Identification and Antimicrobial Susceptibility of Microorganisms Isolated from the Preputium of Healthy Dogs

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Abstract: This study was designed to study the microbiological status of the foreskin mucosa in 100 healthy dogs and determine their antibiotic sensitivity. The most frequently identified organism in the dog foreskin was Staphylococcus sp. (36%) followed in order of frequency by E. coli (30%), Proteus sp. (16%), Pseudomonas sp. (6%), Streptococcus sp. (6%), Bacillus sp. (4%) and Corynebacterium sp. (2%). The isolated strains were subjected to antibiotic susceptibility testing. Staphylococcus sp., E. coli, Streptococcus sp., Bacillus sp. and Corynebacterium sp. were very frequently susceptible to danofloxacin, amoxicillin/clavulanic acid, cloxicillin, amoxicillin and ceftriaxone. It is concluded that the use of danofloxacin, amoxicillin/clavulanic acid, cloxicillin, amoxicillin and ceftriaxone can be useful in the treatment of infections of the male genital organ.

Key words: Infection, antibiotic sensitivity, amoxicillin, treatment, male genital organ, Turkey

INTRODUCTION

Infections of the penis and foreskin are relatively frequent in the dog; they represent 20% of canine penis and preputial lesions. The slightly purulent preputial oozing observed in the normal adult dog is not a result of penis or preputial inflammation (Boothe, 2003).

Doig et al. (1981) investigated the mycoplasma and ureaplasma flora in healthy and sick dogs. They identified mycoplasma in 85% of 136 preputial swabs. It is reported that the presence of this organism is significantly more frequent in infertile than in healthy animals. It is also observed that mycoplasma are often found as saprophytes in the lower genital organs of both male and female animals (Doig et al., 1981).

Ling and Ruby (1978) studied aerobic bacterial flora in samples collected from the preputium and penis in a study performed in 20 healthy dogs. The researchers identified 14 different species of microorganisms in this study. They report a frequency of 60% for Staphylococcus aureus and 35% for Mycoplasma sp. Another report indicates that Mycoplasma sp. were isolated in six of twelve healthy dogs (Rosendal, 1973). In yet, another study performed in 15 stud dogs, samples were collected at various times over a period of a year and a half. No bacteria were isolated in 33 out of 232 (14%) preputial swab samples. Pasteurella multocida was identified in all subjects. Beta-hemolytic streptococci were isolated from 32.8% of 76 preputium samples. Pseudomonas sp. were isolated in one subject and Streptococcus sp. in four. The bacteria isolated from the dogs' preputium and urethra were reported to be opportunistic pathogens (Bjurstrom and Linde-Forsberg, 1992).

Bibliography searches showed that reports describing the preputial flora of healthy dogs was relatively limited. The purpose of this study was to determine the bacterial flora of the preputial mucosa of healthy dogs brought to the hospital and the antibiotics to which isolated microorganisms are susceptible thus, identifying the antibiotic groups which can be used in the male genital organ infections.

MATERIALS AND METHODS

Preputial swab sampling of the dogs: The material for this study consisted of 100 swab samples taken from the foreskin of healthy dogs that were brought to the Surgery Department of the Afyon Kocatepe University Veterinary Faculty. Preputium swab samples were collected as follows: The dogs were held in supine position, their penis freed from the preputium and swabbed in a circular motion from the penile basis to the preputium.

The preputial swabs were placed in transport medium and brought under refrigeration to the Microbiology Department Laboratory of Afyon Kocatepe University Veterinary Faculty.

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553
Table 1: Bacteria isolated from preputial swab samples of dogs

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>n</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus sp.</td>
<td>18</td>
<td>36.0</td>
</tr>
<tr>
<td>E. coli</td>
<td>15</td>
<td>30.0</td>
</tr>
<tr>
<td>Proteus sp.</td>
<td>8</td>
<td>16.0</td>
</tr>
<tr>
<td>Pseudomonas sp.</td>
<td>3</td>
<td>6.0</td>
</tr>
<tr>
<td>Streptococcus sp.</td>
<td>3</td>
<td>6.0</td>
</tr>
<tr>
<td>Corynebacterium sp.</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Bacillus sp.</td>
<td>2</td>
<td>4.0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Isolation and identification of aerobic bacteria from preputial swabs: The samples collected from dog foreskins on sterile swabs were inoculated on blood agar (Oxoid CM55), MacConkey agar (Oxoid CM0109) and Eosin Methylene Blue (EMB) agar (Oxoid CM0069) and incubated for 24-48 h under aerobic conditions at 37°C. The colony morphology and hemolysis characteristics of growth on blood agar were examined. Pure cultures were obtained by blood agar passage after gram staining of the first colonies. The identification of isolated bacteria followed classical methods as shown in Table 1 (Quinn et al., 2002, Holt et al., 1994).

Antimicrobial susceptibility testing: In vitro antimicrobial susceptibility testing was conducted using the Disk Diffusion Method on Mueller Hinton Agar, according to the National Committee for Clinical Laboratory Standards (Thomas and NCCLS, 2002). The antimicrobial susceptibility of isolated bacteria was tested for danofloxacin, rifaximin, amoxicillin/clavulanic acid, cloxacillin, amoxicillin, penicillin, erythromycin, streptomycin, cephalor (Oxoid Ltd., Dasingstoke, UK).

