

**EPIZOOTIOLOGICAL STUDIES ON EAR INFECTION IN
CANINES AND ITS THERAPY**

By

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CERTIFICATE

Mr.SAYARWAR VIJAY KUMAR has satisfactorily prosecuted the course of research and that the thesis entitled, **EPIZOOTIOLOGICAL STUDIES ON EAR INFECTION IN CANINES AND ITS THERAPY** submitted is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that the thesis or part thereof has not been previously submitted by him for a degree of any University.

Date : 20/11/96


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CERTIFICATE

This is to certify that the thesis entitled, **EPIZOOTIOLOGICAL STUDIES ON EAR INFECTION IN CANINES AND ITS THERAPY** submitted in partial fulfilment of the requirements for the degree of **MASTER OF VETERINARY SCIENCE (MEDICINE)** of the Andhra Pradesh Agricultural University, Hyderabad, is a record of the bonafide research work carried out by **Mr.SAYARWAR VIJAY KUMAR** under my guidance and supervision. The subject of the thesis has been approved by the Student's Advisory Committee.

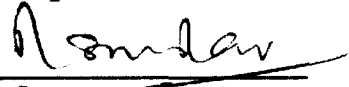
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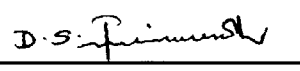


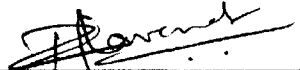
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ABSTRACT

A survey of hospital records for the last three years was carried out to know the incidence of various ear ailments in canines with particular reference to ear infections. Investigations were also carried out to study the epizootiology, cultural aetiology with their drug sensitivity along with a therapeutic trial using topical and parenteral drugs.

Dogs brought to the veterinary Hospital, Bhoiguda with a history of ear troubles were examined for the presence of infection. Out of the 1360 dogs, 410 suffered with ear infection giving an overall incidence of 30.15 per cent.

The incidence of ear infection was found to be significantly ($P < 0.01$) associated with different breeds of the dogs. Pure breed dogs had 60.0 per cent incidence followed by 30.0 per cent among the cross-breds and only 10.00 per cent from the non-descript animals.

The incidence of ear infection was significant ($P < 0.05$) in younger age group since 62.5 per cent incidence was reported in those under 3 years of age and 30.00 per cent were between 3 to 6 years and only 7.5 per cent were aged above 6 years.

Sex had insignificant ($P > 0.05$) association with the ear infection. 70.00 per cent of the dogs had unilateral infection with only one ear being infected against 30.00 per cent of dogs having bilateral infection.

The conformation of the ear significantly ($P < 0.01$) influenced the incidence of ear infection. Dogs with dropped or pendulous ears had higher (55.0%) incidence of infection followed by dogs with semi-erect ears (32.5%) and erect ears (12.5%).

The clinical signs in the affected dogs were variable. Ear scratching, head shaking and ear pain with discharge was present almost in all the affected dogs. A few animals had erythema of ear canal epithelium and head tilt. No dog suffered with fever.

The physical examination of the affected dogs showed normal body temperature, pulse and respiration. The otoscopic examination of the ears revealed normal tympanic membrane except in two cases where it was reddish and ulcerated.

The cultural examination of the ear discharge yielded staphylococci, streptococci, E. coli and pseudomonas along with few unidentified organisms.

The in vitro drug sensitivity on mixed cultures exhibited the highest sensitivity towards ~~ciprofloxacin~~ ciprofloxacin followed by gentamycin, chloramphenicol, tetracycline, ampicillin, penicillin, bacitracin and streptomycin.

The comparative efficacy of the three drugs Ciprofloxacin, Gentamycin and Chloramphenicol Topical and parenteral indicated the highest efficacy by Ciprofloxacin followed by Gentamycin and Chloramphenicol. There was no recurrence of infection within two months post-therapy observation period.

LIST OF ABBREVIATIONS

Fig.	:	Figure
g	:	Gram
i.e.	:	that is
Kg	:	Kilogram
mcg	:	Microgram
mg	:	Milligram
ml	:	Millilitre
mm	:	millimetre
No.	:	Number
P	:	Probability
Q.S.	:	Quantity sufficient
Soln.	:	Solution
Spp.	:	Species
S/C	:	Subcutaneously
I/M	:	Intramuscularly
Viz.	:	Namely
V/S	:	Versus
Wt	:	Weight
<	:	Lesser
>	:	Greater
%	:	Per cent

INTRODUCTION

CHAPTER - I

INTRODUCTION

Ear infection is one of the common conditions encountered in Canine practice and has a world wide distribution. One in eight dogs attending the small animal teaching unit at Edinburgh Veterinary School was Clinically affected with Otitis (Grono, 1980).

Although otitis is not a fatal disease, it causes lot of distress and discomfort to the affected dog and is aesthetically disagreeable to the pet owners. The great variance in the anatomy of the different breeds of dogs makes it imperative that the Clinician consider the length and position of the external ear with reference to fluid drainage, evaporation of absorption (Philips, 1959). However, despite the advancement in therapeutic approach Otitis cases remain refractory and as such frustrate the practising veterinarians. The difficulty in treating otitis is due to the complexity of the aetiological agents and emergence of drug resistance among these organisms which continue to change in a particular area (Grono and Frost, 1969).

Perusal of available literature indicated that no systematic work has been done on the subject of ear infection in Canines in India, in general and in Andhra Pradesh, in particular. Therefore, an attempt has been

made to study the ear infection in Canines with reference to incidence, bacterial aetiology along with their antibiotic sensitivity and a drug trial. Thus with the above objectives, the following parameters were proposed in the present investigation.

1. To study the incidence of various ear ailments in Canines with reference to ear infections
2. To study the epizootiology of ear infection in relation to breed, age, sex and conformation of ear in dogs.
3. To record the Clinical signs in dogs suffering with ear infection.
4. To carry out the cultural examination and drug sensitivity of bacteria causing ear infections.
5. To find out an effective therapy using various topical and systemic preparations.

REVIEW OF LITERATURE

CHAPTER -II

REVIEW OF LITERATURE

2.1 INCENDENCE:

Baxter and Lawler (1972) while studying the incidence and microbiology of otitis externa of dogs and casts in New Zealand reported an incidence of 7.5 per cent of ear infection in dogs being treated at Massey University Veterinary Clinic.

Grono (1980) reported that one in eight dogs attending the small Animal practice, Teaching Unit at the Edinburgh Veterinary school was clinically affected with Otitis externa.

Baba et al. (1981) while studying the incidence of Otitis externa in dogs in Japan observed that about 6.3 per cent of the dogs admitted to the animal hospital suffered with ear infections.

Devaya (1993) in his epidemiological studies on ear infection in dogs at Bangalore reported that 71.70 per cent animals suffered with otitis externa.

2.2 EPIZOOTIOLOGY:

2.2.1 Breed:

Grono and Frost (1969) reported that highest incidence of otitis externa in cocker spaniel (11.5%)

followed by Labrador (6.5%) Miniature poodle (7.0%),
Dechshund (4-5%) and German Shepherd (3.6%).

Baxter and Lawer (1972) while studying the incidence and microbiology of dogs and cats in New Zealand reported that the dogs of those breed with pendulous ears were the most frequently affected ^{ones} with ear infections.

Sharma and Rhoades ((1975) recorded the higher incidence of otitis in miniature poodle when compared with other breeds of dogs

Durr and Freudriger (1976) observed a marked breed disposition while studying the ear-cropping and incidence of otitis externa. They reported the incidence of 18.84 per cent ear infection in Cocker Spaniel dogs.

Grono (1980) stated that certain breeds of dogs had a high incidence of otitis. Breeds with pendulous ear such as the Labrador and Cocker spaniel and those with an hirsute meatus such as Poodles accounted for 60 to 80 per cent of cases in their surveys, suffered with ear infections, and the reasons he explained as the pendulous pinna or the hirsute meatus restrict the ventilation and drainage from the external canal.

Baba et al, (1981) studied the breed wise incidence of otitis externa in canines. They noticed the

incidence of 23.0 per cent in Miniature Poodle, 20.0 per cent in Cocker Spaniel, 10.0 per cent in Pomeranian, 7.0 per cent in German shepherd, 6.0 per cent in Dachshund, 3.0 per cent in Dobermann and 3.0 per cent in cross-bred dogs.

Little *et al.*, (1991) reported that among the 42 dogs studied with ear diseases 12 (28.5%) were German shepherd,, 8(19.0%) were spanials; 4 (9.5%) were Retrievers (including labrador) and 18 (42.8%) belonged to other various breeds.

Devaya (1993) in his epidemiological studies on ear/infection in canine reported the incidence of Otitis as 62.26 per cent in pure breeds (Cocker spaniel, Dalmation, Dachshund, Dobermann, German Shepherd, Labrador and Pomeranian) followed by 26.41 per cent in cross-breeds (German shepherd corsses, Dobermann crosses and Pomeranian crosses) and 11.32 per cent in Mongrels. Similarly the otitis was more in long haired breeds of (36) dogs when compared to short haired breeds ^{of} (17) dogs.

Tondon (1996) while reporting an ear infection in dogs stated that the infection was common in breeds having pendulous ears such as Dachshund, Cocker spaniel, Golden Retriever etc.

2.2.2 Age

Grono and Frost (1969) noticed otitis externa in dogs most frequently between five and eight years of age. They attributed this to the peak development of co-factors such as allergic conditions and Keratinization disorders such as seborrhoea, which were presumed to occur common at this age.

Sharma and Rhoades (1975) observed otitis externa more commonly in dogs of one to four years of age.

According to Grono (1980), the age plays little part in the incidence of otitis externa in man, but in the dogs the highest incidence was usually between the age of five and eight years.

Chengappa et al., (1983) reported the following age wise occurrence of otitis in 160 dogs. 45 (28.15%) dogs were upto two years of age, 38 (23.75%) in two to four years of age, 31 (19.38%) were in four to six years and 46 (28.75%) animals belonged to the age group of above six years. However, the difference in occurrence of ear infection in different age groups according to them was insignificant ($P > 0.001$) statistically.

Little et al., (1991) studied the ear disease in relation to age of the affected dog. Out of 42 animals studied, 2 (4.6%) were of 2 to 4 years: 12 (28.5%) were of

4 to 6 years; 7(17.0%) dogs ranged between 6 to 8 years; 8 (18.4) dogs were of 8 to 10 years aged and only 3 (7.2%) were of 10 years and above.

Devaya (1993) has observed insignificant association between the age and occurrence of ear infection in dogs; although a high incidence was noticed in dogs between 3 to 6 years (43.40%) followed by those dogs aged more than six years (32.08%) and 0 to 3 years (24.53%).

2.2.3 Sex

Grono and Frost (1969) observed higher prevalence of ear infections in males than in females.

Baxter and Lawler (1972) while studying the incidence and microbiology of otitis externa of dogs and cats in New Zealand reported that the sex could not influence the incidence of ear infection and the difference in the incidence of either sex was insignificant.

