

Some Biochemical and Haematological Parameters of Sheep Infected with *Babesia* species

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SUMMARY

Babesia species produce hemolysis of erythrocytes leading to the anemia (It has been suggested that intra-erythrocytic parasites such as *Babesia* and *Plasmodium* produce their hemolytic effects by increasing lipid peroxidation. The levels of trace elements, minerals and vitamins are in normal range in healthy animals. However, their levels decrease significantly in illness and malnutrition. Therefore, this study was carried out to determine some biochemical and haematological parameters of sheep infected with babesiosis. Thirty animals, which have typical symptoms of babesiosis such as fever, anemia, haemoglobinuria and icterus were chosen for this study. Blood samples of all animals were taken from the jugular vein for biochemical and haematological analysis. Serum Fe, Cu, Co, Vitamins C and E, and glutathione (GSH) were measured in a spectrophotometer. Erythrocyte production in the bone marrow increases to compensate the decreased erythrocyte level. This leads to a decreased serum level of Fe, Cu, and Co, which are necessary for the erythrocyte production. Blood parasites produce oxidative stress and lipid peroxidation by destructing the erythrocytes. Lipid peroxidation leads to decreased activity of antioxidant systems. In the present study, it was found that GSH level decreased in infected animals. This result is consistent with the results of other researchers who showed a decrease in GSH level in different parasitic infections. Decrease in GSH level might be due to the use of GSH to protect the erythrocyte damage. It was also found that Fe, Co, Cu, and Vitamins C and E levels decreased in infected animals. After the treatment with babesin, all altered parameters of infected animals were normalized. It was concluded that babesiosis causes anemia, lipid peroxidation, oxidative stress and decreased levels of Fe, Cu, Co, Vitamins C and E, and GSH in sheep. However, Babesin treatment normalizes all these parameters in infected animals.

Key words: Babesiosis, sheep, haemoglobin, haematocrit, erythrocyte, GSH, Fe, Cu, Co, Vitamin C, Vitamin E

Babesia Türleri ile Enfekte Koyunlarda Bazı Biyokimyasal ve Kan Parametreleri

ÖZET

Babesia ve bazı *Plasmodium* türleri eritrositler içerisinde gelişerek çoğalır ve eritrosit yıkımı ile lipid peroksidasyonuna neden olur. Bununla beraber hastalığa bağlı olarak kandaki bazı önemli minerallerin ve vitaminlerin kan seviyesinde azalmalara yol açarlar. Bu çalışmada sağlıklı 10 koyun ile babesiosis'li 20 koyundan kan alınarak eritrosit, hematokrit, hemoglobin, GSH, Fe, Cu, Co, Vit. C, Vit. E değerleri ölçülerek karşılaştırıldı. Daha sonra hasta hayvanlar tedavi edildi ve aynı parametreler yeniden ölçülerek elde edilen sonuçlar karşılaştırıldı. Sonuç olarak sağlıklı gruba göre hasta hayvanlarda eritrosit, hematokrit, hemoglobin, GSH, Fe, Cu, Co, Vit. C değerlerinde önemli oranlarda düşük olduğu tespit edildi.

Anahtar kelimeler: Babesiosis, koyun, hematokrit, eritrosit, hemoglobin, GSH, Fe, Cu, Co, Vitamin C, Vitamin E

INTRODUCTION

Babesiosis is a blood disease, which is caused by the *Babesia ovis* and *Babesia motasi* species in sheep. These species are transmitted by various tick species belonging to the *Ixodidae* family. *Babesia* species produce hemolysis of erythrocytes leading to the anemia (5,7). It has been suggested that intra-erythrocytic parasites such as *Babesia* and *Plasmodium* produce their hemolytic effects by increasing lipid peroxidation (9,11). Parasiter invasions demolish haematopoiesis and its cause anemia. Occured anemia can cause decreased the levels of blood Fe, Co, Cu. Bound to occurred anemia, the values of erythrocyte, haematocrite and haemoglobin decrease in the blood (8,21).

Anti-oxidant vitamins such as E, C and A protect the cells from damage against free oxygen radicals generated as a result of parasitizes (6,14). Vitamins A, C, E, thiamin, riboflavin, panthotenic acid, biotin and folic acid have also a protective role on the liver (18)

The levels of trace elements, minerals and vitamins are in normal range in healthy animals. However, their levels decrease significantly in illness and malnutrition. Therefore, this study was carried out to determine some biochemical and haematological parameters of sheep infected with *Babesia* species.

