Journal of Animal Research: v.7 n.5, p. 857-863. October 2017

DOI: 10.5958/2277-940X.2017.00131.0

Clinico-haematological Profile and Therapeutic Management of Acute Babesiosis in Sheep and Goats

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Received: 06 May, 2017 **Revised:** 28 July, 2017 **Accepted:** 02 Aug., 2017

ABSTRACT

Small ruminants were presented for treatment with the complaint of anorexia, general weakness and lethargy. The common clinical signs included emaciation, suspended rumination, tachycardia, anaemic mucous membranes and prolonged capillary refill time (CRT). *Babesia ovis* and *B. motasi* were identified on microscopic examination of the peripheral blood smears. Severe anaemia was confirmed on haematological evaluation. The animals were given diminazene aceturate, oxytetracycline dihydrate, hematinic, rumenotoric and dextrose-electrolyte. Fresh blood transfusion was additionally performed in two animals. Out of six, five animals survived and one died on second day of treatment. Occurrence of severe acute babesiosis in sheep and goats of Kashmir was thus reported for the first time. Standard treatment protocol showed encouraging results for this disease. However, animals in terminal stage with extremely low PCV may not survive even after blood transfusion. Veterinarians need to be watchful of the vector borne diseases that may now spread beyond the known areas due to global warming and climate change.

Keywords: Babesiosis, blood-transfusion, diminazene, oxytetracycline, goats, sheep

Babesia spp. is a diverse group of tick-borne, obligate, intra-erythrocytic apicomplexan parasites infecting a wide range of vertebrate host. The sporozoites are inoculated by the ticks into the blood stream of domestic and wild animals during blood sucking (Radostits *et al*., 2007). The disease Babesiosis results in a heavy economic loss to the small ruminant industry particularly in the tropical and subtropical countries (Smith and Sherman, 2009). At least four *Babesia* species; *B. ovis*, *B. motasi*, *B. foliate* and *B. crassa* are involved (Razmi *et al*., 2003; Uilenberg, 2006). The former two only are pathogenic (Uilenberg, 2006). *Babesia ovis* is smaller in size (1.0-1.5 µm diameter), widely spread and the clinical features due to its infection highly variable. The classic presentation is a febrile syndrome along with anaemia and haemoglobinuria (Sevinc *et al*., 2007). *B. motasi* is moderately virulent. Diagnosis of *Babesiosis* is based on microscopic examination of Giemsa-stained blood smears and also the typical symptoms (Bose *et al*., 1995). Without treatment many animals develop shock, renal failure and death, however, a few of them may survive after a long convalescent period (Schetters *et al*., 2009).

In Kashmir valley with a typical temperate climate, the tick population over the animal surface shows increase during spring and summer months and the number may persist even up to autumn. Although the presence of Babesia organisms in sheep and goats from Kashmir valley has been reported earlier (Shaw 1989; Rather *et al*., 2015) but the clinical picture in animals with acute Babesiosis and their treatment are discussed for the first time in this paper.

MATERIALS AND METHODS

Disease history

The present study was conducted for clinical babesiosis in small ruminants. Three sheep and three goats were taken for this study. History revealed that animals refuse

to take feeds and fodders, showing general weakness and lethargy from last few days. Animals did not respond to the previous treatment with broad spectrum antibiotics, antipyretics and rumenotorics administered by local field vets.

Clinical observations and diagnosis

On clinical examination, the most common signs noticed were emaciation, suspended rumination, tachycardia, anaemic mucous membranes and elevated capillary refill time (CRT). Auscultation of cardiac area revealed feeble sound in one animal one, but louder in the remaining animals. Lung sounds were normal on auscultation over the chest area in all the cases except one, which had moist rales. Details of the individual animals have been depicted in Table 1 and Fig. 1-3.

Whole blood (2 ml) was collected from jugular vein of all the animals into vials containing ethylene diamine tetra-acetic acid (EDTA) @ 1.5 mg/ml. PCV, Hb, TEC, TLC, DLC and erythrocyte indices (MCV, MCH and MCHC) were determined using the standard methods (Schalm *et al*., 1975). The values obtained and their mean have been presented in Table 2 and Fig. 4-8. Both thin and thick blood smears were prepared from peripheral blood (ear tip) and stained with Giemsa stain (Adams *et al*., 1977). The slides

