Stenotrophomonas maltophilia urinary tract infections in three dogs: a case report

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Abstract: Stenotrophomonas maltophilia was isolated from three dogs with lower urinary tract disorders. The bacterium was cultured from bladder wall biopsy specimens obtained during cystoscopy, whereas urine culture was negative in all cases. The culture of biopsy specimens is useful and may help with the therapy even if diagnosis of the primary disease has been made.

Keywords: cystitis; cystoscopy; Pseudomonas sp.

Stenotrophomonas maltophilia (initially classified as Pseudomonas maltophilia, later Xenotrophomonas maltophilia) is an aerobic, Gram-negative bacillus. It is a bacterium that can be present in almost any aquatic or humid environment and may persist for extended periods in such locations. S. maltophilia survives and multiplies in respiratory secretions, urine or intravenous fluids (Falagas et al. 2009). In human medicine, it is considered to be an uncommon pathogen in immune-competent individuals. Immunocompromised patients (patients with cancer, cystic fibrosis, chronic obstructive pulmonary disease, patients treated with steroids or immunosuppressors) are more susceptible to S. maltophilia infection (Denton and Kerr 1998; Spicuzza et al. 2009). The significance of Stenotrophomonas as an important nosocomial pathogen has risen over the last two decades. S. maltophilia can cause bacteraemia, endocarditis, pneumonia, meningitis, infections of bones and joints, urinary tract, soft tissues, and wounds. The bacterium is intrinsically resistant to β-lactams and is often resistant to other antimicrobials as well (Falagas et al. 2009). In veterinary medicine S. maltophilia is considered to be a coloniser. In domestic animals, there are only a few reports dealing explicitly with S. maltophilia infection. These have detailed the isolation of the bacterium from the airways of patients with chronic respiratory disease (dog, cat, horse) (Albini et al. 2009; Winther et al. 2010). This communication reports on three dogs with S. maltophilia urinary tract infections diagnosed at the Clinic of Dog and Cat Diseases, University of Veterinary and Pharmaceutical Sciences between the years 2006–2010.

Case description

Case 1. The first case was of a year-old spayed female German shepherd. The dog had a history of multiple urinary tract infections (UTI) from the age of two months. The first episode had been diagnosed based on the results of a routine urinalysis without culture. It had been treated with antibiotics which were chosen empirically. The subsequent episode had been documented by urine culture and treated with appropriate antimicrobial agents according to susceptibility tests (Enterobacter sp. was treated with cefuroxime). However, microscopic haematuria with negative urine culture persisted. At the age of six months, the vesicourachal diverticulum had been diagnosed by cystoscopy. Biopsy specimen culture revealed haemolytic E. coli which was treated with co-trimoxazole. A diverticulectomy was performed one month later. After the surgery the dog did not present with any symptoms associated with urinary tract problems for seven months.

The last episode was characterised by pollakiuria and stranguria lasting two weeks. The physical examination, CBC (complete blood count) and serum
The culture of a urine specimen collected by cys-
ter epitelial cells were seen in the urine sediment.

Lipid droplets and in rare cases small

specific gravity of 1.050, pH 6.5 ad 1+ protein on

in our clinic were normal. Urinalysis showed a

istry panel, and ultrasound examination performed

in the age of six months, the dog was neutered.

Feeding of a urologic diet was started. At

months. The dog had received antibiotics repeat-

history of recurrent UTI within the previous five

months. The dog had received antibiotics repeat-

edly (amoxicillin/clavulanic acid), but without any

significant effect. The owner noted pollakiuria af-

edly (amoxicillin/clavulanic acid), but without any

susceptible to chloramphenicol, doxycycline, co-

trimoxazole, and ofloxacin. The dog was treated

with quinolones for three weeks and the problems

resolved. Unfortunately, the owner did not return

for a control examination.

**Case 3.** The third dog was a twelve year-old spayed

female West Highland white terrier. She presented

with a history of pollakiuria without gross haema-

turia over the previous six months. The referring

veterinarian found sand in the urinary bladder by

ultrasound examination. He recommended feeding

of a commercial calculolytic diet for struvite dis-

solution. One month later, the sand disappeared,

but the problem with urination persisted.

The physical examination, CBC and serum bio-

chemistry profile performed in our clinic were

normal. A specimen of urine, obtained by cysto-

centesis, had 1+ protein and sediment examination

results that included 3–5 WBC/hpf and 1–2 tran-

sitional epithelial cells/hpf. Cytologic examination

of the urine sample suggested neoplastic disease.

Culture of the sample was negative for the growth

of bacteria. Ultrasound examination of the urinary

bladder revealed the presence of a thickened cau-

dal part of the bladder wall. Cystoscopy confirmed

the ultrasound findings. An irregular surface of the

bladder neck mucosal membrane and polypoid le-

sions were the main findings. The results of histo-

logical examination of the tissue obtained during

cystoscopy showed transitional cell carcinoma.

Culture of the specimen yielded *S. maltophilia*

susceptible to doxycycline, co-trimoxazole, nor-

floxacín, ciprofloxacin, and piperacillin. The dog

was treated with piroxicam on a long term basis for

the transitional cell carcinoma. Quinolones were

used as antimicrobials according to susceptibility

test results and clinical signs were alleviated to a

minor degree. Because of the primary disease, the

owners did not agree to a control cystoscopy.

