SHORT COMMUNICATION

# Diagnosis and Therapeutic Management of Anaplasmosis in Bovines

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## Abstract

The present study was conducted on anaplasmosis affected seven indigenous cattle and two buffaloes to determine the haemato-biochemical alteration and to know about the therapeutic response of imidocarb dipropionate. Diagnosis of anaplasmosis was based upon peripheral blood smear examination which showed presence of dot-like protozoa at the periphery of the erythrocytes. Observed clinical manifestation in affected animals were anorexia, intermittent fever, tachycardia, increased respiration rate, muscular weakness, emaciation, paler conjunctiva and presence of ticks on body surface. Haemato-biochemical examination revealed significantly lower Hb, PCV, TEC, lymphocyte count, platelets, glucose, albumin and total protein, whereas total leucocytes count, neutrophils count, eosinophils count, AST, ALT, LDH, total bilirubin, globulin and alkaline phosphatase were found significantly higher in anaplasmosis affected cattle and buffaloes as compared to healthy control animals (n=8). Early diagnosis and treatment with imidocarb dipropionate and other supportive therapy was found very effective in anaplasmosis affected animals and had good prognosis.

**Key words:** Anaplasmosis, Buffaloes, Cattle, Haemato-biochemical profile, Imidocarb.

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## Introduction

Historically, the term "anaplasmosis" has been used to describe a ruminant disease brought on by obligate intraerythrocytic parasites of the family Anaplasmataceae, genus Anaplasma, and order Rickettsiales. *Anaplasma marginale* is the causative agent of anaplasmosis in cattle and wild ruminants, and *A. ovis* in sheep and goats. *A. centrale* is closely related to *A. marginale* and causes mild anaplasmosis in cattle (Sharma *et al*., 2013). Infection occurs more sporadically in temperate climate areas. Seropositivity rates in endemic areas frequently exceed 60% and are close to 90%, which indicates a very high incidence of infection in cattle. The reservoir for herd infection is comprised of persistent carriers (Radostits *et al*., 2007). Cattle are found to be more susceptible to *Anaplasma* infection than the buffaloes (Rajput *et al*., 2005).

Young calves are less susceptible to infection with *A. marginale* as compared to older cattle, and when infected poorly manifest clinical symptoms particularly on a low plane of nutrition (Radostits *et al*., 2007). Anaplasmosis is clinically characterized by progressive haemolytic anaemia associated with fever, jaundice, decreased milk production, abortions, hyperexcitability and in some cases sudden death (Richey and Palmer, 1990; Radostits *et al*., 2000). It is transmitted by a diverse group of biological and mechanical vectors. Ticks can spread the disease physiologically, trans-placentally, mechanically (by biting flies or blood contaminated fomites), or both. Diagnosis of anaplasmosis is based upon microscopic examination of intra-erythrocytic parasite or by nucleic acid probe analysis (Radostits *et al*., 2007). The present study was done to determine the haemato-biochemical alterations in anaplasmosis affected cattle and buffaloes and to assess the therapeutic response of imidocarb dipropionate.

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## Materials and Methods

Seven indigenous cattle and two buffaloes were brought at Veterinary Clinical Complex of College of Veterinary and Animal Science, Navania, Udaipur, Rajasthan with history of reduced appetite or off-feed, fever, dullness and emaciation, reduced milk production, ocular discharge, abortion in one cow and presence of ticks on body surface. The clinical findings observed in these animals were inappetence or anorexia, intermittent fever, tachycardia (average 93/min), increased respiration rate (average 41/min), muscular weakness, emaciation, paler conjunctiva and presence of ticks on body surface. Based on history, clinical findings

and presence of ticks on body these cattle were tentatively diagnosed to be infested with protozoal parasites. The disease was confirmed as anaplasmosis based upon blood smears examination, which showed presence of dot-like protozoa at the periphery of the erythrocytes (Fig. 1).

Anaplasmosis affected cattle and buffaloes were treated with inj. Imidocarb dipropionate @ 6.6 mg/kg b.wt., SC., inj. Oxytetracycline @ 10 mg/kg b.wt., IV slow, inj. Vetalgin @ 1 mL/20 kg b.wt., IM., s.o.s., inj. Ivermectin @ 0.2 mg/kg b.wt., SC once, inj. Ferritas @ 10 mL, IM 3 times on alternate day, inj. Tribivet (vit. B-complex) @ 1 mL/20 kg. b.wt., IV for 3 days and electuary Sharkoferrol-vet 3 teaspoonfuls once orally for 10 days.

