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Efficacy of enrofloxacin over cefalexin in the therapeutic management of canine dermatitis

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Abstract
Canine species has predominantly taken a vital position in human life as a companion animal all around the world. Many of the diseases in canine relates organ specific, however dermatological issues in canines are always challenging. When it comes to the pet parents, any visible dermatological disorders need to be attended by a veterinarian with an urgent basis. In the present research attempts were made to find out the clinical recovery by using two antibiotics. A total of 40 dogs based on the dermatological signs were considered and divided in to two groups comprising 20 dogs in each group. Efficacies of antibiotics were evaluated based on in vitro antimicrobial disc diffusion technique. In-vitro sensitivity pattern of bacteria isolated from dog were studied and sensitivity was found 90% to Ciprofloxacin and 51.11% to Enrofloxacin. One group was administered Enrofloxacin and while the other one was treated with Cefalexin for a period of 2 weeks. In the result Enrofloxacin exhibited better improvement over Cefalexin for the disappearance of dermatological lesions.

Keywords: Dermatitis, antibiotic sensitivity test, enrofloxacin, cefalexin

Introduction
Dog is one of the most popular companion animal amongst people. Canine dermatitis has been a big challenge for a veterinarian to treat since multiple etiological agents are responsible to precipitate the skin lesions. Bacterial skin lesions propagate within a short span of time when compared with viral or fungal origin. However, canine atopy and hypersensitivity can be sometime more quicker. Amongst bacteria, staphylococcus is ubiquitous in canine other species skin, but few of pathogenic staphylococcus might leads to severe form of dermatitis. North Easter region of India is having high rainfall and humidity for favoring the bacterial pyoderma. Use of antibiotic in skin diseases is much common but in vitro antibiogram is much needed prior to administration of antibiotic in order to avoid antibiotic resistance. In the present study, suitable antibiotics based on in vitro antibiotic sensitivity test were sorted out and administered to the clinical cases to find out the in vivo effect.

Materials and Methods
The present research was conducted in the Department of Veterinary Clinical Medicine, Ethics & Jurisprudence, Department of Veterinary Epidemiology and Preventive Medicine, and Department of Teaching Veterinary Clinical Complex, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati – 781022, Assam, India. A total of 870 clinical cases were examined for various skin lesions eg. Papules, pustules, macule etc. and clinical signs like pruritus, alopecia seborrhoeic smell etc.

Collection of sample, Isolation and identification of bacteria
Samples were collected with the help of sterile cotton swab for bacteriological study and had put it in to nutrient broth and incubated at 37 °C. Further, inoculates were processed for primary isolation in sheep blood agar and again kept at 37 °C for incubation. A pure colony has been picked up and were again processed for secondary isolation in nutrient agar. The grown colony were subjected for Gram staining to confirm the presence of gram positive bacteria. Colonies positive for Gram positive bacteria were further grown in Mannitol Salt Agar (MSA) to confirm the presence of staphylococcus. Under biochemical studies, isolates were subjected for catalase test to differentiate staphylococcus from streptococcus. Further, coagulase test was performed to differentiate coagulase positive staphylococci from coagulase negative staphylococci.

In addition to above biochemical, Hugh leifson's test was performed to differentiate staphylococci from micrococci.

In-vitro Antibiotic Sensitivity Test

All the confirmed *Staphylococcus* isolates were subjected to 17 different antimicrobial agents to determine the drug sensitivity patterns by using disc diffusion techniques as per Quinn (2011) [5] and according to the performance standards for Antimicrobial Disk Susceptibility Tests, Clinical and Laboratory Standard Institute guidelines, CLSI (2015) [1] and European Committee on Antimicrobial Susceptibility Testing, EUCAST (2015) [2]. The antimicrobial discs were procured from Hi-Media Laboratories Pvt. Ltd., Mumbai. The antimicrobial agents and their concentration per disc used in the present study are mentioned below in Table No. 1.

