



Therapeutic management of clinical caprine anaplasmosis in Thrissur district, Kerala[#]

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Abstract

Anaplasmosis is a fatal infectious disease affecting small ruminants all over the world. Haematological analysis and therapeutic evaluation of anaplasmosis were done in clinically affected goats from Thrissur district, Kerala in this study. A total of 100 blood samples from clinically affected goats were collected and microscopically examined using Field's staining technique for anaplasmosis which revealed 50 per cent positivity. Infected goats showed significant ($p < 0.05$) decrease in their haematological variables like haemoglobin, MCH and platelets, compared to healthy animals. The effectiveness of long-acting oxytetracycline, long-acting enrofloxacin, and imidocarb dipropionate in treating anaplasmosis was 100%, 62.5%, and 50%, respectively. Long acting oxytetracycline was the most effective drug of choice for treating the disease.

Keywords: Anaplasmosis, haematology, therapeutics, oxytetracycline

Goats are crucial for the food and nutritional security of rural poor people, especially in rainfed areas where crop output is unpredictable. Goat farming employs around 70 per cent of the nation's landless agricultural labourers and small farmers (Lata and Mondal, 2021). As per the 20th All India Livestock Census (2019), the country possessed 148.9 million goats and goats contributed to 8.4 per cent of India's livestock GDP *i.e.* Rs.38, 590crores through meat, milk, skin, manure and others. One of the most economically significant rickettsial illnesses affecting ruminants in India is anaplasmosis (Rajan *et al.*, 2021). It is an obligate intraerythrocytic rickettsial organism belonging to the family *Anaplasmataceae* of the order *Rickettsiales*. *Anaplasma capra*, *A. bovis*, *A. ovis* and *A. phagocytophilum* (zoonotic) are the common species.

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In India, ticks species like *Hyalomma*, *Rhiphicephalus* and *Haemaphysalis* are abundant which play an important role in transmission of *Anaplasma* organism. The hot and humid weather in Kerala favours ticks and vector-borne rickettsial diseases such as anaplasmosis. Acute cases of anaplasmosis are manifested by fever, lymph node enlargement and anaemia. Prevalence of caprine anaplasmosis was reported as 70 per cent (Anumol *et al.*, 2011), 11.21 per cent (Nimisha *et al.*, 2017), 18.33 per cent (Honey, 2018) and 14.81 per cent (Dhanasree *et al.*, 2019) in Kerala.

Control of anaplasmosis aimed at a therapeutic outcome with clearance of parasite and reversal of anaemia. Tetracycline is an antibiotic that is frequently used to treat caprine anaplasmosis. *Anaplasma* organisms have recently developed a resistance to oxytetracycline (Shahbazi *et al.*, 2021). It is asserted that imidocarb dipropionate and long-acting enrofloxacin are effective medicines for caprine anaplasmosis.

Prevalence of *Anaplasma* spp. in goats has been documented in several Indian states, including Kerala, although detailed studies on the clinico-haematological changes and therapeutic effects brought on by the disease is rare. Hence, the present study is proposed to understand the clinico-haematological alterations associated with the disease and to determine the therapeutic efficacy of treatment protocols in the affected goats.

Haematological changes and therapeutic efficacy of caprine anaplasmosis in clinically affected goats presented to Kerala Veterinary and Animal Sciences University Hospitals at Mannuthy and Kokkalai, organised farms and house-holds in and around Thrissur district were studied. One hundred goats which had shown predominant clinical signs suggestive of anaplasmosis like anaemia, fever, debility, tick infestation, lymphadenopathy, cough, and nasal discharge were screened for anaplasmosis. Blood was collected from the peripheral ear of suspected goats, thin blood smears were prepared and Field's stain (Himedia laboratories Pvt. Ltd.) was used for staining of the blood smear.

