



Concurrent Infection of *Babesia* sp. and *Theileria* sp. in Cattle

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How to cite this paper

Loya, K., & Beigh, S. A. (2024). Concurrent Infection of *Babesia* sp. and *Theileria* sp. in Cattle. *International Journal of Livestock Research*, 14 (10), 50-54.

Received : May 31, 2024
Accepted : Sep 20, 2024
Published : Oct 31, 2024

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Abstract

A four-year-old cow was presented to the college hospital exhibiting symptoms of anorexia, coffee-colored urine, diarrhea, increased respiratory rate, increased heart rate, severely pale mucous membranes, and swollen lymph nodes. Microscopic examination of a blood smear revealed the presence of pyriform pear-shaped piroplasmic stage of Babesia and piroplasmic stage of Theileria. Treatment was attempted using imidocarb dipropionate at a dosage of 1 ml per 100 kg body weight, in combination with oxytetracycline infusion @ 10 mg/ Kg body weight supplemented with supportive therapy. However, the animal succumbs to death following treatment. The case highlights the clinical case of concurrent infections of tick born pathogen and rapid progression of anemia and death.

Keywords: Cattle, Anaemia, Babesia, Theileria.

Introduction

Bovine babesiosis is recognized as one of the most critical arthropod-borne diseases affecting cattle worldwide, leading to significant morbidity and mortality. It ranks as the second most prevalent blood-borne parasitic disease in mammals, following trypanosomiasis (Hamsho *et al.*, 2015). The disease is caused by intra-erythrocytic protozoal parasites belonging to the order Piroplasmida, phylum Apicomplexa, and genus *Babesia*. These parasites are predominantly found in tropical and subtropical regions (Alonso *et al.*, 1992). The most significant species responsible for bovine babesiosis are *Babesia bovis* and *Babesia bigemina*, which are transmitted by one-host ticks of the *Boophilus* species. The characteristic clinical signs include high fever, depression, anorexia, hemoglobinemia, and hemoglobinuria (Enbiyale *et al.*, 2018). Bovine babesiosis is recognized as an economically important disease affecting cattle, horses, and dogs, and it has gained attention as an emerging zoonotic disease (Maharana *et al.*, 2018). The morbidity and mortality rates associated with bovine babesiosis are influenced by the prevailing treatments in an area and the animals' previous exposure to the infection (Kumar *et al.*, 2018).

Bovine theileriosis is another fatal tick-borne hemoprotozoan disease of cattle, caused by the apicomplexan parasite *Theileria* spp. In India, *Theileria annulata* is a significant species infecting cattle, leading to severe economic losses (Natarajan *et al.*, 2021). *Theileria annulata* is transmitted by various *Hyalomma* ticks, including *H. a. anatolicum* (Bhattacharyulu *et al.*, 1975). Clinically, the disease is characterized by pyrexia, enlargement of superficial lymph nodes, nasal and ocular discharge, salivation, anemia, respiratory distress, and eye lesions (Osman and Al-Gaabary, 2007). Identification of these hemoparasites in infected animals is typically achieved through microscopic examination of blood smears stained with Giemsa (K. Altay *et al.*, 2008).

Case history and Observation

A four-year Cow was presented to the Teaching Veterinary Hospital at the Faculty of Veterinary Science and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir. The cow had a one-day history of diarrhea (Figure 1), anorexia and haemoglobinuria (Figure 2).n clinical examination it had increased heart rate and respiratory rate with rectal temperature of 100°F, pale mucous membranes, and an enlarged pre-scapular lymph node.

Haematological examination results indicative of severe anaemia with values of low hemoglobin (Hb) level of 3 g/dL, red blood cell (RBC) count of $5 \times 10^6/\mu\text{L}$, hematocrit (Hct) at 27.3%. While values of white blood cell (WBC) count was $15.6 \times 10^3/\mu\text{L}$ with lymphocytes (Lym) at 80.3%, monocytes (Mo) at 7.7%, eosinophils (EO) at 6.8%, granulocytes (GR) at 5.2%, and platelets (PLT) at $74 \times 10^3/\mu\text{L}$.

Field stained thin blood smears were examined under the oil immersion objective of a microscope (100x magnification based on the history of anorexia, hemoglobinuria and clinical presentation of enlarged pre-scapular lymph nodes.



Fig. 1: Diarrhoea



Fig. 2: Haemoglobinuria

Diagnosis and Result

Microscopic examination of the blood smear revealed the presence of pear-shaped bodies of *Babesia* and piroplasma of *Theileria* organisms (Figure 3). Based on the clinical signs and blood smear examination, the case was diagnosed as concurrent babesiosis and theileriosis.

The treatment regimen included:

- Intas Imizet (Imidocarb dipropionate) at a dosage of 1 ml per 100 kg body weight, intramuscularly.
- Infuse Oxytet 100 (oxytetracycline) at a dosage of 10 mg/kg body weight in Normal saline, intravenously.
- Intas Ferritas (supplement containing iron sorbitol, folic acid, and vitamin B12), 2 bolus orally for 7 days.

Despite advising the owner to arrange for a blood transfusion as soon as possible, the owner was unwilling to proceed with this treatment. Unfortunately, the animal succumbed on the second day following the initiation of treatment.

