Survey on bacterial isolates from dogs with urinary tract infections and their in vitro sensitivity

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SUMMARY

Bacterial isolates from urine specimen of dogs with urinary tract infections in a geographical region of Central Italy were Escherichia coli (17.48%), Proteus mirabilis (16.59%), Pseudomonas aeruginosa (7.17%), Staphylococcus aureus (6.72%), α-haemolytic streptococci (2.24%), and Klebsiella sp. (0.89%). In vitro antibacterial agent sensitivity showed that none of them was effectively susceptible to any of the antibacterial agents tested, including amikacin, amoxicillin, amoxicillin-clavulanic acid,ampicillin, cefalexin, cefotaxin, doxycyclin, enrofloxacine, erythromycin, gentamycin, kanamycin, netilmicin, rifampicin, streptomycin, sulphanethoxazole/trimethoprim, and tetracyclic.

Keywords : Dog - Urinary tract infection - In vitro sensitivity - Antibacterial agents.

Introduction

Urinary tract infections (UTIs) are among the most common conditions requiring diagnostic and therapeutic intervention in small animal veterinary practices. They typically involve bacteria and are estimated to affect approximately 14% of all dogs during their lifetime; female dogs are more often affected than male dogs [15]. Bacterial UTIs are more common in older cats than in younger cats, and the incidence increases with age [12]. They occur not only in companion animals such as dogs and cats, but are also frequently observed among humans [2, 8, 9]. The causative pathogens in dogs suffering from UTIs of bacterial origin are diverse. Escherichia coli is the most important microorganism responsible for UTIs of dogs. Staphylococcus aureus and Proteus mirabilis were also found to be among the most common infecting bacteria in UTI cases in dogs. Alpha-haemolytic streptococci, Klebsiella pneumoniae, Pseudomonas aeruginosa, Enterobacter spp., other Proteus spp., beta-haemolytic streptococci, and some other miscellaneous bacterial species can be occasionally documented [14]. However, the prevalence of the various species varies considerably from study to study.

Factors thought to be important in preventing UTIs include normal micturition, mucosal defense barrier, antibacterial properties of urine, specific anatomic structures, and systemic immunocompetence. UTIs occur when there is a breach (either temporary or permanent) in host defense mechanisms and sufficient numbers of virulent microbe are allowed to adhere, multiply, and persist in a portion of the urinary tract. The alterations in host defenses may be intrinsic to the patient (i.e., diabetes mellitus) or iatrogenic (i.e., corticosteroid administration). UTIs caused by etiological bacterial agents have been associated with urogenital disease such as cystitis, nephritis, metritis and prostatitis in dogs and cats [24]. Furthermore, some bacterial strains isolated from dogs and cats with UTI were similar to strains isolated from human UTI [12, 16]. These findings suggest that similar strains might be able to cause the infection both in companion animals and humans.

Therapeutic management of UTIs is based on the type of infection, duration of symptoms and aetiology. Surveillance of the susceptibility of major pathogens to a range of antimicrobials can aid clinicians in prescribing the most appropriate antimicrobial agents for infections and is an essential part of monitoring and detecting any increase in resistance. Despite this, empirical treatment of UTIs must be often initiated before availability of laboratory results. Because UTIs are frequently treated with empirically selected antimicrobial agents, assessment of changes in antimicrobial susceptibility patterns over time is important to ensure that the organisms remain susceptible to empirically selected antimicrobial agents. In addition, treatment of these infections is often challenging because some of the isolates are frequently resistant to numerous antimicrobial agents, including those used empirically. Because of the multi-drug resistant profile of some of the isolates, in vitro antimicrobial susceptibility testing is advised to ensure appropriate antibiotic selection in
addition to allowing for monitoring the development of resistant pathogens. Therefore, clarity with regard to the current susceptibility to antimicrobial agents among urinary isolates is important and benefit to veterinary clinicians for providing clinically appropriate and cost-effective therapy for UTIs.