The animals which were positive for intraerythrocytic *Anaplasma* inclusion bodies during blood smear examination were checked for haematological alterations. The whole blood (2 ml) was collected directly from the jugular vein of affected goats into an EDTA vial for haematological examination. The volume of packed red cells (VPRC) (%), haemoglobin (Hb) (g/dL), total erythrocyte count (TEC) ($10^6/L$), total leukocyte count (TLC) ($10^3/L$), thrombocytopenia count (PLT) ($10^3/L$), mean corpuscular volume (MCV) (fl), mean corpuscular haemoglobin (MCH) (pg), mean corpuscular haemoglobin (MCHC) (g/dl) were estimated using automatic haematology analyzer (Orphee, Mythic Vet 18).

The selected animals included both males and females. Out of fifty goats, thirty four were female and sixteen were male. Age varied from less than one month to four years. Twenty four goats positive for *Anaplasma* spp. were selected at random and allotted to three different groups. Eight animals each Groups I, II, and III were treated with injections of imidocarb dipropionate (Babimido, Zydus AHL) at 5mg per kg BW weekly once for two weeks, injections of long-acting enrofloxacin (Enrox LA, Alembic) at 7.5mg per kg BW two doses three days interval, and injections of long-acting oxytetracycline (Steclin LA, Zenex AH) at 20 mg per kg BW twice in three-days interval, respectively. The therapeutic efficacy was assessed based on the disappearance of clinical signs and absence of the organism under blood smear examination, six days for long-acting oxytetracycline; long-acting enrofloxacin and fourteen days for imidocarb dipropionate, post therapy. Data on haematology were analysed by independent sample t-test, using SPSS (Statistical Package for Social Science Version 24).

The main clinical signs observed in goats were fever, anorexia, pallor of mucous membrane, cough and nasal discharge; drop in milk production, emaciated, lymph node enlargement and diarrhoea. Similar finding were observed in goats by Santos and Carvalho (2006), Woldehiwet (2018) and Radostiis *et al.* (2016). Dot-shaped, circular, deep purple intraerythrocytic inclusions with size between 0.2 and 0.5 μ m were considered as positive

for *Anaplasma* spp as done by Shabana *et al.* (2018).

The result of haematological study in goats was shown in Table 1. Analysis of the haematological parameters of the *Anaplasma* spp positive goats revealed a significant decrease in their haematological variables like haemoglobin, MCH and platelets, compared to healthy animals. The alteration observed in total leukocyte count and total erythrocyte count was statistically non-significant compared to healthy animals. Similarly the decrease in the values of MCV, MCHC and VPRC were statistically non-significant compared to healthy animals. The erythrocytic indices revealed normocytic hypochromic anaemia. Mustafa (2011) found that goats with anaplasmosis showed normocytic hypochromic anaemia, which was in accordance with this finding, whereas, Shah *et al.* (2017) reported macrocytic hypochromic anaemia. In this study, haemoglobin levels of the infected goats with anaplasmosis were lower than normal values. Ahmadi-hamedani *et al.* (2012) also noted that anaplasma infected small ruminants had lower haemoglobin levels.

Another frequently observed change in blood parameters of goats with *Anaplasma* spp. was thrombocytopenia. Das *et al.* (2022) observed that animals infected with *Anaplasma* spp. developed thrombocytopenia, which was thought to be immune-mediated destruction, sequestration, and severe vasculitis leading to enhanced increased consumption and decreased production of platelets. Similar to this haematological finding, Khan *et al.* (2019) reported that anaplasma-affected sheep from Lahore had significantly lower levels of Hb and MCH values. But in contrast to our findings, they had a marked decline in total RBC and significant decrease in total leucocyte count. Mean corpuscular volume levels were found to be non-significantly lower in infected goats. Phagocytosis of erythrocyte might be the cause of the decreased MCV in anaplasma infected animals (Aboaziza *et al.*, 2017). In this study, VPRC showed a non-significant decline. The inhibition of the haematopoietic system and phagocytosis of erythrocytes by the reticuloendothelial system were thought to be the causes of the decline in VPRC (Alsaad, 2009).