MATERIALS and METHODS

Thirty animals, which have typical symptoms of babesiosis such as fever, anemia, haemoglobinuria and icterus were chosen for this study. Blood smears were prepared from the ear tips of sheep for the diagnosis of babesiosis. After the microscopic examination twenty of thirty animals were found to be infected with *Babesia* species.

Blood samples of all animals were taken from the jugular vein for biochemical and haematological analysis. Serum Fe, Cu, Co, Vitamins C and E, and glutathione

(GSH) were measured in a spectrophotometer (Perkin Emer-Lambda 1A UV) (2,3,4,13,16,17)

Red blood cell (RBC) count, haemoglobin (Hb) and Packet cell volume (PCV) were determined in a cell counter (20).

After this procedure, animals with babesiosis were treated with subcutan injection of 1 ml/50 kg Babenil (Dif Sanofi Doğu ilaç AŞ) for 15 days. After the treatment, blood samples were taken from the treated animals for the

determination of same parameters. Data were expressed as mean with standard error (SE) and compared by using student's *t* test.

RESULTS

Some biochemical and haematological parameters of infected and un-infected animals are seen in table 1.

Table 1. Some biochemical and haematological parameters of infected and un-infected animals

Parameters	Healthy group n=10				<i>Babesiosis</i> group n= 20					
	Reference Range	Min	Max	X+SE	PRETREATMENT			POSTTREATMENT		
					Min	Max	X+SE	Min	Max	X +SE
RBC ($10^6/\text{mm}^3$)	8-16	9	15	12.3	4	9	8.3	9	14	12.2
PVC (%)	24-50	34	46	42.4	22	32	29.4	36	40	38.2
Hb(gr/100ml)	8-16	11	16	13.3	6	9	7.4	9	13	11.2
GSH (mg/dl)	25.39	21.54	28.54	26.45	13.11	16.20	15.20	19.15	23.11	22.13
Fe (mg/dl)	166-222	170.2	394.8	254.6	64.6	188.4	126.8	106.0	284.4	188
Cu (mg/dl)	58-160	116.8	164.2	192.6	34.2	134.4	116.6	110.4	166.4	136.8
Co (mg/dl)	62.5-240	88.6	254.4	184.6	42.4	126.4	58.4	92.2	230.6	168.6
Vit. C (mg/dl)	1.30	0.96	1.69	1.56	0.64	1.18	1.14	0.98	1.54	1.32
Vit.E (mg/dl)	0.17	0.15	0.19	0.19	0.11	0.14	0.13	0.18	0.19	0.18

a= ($P < 0.001$), b= ($P < 0.005$) Reference range (1,16)

DISCUSSIONS

Babesia species produce haemolysis of erythrocytes leading to the anemia (5,7). Erythrocyte production in the bone marrow increases to compensate the decreased erythrocyte level. This leads to a decreased serum level of Fe, Cu, and Co, which are necessary for the erythrocyte production. Blood parasites produce oxidative stress and lipid peroxidation by destructing the erythrocytes. Lipid peroxidation leads to decreased activity of antioxidant systems (10,15,19). In the present study, it was found that GSH level decreased in infected animals. This result is consistent with the results of other researchers who showed a decrease in GSH level in different parasitic infections (9,12). Decrease in GSH level might be due to the use of GSH to protect the erythrocyte damage. It was also found that Fe, Co, Cu, and Vitamins C and E levels decreased in infected animals. When healthy group compared with ill group in Table 1; the values of RBC, PVC and Hb are found decreased in ill group. Besides after treatment this values are found like healthy group. This results consistent with other researchers, who says bound to blood parasites occurred anemia cause reduced RBC, PVC and Hb (8,21).

After the treatment with Babenil, all altered parameters of infected animals were normalized. There was due to the normal erythrocyte production and decreased lipid peroxidation. It was concluded that *babesiosis* causes anemia, lipid peroxidation, oxidative stress and decreased levels of Fe, Cu, Co, Vitamins C and E, and GSH in sheep. However, Babenil treatment normalizes all these parameters in infected animals.

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