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Comparison of the Effects of Oxytetracycline and Penicillin-Streptomycin in the Treatment of Footrot in Sheep

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Abstract: The purpose of this study is to determine the effects of penicillin+streptomycin (Reptopen-S, Sanofi Doğu İlaç AŞ) and oxytetracycline (Primamycin/LA, Pfizer) in the treatment of footrot in sheep. Footrot is an acute or subacute necrotic infectious disease in sheep. If the treatment is delayed, it can be chronic. The first symptom of the disease is lameness. Ultimately, crevices in the interdigital skin, a bad odor and necrosis are observed. Footrot is among the most serious foot diseases, which causes economic loss in sheep and can be observed in sheep of all ages. In this study it was found that sheep fold and shelter conditions were not suitable for sheep farming and farmers did not pay enough attention to foot diseases. In the treatment of infected sheep in farms, 20 mg kg^{-1} oxytetracycline or 20.000 IU kg^{-1} procaine benzylpenicillin + 20 mg kg^{-1} dihydrostreptomycin was used as i.m. At the end of the treatment it was found that 45% of the sheep in group A, 92.5% of the sheep in group B and 95% of the sheep in group C were treated.

Key words: Sheep, footrot, treatment, oxytetracycline, pencillin-streptomycin

INTRODUCTION

Footrot is a specific, infectious and necrotic inflammation of interdigital skin and corium ungulae, which occurs due to multifactorial factors (İzci, 1993; Koç, 1996; Harwood *et al*., 1997; Thompson *et al*., 1999). Humidity and rainy climate conditions, unsuitable meadows and sheep fold conditions, malnutrition, lack of foot care and traumas are underlying factors in the emergence of footrot. As the cause, it is reported that *Bacteriodes nodosus* and *Fusobacterium necrophorum* has a synergic effect (Egerton *et al*., 1971; Jelinek *et al*., 2001; Piriz and Pobel, 2001). In addition to these, it was stressed that *Clostridium perfingens*, *Streptococcus pyogenes*, *Corynabacterium pyogenes* and *Esherichia coli*'s were also effective (Egerton and Morgan, 1972; Candas and Gorgul, 1983; Yavru *et al*., 1990; Sagliyan and Sindak, 2003; Wassink *et al*., 2003; Sertkaya *et al*., 2004). Failure in horn claw structure is one of the most important causes of foot diseases. The quality of horn claw depends on the dry material amount of keratin and trace mineral levels. In rations, in insufficiency or imbalance of mineral materials, the integrity of interdigital skin is damaged and softening occurs in the horn claw. As a result of this, disease agents easily penetrate into foot tissue and due to continuous stimulation of a germinative layer, an excess amount of horn claw production appears. This situation causes rotting of claw mechanism and results in foot diseases such as refraction and crack in the horn claw, claw deformity and footrot (Kimberling and Ellis, 1990; Alkan and Yavru, 2000; Sagliyan *et al*., 2003; Wassink and Sindak, 2003; Sertkaya *et al*., 2004).

The principal condition in the treatment of feet is meeting hygienic conditions and paying sufficient attention to claw care (Egerton and Parsonson, 1966; Candas and Gorgul, 1983; Brightling, 1988; Parajuli *et al*., 1989; Abbott *et al*., 2003). Secondly, preventive and curative vaccines (Haris, 1968; Grogono-Thomas *et al*., 1994; Ware *et al*., 1994; Jordan *et al*., 1996) and antibiotics should be applied (Piriz and Robel, 2001; Venning *et al*., 1990; Rendell and Callinan, 1997).

Researchers (Haris, 1968; Bulgin *et al*., 1986; Grogono-Thomas *et al*., 1994; Ware *et al*., 1994; Jordan *et al*., 1996) have reported that erythromycin, penicillin, streptomycin and large-spectrum antibiotics were highly effective against *Dichelobacter nodusus* which cause footrot in sheep.

It was reported that footrot was one of the most important infectious diseases in sheep (Demertzis, 1980; Jensen and swift, 1982; Bulgin *et al.,* 1986; Fraser and Atamp, 1987; Belge *et al*., 1996; Grogono-Thomas, 1997; Harwood *et al*., 1997) which causes various economic losses 5-11.6 %, loss of weight and 8-10% fleece loss (Boundy, 1983; Marshall *et al*., 1991; Glynn, 1993; Koç, 1996; Sagliyan, 2003).