During the last years, there is considerable and growing global concern about the increasing levels of antimicrobial resistance in human and veterinary medicine [9, 22] such that antimicrobial resistance surveillance studies are now a necessity. Moreover, given that a transition in therapy may easily occur or be imminent, it has become important to define not only national and international rates of resistance for a range of pathogens but local rates as well, since it has been shown that differential resistance rates even exist for specific pathogens and antimicrobial agents recovered from restricted geographical areas [2, 8]. As already said, antimicrobial treatment of UTIs caused by the most common uropathogens in animals and humans may become complicated, since it may be compromised by increasing antimicrobial resistance. Continued concern about antimicrobial resistance is warranted as are studies on the activities of new agents. However, whereas the development of totally new antimicrobial agents takes several years, the re-evaluation of older antibiotics can be conducted more rapidly. Therefore, the present study was undertaken to assess the prevalence of uropathogens isolated from uncomplicated UTIs of dogs in a geographical region of Italy, to evaluate their in vitro susceptibility to antibiotics commonly used for the treatment of such infections, and to compare the difference in antibiotic susceptibility among different isolates, so that optimal empirical antibiotic therapy in dogs could be determined.

Materials and methods

A survey was carried out on 223 adult dogs (range from 3 to 15 years of age, mean ± standard deviation = 8.8 ± 3.7). There were 116 female dogs and 107 male dogs. All the dogs were from different areas of Tuscany, a geographical region of Central Italy. They were presented with a history of clinical signs suggestive of UTIs at our Veterinary Medical Teaching Hospital (Department of Veterinary Clinic, University of Pisa, Italy) during a 6-month period, beginning in January 1 and ending in June 30, 2004. Such signs included inappropriate urination, dysuria, stranguria, haematuria, or pollakiuria. None of the dogs had been given antimicrobial agents, corticosteroids, or other immunosuppressive agents within 15 days before sampling. However, the possibility of prior treatments with antibiotics during the entire course of their lives can not be fully excluded. Since the aim of our study was to have an overview, we did not attempt to select by gender, ages or specific breeds of dogs.

Urine samples were collected by antepubic cystocentesis. An area of skin on the central midline, caudal to the umbilicus, was cleaned and disinfected using 2 per cent iodine w/v solution in 70 per cent alcohol. The bladder was immobilised by digital palpation and a one-inch long sterile needle was inserted into the bladder. Urine specimens were drawn into a sterile syringe. This method of urine collection was chosen in order to avoid or reduce, as much as possible, the specimens contamination originating in the prepuce and urethra of males, and in the urethra and vagina of females [5].

Following collection, urine samples (8-10 mL) were either processed for bacteriological investigation immediately or refrigerated at 4°C within a few minutes from sampling, until inoculations of bacteriologic media were completed (not more than 4 hours later). Once arrived at the clinical microbiology laboratory (Department of Animal Pathology, Prophylaxis and Food Hygiene, University of Pisa, Italy), well-mixed urine samples were divided into two aliquots in sterile tubes. The approximate number of colony-forming units/millilitre (CFU/mL) of urine was determined for each specimen. For this purpose, an aliquot of 1.0 mL urine sample was diluted in sterile saline solution from 10^{-1} to 10^{-5}. One ml of 10^{-3}, 10^{-4}, and 10^{-5} dilutions were inoculated in Plate-Count agar plates and incubated at 37°C for 72 hours. The counts were determined by the standard method. Four groups were identified : a) <1,000 CFU/mL of urine b) between ≥1,000 and <10,000 CFU/mL c) from ≥10,000 to <100,000 CFU/mL d) ≥100,000 CFU/mL. According to CARTER [4], counts ≥10,000 to <100,000 CFU/mL can be considered as suggestive of infection and a presence ≥100,000 CFU/mL can be considered as clinically important bacteria. Therefore, the identity of bacterial isolates and their sensitivity to antibacterial agents were only determined from specimens yielding bacterial isolations ≥10,000 to <100,000 CFU/mL or ≥100,000 CFU/mL, while all the other cultures were discarded.

For this purpose, an aliquot of 5.0 mL urine specimen was centrifuged for 20 minutes at 3,000 x g at room temperature. After the supernatant was decanted, cultures were made from the deposit. As indicated by LING et al. [15], blood agar and MacConkey (Oxoid, Unipath S.p.A., Garbagnate Milanese, Milano, Italy) agar plates were inoculated, using a sterile loop from the urine sediment for each plate. All plates were incubated aerobically at 37°C and were examined for bacterial growth after overnight incubation, at which time colony morphology was observed. Single bacterial colonies were picked for identification of organisms by standard bacteriologic and biochemical procedures, as reported by CARTER [4].

