Microbial Profile and Antimicrobial Susceptibility of Isol from dogs with Otitis Externa in Kenya

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Abstract

Exudates from 78 dogs with clinical signs of otitis externa in the period 1991 to 2000 were submitted for culture and antimicrobial susceptibility testing. The microbial isolates recovered were Staphylococcus aureus, 40/78 (51.3 %), Streptococcus spp 11/78 (14. 1 %), Pseudomonas spp 11/78 (14.1 %), Proteus spp 8/78 (10.2 %), Escherichia coli 2/78 (2.6 %), Corynebacterium spp 1/78 (1.3 %) and yeasts 3/78 (3.8 %) were infrequently isolated. No organisms were isolated from 2/78 (2.6 %) of samples submitted. Otic cytology is useful in demonstrating yeasts from dogs with otitis externa. These isolates were resistant to tetracyclines, sulphonamides, kanamycin and streptomycin, hence the drugs may not be effective in treating bacterial otitis externa in dogs. However, good sensitivity was observed with gentamycin, chloramphenicol, ampicillin and penicillin. This study has characterized microbial isolates and antimicrobial susceptibility from dogs with otitis externa, information that can be used to provide appropriate antibiotic therapy to affected dogs.

Introduction

The most common ear disease of the dog and cat is otitis externa which may be present in 10 - 20 % of the canine and 2 – 10 % of the feline population (Cole, 2004). Although not a directly life threatening condition, otitis externa diminishes the quality of life of affected patients. Failure to manage otitis externa appropriately often results in recurrent pain, inflammation and infection eventually progressing to end-stage disease. Successful management of otitis externa in veterinary patients requires understanding of the multifactorial pathogenesis, especially the associated secondary bacterial and yeast infections (Angus, 2004; Rosser, 2004).

The common primary factors are (*Otodectes cynotis*); allergies (food, atopy, contact; foreign bodies (grass awns, foxtails), keratinization disorders (seborrhea), trauma, autoimmune disease, sebaceous adenitis and zinc-responsive dermatosis. Predisposing factors for otitis externa include conformation of the ear canal (long canal with a deep vertical component), moisture in the canal, hair in the ears, breed predisposition immunodeficiency syndromes, endocrine imbalances, iatrogenic ear trauma (hair removal and cleaning with cotton-tipped applicators) and obstructive disease due to cancer, polyps and hyperplasia (Rosser, 2004).

The secondary infections are important as they perpetuate and aggravate the inflammatory process after a condusive environment created by other environment entails occlusion of the c prevents drying or proper application of secretion of irritating factors, alterations i canal and formation of a focus of infection (o These organisms include bacterial (*Staphylococcus aureus, Proteus Pseudomonas aeroginosa, Corynebacteriu Escherichia coli*) and yeast infections (*M pachydermatis*). The condition may progres media, which serves as a source of infectio resulting in chronic hyperplastic chan obstruction of the ear canal (Shell, 1994). D procedures are directed towards identifying predisposing and perpetuating factors (Rosse Otoscopic examination is useful in evaluating of the ear canals; the presence of parasites, ex hair or foreign material; the color of the epitheli presence of ulcers or tumours and the appearan integrity of the tympanic membrane (Cole, Cytology is another rapid inexpensive diag procedure that is indicated for initial treatment pla in all cases of otitis externa (Angus, 2004). Cultu susceptibility testing is indicated in recurrent otiti in severe ulcerated otitis when bacteria are seen d the cytologic examination. Biopsy is indicated v abnormal growths are detected. Radiograph occasionally indicated especially in severe or chr otitis, to evaluate the patency of the ear canal, to de the presence of otitis media and otitis interna, anc determine the extent of involvement of surroundi structures. Diagnostic imaging of the ear of dogs a cats may be performed using radiograph ultrasonography, advanced imaging techniques such computed tomography and magnetic resonance imagin to evaluate the ear canal and tympanic bulla (Bischo and Kneller, 2004). A neurological examination is als recommended (Boothe, 2004; Cook, 2004; Gotthelf 2004; Morris, 2004; Shell, 1994). In Kenya, the most frequently used diagnostic tools in the confirmation of otitis externa are hand-held otoscopy and bacterial culture and antimicrobial susceptibility testing.