The purpose of the study is to determine the etiology of footrot and the detection of the effect of penicillin+ streptomycin and oxytetracycline in its treatment.

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MATERIALS AND METHODS

This study included 1685 sheep with a body weight ranging from 25-65 kg, aged between 3 months and 5 years in 16 different sheep farming enterprises. 985 (58.46%) of these sheep were akkaraman, 576 (34.18%) were morkaraman, 124 (7.36%) were of ivesi type. With 270 (16.02%) of the sheep, footrot was observed. Taking anamnesis from the animal owners, records were kept about the condition of sheep shelters, total animal numbers, body weight of the animals, ages of the animals, economic losses caused by footrot to the enterprise and the attitudes of animal owners against foot diseases.

Total 240 out of 270 animals with footrot were included in the study. These were separated from healthy animals and were kept under control in a separate section. With the aim of determining the effect of penicillin+ streptomycin and oxytetracycline in the treatment under the given conditions, if claw deformations were observed, footrot animals were cured and then sheep were arranged

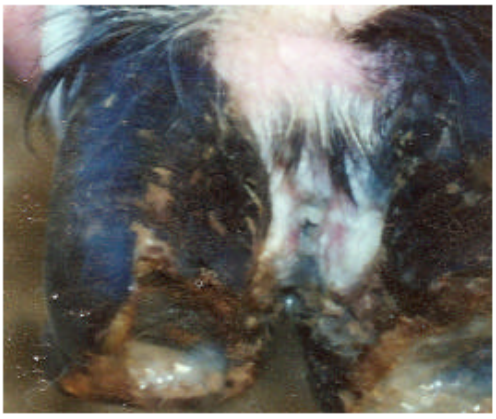

Fig. 1: Limited and mild interdigital dermatitis

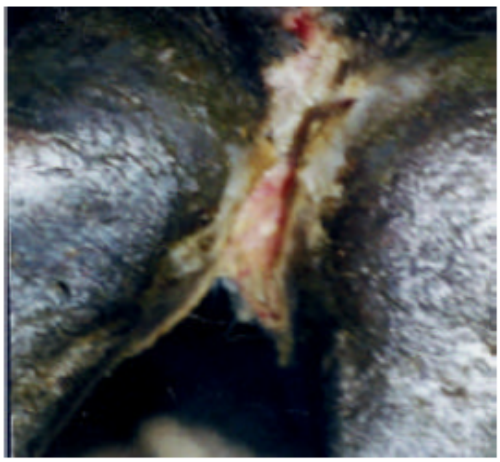

Fig. 2: Expansive and moderate lesions

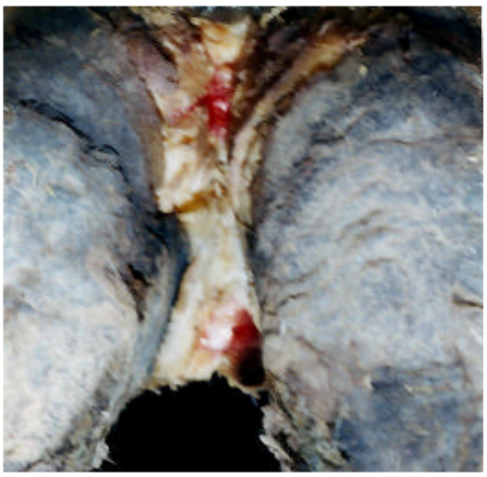

Fig. 3: Severe lesions that spread to the entire heel and sole

in 3 main groups (A, B, C). According to the spread level of footrot, each group was then separated into 3 sub-groups. The first sub-group included limited and mild interdigital dermatitis (Fig. 1), the second sub-group included expansive and moderate lesions (Fig. 2) and the third sub-group included severe lesions that spread to the entire heel and sole (Fig. 3).