No significant relationship of sex with the ear infection was encountered in epidemiological surveys conducted by Sharma and Rhoades (1975) and Ettinger (1984). Similarly no sex predisposition was also observed by Grono (1980) in the incidence of otitis externa in dogs.

Chengappa et al., (1983) reported out of 160 otitic ear canals, 76 (47.5%) were males and 84 (52.5%) were females. However, the difference in occurrence was found insignificant ($P > 0.001$) statistically.

Little et al., (1991) reported that out of 42 dogs studied 26 (61.6%) were males and remaining 16 (38.4%) were females those suffered with ear disease.

Devaya (1993) in his epidemiological studies on ear infection in dogs observed no variation in incidence of the disease in either sexes.

2.3 EARS AFFECTED (UNILATERAL OR BILATERAL)

Devaya (1993) in his clinico-epidemiological, bacteriological and therapeutic studies on ear infection in Canines reported that 62.26 per cent of the dogs were suffering with unilateral infection while 37.74 per cent dogs from bilateral infection having both the ears infected.

2.4 CONFORMATION OF EAR

Durr and Freudrigger (1976) reported that the shape of the ear was one of the important factors associated with the incidence of otitis externa. Lower incidence of otitis was observed by them in breed with ears cropped and attributed the lower frequency to the lack of predisposing factors.

Hayes et al., (1987) while studying effects of ear type and weather on the prevalence of canine otitis externa, reported that the ear infections were more often in dogs with pendulous ears. Dogs with the erect ears had less risk of the infection. Similar findings were also reported by Karatzias and Sarris (1980).

Ascher et al., (1986) in their epidemiological and aetiological survey of external otitis, encountered the higher incidence of ear infection in dogs with pendulous dropping ears compared with those having semi-erect or erect ears. Such findings were also reported earlier by Baba et al., (1981).

Devaya (1993) reported that the dogs with erect ears had 50.94 per cent incidence of ear infection followed by the dogs with drooping ears (35.58%) and semi-erect ears (13.21%).

2.5 CLINICAL SIGNS

Philips (1959) in the chapter on the ear mentioned that in the beginning of the ear infection, the lining of the auditory canal is swollen, sensitive, red and unbroken with little discharge and because of scratching, there might be traumatic injuries on the pinna.

Grono (1980) recorded the cardinal signs of otitis as erythema, increased discharge, pain and pruritus.

Uchida et al., (1994) in their clinical examination of the dogs with otitis externa reported itching, pinna erythema, debris, swelling, ulcers and exudate as major clinical signs of ear infections.

Tondon (1996) stated the most common symptoms of ear infection in dogs as vigorous shaking of head with several attempt of scratching due to irritation, reddening of ear canal, foul smelling discharge which sometimes may be mixed with blood. There might be development of ulcers also in the ear.

2.6 CLINICAL EXAMINATION OF PATIENT

Little and Lane (1989) evaluated experimentally three techniques for the assessment of the integrity of the canine tympanic membrane viz., tympanometry, otoscopy and palpation by a blunt probe. Otoscopic examination was shown by them to be moderately accurate under controlled conditions, however, under field conditions when otitis externa was present, visual inspection of tympanic membrane was seldom possible and the palpation of the tympanic membrane with a blunt probe was shown to be inaccurate and led to rupture of the membrane in a high proportion of cases.

Devaya (1993) carried out physical examination of all the infected ears to note the clinical signs, type of exudate and odour of the ear discharge. Otoscopic

examination was performed on individual patients to observe the condition of ear canal and tympanic membrane following thorough ear cleaning and removal of ear discharge. In dogs with ruptured tympanic membrane, a blunt probe was gently passed to ascertain the rupture.

2.7 CULTURAL EXAMINATION OF EAR DISCHARGE

Wilter (1949) isolated *Micrococcus pyogenes* var *aureus* as the prevailing aetiological agent in cases of suppurative and purulent otitis externa.

Farrang and Mahamoud (1953) while investigating Otorrhoea in dogs found a high incidence of *Pseudomonas aeruginosa* infection.

Gram negative organisms were very rarely isolated in dogs with normal ear and most frequently in chronic otitis externa or in recurrent ear diseases (Fraser, 1965).

Wang (1972) studied cultures of 182 ears with otitis externa from 100 dogs which yielded 158 *Staphylococcus aureus*; 43 *proteus* *mauseri*; 32 *Pseudomonas aeruginosa*, 28 haemolytic streptococci, 19 *Enterococcus* spp and 17 *candida* *tropicalis*.

Baxter and Lawler (1972) studied the incidence and microbiology of otitis externa of dogs and cats in New

Zealand and reported the yeast *pityrosporus pachydermatitis* being the most frequently involved organism, among the other isolates *pseudomonas*, *proteus* and *Staphylococcus aureus* were the most noticeable.

Sharma and Rhoades (1975) studied the microbiology of otitis externa and found *Pityrosporus pachydermatitis* the most frequently involved organisms followed by *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

Krogh et al., (1975) examined culturally the ear swabs from 609 dogs with different types of ear infections. The commonest organisms involved were staphylococci or yeast in 29 per cent samples. Pure yeast infection was in 19 percent and pure Saphylococcal infection was in 16 per cent cases. *Pseudomonas aeruginosa* and *Proteus microbilis* was found in 7 per cent of the cases. No organisms could be isolated from 22 per cent cases.

Blue and Wooley (1977) carried out a bacteriological survey for 1973-75 and found the most prevalent organism in 323 dogs with otitis externa to be *Staphylococcus aureus*; *Pseudomonas aeruginosa* and *proteus* spp.

Lund (1979) carried the cultural studies on 130 swabs from the otitis externa cases and isolated *Staphylococcus aureus* (30.4%) as a frequently occurring bacteria followed by *Pseudomonas aeruginosa* (18.3%) and fungi from

9.6 per cent ears. Other bacteria isolated were proteus spp, Escherchia spp. Steptococci spp and micrococcus spp.

Baba et al., (1981) while studying the incidence of otitis externa in dogs and cats in Japan reported the prevalence of bacteria in following order staphylococci (54.0%) Streptococci (11.0%) E. coli (10.0%) Pseudomonas (8%), yeast (8%); Gram positive rods (10%) and other Gram negative rods (4%).

Dickson and Love (1983) studied 31 dogs with clinical signs of ear irritation along with 26 asymptomatic dogs and reported that very small number of bacteria and yeast could be recovered from asymptomatic dogs while Pseudomonas and proteus spp were frequent isolates from symptomatic dogs with chronic ear irritation.

Chengappa et al., (1983) in their study of microbiological survey of clinically normal and otitic canine ear canal isolated *Pityrosporum pachydermatitis* 23.13 per cent infected and 14.28 per cent normal ear canals; whereas *Staphylococcus aureus* were in 13.13 per cent and 19.04 per cent, otitic and normal ear canal respectively. In addition, *Pseudomonas* spp, *Bacillus* spp, *streptococcus* spp, *proteus* spp were also isolated from few ears. The difference between the mixed flora in infected and normal ear canals was statistically significant ($P < 0.01$).

Akey et al., (1984) examined ear swabs from 33 dogs with otitis which resulted in the isolation of *Pseudomonas aeruginosa* from 9 (27%) *Staphylococcus aureus* from 6 (18%), *Proteus microbilis* from 4 (12%); *Escherichia coli* from 3 (9%), *Corynebacterium Pyogenes* from 2(6%), *Streptocococcus pyogenes* and enterobactor and Anthracoides from one case each.

Mckellar et al., (1990) investigated 60 dogs with otitis externa for cytological studies which revealed staphylococcus spp in 46.7 to 51.0 per cent, stroptococcus spp in 29.6 to 33.3 per cent and coliform in 43.3 to 59.3 per cent of the cases.

Dakshinkar et al., (1992) conducted bacteriological examination of otitis externa cases in canines and reported *Staphylococcus aureus* most frequent isolate (23.93%); *Pseudomonas aeruginosa* (22.22%) and *Staphylococcus epidermis* in (14.81%) cases. But 14.81 per cent of the isolates remained unidentified. Other bacteria isolated included streptococci, proteus, *E. Coli* and *Klebsiella*.

Devaya (1993) isolated bacteria such as *Pseudomonas* spp. Coagulase positive staphylococcus spp; *Esherichia* spp. *Proteus* spp, Beta hemolytic *Streptococcus* spp. *Bacillus* spp and *Klebsiella* spp from the cases of Otitis in dogs.

Tondon (1996) reported the primary infective cause of ear infection in canines such as streptococcus, staphylococcus, Pseudomonas and fungal agents. He said, yeast is the secondary invader in most canine ear infections.

2.8 IN-VITRO DRUG SENSITIVITY

Grono (1980) reported the results of sensitivity of 467 swabs from canine ears affected with Otitis externa were 92 to 98 per cent sensitive to streptomycin, chloramphenicol, tetracycline, neomycin and polymyxin-B, whereas 60 to 69 per cent sensitivity to penicillin and ampicillin. Streptococci were 100 per cent sensitive to penicillin, chloramphenicol, tetracycline and ampicillin, 80 per cent to neomycin and polymyxin-B and 60 per cent to streptomycin. Coliform organisms were 100 per cent sensitive to gentamycin and carbercillin, 77 per cent sensitive to neomycin and polymyxin-B, 50 to 60 per cent sensitive to neomycin and polymyxin-B, whereas 100 per cent resistant to penicillin and ampicillin. Pseudomonas were 100 per cent sensitive to gentamycin 70 to 80 per cent sensitive to polymyxin-B and neomycin and 100 per cent resistant to penicillin and ampicillin. The proteus species of organisms were 100 per cent sensitive to polymixn-B and about 80 per cent sensitive to gentamycin.

Baba et al., (1981) reported the antibacterial susceptibility of bacteria isolated from otitis externa cases. Staphylococci were 90-100 per cent sensitive to ampicillin, cephalosporin, chloramphenicol, erythromycin and gentamycin. 65 to 79 per cent to penicillin and tetracycline. Streptococci were 100 per cent sensitive to ampicillin, chloramphenicol, tetracycline, erythromycin and 50 per cent sensitive to penicillin and colistin. Pseudomonas were 100 per cent sensitive to colistin and gentamycin and almost nil sensitive to penicillin, ampicillin, cephalosporin and chloramphenicol, tetracycline, streptomycin and gentamycin where as the *E.coli* organism were 100 per cent sensitive to ampicillin, cephalosporin, chloramphenicol, colistin and gentamycin.

Lucidi (1982) reported mixed isolates showing resistance to ampicillin, oleandomycin and nalidixic acid. The most effective antibiotic was a combination of two parts of oxytetracycline with one part of oleandomycin which seemed to have synergistic effect.

Sala et al., (1983) found 17 strains of Staphylococcus spp showing sensitivity to pristinamycin, cephalexin, gentamycin and erythromycin.

Magalhaes et al., (1985) observed 68 per cent of the bacterial isolates from earinfection showing sensitivity to gentamycin, 67 per cent to amikacin, 63

per cent to nitrofurantoin, 61 per cent to chloramphenicol but only 50 per cent to tetracycline.

