Research Article

Studies on Alterations of Clinical and Hemato-Biochemical Parameters in Cattle with Anaplasmosis and Its Management

S Sivajothi[1]* and B Sudhakara Reddy[2]

[1]Department of Veterinary Parasitology, College of Veterinary Science, Proddatur-526360, Sri Venkateswara Veterinary University, Andhra Pradesh, India
[2]Department of Veterinary Medicine, College of Veterinary Science, Proddatur-526360, Sri Venkateswara Veterinary University, Andhra Pradesh, India

Abstract

Bovine anaplasmosis is a worldwide tick-borne disease. Cattle with fever, weakness, reduced milk yield, loss of body weight, constipation followed by diarrhea and pale mucous membrane with loss of milk yield were screened for haemoprotozoan diseases during a herd visit. The cattle were subjected to Giemsa stained peripheral blood smear microscopic examination. Out of 31 cattle examined 14 were found to be positive for *Anaplasma marginale*. Clinical examination revealed high rectal temperature, tachycardia, tachypnea, anorexia, pale mucous membrane, weakness, reduced rumen motility, enlarged lymph nodes, and yellowish mucus membranes. Hematology revealed low levels of hemoglobin, packed cell volume, total erythrocyte count, and leucocytosis. Serum biochemical analysis showed elevated levels of ALT, ALP, BUN, total bilirubin and reduced levels of serum albumin. The cattle were treated with injection oxytetracycline @ 10 mg/kg body weight as an intravenous infusion in 500 ml of normal saline, injection ethamsylate @ 10 mg/kg body weight intramuscularly, injection sodium acid phosphate @ 15 ml intramuscularly for 5 days along with supportive medication. Marked improvement was recorded in the condition of the animal after five days of treatment.

Keywords: Anaplasma, Cattle, Haematology, Treatment

***Correspondence**
Author: Sivajothi
Email: Sivajothi579@gmail.com

Introduction

Anaplasmosis is previously known as gall sickness in cattle and it is a tick-borne disease caused by obligate intra-erythrocytic rickettsial microorganisms, i.e. *Anaplasma marginale* and *Anaplasma centrale* of the order Rickettsiales [1]. It is transmitted by ticks, biting flies, and blood-contaminated fomites including used needles, ear tagging, dehorning, and castration equipment [2]. Anaplasmosis is found on six continents and is responsible for high morbidity and mortality in temperate, subtropical, and tropical regions [3]. The cycle of *A. marginale* in ticks is very complex and associated with the tick feeding cycle. Infected erythrocytes ingested by ticks with the blood meal provide the source of *A. marginale* infection for tick gut cells. After the development of the pathogen in tick gut cells, many other tick tissues become infected, including the salivary glands, the site from which *A. marginale* is transmitted to cattle during feeding. Clinically, the disease is characterized by hemolytic anemia, fever, jaundice, decreased milk production, abortions, hyper-excitability, and sudden death [4-6]. The recovered animals act as carriers and remain as a patient source of infection to other susceptible animals. The present communication puts a record on *Anaplasma* infection in a cattle herd, haemato-biochemical changes, and its therapy.

Materials and Methods

Out of 31 crossbred cattle in a herd, 14 were found to be suffering from fever, weakness, reduced milk yield, loss of body weight, constipation followed by diarrhea and pale mucous membrane with loss of milk yield. For preliminary studies, a peripheral blood smear examination was carried out [7]. Blood smears are made by placing a drop of blood on one end of a slide, and using a spreader slide to disperse the blood over the slide's length. The slides were left to air dry, after which they were immersed in methanol for fixing. The fixative is essential for good staining and presentation of cellular detail. After fixation, the slides were stained with Giemsa stain and observed under oil immersion objective (100X) [8]. Out of 31 cattle, 14 were found to be positive for *Anaplasma* organisms. From the 14

cattle which were found to be positive for Anaplasmosis, blood samples were collected from the jugular vein for the present study. Five mille liter of blood sample was collected in EDTA coated vials and clot activator vials for evaluating hematological and biochemical parameters, respectively. All the blood samples were used for the estimation of total erythrocyte count (TEC), hemoglobin concentration (Hb), and packed cell volume (PCV). The sera from blood were separated after centrifugation at 5000 rpm for 10 min and further stored at -20°C until used for estimation of biochemical parameters. The different serum biochemical parameters viz. aspartate aminotransferase (AST), alkaline phosphatase (ALP), glucose, blood urea nitrogen (BUN), total protein, albumin, creatinine, and total bilirubin were estimated. Estimation of haemato-biochemical parameters will be helpful for therapeutic alterations while treating haemoprotozoans in bovines [9].

The cattle were treated with injection oxytetracycline @ 10 mg/kg body weight as an intravenous infusion in 500 ml of normal saline, injection ethamsylate @ 10 mg/kg body weight intramuscularly, injection sodium acid phosphate @ 15ml intramuscularly for 5 days. Oral hematinics containing ferrous fumerate (1500mg), Vitamin B12 (75µg), and Folic acid (7500µg) per bolus were also advised @ 2 boli twice daily, liver tonic along with oral probiotics for 15 days. Marked improvement was recorded in the condition of the animal after five days of treatment.

Results and Discussion

Assessment of parasitic infection and a parasitic load of Anaplasmosis were carried out by microscopic examination of the Giemsa-stained blood smears. Out of 31 animals, 14 were found positive for *Anaplasma marginale. Anaplasma spp.* in the blood smear was observed as dense, rounded, intra-erythrocytic bodies situated on or near the margin of the erythrocytes (**Figure 1**). Most of the cattle were acutely infected and had peculiar clinical signs like high rectal temperature, tachycardia, tachypnea, anorexia, pale mucous membrane, weakness, reduced rumen motility, enlarged lymph nodes, and yellowish mucus membranes. Results of the hematological and serum biochemical parameters are depicted in **Table 1**. Hematology revealed reduced levels of hemoglobin, total erythrocytic count, packed cell volume, and increased leucocyte count. Increased alkaline phosphatase, ALT, BUN, and bilirubin levels.

