

Vertically Transmitted *T. annulata* induced corneal opacity in bovine calf

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ABSTRACT

The present case reports an unusual case of vertically transmitted *Theileria annulata* induced corneal opacity in day old cross-bred cattle calf. The case was presented with history of severe dejection, sternal recumbency, anorexia, pyrexia, clouding of eye, and no response to ceftriaxone and meloxicam administration for last 2 days. Clinical examinations revealed absence of prescapular lymphadenopathy and presence of exophthalmos and corneal opacity. Fecal floatation, complete blood count, blood smear, and lymph node biopsy examination were performed to make a confirmatory

diagnosis. Blood smear reveals presence of several piroplasm organisms in erythrocytes. Case was efficiently and safely managed by using single deep Intramuscular injection of Buparvaquone at the rate of 2.5 mg/kg body weight along with long acting oxytetracycline @ 20 mg/kg body weight every third day along with supportive therapy. The combination was well tolerated by the calf with complete recovery with subsidence of corneal opacity within one week.

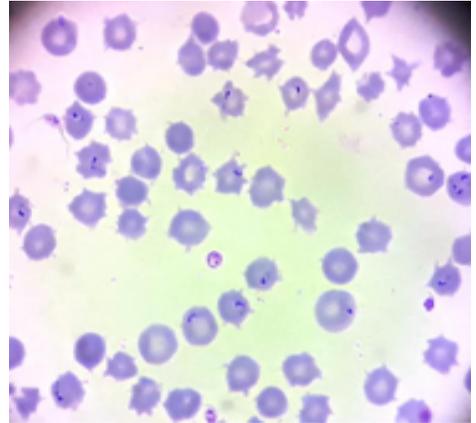
INTRODUCTION

Bovine tropical Theileriosis (BTT) is most important haemoprotozoan disease and among the major constraints to Indian dairy industry encompassing huge annual monetary losses all around the country (Urquhart

Figure 1: Crossbred calf presented with corneal opacity



Figure 2: Giemsa stain revealing presence of signet ring shaped *T.annulata* piroplasm in erythrocytes of blood smear



et al., 2003; Soulsby, 2005) The disease is caused by apicomplexan parasite *Theileria annulata* predominantly transmitted by Ixodid ticks of genus *Hyalomma anatolicum* and affects both domestic and wild bovidae throughout the world. The protozoan has complex life cycle with both vertebrate and invertebrate host. In India, Bovine Tropical Theileriosis is considered as a life-threatening disease to livestock (Tuli *et al.*, 2015).

Theileriosis has been described in three forms viz. acute, sub-acute, and chronic with major clinical manifestations like pyrexia, lymphadenopathy, emaciation, lacrimation, and depression. Most of the incidences of disease are recorded with these chief clinical signs, but occasionally the disease has been recorded with some non-conventional clinical signs like ocular bulging, corneal opacity, nervous form, pseudo pericarditis, and cutaneous nodules (Keles *et al.*, 2003; Godara *et al.*; 2009; Sudan *et al.*, 2012a; Sudan *et al.*, 2012b; Verma and Singh, 2016). Similarly, in most of the cases, the disease has been recorded to be horizontally transmitted with Ixodid ticks, but there are occasional reports of its vertical transmission as well. The present case deals with a rare case of corneal opacity in day old calf diagnosed with bovine tropical Theileriosis.

MATERIALS AND METHODS

History, Clinical Observation and Diagnosis

A day-old cross breed female cattle calf was presented for the clinical examination and professional assistance with history of severe dejection, fever, anorexia, sternal recumbency, ocular discharge, and clouding of cornea. Clinical examination reveals presence of anemia, high fever up to 106°F, blindness, increased respiration, and heart rates. The fever did not show any response to non-steroidal anti-inflammatory drugs and cephalosporin. Ophthalmic examination reveals negative menace test, bilateral copious watery discharge, bulging of the eye ball, and clouding of cornea. To make a laboratory diagnosis, thin blood smear from ear vein was prepared and stained with Giemsa stain revealing the presence of signet ring shaped *T. annulata* piroplasm in erythrocytes of blood smear. Based on the presence of piroplasm the case was confirmed as Bovine tropical Theileriosis.

RESULTS AND DISCUSSION

The case was successfully treated using single deep intramuscular injection of Buparvaquone (Zubion, Intas animal health limited) @ 2.5 mg/kg body weight followed by long acting Oxytetracycline @ 20 mg/kg body weight every third day for two

Table 1: Pre and post therapy Hematological analyses

Parameters	Day 0	Day 14	References range (Benjamin, 2013)
TEC($\times 10^6/\mu\text{l}$)	5.2 $\times 10^6/\mu\text{l}$	6.4 $\times 10^6/\mu\text{l}$	7.4 $\times 10^6/\mu\text{l}$
HB(gm/dl)	9.0	12	8-14
PCV(%)	28	36	33-47
WBC(μL)	6000	11000	8000-13.80 $\times 10^3/\mu\text{l}$
Neutrophils(%)	45	36	32%
Lymphocytes(%)	52	58	62.5%
Monocytes(%)	2.0	3.0	3.7%
Eosinophils(%)	1.0	2.0	1.5%
Basophils(%)	0	1.0	0-1%

times. The adjunct therapy includes intra-muscular injection of meloxicam (Melonex, Intas Pharmaceuticals Ltd.) @ 0.5 mg/kg, intramuscular injection of chlorpheniramine maleate (Cadistin, Zydus animal health Ltd) @ 0.5 mg/kg with oral Vitamin A, D, E and K (Vitum H) (Intavita H, Intas animal health limited) and liver supplement (Livotas syrup, Intas animal health limited). The improvement was observed with first administration of Buparvaquone, oxytetracycline, and melonex, and corneal opacity completely subsided in 1 week.

