



DETERMINATION OF SOME BLOOD PARAMETERS AND MACRO ELEMENTS IN COCCIDIOSIS AFFECTED AKKARAMAN KANGAL LAMBS



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ABSTRACT

Aims of this study, were comparisons of some blood parameters which includes leucocyte count (WBC), erythrocyte count (RBC), Hemoglobin (Hg), Hematocrit level (HCT), Platelets count (PLT) and mean volume of erythrocytes (MCV) and some macro element levels which includes iron (Fe), calcium (Ca), phosphor (P) and magnesium (Mg) in both naturally infected and healthy Akkaraman Kangal lambs. Total of 48 Akkaraman Kangal lambs aged between 3 to 8 weeks were used in study in which 24 of them were clinically healthy and other 24 were coccidiosis infected. Blood and fecal samples were collected. Hematologic levels were determined by hemocytometer and macro elements were determined by biochemical analyzer. Eimeria spp. oocytes were observed in all fecal samples from coccidiosis affected lambs during parasitology examination. Decreases in levels of erythrocyte ($P<0.001$), hemoglobin ($P<0.001$), thrombocyte ($P<0.001$), hematocrit ($P<0.001$) and iron ($P<0.001$), phosphor ($P<0.01$) and increase in level of mean volume of erythrocytes ($P<0.001$) were all found statistically significant. No intergroup significant difference was found for levels of leucocyte and serum calcium and magnesium ($P>0.05$). In conclusion, it was thought that differences in some blood parameters and serum macro element levels should be considered in diarrhea cases.

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Contribution/ Originality

This study is the first study in which have investigated coccidiosis is infected Kangal Akkaraman Lambs.

1. INTRODUCTION

Coccidiosis is a protozoal infection which is most prominent in broiler breeding. Nevertheless, coccidiosis can also be seen in various animals such as calves, lambs and yearlings. It is a contiguous acute or chronic infection characterized by enteritis [1-4]. Even though coccidiosis is commonly seen on various species worldwide, infection is specie specific. Coccidiosis causes anemia, weight loss, maldevelopment and even death in infected species. Both treatment and prevention of infection are quite sumptuous. Therefore it is a critical infection causing severe economic losses in husbandry [5-8].

Diarrhea cases caused by coccidiosis and gastrointestinal helminths can be observed over 3 weeks of age in lambs. Coccidiosis is a protozoal infection caused in lambs by coccidian species of *Eimeria (E.) crandallis*, *E. ovinoidalis* and *E. ahsata* [3, 4]. It is reported that infection is more frequent in lambs aging 3 to 8 weeks. Acute infection is characterized by diarrhea, anorexia, inertia, dehydration and weight loss [4]. Coccidiosis affects ileum, cecum and colon. Petechial bleeding is seen in mild cases, whereas diffuse hemorrhagic bleeding is seen in severe cases in intestines [9].

Elements are essential substances required for growth, development, healthy sustenance and optimum physiology of organisms. Also macro elements such as calcium, magnesium, iron and phosphor are essential elements for the body. (i) Calcium contributes to formation and strengthening of bones and teeth and also regulates nerves and cardiac pulses. It plays an active role in muscular motility, thermal hemostasis and endocrinology. Its deficiency causes rachitism and osteoporosis. (ii) Magnesium stimulates immune system and regulates blood tension. (iii) Iron is a structural part of hemoglobin and enhances responses to weakness and diseases. Its deficiency causes anemia and immunodeficiency. (iv) Phosphor also contributes to formation of bones and teeth and plays active role in catabolism of carbohydrates and lipids and in anabolism of proteins and also in tissue healing. It is also effective in muscular contractions, renal filtrations, cardiac pulsating and impulse transits [10].

It is reported that gastrointestinal symptoms of diarrhea and malabsorption debilitate the absorption of certain macro elements [11]. There are number of studies regarding the differences in blood parameters are caused by coccidiosis and in macro elements are caused by diarrhea [11-14]. It is stated that general clinical gastrointestinal symptoms frequently overlooked in element deficiencies until reaching acute levels [15-18].