Antibacterial sensitivity tests were performed using the disc method. A bacterial colony was seeded from the agar plate to Serum Broth and incubated. Samples from the broth cultures with a turbidity corresponding to 0.5 McFarland standard suspension were evenly smeared over the entire surface of Mueller-Hinton agar plates [3]. After allowing the surfaces of the plate to dry for approximately 2 minutes, selected antibacterial discs (Oxoid, Unipath S.p.A., Garbagnate Milanese, Milano, Italy and Bayer, AG Leverkusen, Germany) were placed on the inoculated surface. Discs were stored at 4°C until their use, according to manufacturers’ instructions. The following antibacterials were tested: amikacin (AK), 30 µg ; amoxicillin (AML), 10 µg ; amoxicillin-clavulanic acid (AMC), 20 µg + 10 µg ; ampicillin (AMP), 10 µg ; cefalexin (CL), 30 µg ; cefotaxin.
(CTX), 30 µg; doxycyclin (DO), 30 µg; enrofloxacin (ENR), 5 µg; erythromycin (E), 15 µg; gentamycin (CN), 10 µg; kanamycin (K), 30 µg; netilmicyn (NET), 30 µg; rifampicin (RD), 30 µg; streptomycin (S), 10 µg; sulphamethoxazole/trimethoprim (SXT) 23.75 µg + 1.25 µg, and tetracyclin (TE), 30 µg. Results were evaluated after incubation at 37°C for 24 hours. Based on the size of the zone of bacterial growth inhibition, bacteria were classified as sensitive, intermediate or moderately sensitive, and resistant, according to manufacturers' instructions (Table I). As reported by the Oxoid manual, the category moderately sensitive indicates a possible therapeutic use of antibiotics under particular clinical circumstances. For example, when antibiotics can be used at high doses, or concentrate in particular sites of infection such as the urinary tract due to their pharmacokinetic, or when an association of antibiotics can be employed.

Results

All of the 223 urine specimens yielded bacterial growth. However, 99 of them (44.39%) showed bacterial counts <1,000 CFU/mL of urine specimen, 11 (4.93%) counts between ≥1,000 and <10,000 CFU/mL, 32 (14.34%) from ≥10,000 to <100,000 CFU/mL, and finally 81 (36.32%) ≥100,000 CFU/mL. Therefore, the identity of bacterial isolates and their sensitivity to antibacterial agents were determined from 114 (51.12%) urine specimens yielding bacterial counts suggestive of infections or clinically significant. Only one species was found in each sample. Altogether, 6 bacterial species were identified in culture-positive specimens. Overall, E. coli was isolated from 39 (17.48%) specimens, P. mirabilis from 37 (16.59%), P. aeruginosa from 16 (7.17%), S. aureus from 15 (6.72%), α-haemolytic streptococci from 5 (2.24%), and Klebsiella sp. from 2 (0.89%). Percentages referred to the totality of cases where bacteriuria was suggestive of infections or clinically important are reported in Table II.

In the present study, none of the bacterial isolates was effectively susceptible to any of the antimicrobial agents tested. Their sensitivity to antibacterial agents is shown in Table III. E. coli isolates were completely resistant to AK, CL, DO, E, K and S (39/39, 100%). Likewise, great numbers of them were resistant to AML, AMP and RD (37/39, 94.87%), TE (36/39, 93.30%), SXT (33/39, 84.61%), AMC (32/39, 84.87%).
The five isolates of α-haemolytic streptococci were totally (5/5, 100%) resistant to AK, AML, AMP, DO, NET, RD and TE, or almost totally (4/5, 80.0%) resistant to ENR, E, CN, K and SXT. Approximately, half (3 or 2/5, 60.0 or 40.0%) of the isolates were also resistant to CTX and S or AMC and CL. In decreasing order, the isolates showed susceptibility to CL (3/5, 60.0%), S (2/5, 40.0%), AMC, CTX, E, and K (1/5, 20.0%), or moderate susceptibility to AMC (2/5, 40.0%), CTX, ENR, CN and SXT (1/5, 20.0%).

Finally, the two isolates of Klebsiella sp. were resistant to all the tested antimicrobial agents except one (20%) case of moderate susceptibility to CTX.

