Variation in clinical markers in cattle naturally infected with bovine tropical theileriosis

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Abstract 124 cattle naturally infected with *Theileria annulata* were inspected for clinical markers. Clinical manifestations of general weakness, reduced appetite, pyrexia reaching 40–42 °C and lachrymal discharge were seen in more than 75 % of the infected animals. Presence of ticks on body, general dullness and depression, recumbency/prostration, oedema of dependent body parts, diarrhea, hypersalivation, pale mucous membranes and yellow colored urine were revealed by more than 50 % of the infected animals. Clinical manifestations of dehydration, abdominal distension/ascites, jaundice and haemoglobinuria were revealed by more than 25 % of the infected animals less than 25 % of the infected animals showed clinical manifestations of exophthalmia, constipation, melena, buccal cavity erosions, congested mucous membranes, nasal discharge and tachypnoea.

Keywords Bovine tropical theileriosis · Cattle · Clinical markers · *Theileria annulata*

Introduction

Bovine tropical theileriosis (BTT) is an important vector-borne protozoan disease imposing serious constraints on the health and productivity of domestic cattle in tropical and sub-tropical regions of the world. The disease is caused

by an apicomplexan parasite *Theileria annulata* and involves *Hyalomma anatolicum anatolicum* as its vector in the Indian subcontinent. BTT accounts for high mortality rates in dairy cattle with over 200 million animals exposed to risk (Radostits et al. 1994; Sudan et al. 2014). The global annual losses due to BTT are estimated to be of US\$800 million (Brown et al. 1995) while in India alone, the disease accounts for an approximate annual loss of US\$384.3 million (Minjauw and McLeod 2003). To add up to the agony, animals with chronic cases of BTT show almost similar types of signs and symptoms with that of other arthropod vector borne diseases like trypanosomiasis, anaplasmosis and babesiosis. The present study was designed with the aim to evaluate the clinical markers of natural *T. annulata* infection in cattle so as to facilitate its symptomatic diagnosis under field conditions.

Materials and methods

124 confirmed naturally *T. annulata* infected (through microscopic blood smear examination) indigenous and crossbred cattle of either sex, were evaluated. Clinical examination of suffering animals was performed and relevant clinical markers such as reduced appetite, hyperthermia, dullness/depression, weakness, ticks on body, lymph node swelling (prescapular), exophthalmia, hypersalivation, nasal discharge, lachrymal discharge, buccal cavity erosion, pale mucus membrane, jaundice, congested mucus membrane, recumbency/prostration, dehydration, tachypnoea, edema of dependent parts, constipation, diarrhea, abdominal distension/ascites, melina, yellow coloured urine and haemoglobinuria were studied. The animals examined in the present study were evaluated alongside the thesis work of master's degree of the first author.

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Results and discussion

The percentages of clinical markers studied under the present study are summarized in Table 1. Clinical manifestations of general weakness, reduced appetite, pyrexia reaching 40–42 °C, lymph node (prescapular) enlargement and lachrymal discharge were revealed by more than 75 % of the infected animals. While, clinical manifestations of presence of ticks on body, general dullness and depression, recumbency/prostration, oedema of dependent body parts, diarrhea, hypersalivation, pale mucous membranes and yellow colored urine were revealed by more than 50 % of the infected animals. Clinical manifestations of dehydration, abdominal distension/ascites, jaundice and haemoglobinuria were revealed by more than 25 % of the infected animals. While, less than 25 % of the infected animals revealed clinical manifestations of exophthalmia, constipation, melena, buccal cavity erosions, congested mucous membranes, nasal discharge and tachypnoea.

Table 1 Scorecard of clinical markers cardinal for bovine tropical theileriosis in cattle

Clinical sign	No. of cattle examined	No. of cattle showing clinical signs	Percent positivity
Hyperthermia	124	102	82.25
Weakness	124	105	84.67
Ticks on body	124	85	68.54
Exophthalmia	124	22	17.74
Recumbency/prostration	124	66	53.22
Dehydration	124	51	41.12
Edema	124	64	51.61
Lymph node (prescapular) enlargement	124	102	82.25
Inappetite	124	109	87.90
Constipation	124	23	18.54
Diarrhoea	124	69	55.64
Abdominal distension/ascites	124	55	44.35
Melena	124	22	17.74
Hypersalivation	124	69	55.64
Buccal cavity erosion	124	22	17.74
pale mucus membrane	124	91	73.38
Jaundice	124	37	29.83
Congested mucus membrane	124	26	20.96
Dullness/depression	124	81	65.32
Nasal discharge	124	20	16.12
Tachypnoea	124	25	20.16
Yellow coloured urine	124	71	57.25
Lachrymal discharge	124	95	76.61
Haemoglobinuria	124	40	32.25

The results of the current study clearly signify that lymph node (prescapular) enlargement, pallor mucous membrane, reduced appetite, marked rise in the body temperature and lachrymal discharge are among the most common clinical markers revealed by animals naturally infected with *T. annulata*. Another significant finding of BTT viz., anemia is contributed to overproduction of cytokines, immune-mediated hemolysis and reactive oxygen species (Nazifi et al. 2009; Saleh et al. 2011). The *T. annulata* infected cells undergo clonal expansion resulting in lymphoproliferation or lymphadenopathy (Woods et al. 2013). Cells infected with *T. annulata* also produce high levels of inflammatory cytokines (Brown et al. 1995) which account for all the major clinical symptoms like pyrexia, anaemia, anorexia, muscle wasting and necrosis (Graham et al. 2001).

In conclusion, detail inspection of infected animals by the field Veterinarian considering these clinical markers could aid in the diagnosis of theileriosis in carrier animals. The consideration of generalized lymph nodes enlargement, pallor mucous membrane, pyrexia, pica, coughing and respiratory distress, lacrimation and exophthalmia as the major clinical markers might be pivotal in clinical diagnosis of theileriosis in the field conditions.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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