

borne diseases is the control of fly and tick vectors using insecticides and acaricides respectively. Tick control, via acaricides or management practices, can be useful in reducing tick burdens, which can lower transmission rates of blood protozoan parasites. A commercial vaccine is available against *T. annulata*. The increase in haemoprotozoan infections with the onset of monsoons can effectively be controlled by taking appropriate tick/ insect control measures. Ectoparasites like ticks and flies can be controlled by External application/ Dipping using chemicals like Flumethrin 1%, Cypermethrin 10%, Deltamethrin 1.25% Amitraz 12.5% pour-on-solution. Close monitoring and treatment of shed / soil is essential to avoid re-infection. Ivermectin 1% (10mg/ml) subcutaneous injection can be given at dose 1ml/50Kg wt.



Fig. 1 haemoglobinuria in Babesiosis affected cattle



Fig. 2 Anaemic conjunctiva in a theileriosis affected cow

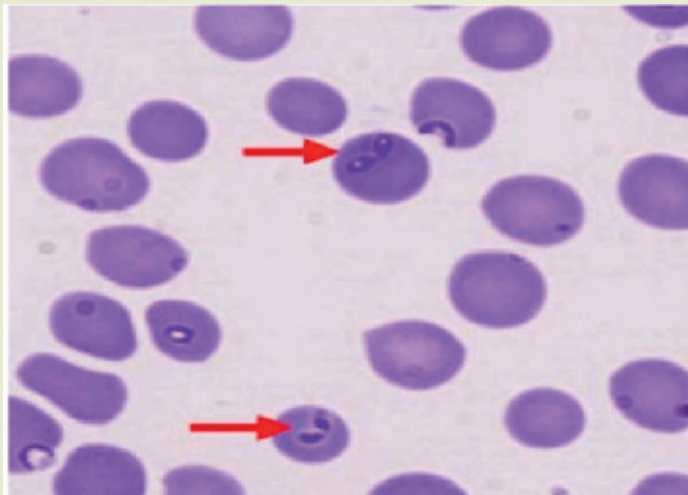


Fig. 3 Babesia piroplasms in RBC



Fig. 4 Emaciated Theileriosis affected cattle with swollen lymphnode

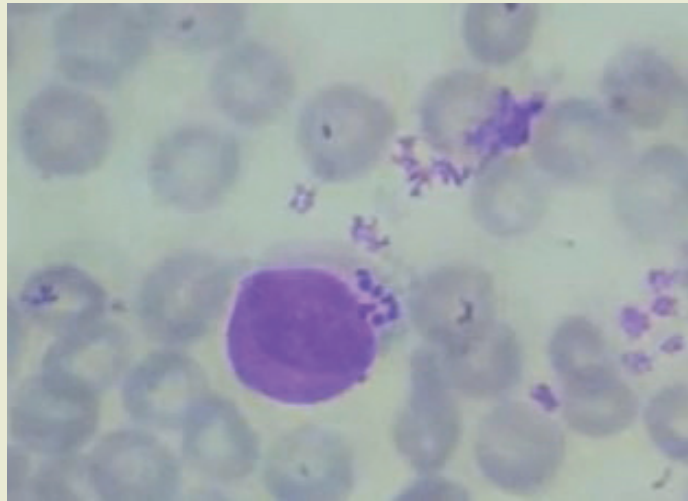


Fig. 5 Theileria Schizont in a mononuclear cell.



Use of mosquito net to prevent insect attack

Image source:

Fig. 1, Facebook page of Southern Veterinary Discussion

Fig. 3, Radostits, O.M., G.C. Gay, K.W. Hinchiff and P.O. Constable, 2007. A text book of the disease of cattle, sheep, goat, pigs and horses10 ed. London: th Saunders Elsevier, pp: 1110-1489, 1527-1530.

Fig. 4, NADRES v2, ICAR-NIVEDI, Bengaluru.

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Common haemoprotozoan diseases in cattle and their management



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Introduction

Haemoprotozoan diseases are called as Tick-borne diseases, which is a complex of several diseases that affect cattle and other livestock species in tropical and subtropical regions. The causative agents are apicomplexan parasites belonging to the genera *Babesia*, *Theileria*, *Trypanosoma*, and rickettsial pathogens of genus *Anaplasma*. These parasites are unicellular parasites and have a life-cycles involving developmental stages in the blood cells and tissues of vertebrate hosts and the gut and tissues of various blood-feeding insect/tick vectors. The important haemoprotozoan diseases of cattle are Theileriosis, Babesiosis, Anaplasmosis and Trypanosomosis. These microscopic parasites are mainly transmitted by arthropod vectors. As India is a tropical country, the hot humid weather during the major part of the year is highly suitable for the multiplication and spread of the insect/tick vectors, resulting in an increased incidence of haemoprotozoan diseases. Infection of animals with the haemoprotozoan parasites initiates the multiplication of these parasites in blood and tissues of vertebrate hosts, which causes disease with different types of clinical signs. The infection can lead to a drastic decline in the health condition of the cattle, reduction in milk yield and draught capacity, and even results mortality, which in turns results in huge economic losses to the farmer.

