



ISSN: 2456-2912
NAAS Rating (2026): 4.61
VET 2025; SP-11(4): 84-86
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www.veterinarypaper.com

Received: 21-12-2025

Accepted: 25-01-2026

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Diagnosis and therapeutic management of *Babesia bigemina* induced jaundice in a calf: A case report

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DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i3Sb.3152>

Abstract

Babesia bigemina and *Babesia bovis* are prevalent in tropical and subtropical regions, causing significant economic losses in cattle industries. Age-related immunity plays a crucial role in primary infections. A 15 days old calf was presented to our veterinary clinical complex, Rajendranagar, Hyderabad with a history of anorexia and hemoglobinuria. Clinical examination revealed enlargement of superficial lymph node, pyrexia and icteric mucous membrane. Hematological examination revealed reduced red blood cells, reduced packed cell volume and decrease in hemoglobin. Examination of peripheral blood smear revealed piroplasms of babesia in blood cells. Serum biochemistry revealed increase in bilirubin and decreased albumin concentration. The animal was treated with diminazine aceturate @ 3.5 mg/kg bwt and long acting Oxytetracycline @ 10mg/kg bwt Deep IM For 3 days followed by supportive therapy.

Keywords: Calf, pyrexia, hemoglobinuria, blood smear, piroplasms

Introduction

Bovine babesiosis, caused by protozoan parasites of the *Babesia* genus, remains a significant concern in animal health, particularly in the cattle industry. The two primary species responsible for the disease, *Babesia bovis* and *Babesia bigemina*, are transmitted by ticks and cause major economic losses in the affected regions (Bock *et al.*, 2004) [2]. With an estimated 250 million cattle worldwide at risk (Radostits *et al.*, 2000) [8], the impact on global livestock production is profound.

The disease is most severe in crossbred cattle, which experience higher morbidity and mortality, while indigenous breeds like zebu cattle and buffaloes tend to serve as carriers, often without showing severe clinical symptoms (Jithendran *et al.*, 1997) [5]. This creates a complex epidemiological scenario where control strategies must account for both symptomatic and asymptomatic carriers.

Clinical symptoms of bovine babesiosis typically include fever, anemia, hemoglobinuria, and, in severe cases, death (Sharma *et al.*, 2013) [9]. The disease's economic burden is not only linked to direct losses due to cattle deaths but also to the cost of treatment, tick control programs, and the decrease in livestock productivity. Effective management requires a multifaceted approach, including tick control, vaccination, and prompt treatment upon detection of clinical signs.

Calves up to 9-12 months old typically exhibit inverse age resistance to babesiosis. However, neonatal calves (<1 month) are susceptible and may display severe clinical symptoms, including inability to suckle, high fever, coffee-colored urine, jaundice, deep, shallow respiration (Karunakaran *et al.*, 2011; Venu *et al.*, 2013; Bal *et al.*, 2016) [7, 11, 1].

Case History and Clinical Observation

A 15 days old female calf was presented with a history of hemoglobinuria, anorexia and lethargy for the past 4 days. Upon clinical examination mucous membrane was icteric (Fig.1), rectal temperature was 104.5 °F with enlarged superficial lymph nodes. Further investigations like peripheral blood smear examination, hematology and serum biochemistry were done to rule out the etiology.

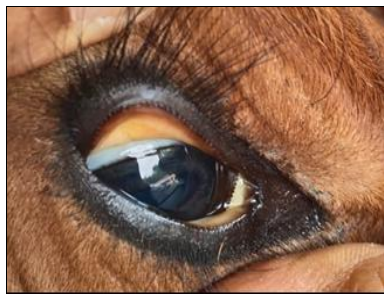


Fig 1: Icteric mucus membrane



Fig 2: Icteric ear flap



Fig 3: Dull and lethargic Calf

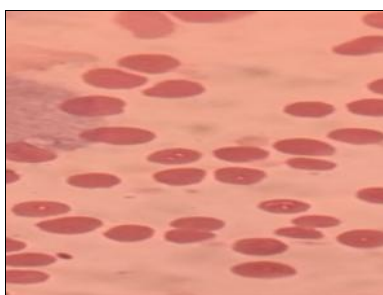


Fig 4: Piroplasmic organisms of babesia in RBC

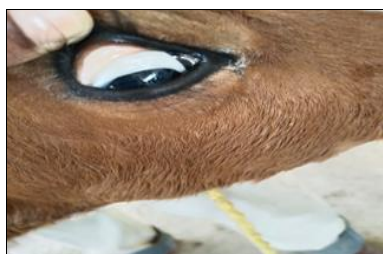


Fig 5: CMM and sclera Post treatment

Results and Discussion

The microscopic examination of a Giemsa-stained blood smear from the 15-day-old suckling calf revealed the characteristic piroplasm stages of *Babesia bigemina*. The parasites were identified by their distinct morphological features, including elongated, rounded dividing forms and multiple organisms, as well as the characteristic pear-shaped

appearance with acute angles, which are indicative of *B. bigemina* infection (Fig.4).

Despite it being relatively rare for calves to develop clinical babesiosis due to the protective effects of maternal immunity and innate immunity, this case demonstrates that it is still possible under certain circumstances (Zintl *et al.*, 2005) ^[12]. The 15-day-old calf, having yet to fully develop its own immunity, succumbed to the infection.

Hematological findings revealed a decrease in hemoglobin and RBC count, which is suggestive of anemia, a common clinical feature in babesiosis. The elevated levels of AST (aspartate aminotransferase), ALT (alanine aminotransferase), and indirect bilirubin in serum biochemistry suggest liver damage and hemolysis, both of which are commonly associated with *Babesia* infections. Hemolysis occurs due to the destruction of infected red blood cells, contributing to the increase in bilirubin and liver enzyme levels.