The hematology changes were estimated on day 0 (before therapy) and day 14 (after recovery) after initiation treatment, and clinical evaluation was also performed on same days. The findings of hematological changes and clinical evaluation have been presented in Table 1 and 2, respectively.

The normal state of theileriosis in indigenous cattle is of endemic stability. Endemic stability is defined as the state where the relation between agent, host, and vector is such that clinical cases occur rarely or not at

all. It is a reported fact that in endemic areas all indigenous adult animals are affected, but case mortality is only 20%. But this stability is disturbed with the introduction of less resistant exotic crossbred cattle, which may suffer up to 20-90% mortality. Immunity to *Theileria* spp. is mainly cell mediated, which is very weak in calves. Therefore, young calves are highly susceptible to theileriosis and usually encounter infection in perinatal period (Radostits, 2006). Affected calves, whether crossbred or indigenous, have been recorded with high morbidity and mortality.

This case reports a day-old calf treated for pyrexia for 2 days was diagnosed with theileriosis by the presence of intra-erythrocytic piroplasm in blood smear on the third day. Normal superficial lymphnodes and absence of vector on body of calf was suggestive of transplacental transmission of disease to the calf. Conventionally, the ticks transmits sporozoites of pathogens to host, which reaches circulation through local lymph nodes. The incubation period for transmitted *T. annulata* after reaching host circulation ranges from 7-21 days. There are some reports of hereditary transmission of *T. annulata* (Markov, 1962; Sudan *et al.*, 2012; Gupta *et al.*, (2004)). Recently, reported similar incidence of theileriosis in calves

Table 2: Clinical case evaluation sheet

Recovery Parameters	0 -day	03 -day	07 -day
Depression	++++	----	--
Pyrexia	++++	----	-
Corneal Opacity	++++	+++	-
Appetite	Anorexia	Inappetance	Normal

of less than 7 days of age supports trans-placental transmission of *T.annulata*. Moreover, previous studies reported that carrier dams can transmit *T. annulata* through placenta to their offspring's, which will suffer massive parasitemia at birth (Urquhart *et al.* 2003; Soulsby 2005; Taylor *et al.* 2007; Lefevre *et al.* 2010). The disease in such cases is reported to have shorter incubation period with appearance of clinical manifestations before the transfer of immunity from dam to young one can occur. There are reports of ophthalmological pathologies occurring in cases of bovine tropical theileriosis like bulging of eye ball, conjunctival hyperemia, eyelid edema, and chemosis (Soulsby 2005; Taylor *et al.* 2007), but this report of corneal opacity present in day old calf is important and that after trans-placental transmission of theileriosis in the calf is a rare documentation.

Allsopp *et al.*, 2007, documented that calf from immune carrier dam can transmit theileriosis to neonate during gestation period and results in either still birth or full-term birth of live foal with normal physiological functions and normal superficial lymph nodes. Khan *et al.*, (2011) also reported that disease is manifested in majority of cases with chief clinical symptoms like enlarged lymph nodes, pyrexia up to 107°F, lachrymation, depression, and labored breathing. There are rare reports of *T. annulata* induced corneal opacity in regular practice (Singh *et al.* 2015) and corneal opacity is credited to invasion of lens, cornea, and iris (Irvin and Mwamachi, 1983). Similarly, lymphadenopathy, which is not present in this case, was credited to lymphoid hyperplasia due to macroshizont multiplication inside lymphocytes (Jabbar *et al.*, 2008). Anemia occurs due to erythrophagocytosis and subsequent removal by reticuloendothelial system (Singh *et al.*, 2001). Hematology reveals leucopenia, decreases hemoglobin and packed cell volume, which is in accordance to the findings of Sandhu *et al.*, (1998). The present case was successfully treated with single intramuscular injection of Buparvaquone at the dose rate of 2.5 mg/

kg BW. This is in accordance with Gupta *et al.* (2004); Naik *et al.* (2010), and Qayyum *et al.* (2010), who used the similar therapy with success.

CONCLUSION

In conclusion, the neonatal calf was diagnosed with congenital occurrence of theileriosis on the basis of age of a calf less than the minimum incubation period of Theileriosis, i.e., 7 days, the clinical sign of clouding of cornea and absence of disease transmitting vector as well as no enlargement of superficial lymph nodes, in the reported case, positive blood smear and lymph node biopsy examination. Corneal opacity is a rare clinical manifestation of theileriosis and should be considered as differential diagnosis for theileriosis.

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