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A case of *Pasteurella multocida* peritoneal dialysis-associated peritonitis and review of the literature

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Summary *Objectives*: Two episodes of peritoneal dialysis-associated peritonitis, which occurred four months apart and were both due to *Pasteurella multocida*, were noted in a 73 year old woman. This report aims to describe the clinical history of these episodes and the microbiological investigations that were undertaken. The relevant literature will also be discussed.

Methods and results: Basic microbiological tests identified the organism as *Pasteurella multocida*, and further work at a specialist laboratory classified it as *Pasteurella multocida* subsp. *multocida*. Pulsed field gel electrophoresis confirmed that the strains isolated from the two clinical episodes originated from the same clone. A literature search was performed, looking particularly for patients who experienced more than one episode of peritonitis caused by *Pasteurella* spp, whether due to recurrence or re-infection.

Conclusions: It is likely that the infection resulted from a domestic cat, as there was evidence of a cat bite to the dialysis tubing in the period between the two episodes. Re-infection with two identical strains of pasteurella is more probable than relapse, for reasons discussed. Strict hygiene and avoiding contact between dialysis tubing and domestic animals must be emphasised to try to prevent pasteurella and other animal-associated infections in this already vulnerable population.

Introduction

A 73-year-old woman with renal failure experienced two episodes of *Pasteurella multocida* peritoneal dialysis (PD) associated peritonitis, four months apart. As this is an unusual infection, further

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microbiological investigations were undertaken, with the help of a specialist laboratory. The clinical details of this case and the bacteriology and molecular investigations will be described. A review of the current literature will also be presented.

Methods and case report

A literature report was performed, whereby papers were identified by searching PubMed through the National Library of Medicine. Relevant references from the articles obtained were sought. In particular, cases of recurrence or re-infection in PD-associated peritonitis caused by *Pasteurella* spp were sought. Not all the papers obtained were included in the review because of space limitations. However, we endeavoured to choose papers that were particularly good examples relevant to the matters discussed.

The case is reported as follows: a 73 year old Caucasian female with end stage renal failure due to adult polycystic kidney disease started continuous ambulatory PD in June 2000. Her first few months on dialysis were complicated by several episodes of PD peritonitis, including infections with S*taphylococcus aureus*, coagulase-negative staphylococci, *Escherichia coli* and *Klebsiella aerogenes*.

She presented in February 2001 with a one-day history of abdominal pain and turbid dialysate after an accidental PD catheter disconnection the previous day that she had not reported. She was prescribed intraperitoneal vancomycin and gentamicin according to unit protocol. Analysis of the dialysate revealed a total white cell count of 4442/ml, (90% polymorphs) and a total red cell count of 190/ml. Gram negative rods were seen on Gram stain. Culture confirmed the presence of Gram negative rods, which grew aerobically after 48 hours. They did not grow on MacConkey's media and were confirmed as *Pasteurella multocida* by a commercial identification kit (API 20NE BioMerieux, Marcy l'Etoile, France). Sensitivities were determined by a modified disc diffusion method, based on the Stokes method, and the isolate was fully susceptible to penicillin, gentamicin and ciprofloxacin. The patient continued on intraperitoneal gentamicin monotherapy for three weeks. The patient had a history of close contact with her two domestic cats but there was no suggestion of poor PD technique, nor evidence of direct contamination of the dialysis tube following the disconnection. The patient's PD exchange technique was subsequently confirmed by direct observation (and indirect observation that the patient was unaware of), and found to be good.

The patient recovered fully from this episode without removal of the Tenchkoff catheter. She presented again six weeks later with a turbid dialysate, but was otherwise asymptomatic. This episode of PD peritonitis was culture negative and was temporally associated with a colonoscopy. She was treated with intraperitoneal vancomycin and gentamicin for three weeks.

She then re-presented in June 2001 with a one-day history of diarrhoea, abdominal pain and a turbid dialysate. On this occasion she was febrile. The dialysate contained 3500 white cells/ml (99% polymorphs), 200 red cells/ml and again yielded Gram negative rods on culture, which were later identified as *Pasteurella multocida*. The isolate was again fully susceptible to penicillin and ciprofloxacin, but showed reduced sensitivity to gentamicin *in vitro*. She received intraperitoneal gentamicin and oral ciprofloxacin for a total of two weeks.

Despite numerous infective complications, neither specific problems with the patient's dialysis technique, nor an alternative source of infection were identified at this stage. After the second episode of pasteurella peritonitis she decided to give away her two cats. She had no further pasteurella infections in the following 12 months. The same Tenchkoff peritoneal catheter remained in situ throughout.