For haemato-biochemical estimation blood samples from affected cattle (n=6) and buffaloes (n=2) were collected from jugular vein in vacutainers with and without EDTA and were immediately transported to laboratory in ice box. Eight apparently healthy cattle were also used to compare normal haemato-biochemical parameters. Blood samples containing EDTA were used to estimate haematological parameters, and blood samples without anticoagulants were utilised to separate serum by conventional methods for biochemical analysis. Peripheral blood smears from ear vein were prepared and stained with Giemsa's stain for confirmation of protozoal parasites by microscopic examination. Blood smears were examined at 100 x under oil immersion. The findings were compared between anaplasmosis affected and healthy animals irrespective of species of animals involved by using student's 't' test (Snedecor and Cochran, 1994).

## Results and Discussion

Haematological study in an aplasmosis affected animals revealed significantly ($p<0.05$) lower haemoglobin (Hb), packed cell volume (PCV), total erythrocytes count (TEC), lymphocyte count and platelets, whereas total leucocytes count, neutrophils count and eosinophils count were found significantly ($p<0.05$) higher in anaplasmosis affected animals as compared to healthy control animals. However, monocytes count, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) differ non-significantly as compared to healthy control animals (Table 1).

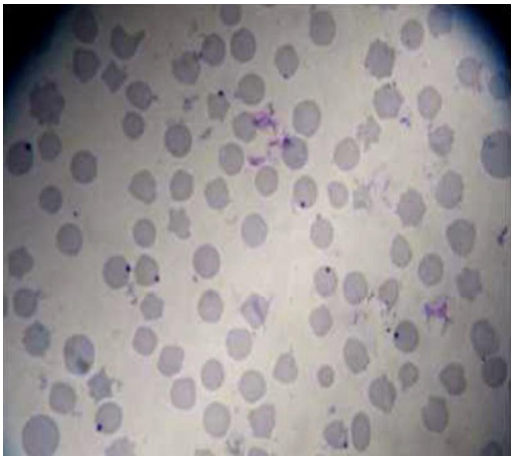

**Fig. 1:** *A. marginale* protozoal parasite in RBCs

**Table 1:** Haematological parameters in anaplasmosis affected and healthy control animals (Mean ± SE)

| Haematological parameters | Anaplasmosis affected animals (n=8) | Healthy control animals (n=8) |
|---|---|---|
| Hb (g/dL) | 8.46±0.21* | 11.63±0.31 |
| PCV (%) | 27.10±0.84* | 35.91±0.67 |
| TEC (x $10^6$/µL) | 6.18±0.19* | 7.46±0.28 |
| TLC (x $10^3$/ µL) | 18.67±1.03* | 8.12±0.52 |
| Neutrophils (%) | 46.34±2.47* | 33.57±1.31 |
| Eosinophils (%) | 9.37±1.31* | 4.67±0.82 |
| Lymphocytes (%) | 44.19±1.24* | 57.96±1.67 |
| Monocytes (%) | 2.53±0.37 $^{NS}$ | 2.33±0.29 |
| MCV (fl) | 46.0±1.81 $^{NS}$ | 47.10±2.46 |
| MCH (pg) | 15.10±.021 $^{NS}$ | 15.56±0.74 |
| MCHC (g/dL) | 33.53±0.61 $^{NS}$ | 32.80±0.48 |
| Platelets (x $10^5$/µL) | 3.31±0.18* | 4.66±0.23 |

*= $p<0.05$, NS= non-significant.

Decreased Hb, PCV and TEC in anaplasmosis affected animals may be due to erythrophagocytosis, which was triggered by parasitic damage to erythrocytes, and the clearance of dead cells by the bovine reticuloendothelial system. Mbassa *et al*. (1994) reported that toxic metabolites of tick-borne haem-protozoa interfere with the process of erythropoiesis and impart harmful effect on bone marrow resulting in development of anaemia.

