

Alterations in Haematological and Biochemical Parameters in Morkaraman Sheep with Natural *Psoroptes ovis* Infestation

Gürbüz GÖKÇE¹  Şemistan KIZILTEPE²

¹ Kafkas University, Veterinary Faculty, Department of Internal Medicine, TR-36100 Paşaçayır, Kars - TURKEY

² Kars Food, Agriculture and Livestock Directorate, TR-36100 Kars - TURKEY

Makale Kodu (Article Code): KVFD-2013-9200

Summary

This study was carried out to determine possible alterations in some haematological and biochemical parameters in Morkaraman sheep naturally infested with *Psoroptes ovis*. For this purpose 22 sheep infested naturally with *P. ovis* and 10 clinically healthy sheep (control) were used. Serum total protein and globulin values were found to be high in sheep with *Psoroptes ovis* compared to control group while serum albumin value was low. Low blood haemoglobin concentration, low blood total Leukocyte (WBC), erythrocyte (RBC), lymphocyte, neutrophile and monocyte and high eosinophil numbers were detected in sheep infested with *Psoroptes ovis* compared to control group. The results of this study, therefore, show that Psoroptic mange causes decrease in serum total albumin, increase in protein and globulin concentrations and decrease in total RBC, WBC, neutrophile numbers, increase in eosinophile numbers, decrease in haemoglobin concentration in Morkaraman sheep.

Keywords: Morkaraman Sheep, *P. ovis*, Haematology, Biochemistry

Morkaraman Koyunlarda Doğal *Psoroptes Ovis* Enfestasyonunda Hematolojik ve Biyokimyasal Değişiklikler

Özet

Bu çalışma *Psoroptes ovis* ile doğal olarak enfeste morkaraman koyunlarda bazı hematolojik ve biyokimyasal parametrelerdeki olası değişiklikleri saptamak amacıyla yapıldı. Bu amaçla *P. ovis* ile doğal olarak enfeste 22 koyun ve klinik olarak sağlıklı 10 koyun (kontrol) kullanıldı. *Psoroptes ovis* ile enfeste koyunlarda, kontrol grubuna göre serum total protein ve globulin değerleri önemli derecede yüksek bulunurken, serum albumin konsantrasyonu önemli derecede düşüktü. *Psoroptes ovis* ile enfeste koyunlarda kontrol grubuna göre, önemli derecede düşük hemoglobin konsantrasyonu, düşük total lökosit (WBC), eritrosit (RBC), lenfosit, nötrofil ve monosit değerleri saptandı. Kontrol grubuna göre, *Psoroptes ovis* ile enfeste koyunlarda euzinofil sayıları daha yüksek bulundu. Bu çalışmanın sonuçları, psoroptik uyuzun Morkaraman koyunlarda total serum protein ve globulin konsantrasyonunda artış, albumin konsantrasyonunda azalış ile kanda WBC, RBC, nötrofil ve lenfosit sayılarında azalma, hemoglobin konsantrasyonunda azalma, euzinofil sayısında artışa neden olduğunu göstermektedir.

Anahtar sözcükler: Morkaraman Koyun, *P. ovis*, Hematoloji, Biyokimya

INTRODUCTION

Psoroptic scabies, caused by *psoroptes ovis*, is distributed world-wide. It is characterised chronic dermatitis, intense pruritis, rump, papules, crusts, excoriation and lichenification in sheep [1,2]. The economic impact include weight loss [3], hair and skin damage, decreased milk production, lower conception rates, alteration of energy metabolism, poor lamb growth and increased susceptibility to the other disease and death [1,2,4,5]. Severe bacterial infections are involved

commonly in severe cases. However, clinical signs of psoroptic mange in sheep are similar to other scabies like sarcoptic and chorioptic mange. Therefore, clinical signs are not sufficient for its diagnosis and differentiation from other manges. It is essential that confirmatory diagnosis of *P. ovis* is needed to be made by microscopically.

In addition to dermatological and behavioural changes, systemic effects (haematological and biochemical changes)



İletişim (Correspondence)



+90 474 2426836/5238



dr-gkce@hotmail.com

occurred due to lesions in cattle and sheep infested with *P. ovis* [4,6-10]. These systemic effects are neutrophilia, lymphopenia, eosinophilia, reduce haemoglobin concentration and hypoproteinemia [11]. Systemic effects of *P. ovis* infestations are commonly reversed with appropriate treatment. The effects of *P. ovis* on haematological and biochemical constituents of cattle were well-studied [7-10]. But few studies have been reported on the effects of *psoroptes ovis* regarding biochemical and haematological changes in some breeds of sheep [4,11]. However, to the best of author knowledge, no report has been published up to date on the effects of *P. ovis* on the subject of haematological and biochemical parameters in Morkaraman sheep.