Detailed questioning later revealed that the patients cats had been noticed playing with the tube from the cycler reservoir to the patient. Before the second episode of peritonitis one of the cats had actually bitten the dialysis tube.

Typing analysis of the two pasteurella isolates was performed at the Unit of Microbiology and Molecular Epidemiology, National Veterinary School in Lyon. This confirmed that the two isolates originated from the same clone, as the pattern of their *Sma*I digested DNA on pulsed field gel electrophoresis carried out on a Chef DR III apparatus (BioRad, Richmond, USA) was identical (Figure 1). Sugar acidification patterns on API 50CH (BioMerieux, Marcy l'Etoile, France) were also identical for both strains and further identified the isolates as *Pasteurella multocida* subsp. *multocida* according to Bergey's Manual of Determinative Bacteriology.[1] (Table 1).

Discussion

Pasteurella multocida is an aerobic Gram negative cocco-bacillus, which exists as part of the normal upper respiratory flora of cats and other domestic and wild animals. In humans, *Pasteurella* spp. may cause infected animal bites, cellulitis and

Table 1 Biochemical differentiation of *Pasteurella multocida* subsp.[1]

	Dulcitol	Maltose	Mannitol	Sorbitol	Trehalose	Xylose
Pasteurella multocida subsp. multocida	NEG	NEG	POS	NEG	POS	POS
Pasteurella multocida subsp. septica	NEG	NEG	POS	POS	V*	V*
Pasteurella multocida subsp. gallicida	NEG	NEG	POS	POS	NEG	POS
Isolates from this case report	NEG	NEG	POS	NEG	POS	POS

* Variable result (positive or negative).

pneumonia. While *Pasteurella* spp. often act as opportunistic pathogens in immunocompromised patients, (including those with malignancy, cirrhosis, diabetes, HIV infection and chronic pulmonary disease, in addition to patients with end stage renal failure) pasteurella PD peritonitis is rare.[2,3]

The first reported case of pasteurella PD peritonitis was by Paul and Rostand in 1987 who described a patient on intermittent PD, who developed *Pasteurella multocida* infection following damage to the dialysis tubing by a cat bite or scratch.[4] Since then, there have been about a dozen case reports of pasteurella PD peritonitis, most of which also describe direct trauma to the tubing.[3,5–8] However,

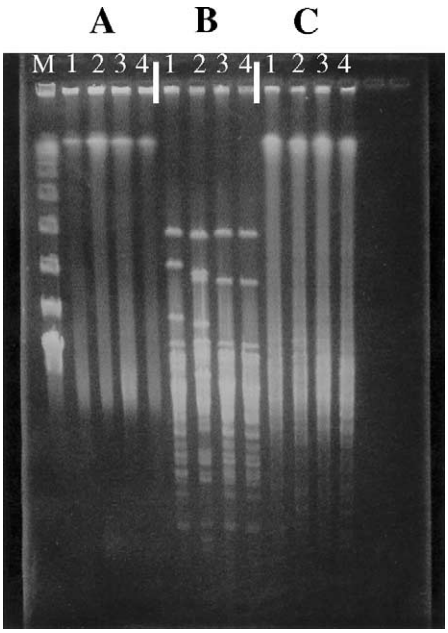

Figure 1 Result of pulsed field gel electrophoresis analysis of strains of *Pasteurella multocida*. Migration conditions: 12 °C, 6 V/cm at 120° angle, pulse time 5—20 sec for 24 hr. A: set with *Apa*I digestion; B: set with *Sma*I digestion; C: set with *Xba*I digestion. 1: *P. multocida* subsp. *multocida* reference strain (ATCC 43137); 2: *P. multocida* subsp. *septica* reference strain (NCTC 11995); 3 and 4: PD associated *P. multocida* subsp. *multocida* strains showing similar patterns; M: Lambda ladder molecular weight marker.

there are reports of pasteurella infection occurring without animal bites or scratches, and also of spontaneous pasteurella peritonitis in cirrhotic patients or those with a history of alcohol addiction.[9] The majority of reports of PD peritonitis describe infection with *Pasteurella multocida* subspecies *multocida*, however there is one case report of *Pasteurella multocida* subspecies *dagmatis*.[10]