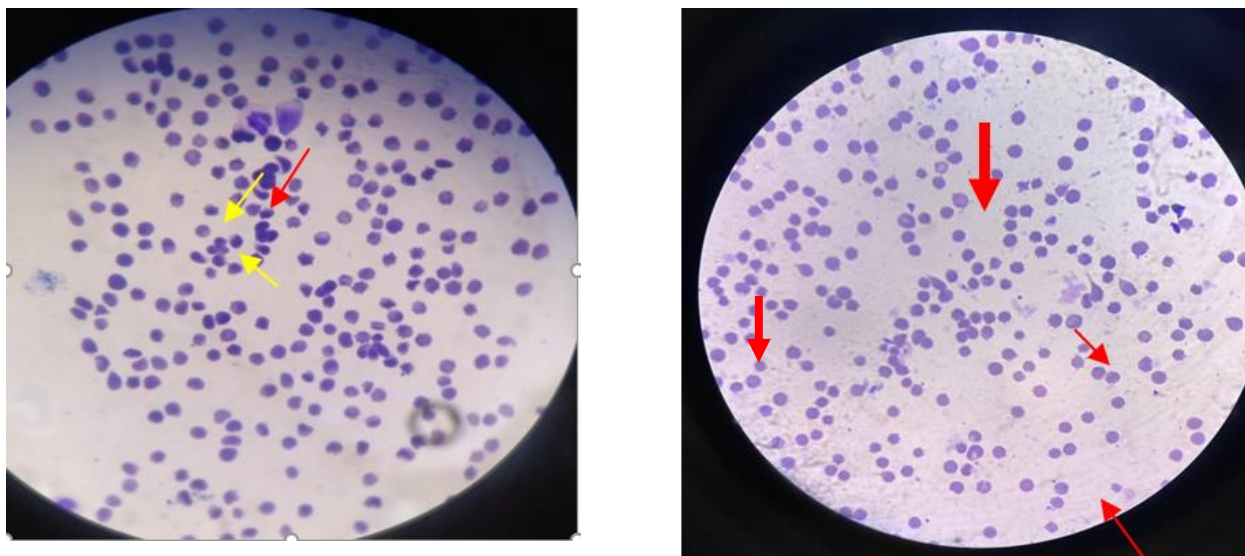


Fig. 3: Presence of babesia (yellow arrow) and theileria (red arrow) in RBC

Discussion

The present case revealed positive infections of both *Babesia* and *Theileria*. Clinical signs included anemia, diarrhea, hemoglobinuria, pale mucous membranes, and increased heart and respiratory rates. The cow had no tick infestation, jaundice, or ocular/nasal discharge. Hematological examination showed low hemoglobin, RBC, platelets, and granulocytes, with increased WBC, lymphocytes, and monocytes, but normal hematocrit levels.

The findings align with previous studies: low hemoglobin levels are consistent with damage caused by the parasites during RBC multiplication (Ibrahim *et al.*, 2012), and increased WBC and lymphocytes are typical of *Theileria* infections (Gharbi *et al.*, 2017). However, discrepancies were noted, such as normal hematocrit levels (Chigozie S *et al.*, 2014) and increased WBC counts, differing from some reports of leucopenia in *Theileria* infections (Goddeeris *et al.*, 1982).

Despite recommendations for a blood transfusion, the owner's refusal led to the cow's death within two days due to severe anemia. This outcome highlights the rapid progression and severity of babesiosis and theileriosis when treatment is delayed, as noted in similar cases (Gungi *et al.*, 2016). The study underscores the importance of early diagnosis and prompt treatment to prevent severe outcomes in infected cattle.

The cow's normal rectal temperature and lack of jaundice contrast with typical presentations of these diseases. Coffee-colored urine, a principal clinical feature of babesiosis (Mandal, 2012), results from hemoglobinuria (Nyindo, 1992).

Increased heart and respiratory rates were likely due to intravascular hemolysis, leading to hypoxia (Enbiyale *et al.*, 2018). Swollen lymph nodes are consistent with findings in Babesia and Theileria infections, attributed to the replication of sporozoites in lymphocytes (Natarajan *et al.*, 2021).

Comparisons with anaplasmosis and trypanosomiasis, which share similar clinical signs (anaemia, fever, pale mucous, icterus, sometimes nervous signs) it lacks hemoglobinuria (Constable *et al.*, 2017), further support the diagnosis.

Hematological results showing reduced Hb, RBC, platelets, and granulocytes, alongside increased WBC, lymphocytes, and monocytes, with normal Hct, in babesiosis and theileriosis infections, which align with reports by Chigozie *et al.* (2014) and Niazim *et al.* (2008).

Conclusion

In conclusion, this case illustrates the critical need for timely intervention in bovine babesiosis and theileriosis. Anaemia is a severe threat to animals; delays in treatment can lead to rapid deterioration and mortality, emphasizing the importance of early diagnosis, appropriate treatment, and potential supportive measures such as blood transfusions. Therefore, the recent work could provide guidance to the owners to follow the clinician's advice to avoid such fatal cases in the future.

Contribution by Authors

Each co-author contributes equally.

Conflict of Interests

There is no conflict of interest.

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