Dakshinkar et al. (1992) while studying *in vitro* sensitivity pattern of bacterial isolates from ears of canine otitis revealed a total resistance towards streptomycin, cloxacillin and ampicillin was poorly exhibited by most isolates. The gentamycin and neomycin were found to be most effective antibiotics.

Devaya (1993) in his bacteriological studies on ear infection in dogs reported that the organisms were sensitive to gentamycin, norfloxacin, neomycin, polymyxin-B, chloramphenicol, bacitracin and cephalexin and resistant to penicillin, ampicillin and amoxycillin.

2.9 TREATMENT

Fraser (1961) found a combination of chloramphenicol and dapsone to be most effective in ear infections. Houdshell and Hennessey (1972) obtained good results in 85 of 299 cases of otitis externa treated twice daily for seven days with ear drops containing 3 mg gentamycin sulphate and one mg betamethazone valerate per ml: 98 per cent of bacteria isolated from affected ears including staphylococci, streptococci, pseudomonas, proteus, aerobacter and Klebsiella were susceptible to gentamycin compared with 91 per cent sensitivity to chloramphenicol and 80 per cent to neomycin.

Ehinger (1976) used sofam (Preparation containing DMSO, Dexamethazone acetate, neomycin†, oledomycin and polymyxin-B) in the treatment of otitis externa in 16 dogs and of them 14 responded well to the treatment.

Algoet (1979) reported satisfactory results in 88 dogs with both acute and chronic otitis when treated with preparation containing neomycin, polymyxin-B and dexamethazone and monosulfurn in dimetyl sulphoxide.

Baba et al., (1981) reported that based on the antibacterial susceptibility of bacteria isolated from otitis externa in dogs, the first choice of antibiotic for the mixed infection was gentamycin followed by chloramphenicol and ampicillin.

Devaya (1993) in his therapeutic studies on ear infection in dogs tried chloramphenicol and gentamycin topical along with parenteral route and cephalixin oral route obtained better results with gentamycin topical and parenteral route combination.

Hiel et al., (1993) in their studies on gentamycine uptake by cochlear hair cells precedes hearing impairment during chronic treatment observed the toxic effects of the drug used for 10 to 14 days by systemically.

Gentamycin sulphate is commonly used in treatment of ocular, aural, cutaneous, enteric and systemic infestation and if used for a long period, about 25 per cent of patients might show ototoxicity (Verma, 1994).

Hydrogen peroxide releases free oxygen on reaction with catalase of mucose and denuded skin of the ear when poured, leading to effervescence. The released nascent oxygen exerts brief germicidal effect and the bubbling helps in mechanical removal of pus and tissue debris thereby acting as cleansing agent, (Verma, 1994).

Logas (1994) reported that otitis externa could be a complicated and difficult disease to diagnose and treat. Because of the unique physiology of ear canal and common pathophysiology of otitis externa regardless of the underlying cause, the clinician must rely on history, dermatologic examination and ancillary tests to determine the cause^{and} the appropriate therapy for a particular case.

Uchida et al., (1994) conducted a clinical trial to evaluate the efficacy of one per cent piramicin suspension in the treatment of canine otitis externa associated with *Malassezia pathydermatis* by administering the drug twice daily for a period of two weeks. Satisfactory results were achieved in 33 of 40 dogs without any noticeable side effects of the drug.

Vestibulotoxic and ototoxic effects often are seen after long term high-dose systemic treatment with gentamycin, but toxic effects after topical use have not been reported in animals (Strain et al., 1995).

MATERIALS AND METHODS

CHAPTER - III

MATERIALS AND METHODS

3.1 INCIDENCE

In order to find out the incidence of ear ailments in canines, the out patient record of the Veterinary Hospital, Bhoiguda, Secunderabad formed the source of present data. The total number of dogs treated for various ear ailments during the last three years, (January 1993 to December 1995) was taken into account to calculate the per cent incidence of various ailments affecting the ears in dogs.

3.2 SELECTION OF CLINICAL CASES

Dogs brought to the Veterinary Hospital, Bhoiguda with a history of ear infections during the study period of two semesters were investigated and those found positive on clinical examination for ear infections were further subjected to epizootiological, microbiological and drug sensitivity studies along with therapeutic trials.

3.3 HISTORY OF THE ANIMAL

An individual score - sheet was maintained for each positive animal which contained Case No., Sex, age, breed, conformation of the ear and ears affected, either unilateral or bilateral. These factors helped in studying the epizootiology of the ear infection.

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3.4 CLINICAL SIGNS

Clinical signs such as erythema, ear scratching, pain, the ear discharge, head shaking and head tilt were recorded in a score - sheet specially designed for this study (Appendix -C).

3.5 CLINICAL EXAMINATION OF THE ANIMAL

Clinical examination of the animal was carried out in respect of body temperature, pulse and respiration, both before and after treatment. Type and odour of ear discharge, if any, was also recorded. Otoscopic examination was carried on individual ears to find out the condition of the ear canal and integrity of the tympanic membrane. The unco-operative dogs were sedated using Xylocad* intramuscularly at the dose rate of 1 to 2 mg/ per kg body weight.

3.6 COLLECTION OF EAR SWABS

Sterile cotton swabs were collected from the ear discharge taking all possible aseptic precautions. Within 3 to 4 hours, the swabs were transferred to the laboratory to carry out cultural isolation and drug sensitivity test.

* Xylocad - A proprietary product of Cadila Veterinary, Ahmedabad-380 008. Each ml containing Xylazine hydrochloride 20 mg; methyl paraben 0.15%; Propyl paraben 0.02% in aqueous base q.s.

3.7 CULTURAL EXAMINATION OF EAR SWABS

All the ear swabs from individual cases were subjected for cultural procedures to isolate and understand the bacterial aetiology of the ear infection.

3.7.1 Preparation of media

All the media used in this study were dehydrated media obtained from M/s Hindustan Dehydrated Media, Bombay. Only blood agar and potassium tellurite media were prepared in the laboratory according to Cruickshank et al., (1975).

The media were prepared, sterilized and poured into sterile petridishes as per the manufacturer's directions. The details regarding the composition and preparation of different media is furnished in Appendix - A. The plates were incubated at 37°C for 24 hrs to check the sterility before they were used for bacterial cultivation.

The following media were used for isolation and identification of the bacteria:

1. Nutrient Broth
2. Nutrient Agar
3. Blood Agar
4. Edward's medium
5. Mannitol Salt Agar

6. Mac Conkey's Lactose Agar
7. Pseudomonas Isolation Agar
8. Potassium Tellurite Agar.

3.7.2 Isolation of bacteria

The ear swabs collected from the ear infections were put to the Nutrient broth tubes and incubated aerobically at 37°C for 24 hours. Next day, the broth culture was streaked on the selective media and incubated at 37°C for 24 hours. Following next day, the plates were examined for colony morphology and Gram's staining reaction. Pure cultures were identified upto the genus level as per the standard methods listed in Bergy's Manual of Determinative Bacteriology. (Buchanan and Gibbons, 1974).

3.8 IN - VITRO DRUG SENSITIVITY

The drug sensitivity test was performed on the mixed culture isolates using disc diffusion method (Cruickshank et al., 1975) because of its speed and simplicity.

3.8.1 Preparation of inoculum

Nutrient broth was inoculated with a loopful of mixed culture and the tubes were incubated at 37°C for 16 to 18 hours.

3.8.2 Inoculation of Plates

The young broth culture of 16 to 18 hours, about 2 ml was poured into nutrient agar plate and the inoculum was spread uniformly over the entire agar surface by the to and fro motions of the plate. The excess culture fluid was drained off the plates and after replacing lids the plates were left at room temperature for 10 to 15 minutes to dry the inoculum.

3.8.3 Antibiotic discs

The sensidiscs* of eight different chemotherapeutic agents listed below were used in the present investigation.

S.No.	Chemotherapeutic agent	Symbol	Concentration (Disc potency)
1.	Ampicillin	A	10 mcg
2.	Bacitracin	B	10 units
3.	Ceprofloxacin	C	5 mcg
4.	Chloramphenicol	Cp	30 mg
5.	Gentamycin	G	10 mg
6.	Penicillin	P	10 units
7.	Streptomycin	S	10 mcg
8.	Tetracycline	T	30 mcg

* Span Diagnostics, Udhana (Surat), India.

3.8.4 Application of discs

Each inoculated plate was earlier divided into four equal portions by marking externally with a grease pencil. The standard sensidiscs from their respective vials were taken out using a flamed forceps and placed carefully one into each portion of the plate at least 15 mm away from the edge and at an equal distance from each other. Then the plates were allowed to stand at room temperature (pre-diffusion time) for 15 to 30 minutes and later incubated at 37°C for 24 hours.

3.8.5 Reading of Sensitivity

The diameter of the zone of inhibition was measured in millimeter using a fine scale.

The interpretation was made as per the zone size interpretation chart supplied by the manufacturer of discs (Appendix - B).

3.9 TREATMENT OF CLINICAL CASES

For treatment purpose, in all, forty clinical cases of ear infection were divided randomly into four different groups, first three groups contained twelve dogs in each and were subjected to the following topical and parenteral treatment. The fourth group contained four dogs only and were kept as control animals. Before the treatment started, all the infected ears were cleaned

using Hydrogen peroxide (H_2O_2), swab dried and subjected to the following treatments :

Group I: Dogs in this group were dropped with OTEK-AC¹ ear drops, 4 to 5 drops in each ear followed by injection Chlorophen² given intramuscularly at the dose rate of 15 mg per kg body wt.

Group II: These dogs were instilled with Genticyn³ ear drops, 4 to 5 drops in each ear followed by injection Gentabio⁴ 3 mg per kg body wt intramuscularly.

Group III: Dogs of this group were given Ciplox⁵ ear drops, 4 to 5 drops in each infected ear

-
1. OTEK - AC ear drops : A proprietary product of FDC Limited, Bombay- 400 102. Each 5 ml containing Prednisolone 0.5%, Chloramphenicol 5%, Lignocaine HCl 2%, Acetic Acid 2% in propylene glycol vehicle.
 2. Chlorophen - A proprietary product of Vet India Pharmaceuticals Ltd., Hyderabad. Each ml containing Chloramphenicol 100 mg.
 3. Genticyn ear drops - A proprietary product of Nicolas Piramal India Ltd., Pithampur Dist., Dhar (M.P.) containing gentamycin sulphate and Benzalkonium chloride 0.02%.
 4. Gentabio - A proprietary product of Vet Care Division, Bangalore - 500 002. Each ml containing gentamycin 40 mg.
 5. Ciplox ear drops - A proprietary product of Cipla Ltd., Bombay, containing Ciprofloxacin 0.3%, Benzylkonium chloride 0.01% Aqueous vehicle.

followed by injection Ciproden⁶ 8 mg per kg body weight intravenously twice daily.

