**Peritonitis Secondary to Uncommon Gram-Negative Coccobacillus Transmitted From a Cat in a Patient on Peritoneal Dialysis**

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**Abstract**

Peritonitis caused by gram-negative organisms is a significant complication encountered in patients undergoing peritoneal dialysis and is associated with high morbidity and mortality. There has been recognition of peritonitis caused by uncommon organisms because of improved microbiological detection techniques. In this article, we report a rare case of peritonitis caused by *Pasteurella multocida*. We present a 58-year-old male on peritoneal dialysis with fever and abdominal pain. The peritoneal fluid was cloudy, and the analysis was consistent with peritonitis. The peritoneal fluid culture grew *Pasteurella multocida*. The patient was treated with a 3-week course of intraperitoneal cefazidime, which resulted in the resolution of infection with the salvation of the peritoneal dialysis catheter. Patient education plays a very critical role in the prevention of peritonitis from *Pasteurella multocida*, particularly if patients have pets at home. The domestic pets should be kept away from the dialysis equipment and should not be allowed into the room during dialysis treatment. Incorporating the education in handing pets during the training session is the key aspect.

**Keywords**

*Pasteurella multocida*, cats, peritoneal dialysis, peritonitis, gram-negative coccobacilli

**Introduction**

Peritonitis caused by gram-negative organisms is a significant complication encountered in patients undergoing peritoneal dialysis (PD) and is often associated with high morbidity and mortality.¹ *Pasteurella multocida* is an aerobic and facultative anaerobic gram-negative coccobacillus, which is a normal commensal of oropharynx of many animals but is predominant in domestic pets like cats and dogs.² It was first identified in 1878 by Perroncito and was named after Louis Pasteur in 1880 who described this bacterium in diseased birds.³ This bacterium is found in the oropharynx of 30% of live stockbreeders.⁴ Infection with bacteria is rare in humans but commonly occurs in immunocompromised patients. It is susceptible to most common antibiotics.

Case Report

A 58-year-old male on PD presented to the outpatient dialysis clinic with a chief complaint of fever, abdominal pain, and cloudy effluent for 1-day duration. He denied any touch contamination. The patient has been on PD for 4 months. He has been working as a supervisor and it was a desk job. The patient denied any history of smoking, alcohol intake, or illicit drug use. The patient is married and has cats as domestic pets. The patient admitted that the cats were present in the room while he was performing PD. As per the patient, he always washed his hands while accessing PD equipment. The patient had not witnessed that the cats licked, bitten, or scratched the PD equipment. There was no leakage witnessed in the PD equipment. Past medical history is significant for

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Antibiotic & Minimum Inhibitory Concentration & Sensitivity Result \((S = \text{Sensitive}, R = \text{Resistant})\) \\
--- & --- & --- \\
Ampicillin & 0.5 µg/mL & S \\
Ceftazidime & \(\leq 0.03\) µg/mL & S \\
Chloramphenicol & 1 µg/mL & S \\
Levofloxacin & <0.03 µg/mL & S \\
Penicillin & 0.25 µg/mL & S \\
Trimethoprim/sulfamethoxazole & 0.25/4.75 µg/mL & S \\

Table 1. Sensitivities of Pasteurella multocida.

In an analysis of 124 patients on PD done by Broughton et al,\(^5\) 12 different zoonotic organisms caused peritonitis and animals were involved in 24% of the cases. Catheter loss occurred in 27% of the patients, and the overall mortality was 24%. Pasteurella species peritonitis was reported in 24 patients, and cats were involved in 21 cases. Other pets involved were dogs and hamsters.\(^5\)

This bacterium is normal commensal in 50% to 90% of cats and 50% to 66% of the dogs in their oral cavity. It is also present in the claws of 20% of the cats.\(^35\) As per Nishina et al, two thirds of the patients presented with peritonitis within 12 months of initiation of PD.\(^20\) Most of the reported cases of peritonitis associated with this pathogen were due to close contact with cats or puncturing of the dialysis tubing by cats.

