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

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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 eusinophile 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


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

INTRODUCTION

Psoroptic scabies, caused by *psoroptes ovis*, is distributed world-wide. It is characterised chronic dermatitis, intense pruritus, rump, papules, crusts, excoriation and lichenification in sheep. 1-2. The economic impact include weight loss, hair and skin damage, decreased milk production, lower conception rates, alteration of energy metabolism, poor lamb growth and increased suscibility to the other disease and death. 1-2,4,8. 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)
occurring due to lesions in cattle and sheep infested with *P. ovis* [4-10]. These systemic effects are neutrophilia, lymphopenia, eosinophilia, reduce haemoglobin concentration and hypopoteinemia [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 aspartatae amino transpherase (AST), alanine aminotranspherase (ALT) and concentrations of creatinine by using commerical kits by an auto analyser. The concentrations of globulin were calculated by subtrahing the albumin concentration from the concentration of total protein.

**Statistical Analyses**

All the values were expressed as the mean and standard deviation (Mean ± 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 liching at their own backs or flanks, pruritis and serous exudation and scab formation.

**Parasitological Findings**

*P. ovis* was detected with microscobical 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 evaluation were examined 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
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, hematocryte and erythrocyte fragility or due to toxaemia 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 [4,13]. 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 [40], 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 eosinophil numbers, decrease in haemoglobin concentration in Morkaraman sheep.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Psoroptic Sheep (n=22) (Mean±SD)</th>
<th>Control (n=10) (Mean±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC (10⁹/l)</td>
<td>7.6±1.2*</td>
<td>10.7±0.4</td>
</tr>
<tr>
<td>Lymphocytes (10⁹/l)</td>
<td>4.1±0.6*</td>
<td>6.2±0.5</td>
</tr>
<tr>
<td>Neutrophils (10⁹/l)</td>
<td>1.2±0.3*</td>
<td>3.4±0.1</td>
</tr>
<tr>
<td>Monocytes (10⁹/l)</td>
<td>0.4±0.1**</td>
<td>0.5±0.2</td>
</tr>
<tr>
<td>Eosinophils (10⁹/l)</td>
<td>2.3±0.1**</td>
<td>0.6±0.1</td>
</tr>
<tr>
<td>RBC (10⁹/l)</td>
<td>4.6±0.2*</td>
<td>6.3±0.3</td>
</tr>
<tr>
<td>Hb (g/dl)</td>
<td>7.6±0.7**</td>
<td>10.8±0.4</td>
</tr>
<tr>
<td>PCV %</td>
<td>21±0.3</td>
<td>35±0.1</td>
</tr>
</tbody>
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Significant differences in values between in sheep infested with *P. ovis* and control group were indicated *P<0.05, **P<0.01

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<tr>
<td>TP (g/l)</td>
<td>78.1±0.5**</td>
<td>67.3±0.5</td>
</tr>
<tr>
<td>Albumin (g/l)</td>
<td>19.4±0.2**</td>
<td>35.8±0.5</td>
</tr>
<tr>
<td>Globulin (g/l)</td>
<td>55.6±0.2**</td>
<td>32.3±0.2</td>
</tr>
<tr>
<td>Albumin/Globulin</td>
<td>0.34±0.01</td>
<td>1.09±0.04</td>
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<tr>
<td>AST (IU)</td>
<td>67.1±1.8</td>
<td>69.5±0.7</td>
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<tr>
<td>ALT (IU)</td>
<td>15.5±1.9</td>
<td>17.4±2.5</td>
</tr>
<tr>
<td>Creatinine (µmol/l)</td>
<td>97.2±0.1</td>
<td>97.6±0.3</td>
</tr>
</tbody>
</table>

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


