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## Haematobiochemical changes in subclinical hemoprotozoan infections in Bovine

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**Abstract**

Haemoparasites pose a great threat in dairy industry as they cause mortality in cattle in severe parasitemia. Subclinical hemoparasitic infections which are less severe are also of concern as they cause markedly impair the health and production performance of cattle. Hence a study was undertaken to understand the health impact of subclinical hemoparasitic infections in cattle by haematological and biochemical analysis. Haematological study revealed anaemia and monocytosis. Serum biochemical analysis revealed hypoproteinemia and hypergammaglobulinemia.

**Keywords:** Bovine, haemoprotozoans, *Babesia* spp, *Anaplasma* spp, haemoglobulinaemia hypoalbuminemia

**Introduction**

Haemoprotozoan diseases cause devastating losses to the livestock industry and pose major constraints to the dairy industry throughout the world [1, 2]. Recovered animals further remain as carriers with subclinical infection creating a potential source of infection to healthy susceptible population. Such carrier animals will not exhibit clinical symptoms until there is immune suppression due to physiological or pathological reasons.

Paul *et al.* (2016) [3] studied the haematological parameters of slaughtered trade cattle in Maiduguri, Nigeria and found that all the haematological parameters were within range of normal values except a significant difference ( $p < 0.05$ ) in mean Packed Cell Volume (PCV) and total White Blood Cell (WBC) counts between infected and uninfected slaughtered cattle. Hence it was concluded that haemoparasites may be associated with changes in PCV and WBC count. Olayemi and Oyewale (2002) [4] reported that the presence of blood parasites renders the RBC to be more susceptible to osmotic lysis resulting in lowered PCV values. Hence the present study was chosen to assess the haematobiochemical variations during subclinical haemoprotozoan infections in cattle in an organised farm at Vithura, Thiruvananthapuram.

Geographically, the chosen farm at Vithura is at close proximity with forest area and hence tick infestation and haemoprotozoan infections due to heavy tick infestation is a great menace to cattle in and around Vithura. Along with identifying the cattle suffering in subclinical phase of hemoparasitic infections a detailed study on haematological and serum biochemical parameters of the identified carrier animals was done in parallel. The analysis would help to analyse the health status of cattle under subclinical condition of hemoprotozoan infection by evaluating the alterations in haematology, liver function and kidney function of such animals.

**Materials and Methods****Study area and Study population**

The present study was carried out in a cattle farm at Vithura in Thiruvananthapuram, Kerala. The cattle which appeared clinically normal with no clinical signs hinting hemoprotozoan infection were included for the study.

**Collection of samples**

About 5 ml of blood was collected from the jugular vein into two vacutainer tubes; one with EDTA and the other with clot activator. The blood collected in clot activators were kept at room temperature for one hour and then centrifuged at 1000rpm for 10 min. The serum at the top of the tube was pipetted out into serum vials and stored at -20 °C until analysis. Blood smears were prepared with blood from peripheral vein.

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### Analysis of haematological parameters

The haematological parameters of the blood sample was analysed with automatic haematology analyser (HORIBA).

### Analysis of serum biochemical parameters

Liver and kidney function test were performed with the serum samples using spectrophotometer (ERBA). The parameters serum bilirubin, AST, Blood Urea Nitrogen (BUN), Urea, Creatinine, Total Protein, albumin and Globulin were included for the study.

## Results and Discussion

### Haematological analysis

Of the eight haematology parameters analysed (Hb, PCV, RBC count, WBC count, differential count, MCV, MCHC and MCH), cattle found positive for hemoparasites by ELISA revealed that Haemoglobin level was below normal (<8gm%) in 26% of *Babesia* seropositive animals in 26% of *Anaplasma* seropositive animals and in 29% of animals seropositive for *Babesia* and *Anaplasma*. As the haemoglobin concentration was below normal, MCHC was also below normal in 32%, 31% and 32% of animals seropositive for *Babesia*, *Anaplasma* and both respectively. The data on haematological evaluation is given in Table 1.

Haematological analysis of cattle found positive for hemoparasites by blood smear examination revealed that out

of the 24 animals with *Babesia* organism in blood smear, 8 (33%) animals had low haemoglobin concentration. The percentage of haemoglobulinaemia was 18% (5 out of 28) for animals with *Anaplasma* organisms in blood smear. All the animals with both *Anaplasma* and *Babesia* in blood smear had haemoglobin level below normal. Out of the 24 animals with *Babesia* organism in blood smear, 7 (30%) animals had monocytosis. 46% (13 out of 28) of animals with *Anaplasma* organisms in blood smear had monocytosis. All the animals with both *Anaplasma* and *Babesia* in blood smear had monocytosis.