Group IV: These animals were kept as infected control and were given only placebo treatment, i.e., instillation of distilled water 4 to 5 drops in each infected ear along with injection of distilled water one ml intramuscularly.

The medicated ears were massaged gently for about a minute for uniform distribution of the medicine.

The treatment was continued over a period of seven to fourteen days. The therapeutic response of each case was assessed based on the clinical improvement and absence of ear discharge and ear pain. All the cured cases were observed further for a period of two months following the treatment to record the recurrence of ear infection, if any.

3.10 STATISTICAL ANALYSIS

Statistical analysis of the data was carried out as per the procedures described by Snedecor and Cochran (1967).

6. Ciproden - A proprietary product of Dennis Chem Lab Ltd., Chnabal, Taluk Kalol - 382 729, Each 100ml infusion containing 200 mg of Ciprofloxacin.

The Chi - Square (χ^2) test was employed to study the epizootiological parameters such as age, sex, breed and conformation of ear.

$$\text{Chi - Square } (\chi^2) = \sum \frac{(f_o - f_c)^2}{f_c}$$

where, \sum = Summation

f_o = Observed frequency

f_c = Calculated frequency

...

RESULTS

CHAPTER IV

RESULTS

4.1 INCIDENCE

In the present study, to find out the incidence of various types of ear ailments/disorders in canines, the case records of last three years (1993 to 1995) belonging to Veterinary Hospital, Bhoiguda, Secunderabad were scrutinized. During that period, a total number of 35,400 canine cases were registered and amongst them 1360 dogs suffered with various ear ailments. The data is projected in table 1 and figure 1. The data showed that, 410 (1.16%) dogs suffered with otitis (ear infections), followed by 290 (0.82%) dogs being brought to Hospital for regular ear cleaning; 247 (0.69%) dogs had haematoma; 220 (0.62%) dogs suffering with traumatic wounds and only 193 (0.55%) dogs were affected with mange, whereas amongst the various ear ailments, 30.15 per cent dogs suffered with ear infection alone.

4.2 EPIZOOTIOLOGY

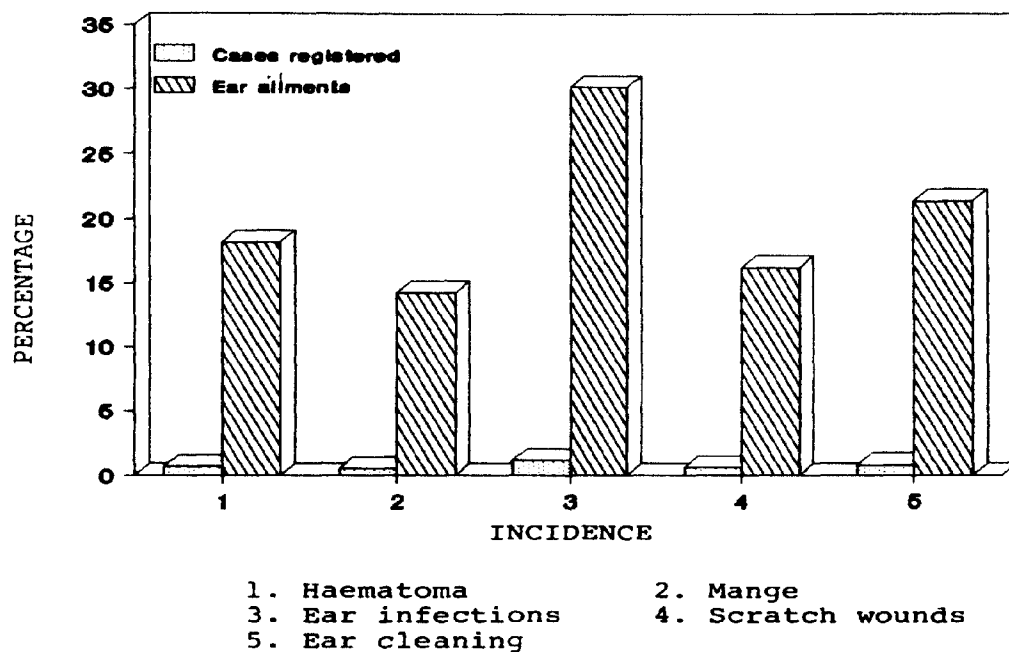
4.2.1 Breed

To find out the association of various breed with the incidence of ear infection, the total number of cases examined individually, during the study period, were taken into account. As shown in table 2 and figure 2, 440 dogs were examined and of them, 180 (60.0%) dogs belonged to

Table 1: Incidence of various ear ailments in canine

S.No.	Ear ailment	Year				Per cent incidence based on	
		1993	1994	1995	Total	*Total number of cases registered	Total number of ear ailments
1.	Haematoma	80	85	82	247	0.69	18.16
2.	Mange	60	65	68	193	0.55	14.19
3.	Otitis/ear infections	120	140	150	410	1.16	30.15
4.	Scratch wounds	80	70	70	220	0.62	16.17
5.	Ear cleaning	80	90	120	290	0.82	21.33
Total		420	450	490	1360	3.84	100.00

* Total number of cases registered during three years period (35,400)



**Fig. 1 : HISTOGRAM SHOWING VARIOUS EAR AILMENTS
IN CANINES (percentage)**

Table 2: Incidence of ear infection in canines in relation to breed of the animal

S.No.	Breed	No. of dogs		Per cent incidence based on		Remarks
		*Examined	Positive	Total No. of dogs examined	Total No. of positive dogs	
1.	Pure breed	180	24	5.45	60.00	
2.	Cross breed	170	12	2.73	30.00	
3.	Non-discript	90	4	0.91	10.00	
Total		440	40	9.09	100.00	

* No. of dogs examined during the study period
 $(P < 0.01; \chi^2 = 7.68 > 6.68)$

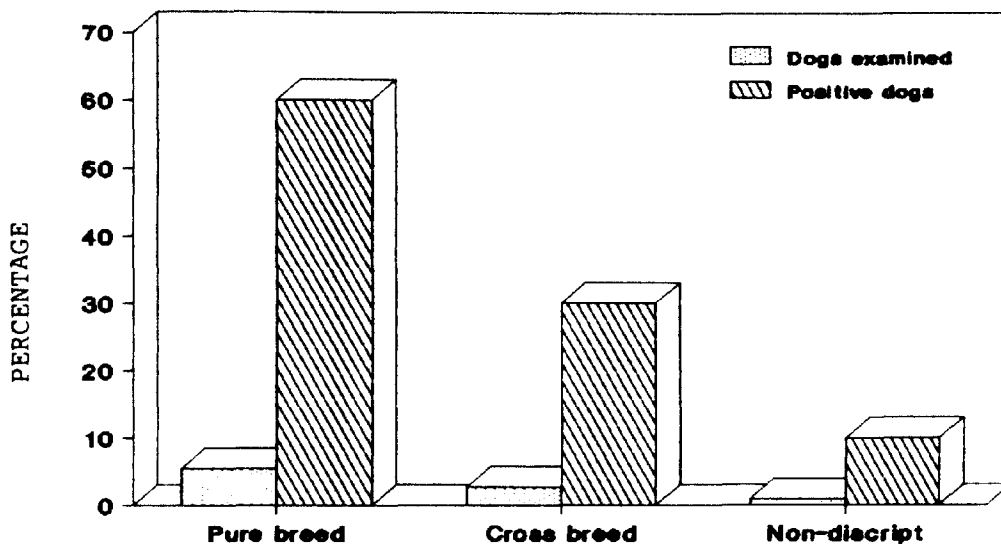


Fig. 2: HISTOGRAM SHOWING EAR INFECTION IN CANINES IN RELATION TO BREED (percentage)

pure breed category comprising of German shepherd, Dalmatian, Pomeranian, Labrador, Dobermann and Dachshund; of them, 24 (60.0%) dogs suffered with ear infection followed by 12 (30.0%) dogs of cross breed variety which included crosses of above breeds and lastly only 4 (10.0%) affected dogs were of non-descript group. The high incidence among the pure breed dogs was highly significant statistically ($P < 0.01$; $\chi^2 = 7.68 > 6.63$).

4.2.2 Age

The incidence of ear infection in relation to age is tabulated in table 3 and figure 3. Of the 40 positive dogs, 25 (62.5%) were upto three years aged and 12 (30.0%) were between 3 to 6 years and only 3 (7.5%) of the infected dogs were aged above six years. The association of age with the ear infection was found significant statistically ($P < 0.05$; $\chi^2 = 6.20 > 5.99$).

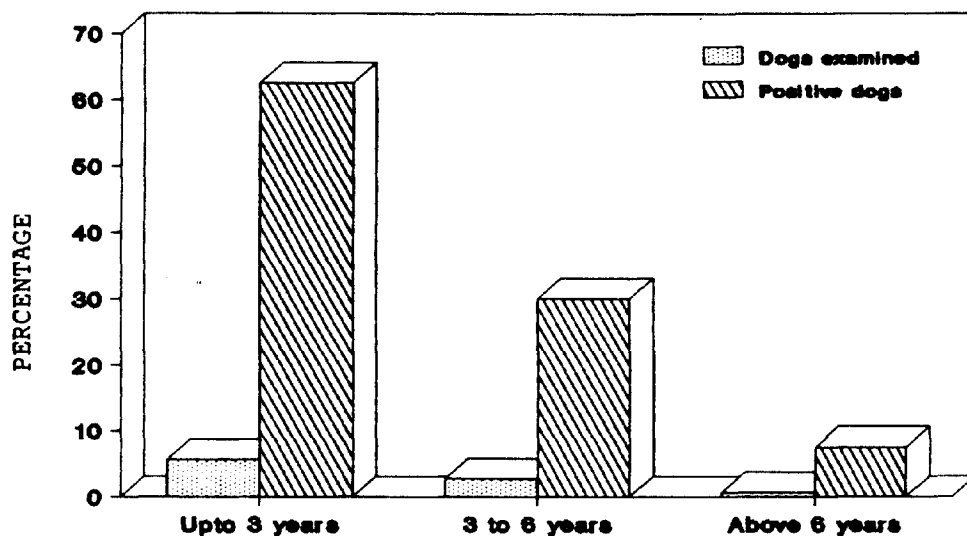
4.2.3 Sex

In the present investigation, out of 40 positive cases of ear infection, 22 (55.0%) were males and remaining 18 (45.0%) were females. The results are exhibited in table 4 and figure 4. Though the involvement of males was slightly higher over the females, the difference was insignificant statistically ($P > 0.05$; $\chi^2 = 0.45 > 3.84$).

