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Successful treatment of bilateral exophthalmia due to theileriosis in a cattle calf

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Abstract
A two-month-old female cattle calf was brought to the department with a history of bilateral bulging of eyeballs out of their sockets and inappetence for the last 10 days. A thorough clinical examination revealed a high temperature, enlarged prescapular lymph nodes, and bilateral exophthalmia with a dry cornea. A haematological examination revealed anaemia and on blood smear examination theileriosis was confirmed. Buparvaquone was injected into the calf intramuscularly at a dose rate of 2.5 mg/kg BW and repeated on the 6th day. Oxytetracycline @ 10 mg/kg BW intravenously and Meloxicam @ 0.3 mg/kg BW intramuscularly were administered once daily for five consecutive days. Nandrolone decanoate was injected intramuscularly at a total dose of 25 mg. Commercial preparation of vitamin A, E, D_3, and biotin (Intavita-H® @ 1 ml) was injected intramuscularly at three-day intervals three times; Vitamin B complex (Tribivet® @ 3 ml) was also injected intramuscularly. Topical instillation of Ciplox® (ciprofloxacin) and Refresh tear® (Carboxy-methyl cellulose sodium) eye drops were recommended for 7 days. The animal had an uneventful recovery.

Keywords: Exophthalmia, theileriosis, cattle calf

1. Introduction
Cattle are susceptible to Theileriosis, a severe haemoprotozoan disease caused primarily by *Theileria annulata* and *Theileria orientalis*. *Theileria annulata* causes the tick-borne disease Bovine Tropical theileriosis (Brown, 1997; Preston, 2001) [5, 10], which is characterized by fever (39-41 °C), lymphadenopathy, depression, anorexia, anaemia, a decrease in milk production, nasal and ocular discharges, and dyspnea (Soulsby, 1982) [6]. The transmission occurs when ticks of the genus *Hyalomma* attach to hosts and excrete *Theileria* sporozoites through their saliva. In terms of high death and morbidity rates, the disease has a significant negative economic impact (Brown, 1990) [2]. Climate, age, breed, tick density, location, management issues, and environmental factors all affect the prevalence of theileriosis, which is a major contributor to the spread of bovine theileriosis. The annual economic loss is in India attributable to ticks and tick-borne diseases in animals has been estimated at USD 498.7 million, with BTT contributing USD 384.3 million annually (Minjauw and Mc Leod, 2003) [1]. The basic diagnostic criteria for theileriosis include clinical signs, microscopic analysis of stained blood, and lymph node biopsy smears. Exophthalmia is a disorder that is fairly common in cross-bred calves but is infrequently documented in adult cross-bred cattle. This report describes a case of theileriosis in a calf with the clinical manifestation of bilateral exophthalmia.

2. Clinical examination, Results, and Discussion
A two-month-old female cattle calf was presented to the department with a history of bilateral bulging of eyeballs out of their sockets and inappetence for the last 10 days. A thorough clinical examination revealed a high temperature (105^0 F), enlarged prescapular lymph nodes, pale mucous membrane, and severe bilateral exophthalmia with a dry cornea (Fig. 1). For haematological examination, 2 ml blood was collected from the jugular vein into the EDTA vial. In addition, blood smears were prepared from the ear's marginal vein, stained with Giemsa stain, and examined through the oil immersion lens of a light microscope. A haematological examination revealed anaemia and leucocytosis (Table 1).

Table 1: Haematological parameters along with reference range

Parameters	Values	Normal reference range
Haemoglobin (gram/decilitre)	6.5	8-15
Packed Cell Volume (%)	20	24-46
Total Leukocyte count (/cubic centimeter)	7.66	4-12
Neutrophils (%)	40	15-33
Lymphocytes (%)	58	45-75
Monocytes (%)	2	0-2

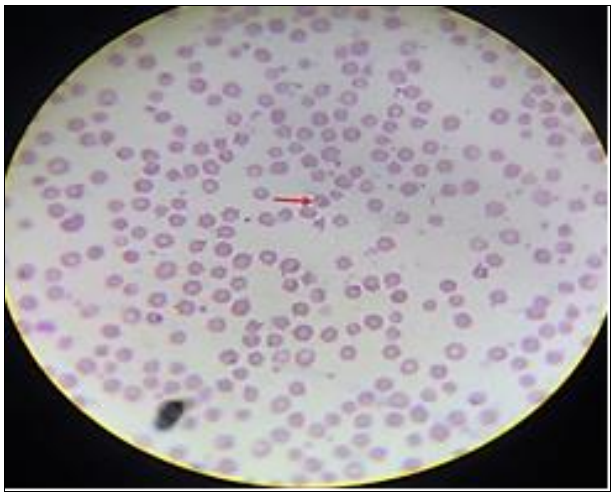

Fig 1 and 2: Showing severe bilateral exophthalmos (Fig. 1) and showing intra-erythrocytic piroplasm stages (Giemsa staining) (Fig. 2).

A blood smear examination revealed an intra-erythrocytic piroplasm stage under Giemsa staining confirming theileriosis (Fig. 2). Buparvaquone was injected into the calf intramuscularly at a dose rate of 2.5 mg/kg BW and repeated on the 5th day. Oxytetracycline @ 10 mg/kg BW intravenously and Meloxicam @ 0.3 mg/kg BW intramuscularly were administered once daily for five consecutive days. Nandrolone decanoate was injected intramuscularly at a total dose of 25 mg. Commercial preparation of vitamin A, E, D_3, and biotin (Intavita-H® @ 1 ml) was injected intramuscularly at three-day intervals three times; Vitamin B complex (Tribivet® @ 3 ml) was also injected intramuscularly. Topical instillation of Ciplox® (ciprofloxacin) and Refresh tear® (Carboxy-methyl cellulose sodium) eye drops were recommended for 7 days.