The bacterium is implicated in soft tissue infections, septic arthritis, pneumonia, and endocarditis in humans.\(^36\) Invasive infections are more common in immunocompromised patients including cirrhosis, alcoholism, malignancy, diabetes mellitus, human immune virus deficiency infection, chronic pulmonary disease, and chronic kidney disease.\(^37\) Life-threatening infections reported including infective endocarditis and sepsis.\(^36\)

### Discussion

Peritonitis is an important and serious complication often resulting in PD catheter loss and change in dialysis modality. When the infection does not respond to the routine treatment, infection from unusual organisms should be suspected including zoonosis. There has been increased recognition of peritonitis caused by rare organisms like *Pasteurella multocida*, which is related to close contact with pets.

Pets are an integral part of many households and share close bonding with the owners. Pets play a crucial role in coping with stress and provide psychological support. The close contact with the pets poses potential health risks like infections, allergies, and injuries sustained from bites, scratches, and attacks. Close contact with pets should prompt the health care provider to suspect zoonosis.\(^5\)

The first case of *Pasteurella multocida* PD-associated peritonitis was reported in 1987.\(^6\) Peritonitis from this organism has been reported infrequently but has been recognized as a significant cause. The increase in the number of cases reported might be attributed to the increased pet breeding at home. We summarized all the cases listed as *Pasteurella multocida* peritonitis on literature review from PubMed in Table 2. Cats cause most of the PD-related peritonitis from *Pasteurella multocida*, accounting for more than 90% of the cases.\(^5\) Mode of transmission of this zoonotic organism is through the licks, bites, and scratches of the pets.\(^5\) Transmission can also be from contamination of the dialysis machine and tubes. Another possible way of transmission is hand contamination from the patient’s oropharyngeal colonization of *Pasteurella multocida*.\(^4\)

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Patients doing continuous ambulatory PD are less prone to develop peritonitis from *P. multocida* compared with patients on continuous cyclic PD because of fewer chances for the pets to come in contact with the dialysis bags and tubing. The patients who had peritonitis from *P. multocida* were either on continuous cyclic PD or nocturnal intermittent PD in most of the cases reported. The pets, mostly cats, play with the longer dialysis tubes.

### Table 2. Summary of All the Cases Listed as *Pasteurella multocida* Peritonitis With Patients on Dialysis as per PubMed Review of Literature.