Table 3: Incidence of ear infection in cannins in relation to age of the animal

S.No.	Age group	No. of dogs		Per cent incidence based on		Remarks
		*Examined	Positive	Total No. of dogs examined	Total No. of positive cases	
1.	Upto 3 years	220	25	5.68	62.50	
2.	3 to 6 years	120	12	2.72	30.00	
3.	Above 6 years	100	3	0.69	7.50	
Total		440	40	9.09	100.00	

* No. of dogs examined during the study period
($P < 0.05$; $\chi^2 = 6.20 > 5.99$)

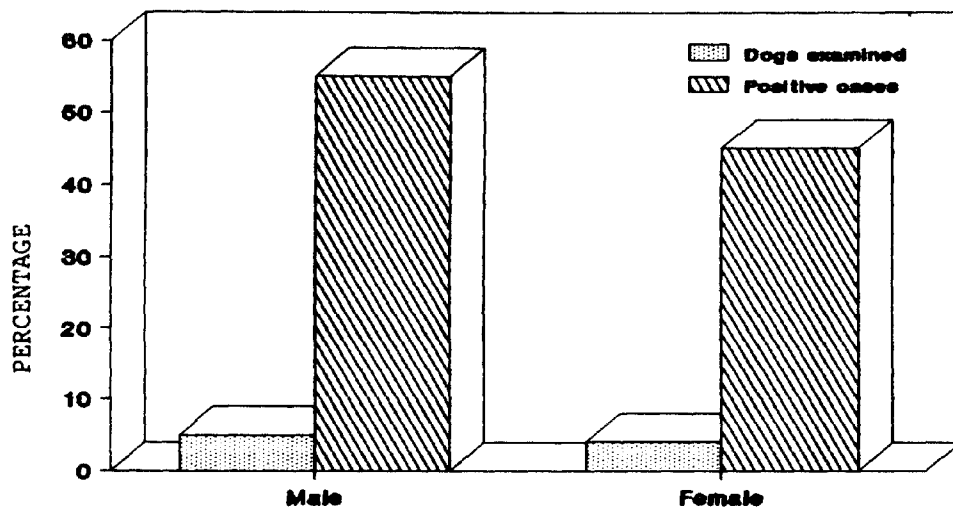


**Fig. 3: HISTOGRAM SHOWING EAR INFECTION IN CANINES
IN RELATION TO AGE OF THE ANIMAL (percentage)**

Table 4: Incidence of ear infection in canines in relation to sex of the animal

S.No.	Sex	No. of dogs		Per cent incidence based on		Remarks
		*Examined	Positive	Total No. of dogs examined	Total No. of positive cases	
1.	Male	230	22	5.00	55.00	
2.	Female	210	18	4.09	45.00	
Total		440	40	9.09	100.00	

* No. of dogs examined during the study period
 $(P < 0.05; \chi^2 = 0.45 > 3.85)$



**Fig.4 : HISTOGRAM SHOWING EAR INFECTION IN CANINES
IN RELATION TO SEX OF THE ANIMAL (percentage)**

4.3 EARS AFFECTED

The incidence of infection in relation to ears affected is shown in table 5 and figure 5. It was evident that 28 (70.0%) out of 40 affected dogs had unilateral ear infection when compared with those 12 (30.0%) dogs with bilateral ear infection.

4.4 CONFORMATION OF THE EAR

Out of 40 cases of ear infection in canines, 5 (12.5%) dogs had erect ears, 13 (32.5%) had semi-erect ears and 22 (55.0%) dogs had dropped or pendulous ears. The difference in the incidence of conformation of the ears was highly significant ($P < 0.01$; $\chi^2 = 13.30 > 9.21$). The results of incidence of ear infection in canines in relation to conformation of year is shown in table 6 and figure 6.

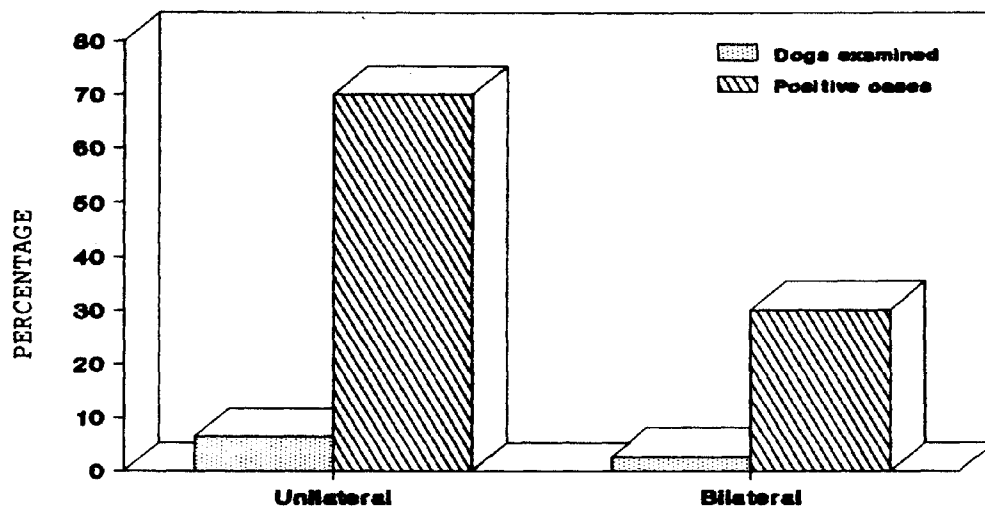
4.5 CLINICAL SIGNS

The frequency of the various clinical signs observed in dogs with ear infection is tabulated in table 7 and figure 7. Of the 40 dogs observed with ear infection, almost all of them had ear scratching and pruritus, about 90 per cent of them had ear pain and head shaking, about 85.6 per cent had ear discharge and few of them had head tilt and erythema of the ear canal.

Table 5: Incidence of ear infection in canines in relation to ears affected

S.No.	Ear affected	No. of dogs		Per cent incidence based on		Remarks
		*Examined	Positive	Total No. of dogs examined	Total No. of positive cases	
1.	Unilateral	240	28	6.36	70.00	
2.	Bilateral	200	12	2.73	30.00	
Total		440	40	9.09	100.00	

* No. of dogs examined during the study period

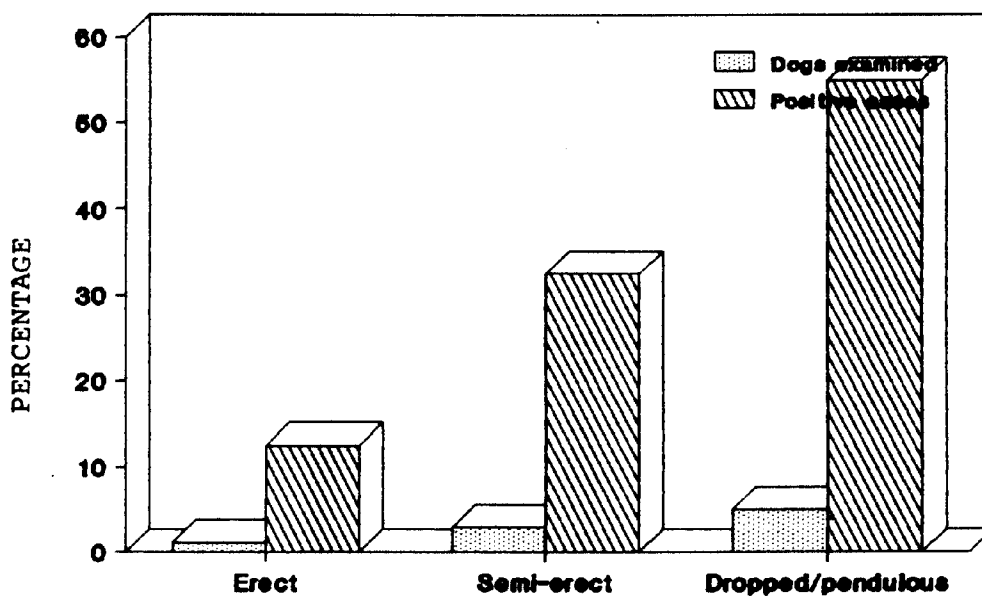


**Fig.5 :HISTOGRAM SHOWING EAR INFECTION IN CANINES
IN RELATION TO EAR AFFECTED (percentage)**

Table 6: Incidence of ear infection in canines in relation to conformation of the ear

S.No.	Conformation of ear	No. of dogs		Per cent incidence based on		Remarks
		*Examined	Positive	Total No. of dogs examined	Total No. of positive cases	
1.	Erect	150	5	1.13	12.50	
2.	Semi-erect	150	13	2.96	32.50	
3.	Dropped/pendulous	140	22	5.00	55.00	
Total		440	40	9.09	100.00	

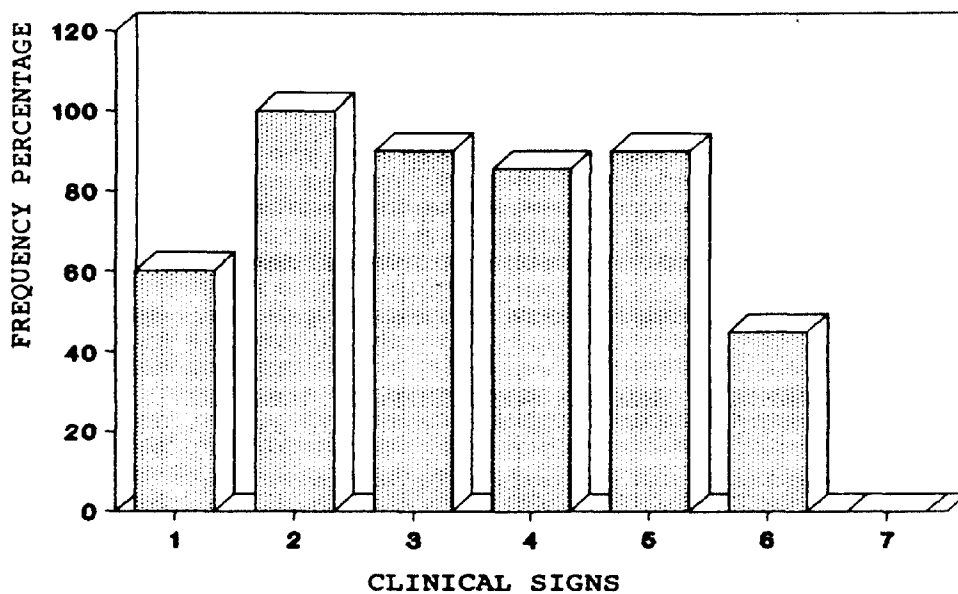
* No. of dogs examined during the study period
($p < 0.01$; $\chi^2 = 13.30 > 9.21$)



**Fig. 6 : HISTOGRAM SHOWING EAR INFECTION IN CANINES
IN RELATION TO CONFORMATION OF THE EAR
(percentage)**

Table 7: Frequency of clinical signs observed in dogs with ear infection

S.No.	Clinical signs	Frequency (%) (n=40)
1.	Erythema	60.20
2.	Ear scratching	100.00
3.	Ear pain	90.00
4.	Ear discharge	85.60
5.	Head shaking	90.00
6.	Head tilt	45.00
7.	Fever	Nil



- | | |
|-----------------|-------------------|
| 1. Erythema | 2. Ear scratching |
| 3. Ear pain | 4. Ear discharge |
| 5. Head shaking | 6. Head tilt |
| 7. Fever | |

Fig. 7 : HISTOGRAM SHOWING FREQUENCY OF CLINICAL SIGNS OBSERVED IN DOGS WITH EAR INFECTION (percentage)

4.6 CLINICAL EXAMINATION OF THE PATIENT

During physical examination of the dogs with ear infection, none of them showed any rise of body temperature, pulse and respiration (Table 8). The otoscopic examination of the infected ears revealed that almost all the animals had intact tympanic membrane, except two of them showings the signs of ulceration with inflammation.