Discussion

This study represents an evaluation of the species distribution of bacterial uropathogens in dogs from a geographical area of Italy. In addition, an evaluation was performed of the in vitro effectiveness of a representative panel of antibiotics against a number of isolates obtained from dogs with UTI. E. coli, P. mirabilis, P. aeruginosa, S. aureus, α-haemolytic streptococci, and Klebsiella sp. were isolated from the urine of dogs with UTIs. Some investigators reported data on bacterial isolates from urine specimens of dogs in many countries. However, to the best of our knowledge, no data are available from Italy. In the United States, HOGLE [10] observed that the bacteria most frequently isolated from selected specimens of canine urine were P. aeruginosa, Proteus spp., E. coli, and S. aureus. Later, WOLLEY and BLUE [24] showed that the most frequently cultured bacteria from canine urine specimens were E. coli, Proteus spp., S. aureus, and P. aeruginosa. Otherwise, E. coli, Streplococcus (Enterococcus) faecalis, Staphylococcus epidermidis and Proteus spp. were the most common bacteria isolated from dogs with UTIs in the United Kingdom [23]. OXENBORG et al. [19] found that Proteus spp., E. coli and Staphylococcus spp. were the most common isolates from dogs affected with UTIs in Australia. PERSON et al. [20] reported that in France the most frequently isolated bacteria from canine urine specimens were P. mirabilis, E. coli, S. aureus, P. aeruginosa and Acinetobacter spp. Later, in further investigations carried out in the United States, E. coli was the most common isolate, along with Staphylococcus.
<table>
<thead>
<tr>
<th>Antibacterial agents</th>
<th><em>Escherichia coli</em> (n=39)</th>
<th><em>Proteus mirabilis</em> (n=37)</th>
<th><em>Pseudomonas aeruginosa</em> (n=16)</th>
<th><em>Staphylococcus aureus</em> (n=15)</th>
<th>α-haemolytic streptococci (n=5)</th>
<th><em>Klebsiella</em> spp (n=2)</th>
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<tbody>
<tr>
<td></td>
<td>S</td>
<td>I/MS</td>
<td>R</td>
<td>S</td>
<td>I/MS</td>
<td>R</td>
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<tr>
<td>AK</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>39 (100%)</td>
<td>1 (3%)</td>
<td>0 (0%)</td>
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<td>AML</td>
<td>2 (5%)</td>
<td>0 (0%)</td>
<td>37 (95%)</td>
<td>1 (3%)</td>
<td>2 (5%)</td>
<td>34 (92%)</td>
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<td>AMC</td>
<td>4 (10%)</td>
<td>3 (7%)</td>
<td>32 (82%)</td>
<td>12 (32%)</td>
<td>6 (16%)</td>
<td>19 (51%)</td>
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<td>0 (0%)</td>
<td>37 (95%)</td>
<td>1 (3%)</td>
<td>1 (3%)</td>
<td>35 (94%)</td>
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<td>0 (0%)</td>
<td>0 (0%)</td>
<td>39 (100%)</td>
<td>0 (0%)</td>
<td>2 (5%)</td>
<td>35 (94%)</td>
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<td>CTX</td>
<td>8 (20%)</td>
<td>10 (26%)</td>
<td>21 (54%)</td>
<td>17 (46%)</td>
<td>8 (22%)</td>
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<td>39 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>37 (100%)</td>
</tr>
<tr>
<td>ENR</td>
<td>13 (33%)</td>
<td>5 (13%)</td>
<td>21 (54%)</td>
<td>4 (11%)</td>
<td>1 (3%)</td>
<td>32 (86%)</td>
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<tr>
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<td>0 (0%)</td>
<td>39 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
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<td>CN</td>
<td>10 (26%)</td>
<td>3 (7%)</td>
<td>26 (67%)</td>
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<td>8 (22%)</td>
<td>10 (27%)</td>
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<td>0 (0%)</td>
<td>39 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>37 (100%)</td>
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<tr>
<td>NET</td>
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<td>31 (79%)</td>
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<tr>
<td>RD</td>
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<td>0 (0%)</td>
<td>37 (95%)</td>
<td>1 (3%)</td>
<td>1 (3%)</td>
<td>35 (94%)</td>
</tr>
<tr>
<td>S</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>39 (100%)</td>
<td>1 (3%)</td>
<td>0 (0%)</td>
<td>36 (97%)</td>
</tr>
<tr>
<td>SXT</td>
<td>6 (15%)</td>
<td>0 (0%)</td>
<td>33 (85%)</td>
<td>5 (13%)</td>
<td>0 (0%)</td>
<td>32 (86%)</td>
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<tr>
<td>TE</td>
<td>3 (7%)</td>
<td>0 (0%)</td>
<td>36 (92%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>37 (100%)</td>
</tr>
</tbody>
</table>

S: Sensitive; I/MS: Intermediate or Moderately Sensitive; R: Resistant.

