

Tick-Borne Haemoprotazoan Infections in Bovines and Their Control Strategies

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Abstract

Multi-species tick infestations are common in cattle (especially in crossbred) and buffaloes. Ticks transmit diseases such as theileriosis, babesiosis and anaplasmosis, they also cause extensive damage to livestock health. These tick-borne haemoparasitic diseases constitute a major constraint to livestock production and have a considerable impact resulting in huge economic losses in affected countries.

Introduction

India contributes a major part of the World's livestock by sharing approximately 193.46 million cattle and 109.85 million buffaloes in organized and unorganized sectors (as per 20th livestock census). These animals are suffering from tick infestation almost throughout the year. Species of *Theileria*, *Babesia*, and *Anaplasma* are tick-borne parasites that are prevalent throughout the world, particularly prevalent in the tropics and subtropics and are associated with diseases of Theileriosis, Babesiosis, and Anaplasmosis, respectively, that pose a significant health threat to livestock production in many countries (Dantas *et al.*, 2012).

Haemoparasites have generally been shown to cause destruction of red blood cells resulting in anaemia, jaundice, anorexia, weight loss and infertility (Akande *et al.*, 2010). The direct losses caused by the parasites are attributed to acute illness and death, premature slaughter and rejection of some body parts at meat inspection. Indirect losses include the reduction of productive potential such as decreased growth rate, weight loss in young growing animals and late maturity of slaughter stock. Farmers may not appreciate the effects of these haemoparasites on their animals, perhaps due to the subclinical nature of presentation and chronic nature of the affected animals. *Babesia*, *Theileria* and *Anaplasma* are tick-borne haemoparasites that globally impact animal health and economy in view of mortality, reduced milk, meat and hide production and lower animal draft power (Radostits *et al.*,

2000). Hence, control of vectors, immunoprophylaxis, early diagnosis and treatment are necessary to prevent mortality and associated production losses.

Transmission, Pathogenesis and Clinical Signs

Bovine babesiosis is caused by the intraerythrocytic haemoprotozoa of *B. bigemina*, *B. bovis*, *B. divergens* and *B. major* which are transmitted by Ixodid ticks *Rhipicephalus (Boophilus) microplus* (Bose *et al.*, 1995). Incubation period varies according to the *babesia spp* affecting cattle and buffaloes. Pathogenesis is mainly due to parasitaemia, which causes high fever up to 45.5 °C, destruction of large number of erythrocytes due to autoimmune mechanism, blood loss, cerebral anoxia, accumulation of toxic byproducts, release of kinin and intravascular coagulation. Symptoms include anorexia, weakness, cessation of rumination, depression, salivation, dryness of muzzle, lacrimation, reduced milk yield, diarrhoea, brick red conjunctiva which later turns to anaemic. In advanced stages, severe anaemia, haemoglobinuria, jaundice and death may be noticed. In chronic infections, animals may be weak and emaciated for weeks (Bhatia *et al.*, 2010).

Bovine theileriosis is a tick-borne disease caused by *Theileria annulata* and *Theileria parva*, which are pleomorphic forms and occur in lymphocytes, histiocytes and erythrocytes of vertebrate hosts. They cause a fatal disease in dairy animals and transstadial transmission occurs by *Hyalomma spp*, *Rhipicephalus spp*. Exotic, cross-bred animals and indigenous calves are more susceptible to infection and suffer more. Indigenous cattle do not show clinical signs, remain as carrier and act as source of infection to other susceptible animals. The incubation period varies from 9-25 days. The disease is characterized by lymphadenopathy, splenomegaly, fever (40-41.5 °C), anaemia, inappetence, laboured breathing, serous nasal discharges, coughing, rough hair coat, weakness and loss of body weight (Maharana *et al.*, 2016). Bilirubinuria, jaundice followed by weakness and death may be noticed in later stages. Nervous signs are reported in cerebral form of theileriosis.

Another tick-borne haemoprotozoan disease, anaplasmosis also called gall sickness is a vector-borne disease of cattle and buffaloes, that is caused by an obligate intraerythrocytic rickettsial microorganism, *Anaplasma marginale* and *Anaplasma centrale*, that are mostly transmitted by *Rhipicephalus (Boophilus) microplus*, *Dermacentor*, *Hyalomma*, *Ixodes*. *Argas* and *ornithodoros* also act as vectors. Characteristic features of the disease include progressive haemolytic anaemia associated with fever, anorexia, jaundice, decreased milk production, abortions, hyperexcitability and in peracute cases death occurs within 24hrs in adult dairy cows.

Postmortem Lesions

In babesiosis, lesions include emaciations, yellowish discoloration of subcutis, swelling and congestion of internal organs, enlargement of spleen, live, distended gall bladder, enlarged and congested lymph nodes and kidneys, and urinary bladder containing coffee-colored urine. Emaciated carcass, pale mucous membranes, enlarged superficial lymph nodes, spleen and liver, distended gall



bladder with thick bile, congested and petechial haemorrhages on kidney and lungs, punched necrotic ulcers in abomasum are pathognomonic to theileriosis.

Diagnosis

Based on history, clinical manifestations, demonstration of piroplasms in stained blood smears, Koch's blue bodies in lymphocytes in lymph node biopsy smears (theileriosis), necropsy findings and prevalence of ticks in endemic areas. Molecular techniques and serological tests like complement fixation, indirect fluorescent antibody, indirect haemagglutination tests and capillary haemagglutination tests, etc. may be used.

Treatment And Control

Chemoprophylaxis, immunoprophylaxis and chemotherapy along with supportive therapy are important control measures. For babesiosis, Dimenazene aceturate is given @ 3-5 mg/kg bw through i/m route for two consecutive days. Imidocarb dipropionate is given @ 1.2 mg/kg bw as a single dose through s/c route. 1% trypan blue solution (50-100 ml) given strictly through i/v route is the oldest remedy for babesiosis.

In India, the commercial vaccine Rakshavac-T @ 3 ml, subcutaneous injection, once a year is recommended in crossbred and exotic cattle aged 2 months and above against theileriosis. Buparvaquone @ 2.5 mg/kg bw through i/m route is highly effective for treating theileriosis. Oxytetracycline @ 15mg/kg bw through i/m route to be given 4-6 times daily. Parvaquone @ 20 mg/kg bw through i/v route as a single dose is highly effective. Halofuginone is given @ 1-2 mg/kg bw orally once.

Tetracycline @ 6-10 mg/kg bw, given as single i/m injection is effective in anaplasmosis, usually three such daily injections are given. Supportive treatment includes blood transfusion, multivitamin supplements, and fluid therapy. Control of ticks and proper treatment of positive cases in segregation help in the effective control of diseases.

Discussion And Conclusion

Ticks, which transmit parasites such as *Hyalomma* and *Rhipicephalus* spp. are a major concern for dairy farmers during the rainy and summer seasons. The most important tick-borne haemoparasites in cattle and buffaloes are *Babesia*, *Theileria* and *Anaplasma* (Zahid *et al.*, 2005). These haemoparasites account for substantial losses in terms of decreased working capacity, growth, and productivity of animals. Repeated use of chemical acaricides for tick management resulted in the establishment of acaricide-resistant tick populations, insecticide residues in livestock products and environmental pollution. Significant economic loss due to tick infestation in crossbred, indigenous cattle and buffaloes was estimated. Hence, prophylactic measures, early diagnosis based on history, clinical manifestations, blood smear examination, haematology, serum biochemical analysis and early treatment can prevent high mortality rates and production losses.



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