4.7 CULTURAL EXAMINATION OF EAR DISCHARGE

The results of cultural examination of the ear discharges are projected in table 9 and figure 8 to 14. Amongst the various bacteria isolated, 30 cultures (75.00%) of the organism belonged to Staphylococci Spp.; 24 cultures (60.00%) were of Streptococci group, 10 cultures (25.00%) were E. coli organisms and only 7 cultures (17.5%) were of pseudomonas group. Five cultures could not be identified properly.

4.8 IN VITRO DRUG SENSITIVITY

Out of the eight antibiotics tested for sensitivity of the mixed cultures, ~~Cephradex~~ Cephalexin showed the highest (85.00%) sensitivity; followed by Gentamycin (80.00%); Chloramphenical (70.00%); Tetracycline (55.00%); Ampicillin and Penicillin-G each (42.5%) and Bacitracin (37.5%) Streptomycin had the least sensitivity of 32.5 per

Table 8: Clinical examination of the dogs having ear infection

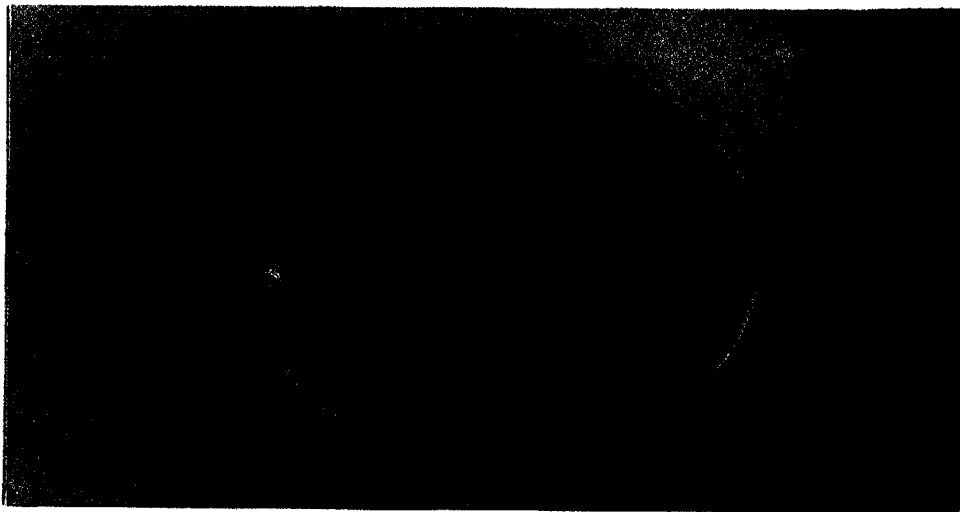
S.No.	Case No.	Temperature (°F)	Pulse per min	Respiration per mt	Condition of the ear canal	Condition of tympanic membrane	Remarks
1.	249	101.6	82	18	Normal	Normal	
2.	254	102.4	80	20	Normal	Normal	
3.	1225	101.8	82	17	Normal	Normal	
4.	1658	102.2	80	25	Inflamed	Normal	
5.	1834	101.6	80	17	Normal	Normal	
6.	1850	101.8	82	20	Inflamed	Normal	
7.	1965	101.6	84	22	Inflamed	Normal	
8.	2028	101.2	85	20	Normal	Normal	
9.	2367	101.0	83	17	Normal	Normal	
10.	2469	101.6	87	17	Normal	Normal	
11.	2470	101.8	85	15	Normal	Normal	
12.	2576	101.6	82	20	Normal	Normal	
13.	2578	101.2	80	20	Normal	Normal	
14.	2713	101.4	84	22	Normal	Normal	
15.	2735	101.6	82	17	Normal	Normal	
16.	2790	101.8	80	21	Normal	Normal	
17.	2835	101.8	82	20	Normal	Normal	
18.	2840	102.0	85	20	Normal	Normal	
19.	3021	101.2	82	22	Normal	Normal	
20.	3082	101.8	84	22	Normal	Normal	
21.	3163	102.2	86	25	Inflamed	Ruptured	

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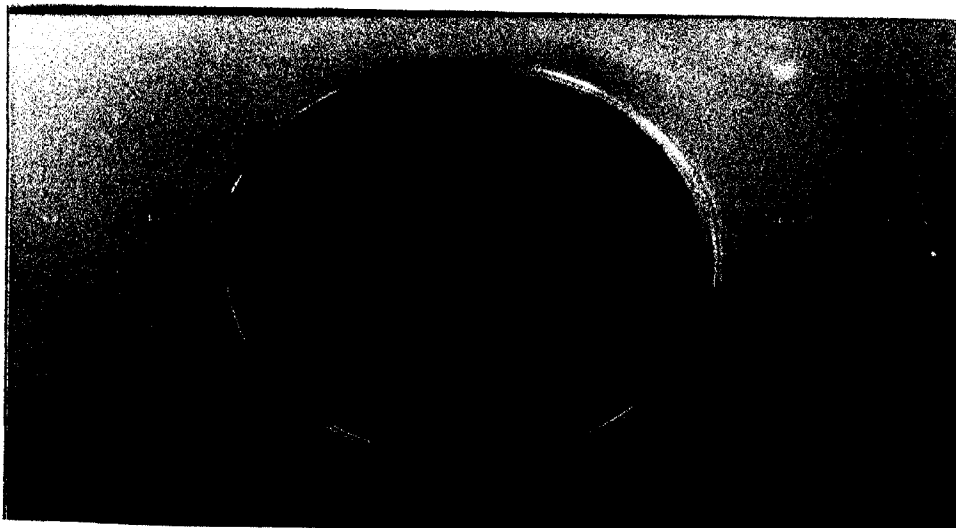
S.No.	Case No.	Temperature (°F)	Pulse per min	Respiration per mt	Condition of the ear canal	Condition of tympanic membrane	Remarks
22.	3167	101.6	84	18	Normal	Normal	
23.	3539	102.2	84	24	Normal	Normal	
24.	3589	101.6	80	20	Normal	Normal	
25.	3630	101.4	83	24	Normal	Normal	
26.	3639	101.4	82	20	Normal	Normal	
27.	3640	101.6	80	20	Normal	Normal	
28.	3659	101.6	84	20	Normal	Normal	
29.	3709	101.6	82	20	Normal	Normal	
30.	4015	101.0	80	20	Normal	Normal	
31.	4016	101.2	85	20	Normal	Normal	
32.	4017	101.4	85	20	Normal	Normal	
33.	4367	101.6	82	20	Normal	Normal	
34.	4377	101.6	80	15	Normal	Normal	
35.	4422	101.4	85	20	Normal	Normal	
36.	4496	101.2	80	22	Normal	Normal	
37.	4500	101.4	82	20	Normal	Normal	
38.	4507	101.2	80	20	Normal	Normal	
39.	4651	101.6	84	20	Normal	Normal	
40.	4709	101.4	82	22	Normal	Normal	

Table 9: Types of bacteria isolated from ear discharge

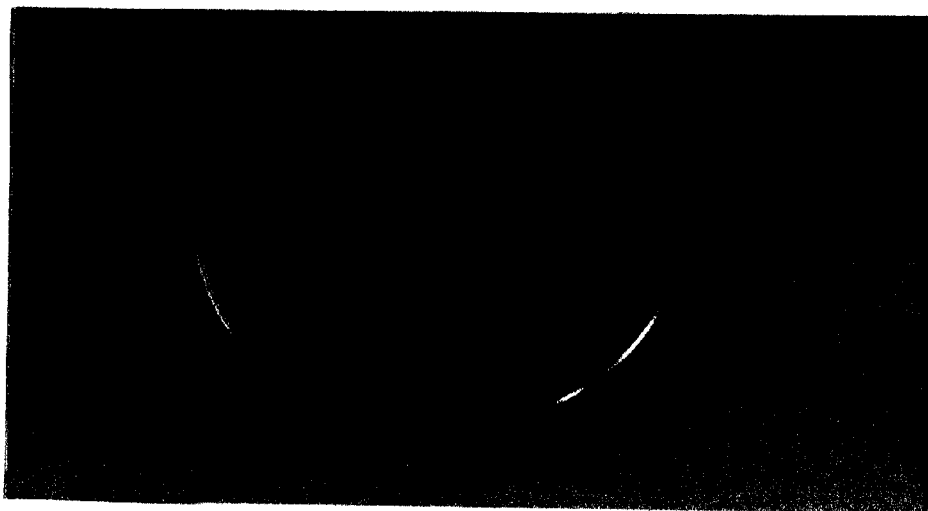
S.No.	Name of bacteria	No. of isolates	Percentage	Remarks
1.	Staphylococci spp.	30	75.00	
	(i) Coagulase positive	22	55.00	
	(ii) Coagulase negative	8	20.00	
2.	Sterptococci spp.	24	60.00	
	(i) Hemolytic	14	35.00	
	(ii) Non-haemolytic	10	25.00	
3.	<i>Escherichia coli</i>	10	25.00	
4.	<i>Pseudomonas</i> spp.	7	17.50	
5.	Unidentified organism	5	12.50	



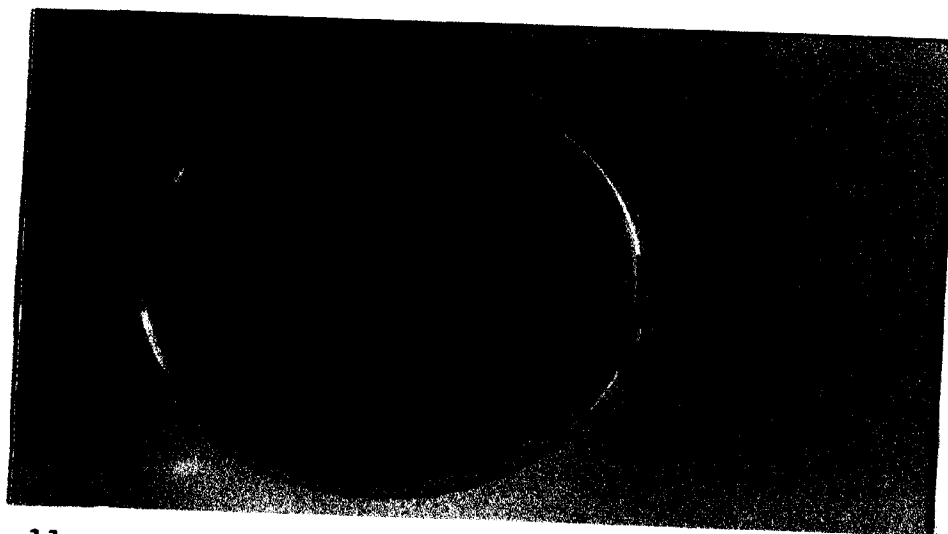
8. Staphylococci colonies on Mannitol
 salt agar.