AK: amikacin; AML: amoxicillin; AMC: amoxicillin-clavulanic acid; AMP: ampicillin; CL: cefalexin; CTX: cefotaxin; DO: doxycyclin; ENR: enrofloxacin; E: erythromycin; CN: gentamycin; K: kanamycin; NET: netilmicin; RD: rifampicin; S: streptomycin; SXT: sulphamethoxazole/trimethoprim; TE: tetracyclin.

Table III. — In vitro sensitivity to the tested antibacterial agents of bacterial isolate from canine urine specimen.
spp., *Proteus* spp. and *Klebsiella* spp. as bacterial genera [15, 17]. More recently, *E. coli* and *Streptococcus/Enterococcus* spp. were the most frequently isolated microorganisms from cases of persistent UTIs and reinfections in dogs [21]. Therefore, the spectrum of bacteria observed in our survey is similar to those previously reported by other authors.

Different percentages of bacterial isolations have been reported. This may be due to differences of the population studied and to the different number of specimens examined. It is evident that *E. coli* and *P. mirabilis* in our study were the main organisms associated with UTIs in dogs accounting for 17.48% and 16.59%, respectively, of the 114 cases suggestive of infection or with clinically important bacteriuria (Table II).

In earlier studies no bacteria were isolated from relatively high percentages of canine urine specimens. For instance, WOOLEY and BLUE [24] reported that no bacteria were isolated from 21.9% of canine urines. In our study all the samples yielded bacterial growth, although small numbers of bacteria were isolated from approximately a half of the samples. This is in agreement with previous results of other authors. PERSON et al. [20] showed that 49% of canine urine specimens yielded not significant (<100,000 CFU/mL) bacterial growth. LING et al. [15] reported that 21.8% of urine isolates from male dogs and 18.0% of isolates from female dogs had colony counts ≤10,000 CFU/mL in samples collected by cystocentesis.

Since the aim of our study was to have an overview, we did not attempt to select by gender, ages or specific breeds of dogs. However, it has been previously demonstrated that host age, sex and breed can represent some important predisposing factors to UTIs and even to some of the bacterial species isolated [15, 20].

*E. coli*, *P. mirabilis*, *P. aeruginosa*, *S. aureus*, α-haemolytic streptococci, and *Klebsiella* spp. are ubiquitous in the environment. Usually considered as contaminants they have emerged as important pathogens. These organisms cause a variety of infections including UTI [14]. Uropathogens have shown a slow but steady increase in resistance to several antibiotics over the last decade and antibiotic resistance is a remarkable clinical problem in treating infections caused by these microorganisms. For instance, *E. coli* and other *Enterobacteriaceae* have become less susceptible to commonly used antibiotics such as ampicillin, amoxyccillin, sulphonamides, trimethoprim and fluoroquinolones [21]. Our results signal the problem of multi-drug resistant microorganisms. Considering the totality of isolates, general resistance rates varied from 96.48% to 99.12% for tetracyclines (TE and DO), and from 49.12% to 97.36% for aminoglycosides (CN, NET, K, AK and S). These latter were the most represented antibiotic group in the present survey, and the lowest (49.12%) resistance rate was recorded to gentamycin. Overall, resistance rates to beta-lactam antibiotics varied from 51.75% to 95.61%. In particular, this accounted for 70.17% to 95.61% in the penicillin group (AMC, AMP and AML), and for 51.75% to 90.35% in the cephalosporin group (CTX and CL). To the other groups of antibiotics, recorded resistance rates in decreasing order were 98.24% to erythromycin (belonging to the group of macrolides), 92.98% to rifampicin (group of rifamycins), 85.96% to the association sulphametoxazole/trimethoprim, and finally 69.29% to enrofloxac in (group of quinolones). Therefore, all the antimicrobial agents that we studied demonstrated very high levels of *in vitro* resistance, which suggests that in this case none of them would have been useful as adequate therapy for dogs with UTI, and that probably they would have virtually been useless for treatment of other infections caused by the same bacterial isolates. As a consequence, the role of new agents not tested in this study should have needed to be considered based on available susceptibility/resistance data. Despite this, it is worth noting that susceptibility tests may yield misleading results, since discs placed on the cultures approximate concentrations of antibacterial achievable in blood, whereas urinary antibacterials achieve 10 to 100 times these concentrations. Therefore, results read out as resistant *in vitro* may not really be resistant *in vivo*. However, results read out as susceptible should really be effective.