Decrease in TEC, Hb, PCV and MCV and increase in MCH and MCHC in animals clinically and subclinically infected with *Babesia* was reported by Sharma *et al.* (2016) [5]. However, MCHC was observed to be lower than normal level in seropositive animals in this study. Paul *et al.* (2016) [3a] and Kamani *et al.* (2010) [6] also reported a difference in PCV between cattle infected with hemoparasites and uninfected cattle. They reported an increase in the WBC count in cattle infected with hemoparasites. The anaemia in subclinical infections could be due to lyses of erythrocytes by parasites [7], indiscriminate phagocytosis of infected and non-infected erythrocytes by activated macrophages system [8], suppression of erythropoietic activity of bone marrow [9] and antigen antibody mechanism [10].

**Table 1:** Haematological evaluation of cows seropositive for haemoprotozoans

Sl. No.	Parameters		<i>Babesia</i> seropositive (out of 38)	<i>Anaplasma</i> seropositive (out of 42)	Positive for both (out of 31)	Parameter range
1	Haemoglobin		10 (26%)	11(26%)	9(29%)	Below normal
			28	30	22	8-15gm%
			0	0	0	Above normal
2	PCV		0	0	0	Below normal
			38	38	38	24-46%
			0	0	0	Above normal
3	RBC		0	0	0	Below normal
			38	42	31	5-10 x10 <sup>6</sup> /ul
			0	0	0	Above normal
4	WBC		1	1	1	Below normal
			33	38	27	4-12 x10 <sup>3</sup> /ul
			5(13%)	3(7%)	3(10%)	Above normal
5	Differential count (DC)	Neutrophil	27(71%)	29(69%)	24(77%)	Below normal
			9	10	5	45-64%
			2	3	2	Above normal
		Lymphocyte	11(29%)	14(33%)	10(32%)	Below normal
			27	28	21	45-75%
			0	0	0	Above normal
		Eosinophils	38	42	31	Normal
			0	0	0	>20%
		Monocytes	26	27	20	Normal
12(32%)	15(36%)		11(36%)	>8%		
6	MCV		0	0	0	Below normal
			38	42	31	40-60 fl
			0	0	0	Above normal
7	MCHC		12 (32%)	13(31%)	10(32%)	Below normal
			26	29	21	30-36 g/dl
			0	0	0	Above normal
8	MCH		38	0	0	Below normal
				42	31	11-17pg
				0	0	Above normal

### Serum biochemical analysis

On analyzing the serum biochemical parameters significant variations from normal values of serum total protein and globulin content. Changes were not observed in other

biochemical parameters under study. The data on evaluation of serum biochemical parameters is given in Table 2. Sharma *et al.* (2016) [5a] reported that there was no significant variation in BUN, Creatinine, SGPT, SGOT, total protein and

globulin in animals with subclinical *Babesia* infection. Serum biochemical analysis revealed that twelve (50%) out of 24 animals with *Babesia* organisms in blood smear and 11 (39%) out of 28 of animals with *Anaplasma* organisms in blood smear had hypoproteinaemia. Also all the animals (2 out of 2) with *Anaplasma* and *Babesia* organisms in blood smear had hypoproteinaemia. Nine (32%) out of 28 of animals with *Anaplasma* organisms in blood smear had hypoproteinaemia. Also all the animals with *Anaplasma* and

*Babesia* organisms in blood smear had hyperglobulinaemia. However, only one out of 24 animals with *Babesia* organism in blood smear had hyperglobulinaemia.

Serum biochemical analysis revealed that Total protein was below normal in 32% of *Babesia* seropositive and 24% of *Anaplasma* seropositive cases. Globulin content was high in 40% of *Babesia* seropositive, 36% of *Anaplasma* seropositive animals and 39% of animals seropositive for both.

**Table 2:** Serum biochemical evaluation of animals seropositive for haemoproteozoans

Sl. No.	Normal value	<i>Babesia</i> seropositive (out of 38)	<i>Anaplasma</i> seropositive (out of 42)	Positive for both (out of 31)	Range of parameter	Normal range
1	BUN (mg/dL)	0	0	0	<10	10-25
		38	42	31	10-25	
		0	0	0	>25	
2	Creatinine (mg/dL)	0	0	0	<0.5	0.5-2.2
		38	42	31	0.5-2.2	
		0	0	0	>2.2	
3	Total Protein (g/dL)	12 (32%)	10(24%)	0	<6.7	6.7-7.5
		22	26	27	6.7-7.5	
		4 (11%)	6 (14%)	4(3%)	>7.5	
4	Albumin (g/dL)	0	0	0	<3.4	3.4-4
		38	42	31	3.4-4	
		0	0	0	>4	
5	Globulin (g/dL)	0	0	0	<3	3-3.5
		23	27	19	3-3.5	
		15 (40%)	15(36%)	12(39%)	>3.5	
6	AST (U/L)	4 (11%)	8 (19%)	5(16%)	<60	60-125
		31	32	24	60-125	
		3	2	2	>125	
7	Bilirubin (mg/dL)	38	41	31	0-1.6	0-1.6
		0	0	0	>1.6	

## Conclusion

The study revealed that cattle in subclinical hemoproteozoan infections had anaemic changes along with monocytosis in haematological analysis. Biochemical analysis revealed hypoproteinemia despite the fact that animals didn't evince any clinical signs during subclinical hemoparasitic infections.

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