Comparisons of some blood parameters and macro element levels from both coccidiosis affected and healthy Akkaraman Kangal lambs were aimed in this study.

2. MATERIALS & METHODS

A total of 48 Akkaraman Kangal lambs aging between 3 to 8 weeks and bred in same conditions in Divriği county of Sivas province in Turkey were used of which 24 of them were clinically healthy and other 24 were coccidiosis affected. Fecal samples were collected on all lambs and *Eimeria* spp. oocytes were investigated on fecal samples using native and flotation methods.

Blood samples of 5 ml were collected from antebrachial cephalic vena of all lambs from into gel coated yellow capped biochemistry and EDTA coated tubes. Blood samples were transferred to laboratory under cold chain immediately. Serum was obtained with centrifugation at 4.000 rpm for 10 min. Obtained serum samples were stored in -20°C until analysis day. Certain hematologic parameters which includes leucocyte counts (WBC), erythrocyte count (RBC), Hemoglobin (Hg), Hematocrit level (HCT), Platelets (PLT) and mean volume of erythrocytes (MCV) were determined using automatic hemocytometer (Hematologic Analyzer System 9000, Serono Diagnostics).

In obtained serums, levels of iron (Fe), calcium (Ca), phosphor (P) and magnesium (Mg) were determined using clinic biochemistry analyzer (Mindray BS200, PRC).

2.1. Statistical Analysis

Normalization test was done for evaluation of obtained data. Independent-Samples t-test was done on all parameters exhibiting normal distribution (MCV, PLT, Fe, Ca and Mg). Mann – Whitney U test was done on parameters do not exhibiting normal distribution in at least one group data (RBC, WBC, Hg, HCT and P). All tests were done using SPSS 15.0 package program for windows software [19].

Ehtical approval for this study was taken from Animal Experiments Local Ethics Committee of Cumhuriyet University (04.08.2016; No. 83).

3. RESULTS

Obtained data of blood parameters including WBC, RBC, Hg, HCT, PLT and MCV and of macro elements levels including Fe, Ca, P and Mg from both coccidiosis affected and healthy Akkaraman Kangal lambs are presented in Table 1. Parameters from independent-samples t-tested were presented as mean \pm standard error of mean ($\bar{X} \pm S\bar{X}$) and Mann – Whitney U tested parameters were presented as median (Table 1).

Decreases in levels of RBC ($P < 0.001$), Hg ($P < 0.001$), HCT ($P < 0.001$), PLT ($P < 0.001$), Fe ($P < 0.001$) and P ($P < 0.01$) and increase in level of MCV ($P < 0.001$) were found statistically significant in coccidiosis affected lambs. No intergroup significant difference was found for levels of WBC and serum Ca and Mg ($P > 0.05$).

Table-1. Some blood parameters and macro element levels from both healthy and coccidiosis affected Akkaraman Kangal lambs.

Parameters	Reference Values*	Groups $\bar{X} \pm S\bar{X}$ median		Significance (P)
		Healthy n=24	Infected n=24	
RBC ($10^{12}/L$)	9-15	9.64	7.13	***
WBC ($10^9/L$)	4-12	6.95	7.15	ns
Hg (g/dL)	9-15	10.01	7.52	***
HCT (%)	27-45	32.48	28.05	***
MCV (fL)	28-40	34.29 \pm 0.20	37.08 \pm 0.35	***
PLT ($10^9/L$)	100-800	633.58 \pm 13.98	485.04 \pm 16.07	***
Fe ($\mu\text{g}/\text{dL}$)		76.13 \pm 0.62	67.81 \pm 1.14	***
Ca (mg/dL)	11.5-13	10.54 \pm 0.23	10.51 \pm 0.24	ns
P (mg/dL)	5.0-7.3	2.65	2.48	**
Mg (mg/dL)	2.2-2.8	5.59 \pm 0.09	5.61 \pm 0.09	ns

L: liter, dL: deciliter, fL: femtoliter, g: gram, pg: picogram

\bar{X} : Mean, $S\bar{X}$: Standart error of mean, ns: non significant ($P > 0.05$), **: $P < 0.01$, ***: $P < 0.001$

* Radostits, et al. [10]; Kramer [20]; Anonymous [21].

