Interpretation of Serum 25-Hydroxy Vitamin D3 Concentrations in Sheep with Naturally Occuring Sarcoptic Mange

Abstract

Sarcoptes scabiei is probably the most common mite species in domestic animals. There is lack of evidence showing the current status of vitamin d reserves in sarcoptic mange infested sheep. Therefore the aim of the present study was to analyze serum 25 hydroxy vitamin D3 (25 OH D3) concentration among sheep with scabies. Microscopical examination of deep skin scrapings to those of 28 sheep presenting alopecia, crusting, lichenification and scaling showed presence of sarcoptic mange. Serum 25 OH D3 levels among infested sheep showed a statisticaly significant difference in sheep with sarcoptic mange (group I 25.53±13.30 mg/dl) in contrast to group II (n=14) control sheep (84.70 ± 21.11 mg/dl). In conclusion vitamin d deficiency must be taken into consideration

Key Words: Sheep, Sarcoptic Mange, Vitamin D

Research Article

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Introduction

Small ruminants are well recognized as to modify to unpleasantly rough conditions. Indeed the mounting effects of overcrowding, nutritional deficiency and several diseases might result with economic losses (Tilahun, 1995). Among the diseases of sheep, mange mites are one of the most important economic loss reason in relation to integumentary system and block export due to morphlogical defects (Woldemeskel, 2000). Mange mite infestations are contagious dermatological disease, causing reduced meat quality because of skin damage reflected by pruritus, alopecia, hyperkeratosis with lesions initially located on the head and neck, weight loss, irritation and death in severe cases (Rao and Naidu, 1999). The distribution of mites on affected small ruminants alter according to season (Urquhart et al., 1996) and the vast majority of outbreaks exist in cold months (Neog et al., 1992). Mange mites extend via direct contact among sheep, also in ewe to lamb, during sucking (Schmidt, 1994).

The vast majority of mange infetstation is caused by 4 different types of mites such as sarcoptic, psoroptic, chorioptic and demodectic (Radostits et al., 1994). Among sheep, Sarcoptes spp. is the foremost reason of mange causing dermatitis and primary/secondary skin lesions along with pruritis [sheep lost grazing time and general body condition]. Afterwards vesicles, papules, thickening of the skin and scabs occur (Radostits et al.,1994). Vitamin D levels has not previously been analyzed in sheep with sarcoptic mange, which promptly motivated present authors hypothesizing that vitamin D levels might be altered in this disease. Therefore the purpose of the present study was to detect serum 25 OH D3 levels among infested sheep with sarcoptic mange.

Material and Methods

Twenty eight sheep of both sexes (n=11 female, n=17 male) were presented to Adnan Menderes University, Faculty of Veterinary, Department of Internal Medicine with the history of alopecia, scaling and crusting on both ears and face. On detailed examination the affected area was intensely excoriated [itching, scratching and biting along with self trauma]. Furthermore alopecia, thick brown/whitish scabs and thickened skin were observed. The lesions were evident on the ear, nose and mouth (Figure 1.).

Figure 1: Fascial lesions in naturally infected sheep with S. Scabiei.

Diagnosis of sarcoptic mange was based on a) deep skin scrapings (n=28) were collected from lesional sides (face and ear lesions) in 10 % NaOH, brought to the Department of Internal Medicine, Faculty of Veterinary, Adnan Menderes University and b) by 6 mm skin punch biopsy and c) acetate tape impression for lesional sites not suitable for skin scraping i.e. periocular area for mite examination. Study population enrolled were I. group involved 28 sheep with sarcoptic

mange whereas II. group composed of control animals (n=14) without appearent clinical signs. Serum 25 OH D3 levels were detected by Savant Point of care immunochromatography device (China).

Statistical Analysis

All datas were stated as mean and standard deviation of mean and the normality of data was determined via Komorrov- Simirnov analyses. In an attempt to make comparison, Mann-Whitney U test was performed to determine the differences between infested and healthy groups. p value <0,05 was considered statistically significant and SPSS (22.0 IBM, Chicago) statistical package was performed for all analyses.

Results

Clinical signs

The vast majority of sheep (belonging to 3 different sheep flocks from Eagean region of Turkey, regarding Aydin Municipality), at the age of 2 to 4 years of age, of both sexes (n=15 male, n=13 female), Observed clinical signs, as detected by regular flock visits and field study, of the flocks infested with sarcoptic mite showed exfoliative dermatitis, scaling and crusting along with intense pruritus (n=27), self-trauma (n=13) and loss of wool (n=26). Entire lesions existed in non-woolly skin of the body mainly detected on to the face, similar to what have been described elsewhere (Al-Shebani et al., 2012; Iqbal et al., 2015; Kaufman et al., 2009). Primary/secondary skin lesions (Ural, 2014) detected were as follows; alopecia, erythema, severe crusting near the mouth (lips, nostrils) spreading to other parts of the head, face and ears. Severe cases showed excoriation (i.e. self-trauma due to itching), wool loss, thickened brown scabs and wrinkling of the surrounding skin (Iqbal et al., 2015).