Therefore, the present study was conducted to determine the haematological and the biochemical changes in Morkaraman breed sheep naturally infested with *Psoroptes ovis*.

MATERIAL and METHODS

Animals

A total of 32 Morkaraman sheep, aged between 1-3 years, were used in this study. Twenty-two of these animals were infested with *P. ovis* naturally and 10 clinically healthy Morkaraman sheep (parasite free) control animals were used in this study.

Clinic Examinations

Routine clinical examination was carried out and body temperature, heart and respiratory rate were recorded for each animal.

Parasitological Examination

For parasitological examination, Scales from peripheral active lesions were scraped with a scalpel until the skin bleeds slightly. The material was then placed on a slide, treated with a 10% solution of potassium hydroxide and then gently warmed until the crusts were softened. It was then covered with thin layer of a cover-slip. Microscopic examination was then carried out under low light power (about 100 diameters) with diaphragm closed down.

Haematology

Peripheral blood samples were collected in dipotassium ethylenediaminetetraacetic acid (EDTA)- coated evacuated tubes and used to count total white blood cell (WBC), total red blood cell (RBC) numbers and measure packed cell volume and haemoglobin concentration (Hb). Differential leucocyte numbers and other hematological analyses were performed manually as described previously [12].

Biochemistry

Serum samples, collected from each animal, were used

to determine the concentrations of serum total protein (TP), albumin, creatinine and activities of serum aspartate amino transferase (AST), alanine aminotransferase (ALT) and concentrations of creatinine by using commercial kits by an auto analyser. The concentrations of globulin were calculated by subtracting the albumin concentration from the concentration of total protein.

Statistical Analyses

All the values were expressed as the mean and standard deviation (Mean \pm SD). Student's t-test was used to analyse the significance of the difference between the groups.

RESULTS

Clinical Findings

Common clinical signs in sheep were scratching, biting and licking at their own backs or flanks, pruritis and serous exudation and scab formation.

Parasitological Findings

P. ovis was detected with microscopical examination of scales taking from peripheral active lesions. Parasitological agents, which were found coincident with the morphological characteristics of *P. ovis* in microscopic examination of scales from peripheral active lesions in all sick animals. Morphological characteristics of *P. ovis* in microscopic examination were evaluated as described elsewhere [12].

Haematological Findings

There was a significant reduction in the number of RBCs ($P < 0.05$), total leucocytes, lymphocytes, neutrophils, monocytes ($P < 0.05$) and Hb concentration and increase eosinophil values ($P < 0.01$) sheep infested with *P. ovis* compared to control group (Table 1).

Biochemical Findings

There were significant increases in the concentrations of total protein ($P < 0.01$), total globulin ($P < 0.01$) and decreases in albumin concentrations ($P < 0.01$) in psoroptic mange group comparing to control group. There are no significant differences in the concentrations of AST and ALT in psoroptic mange group compared to those of control group (Table 2).

DISCUSSION

Sheep scab is caused by the non-burrowing mite; *Psoroptes* is the most important ectoparasite of sheep. It is very active in the keratin layer and causes direct damage to the skin result in chronic disease. The disease causes skin lesions, wool loss, reduction feed intake, suppression

Table 1. Haematological values (Mean±SD) of Morkaraman sheep infested with *P. ovis* and control group

Tablo 1. *P. ovis* ile enfeste ve kontrol grubundaki koyunlarda Hematolojik değerler (Mean±SD)

Parameters	Psoroptic Sheep (n=22) (Mean±SD)	Control (n=10) (Mean±SD)
WBC (10 ⁹ /l)	7.6±1.2*	10.7±0.4
Lymphocytes (10 ⁹ /l)	4.1±0.6*	6.2±0.5
Neutrophils (10 ⁹ /l)	1.2±0.3*	3.4±0.1
Monocytes (10 ⁹ /l)	0.4±0.1**	0.5±0.2
Eosinophils (10 ⁹ /l)	2.3±0.1**	0.6±0.1
RBC (10 ¹² /l)	4.6±0.2*	6.3±0.3
Hb (g/dl)	7.6±0.7**	10.8±0.4
PCV %	21±0.3	35±0.1