Table 1. Haematological parameters of control and *Anaplasma* infected groups

Sl. no.	Variable	Mean \pm SE		t- value	p-value
		Infected group	Control group		
1.	Total leukocyte ($\times 10^3/\mu\text{L}$)	7.444 \pm 0.486	6.566 \pm 1.268	0.595 ^{ns}	0.55
2.	Total erythrocyte ($\times 10^6/\mu\text{L}$)	14.136 \pm 0.590	13.741 \pm 0.771	0.227 ^{ns}	0.82
3.	Haemoglobin(g/dL)	8.58 \pm 0.330	10 \pm 0.428	1.462*	<0.03
4.	MCV (fl)	16.022 \pm 0.662	17.616 \pm 1.101	0.814 ^{ns}	0.41
5.	MCH (pg)	6.150 \pm 0.209	7.383 \pm 0.506	1.945*	<0.04
6.	MCHC (g/dl)	39.276 \pm 1.370	42.100 \pm 1.617	0.702 ^{ns}	0.48
7.	VPRC (%)	23.106 \pm 1.267	24.066 \pm 1.828	0.257 ^{ns}	0.79
8.	PLT ($\times 10^3/\mu\text{L}$)	318.08 \pm 39.633	652.833 \pm 117.509	2.758*	<0.01

* - Significant (P < 0.05), ns - Non significant

Table 2. Comparative efficacy in terms of recovery of goats suffering from anaplasmosis after six and fourteen days treatment with different

Group	Drug and Duration of therapy	Dose and Route	No of animals with clinical recovery and blood smear clearance of <i>Anaplasma</i> spp	Percentage of improvement (%)
I.	Imidocarb dipropionate (Weekly once for two weeks)	5mg/kg body weight I/M	4	50
II.	Long-acting enrofloxacin (Two doses three days interval)	7.5mg/kg body weight I/M	5	62.5
III.	Long-acting oxytetracycline (Twice in three-day interval)	20 mg/kg body weight I/M	8	100

The result of treatment trials is given in Table 2. As all the animals in group III completely recovered after six days of therapy, it was revealed that oxytetracycline treatments were more effective against *Anaplasma* infection in goats at a dose rate of 20 mg per kg body weight I/M. Ali *et al.* (2014) used oxytetracycline (20 mg per kg body weight day) against *A. ovis* infection in small ruminants and showed complete recovery after the 10th day of treatment. A dose rate of 7.5 mg per kg BW I/M of enrofloxacin was found to be less effective as 62.5 per cent of the animals recovered after six days of treatment. But, Singh *et al.* (2014) observed that long-acting enrofloxacin at 7.5 mg per kg body weight in a two-dose therapy was effective compared to oxytetracycline in cattle due to the high plasma concentration of the drug achieved in a short period of time. However, Honey (2018) reported that 100 per cent of goats with anaplasmosis recovered after receiving the same drug. Imidocarb dipropionate at a dose rate of 5 mg body weight I/M was the least effective, since only 50 per cent of the animals showed a recovery on fourteenth day after the treatment. But, Nitture *et al.* (2020) reported a single dose of imidocarb dipropionate administered deep intramuscularly at a rate of 5 mg per kg of body weight resulted in complete recovery by the seventh day with 100 per cent efficacy rate. Taking into consideration the clearance of organisms by blood smear examination and improvement of clinical signs, long-acting oxytetracycline would be considered a more effective drug than long-acting enrofloxacin and imidocarb dipropionate as reported by Atif *et al.* (2012). The efficacies of three treatments were statistically non-significant.

Summary

Anaplasmosis is a vector-borne infectious disease. Animals affected with anaplasmosis showed clinical signs like anaemia, lymph node enlargement and anorexia. Accurate therapeutic management and better diagnosis of anaplasmosis through haematological analysis are crucial. Haematological analysis revealed normocytic hypochromic anaemia with thrombocytopenia. Oxytetracycline was found to be a better

therapeutic option than enrofloxacin and Imidocarb dipropionate.

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Conflict of interest

There were no conflicts of interest reported by the authors.

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