4. DISCUSSION

Diarrhea is a frequent symptom on newborn lambs and yearlings which causes maldevelopment and death and also causing severe economic losses due to expensive costs of treatment and prevention. Clinical stages of diarrhea can range from mild cases where no systematic symptoms are evident to severe acute cases with dehydration and electrolyte imbalances which may result in death. Diarrhea prognosis in lambs and yearlings may due to infections from bacteria, viruses, protozoa or parasites. Cryptosporidiosis and coccidiosis are protozoan causes of diarrhea [4, 22].

Some researchers are stating that coccidiosis caused diarrhea in both lambs and yearlings are prominent over 3 weeks of age and frequent in 3 to 12 weeks of age period [3, 4, 22]. Coccidiosis affected lambs in this study were lambs with 3 to 8 weeks of age.

Hemorrhagic diarrhea in lambs is a diagnostic indicator of coccidiosis [3]. Precise diagnosis of coccidiosis can be conducted by observing Eimeria spp. oocysts under light microscope in fecal samples prepared by native or flotation methods [1, 6, 23, 24]. Diagnosis in this study was done by observing Eimeria spp. oocysts under light microscope in fecal samples prepared by native and flotation methods.

It is reported that there is a moderate difference is evident in blood parameters in cases of coccidiosis [13, 23, 25]. Rakhshandehroo, et al. [13] are reported that hemoglobin levels were decreased in coccidiosis affected yearlings. Mimioğlu, et al. [25] are stated that coccidiosis would alter hematology outlook and decrease both erythrocyte and hemoglobin levels.

Özer, et al. [26] are reported that coccidiosis affected lambs were having anemia and decreased erythrocyte counts. Aumont, et al. [27] are reported that coccidiosis is decreasing hematocrit levels in affected goats. Stockdale, et al. [14] are reported that levels of erythrocyte, hemoglobin and hematocrit were decreased in calves having

coccidiosis. Turgut [24] is reported that thrombocyte counts are decreasing in protozoan infections due to increases in thrombocyte breakdown and utilization. In accordance with previous studies [14, 24-27] levels of erythrocyte, hemoglobin, hematocrit and thrombocyte were found decreased in coccidiosis affected lambs compared to healthy lambs in our study. Such decreases in blood parameters were thought to be caused by petechial hemorrhages in intestines. Rakhshandehroo, et al. [13] are reported that leucocyte counts are showing difference in coccidiosis affected goats in accordance with infection period. However, in this study no significant difference was observed intergroup for leucocyte counts. In a study conducted on calves having diarrhea and healthy calves [28] no significant intergroup difference was observed for serum calcium and magnesium levels. Similarly, in our study there was no significant intergroup difference in lambs having coccidiosis and healthy lambs for serum Ca and Mg levels ($P > 0.05$).

Bangoura and Dausgies [29] are reported that MCV levels were increasing in coccidiosis. In this study, MCV increase was observed in lambs having coccidiosis which might due to blood and electrolyte losses from intestinal bleeding. Certain studies [30, 31] are reported that serum levels of Fe and Zn would decrease following tissue injuries caused by infectious, immunogenic, traumatic, parasitic or other agents. Yoshimi [32] is reported that Fe deficiency was evident in calves following diarrhea. Kraft and Dürr [33] also Turgut [24] are pointing out that decreased serum Fe and P levels in diarrheic calves would be caused by malabsorption and anorexia. Similarly, decreases in Fe and P levels were observed in our study. It is thought that the decrease in serum Fe levels was caused by intestinal degeneration and in serum P levels was caused by malabsorption and anorexia.

5. CONCLUSION

As a conclusion, differences in some blood parameters and macro element serum levels of coccidiosis affected Akkaraman Kangal lambs were determined compared to healthy lambs. We are proposing that such differences are valuable for consideration in diarrhea cases.

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