The owner of the calf saw a notable improvement in the clinical condition on the second post-therapy day (Fig. 3). On the second day of treatment, the calf began to consume its feed. Within five days of finishing therapy, the calves' owners reported that they had regained their usual appetite and that both protruding eyeballs had significantly shrunk (Fig. 4).

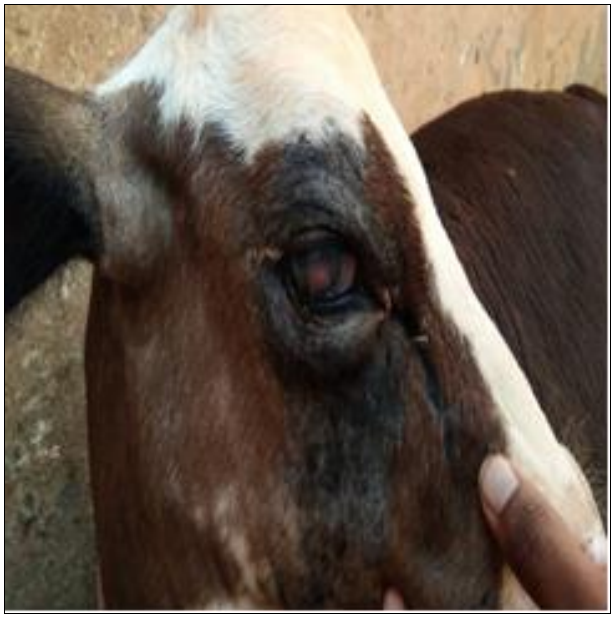

Fig 3 and 4: Images showing calf on 2nd (Fig. 3) and 5th (Fig. 4) postoperative day.

The present report clearly demonstrates the affected calf was anaemic. Theileriosis is characterized by anaemia that results from the overproduction of cytokines and reactive oxygen species (Nazifi *et al.*, 2009; Saleh *et al.*, 2011) [14, 8]. Aplastic anaemia and other hypoplastic clonal haematological illnesses have historically been treated with anabolic steroids (Tsiara *et al.*, 2004) [13]. By boosting endogenous erythropoietin production, pharmacologic doses of anabolic steroids enhance red cell mass; hypoxia and anabolic steroids both work synergistically to promote erythropoietin release by the kidney (Neff *et al.*, 1981) [9]. In the current report, nandrolone decanoate's promotion of endogenous erythropoietin production and/or the antioxidant capacity of vitamins A, D3, E, and H may be responsible for the anaemia's notable improvement (Singh *et al.*, 2012) [12]. Considering that BTT transmits extra-vascular lyses of RBCs and prevents the affected calves from being iron deficient, the anabolic steroid was chosen over the administration of iron supplements for

the management of anaemia.

Considering that buparvaquone has a plasma half-life of about 7 days, the second dose was given at day 6. Furthermore, it takes roughly 6 to 8 days for the injected sporozoites to transform into macro schizonts in the host mononuclear cells. The macro schizonts and intraerythrocytic piroplasms are the principal targets of buparvaquone's action, therefore the sporozoites that the ticks infected on day 0 might evade the first dose of the drug. Due to their maturation into macro schizonts, the second dose of buparvaquone given on day 6 will kill the escaping sporozoites. Tumor necrosis factor alpha (TNF- α), in particular, is highly produced by *T. annulata*-infected cells (Brown *et al.*, 1995) [5]. Graham *et al.* (2001) [15] opined that this cytokine is an effective inducer of the primary clinical signs of acute tropical theileriosis, including fever, anaemia, anorexia, muscle wasting, and necrosis. These signs and symptoms are seen in severe tropical theileriosis cases. TNF-α has also been linked to promoting the proliferation of infected cells and facilitating the ulcerative lesions linked to tropical theileriosis (Forsyth *et al.*, 1999) [7]. The infiltration of lymphocytes, expansion of the extraocular muscle, and buildup of glycosaminoglycan (GAG) are all thought to contribute to the clinical signs of oedema, proptosis, and diplopia in thyroid-associated Ophthalmopathy (Balazs and Kora'nyi, 2011) [4]. Numerous cytokines, such as TNF-α, interleukin-1, and interferon-gamma, which can express HLA-DR antigens, stimulate the proliferation of fibroblasts, create GAG, and free oxygen radicals are secreted by the activated lymphocytes. The proliferation of infected macrophages causes the pathological changes seen in various organs and tissues of *T. annulata*-infected animals, while pro-inflammatory cytokines produced by these cells, particularly TNF-α, are responsible for other clinical symptoms (Branco *et al.*, 2010; El-Deeb and Iacob, 2012) [11, 16]. Therefore, it is entirely possible that the overproduction of TNF-α and infiltration of lymphocytes are responsible for the ophthalmopathy of calf theileriosis. The addition of antioxidants and hematopoietic agents is able to save calves with fatal theileriosis, it can be concluded. A novel therapy regimen for calf theileriosis also requires large-scale clinical investigations on supplementary antioxidants, hematopoietic agents, and TNF-α blockers.

3. References

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