Transplacental transmission of Babesiosis in six week old Holstein Freisien Calf

V Agrawal, AK Jayraw, M Shakya, GP Jatav, N Jamra, N Singh and R Jain

DOI: https://doi.org/10.22271/j.en.to.2020.v8.i5a.7500

Abstract
Bovine babesiosis caused by different species of intraerythrocytic Babesia mainly Babesia bigemina and Babesia bovis. Babesiosis is mainly transmitted by ticks, however, transuterine/ transplacental transmission can not be ignored. In the present study both mother and its 42-day- old calf were infected with babesiosis. Since simultaneous infection of babesiosis in mother and its young calf has not been reported so far, hence it is placed on the record. Due to good body condition score and young age of the calf, after the treatment, very next day coffee colored urine became clear which is indicating, timely treatment of babesiosis in young calves is highly effective.

Keywords: Babesia bigemina, transplacental, young calf, parasitaemia

Introduction
Bovine babesiosis caused by different species of intraerythrocytic Babesia mainly Babesia bigemina and Babesia bovis. Babesia comes under family Babesiidae, order Piroplasmida and phylum Apicomplexa. It is transmitted by ticks and according to [1] 80% of world cattle population is exposed to tick infestation and one engorged tick is responsible for 0.7g milk production loss or average financial loss including production losses plus cost of control per animal per year isUS$7.3/head/year. It is an important emerging zoonosis of humans and second most occurring blood borne disease of animals [2]. Adult animals are more susceptible for babesiosis than young one. Further, resistance against babesiosis diminishes after the 9-12 monthage of calf. Likewise indigenous cattle and buffaloes are more resistant than cross-bred animals [3]. More than one fifth of agriculture household are having less than 0.01 hectare land and their principal source of income is livestock. Farmers having cattle head can withstand distress due to adverse weather condition [4]. Exotic and indigenous cattle population in Indore is 1,63,849 and 76, 025, respectively [5]. Babesiosis is mainly transmitted by ticks and it is assumed that it is also transmitted by transuterine/ transplacental route. Since simultaneous infection of babesiosis in mother and its young calf has not been reported so far, hence it is placed on the record.

Case history
A Holstein-Friesian crossbred calf of Santer village of tehsil Mhow, district Indore was attended on the complaint of coffee colored urine. On clinical examination, calf was showing high rise of temperature105.3°F, increased pulse rate, laboured breathing, pale conjunctiva and anorexia. Body condition score of calf was 5 (fat deposition on hip bones, ribs very well covered, tail head area was very lumpy and body outline bulging due to fat) while body condition score of mother was 2 (backbone visible, hips & shoulder bones visible, ribs visible faintly, tail head area slightly recessed, body outline bony) [6]. The mother (Holstein-Friesian crossbred cow) was showing only pale conjunctiva, otherwise, the clinical symptoms like temperature, pulse rate and respiration rate were normal.

Materials and Methods
Drop of blood from ear vein of mother and its calf for detection of haemoparasites was taken. The area of puncture was cleaned with 70% alcohol, smaller marginal ear veins were punctured with sterile needle and the first drop of blood was taken for thin smear preparation.
Simultaneously by taking aseptic measures 2 ml blood sample in EDTA vacutainer from mother and its calf were collected separately from jugular vein for detection of anaplasmosis and for evaluation of various hematological parameters. According to [7] blood from jugular vein should be preferred as *Anaplasma* does not accumulate in capillaries. Due to less severe form of plasmodiasms in RBCs diagnosis, management and good cellular changes in these cases are grateful to the Dean, College of Veterinary Science and A.H., Mhow where blood smear preparation and haematological parameters were studied. Blood smears were prepared from collected blood, air dried and fixed with methanol. Fixed blood smears were stained with Giemsa stain and examined under oil immersion. Blood samples were evaluated for various haematological parameters, viz. Hb (gm %), TEC (10⁶ /cumm), PCV (%) and blood cellular changes i.e. TLC (10⁹/cumm) and differential leukocyte count (%). Number of infected RBCs, out of 1000 RBC were counted and then result was expressed as percentage.

Results and Discussion
Although appetite, respiratory rate, pulse rate and temperature of mother were normal and level of parasitaemia was very low (0.002%). The level of parasitaemia in calf was higher than that of mother which was about 1%. When haematological parameters were compared between mother and its calf, the difference was observed as, Hb concentration (9.50 and 11.01), PCV value (29.25 and 33.50), TEC level (6.23 and 7.10) and TLC values (7.75 and 8.95), respectively. Decreased values of hematological parameters particularly in cattle might be due to the presence of plasmodiasms in RBCs leading to lysis and release of toxic metabolites by plasmodiasms might have negative impact on the process of erythropoiesis. Both mother and its calf were treated with diminazeneaceturate@5 mg/kg body weight intramuscularly along with supportive therapy. Very next day of the treatment, urine of the calf was found as clear. Both mother and its calf showed good response to diminazene aceturate which was also revealed by haematological parameters at 10th day of infection i.e. Hb concentration (10.60 and 11.90), PCV value (32.35 and 34.50), TEC level (7.12 and 8.15) and TLC values (8.05 and 9.25), respectively.