No report was available on the microbial profile and antimicrobial susceptibility of isolates from dogs with otitis externa in Kenya. Yet otitis externa cases (that are sometimes recurrent) caused by some resistant bacteria to common antimicrobial agents, are frequently

diagnosed in dogs presented to the small animal clinic over the past decade. Hence the need for this study.

Materials and Methods

A total of 78 samples of exudates from dogs with clinical signs of otitis externa submitted to the microbiology laboratory of the Department of Clinical Studies, University of Nairobi in the period 1991 to 2000 for microbial culture and antimicrobial susceptibility testing were analyzed in this study. The exudates were collected using sterile cotton tipped swabs that were introduced into the external ear of affected dogs. These were routinely cultured using blood agar (Blood Agar Base No. 2, Oxoid Ltd, Basingstoke, Hampshire, England). Antimicrobial susceptibility testing was performed using the Disk Diffusion method (Baron, *et al.*, 1994), using trips for sulphonamides, potentiated sulphonamides, penicillin, ampicillin, tetracycline, streptomycin, kanamycin, chloramphenical and gentamycin (Octodiscs 100, HiMedia Laboratories Ltd). A summary of the year, case number, microbial isolates and outcomes of antimicrobial susceptibility testing was prepared and used to determine the percentage of microbial organisms isolated from the dogs. The percentage resistance towards several antimicrobial agents (sulphonamides, potentiated sulphonamides, penicillin, ampicillin, amoxycillin, tetracyclines, streptomycin, kanamycin, chloramphenicol and gentamycin) was determined for each isolate in the study. In addition, the mean resistance of the isolates towards each of the antimicrobial agents was calculated and compared.

Results

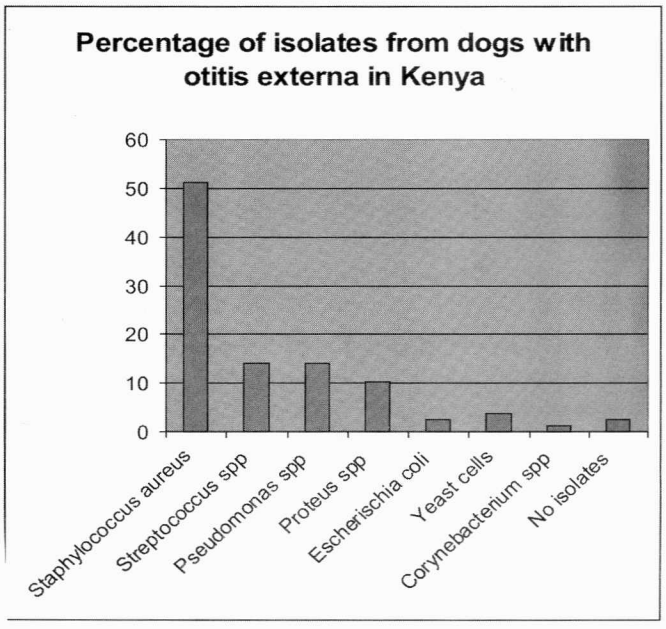
The results of the microbial isolates recovered from the ear canals of dogs with otitis externa are presented in Tables 1 and Figure 1. A total of 78 exudates from dogs with otitis externa were analyzed. Of these, 76 (97.4 %) had microbial isolates while 2 samples (2.6 %) yielded no microorganisms. The most frequently isolated bacteria was *Staphylococcus aureus* 40/78 (51.2 %), while moderately isolated bacteria included *Streptococcus spp and, Pseudomonas spp* each 11/78 (14.1 %) and *Proteus spp* 8/78 (10.1 %) of the samples. Microorganisms that were infrequently isolated included *Escherichia coli* 2/78 (3.8 %) and *Corynebacterium spp* 1/78 (1.3 %) and yeast cells 3/78 (2.6 %).

