International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; SP-8(2): 124-126
www.biochemjournal.com
Received: 24-12-2023
Accepted: 30-01-2024

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Effect of Buparvaquone in successful therapeutic management of Caprine Theileriosis

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DOI: https://doi.org/10.33545/26174693.2024.v8.i2Sb.519

Abstract
Caprine theileriosis is a tick–borne infectious disease of goats predominantly transmitted by the *Ixodid* ticks of the genus *Rhiphicephalus* and *Hyalomma* species. In this present study a one-year-old female beetal goat was found to be suffering from inappetence, weakness, jowl edema since 2 days. Detailed clinical examination revealed rough body coat, emaciation, prostration, inability to get up, pyrexia, tachycardia, pale mucus membranes and enlarged lymph nodes. Anaemia, reduced haematocrit, leucocytosis, hypoproteinaemia and hypoalbuminaemia were the significant haematobiochemical abnormalities recorded in the goat. Theileriosis infection was confirmed by detection of piroplasms in red blood cells of Giemsa stained peripheral blood smears. Therapeutic management of the goat with buparvaquone along with supportive treatment resulted in uneventful recovery of the affected goat.

Keywords: *Theileria luwenshuni*, buparvaquone, anemia, goat

Introduction
Goats are important for people's food and nutritional security in northeastern India, since crop output is unpredictable. A limiting element in the effectiveness of small ruminant production systems is the presence of illnesses that specifically affect these animals, including vector-borne hemoprotozoan infections. The common tick/vector transmitted agents that infect small ruminants and cause significant financial losses include *Babesia spp.*, *Theileria spp.*, and *Anaplasma spp*. (Torres *et al*., 2012) [9]. *Theileria*-genus protozoan species are the source of the tick-borne hemoprotozoan disease known as theileriosis. These are the family's obligatory intracellular parasites. Due to the disease's significant risk to the livestock business and its high rate of morbidity and mortality, goat production has been hampered. This report discusses the successful management of theileriosis in goats after it has been detected.

Case Report: A 1 year old female beetal goat weighing about 15 kg at Assam Agricultural University, Goat Research Station, Burnihat, Assam was found with the history of anorexia, and prostration. Routine clinical examination revealed rough coat, emaciation, prostration, jowl edema, inability to stand up, lethargy, pyrexia (105ºF), tachycardia, pale mucous membrane and slight enlargement of lymph nodes. Blood samples were examined for haemato-biochemical changes and the presence of haemoprotozoa for diagnostic purposes. Anaemia, reduced haematocrit, leucocytosis, hypoproteinaemia and hypoalbuminaemia were recorded on hemato-biochemical analysis (Table: 1). *Theileria luwenshui* was found in RBCs in a blood smear produced from peripheral blood and stained with Giemsa stain and viewed under oil immersion (x100) (Fig. 1). The case was diagnosed as caprine theileriosis based on detection of Piroplasm (parachute, comma shaped) in the red blood cells of the Giemsa stained peripheral blood smears by microscopy. On days 0th and 10th, blood samples were obtained for haemato-biochemical and parasitological analysis. The therapeutic management of caprine theileriosis in this case included injecting buparvaquone at a rate of 2.5mg/kg B.W. intramuscularly for two doses separated by 48hrs, and injecting chlorpheneramin maleate 2 ml intramusculrly 20 minutes before buparvoquone administration. The antibiotic oxytetracycline was given intra venously for 5 days at a dose of 10 mg/kg body weight once per day with NSS. Subcutaneous administration of ivermectin @ 0.2 mg/kg body weight and meloxicum @ 0.5 mg/kg body weight was injected once IM ly.

The supportive treatment includes injection of Vitamin B-complex @ 1.5 ml IV ly OD for 5 days, followed by 2 tsf. hematinic syrup PO BID for 7 days to improve the anaemic status. Clinical status of the animal was improved progressively from the 2nd day of treatment and uneventful clinical recovery was noticed after tenth day of treatment.