Less severe form of babesiosis in calf and positive response to the treatment in the form of absence of haemoglobinuria on next day of the diminazene therapy might be due to the fact that, up to the age of 11 weeks, clinical signs and pathological changes are mild and short lived in case of calves, which might also due to inverse age resistance observed in calves. As per [13], the resistance in young ones is due to transfer of maternal antibodies by feeding of colostrum. While after inoculation of *B. divergens* in calf, no difference was reported clinically as well as serologically by [14]. There are some non–immunological factors which are responsible for hindrance of the development of *Babesia* in erythrocytes. Shining side of babesiosis at young age (generally <9months) is that they become resistant to severe disease when rechallenged at adult age due to natural pre-immunization. At young age, biochemical characteristics of RBCs are not favorable for development of plasmodiasms and spleen phagocytizes the infected RBCs. Therefore, mild form of disease along with good body condition score of young calf might have been observed in the present study. Inspite of low level of parasitaemia, the mother was treated due to low haematological parameters. Few reports of transplacental transmission of babesiosis are also available. Rare cases of transplacental transmission of *B. bigemina* in calves might be due to the strain of parasites, immune status and injury to the blood vessels of placental membranes of host.

Conclusion
In present study, since mother of calf was also positive for babesiosis and no ticks were present at farm as well as on the animal body, hence it appears that, the calf might have got the infection by transplacental route. Due to less severe form of the disease and good body condition score of the calf, haemoglobinuria of the calf was disappeared on very next day of the treatment, is indicating the treatment is highly effective in case of young calves. Considering the rarest case of *Babesia* infection in an adult cow and its young calf, authors want to place it on record.

Acknowledgements
The authors are grateful to the Dean, College of Veterinary Science & A.H., Mhow for providing the facilities to carry out this work.

References
1. FAO. Resistance management and integrated parasite control in ruminants–guidelines, module 1–ticks: acaricide resistance: diagnosis, management and prevention. Food and Agriculture Organization. 2004, 25–77.
2. Gohil S, Herrmann S, Günther S, Cooke BM. Bovine babesiosis in the 21st century: advances in biology and functional genomics. International Journal for Parasitology. 2013; 43(2):125-132.
3. Jithendran KP. A note on haemoproteozoan parasites of cattle and buffaloes in Kangra valley of Himachal Pradesh. The Indian Journal of Animal Sciences. 1997; 67:207–208.
4. Department of animal husbandry, dairying and fisheries. www.dahd.nic.in/about-us/divisions/cattle-and-dairy-development. 2019
5. Department of animal husbandry, dairying and fisheries (DADF). 20th Livestock census. Basic animal husbandry statistics. Ministry of Agriculture, Govt. of India, 2017.
6. https://www.daf.qld.gov.au/__data/assets/pdf_file/0015/5320/Animal-HD-Investigation-Condition-scores.pdf
7. OIE. Bovine anaplasmosis in the Terristrialanimals health code. World Organisation for Animal Health. 2018.
8. Feldman, Bernard F, Zinker Joseph G, Jain Nemi C. Schalm’s Veterinary Haenratology. 5th edn. Lippin Cott Williams and Walkins, 351, West Garden Street, Baltimore, Maryland, USA, 2000.
9. Modi DV, Bhadesiya CM, Mandal GC. Hematobiochemical changes in crossbred cattle infected with *Theileria annulata* in Banaskantha district of Gujarat. International Journal of Scientific and Research Publication. 2015; 5:1-4.
10. Mbassa GK, Balemba O, Maselle RM, Mwaga NV. Severe anaemia due to haematopoietic precursor cell destruction in field cases of East Coast Fever in Tanzania. Veterinary Parasitology. 1994; 52(3-4):243-256.
11. Radostits OM. Veterinary medicine: a textbook of the diseases of cattle, sheep, pigs, and horses. Lea & Febiger, 1979.
12. Egeli AK. Babesiosis in a six-day-old calf. Veterinary Record. 1996; 139(14):344-345.
13. Zintl A, Gray JS, Skerrett HE, Mulcahy G. Possible mechanisms underlying age-related resistance to bovine babesiosis. Parasite immunology. 2005; 27(4):115-120.

14. Christensson DA. Clinical and serological response after experimental inoculation with Babesia divergens of newborn calves with and without maternal antibodies. Acta Veterinaria Scandinavica. 1987; 28(3-4):381-392.

15. Levy MG, Clabaugh GR, Ristic M. Age resistance in bovine babesiosis: role of blood factors in resistance to Babesia bovis. Infection and immunity. 1982; 37(3):1127-1131.

16. Tufani NA, Fazili MR, Malik HU, Beigh SA, Dar KH. Clinico-haematological Profile and therapeutic management of acute babesiosis in a Holstein-friesian crossbred cow. Veterinary Clinical Science. 2015; 3(3):11-14.

17. Jorgensen WK. The Merck veterinary manual, 9th edn. The Merck & Co Inc, Whitehouse Station, 2008, 21-26.

18. Costa SC, de Magalhães VC, de Oliveira UV, Carvalho FS, de Almeida CP, Machado RZ et al. Transplacental transmission of bovine tick-borne pathogens: frequency, co-infections and fatal neonatal anaplasmosis in a region of enzootic stability in the northeast of Brazil. Ticks and tick-borne diseases. 2016; 7(2):270-275.