Table 1: Signalment and clinical signs in sheep and goats with acute Babesiosis

Signalment	Animal numbers (●= Present)						
	1	**2**	**3**	**4**	**5**	**6**	**(%) or Mean**
Species (Sheep-S, Goat-G)	G	G	G	S	S	S	-
Age (years)	4	3	4	2	3	4	3.33
Sex (Male-M, Female-F)	F	F	F	F	F	M	-
Pregnancy	-	-	-	●	●	-	(2/6, 33.33%)
Recent lambing	●	●	●	-	-	-	(3/6, 50.00%)
Clinical signs							
Ticks present on the body	-	●	-	-	-	●	(2/6, 33.33%)
Dull and depressed	-	●	●	●	●	●	(5/6, 83.33%)
Nasal discharge	-	-	-	●	-	-	(1/6, 16.67%)
Coughing	-	-	-	-	●	-	(1/6, 16.67%)
Severely ill	●	●	●	●	-	●	(5/6, 83.33%)
Comatose	●	-	-	-	-	-	(1/6, 16.67%)
Suspended rumination	●	●	●	●	●	●	(6/6, 100%)
Anorexia	●	●	●	●	●	●	(6/6, 100%)
Emaciation	●	●	●	●	-	●	(5/6, 83.33%)
Watery blood	●	●	●	●	-	●	(5/6, 83.33%)
Anaemic/white mucous membranes	●	●	●	●	-	●	(5/6, 83.33%)
Icteric mucous membranes	-	-	-	-	●	-	(1/6, 16.67%)
CRT (sec.)	10	5	5	7	2	10	6.50
Coffee coloured urine	-	●	●	●	-	●	(4/6, 66.67%)
Yellow coloured urine	-	-	-	-	●	-	(1/6, 16.67%)
Diarrhoea	-	-	●	-	-	-	(1/6, 16.67%)
Dehydration (mild +, moderate ++, severe +++, Shock ++++)	++++	++	++	++	+	+++	-
Rumen motility (/2 min.)	0	0	0	1	0	0	0.17
Body temperature (^{O}F)	100.6	105.6	106.0	102.0	104.0	100.2	103.07
Respiratory rate (/min.)	32	28	32	18	64	36	35
Hear rate (/min.)	130	145	115	135	96	120	123.50
Water hummer pulse	-	●	●	●	-	●	(4/6, 66.67%)
Previous treatment	●	●	●	●	●	●	(6/6, 100%)

Fig. 1: Ticks inside ear pinna in a goat

Fig. 2: Goat evacuating coiled pasty faeces

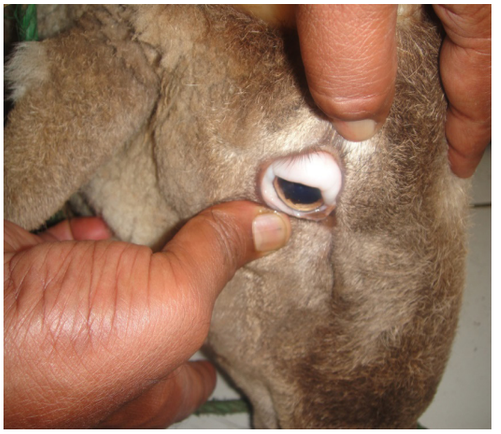

Fig. 3: White (highly anaemic) conjunctiva in a ram

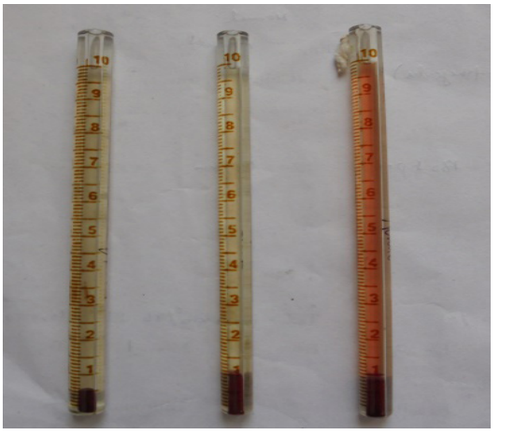

Fig. 4: Extremely low PCV (6%, 10% and 9% from left to right) in three goats and sanguineous (right)

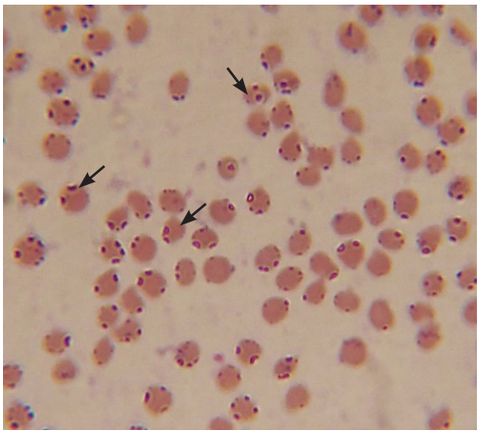

Fig. 5: Microphotograph of blood smear showing *B. ovis* in a goat, Giemsa stain; 100X objective