**DISCUSSION AND CONCLUSIONS**

*S. maltophilia* has emerged as an important

opportunististic pathogen in the debilitated host

(Looney et al. 2009). In most human patients,
*S. maltophilia* infection is acquired in the hospital

setting (Laying et al. 1995). However, none of our

patients were hospitalised prior to cystoscopy and

bladder wall biopsies. The infection may be sec-

ondary to urinary tract surgery or catheterisation or

be present against a background of structural uri-

nary tract abnormality (Vartivarian et al. 1996).
All our dogs with *Stenotrophomonas maltophilia* urinary tract infection presented with chronic urologic problems. None of the dogs were catheterised before biopsy. The only surgery was diverticulectomy in the German shepherd six months before biopsy specimen culture. This dog with a diagnosis of vesicourachal diverticulum was predisposed to have chronic urinary tract infections, because stasis of urine in the diverticulum often leads to recurrent or persistent infection and inflammation. The first culture of the bladder wall revealed haemolytic *Escherichia coli*. At the time of diverticulectomy, the culture of the biopsy specimen had not been performed. It is possible that the bladder wall was colonised with the *S. maltophilia* at that time.

In the second case we were not able to identify any predisposing factor to infection. Impairment of mucosal defence barriers (surface mucoprotein layer, intrinsic mucosal antimicrobial properties), impairment of local immune response (production of secretory immunoglobulin A) or depressed antimicrobial properties of urine may be considered (Osborne and Lees 1995). However, previous antibiotic treatment might promote further colonisation and infection by antibiotic-resistant bacteria (Martinez and Baquero 2002). In the clinical setting, differentiation between colonisation or contamination and true *S. maltophilia* infection is often difficult. It was suggested that *S. maltophilia* is associated with clinically overt infection only when acting synergistically with other pathogens. Only in the first case did we find a combination of *S. maltophilia* and *Pseudomonas* sp. In the other cases, *S. maltophilia* was the only bacterium to grow in biopsy specimen culture.

Urothelium damage caused by neoplasia is another predisposing factor for secondary bacterial infections (Osborne and Lees 1995). Nagai (1984) noted that nearly half of patients from whom *S. maltophilia* was cultured had a neoplastic lesion at the site of isolation of the bacterium (significant-ly higher incidence than other isolated species). He proposed that an altered microenvironment caused by anaerobic glycolysis with a resulting accumulation of lactic acid in neoplastic tissue could provide conditions favourable for the multiplication of this bacterium.

Despite the fact that we were not able to identify any risk factors in the Labrador retriever, we are convinced that the finding of *S. maltophilia* is not colonisation but rather an infection, because of the histological diagnosis of chronic cystitis.

Although reclassified, *S. maltophilia* is essentially a *Pseudomonas*, which is the 7th most common bacterial species in urinary tract infections of dogs (Ling et al. 2001). This study was made on a large number of animals. The vast majority of the *Pseudomonas* isolates were most often of the species *aeruginosa* (95%). *Pseudomonas maltophilia* was identified only in four out of 8 354 cases (0.05%). Unfortunately, there are no details of predisposing or complicating factors in these cases.

The negative results of urine culture in all three cases are interesting. *S. maltophilia* was found only in the bladder wall, but not in urine. Culture of the bladder mucosal biopsy is recommended in cases of urolithiasis and negative urine culture, but it is not a routine procedure in other causes of lower urinary tract disorders (Hamaide et al. 1998). The ability of bacteria to adhere to the surface of cells is an important factor in the colonisation of the mucosal surface. *S. maltophilia* is very well adapted to colonising epithelial cells. This is due to its positively charged surface, flagella and fimbrial adhesion (Oliveira-Garcia et al. 2003). *S. maltophilia* also forms biofilms on its own or together with other species. The biofilms may be formed on indwelling devices or within the urinary tract itself (Hatt and Rather 2008). Thus the bacterium is more resistant to antibiotics.

The clinical signs in the German shepherd and Labrador retriever resolved, while in the West Highland white terrier they were alleviated to a minor extent. This incomplete recovery is probably the consequence of the neoplastic primary disease. Unfortunately, we were not able to check the culture of the bladder wall after the treatment because of the owner’s wish not to re-biopsy. The necessity of the general anaesthesia for cystoscopy is the disadvantage of this method and may complicate the evaluation of the treatment.

*S. maltophilia* is found in various environments but it prefers water or humid milieu. It is able to adhere to synthetic materials and may adhere to catheters and other medical devices (Falagas et al. 2009). The possibility of contamination of the cystoscope with *S. maltophilia* was considered, but the patients were diagnosed over the space of four years and the endoscopic equipment was used for other patients with culture results negative for *S. maltophilia*. In addition, the results of the susceptibility test in all three patients were different and all dogs improved after the course of antibiotic therapy.

In conclusion, we recommend the culture of bladder wall biopsy specimens, regardless of negative
culture of urine samples, in addition to the diagnosis of the primary disease, especially in cases that may cause impairment of systemic or local host defence. The infection may exacerbate the course of the disease and reduce the chance for recovery. In addition, when risk factors in the urinary tract are present, a finding of \textit{S. maltophilia} indicates rather infection than colonisation.

\textbf{REFERENCES}


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