ ) and significantly ( $P<0.05$ ) increase in mean MCV ( $57.35\pm0.36\text{fl}$ ) and eosinophil count ( $0.017\pm3.01\times10^3\text{cells/mm}^3$ ) in cattle with theileriosis compare with control mean which is in agreement with Col and Uslu (2006) and Qayyum *et al.* (2010) reported significant ( $P<0.05$ ) decrease in Hb, PCV and RBC count. Mean MCV was significantly ( $P<0.05$ ) higher in cattle with theileriosis. Macrocytic normochromic anaemia was noticed in cattle with theileriosis which is in agreement with Muraleedharan *et al.* (2005).

**Table 2:** Haematology of cattle with theileriosis

| Parameters                               | Apparently Healthy Cattle (n=10) | Cattle with Theileriosis (n=100) | "t"                |
|------------------------------------------|----------------------------------|----------------------------------|--------------------|
| Haemoglobin (g/dl)                       | $10.48\pm0.45$                   | $8.8\pm0.195$                    | 4.24*              |
| Packed Cell Volume (%)                   | $29.9\pm0.94$                    | $27.5\pm0.5$                     | 2.76*              |
| RBC ( $10^6\text{ cells/mm}^3$ )         | $5.47\pm0.26$                    | $4.8\pm0.93$                     | 5.56 *             |
| MCV (fl)                                 | $54.19\pm2.15$                   | $57.35\pm0.36$                   | 2.36 *             |
| MCH (pg)                                 | $18.34\pm0.77$                   | $18.61\pm0.25$                   | 0.32 <sup>NS</sup> |
| MCHC (%)                                 | $33.6\pm0.54$                    | $32.42\pm0.37$                   | 0.98 <sup>NS</sup> |
| WBC ( $10^3\text{cells/ mm}^3$ )         | $12\pm1.61$                      | $11.1\pm0.5$                     | 0.59 <sup>NS</sup> |
| Neutrophils ( $10^3\text{cells/ mm}^3$ ) | $4.56\pm0.65$                    | $3.74\pm0.02$                    | 1.11 <sup>NS</sup> |
| Lymphocytes ( $10^3\text{cells/ mm}^3$ ) | $7.46\pm1.18$                    | $7.20\pm0.39$                    | 0.34 <sup>NS</sup> |
| Eosinophils ( $10^3\text{cells/ mm}^3$ ) | $0.004\pm2.6$                    | $0.017\pm3.01$                   | 1.33*              |
| Monocytes ( $10^3\text{cells/ mm}^3$ )   | $0.0007\pm0.73$                  | $0.0083\pm1.7$                   | 1.4 <sup>NS</sup>  |
| Platelets ( $10^5\text{cells/ mm}^3$ )   | $2.19\pm1.03$                    | $1.25\pm0.58$                    | 4.49 **            |

\*\*Significant ( $P<0.01$ ); \* Significant ( $P<0.05$ ); NS: Not significant ( $P>0.05$ )

The mean serum biochemical values of apparently healthy cattle and cattle with theileriosis in cattle are presented in the Table 3. Serum biochemistry revealed significant ( $P<0.05$ ) reduction in mean serum albumin ( $20.44\pm0.91\text{g/L}$ ) and alteration in albumin: globulin ( $0.52\pm0.4$ ) ratio was observed to their control mean ( $22.74\pm3.12\text{g/L}$  and  $0.67\pm0.12$ ) which is similar to the findings of Aulakh and Singla (2006). A significant ( $P<0.01$ ) increase in mean total protein ( $82.1\pm3.5\text{ (g/L)}$ ) and mean globulin ( $61.7\pm3.75\text{g/L}$ ) was observed in cattle with theileriosis when compared to that of control mean ( $57.7\pm5.9\text{g/L}$  and  $34.9\pm4.11\text{g/L}$ ). The mean creatinine ( $1.17\pm0.04\text{mg/dl}$ ), AST ( $133.3\pm38.84\text{ IU/L}$ ) and ALT ( $79.6\pm26.11\text{ IU/L}$ ) in these animals did not show any significant difference.

**Table 3:** Serum biochemistry of cattle with theileriosis

| Parameters          | Apparently Healthy Cattle (n=10) | Cattle with Theileriosis (n=100) | "t"                |
|---------------------|----------------------------------|----------------------------------|--------------------|
| Total protein (g/L) | 57.7±5.9                         | 82.1±3.5                         | 4.18**             |
| Albumin (g/L)       | 22.74±3.12                       | 20.44±0.91                       | 2.03*              |
| Globulin (g/L)      | 34.9±4.11                        | 61.7±3.75                        | 5.02**             |
| Albumin: Globulin   | 0.67±0.12                        | 0.52±0.4                         | 0.095*             |
| Creatinine (mg/ dL) | 1.25±0.13                        | 1.17±0.04                        | 0.61 <sup>NS</sup> |
| AST ( IU/ L)        | 119±38.7                         | 133.3±38.84                      | 1.12 <sup>NS</sup> |
| ALT (IU/ L)         | 51.5±4.15                        | 79.6±26.11                       | 1.06 <sup>NS</sup> |

\*\*Significant ( $P<0.01$ ); \* Significant ( $P<0.05$ ); NS- Not significant ( $P>0.05$ )

### Conclusion

The incidence of theileriosis in the present study was 24.21 per cent among the one hundred and ten animals registered in large animal medicine unit. Theileriosis was diagnosed based on the clinical signs (fever and enlarged lymph nodes), detection of parasites and polymerase chain reaction. From the present study the predominant clinical signs in theileriosis were enlarged lymphnode, pale mucous membrane, anorexia, tachycardia, dyspnoea, tick infestation and bruxism. Haematological alterations included macrocytic normochromic anemia, eosinophilia with thrombocytopenia. Serum biochemistry showed alteration in albumin: globulin ratio, hyperproteinemia, hypoalbuminemia with hyperglobulinemia in cattle with theileriosis.

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