| Author                  | Year | Age/Gender | Duration (Months) | Dialysis Mode | Leakage | Dialysate Culture | Animal Exposure | Treatment | Outcome |
|-------------------------|------|------------|-------------------|---------------|---------|--------------------|----------------|-----------|---------|
| Paul and Rostand        | 1987 | 55/female  | 4                 | CCPD          | Present | Positive           | Cat bite/scratch | Gentamicin | Improved|
| Frankel and Cassidy     | 1991 | 55/male    | 15                | CAPD          | Absent  | Positive           | Cat exposure    | Gentamicin, ciprofloxacin | Improved|
| London and Botteme      | 1991 | 54/male    | 6                 | CCPD          | Present | Positive           | Cat bite        | Cefazolin, gentamicin     | Improved|
| Elsey et al             | 1991 | 25/male    | ≤24               | CCPD          | Present | Positive           | Cat exposure    | Cephradine, gentamicin     | Improved|
| Kitting et al           | 1996 | 75/male    | 6                 | CAPD          | Present | Positive           | Cat bite        | Cefamandole            | Improved|
| Urbani et al            | 1996 | 42/female  | 108               | CCPD          | Present | Positive           | Cat bite        | Penicillin, gentamicin     | Improved|
| Logan and Adham         | 1997 | 12/male    | 7                 | CCPD          | Present | Positive           | Cat bite        | Cephapirin, gentamicin     | Improved|
| Mackay et al            | 1997 | 73/male    | 12                | CCPD          | Absent  | Positive           | Cat bite        | Cefazidime             | Improved|
| Joh et al               | 1998 | 55/male    | 12                | CCPD          | Present | Positive           | Cat bite        | Amoxicillin/subbacotan, gentamicin | Improved|
| Musio and Tiu           | 1998 | 46/female  | 7                 | CCPD          | Absent  | Positive           | Cat exposure    | Piperacillin, ciprofloxacin | Improved|
| Hamai et al             | 1999 | 49/male    | 4                 | CCPD          | Absent  | Positive           | Cat exposure    | Cefazolin, tobramicin      | Improved|
| Chadha and Warady       | 1999 | 16/male    | 60                | CCPD          | Absent  | Positive           | Cat bite        | Ticarcillin, tobramicin    | Improved|
| Van Langenhove et al    | 2000 | 22/female  | 12                | CCPD          | Present | Positive           | Cat scratch     | Ceftazidime             | Improved|
| Martinez et al          | 2000 | 46/female  | NA                | CCPD          | NA      | Positive           | NA             | Ceftazidime             | NA       |
| Kanaan et al            | 2002 | 24/female  | 7                 | CCPD          | Absent  | Positive           | Cat exposure    | Ciprofloxacin           | Improved|
| Silley et al            | 2004 | 48/female  | 36                | CAPD          | Present | Positive           | Cat bite        | Ceftazolin, gentamicin, ampicillin | Improved|
| Cooke et al             | 2004 | 73/female  | 8 and 12          | CAPD          | Present | Positive           | Cat bite        | Gentamicin, ciprofloxacin | Improved|
| Mat et al               | 2005 | 52/male    | 3                 | CCPD          | Present | Positive           | Cat exposure    | Ceftazolin, amikacin      | Improved|
| Malik et al             | 2005 | 21/female  | 36                | CCPD          | Present | Positive           | Cat bite        | Gentamicin, cefazolin, pipercillin/tazobactam | Improved|
| Malik et al             | 2005 | 58/male    | 12                | CCPD          | Absent  | Positive           | Cat bite        | Gentamicin             | Improved|
| Olea et al              | 2006 | 46/female  | 24                | CCPD          | Absent  | Positive           | Cat exposure    | Ceftazidime             | Improved|
| Antony and Oglesby      | 2007 | 48/female  | NA                | CAPD          | Absent  | Positive           | Dog exposure    | Cefazolin, gentamicin      | Improved|
| Rondon-Berrios and Trevejo-Nunez | 2010 | 38/female  | 60                | CCPD          | Present | Positive           | Cat exposure    | Piperacillin/tazobactam, ampicillin, levofloxacine | Improved|
| Mugambi and Ullian      | 2010 | 36/female  | NA                | CCPD          | Absent  | Positive           | Cat exposure    | Gentamicin, ciprofloxacin | Improved|
| Satomura et al          | 2010 | 58/male    | 84                | CCPD          | Absent  | Positive           | Cat exposure    | Ceftazidin, levofloxacine | Improved|
| Nishina et al           | 2011 | 45/male    | 84                | CCPD          | Absent  | Positive           | Cat exposure    | Vancomycin, cefazadime    | Improved|
| Weiss and Panesar       | 2012 | 57/male    | 1                 | CAPD          | Absent  | Positive           | Cat and dog exposure | Amoxicillin-clavulanic acid | Improved|
| Sol et al               | 2013 | 7/female   | 24                | NIPD          | Present | Positive           | Cat exposure    | Ampicillin               | Improved|
| Kim et al               | 2014 | 25/female  | 24                | CAPD          | Absent  | Positive           | Cat exposure    | Cefazolin, gentamicin      | Improved|
| Dresselaars et al       | 2014 | 62/female  | 37                | CAPD          | Absent  | Positive           | Cat exposure    | Cefalothin, ciprofloxacin | Improved|
| Poliquin et al          | 2015 | 28/female  | 1                 | CAPD          | Present | Positive           | Cat bite        | Ceftazidime             | Improved|
| Poliquin et al          | 2015 | 37/female  | 15                | CAPD          | Absent  | Positive           | Cat bite        | Cefazolin             | Improved|
| Poliquin et al          | 2015 | 41/male    | 18                | CAPD          | NA      | Positive           | Cat bite        | Cefazolin             | Improved|
| Poliquin et al          | 2015 | 51/female  | 7                 | CAPD          | Absent  | Positive           | Cat exposure    | Amoxicillin-clavulanic acid | Improved|
| Poliquin et al          | 2015 | 37/female  | 132               | CAPD          | Absent  | Positive           | Cat exposure    | Ceftazoxone, amoxicillin  | Improved|
| Poliquin et al          | 2015 | 59/female  | 36                | CAPD          | Absent  | Positive           | Cat exposure    | Ceftazidime             | Improved|
| Poliquin et al          | 2015 | 69/female  | 1                 | CAPD          | NA      | Positive           | Cat bite        | Ceftazidime             | Improved|
| Giron et al             | 2017 | 72/female  | 24                | CCPD          | Present | Positive           | Cat bite        | Ceftazidime             | Improved|

