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Efficacy of Enrofloxacin in the Treatment of Recurrent Pyoderma in Dogs

B. Sudhakara Reddy[1]*, K. Nalini Kumari[2], V. Vaikunta Rao[3], V.C. Rayulu[4], S. Sivajothi[4]

[1]*Department of Veterinary Medicine, College of Veterinary Science, Sri Venkateswara Veterinary University, Proddatur, Andhra Pradesh, India.*
[2]*Department . of Veterinary Medicine, College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati, Andhra Pradesh, India.*
[3]*Department . of Veterinary Medicine, College of Veterinary Science, Sri Venkateswara Veterinary University,, Gannavaram, Andhra Pradesh, India*
[4]*Department. of Veterinary Parasitology, College of Veterinary Science, Sri Venkateswara Veterinary University, Proddatur, Andhra Pradesh, India*

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Abstract

Dogs with a history of more than three episodes of skin infections in a period of one year were selected for a study on recurrent pyoderma. Oral enrofloxacin along with appropriate simultaneous medication for the underlying associated conditions were chosen as therapy for recurrent pyoderma in dogs. Response to therapy was excellent in all the cases. Improvement was noticed by 12 to 20 days and 20 to 26 days in recurrent superficial and deep pyoderma respectively. Relapse occurred in one dog by 45 days due to re-introduction of allergic food. Enrofloxacin proved to be an effective, safe and convenient antibiotic for the treatment of recurrent pyoderma in dogs.

Keywords: Recurrent Pyoderma; Dogs; Enrofloxacin

Introduction

Staphylococcal pyoderma is a common skin disorder of the dogs. Infections may be superficial, deep, or both. *Staphylococcus intermedius* is the most commonly isolated bacterium. Systemic antibiotic therapy is usually required; commonly recommended antibiotics include B-lactamase-resistant compounds, such as clindamycin, lincomycin, potentiated sulfonamides, amoxicillin clavulanate, cephalosporins, and fluoroquinolones. Most of the staphylococci bacteria cultured from the recurrent pyodermas are susceptible, *in-vitro*, to fluoroquinolones (Scott *et al*., 2001; Reddy *et al*., 2011). Recurrent pyoderma is an important clinical skin problem in dogs and frequently occurs as a result of uncorrected under lying cause(s) or use of inappropriate antibiotics or improper duration of antibiotic therapy (Ihrke, 2005). Fluoroquinolones are broad-spectrum bactericidal antibiotics with a high bioavailability. Though use of enrofloxacin is not unusual in the treatment of first time pyoderma, no in-depth study reports are available regarding its efficacy in cases of recurrent pyoderma in dogs. Effect of enrofloxacin in canine staphylococcal pyoderma was recorded in two decades back in abroad (Paradis *et al*., 1990). But, details regarding the use of enrofloxacin in the treatment of recurrent pyoderma in dogs were lacking in India. This paper reports the efficacy of enrofloxacin in the treatment of recurrent pyoderma in dogs and simultaneous treatment of associate conditions responsible for recurrent pyoderma.

Materials and methods

The present investigation was carried out on the dogs referred to the College Hospital of College of Veterinary Science, Tirupati and presented at major Veterinary Hospitals around Tirupati. Dogs with a history of more than three episodes of skin infec-

*Corresponding author: *B. Sudhakara Reddy*

E-mail address: bhavanamvet@gmail.com

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tions in the past one year were included in the study as also done by Bensignor and Germain (2004). Thorough clinical examination was carried out to identify external parasitic infestation, to note the nature and distribution of lesions besides obtaining good anamnesis. The dogs were also thoroughly examined by glass slide impression smears, tape impression smears, skin scrapings and hair plucks as per the methods described by Curtis (2001), Reddy and Sivajothi (2014) in order to confirm pyoderma and other concurrent dermatoses. Whole blood and serum were also collected for studying haematology and serum biochemistry in order to find out or confirm the associated conditions and (or) underlying factors. Laboratory procedures were analysed according the procedures mentioned in the previous literature (Reddy *et al*., 2014a; 2014b).