In the present study, *P. aeruginosa*, *E. coli*, *S. aureus*, α-haemolytic streptococci and *Klebsiella* exhibited high level of drug resistance to all the antibiotics. Lowest resistances (27.02% and 32.43%, respectively) were shown by *P. mirabilis* to CN and CTX. The resistance rates to antimicrobials has increased over the years and vary from country to country [8]. Although it is inaccurate to compare prevalence data of studies which used different antibacterial sensitivity tests, the results we obtained are different to those described in other publications for the same pathogens in other areas of the world. In one study from the United States, all the isolates with the exception of *P. aeruginosa* exhibited 100% susceptibility to one, two or three of the tested antimicrobial agents [9]. Results from another study showed that susceptibility of the different isolates varied from 80 to 100% to some of the tested bactericial agents [23]. Only ten out of one-hundred ten isolates were resistant to all agents in a survey carried out in the United Kingdom [22]. Strains of *E. coli* and *Proteus* spp. isolated from Australia were 100% sensitive to gentamycin, whereas *E. coli* was susceptible (>80%) to nitrofurantoin and nalidixic acid too [18]. In France, a representative panel of antibiotics was effective against a number of isolates obtained from dogs with UTI [19]. In a more recent investigation carried out in the United States, 70.5% of the bacterial isolates were susceptible to at least one commonly prescribed antibiotic *per os*, and 18.5% of them were resistant to all commonly prescribed antibiotics administered *per os*, but were susceptible to a secondary antibiotic [20]. There is no obvious explanation for all these differences. These may be due to geographical variations or to differences in the number of animals and type of population surveyed, or may be attributable to differences of the antibacterial sensitivity tests performed. In the present investigation, we can not completely exclude the possibility that the isolates could have acquired drug resistance after exposure to prior treatments with antibiotics, undertaken because of various bacterial pathologies occurring in the course of animals’ life. In addition, we did not attempt to investigate and identify mechanisms of antibacterial drug resistance, since this was beyond the aim of our study. However, it can be presumed that one or more of the most common mechanisms of bacterial resistance could have been occurred, as
reviewed by DEVER and DERMODY [7].

As known, a global trend of increase in antibiotic resistance has been shown worldwide [9]. One of the main reasons for this trend is the increase in antibiotic consumption, because increased usage of antibiotics in a patient population may affect the rate of infections caused by resistant bacteria in that population. The use of antimicrobial drugs in animals is another of the major factors selecting for the emergence of resistant bacterial strains. As a consequence, the veterinary use of antimicrobials has received much publicity recently and is now under close scrutiny because of the importance of preserving the efficacy of antimicrobial therapy. At present, investigations in veterinary species are concentrated on production animals owing to the extensive use of antimicrobials in agriculture and the well-documented transfer of resistant bacteria from animals to human beings in food [1]. Since antimicrobial usage in production animals has been shown to lead to the emergence of resistant bacteria, surveillance protocols have been established in many countries, and several countries have now banned the use of certain antibiotics as growth promoters. Therefore, there is a substantial pool of information for livestock species. In contrast, there is comparatively little information about antimicrobial resistance in domestic pets such as dogs and cats. The development of antimicrobial resistance in companion animals and the implications to human health are poorly documented. Companion animals occupy a unique position among the domestic species because they are kept in the home. A recent report suggests an increasing trend in the development of resistance in companion animal pathogens [22]. The interrelationship of antimicrobial resistance in the flora of human beings and domestic pets was confirmed by DAVIES and STEWART [6]. Therefore, since the use of antimicrobial drugs for companion animals is far more liberal than for food producing animals [18], it is also very important to evaluate their use in companion animals because they may act as reservoirs of drug-resistant bacteria. UTI is one of the most common diseases in dogs and is also observed both in humans and other companion animals such as cats. From the results in some studies, it has been presumed that dogs and cats may be alternative reservoirs for humans [12, 16]. In the present study, the fact that 49.12% to 96.49% of isolates were resistant to all the antimicrobial agents tested is of great importance and means these antibiotics cannot be used as empirical therapy for UTI in dogs. Probably, the transmission of strains or genetic determinants like these to people could be a threat [22]. This information needs to be considered when empirical therapy for UTIs in dogs is chosen. As the magnitude and variation of antimicrobial resistance in human medicine grow, so does the need for continuous surveillance in veterinary medicine. Clearly, continued surveillance is essential to maintaining the safety and cost-effectiveness of empirical therapy as a management strategy for UTI in dogs.

References