The feet of all sick animals in all groups were penetrated into 10% zinc sulfate solution for 15-20 min every other day for two weeks. The animals in groups A (n = 80) were taken as the control group and their feet were penetrated into only 10% zinc sulfate solution. With the sick animals in group B (n = 80) zinc sulfate was applied and for five days 20 mg kg^{-1} oxytetracycline (Primamycine/LA, Pfizer) as i.m was used. In group C, (n = 80) 10% zinc sulfate and 20,000 IU kg^{-1} procaine benzylpenicillin+20 mg kg^{-1} Dihydrostreptomycin (Reptopen-S, Sanofi Doğu İlaç AŞ) was used as i.m for again five days.

With the aim of determining hematological values in the flock with the disease, 20 animals were randomly selected from the healthy and footrot sheep and their blood samples were collected. Hematological values (erythrocyte number, leukocyte number, hemoglobin amount, hematocrit value) were detected using a blood count machine (Caredise, H-2000, USA).

RESULTS

In sheep farming enterprises where the study was carried out (n = 16) a total of 1685 sheep were examined. At 16.02 (n = 270) footrot was detected. 240 of these sheep (128 akkaraman, 65 morkaraman, 47 ivesi) were included in the study.

Table 1: Grouping of footrot sheep applied treatment program and recovery periods

	Main groups								
	A			B			C		
Applied treatment program	10% zinc sulfate			10% zinc sulfate and oxytetracycline			10% zinc sulfate and penicillin+streptomycin		
Sub groups	I	II	III	I	II	III	I	II	III
Number of patients (n)	45	20	15	45	20	15	45	20	15
Number of treated animals (n)/day	26/10	7/20	3/30	43/10	18/14	13/30	44/10	18/20	14/30

Table 2: Blood values obtained from healthy and footrot sheep

	Healthy		Footrot	
Parameters	Lower-upper limit	Average	Lower-upper limit	Average
WBC (10^3 mm^{-3})	5-10	6.41	9-15	14.16
RBC (10^6 mm^{-3})	5-6	5.20	2-5	2.55
Hb (g dL^{-1})	10-13	12.23	6-8	6.57
PCV (%)	29-41	38.41	15-34	17.32

For applying the settled treatment procedure, three main groups (A, B, C) were formed by separating healthy sheep and putting them under control in different sections. According to the severity of the lesions observed in animals of all main groups, three sub-groups were formed. In all sick sheep different degrees of lameness, according to the severity of the lesions were observed. In sheep with limited and mild lesions (sub-group 1) a mild lameness and glow, swelling and a serious flow was observed in the interdigital area. In sheep with expansive and moderate severity lesions (sub-group 2) it was found that lameness was more severe. There was a bad odor and necrosis in the skin between the claws. And in sheep which were included in third sub-group, more severe necrotic lesions had spread over the entire sole and heel and penetrated into deeper tissues were observed. Lameness was observed in all of the animals in this group. It was also observed that, if the lesion was present in one foot, the animal walked on three feet, if the lesion occurred in 2 feet, the animal stood on carpal or tarsal joints. And if footrot was spread on all feet, it was found that the animals tended to lie down all the time, were inactive, had loss of appetite and weight.

It was found that the animals which were separated into three groups (A, B, C) according to localization and severity of lesions responded differently to the treatment. The animals in the first sub-group, where the lesion was limited and mild, gave the quickest response to the treatment. However, animals in the third sub-group, where lesions were expansive and severe, were treated for a longer period (Table 1).

At the end of the study, it was found that 45% of sheep in group A, 92.5% of sheep in group B and 95% of sheep in group C were treated.

It was found that with diseased flocks, hygienic rules were not applied in shelters. It was determined that in sheep fold and shelters, the ground was covered with mud due to dampness and urine. It was found that in all of the enterprises sheep numbers had exceeded capacity. In examinations and anamnesis, it was found that economic losses such as significant loss of weight, decrease in milk production, excluding from sheep farming and decrease in stock weight appeared.

In the analysis of blood collected from healthy and footrot sheep were compared, it was found that leukocyte numbers were higher in footrot sheep than the healthy ones, although erythrocyte, hemoglobin and hematocrit values were lower than the healthy sheep (Table 2).