9. Streptococci colonies on Edward's
 medium



10. E. coli colonies on Mac conkey's Agar



11. Pseudomonas colonies on Pseudomonas
Isolation Agar

Table 10: In vitro drug sensitivity of mixed cultures from ear discharge

S.No.	Symbol	Name of the drug	Concentration	Sensitive bacteria				Resistant		Remarks
				Sensi- tive	Interme- diate	Total	%	No.	%	
1.	C	Ciprofloxacin	5 mcg	14	24	34	85.0	6	15.0	
2.	G	Gentamycin	10 mcg	12	20	32	80.0	8	20.0	
3.	CP	Chloramphenicol	30 mcg	10	18	28	70.0	12	30.0	
4.	T	Tetracycline	30 mcg	7	15	22	55.0	18	45.0	
5.	A	Ampicillin	10 mcg	-	17	17	42.5	23	57.5	
6.	P	Penicillin-G	10 units	-	17	17	42.5	23	57.5	
7.	B	Bacitracin	10 units	-	15	15	37.5	25	62.5	
8.	S	Streptomycin	10 units	-	13	13	32.5	27	67.5	



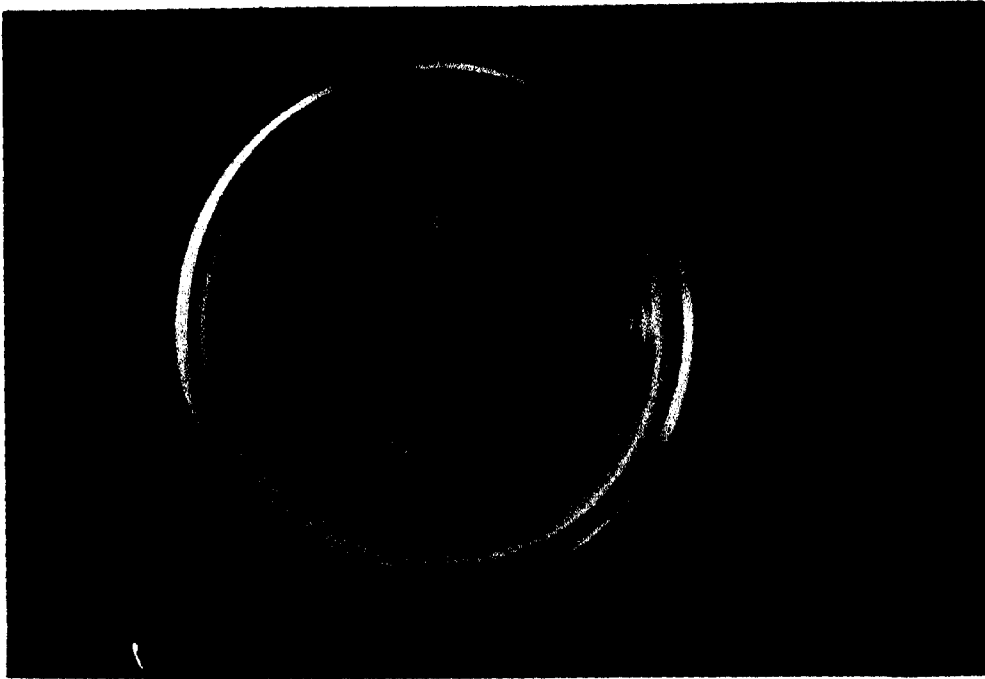
12a. In vitro drug sensitivity of mixed cultures from ear discharge

1. Ciprofloxacin

2. Gentamycin

3. Ampicillin

4. Bacitracin



12b. In vitro drug sensitivity of mixed cultures from ear discharge

1. Tetracycline

2. Streptomycin

3. Penicillin

4. Chloramphenicol

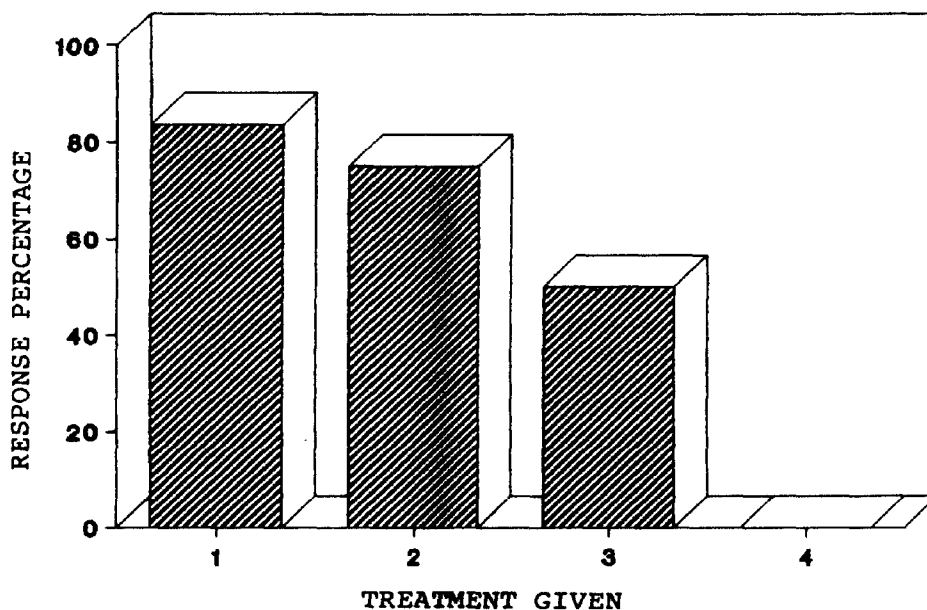
cent only. The results of the drug sensitivity are exhibited in table 10 and figure 12.

4.9 TREATMENT

To study the therapeutic response of ear infection in canines, three drugs were tried and evaluated for their comparative efficacy (Table 11 and Figure 13). The antibiotic ciprofloxacin topical and parenteral combination could treat 10 out of 12 cases giving 83.4 per cent efficacy when compared with the Gentamycin topical and parenteral treating 9 out of 12 cases yielding 75.00 per cent efficacy and the Chloramphenicol topical and parenteral treating 6 out of 12 cases giving 50.00 per cent response. The animals in control group continued to carry the infection throughout the study and observation period. None of the treated dogs showed the recurrence of infection during two months observation period after the treatment.

Table 11: Efficacy of different drugs in treatment of ear infection in cannins

S.No.	Treatment given	No. of dogs		Per cent response	Remarks
		Treated	Cured		
1.	Ciprofloxacin topical and parenteral	12	10	83.4	
2.	Gentamycin topical and parenteral	12	9	75.0	
3.	Chloramphenicol topical and parenteral	12	6	50.0	
4.	Control group	4	Nil	Nil	



1. Cefprofloxacin topical and parenteral
2. Gentamycin topical and parenteral
3. Chloramphenicol topical and parenteral
4. Control

Fig.13: HISTOGRAM SHOWING EFFICACY OF DIFFERENT DRUGS IN TREATING EAR INFECTION IN CANINES (percentage)

DISCUSSION

CHAPTER V

DISCUSSION

The present study was conducted to find out the general incidence of ear ailments with reference to ear infection in dogs along with the epidemiological factors associated with the ear infection in different breeds and different ages of either sexes. Ear discharge was cultured in the laboratory and the drug sensitivity of mixed organism was carried out to formulate the therapeutic regime.

A survey of the case records belonging to the Veterinary Hospital, Bhoiguda, Secunderabad for the last three years (1993 to 1995) was conducted with reference to ear ailments. Out of 35,400 dogs registred during that period, 1360 (3.84%) animals suffered with various ear ailments and of them, 410 dogs had ear infections giving an overall incidence of 30.15 per cent. Earlier Baxter and Lawler (1972), Grono (1980) and Baba et al., (1981) have reported lesser incidence of ear infection in dogs of foreign countries, whereas Devaya (1993) had reported higher incidence of 71.70 per cent in Bangalore in his epidemiological studies on ear infection in canines. The varied incidence of ear infection in different areas might be due to the geographical differences of the causative agents as reported by Grono and Frost (1969).

In the present study, the ear infection was found to be significantly ($P < 0.01$) associated with the dogs of different breeds. Dogs belonging to pure breeds such as German shepherd, Doberman, Labrador, Pomeranian, Dechshund and Dalmatian suffered more frequently when compared with dogs of crossbred and non-descript types. These results are in agreement with the earlier reports of Fraser (1961), Grono and Frost (1969), Baba et al., (1981) and Devaya (1993). Earlier Devaya also reported 62.26 per cent, 26.41 per cent and 11.32 per cent ear infection in Pure breed, Cross breed and mongrel dogs in Bangalore city.

The incidence of ear infections was significantly ($P < 0.01$) associated with different age groups. The incidence of ear infection in the present study decreased along with the advancement in the age. The dogs upto three years had significantly higher incidence when compared with those of 3 to 6 years and above six years in age. These results corroborate with the earlier reports of Sharma and Rhoades (1975) and Chengappa et al., (1983). However, the contradictory reports of the increasing incidence of ear infection along with the increasing age was reported by Little et al., (1991). Some workers observed that the highest incidence between 5 to 8 years of age (Grono and Frost, 1969; Grono, 1980; and Devaya, 1993). In the present study the decrease in the incidence

alongwith the increase in the age might be due to the increased resistance of the animal along with the advancement in age and taking care of some managerial factors such as cleaning the ears regularly at younger age and plugging the ears with cotton plug prior to giving the bath.

In the present observation the sex of the dog did not play any significant ($P>0.01$) role in the incidence of ear infections. These findings correlate with the earlier reports of Baxter and Lawler (1972) Sharma and Rhods (1975), Chengappa et al., (1983), Little et al., (1991) and Devaya (1993). However, Grono and Frost (1969) reported higher prevalence of ear infection in males than in females.

In the present observation most of the dogs suffered with unilateral infection i.e., affecting only one ear when compared with the bilateral infection in few dogs. These findings are in agreement with the reports of Devaya (1993) and for this no specific reason could be explained.

Conformation of the ear played a major role in the aetiology of incidence of ear infection in dogs. In the present investigation dogs with dropped or pendulous ears suffered maximum ($P<0.01$) when compared with those having semi-erect or erect ears. These findings are in agreement with the earlier reports of Joshua (1958), Durr

and Freudrigger (1976), Hayes et al., (1987), Baba et al., (1981) and Devaya (1993). However, Blakemore (1968) observed insignificant difference between the conformation of the ear and occurrence of ear infection rather they have reported relatively more incidence in dogs with erect ears as compared to dropped and semi-erect ears. However, the higher incidence of ear infection in the dropped or pendulous ears as seen in the present study might be due to the fact that pendulous drooping ears would predispose the animal for ear infection because of insufficient ventilation for absorption and evaporation of moisture leading to maceration of the ear canal epithelium and subsequent ear infection. (Ehinger, 1976; and August 1988). This together, with an adequate temperature and blood supply makes the tortuous ear canal an ideal environment for bacterial and fungal growth, (Grono, 1980). But the other breed of dogs with erect or semi-erect ears also suffered to some extent with ear infections perhaps as a secondary complication to many primary ear ailments (Devaya, 1993).