Generally, the isolates that were frequently encountered were resistant to sulphonamides, potentiated sulphonamides, streptomycin and kanamycin. However, good sensitivity was noted with ampicillin and penicillin. Chloramphenical resistance was noted mainly by *Pseudomonas spp*. The results of the antimicrobial sensitivity testing for the 4 most frequently isolated microorganisms towards the specific drugs are summarized in Table 2 and illustrated in Figure 2.

Table 1. Microbial isolates from dogs with otitis externa in Kenya.

ISOLATES	Number of samples	Percentage of isolates
Staphylococcus aureus	40	51.2
Streptococcus spp	11	14.1
Pseudomonas spp	11	14.1
Proteus spp	8	10.2
Escherichia coli	2	2.6
Yeast cells	3	3.8
Corynebacterium spp	1	1.3
No organisms isolated	2	2.6
TOTAL	78	100

Figure 1. The microbial profile of isolates from dogs with otitis externa in Kenya.

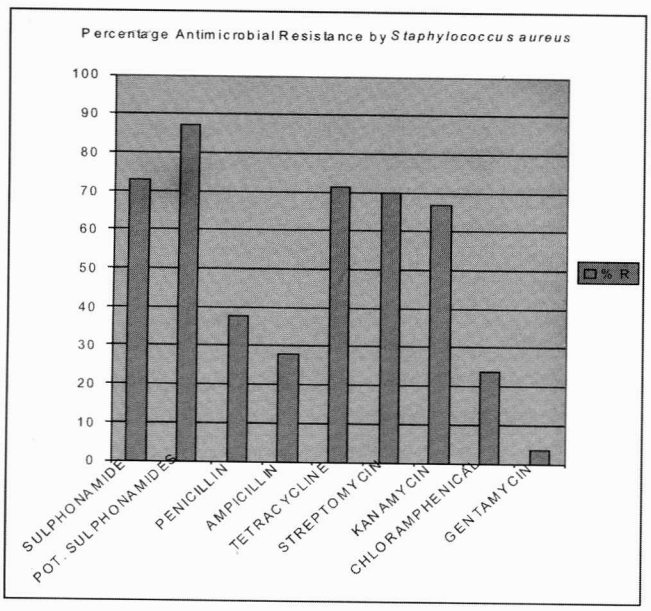


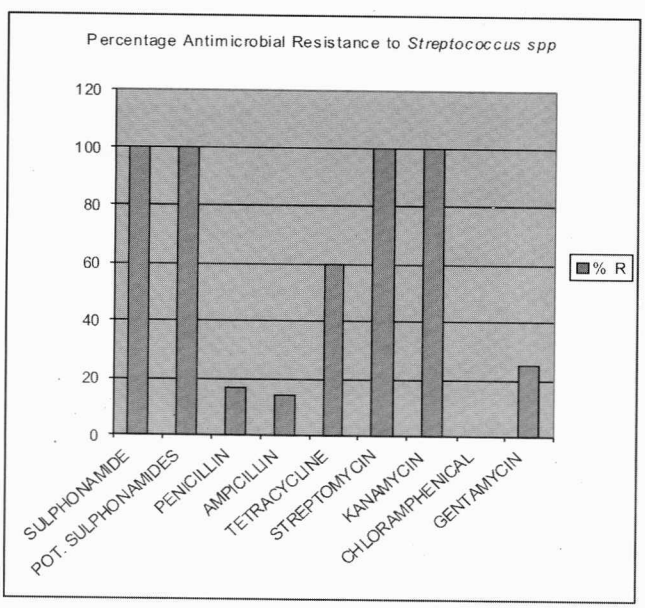
Discussion

The study showed pathogenic microbial flora recovered from dogs with otitis externa in Kenya. Its findings were similar to those in other parts of the world which indicate that *Staphylococcus aureus* is the commonest organism isolated from normal dogs and those with otitis externa (Cole, *et al.*, 1998; Graham-Mazie and Rosser, 2004; Mckeller, 1998; Rosser, 2004; Shimizu, *et al.*, 2001). The occurrence of *Pseudomonas spp* and *Proteus spp* from dogs with otitis externa often reflect a chronic clinical disease. However, all these microbial isolates are secondary invaders after underlying predisposing

etiological factors to the ears of these dogs during this study. Yeasts are commensal flora of the external ear canal of dogs that are predisposed by moisture environmental condition and frequent antimicrobial