There is a suggestion that patients with pasteurella PD peritonitis were generally more symptomatic with fever, nausea, vomiting and severe abdominal pain, when compared to other cases of PD peritonitis.[6] Although our patient had abdominal pain, she was not otherwise clinically unwell. In addition, many of the reported cases were in patients using cycling devices, reasons for which are not clear.[9,11] Van Langenhove et al. analysed eight of the published cases of pasteurella PD peritonitis,[9] and found that all made a complete recovery, as did our patient. This is in marked contrast to patients who are bacteremic with *Pasteurella spp.*, who have a mortality rate of up to 30%.[3]

Pasteurella multocida is usually susceptible to penicillin in vitro, which is considered the treatment of choice. Tetracyclines, cephalosporins and quinolones are suitable alternatives.[3] Susceptibility to aminoglycosides is often borderline and variable.[11] The second isolate from our patient was resistant to gentamicin in vitro, which is likely to have arisen from previous gentamicin exposure.

It is likely that our patient suffered from re-infection with two identical strains of pasteurella, rather than relapse. Other than an episode of culture-negative peritonitis temporally related to a colonoscopy, she was well for the intervening four months, and her Tenchkoff catheter was retained. The possibility of relapse cannot be completely ruled out. However, this would probably have manifested itself sooner rather than later, especially as the Tenchkoff catheter did remain in situ. There is one report in the literature of a patient from Japan on automated nocturnal intermittent peritoneal dialysis who had recurrent 'cat-associated' peritonitis.[5] However only one of

the three episodes of PD peritonitis was due to *Pasteurella multocida* and the other two were due to *Enterobacter agglomerans* and alpha-haemolytic streptococci.

While it is widely recognised that cats are associated with human pasteurella infections, the evidence in our patient, although strong, remains circumstantial as we were unable to obtain any samples from the cats concerned.

Strict personal hygiene and avoiding contact between dialysis tubes and domestic animals, especially in designated bag-changing areas and when the patient is doing an exchange, must be emphasised to try and prevent pasteurella and other domestic animal-associated PD peritonitis. However, drastic measures such as in our case, giving the cats away to a friend may be the only way to prevent recurrent infection.

Conflict of Interest: No conflicting interest declared.

References

1. Holt GJ, Krieg NR, Sneath PHA, et al. Family *Pasteurellaceae*. In: Holt GJ, Krieg NR, Sneath PHA, Staley JT, Williams ST, editors. *Bergey's manual of determinative bacteriology*. 9th Edition. Baltimore: The Williams and Wilkins Co.; 1994, p. 196—284.
2. Von Graevenitz A, Amsterdam D. Microbiological aspects of peritonitis associated with continuous ambulatory peritoneal dialysis. *Clin Microbiol Rev* 1992;**5**:36—48.
3. Musio F, Tiu A. *Pasteurella multocida* peritonitis in peritoneal dialysis. *Clin Nephrol* 1998;**49**:258—61.
4. Paul RV, Rostand SG. Cat bite peritonitis: *Pasteurella multocida* infection following feline contamination of peritoneal dialysis tubing. *Am J Kidney Dis* 1987;**4**:318—9.
5. Hamai K, Imai H, Ohtani H, et al. Repeated cat-associated peritonitis in a patient on automated nocturnal intermittent peritoneal dialysis. *Clin Exp Nephrol* 1999;**1**:59—61.
6. Joh J, Padmanabhan R, Bastani B. *Pasteurella multocida* peritonitis following cat bite of peritoneal dialysis tubing. *Am J Nephrol* 1998;**18**:258—9.
7. Loghman-Adham M. *Pasteurella multocida* peritonitis in patients undergoing peritoneal dialysis. *Pediatr Nephrol* 1997;**11**:353—4.
8. London RD, Bottone EJ. *Pasteurella multocida*: zoonotic cause of peritonitis in a patient undergoing peritoneal dialysis. *Am J Med* 1991;**91**:202—4.
9. Van Langenhove G, Daelemans R, Zachee P, et al. *Pasteurella multocida* as a rare cause of peritonitis in peritoneal dialysis. *Nephron* 2000;**85**:283—4.
10. Wallet F, Toure F, Devalckenaere A, et al. Molecular identification of *Pasteurella dagmatis* in a patient undergoing peritoneal dialysis. *J Clin Micro* 2000;**38**:4681—2.
11. Uribarri J, Bottone EJ, Lodon RD. *Pasteurella multocida* peritonitis: are peritoneal dialysis patients on cyclers at increased risk? *Perit Dial Int* 1996;**16**:648—9.