Clinical examination of the dogs affected with ear infection was carried out to report any deviation from the normal health by recording the body temperature, pulse respiration and examination of soundness of tympanic membrane using otoscope. Almost all the infected dogs showed the evidence of ear scratching, pain, head shaking

and ear discharge. None of the affected dogs showed any deviation from normal temperature, pulse and respiration. The tympanic membrane was observed normal by otoscopic examination in almost all the dogs except in two animals where it was seen inflamed and ruptured. Earlier Little and Lane (1989) and Devaya (1993) also carried out otoscopic examination of the infected ears and reported similar results.

In the present investigation, the cultural examination of the ear discharge showed that the organisms Staphylococci being associated with most of the infections followed by streptococci, *E. coli*, and Pseudomonas. These findings are in agreement with the Wang (1972), Blue and Wooley (1977), Lund (1979), Baba et al., (1981), Dakshinkar et al., (1992) and Devaya (1993). The few unidentified organisms in the present study might be the fungi since they are also associated with the ear infections along with other organism as reported by Baxter and Lawler (1972), Sharma and Rhoades (1975) and Chengappa et al., (1983). Further studies are needed to study the nature of these unidentified organisms.

The drug sensitivity test of the mixed organisms in the present study indicated the highest sensitivity towards the cep~~ro~~^{ro}flexin followed by gentamycin and chloramphenicol. The least sensitivity was shown towards the antibiotics such as streptomycin, bacitracin,

penicillin and ampicillin. Earlier the highest sensitivity towards gentamycin and chloramphenicol was reported by Grono (1980), Sala et al., (1983) and Devaya (1993). The highest sensitivity against Cefprozil, reported in the present study is on the lines of Sala et al., (1983) and Devaya (1993). The least sensitivity reported in the present study corroborate with the reports of Dakshinkar et al. (1992).

The treatment of the ear infection in the present study revealed the highest efficacy by using cefprozil topical and parenteral combination followed by gentamycin and chloramphenicol. The cefprozil being the new type of antibiotic, no data was available to compare the present findings. Devaya (1993) reported better results with cephalixin by oral use. However, the efficacy of the gentamycin and chloramphenicol reported in the present studies are in agreement with the reports of Fraser (1961), Baba et al., (1984), Devaya (1993) and Verma (1994). The better results were obtained when the gentamycin was combined with dexamethasone (Fraser, 1961; Algoet, 1979); since corticosteroid was useful to counteract the inflammation. But the gentamycin sulphate if used for a longer period, about 25 per cent of patients might show ototoxicity (Verma 1994). Since the organisms recovered from the patients with chronic ear infection are often opportunists living in the debris, Keratin and

necrotic bone tissue (Anon, 1996), a thorough cleaning of the ear is essential. Therefore, in the present therapy, Hydrogen peroxide was used as a cleaning agent since it releases free oxygen on reaction with catalase of mucosa and denuded skin of the ear when poured leading to efferevescence. The release^d nascent oxygen exerted^d brief germicidal effect and the bubbling helped^d in mechanical removal of pus and tissue debris (Verma, 1994).

In the present study, though the drug of choice was ciprofloxacin yet it could treat only ten out of twelve ear infection cases and two cases were left untreated. This failure might be due to the involvement of unidentified organisms which might belong to fungal group. The isolation, identification and drug sensitivity of fungal organisms need^s further studies.

SUMMARY

CHAPTER VI

SUMMARY

A survey was carried out to study the incidence of various ear ailments in canines with a particular reference to ear infections. Studies were also made in aspects of epizootiological factors, cultural isolation of bacteria causing ear infection along with their drug sensitivity and a therapeutic regime.

In the present investigation, 1360 dogs with ear ailments were analysed. Of them, 410 animals suffered with otitis thus giving an incidence of 30.15 per cent.

The ear infections were found to be significantly ($P < 0.01$) associated with breed of the dog. Pure breed animals has 60.00 per cent incidence followed by 30.00 per cent in cross-bred and only 10.00 per cent incidence in non-descript breeds.

In relation to age of the animal, the dogs in the age group upto 3 years had 62.5 per cent incidence ($P < 0.05$); dogs of 3 to 6 years had 30.00 per cent incidence whereas animals of above six years in age had least (7.5%) incidence.

Sex had no influence on the incidence of ear infection in canines ($P < 0.05$).

Most of the affected dogs (70.0%) had the unilateral infection affecting one ear alone when compared with 30.0 per cent of the animals with bilateral infection.

The conformation of the ear had significant ($P < 0.01$) influence on the ear infection. Dogs with erect ears had least (12.5%) infection and those with dropped or pendulous ears had the highest (55.00%) incidence, whereas dogs with semi-erect ears had 32.5 per cent incidence.

The frequency of the clinical signs amongst the affected ones were variable. Almost all the affected dogs had ear scratching and head shaking with ear pain and discharge and few animals had erythema of the canal epithelium and head tilt. None of the affected dogs showed any rise of body temperature.

The physical examination of the infected dogs revealed the normal body temperature, pulse and respiration. The otoscopic examination of the tympanic membrane indicated intactness in all the cases except in two animals those revealing inflammation and ulceration.

Cultural examination of the ear discharge indicated the presence of Staphylococci, Streptococci, *E. coli* and Pseudomonas and few unidentified organisms.

The drug sensitivity test on the mixed cultures indicated that 85.00 per cent organisms being sensitive to

Cep~~ro~~^{fl}~~oxacin~~ followed by decreasing order of Gentamycin, Chloramphenicol, Tetracycline, Ampicillin and Penicillin; Bacitracin and Streptomycin.

Out of the three drugs tried for therapeutic efficacy the most effective was cⁱprofloxacin topical and parenteral followed by the drugs Gentamycin and Chloramphenicol. None of the dogs showed any evidence of recurrence during the observation period of two months after the treatment.

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APPENDICES

APPENDIX - A**COMPOSITION AND PREPARATION OF MEDIA (HI-MEDIA) USED IN THE STUDY****1. NUTRIENT BROTH (M 002)**

Composition	Grams/litre
Peptone	5.0
Sodium Chloride	5.0
Beef Extract	1.5
Yeast Extract	1.5
pH at 25°C	7.4+0.2

Preparation

To rehydrate this medium 13 grams of the medium was suspended in one lit. of distilled water, heated to boiling temp. to dissolve the medium completely and sterilised by autoclaving at 15 lbs pressure for 15 minutes.

2. NUTRIENT AGAR (MM 012)

Composition	Grams/litre
Beef Extract	10.0
Peptone	10.0
Sodium Chloride	5.0
Agar	12.0
pH at 25°C	7.4+0.2

Preparation

37 grams of the medium was dissolved in one lit. of distilled water heated to boiling temp. and sterilised by autoclaving at 15 lbs pressure (121°C) for 15 minutes.

3. MANNITOL SALT AGAR (M 118)

Composition	Grams/litre
Beef Extract	1
Proteose peptone	10
Sodium chloride	75
D-Mannitol	10
Phenol Red	0.025
Agar	15.0
pH at 25°C	7.4±0.2

Preparation

To rehydrate the medium, 111 grams of this medium was dissolved in one lit. of distilled water boiled to dissolve and sterilized by autoclaving at 15 lbs pressure (121°C) for 15 minutes.

4. MAC CONKEY AGAR (M 008)

Composition	Grams/litre
Peptone	17
Proteose peptone	3
Lactose	10
Bile Salts	1.5
Sodium Chloride	5
Neutral Red	0.03
Agar	15
pH at 25°C	7.1+0.2

Preparation

To prepare the medium 51.5 gms of the medium was suspended in one lit. of distilled water boiled to dissolve the medium completely and sterilized by autoclaving at 15 lbs pressure (121°C) for 15 minutes.

5. PSEUDOMONAS ISOLATION AGAR (M 406)

Composition	Grams/litre
Peptone	20.0
Magnesium Chloride	1.4
Potassium Sulphate	10.0
Agar	13.6
Irgasan (R)	0.3
pH at 25°C	7.2+0.2

Preparation

To prepare the medium 45.3 grams of the medium was suspended in one lit. of distilled water, containing 10.0 glycerol, boiled to dissolve the medium completely and sterilized by autoclaving at 15 lbs pressure (121°C) for 15 minutes.

6. EDWARDS MEDIUM (M 748)

Composition	Grams/litre
Beef Extract	10.0
Peptone	10.0
Aesculin	1.0
Sodium Chloride	5.0
Crystal Violet	0.0013
Thailous Sulphate	0.38
Agar	15.0

Preparation

41 grams of the medium was suspended in one lit. of distilled water, boiled to dissolve the medium completely and sterilized by autoclaving at 15 lbs pressure (121°C) for 15 minutes.

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APPENDIX - B

ANTIBIOTIC SENSITIVITY - ZONE SIZE - INTERPRETATION CHART (HI MEDIA)

S.No.	Antimicrobial Agent	Symbol	Disc concentration	Diameter of zone of inhibition (mm)		
				Resistant	Intermediate	Sensitive
1.	Ampicillin	A	10 mcg	20	21-28	29
2.	Bacitracin	B	10 units	8	9-12	13
3.	Chloramphenicol	CP	30 mcg	12	13-17	18
4.	Ciprofloxacin	C	5 mcg	15	16-20	21
5.	Gentamycin	G	10 mcg	12	13-14	15
6.	Tetracycline	T	30 mcg	14	15-16	19
7.	Streptomycin	S	10 mcg	11	12-14	15
8.	Penicillin	P	10 units	19	20-27	28

HINEDIA Laboratories Private Ltd., Bombay, India

APPENDIX - C

COLLEGE OF VETERINARY SCIENCE, R'NAGAR
DEPARTMENT OF MEDICINE

CASE-SHEET FOR EAR INFECTION

I. History of the Animal :

Case No:	Kind of Animal:	Sex:
Age :	Breed :	Confirmation of the Ear.
		Erect/Semierect/ dropped

Unilateral/Bilateral

II. Name & Address of the Owner :

III. Clinical Signs (Before / After Treatment)

Temp:	Pulse:	Respi:
- Ear Discharge		Present / Absent
- Nature of Discharge		Watery / Purulent
- Pruritus		Present / Absent
- Shaking / Tilting of Head		Present / Absent

IV. Types of Bacteria isolated for the Ear discharge:

V. Drug Sensitivity of the Bacteria (Mixed Culture)

Pen	Strepto	Tetra	Ampi
Baci	Genta	Trimetho	Cipro

VI. Therapy given:

3089

Signature of the Major Advisor