Microscopical examination results

The microscopic examination of skin scrapings revealed S. scabiei mites (in all sheep enrolled) based on its morphological characteristics (Figure 2.) as differentiated by rounded mouth parts, short posterior legs along with the existence of empodial claws and pulvillus on first 2 pairs of legs, occurence of transverse ridges on dorsal surface of the body and finally excluding eyes/stigmata, previously detected by (Wall and Shearer, 2001), and reported similarly to (Murthy et al., 2013).

Figure 2: Affected sheep, lesional site (auricular area) as skin scraping was detected showing characteristical appearence of S. scabiei.

Serum 25 oh d3 levels among infested sheep

Mean ± sd values for serum 25 oh D3 levels among infested sheep were shown in table 1. There was a statisticaly significant difference found in sheep with sarcoptic mange (group I) in contrast to group II control sheep.

Table 1. Mean ± sd values for serum 25(OH)D3 levels among infested sheep

	Sheep with sarcoptic mange (n=28)	Healthy sheep (n=14)
Vitamin D3	25,53 ± 13,30	84,70 ± 21,11
P value	0,000	

Discussion

Given the sarcoptic mange classically associated with nutritional deficiencies (i.e. poor feeding) and overcrowding (Iqbal et al., 2015), similar management problems were observed in 3 different sheep flocks enrolled in the present study. This might be briefly discussed as vitamin d deficiency might play a role within the occurence of sarcoptic mange infestation among sheep. Inflammation take participation in several chronic diseases and questions aroused about the influence of vitamin D deficiency on inflammatory processes (Mangin et al., 2014). Researches found an association between inflammation and low serum 25-hydroxyvitamin D3 [25(OH)D3] (Meckel et al., 2016; de Souza et al., 2016), which might be associated with sarcoptic mite infestation in sheep of this study. In sheep, Sarcoptes scabiei var. ovis is rare and affects only sparsely haired parts of the body such as face and ears (Solusby, 1982; Bates, 2000; Radostits et al., 1994, Wall and Shearer, 2001). The tunneling activities of these mites cause intense itching and scratching leading to the development of sores and scabs. Similarly all enrolled sheep presented crusting and alopecia on facial area.

Vitamin D deficiency has been well recognized to associate with the occurence of several human diseases. However according to the present authors' knowledge currently no available evidence suggested how natural sarcoptic mange infestation directly acts on variation in vitamin D metabolism due to a total lack of studies in sheep. On the other hand some previous studies evalauated vitamin d levels in sheep other than mange infestation. In a prior study 14 sheep with caseous lymphadenitis revealed significantly ($p<0.001$) lower (29.56±0.79) serum 25(OH) levels in contrast to 10 healthy (control group) sheep (with higher levels 41.13±1.20) (Basbug et al., 2014). A prior investigation included rickets in nursing lambs with Vitamin D deficiency as the cause, [as detected by serum vitamin D concentrations between 0.4-30 ng/mL (reference: > 30 ng/mL) (Van Saun, 2004). Another study reported plasma 25(OH)D3 levels, lower in lambs (3.9 5 ±1.4 ug/L) than in ewes (15.7 ±5.9 ug/L) 1, 3 mean + sem, n=8) (Caple et al., 1988). In the present study a significant difference was found among diseased sheep infested with sarcoptic mange (p=0,000).

Inflammation is relied as a contributing factor in the vast majority of chronic disorders. The influence of vitamin D deficiency on inflammation has recently been investigated whereas researches have not demonstrated a causative effect.

Proinflammatory cytokine expression might be a key factor within the pathogenesis of scabies, which could briefly denote inflammation within this infestation. Prior research denoted that IL1β could arouse via integumenter inflammation as a consequence of physical stimuli of the burrowing mites (Portugal et al., 2007). On the other hand immunology of sarcoptic mange infestation still remains unclear. In addition host immune respond in early scabies presented a nonprotective TH2 allergic response, whereas in late scabietic cases a TH1 cell-mediated protective response was involved (Al-Musawi et al., 2014). Vitamin D has been denoted as an immune system regulator (Cantorna 2006). Furthermore 1,25dihydroxycholcecalciferol, a well known active metabolite of vitamin D modulates T-cell mediated immunity (Yang et al., 1993a; Yang et al., 1993b). All those aforementioned contributing factors might be briefly explain the pathogenesis of sarcoptic mange and related vitamin d deficiency observed in the present study.

Regarding different animal species sarcoptic mange (S. scabiei infestation) cause adaptive and/or inflammatory

immune responses following 4 to 6 weeks after acquaintance with mite (Morgan et al., 2013; Cote et al., 2013). The rash and itch in relation with scabies may be characterized by both type I and type IV, immediate and delayed, respectively, hypersensitivity reactions (Sajad et al., 2017). All involved sheep with vitamin deficiency presented severe itching and self trauma in the present study.

In conclusion vitamin D deficiency must be taken into consideration in scabietic sheep. Vitamin D therapy should definitely be added at the correct doses in sheep with scabies.

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Kaynaklar

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