Theileriosis:

Theileriosis is a group of tick-borne diseases caused by *Theileria* spp. Theileriosis is potentially fatal in susceptible cattle and is a major cause of economic loss for dairy farms globally. Bovine tropical theileriosis in cattle is caused by the species *T. annulata*, and it is a lymphoproliferative disease showing high mortality and morbidity. It is an acute and highly fatal disease, especially for cross-bred and exotic animals. Native cattle breeds and buffalo are more resistant and tolerant to *T. annulata* infection. Other species like *T. sergenti*/

buffeli/orientalis cause bovine benign theileriosis with mild symptoms or asymptomatic disease. Tick vectors of different genera *Hyalomma*, *Rhipicephalus*, *Haemaphysalis*, and *Amblyomma* are involved in disease transmission of Theileriosis. The occurrence of Bovine tropical Theileriosis is very high in late summer and during monsoon, when there is an increase in vector population. During tick bites, the parasite sporozoites are injected into cattle by infected vector ticks. Clinical signs vary according to the level of infection, and range from mild to severe and fatal. Early signs include enlarged superficial lymph nodes, mainly prescapular lymph nodes, fever (40.5-41.5°C), increased heart rate, laboured breathing, dyspnoea, nasal discharge, coughing, and anorexia. A fever reduction is seen in later stages with extreme weakness and prostration, anaemia, bilirubinemia and jaundice. The disease can be treated by intramuscular administration of Buparvaquone (2.5 mg /Kgt.). Oxytetracycline has proved to be effective against schizontal stages of *Theileria* during early stage of disease. A commercial vaccine Rakshavac-T is available for immunisation against *Theileria annulata*.

Babesiosis:

It is a febrile disease caused by infection with protozoa of the genus *Babesia*, which are transmitted by ixodid ticks. The disease can cause high mortality in adult cattle, especially exotic breeds and generally calves of age up to 9-12 months are naturally resistant to the infection. It is also known as Tick Fever, Red Water Disease and Texas Fever. In addition to cattle, other livestock and wild animals are also susceptible. The animals get infection by introduction of sporozoites of the parasite into the host's blood through tick bite. Multiplication of parasite in RBCs results in severe intravascular haemolysis. The clinical signs are high fever (40-41°C, up to 45°C), severe anemia, hemoglobinuria, with passage of dark or coffee coloured urine, increased pulse rate, and respiratory rate, anorexia, weakness, depression, dryness of muzzle, reduced milk

yield, icterus (yellowing of the mucous membranes) and incoordination and biting of teeth in the cerebral form of the disease. The disease can become fatal if not treated. In cattle, *Babesia bigemina* and *B. bovis* are the two species commonly found to cause disease in India. The most common treatment is using specific drugs. Diminazene aceturate is effective against *B. bovis* and *B. bigemina* at a dose rate of 3.5 mg/kg, IM, or Imidocarb at 1.2 mg/kg, SC, once. Supportive treatment using anti-inflammatory drugs, corticosteroids, and fluid therapy will help in better recovery. Blood transfusions can be done in case of severe anaemia.

Bovine Anaplasmosis:

The disease is also known as gall sickness. The disease is very common in tropical and subtropical countries. It is a non-contagious rickettsial disease caused by the intra-cellular rickettsial pathogen of Genus *Anaplasma*. In India, the disease is caused mainly by the species *A. marginale* and *A. centrale*. Transmission can occur through a variety of insect vectors like *Tabanus* and *Stomoxys*, or through ticks of Genus *Rhipicephalus* (*Boophilus*), *Argus*, and *Ornithodoros* spp. The infection also gets transmitted from infected cattle to the foetus through the placenta. The disease is mostly observed in cattle above 18 months of age. The pathogenic effects occur due to multiplication of the parasite in RBCs and haemolysis. Occasionally fever is seen. Clinical signs are anaemia, bilirubinemia and sometimes haemoglobinuria, dyspnoea, jaundice and pale visible mucus membrane. The disease is characterized in the acute form by fever, anaemia, weakness, constipation, brownish urine, icterus, anorexia, dullness or depression, dehydration, and laboured breathing. Animals will have a slow recovery from acute disease, resulting in reduced milk production and remain as lifelong carriers, and can act as reservoirs for infection. Generally, mortality is between 5 to 40 percent, but may reach 70 percent during a severe outbreak. *Anaplasma* in cattle cases can be treated using

tetracycline in the early stages of infection at a dose rate of 6-10 mg/kg body weight twice a day I/M or using long-acting oxytetracycline at a dose rate of 20 mg/kg body weight I/V with a single dose and two doses of 7 days apart in case of chronic infection. Imidocarb is highly effective against *A. marginale* at a dose rate of 1.5 mg/kg body weight.

Trypanosomosis (surra):

This disease is also known as Surra and is an important haemoprotozoan disease affecting cattle in India caused by protozoa *Trypanosoma evansi*. The disease occurrence is seen more during the monsoon. The parasite is transmitted mechanically, by biting flies of genus *Tabanus* and *Stomoxys*. It is prevalent in cattle and buffaloes in most parts of the country. In per acute form, the animal shows nervous symptoms like convulsions followed by death in 2-3 hours. Acute form is characterized by staggering gait, eyes staring and wide open, encircling movement, nervous excitement, apparent blindness and twitching of muscles. The animal appears dull, collapses and dies within 6-12 hours. Chronic form is characterized by progressive emaciation, intermittent fever, anaemia, oedema of legs and genital area, lacrimation from both eyes and death of the animal may occur. Diminazene aceturate (DA) is the most widely used medicine for treatment of surra in ruminants followed by Isometamidium chloride (IMC) at 0.5 mg/kg for prevention and 1.0 mg/kg bw for treatment. Melarsominedihydrochloride (Cymelarsan) can be used at dose of 0.5, and 0.75 mg/kg bw in cattle, and buffaloes, respectively.

Diagnosis and Control:

In general blood protozoal parasite infections can be diagnosed by clinical signs and laboratory testing of blood samples. Diagnosis is mainly carried out by microscopic detection of parasite stages in blood smears or by Polymerase chain reaction (PCR) detection of parasite DNA in blood. Most common control method of tick-