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# ***Pasteurella multocida* Peritonitis in a 3-Year-Old Patient Undergoing Peritoneal Dialysis: Case Report and Review of the Literature**

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**Abstract:** *Pasteurella multocida* has been rarely reported to cause peritonitis in children. Peritoneal dialysis (PD) peritonitis is associated with high mortality despite appropriate treatment; therefore, its early detection is essential. Here, we report the case of a 3-year-old girl, undergoing treatment with PD, who developed peritonitis caused by *P. multocida* after a domestic cat scratched a dialysate bag used for PD. The patient was treated with antibiotics and her condition was soon in remission. PD peritonitis can occur despite the isolation of equipment, as in this case, it is preferable to completely avoid having pets if possible. But, there is the benefit of pets which heal the minds of humans with a chronic illness. We propose that it is preferable for PD patients to keep pets away from rooms where they store PD equipment and perform PD.

**Keywords:** Peritonitis, Peritoneal Dialysis, *Pasteurella multocida*, Pet, Hygiene

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## **1. Introduction**

Peritonitis is a major serious complication of peritoneal dialysis (PD) therapy and is one of the important reasons for the discontinuation of PD. *Pasteurella multocida* is a Gram negative zoonotic pathogen found in the oral cavities of domestic cats, dogs, and other wild and domestic animals. Infectious diseases caused by the transmission of *P. multocida* to humans have been reported to result in systemic infections including sepsis and local infections involving soft tissues or respiratory system. To date, 29 cases of PD-associated *P. multocida* peritonitis linked to animal contact have been reported in the literature (Table 1) [1-29]. Among these, only two cases have been reported in pediatric patients undergoing PD (cases 2 and 3).

We report the case of a 3-year-old patient who experienced PD-associated peritonitis due to *P. multocida*.

## **2. Case**

A three-year-old female patient with end-stage renal disease caused by congenital nephrotic syndrome of the Finnish type

was treated with automated peritoneal dialysis (APD) and continuous ambulatory peritoneal dialysis (CAPD) for 26 months. Her mother found scratches on the dialysate bag that was used for PD. Two days later, the patient was admitted to our hospital with slight fever and cloudy effluent in the dialysis bag. She was 86.3 cm tall, and weighed 10.2 kg. Physical examination upon admission revealed no abdominal pain. There were no signs of either tunnel or exit-site infections or damage to the catheter and tube.

The patient's vital signs were as follows: a respiratory rate of 120 beats/min, a heart rate of 120 beats/min, blood pressure of 108/62 mmHg, and a temperature of 37.4°C. No tenderness was present in her abdomen. Her laboratory data on admission showed a white blood cell (WBC) count of 12,800/ $\mu$ L with 84.9 % neutrophils, blood urea nitrogen of 50.7 mg/dL, creatinine level of 4.55 mg/dL, and C-reactive protein level of 9.73 mg/dL. Analysis of her initial dialysis fluid revealed a cell count of 16 WBC/ $\mu$ L.

Gram staining revealed Gram negative bacteria in her peritoneal fluid and *P. multocida* was identified via bacterial culturing. Minimum inhibitory concentrations of known

antibiotics against the pathogen were piperacillin <1 µg/ml, cefazolin <0.5 µg/ml, ceftriaxone <0.25 µg/ml, imipenem/cilastatin 0.25 µg/ml, and levofloxacin <0.25 µg/ml.

APD was changed to CAPD therapy. The patient was treated with a combination of intraperitoneal cefazolin four times a day and intravenous piperacillin once a day.

She developed a high fever, and the WBC count of the fluid dialysate increased to 778/µL on the day following hospitalization. The high fever disappeared on the second day of treatment, and the laboratory findings improved by the 9th day. The treatment was changed to only intravenous cefazolin on the 9th day after starting the combination therapy, and was subsequently changed to oral cefdinir on the 12th day.