Significant differences in values between in sheep infested with *P. ovis* and control group were indicated * P<0.05, ** P<0.01

Table 2. Biochemical values (mean±SD) of Morkaraman sheep infested with *P. ovis* and control group

Tablo 2. *P. ovis* ile enfeste ve kontrol grubundaki koyunlarda biyokimyasal değerler (Mean±SD)

Parameters	Psoroptic Sheep (n=22) (Mean±SD)	Control (n=10) (Mean±SD)
TP (g/l)	78.1±0.5**	67.3±0.5
Albumin (g/l)	19.4±0.2**	35.8±0.5
Globulin (g/l)	55.6±0.2**	32.2±0.2
Albumin/Globulin	0.34±0.01	1.09±0.04
AST (IU)	67.1±1.8	69.5±0.7
ALT (IU)	15.5±0.9	17.4±2.5
Creatinine (µmol/l)	97.2±0.1	97.6±0.3

Significant differences in values between in sheep infested with *P. ovis* and Control Group were indicated ** P<0.01

in weight gains in young animals and weight loss in adults. The majority of sheep become infected while mites are active. These infected sheep become reservoir and may introduce the mite to the healthy flocks during summer and autumn, and initiate outbreaks when the cold season arrives [1,2]. Therefore, differential diagnosis and its adequate treatment need to be done to prevent economical loss, new outbreaks and to apply control programmes in infected sheep. In this study, common clinical findings in sheep diagnosed *P. ovis* were scratching, biting and licking at their own backs or flanks, pruritis and serous exudation and scab formation. These findings are in agreement previous reports [2,13,14]. On the other hand common clinical signs reported herein are not definitive and differential diagnosis. Therefore, certain diagnosis has been made by a microscopic examination in this study.

Haematological findings showed significant decrease in total WBC, monocytes, lymphocytes and neutrophile numbers in Psoroptic sheep as compared to control group. Decreased lymphocyte numbers should be attributed to stress leukogram during the course of the disease [11]. A decrease in total WBC, neutrophils and monocyte

numbers in the peripheral blood may be closely associated with mite activity and caused by efflux of these cells from circulating granulocyte pool [4]. Furthermore, the decrease of lymphocyte numbers may be occurring due to stress which is occurring during dermatitis [4,15]. Decrease in this blood cells increase susceptibility to various viral and bacterial diseases, which may cause economical losses. Mean eosinophil numbers in psoroptic sheep were higher than control group. An increase in the numbers of circulating eosinophil has associated with parasitic infestations [16,17]. This could be due to allergic reactions caused by mite or their products of inflammatory reactions and due to activation of immune system. This supports the hypothesis that coetaneous response to mites is at least a part of hypersensitivity reaction [11].

P. ovis on cattle ingest erythrocytes [18]. But this does not occur in sheep [19]. Therefore, in this study, decreased RBC counts were suggested that it could result from a suppression of erythropoiesis and chronic dermal inflammation [11]. The Hb values were also significantly lower in infested animals, which because of significantly low erythrocyte counts, hametocyte and erythrocyte fragility or due to toxemia caused by mites [17]. The decrease in packed cell volume in infested sheep may be contributed by the decrease in cellular components in blood due to infestation of mange mites. This may cause anaemia in psoroptic sheep.

Serum total protein and globulin concentrations were higher in psoroptic sheep than control group. Serum albumin concentration was lower in psoroptic group than control group. Decreased serum albumin concentrations may have been due to anorexia reported herein which is a feature of severe scab [4,11]. Furthermore, decline in serum albumin concentration in sheep infested with *P. ovis* may attribute to leakage of serum proteins through the more permeable hypertrophic or damaged epithelium of the skin [4]. An increase in serum globulin concentration can indicate the development of an antibody response to the present antigen [4,11,13]. Furthermore, in the study, increase the total protein, and the decrease in A/G ratio were likely due to increased globulin concentration that is associated with chronic inflammatory reaction in the skin. No significant difference found in AST, ALT activities and creatine concentrations values between two groups. This shows that *P. ovis* infestation has no effect on the liver and kidney functions in sheep. On the contrary, Fisher and Crookshang [8], reported that kidney and liver may be damaged and serum concentrations of cholesterol may be decreased during course of *P. ovis* infestation in calves.