DISCUSSION

Many researchers report that foot diseases are one of the most important problems of animal farming. It was underlined that, foot diseases cause many important economic losses to sheep farming, such as decrease in lactation period and milk amount, decrease in stock weight, premature births, decrease in fleece amount and quality and death (Jensen *et al*., 1982; Parajuli *et al*., 1989; İzci, 1993; Webb Ware *et al*., 1994; Koç, 1996).

In anamnesis taken from flock owners and in records, it was found that economic losses that support literature results emerged.

Researchers (Boundy, 1983; Bulgin *et al*., 1986; Yavru *et al*., 1990; Harwood *et al*., 1997) report that footrot occurs as a result of multifactorial factors. It was suggested that malnutrition, lack of mineral materials (Ca, Zn, P, Cu, Se, Mg etc) in rations (Kimberling and Ellis, 1990; Glynn, 1993; Alkan *et al*., 2000; Sagliyan, 2003; Sagliyan *et al*., 2003), environmental factors, lack of regular foot and claw care, lack of hygienic rules in shelter and meadows, climatic and seasonal changes, malnutrition, keeping an excess number of sheep in enterprises also had an effect (Demertzis, 1980; Ware *et al*., 1994; Thompson *et al*., 1999; Wassink *et al*., 2003).

It was found in the study that animal keepers did not have enough knowledge about animal nutrition. They especially did not know the importance of mineral substances, did not provide regular foot and claw care in their enterprise, kept animals above the capacity of the enterprises and did not pay attention to hygienic rules in shelters. The farmers should be informed about these issues.

Researchers (Belge *et al*., 1996; Sertkaya and Sindak, 2004) reported that leukocyte levels in footrot sheep were higher than normal values, however, erythrocyte, hemoglobin and hematocrit values were lower than the physiologic limit.

In the study, blood analysis obtained from footrot and healthy sheep provided information supporting the researchers' findings (Belge *et al*., 1996; Sertkaya *et al*., 2004).

Researchers (Egerton and Parsonson, 1966; Haris, 1968; Venning *et al*., 1990; Marshall *et al*., 1991; Jelinek *et al*., 2001; Piriz and Pobel, 2001) report that the best method in the treatment of footrot is the use of prenatal or local antibiotics in addition to bathing the foot with foot antiseptics after removing the necrotic tissues from the claws.

It was also observed that the healing period in groups where a foot bath and antibiotics were used (groups B and C) was shorter than in group A, where only foot antiseptic was used.

Researchers (Egerton and Roberts, 1971; Egerton and Morgan, 1972; Fraser and Atamp, 1987; Brightling, 1988) reported that in the treatment and prevention of footrot, vaccines can be used against *Bacteriodes nodosus*. In the study, no vaccine was applied in footrot sheep for curative and preventive purposes.

Jordan *et al*. (1996) reported that in two sheep farms, which were infected with footrot, they applied 20 mg kg^{-1} oxytetracycline and observed 58 and 92% healing results. They reported that in the farm where they obtained 92% success they kept the infected sheep in a dry and clean section for 24 hours after antibiotic treatment.

Rendell and Callinan (1997) obtained 97.0, 98.4 and 97.5% success levels respectively in three farms where they applied a 10% zinc sulfate foot bath and 20 mg kg^{-1} i.m oxytetracycline on infected sheep. At the first farm, where they used 10 mg kg^{-1} erythromycin they found 93.7% healing; at the second farm they obtained 96.8% healing and at the third farm they obtained 98.7% healing. Ware *et al*. (1994) suggested that they observed 94-97% healing in footrot sheep on which they used oxytetracycline and 88-97% healing in footrot sheep on which they used erythromycin.

In the study, animals with footrot were kept under control in dry, hygienic and separate sections within the limitations of the study. In the group which was treated with 20 mg kg^{-1} i.m oxytetracycline 92.5% healing was observed and in the group which was treated with i.m 20,000 IU kg^{-1} procaine benzylpenicillin + 20 mg kg^{-1} dihydrostreptomycin 95% healing was observed.

Consequently, in the flocks with footrot, infected animals should certainly be separated from healthy ones and should be kept in a dry, hygienic and suitable environment. The claws of sick animals should be cut according to certain rules. The feet should be washed with foot antiseptic (10% zinc sulfate), one of the large spectrum antibiotics (oxytetracycline or penicillin + streptomycin) should be applied to sick animals.

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