All the dogs were treated orally with enrofloxacin at 5 mg/ kg body weight, once daily (Ihrke, 1996) and the antibiotic was continued up to one and two weeks beyond the point of clinical recovery in dogs with recurrent superficial pyoderma and recurrent deep pyoderma respectively. Following therapy, the dogs were monitored clinically at regular intervals i.e. on days 7, 14, 21 and 28 etc. Efficacy of therapy was assessed based on the attainment of clinical normalcy. By assessing the clinical symptoms and lesions, response to therapy was graded as excellent, good, fair and poor (Bloom and Rosser, 2001). Time taken for complete recovery was also noted as per owners' statement in all the dogs. All the dogs were monitored for recurrence of pyoderma for a period of six months after recovery. Supportive therapy was carried out with daily supplementation of a skin tonic i.e. glossy coat at the dose rates suggested by manufactures and bathing was advised twice weekly with benzoyl peroxide (2.5%) shampoo. Demodicosis associated with recurrent pyoderma was treated with oral ivermectin at 300-600 µg/kg body weight as incremental doses, looking for any toxic symptoms. Previously, dogs affected with demodicosis were also treated with in the similar pattern (Reddy and Kumari, 2010; Sivajothi *et al*., 2013a). Medication was continued till two consequent negative skin scrapings were obtained at an interval of ten days. Scabies was treated with oral ivermectin at 200 µg/kg body weight, weekly twice for one more week after the skin scrapings becoming negative besides clinical improvement (Reddy and Kumari, 2013). Ticks and lice were treated with ivermectin at 200 µg/kg body weight, s/c once, followed by external application of cypermethrin once a week to prevent recurrence of external parasitic infestation. Flea infestation was treated with fipronil spray twice a month (Medleau *et al*., 2003). Hypothyroidism was initiated treatment with oral Levothyroxin sodium at 20 µg/kg body weight twice a day. Malassezia dermatitis was treated with oral ketoconazole at 5 mg/kg body weight per day and treatment for seborrhea was carried out with skin tonics containing essential fatty acids.

Results

Clinical data pertaining to the recurrent pyoderma dogs was mentioned in Table 1 which includes age, breed, sex, duration of infection, underlying factors and previous antibiotic therapy. Observations of clinical recovery made at weekly intervals is presented in Table 2. The path of recovery of recurrent superficial pyderma was shown in Fig. 1.

Fig. 1. Path of recovery of recurrent superficial pyoderma with enrofloxacin

Discussion

Out of twelve dogs selected for study, seven were females and five were males. Nine had recurrent

Table 1. Clinical data of 12 dogs with recurrent pyoderma

Case No	Breed	Type of Recurrent pyoderma	Sex	Age (Y.M)	Duration of infection (Months)	Underlying factor (s)	Previous antibiotic therapy and duration
1.	Labrador	Superficial	F	4	4	None identified	Lincomycin
2.	Labrador	Superficial	F	5.2	6	Hypothyroidism, Tick infestation	Amoxicillin clavulanate, Enrofloxacin
3.	Labrador	Superficial	F	3.2	3	Flea allergic dermatitis	Lincomycin, amikacin
4.	Pug	Superficial	F	3.5	4	Malassezia dermatitis	Cephalexin
5.	Lhasa Apso cross	Superficial	M	5.2	18	Food allergy	Penicillin, Amoxicillin clavulanate
6.	Non-descript	Superficial	F	8	6	Tick infestation,	Lincomycin, amikacin
7.	Pomeranian	Superficial	F	5.2	4	Seborrhea	Cephalexin
8.	Pomeranian	Deep	F	6	4	Tick infestation, Lice infestation	Lincomycin
9.	Non-descript	Superficial	M	4	3	Sarcoptic mange	Amoxicillin clavulanate, Cephalexin
10.	Non-descript	Deep	M	3.2	12	Demodicosis	Lincomycin
11	Doberman	Superficial	M	5.5	14	None identified	Lincomycin, Amoxicillin clavulanate
12	Non-descript	Deep	M	2	6	Demodicosis	Enrofloxacin

superficial pyoderma while three had recurrent deep pyoderma. Age of dogs ranged from 2 to 8 years, with breeds like Labrador, Pomeranian, Doberman, Pug and Non-descriptive, weights ranging from 8 to 40 kg. Duration of clinical signs ranged from 3 to 18 months. The dogs were previously treated with different antibiotics such as penicillin, lincomycin, enrofloxacin, amoxicillin clavulanate, cephalexin and amikacin but for a shorter period of about one week. Thorough anamnesis revealed that failure to identify and treat the underlying factors, use of a narrow spectrum or an inappropriate antibiotic(s) and therapy of an insufficient duration might be responsible for recurrent pyoderma in the dogs presented. But upon thorough investigation it was found that out of 12 dogs with recurrent pyoderma, demodicosis was noticed in 2 dogs (16%), followed by Malassezia dermatitis, food allergy, keratinization disorders (seborrhea), scabies, tick infestation and flea infestation in one dog each (8%). Mixed conditions i.e. combination of lice and tick infestation, and a combination of hypothyroidism and tick infestation in one dog each (8%) were also noticed. However no associated conditions could be noticed in the remaining 2 dogs (16%). Bloom and Rosser (2001) failed to identify the underlying cause associated with pyoderma in 2 dogs out of 21 dogs. Bensignor and Germain (2004) also could not identify the associated conditions in two out of 30 dogs of their study on canine recurrent pyoderma. Reddy *et al*. (2014c) also reported the failure to identify the underlying factors in two dogs out of 13 dogs suffering with recurrent pyoderma in the study.