Table 1: Disc used for i*n-vitro* Antimicrobial Sensitivity Test

Sr. No.	Antimicrobial disc	Symbol	Concentration per disc
1	Amoxycillin & Clavulanic acid	AMC	30 mcg
2	Ampicillin & Sulbactum	AS	10/10 mcg
3	Amoxycillin & Cloxacillin	Ax	10 mcg
4	Ciprofloxacin	CIP	5 mcg
5	Cefotaxime	CTX	5 mcg
6	Cefalexin	CN	30 mcg
7	Ceftazidime	CAZ	30v
8	Ceftriaxone & Tazobactum	CIT	30/10 mcg
9	Clindamycin	CD	2 mcg
10	Doxycyclin	DO	10 mcg
11	Enrofloxacin	Ex	5 mcg
12	Fusidic acid	FC	30 mcg
13	Gentamicin	GEN	10 mcg
14	Mupirocin	MU	5 mcg
15	Penicillin G	P	10 mcg
16	Streptomycin	S	10 mcg
17	Tetracyclin	TE	30 mcg
18	Cefoxitin	CX	30 mcg

Therapeutic Management of Staphylococcal infection in Dog

A total 40 no of cases were selected based on clinical findings and microbiological study. The total number of cases was again divided in to 2 groups viz. Group A and Group B, comprising of 20 animal each. Based on the antibiotic sensitivity enrofloxacin and cefalexin were chosen for the therapeutic management. The treatment efficacy was measured considering grade of recovery, A-worst, B-no change, C-slight recovery, D-significant improvement and E-complete remission of the lesion Tsoureli-Nikita *et al*. (2002) [9]

Statistical analysis of data was carried out wherever necessary as per the methods described by Snedecor and Cochran (1994) [8] by applying computer software SAS Enterprise Guide 4.2.

Result and Discussion

In this study primary lesions were papules (11.26%), pustules (21.72%) in Figure 1, macules (16.09%), nodules (4.36%), plaque (7.81%) and wheal (5.05%). Hnlica (2011) [3] found similar kind of primary lesions in dog suffering from dermatitis. Moreover, crust and scales (54.48%) were observed highest in the present study was in accordance with the findings of Reddy *et al*. (2016) [6], who observed prominent lesions of crusted papules, epidermal collarets, scales and crust in both superficial and deep pyoderma. Further, exfoliation (25.63%), comedones (5.51%), erythema (15.05%), ulcers, erosions, excoriation (14.71%), sinus and fistula (0.80%), fissures (3.90%), eczema (12.29%), lichenification (18.50%), vitiligo (1.3%), seborrhoea (10.80%) and epidermal collarets (16.66%) in Figure 2 were other secondary lesions were encountered in the entire study were mentioned in Figure 3.

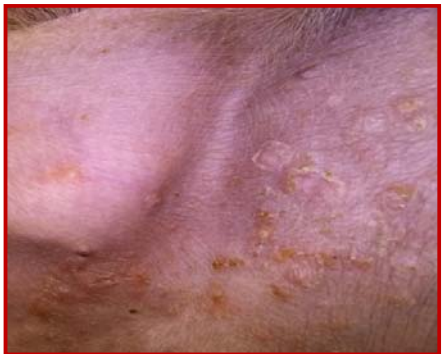

Fig 1: Impetigo or superficial pustular dermatitis

Fig 2: Epidermal collarets and exfoliation

The dermatological lesions were found to be mostly scattered over the dorsal surface of the body. The present finding was in accordance with the findings of Loeffler *et al*. (2018) [4] and Reddy *et al*. (2016) [6]. Flea, tick, mange are mostly predominate in the dorsal surface where the dog cannot reach easily, which might be the cause of pruritus on the dorsal surface of the body.

Various isolates of staphylococci, pseudomonas, streptococci could be grown in the specific media during the bacteriological examination.