Abbreviations: CCPD, continuous cyclic peritoneal dialysis; CAPD, continuous ambulatory peritoneal dialysis; NA, not available; NIPD, nocturnal intermittent peritoneal dialysis.
trembling and the pump sound on the cycler may be an attractive toy for the cats.29

Patients who are initiated on PD should be questioned about the pets they own or the intention of owning the pets. Incorporating the education on proper handling of the pets during training sessions plays a very critical role in the prevention of peritonitis from *P. multocida*. Regular care of the pets, careful hand washing, proper disposal of animal waste, and placing barriers that limit the access of the pet to the dialysis equipment are the interventions that showed a significant impact on the behavior of patients toward pets. Abebe et al demonstrated this at a single dialysis center resulting in the resolution of pets-related peritonitis.38 Most reported cases of peritonitis from *P. multocida* mostly by contact from pets reiterates the importance of personal hygiene.

*Pasteurella multocida* peritonitis symptoms are evident as early as 24 hours with fever, cloudy effluent, and severe abdominal pain.4 Dialysis cultures are usually positive, with negative gram stain and blood cultures. P. multocida organisms produce a characteristic musty odor and grow on blood or chocolate agar at 37°C.39 Molecular techniques like DNA sequencing and 16S rRNA gene polymerase chain reaction are used for rapid identification and characterization of *P. multocida* with 16S rRNA gene polymerase chain reaction most commonly used at present.40

Symptoms improve rapidly within 48 to 96 hours after initiation of treatment.4 *P. multocida* is susceptible to most of the antibiotics, which covers gram-negative bacteria.29 The IP antibiotic treatment for 3 weeks is sufficient.2 The most frequently used antibiotic is gentamicin.29 *Pasteurella* can produce β-lactamases and can be penicillin resistant, and hence, ampicillin/sulbactam, amoxicillin/clavulanate, and piperacillin/tazobactam are recommended for the treatment.29 There is a high likelihood of PD catheter salvage, with catheter removal in only 11% of cases. There has been no mortality reported with *P. multocida* peritonitis.34

**Conclusion**

Education plays a very critical role in the prevention of peritonitis from *P. multocida*, particularly if patients have pets at home. Hand washing, regular pet care, proper handling of animal waste, and adding barriers that will prevent pets from accessing the PD equipment are the potential interventions. Preventing the pets from entering the room while making connections and treatment also alleviates the risk of peritonitis from *P. multocida*. Incorporating education in handling pets during the training session is a crucial aspect.

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**Ethics Approval**

Our institution does not require ethical approval for reporting individual cases report.

**Informed Consent**

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