

Plasma Ascorbic Acid Levels in Lambs With Coccidiosis

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Abstract: This study evaluated 30 lambs, 20 naturally infected with coccidia oocysts (infected group) and 10 healthy lambs (control group). Blood samples were collected from both groups for evaluation of ascorbic acid values in plasma and blood cells analysis. Mean plasma ascorbic acid values in the infected group were lower than those in the control group (0.76 ± 0.19 and 2.00 ± 0.58 mg/dl, respectively). A decrease in erythrocyte, haemoglobin and haematocrit values and an increase in leukocyte values were determined.

Key Words: Coccidiosis, lamb, ascorbic acid, haematology

Koksidiozlu Kuzularda Plazma Askorbik Asit Düzeyleri

Özet: Bu çalışmada, 20'si Eimeria oosistleri ile doğal olarak enfekte, ve 10 adet sağlıklı olmak üzere toplam 30 kuzu değerlendirildi. Plazma askorbik asit düzeyleri ve hematolojik analizleri için her iki gruptan kan örnekleri alındı. Hastalıklı gruptaki kuzuların plazma askorbik asit değerleri sağlıklı kuzuların plazma askorbik asit değerlerinin altında bulundu(sırasıyla $0,76 \pm 0,19$ ve $2,00 \pm 0,58$ mg/dl).Yapılan hematolojik analizler sonucunda hematokrit değer, eritrosit sayısı ve hemoglobin miktarında düşüş, lökosit sayısında ise artış saptandı.

Anahtar Sözcükler: Koksidiozis, kuzu, askorbik asit, hematoloji

Introduction

Coccidiosis is common in young lambs aged 2-8 weeks. It is becoming increasingly important in sheep production, particularly in intensive production systems (1). Coccidiosis is caused by single-celled parasites (protozoa) called Eimeria, which undergo a simple life cycle in the gut (2). Virtually all sheep flocks are infected with coccidia, but only some lambs develop clinical disease (3). Clinical coccidiosis occurs when damage to the gut is sufficiently severe to cause dysfunction. This normally occurs at the beginning of the parasite's sexual multiplication stage, when parasite numbers reach their peak. The lambs may suffer from dullness, inappetence, diarrhoea, dehydration, weight loss, tenesmus, rectal prolapse and anaemia (1).

It has been shown that animals with protozoa and infectious diseases have lower plasma ascorbic acid concentrations (4,5), and ascorbic acid deficiency can cause diarrhoea and pneumonia (6). Kolb (7) also reported that ascorbic acid concentrations decreased in coccidial infections.

The purpose of this study was to establish the importance of ascorbic acid in coccidial infection.

Materials and Methods

The materials of this study were obtained from a farm in Burdur province. A total of 30 lambs (1-2 months old), 20 lambs with diarrhoea and infected with coccidia oocysts (infected group) and 10 healthy lambs (control

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group), were used. No drugs were applied to either group. General checks were made all of the lambs in the control group before the study and all lambs were identified as healthy according to the blood parameters, body temperature and respiratory rate. Faeces samples of lambs in the control group were coccidian free.

About 5 g of faeces was taken from the gut. Firstly faeces samples were examined directly under the microscope. The oocyst count per gram of faeces was determined using the modified McMaster technique. Sporulation for oocyst identification was carried out in 10 lambs' faecal samples which had oocyst counts of at least 5500 per gram of faeces. Briefly, samples were incubated in 2% potassium dichromate at room temperature for 3-4 days. The sporocysts were concentrated by centrifugal flotation using saturated salt solution. The species were subsequently identified according to the sizes and morphological features of sporocysts.

Jugular blood was collected in EDTA containing a vial of both groups. Plasma of these samples was obtained (Hettich Zentrifugen Universal 30F model centrifuge device) by centrifuging 3000 cycles for 7 min. Plasma ascorbic acid levels were measured on a spectrophotometer (Shimadzu UV-1601 model) as described by Kyaw (8). Haematological analyses were carried out on a cell counter, MS9 (MELET SCHLOESING Laboratoires, France). The results were analysed using SSPS for MS-Windows Release 10.0.