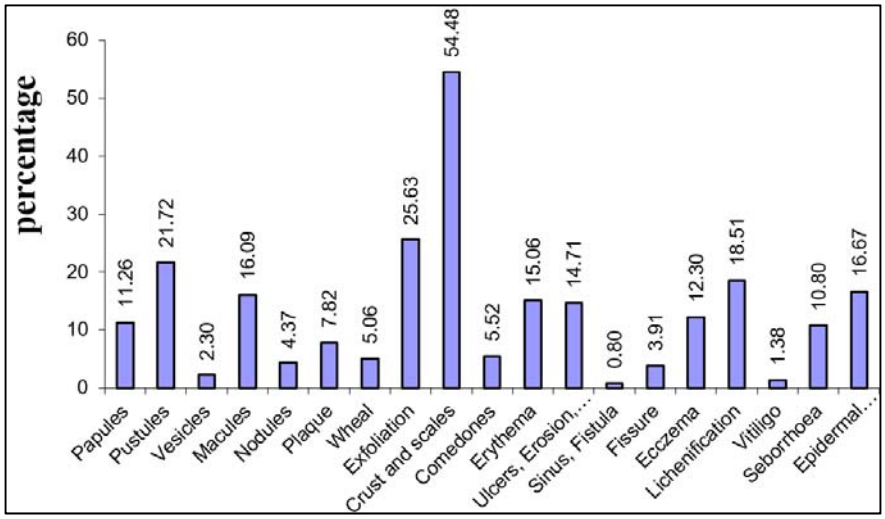

Fig 1: Bar diagram showing the various skin lesions recorded

In the overall sensitivity test, highest sensitivity was recorded to cefalexin (90%), followed by ceftriaxone+sulbactum (73.33%), enrofloxacin (51.11%), ceftriaxone/tazobactum (26.11%), doxycycline (41.11%), mupirocin (32.22%), Ceftriaxone+tazobactam (26.11%), fusidic acid (24.44%), streptomycin (22.22%), Gentamicin (17.78%), Ceftazidime (17.22%), clindamycine (17.22%), ciprofloxacin (12.22%), tetracycline (8.33%), amoxicillin+clavulanic acid (7.78%), cefotaxim (3.33%) and amoxicillin (0.56%). Suresh *et al.* (2010) [7] found the highest sensitivity to chloramphenicol followed by cephalexin and enrofloxacin for staphylococci associated recurrent pyoderma in dog.

Table 2: In-vitro sensitivity pattern of bacteria isolated from dog

Sl. No.	Antimicrobial disc	Symbol	Sensitive / %
1	Amoxycillin/Clavulanic acid	AMC	7.78
2	Ceftriaxone &Sulbactum	CIS	73.33
3	Amoxycillin&Cloxacillin	AX	0.56
4	Ceftazidime	CAZ	17.22
5	Clindamycine	CD	17.22
6	Ciprofloxacin	CIP	12.22
7	Ceftriaxone &Tazobactum	CIT	26.11
8	Cefalexin	CN	90.00
9	Ceftriaxone	CTX	3.33
10	Doxycyclin	DO	41.11
11	Enrofloxacin	EX	51.11
12	Fusidic acid	FC	24.44
13	Gentamicin	GEN	17.78
14	Mupirocin	MU	32.22
15	Penicillin G	P	0.00
16	Streptomycin	S	22.22
17	Tetracyclin	TE	8.33

In the therapeutic measurement Group A was treated with Cefalexin @ 25 mg/kg bwt orally, once daily for 2 weeks and Enrofloxacin to Group B @ 10 mg/kg, bwt, once daily, orally for 2 weeks. For the ease of statistical analysis the grades A, B, C, D and E were considered as 1, 2, 3, 4 and 5.Chi square test showed that there was an association between stage of recovery and the administration of medicine. In the result it was found that the significant recovery (D) was more in enrofloxacin group (42.50%) than the cefalexin group (26.70%). However, when the complete remission (E) was considered the highest recovery was found in cefalexin group (25.50%) when compared with enrofloxacin (15.80%). Figure 2.

Fig 3: Mosaic plot showing the various stages of recovery

Conclusion

In the conclusion it can be inferred that dog suffered from dermatitis exhibited remarkable recovery when treated with enrofloxacin and cefalexin. The efficacy of enrofloxacin was better and quicker when compared with cefalexin. However, from duration point of view cefalexin took prolong duration as compared to enrofloxacin and simultaneously the complete remission was more while using cefalexin. Thus it was concluded that the therapeutic efficacy of enrofloxacin was better than cefalexin in treating canine bacterial dermatitis and it is cost effective.

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