In conclusion, the result of this study indicates that psoroptic mange may cause increase in serum total protein and globulin, decrease in albumin concentrations, decrease in total RBC, WBC, neutrophil numbers, increase in eusinophil numbers, decrease in haemoglobin concentration in Morkaraman sheep.

REFERENCES

1. Radostits OM, Gay CC, Hinchcliff KW, Constable PD: Veterinary Medicine. 10th ed., pp.1610-1611, W.B. Saunders, London, 2006.
2. Arslan M, Gökçe G: Morkaraman koyunlarda doğal psoroptik uyuz (*Psoroptes ovis*)'un doramectin ile sağaltımı. *Kafkas Univ Vet Fak Derg*, 1 (1-2): 75-77, 1995.
3. Kirkwood A C: Effects of *Psoroptes ovis* on weight of sheep. *Vet Rec*, 107, 469-470, 1980.
4. Meintjes T, Fourie LJ, Horak IG: Effects of the scab mite *Psoroptes ovis* on the haematology and live mass of Merino and Dorper sheep. *Onderstepoort J Vet Res*, 69, 285-293, 2002.
5. Cole NA, Guillot FS: Influence of *Psoroptes ovis* on the energy metabolism of heifer calves. *Vet Parasito*, 23, 285-295, 1987.
6. Losson BJ, Lonneux FJ, Lekimme M: The pathology of psoroptes ovis infestation in cattle with special emphasis on breed difference. *Vet Parasitol*, 83 (3): 219-229, 1999.
7. Losson B, Detry-Pouplard M, Pouplard L: Haematological and immunological response of unrestrained cattle to *Psoroptes ovis*, the sheep scap mite. *Res Vet Sci*, 44, 197-201, 1988.
8. Fisher WF, Crookshank HR: Effects of *Psoroptes ovis* (Acarina: Psoroptidae) on certain biochemical constituents of cattle serum. *Vet Parasitol*, 11, 241-251, 1982.
9. Stromberg PC, Fisher WF, Guillot FS, Pruett JH, Price RE, Gren RA: Systemic pathologic responses in experimental *Psoroptes ovis* infestation of Hereford calves. *Am J Vet Res*, 47, 1326-1331, 1986.
10. Stromberg PC, Guillot F: Bone marrow response in cattle with chronic dermatitis caused by *Psoroptes ovis*. *Vet Pathol*, 24, 365-370, 1987.
11. O'Brien DJ, Robinson AB, Gray J, Sand O'Reilly PF: Haematology and blood chemistry during the course of psoroptis scabies in sheep. *Vet Res Commun*, 19, 39-48 1995.
12. Coles EH: Veterinary Clinical Pathology. p.15. WB Saunders, Philadelphia, 1980.
13. van den Broek, AH, Huntley JF, MacHell J, Taylor M, Bates P, Groves B, Miller HR: Cutaneous and systemic responses during primary and challenge infestations of sheep with the sheep scab mite, *Psoroptes ovis*. *Parasit Immunol*, 22 (8): 407-414, 2000.
14. Sargison ND, Scott PR, Pirie RS: Effect of an outbreak of sheep scab (*Psoroptes ovis*) during mid-pregnancy on ewe body condition and lamb birthweight. *Vet Rec*, 25, 136, 287-289, 1995.
15. Stromberg PC, Guillot FS: Hematology in the regressive phase of bovine psoroptis scabies. *Vet Pathol*, 24, 371-377, 1987.
16. Nelson WA, Bell JF, Clifford CM, Keirains JE: Interaction of ectoparasites and their hosts. *J Med Entomol*, 13, 389-428, 1977.
17. Aatish HU, Sindhu Z, Iqbal Z, Jabbar A, Tasawar Z: Prevalance of sheep mange in district Dera Ghazi Khan (Pakistan) and associated haematological/biochemical disturbances. *Int J Agricult Biol*, 9, 917-920, 2007.
18. Wright FC, Deloach JR: Feeding of *Psoroptes ovis* (Acari: Psoroptidae). *J Med Entomol*, 18, 349-350, 1981.
19. Rafferty DE, Gray JS: The feeding behavior of *Psoroptes* spp. mites on rabbits and sheep. *J Parasitol*, 73, 901-906, 1987.