Discussion

Ixodid ticks belonging to the genera *Hyalomma*, *Haemophysalis*, and *Rhiphicepahlus* are the vectors of *Theileria* spp. transmission (Meenu *et al*., 2021) [5]. *Theileria lestoguardi, T. uilenbergi*, and *T. luwenshuni* are highly harmful species for small ruminants, while *T. ovis* and *T. separate* are low pathogenic species (Yin *et al*., 2007) [10]. Previous observations provide support for the clinical symptoms in this case (Shruthi *et al.*, 2017) [8]. Anaemia was the cause of the dyspnea and tachycardia. The presence of comma- and parachute-shaped piroplasms in the red blood cells (RBCs) in this goat case confirmed theileria infection, which was also described by Altay *et al.* (2007) [3]. Pleomorphic piroplasms in red blood cells of Theileria-affected goats, comprising rod, pear, dot, nail, comma, oval, parachute, round, and semi-comma shapes, were reported by Shruthi *et al.* (2017) [8] in the Indian state of Karnataka. Microscopical analysis of stained blood smears can be used as a quick confirmatory diagnostic test for the start of curative treatment in animals affected by Theileriosis, even though it is less sensitive than molecular techniques like polymerase chain reaction (PCR) for the detection of low levels of parasitaemia in theileriosis affected animals (Rabeya Begam *et al*., 2019) [7]. Anaemia, decreased haematocrit, leucocytosis, hypoproteinaemia, and hypoalbuminaemia are significant alterations in haematobiochemical parameters associated with caprine theileriosis in this study. These changes cause intermandibular edema in the affected goat. According to AL-Amery and Hasso (2002) [1], leucocytosis in the early stages of infection results from increased lymphocyte proliferation, while anaemia in theileriosis is caused by the immune system eliminating erythrocytes infected with piroplasms. This is consistent with the findings of Banka *et al.* (2020) [4], who observed low PCV, leucocytosis, and anaemia. They hypothesised that changes in the osmolality of circulating blood reduce red blood cells' capacity to undergo deformation under specific pathophysiological conditions, leading to low microvascular perfusion and organ dysfunction. Al-fetly (2012) [2] also found hypoproteinemia with hypoalbuminaemia in small ruminant theileriosis. The affected goat in this case study may have intermandibular odema due to hypoproteinemia with noticeably reduced albumin levels. For the successful therapeutic care of caprine theileriosis, oxytetracycline in combination with buparvoquone is advised, since it is the medicine of choice for managing all kinds of theileriosis (Banka *et al*., 2020) [4]. As a result, supportive therapy together with a dose of buparvoquone and oxytetracycline were used to treat the affected goat. To enhance the animal's anaemia status and lessen the inflammatory process linked to theileriosis, supportive therapy with anti-inflammatory drugs and multivitamin preparations containing haematinics is advised (Nagar *et al*., 2019) [6]. A similar course of treatment with minimal adjustments was also taken by Banka *et al.* (2020) [4]. The key tactics advised for effective clinical and preventive management of caprine theileriosis are early clinical and laboratory diagnosis linked to early therapeutic intervention of the disease, control of acarids, and improvement of the animal's overall nutritional status by adequate of concentrate, roughage feeding.

Table 1: Hemato-biochemical parameters comparison between 0th day and 10th days of treatment in goat with Theileriosis

Parameters	0th day of treatment	10th day of post treatment
Hemoglobin (g/dl)	6.3	8.2
TEC (10^6/ mm^3)	8.1	9.5
PCV (%)	16.41	24.10
TLC (10^3/ mm^3)	18.42	13.30
Total serum protein (g/dl)	5.11	6.38
Albumin (g/dl)	2.00	2.93

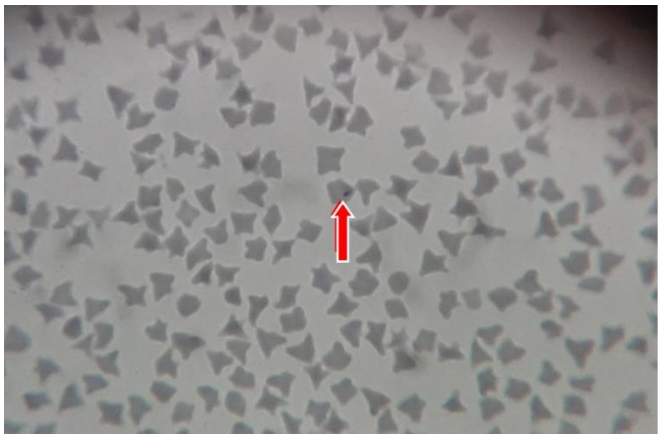

Fig 1: Microscopic view of *Theileria luwenshuni*, in RBCs of the infected goat

Conclusion

The results of this clinical case study demonstrated that a combination therapy of Buparvaquone @ 2.5mg/kg and Oxytetracycline @ 10mg/kg body weight, together with supportive therapy, is effective against *Theileria luwenshuni* with no side effects and the goat recovered with any difficulty.

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