Results

The infected lambs manifested clinical symptoms such as loss of appetite, fever, weakness, weight loss and bloody diarrhoea. Tenesmus and less commonly rectal prolapse were the other clinical findings. There was also

severe anaemia characterised by pale mouth and eye mucosa and dehydration. According to the haematological value, the anaemia was normochromic and normocytic.

In this study, in severe cases it was noted that there was more than one species. The most common types were *Eimeria bakuensis* (*E. ovina*) and *E. ovinoidalis*. At the faecal examination numbers of oocysts varied from 5000 to 10,000/g. Small numbers of *E. parva* oocysts were also observed.

Mean, minimum and maximum plasma ascorbic acid values between the infected and control groups are shown in Table 1. According to the variance analyses, ascorbic acid values between both groups were significantly different ($P < 0.001$).

Table 1. Mean, minimum and maximum plasma ascorbic acid values between the naturally infected and control groups.

Parameter	Infected group (X ± Sx)	Control group (X ± Sx)	P
Ascorbic acid (mg/dl)	0.76 ± 0.19 0.48-1.18	2.00 ± 0.58 1.20-2.80	***

*** P < 0.001

Leukocyte account increased while haemoglobin, erythrocyte and haematocrit values decreased in the infected group (Table 2).

Discussion

Coccidia are protozoa that parasitise the intestinal mucosa of all animal species (9,10). Coccidiosis affects the living host in many ways, depending upon the tissue preference of the particular parasite involved and the number of oocysts in the initial infection (11).

Table 2. Mean blood leukocyte, erythrocyte, haemoglobin and haematocrit values between the naturally infected and control groups.

Parameters	n	Infected group (X ± Sx)	n	Control group (X ± Sx)	P	Normal values in sheep*
WBC (10 ⁹ /l)	20	26.94 ± 4.28	10	12.17 ± 1.47	**	4.0-12.0
RBC (10 ¹² /l)	20	7.47 ± 0.26	10	11.09 ± 0.65	***	9.0-15.0
Hb (g/l)	20	6.82 ± 0.17	10	10.71 ± 0.67	***	9.0-15.0
Hct (%)	20	23.10 ± 0.68	10	31.66 ± 1.60	***	27.0-45.0

* Normal values taken from Radostits et al. (10).

** P < 0.01

*** P < 0.001

In our study, the most common types were *Eimeria bakuensis* (*E.ovina*) and *E. ovinoidalis*. These results are in agreement with other investigations (12).

Ascorbic acid level decreased in infectious diseases because of inappetence and especially decrease intake of proteins. As a result of this, the immune system will be depressed (7). Ascorbic acid deficiency can often result in impaired resistance to infectious organisms (13,14). Increased demands for ascorbic acid occur in acute or chronic disease conditions because of increased tissue utilisation (15). In this study, in the control group mean ascorbic acid was 2.00 ± 0.58 mg/dl and in the infected group it was 0.76 ± 0.19 mg/dl. In the infected group plasma ascorbic acid values were below the normal range. According to the variance analysis, in the infected group ascorbic acid values were significantly lower than those in the control group ($P < 0.001$).

In experimental studies, a decrease in the haematocrit values of animals infected with coccidiosis has been observed (16). In our study, in addition to a decrease in

haematocrit values, haemoglobin values and erythrocyte numbers also decreased, while an increase in leukocytes was observed. A decreased haematocrit value can result from bloody diarrhoea. Decrease haematological values in infected lambs can be attributed to intestinal tissue damage due consequent blood loss caused by endogenous stages of Eimerian parasites (17). Leukocyte levels were very high in lambs with coccidiosis in this study. This was attributed to the severe tissue damage in the intestine and fever. Radostist et al. (10) reported that tissue damage and fever can cause leukocytosis.

In conclusion, because of the low serum vitamin C levels of the animals with coccidiosis, administration of vitamin C was suggested to be useful combined with the classical treatment.

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