Figure 2. Percentage antimicrobial resistance (% R) by *Staphylococcus aureus* and *Streptococcus spp*





therapy. These yeast cells are frequently isolated from dogs with otitis externa in many parts of the world, unlike this study, may be, due to the diagnostic protocol adopted in isolation of the fungi. *Malassezia pachydermitis* is a common pathogen of otitis externa in dogs demonstrated by otic cytology (Masuda, *et al.*, 2000; Noxon, 1994), a procedure that was not routinely performed during the study period. The fungi require specific therapy, hence a need to rule them out in dogs with chronic otitis externa, by performing otic cytology.

Additional clinical data should always be obtai whenever a dog is presented to the veterinarian wit complaint of otitis externa. Some of the possible clini syndromes to consider in this region are the hi prevalence of hemoparasites like *Babesia canis* a ehrlichial infections, which tend to lower the immu status of affected dogs. Food allergies and oth dermatological conditions should also be investiga as they often manifest clinically as otitis externa affected dogs. Although the study revealed presence pathogenic microorganisms isolated from dogs w otitis externa, the number of samples is comparative low (78 swabs in 10 years). This could be due to t fact that not all dogs with otitis externa were sampl reflecting the need to encourage clinicians to subm clinical material for diagnostic purposes.

The data revealed a wide variation in the number antimicrobial sensitivity tests performed for the 4 ma isolates towards the 8 antimicrobial agents (potentiat sulphonamides, sulphonamides, penicillin, ampicill streptomycin, kanamycin, chloramphenicol an gentamycin). Therefore the results were presented a percentage resistance based

on the number of isolates for which antimicrobi sensitivity testing was performed. To overcome suc variations in future studies, it is recommended th diagnostic laboratories standardize the antimicrobi agents for which susceptibility testing is routine performed.

The observation of high resistance towards tetracycline sulphonamides, potentiated sulphonamides an kanamycin is consistent with data published by othe workers elsewhere (Cole, *et al.*, 1998; Graham-Maz and Rosser, 2004; Mckeller, 1998; Shimizu, *et al.*, 2001 However, the percentage resistance in this study wa higher compared to previous reports on drug resistanc (Shimizu, *et al.*, 2001). Whereas it may be tempting t recommend that these drugs should not be used for th management of otitis externa, experienced clinician have argued that the otic preparations are administere at concentrations higher than those used in th antimicrobial sensitivity testing. In addition, oti flushing plays an important role in the effectiv management of otitis externa in dogs, as the procedur greatly reduces the overall microbial load in infecte ears and thus facilitates the action of antimicrobia agents in affected dogs.

This study has shown moderate susceptibility of th isolates towards ampicillin and streptomycin and ver good susceptibility of the isolates towards gentamycin and chloramphenicol. This could suggest that clinician reserve the use of these drugs only in cases in which isolated pathogens demonstrate antimicrobial resistance to other commonly used drugs. Further research is required to determine the importance of yeasts in the

Table 2. Summary of the percentage antimicrobial resistance of isolates from dogs with otitis externa in Kenya.

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ISOLATES	*Staphylococcus aureus*		*Streptococcus spp*		*Pseudomonas spp*		*Proteus spp*			
ANTIMICROBIAL AGENT	Percentage Resistance	Isolates	Percentage Resistance	Isolates	Percentage Resistance	Isolates	Percentage Resistance	Isolates	Total Isolates	Mean Resistance
SULPHONAMIDES	72.7	11	100	3	100	4	66.7	3	21	84.9
POTENTIATED SULPHONAMIDES	87	23	100	6	100	10	100	8	47	96.8
PENICILLIN	37.5	24	16.7	6	100	3	66.7	3	36	55.2
AMPICILLIN	27.8	36	14.3	7	71.4	7	60	5	55	43.4
TETRACYCLINE	71.4	35	60	10	81.8	11	75	8	64	72.1
STREPTOMYCIN	70	10	100	3	80	5	40	5	23	72.5
KANAMYCIN	66.7	9	100	2	100	5	20	5	21	96.7
CHLORAMPHENICAL	23.8	21	0	5	66.7	6	40	5	37	32.6
GENTAMYCIN	3.7	27	25	8	0	9	0	7	51	7.2
Sum		185		47		56		49	355	
Standard deviation		9.99		2.588		2.777		1.878	15.828	
Mean		23.125		5.875		7		5.444	39.444	
Range		9 to 36		2 to 10		3 to 11		3 to 8	21 to 64	