Similar findings were also reported by Sharma *et al*. (2013) in anaplasmosis affected animals. In contrast to present findings, Vahora *et al*. (2012) recorded normal values of PCV along with decreased TEC and Hb concentration. Leucocytosis and neutrophilia in anaplasmosis may be due to marked systemic inflammatory response. Higher eosinophils in anaplasmosis might be associated with ongoing allergic reactions to presence of ticks on body of the affected animals or their metabolic products. Although the exact causes of thrombocytopenia in anaplasmosis are not yet known, several factors, such as platelet sequestration in the spleen, immune-mediated platelet death, and the emergence of disseminated intravascular coagulation, might play a role. However, non-significant difference observed in MCV, MCH and MCHC in anaplasmosis affected animals as compared to healthy control animals in present study may be attributed to the normocytic normochromic anaemia in anaplasmosis affected animals.

Biochemical analysis revealed significantly ($p<0.05$) lower glucose, albumin and total protein (TP), whereas aspartate transaminase (AST), alanine transaminase (ALT), lactate dehydrogenase (LDH), total bilirubin (TBIL), globulin and alkaline phosphatase (ALP) were significantly ($p<0.05$) higher in anaplasmosis affected animals as compared to

healthy control animals. A reduction in blood glucose level in anaplasmosis affected animals might be due to anorexia and impaired liver function (Zulfiqar *et al*., 2012). However, no significant difference was observed in BUN and creatinine values of anaplasmosis affected animals as compared to healthy control animals under study, which may reflect absence of renal impairment (Table 2).

**Table 2:** Biochemical parameters in anaplasmosis affected and healthy control animals **(**Mean ± SE)

| Biochemical parameters | Anaplasmosis affected animals (n=8) | Healthy control animals (n=8) |
|---|---|---|
| Glucose (mg/dL) | 51.24±1.07* | 64.63±1.77 |
| Albumin (g/ dL) | 2.34±0.12* | 3.36±0.10 |
| Globulin (g/ dL) | 4.02±0.15* | 3.26±0.28 |
| TP (g/dL) | 6.69±0.23* | 7.74±0.07 |
| AST (U/L) | 126.02±3.47* | 87.21±2.33 |
| ALT (U/L) | 74.26±4.02* | 29.29±0.67 |
| LDH (IU/L) | 526.05±18.23* | 338.17±29.14 |
| ALP (IU/L) | 129.36±2.18* | 47.29±0.89 |
| TBIL (mg/ dL) | 0.49±0.02* | 0.27±0.27 |
| Creatinine (mg/ dL) | 0.73±0.05 $^{NS}$ | 0.74±0.02 |
| BUN (mg/ dL) | 18.25±0.75 $^{NS}$ | 17.87±0.79 |

*= p<0.05, NS= non-significant.

Increased serum activity of AST, ALT, LDH and ALP could be attributed to hepatopathy. Centrilobular hepatitis with hypoxic liver damage could be the possible mechanism that resulted in significant changes in hepatic enzymes (Taboada and Lobetti, 2006). These findings were similar to Kataria and Bhatia (1991) and Coskun *et al.* (2012). They stated that damage to the skeletal or heart muscles, hepatic tissues and erythrocytes might result in considerable increase in the level of AST and ALT. Increased globulin in anaplasmosis affected animals signifies that the defensive immune system might be activated leading to elevation of circulating immunoglobulin in the serum to counter the infection in the system. Increased total bilirubin in anaplasmosis affected animals might be due to excessive destruction of RBCs and the indirect hepatocellular damage.

The significant (p<0.05) reduction of serum total protein and albumin in anaplasmosis affected animals might be related to liver dysfunction as a primary and secondary impact of disease as fever and loss of appetite (Hassan *et al*., 2016) or may also be related with extravasation of proteinaceous fluid at the site of ectoparasites bite or injury. According to Raval (1997) protein deficiency indicated malnutrition, disturbed regressive hepatic functional status and glomerular filtration capacity. However, in the present study no significant difference was observed in BUN and creatinine values of anaplasmosis affected animals as compared to healthy control animals.

Treatment of anaplasmosis affected animals with imidocarb dipropionate, oxytetracycline, ivermectin and other supportive therapy showed marked improvement after 3 days of treatment. On the seventh day of treatment, all animals showed clinical improvement, although it takes significantly longer for production to regain optimally.