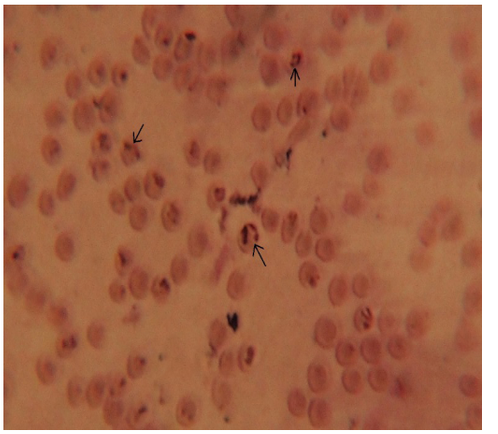

Fig. 6: Microphotograph of blood smear showing *B. motasi* in a goat, Giemsa stain; 100X objective

Table 2: Haematological parameters in sheep and goats with acute Babesiosis

Haemogram	Unit	Cases affected with Babesiosis						Mean
		Goats			Sheep			
		1	2	3	4	5	6	
HB	g/dl	1.80	3.00	3.40	3.00	10.00	2.00	3.87
PCV	%	6.00	9.00	10.00	10.00	36.00	6.00	12.83
TEC	10^6/µl	1.10	1.75	2.00	2.10	6.20	1.20	2.39
MCV	fL	54.55	51.43	50.00	47.62	58.06	50.00	51.94
MCH	pg	16.36	17.14	17.00	14.29	16.13	16.67	16.26
MCHC	%	30.00	33.33	34.00	30.00	27.78	33.33	31.41
TLC	10^3/µl	12.60	9.30	11.60	11.50	13.20	8.20	11.07
Neutrophil	%	67	80	76	89	75	60	74.50
Lymphocytes	%	28	14	18	8	20	32	20.00
Monocytes	%	2	4	2	3	2	4	2.83
Eosinophil	%	3	2	4	0	3	4	2.67
Basophil	%	0	0	0	0	0	0	0.00

were examined under oil immersion objective (100X) of the light microscope for morphological identification of the parasites within the RBCs (Nawathe *et al*., 1995).

Therapeutic regimen

All sheep and goats included in the study were treated with diminazene aceturate (Inj. Berenil RTU, MSD) @ 3.5 mg/kg, deep IM, OD for two consecutive days,, oxytetracycline dehydrate (Inj. Vetocycline DS, Vetoquinol) @ 10 mg/kg, IM, OD for 3 days, hematinic (Inj. Feritas, Intas Pharmaceuticals) @ 1 ml/50 kg, IM, twice weekly for 2 weeks, rumenotoric (Liq. Brotone, Virbac) 15 ml, orally, OD for 10 days and dextrose-electrolyte combination (Inj. Rintose, Vetoquinol) @ 5 ml/kg, IV, OD for 2 days. Fresh blood transfusion was additionally performed in two animals; one goat and one sheep @ 20 ml/kg (Fig. 9 & 10).

RESULTS AND DISCUSSION

Babesia ovis and *B. motasi* were identified on microscopic examination of peripheral blood smears in small ruminants included in this study. The smaller round to oval, marginally located piroplasms inside the erythrocytes designated as *Babesia ovis* (Fig. 5 & 7) were found in two goats and two sheep. In the remaining two animals, single and double pyriform *B. motasi* (Fig. 6 & 8) were identified. The identification of the piroplasms was done as per the standard criteria described by Smith and Sherman (2009). Several studies have reported *B. ovis* and *B. motasi* as the main causes of babesiosis in sheep and goats (Razmi *et al*., 2003). The transmission of *Babesia* parasites is mostly through the bite of infected ticks during blood sucking. The merozoites are introduced; they invade host erythrocytes, reproduce asexually and form a pair of trophozoites. The trophozoites are released. They re-invade other red blood cells and lead to intravascular haemolysis and anaemia. Iatrogenic transmission with repeated use of hypodermic needle without sterilization in hospitals or during mass vaccination may also take place. The main consequence of the disease was haemolytic anaemia (Habibi *et al*., 2004; Sevinc *et al*., 2007) results from mechanical damage (Callow and Pepper, 1974), autoimmune phenomena (Argon, 1976), increased host erythrocyte permeability (Alkhalil *et al*., 2007) and erythrophagocytosis by activated macrophage (Saleh, 2009).