pathogenesis of otitis externa in Kenya by use of routine otic cytology, and the trends in the microbial profiles and antimicrobial susceptibility outcomes in the next decade. The information would be used to determine the most suitable approaches/ strategies for medical management of otitis externa in dogs in Kenya.

References

Angus, J.C. 2004. Otic cytology in health and disease. Veterinary Clinics of North America Small Animal Practice 34:411-424.

Baron, E.T., Peterson, L.R., and FineGold, S.M. 1994. (Eds) Methods for testing antimicrobial effectiveness. In Bailey and Scott's Diagnostic Microbiology 9th Edition 168-188. Mosby –Year Book, Inc St. Louis, Missouri 63146.

Bischoff, M.G., and Kneller, S.K., 2004. Diagnostic imaging of the canine and feline ear. Veterinary Clinics of North America Small Animal Practice 34:437-458.

Boothe, H.W. 2004. Surgery of otitis media and otitis interna. In Saunders Manual of Small Animal Practice 392-395 Birchard, S.J., Sherding, R.G. (Ed). W.B. Saunders Philadelphia 19106.

Cook, L.B. 2004. Neurologic examination of the ear. Veterinary Clinics of North America Small Animal Practice 34:425-435.

Cole, L.K., 2004. Otoscopic evaluation of the ear canal. Veterinary Clinics of North America Small Animal Practice 34:397-410

Cole, L.K., Kwochka, K.W., Kowalski, J.J., and Hillier, A., 1998. Microbial flora and susceptibility patterns of isolates pathogens from the horizontal ear canal and middle ear in dogs with otitis media. Journal of American Veterinary Medical Association 212:534-538.

Gortel, K. 2004. Otic flushing Veterinary Clinics of North America Small Animal Practice 34:557-565.

Gotthelf, L.N., 2004. Diagnosis and treatment of o media in dogs and cats. Veterinary Clinic North America Small Animal Practice 34: 487.

Graham-Mazie, C.A., and Rosser, E.J., 2 Comparison of microbial isolates susceptibility patterns from the external ear c of dogs with otitis externa. Journal of Amer Animal Hospital Association 40:102-108.

Masuda, A., Sukegawa, T., Mizumoto, N., Tan Miyamoto, T., Sasai, K., and Ba, E., 2000. S of lipid in the ear canal in canine otitis ext with Malassezia pachydermitis. Journa Veterinary Medical Science 62:1177-1182.

Mckeller, Q. A. 1998. Antimicrobial resistance veterinary perspective. British Medical Jou 317: 610-611.

Morris, D.O. 2004. Medical therapy of otitis ext and otitis media. Veterinary Clinics of N America Small Animal Practice 34:541-55

Noxon, J.O. 1994. Otitis externa. In Saunders Ma of Small Animal Practice. 375-379. Birchard, S Sherding, R.G. (Ed). W. B. Saunders Philadel 19106.

Rosser, E.R. 2004. Causes of otitis externa. Veteri Clinics of North America Small Animal Prac 34:459-468.

Shell, L.G. Otitis Media and Otitis Interna (1994) Saunders Manual of Small Animal Practice. 3 391 Birchard, S.J., Sherding, R.G. (Ed) W. Saunders Philadelphia 19106.

Shimizu, A., Wakita, Y., Nagase, S., Okabe, M., K T., Hayashi, T., Nagase, N., Sasaki, A., Kawa J., Yamachita, K., and Takagi, D. 20 Antimicrobial susceptibility of Staphyloco intermedius Isolated from healthy and disea dogs. Journal of Veterinary Medical Scien 63:357-360.