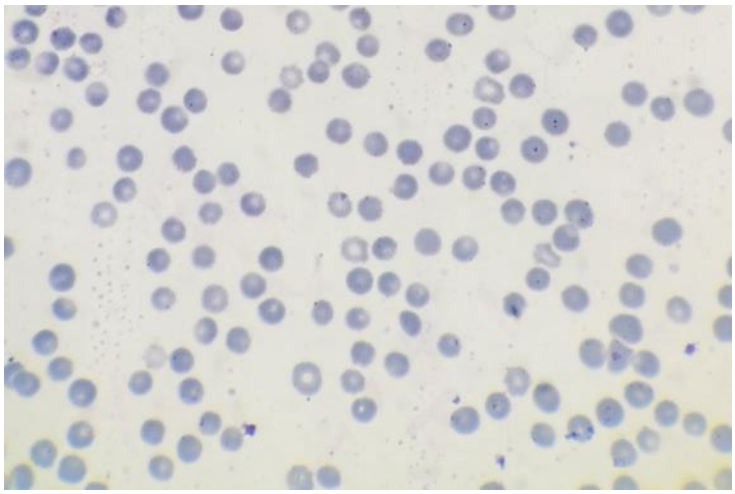

Figure 1 Stained cattle blood smear positive for *Anaplasma marginale* in the blood smear (1000X)

Anaplasma marginale is responsible for great economic losses in developing countries like India, where it is highly endemic [10]. In the present study, the diagnosis of anaplasmosis in cattle was based on case history and microscopic examination of a peripheral blood smear. After the invasion of the parasite into red blood cells, they divide into eight initial bodies and enlarge within its thin outer membrane, forming a large dot. When infected red blood cells rupture, the parasite's membrane also ruptures, releasing the initial bodies into the bloodstream to invade other RBCs. As the infection progresses, more and more RBCs contain parasites and are destroyed.

As the disease progresses, infected and even uninfected red blood cells are destroyed predominantly in the liver and spleen, resulting in increasing anemia without hemoglobinemia and hemoglobinuria, which is responsible for the pallor mucus membranes and rapid bounding pulse. Due to hemolytic anemia, the animal cannot tolerate stress, leading to fatigue and weakness [11]. The values of TLC were higher in cattle with disease conditions. Leucocytosis indicates stimulation of lymphoid organs and systems due to parasites and their toxins. But, anemia is considered to be a major component of anaplasmosis.

The findings of the present study agreed with the marked anemic condition, liver dysfunctions, and rise in immunoglobulin levels with *Anaplasma marginale* infections in dairy cattle [12]. In the present study,

hyperbilirubinemia is due to excessive destruction of erythrocytes and indirect hepatocellular damage. During the disease process, the animals' hemopoietic system was activated in response to erythrophagocytosis. Lower PCV and higher TBIL, AST, and ALT indicate liver dysfunction. These findings were similar to previous findings [5, 6]. They stated that damage to the skeletal or heart muscles, hepatic tissues, and erythrocytes may result in a considerable increase in the level of AST and ALT. In the present study, cattle with Anaplasmosis were successfully treated with intravenous administration of Oxytetracycline. The following therapeutic regimen was in accordance with the previous study reports [13].

Table 1 Haematological and serum biochemical changes in cattle with Anaplasmosis

S.No	Parameters	Cattle with Anaplasmosis (n=14)		Reference range (4)
		Mean ± S.E.	Range	
1	Haemoglobin (g/dl)	8.98 ± 0.85	7.94 – 9.61	8.0 -15.0
2	PCV (%)	25.60 ± 0.92	23.0 – 30.0	24.0 - 46.0
3	TEC $x10^6$/cumm	5.12 ± 1.09	4.12 – 6.18	5.0 - 10.0
4	TLC /cumm	13098.0 ± 812.1	11608 – 14002	4000 – 12000
5	Neutrophils /cumm	2912.7 ± 811.22	2800 – 3716	600-4120
6	Lymphocytes /cumm	9015.1 ± 901.21	8005 – 10210	2500-7500
7	Monocytes /cumm	819.3 ± 32.3	695 – 912	25-840
8	Eosinophils /cumm	408.70 ± 39.16	201 – 445	0-2400
9	Total protein (g/dL)	6.18 ± 1.89	5.21 – 7.81	5.7- 8.1
10	Serum albumin (g/dL)	2.87 ± 0.44	2.41 – 3.28	2.1- 3.6
11	AST (IU/L)	166.12 ± 9.28	152 – 193	78-132
12	BUN (mg/dL)	28.42 ± 4.19	24 – 35	6.0-27.5
13	Alkaline phosphatase (IU/L)	79.12± 8.21	56 – 92	0-500
14	Total Bilirubin (mg/dL)	2.86 ± 0.12	1.06 – 3.49	0.17-8.55

The prognosis for anaplasmosis is depending on the different factors. Younger animals have good prognosis than adult animals. Most infected cattle don't succumb to death but it remains persistently infected and chronic carriers of pathogen. This further leads to subsequent transmission to other cattle. The disease can be prevented by control of vectors and maintain farm hygiene while handling any surgical interventions.

Conclusion

Present study concludes any cattle with clinical signs of high rectal temperature, tachycardia, tachypnea, anorexia, pale mucous membrane, enlarged lymph nodes, and yellowish mucus membranes will be suspected for anaplasmosis and it should be differentiated from other haemoprotozoan diseases by peripheral blood smear examination.

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