Both *B. ovis* and *B. motasi* have similar life cycles and produce similar disease. However, those affecting small ruminants are comparatively less pathogenic than their bovine counterparts (Cebra and Cebra, 2012). Although goats are considered more resistant and do not develop severe parasitemia and clinical signs (Cebra and Cebra,

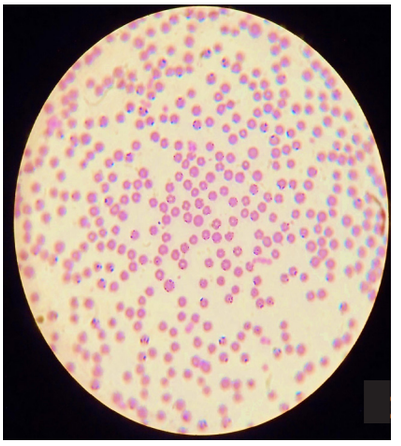

Fig. 7: Microphotograph of blood smear showing *B. ovis* in a sheep, Giemsa stain; 100X objective

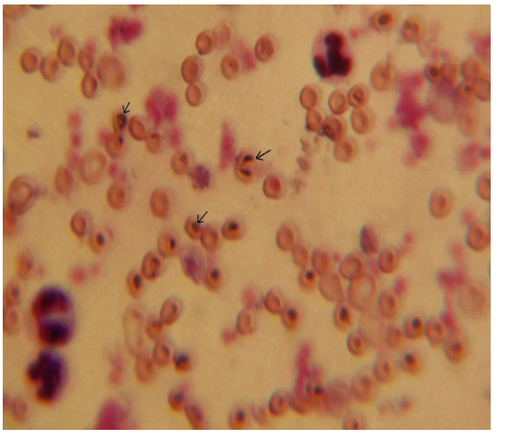

Fig. 8: Microphotograph of blood smear showing *B. motasi* in a sheep, Giemsa stain; 100X objective

Fig. 9: Blood transfusion in a goat

Fig. 10: Blood transfusion in a ram

2012). However, in this study, severe anaemia was noticed in both sheep and goats. Friedhoff (1988) stated that anaemia becomes more prominent in sheep than in goats and that *B. ovis* is the most pathogenic *Babesia* spp. in sheep. The pathogenicity of *B. motasi* is not high as they are moderately virulent (Soulsby, 1982).

The clinical signs observed in sheep and goats of this study were similar to those reported earlier (Radostits *et al*., 2007; Woldehiwet, 2008). Distress may exacerbate the signs (Cebra and Cebra, 2012). In our animals conditions like extreme season, advanced pregnancy and parturition might have contributed. Presence of haemoglobinuria in these animals is highly suggestive of intravascular haemolysis. Red tinged plasma noticed in one animal (Fig. 4) also indicates intravascular haemolysis.

In the small ruminants of the present study, high counts of nucleated erythrocytes could be due to hypoglycaemia. The parasites consume blood glucose (Cebra and Cebra, 2012). Presence of Howell-Jolly bodies, anisocytosis and pallor of RBCs observed in most of these cases represent severe anaemia. Critically low level of Hb, PCV and TEC indicate intravascular haemolysis. Macrocytosis is more likely to occur in response to haemolytic anaemia than to haemorrhage (Schalm *et al*., 1975). Increased MCH content could be attributed to high reticulocyte count. A false increase in MCH may occur due to free haemoglobin

in the plasma (Schalm *et al*., 1975). An elevated TLC due to relative increase in the neutrophil count represents immune response. In the present study *Rhipicephalus* and *Haemaphysalis* ticks were identified. They were responsible for the transmission of *B. ovis* and *B. motasi*.

All the animals in this study were treated with a standard protocol. Two animals showing severe anaemia were also provided supportive blood transfusion. Simultaneous parenteral therapy with diminazene aceturate and oxytetracycline along with supportive therapy is the treatment of choice for small ruminants with acute babesiosis (Ijaz *et al*., 2013). The peripheral blood smear examination was negative for *Babesia* piroplasms in all the animals one week later. Most of our sheep and goats showed marked clinical improvement and their haematological values also followed similar trend. However, one critically ill goat with extreme anaemia died on second day despite blood transfusion. According to Radostits *et al*. (2007) renal failure develops in the terminal stage of babesiosis may be the cause of death.

CONCLUSION

Acute Babesiosis unknown till date in sheep and goats reared in Kashmir valley has emerged as a new severe threat to both sheep and goats. The condition needs to be considered in the differential diagnosis of diseases presented with symptoms resembling it. Standard complete treatment protocol shows encouraging results. In advance stage of the disease animals with extremely low PCV may not survive even after blood transfusion. Veterinarians need to be watchful of the vector borne diseases that may now spread beyond the known areas due to global warming and climate change.

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