This case emphasizes the need for vigilance even in younger calves, as maternal immunity may not always provide complete protection against such infections, and early diagnosis and treatment are crucial for managing clinical babesiosis in young animals.

The calf in this case was successfully treated with a combination of diminazine aceturate at 3.5 mg/kg body weight every 15 days, Oxytetracycline at 10 mg/kg body weight Deep IM for 3 days, DNS (dextrose normal saline) at 10 ml/kg body weight, toxol 1ml/10 kg wt (for supportive therapy), Ivermectin was administered for the control of endo and ectoparasites at the dose rate @0.2 mg/kg SC, antipyretics, oral hematinics (ARBC Syrup @ 10 ml BID PO) and liver tonic like (livotas @ 15 PO BID for 15 days) Following the treatment regimen, the calf returned to a clinically normal state post treatment, peripheral blood smear revealed no blood parasites in RBC and there was a significant improvement in the hematology and serum biochemistry which highlights the efficacy of this treatment approach in managing babesiosis in young calves.

As observed, young calves exhibit a strong innate immunity compared to adult cattle, providing them with some level of resistance against the primary infection of *Babesia* spp. This is consistent with the concept of age-related immunity towards babesiosis in cattle, where calves typically do not develop the severe form of the disease, despite being infected (Goff *et al.*, 2001) ^[13]. As Zintl *et al.* (2005) ^[12] noted, infected calves often present with persistent low parasitaemia and mild clinical signs, rather than severe symptoms.

The hematological alterations observed in this case, including anemia and hemoglobinuria, were primarily due to the intense hemolysis caused by the intraerythrocytic *Babesia* spp. parasites. This hemolysis leads to the clinical signs of hemoglobinuria, anemia, and an elevated heart rate, which serves as a compensatory mechanism to enhance oxygen delivery to tissues. These findings align with those presented by Constable *et al.* (2017) ^[3].

Interestingly, although *Babesia* infections in calves do not generally lead to severe disease, they may still exhibit mild symptoms without significant ill-effects (Zintl *et al.*, 2005) ^[12]. Treatment regimens, including diminazene aceturate, hematinics, and antipyretics, have been successful in controlling the infection and alleviating symptoms in affected animals (Bal *et al.*, 2016) ^[1].

Regarding drug options, imidocarb dipropionate is generally considered the drug of choice for treating bovine babesiosis due to its 100% efficacy, followed by diminazene aceturate, which is effective with 90% efficacy at 10 days post-treatment. Both drugs are crucial in treating babesiosis in

cattle, depending on the specific circumstances of the infection.

The case of *Babesia bigemina* infection in a four-month-old calf, as reported in the present study, mirrors previous findings in the literature. In India, cases of *B. bigemina* infection in young calves have been rare, with some reports indicating that the infection tends to occur more commonly in adult animals (Karunakaran *et al.*, 2011; Venu *et al.*, 2015) [7, 11]. However, Karunakaran *et al.* (2011) [7] reported a similar case in a 20-day-old Jersey calf, where intrauterine transmission was considered a likely cause. The mother of the calf had been treated for babesiosis during the third trimester of pregnancy, potentially allowing for transmission of the parasite to the unborn calf.

Babies born to infected mothers may have a degree of immunity, both from colostral-derived antibodies and their own innate age-related immunity, which typically persists for

up to six months. However, at high levels of tick transmission, it is possible for all newborn calves to become infected with *Babesia* by six months of age. Although many calves show no clinical signs of infection, they may develop some degree of immunity (Jorgensen, 2008) [6]. While colostral immunity provides some protection, the transmission of ticks during the critical early period can still pose a risk. Thus, not all calves become immune if acaricide treatments are inadequate or if tick transmission is high.

In the present case, despite the calf's age, clinical symptoms of babesiosis were evident. The calf was treated successfully with a combination of diminazene aceturate, oxytetracycline, supportive therapy, and oral hematinics, which is consistent with previous reports (Karunakaran *et al.*, 2011; Bal *et al.*, 2016; Dinesh, 2021) [7, 1, 4]. These treatments helped alleviate clinical signs and bring the calf back to a clinically normal state.

Parameters	Pre treatment	Post treatment	Range (Units)
hemoglobin	3.1 g/dl	7.4 g/dl	8.5-12.2 g/dl
PCV	18%	25%	22-33%
RBC	2.11 million /UL	4.8 million /UL	5.1-7.6 million /UL
WBC	13000	18000	49000-12000
Neutrophils	36%	38%	30-40%
SGOT	1145 IU/dl	137 IU/dl	78-132 IU/dl
Indirect bilirubin	2.3 (mg/dl)	0.5 (mg/dl)	0.1-0.9 (mg/dl)
total protein	4.6 g/dl	6.55 g/dl	6.76-7.46g/dl
Albumin	2.8	3.1 g/dl	3-3.6 g/dl

Conclusion

In conclusion, while *Babesia* infection in calves is rare, the colostral immunity and age-related resistance likely play significant roles in limiting its severity. However, when babesiosis does occur, proper treatment with diminazene aceturate and supportive therapy, including oxytetracycline and oral hematinics, can be highly effective. Furthermore, controlling babesiosis in endemic areas requires effective tick management strategies, including proper use of acaricides and rotational treatments, to minimize transmission to young animals during the critical early period.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article

Deepika A, Kumar VVVA. Diagnosis and therapeutic management of *Babesia bigemina* induced jaundice in a calf: A case report. *International Journal of Veterinary Sciences and Animal Husbandry*. 2026;SP-11(3):84-86.

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