In general, anaplasmosis is an important disease of ruminants, which is clinically characterized by progressive haemolytic anaemia associated with fever, jaundice, decreased milk production and abortion. Peripheral blood smear examination and haemato-biochemical alterations are important tools for for confirmatory diagnosis and prognosis of anaplasmosis in animals. Treatment with imidocarb dipropionate and other supportive therapy is effective in anaplasmosis in cattle and buffaloes.

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## References

Coskun, A., Ekici, O.D., Guzelbektes, H., Aydo, G.D.U., & Sen, I. (2012). Acute phase proteins, clinical, haematological and biochemical parameters in dairy cows naturally infected with *Anaplasma marginale*. *Kafkas University Veteriner Fakultesi Dergisi, 18*(3), 497-502.

Hassan, R.M., Essa, A.A., & Mustafa, B.H.S. (2016). Influence of two species of ticks and lice on some hematological parameters in black goats during spring and summer seasons in Sulaimani Governorate - Kurdistan region. *Tikrit Applied Science Journal*, *21*(4), 36-43.

Kataria, N.,& Bhatia, J.S. (1991). Activity of some enzymes in the serum of dromedary camels. *Research in Veterinary Science*, *51*(9), 174-176.

Mbassa, G.K., Balmba, O., Maselle, R.M., & Mwaga, N.V. (1994). Severe anaemia due to hematopoietic precursor cell destruction in field cases of East Coast Fever in Tanzania. *Journal of Veterinary Parasitology, 52*(3), 243-256.

Radostits, O.M., Gay, C.C., Blood, D.C., & Hinchliff, K.W. (2000). *Veterinary Medicine*. A text book of the diseases of cattle, sheep, goats and horses. 9th Edn. London, New York, Philadelephia, WB Saunders Co., p. 1261-1265.

Radostits, O.M., Gay, C.C., Hinchliff, K.W., Blood, D.C., & Constable, P.D. (2007). *Veterinary Medicine*. 10th edn, ELBS Baillire, Tindall, London.

Rajput, Z.I., Hu, S.H., Arijo, A.G., Habib, M., & Khalid, M.J. (2005). Comparative study of *Anaplasma* parasites in tick carrying buffaloes and cattle. *Journal of Zhejiang University-Science, 6,* 1057-1062.

Raval, S.K. (1997). Epidemiological surveillance, clinico-pathology, diagnostic and techno economic aspects of Fascioliasis in buffaloes. *Ph.D. Thesis,* Gujarat Agricultural University, Anand Campus, Anand, India.

Richey, E.J., & Palmer, G.H. (1990). Bovine anaplasmosis. *Compendium on Continuing Education for the Practising Veterinarian, 12*(11), 1661-1668.

Sharma, A., Singla, L.D., Kaur, P., Bal, M.S., Barth, B.K., & Juyal, P.D. (2013). Prevalence and haemato-biochemical profile of

*Anaplasma marginale* infection in dairy animals of Punjab (India). *Asian Pacific Journal of Tropical Medicine*, *6*(2), 139-144.

Snedecor, G.W., & Cochran, W.G. (1994). *Statistical Methods*. 8th ed. The Iowa State University Press, Ames, Iowa, USA.

Taboada, J.,& Lobetti, R. (2006). Babesiosis. In: Greene C.E. (3rd Ed.): *Infectious Diseases of the Dog and Cat*. Philadelphia, PA: WB Saunders; p. 722.

Vahora, S.P., Patel, J.V., Patel, B.B., Patel, S.B., & Umale, R.H. (2012). Seasonal incidence of haemoprotozoal diseases in crossbred cattle and buffalo in Kaira and Anand districts of Gujarat, India. *Veterinary World, 5*(3), 223-225.

Zulfiqar, S., Shahnawaz, S., Ali, M., Bhutta, A.M., Iqbal, S., Hayat, S., Qadir, S., Latif, M., Kiran, N., Saeed, A., Ali, M., & Iqbal, F. (2012). Detection of *Babesia bovis* in blood samples and its effect on the haematological and serum biochemical profile in large ruminants from Southern Punjab. *Asian Pacific Journal of Tropical Biomedicine, 2*(2), 104-108.