Out of twelve dogs initiated therapy, ten dogs could be monitored fully with complete recovery in all of them indicating that this antibiotic was 100 per cent efficacious. Five cases (cases 3,4,6,7 and 9) of superficial pyoderma improved significantly by seventh day, as they were free from the primary lesions such as papules, crusted papules and pustules. However, complete recovery was evident by fourteenth day with disappearance of even secondary lesions like erythema, crusts, hyperpigmentation, scales etc. Three cases (cases 1, 2 and 5) of superficial pyoderma exhibited only some response to therapy by seventh day with resolution of primary and secondary lesions on 14th and 21st days of therapy. Variation exhibited in the duration (i.e. 2-3 weeks as per clinical observation or as per owner statement, days 12-20) of response by the dogs with recurrent superficial pyoderma might be

Table 2. Therapeutic response with enrofloxacin in dogs with recurrent pyoderma

Case No	Response exhibited (on day)				Exact time taken for complete recovery as per owners' statement (on day)	Relapse
	7	14	21	28		
1.	F	G	E		20	No
2.	G	G	E		18	No
3.	G	E			14	No
4.	G	E			12	No
5.	F	G	E		18	Yes (45 days)
6.	G	E			14	No
7.	G	E			13	No
8.	F	G	E		20	No
9.	G	E			14	No
10.	F	G	G	E	26	No
11.	Dropped in the middle of therapy					
12.	Dropped in the middle of therapy					

Clinical response:
E: Excellent: Complete remission of clinical signs of recurrent pyoderma and point of recovery.
G: Good: Most primary lesions have resolved but mild secondary lesions such as erythema, crusts and scales are still evident.
F: Fair: Some response to treatment but primary and secondary lesions are still evident.
P: Poor: No change or worsening of the condition.

due to variation in the extent of lesions, response of the associated conditions, and the inability to identify the underlying factor and thus its treatment.

One dog with deep recurrent pyoderma (case 8) showed only some improvement by the end of 7 days with the presence of deep pustules, folliculitis and ulcers. Though these lesions healed by two weeks, secondary lesions such as erythema, hyperpigmentation and pruritus were still observed in this dog. However complete recovery was observed with the use of antibiotics for 21 days. In another case of recurrent deep pyoderma (case 10), with generalized demodisosis as an underlying factor, resolution of primary and secondary lesions was observed only on 21 and 28 days of therapy respectively. Prolonged recovery time in this case could be due to the severity and extent of the lesions and the longer time taken for treating demodicosis. In the recent studies on demodicosis was also mentioned that Demodex was one of the important associated condition for development of pyoderma in dogs (Sivajothi *et al*., 2013b).

These findings are in agreement with Kuhl (2009) who stated that most superficial pyodermas require at least three weeks of systemic antibiotics while the duration of antibiotic therapy for deep pyodermas is highly variable and they require long term therapy. All the dogs were monitored for recurrence for a period of six months. Out of ten dogs of this group, one dog had recurrence (superficial pyoderma) after 45 days of therapy. Recurrence was mainly due to food allergy associated with reintroduction of chicken and fish. The dog after recurrence was treated with the same antibiotic, strictly advising elimination of chicken and fish. Excellent clinical response with enrofloxacin was reported by Paradis *et al*. (2008), and Hillier *et al*. (2006) in the treatment of canine pyoderma. No adverse effects were seen with this antibiotic used in the present study.

Enrofloxacin is a broad spectrum bactericidal antibiotic from the class of fluoroquinalones, with an excellent activity against multi resistant organisms with very rapid killing ability. The drug has high lipofilicity which allows its penetration into gram-positive and gram-negative bacteria. The mode of action is by inhibition of an enzyme called DNA gyrase, which cuts bacterial DNA, allowing super coiling of the chromosomes. In mammals the equivalent enzyme topoisomerase (which is structurally different) is poorly inhibited. The drug has potent tissue penetration which is partially related to uptake in to macrophages in chronic inflammatory tissue (Rosenkrantz, 2009).

Conclusion

this study confirmed that enrofloxacin is safe and effective in the treatment of recurrent superficial

and recurrent deep pyoderma in dogs. The once daily dosing makes enrofloxacin a very convenient antibiotic for dog owners, which should increases owners' compliance. Addressing the underlying factors and following proper dose and duration of the antibiotic might have prevented recurrence of the disease in the present study.

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