RESULTS AND DISCUSSION

The most frequently identified organism in the dog foreskin was Staphylococcus sp. (36%) followed in order of frequency by E. coli (30%), Proteus sp. (16%), Pseudomonas sp. (6%), Streptococcus sp. (6%), Bacillus sp. (4%) and Corynebacterium sp. (2%). The prevalence of microorganisms isolated from the healthy dog foreskin was found to be statistically significant (p<0.05). The isolated strains were subjected to antibiotic susceptibility testing. Staphylococcus sp., E. coli, Streptococcus sp., Bacillus sp. and Corynebacterium sp. were very frequently susceptible to danofloxacin, amoxicillin/clavulanic acid, cloxacillin, amoxicillin and ceftiofur.

Limited information is available on the preputial flora of male dogs. That’s why this study was performed to identify the preputial aerobic flora of healthy dogs brought to the hospital.

Bjurstrom and Linde-Forsberg (1992) have reported that bacteria isolated from the foreskin of male dogs are similar to those found in the genital organs of female dogs inhabiting the same shelter (P. multocida, β-hemolytic streptococci and E. coli) (Table 1).

Elad et al. (1992) reported the presence of Corynebacterium group D2, Pseudomonas aeruginosa and Proteus sp. in one of two dogs with urinary tract infection while P. aeruginosa and Corynebacterium group D2 were isolated in the other animal. In this study, Proteus sp. were isolated in eight, Pseudomonas sp. in three and Corynebacterium sp. in one of 100 dogs. The study results are similar in respect to those of Elad et al. (1992) even though these authors had isolated the microorganisms from the urine samples of two dogs.

The study by Goultsou et al. (2006) of samples from the scrotal; skin of rams reported the presence of Staphylococcus sp. in 48, Bacillus sp. in 32 (33%) and A. pyogenes in 16. The same researchers report that the microorganisms frequently isolated from preputial cavity samples are Staphylococcus sp. in 16, E. coli in 15 and A. pyogenes in four rams. They also report that A. pyogenes caused orchitis in the rams (Goultsou et al., 2006). It should be underlined that the dogs in the experiment reported here were clinically healthy with no scrotal disease.

Approximately 10-15% of dogs are reported to be experiencing urinary tract infection during their entire lifetime. Also, it is stressed that the female animals are more frequently affected (Bartges, 2004; Lulich and Osborne, 1995). Published reports indicate that urinary tract infections may be concomitant with genital tract infections. In this study, microorganisms were identified in 50 of the 100 dogs. These dogs however, were not submitted to urine examination because they were considered healthy. The clinical studies show that penile and preputial infection is not frequent in the dog, a statement supported by the available published reports.

The flora of the lower genitourinary system exerts a protective effect by preventing the cellular adhesion and inhibiting the growth of pathogenic microorganisms. Microorganisms present in healthy dogs are only rarely reported to cause urinary tract infection (Lulich and Osborne, 2004; Osborne and Lees, 1995). In this study, no complaints suggesting urinary tract infection was elicited from the owners of dogs brought to the clinic. This finding supports the published data (Table 2).

Data on the antimicrobial susceptibility of microorganisms isolated from the healthy dog foreskin was not encountered in the literature search that the researchers performed. The present study reports these tests.

The Staphylococcus sp. isolated from 18 of the dogs were sensitive to rifaximin in 95% and ceftiofur in 93.3%. E. coli, isolated in 15 animals was sensitive to
Table 2: Antimicrobial susceptibility of isolated microorganisms

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Strain no</th>
<th>Danofloxacin</th>
<th>Rifaximin</th>
<th>Clavulanic acid</th>
<th>Amoxicillin</th>
<th>Tetracycline</th>
<th>Penicillin G</th>
<th>Erythromycin</th>
<th>Streptomycin</th>
<th>Ceftiofur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus sp.</td>
<td>18</td>
<td>91.6</td>
<td>95.0</td>
<td>90.0</td>
<td>83.3</td>
<td>85.0</td>
<td>63.3</td>
<td>58.3</td>
<td>50.0</td>
<td>46.6</td>
</tr>
<tr>
<td>E. coli</td>
<td>15</td>
<td>86.6</td>
<td>73.3</td>
<td>80.0</td>
<td>73.3</td>
<td>66.6</td>
<td>46.6</td>
<td>33.3</td>
<td>53.3</td>
<td>33.3</td>
</tr>
<tr>
<td>Proteus sp.</td>
<td>8</td>
<td>25.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>75.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pseudomonas sp.</td>
<td>3</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Streptococcus sp.</td>
<td>3</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
</tr>
<tr>
<td>Corynebacterium sp.</td>
<td>2</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

danofloxacin in a proportion of 86.6% and to ceftiofur in 80%. Proteus sp. isolated from eight dogs were sensitive to tetracycline in 75% while the Pseudomonas sp. found in 3 subjects were sensitive in 33.3% to danofloxacin, rifaximin, amoxicillin/clavulanic acid, clavulanic acid and ceftiofur.

Streptococcus sp. were also found in 3 subjects were 100% sensitive to danofloxacin, rifaximin, amoxicillin/clavulanic acid, clavulanic acid amoxicillin and ceftiofur. Isolated in one dog included in the study, Corynebacterium sp. were sensitive (100%) to danofloxacin, rifaximin, amoxicillin/clavulanic acid, clavulanic acid amoxicillin and ceftiofur. Finally, Bacillus sp. which were grown from 2 cases were found sensitive to danofloxacin, rifaximin, amoxicillin/clavulanic acid, clavulanic acid amoxicillin and ceftiofur in both i.e., 100%.

**CONCLUSION**

The study shows that Staphylococcus sp. were the most frequently isolated microorganisms from the foreskin of healthy dogs in this study followed by E. coli (30%). The antimicrobial susceptibility tests determined that ceftiofur followed by rifaximin and amoxicillin/clavulanic acid could be used in cases of infection.

**REFERENCES**