The patient had a domestic cat. Her mother had not found the cat playing with, biting, or puncturing the PD tube or bags but found scratches on a bag used for PD. The patient had a history of close contact with her cat. Although she had undergone home PD for 2 years, she had no history of PD-related peritonitis.

### 3. Discussion

*Pasteurella* is a genus comprising 13 species of Gram negative facultative anaerobic coccobacilli, found in the normal flora of several animals, including cats (up to approximately 90% of cat populations) and dogs (up to approximately 60% of dog populations) [30]. In addition, it has also been reported that one-third of healthy livestock breeds are oropharyngeal carriers

of this pathogen. Human infection occurs following animal bites, scratches, or even licks. *P. multocida* usually causes skin, soft tissue, respiratory tract, bone and joint infections. It is an uncommon cause of peritonitis in patients undergoing peritoneal dialysis. Peritonitis caused by *P. multocida* is estimated to comprise approximately 8% of PD-associated peritonitis [9]. However, only 30 cases of *P. multocida* peritonitis in association with PD have been reported (Table 1), of which 3 were pediatric (cases 1–3). In most cases, the patients had a domesticated cat, and APD was more commonly used method of dialysis than CAPD. The reason for this remains unclear, but it is postulated that the relatively short duration of PD exchange in CAPD reduces the chances of cats coming into contact with PD tubes. Further, long PD tubes necessary for APD and the warming dialysate bags used appear to be more attractive toys for cats.

In this case, the pathogen was observed using Gram staining. However, 14 out of the 23 cases examined have been reported to be negative, and the detection rate was low. The reason for this is remained unclear, but it is likely that *P. multocida* is susceptible to heat and ultraviolet rays [9, 27].

Peritonitis caused by *P. multocida* develops within 24 hours of exposure, and its subjective symptoms are strong [23]. In this case, the onset of peritonitis required 2 days. It is possible that very few pathogens were present as contaminants and because the dialysis methods comprised eight cycles of APD and two cycles of CAPD per day, any bacteria were washed away and their growth was suppressed.

**Table 1.** Cases of *Pasteurella multocida* peritonitis reported in the literature.

case	Age(years)	sex	PD type	animal	leak	Gram staining	reference
1	4	F	APD,CAPD	cat	-	Gram(-) rod	This case
2	7	F	NIPD	cat	-	Gram(-) rod	1
3	12	F	CCPD	cat	+	-	2
4	16	M	APD	cat	NR	NR	3
5	21	F	CCPD	cat	+	NR	4
6	22	F	CCPD	cat	-	-	5
7	24	F	CCPD	cat	-	NR	6
8	25	F	CAPD	cat	-	-	7
9	25	M	CCPD	cat	-	-	8
10	29	F	NIPD	cat	-	-	9
11	36	F	CCPD	cat	-	-	10
12	38	M	CCPD	cat	+	-	11
13	42	F	CCPD	cat,dog	+	-	12
14	46	F	APD	NR	NR	Gram(-) rod	13
15	46	F	CCPD	cat	-	Gram(-) rod	14
16	47	F	CCPD	cat	-	Gram(-) rod	15
17	48	F	CAPD	cat	NR	-	16
18	48	F	CAPD	dog	NR	-	17
19	49	M	CAPD	cat,dog	-	NR	18
20	49	M	NIPD	cat	NR	Gram(-) rod	19
21	52	M	CCPD	cat	-	NR	20
22	54	M	CCPD	cat	+	Gram(-) rod	21
23	55	F	CCPD	cat	+	-	22
24	55	M	CAPD	cat	+	NR	23
25	55	M	CCPD	cat	+	-	24
26	58	M	CCPD	cat	+	Gram(-) rod	25
27	58	M	CCPD	cat	-	-	26
28	73	M	CAPD	cat	-	NR	27
29	73	F	CAPD	cat	-	Gram(-) rod	28
30	75	M	CAPD	cat	+	-	29

Abbreviation: M; male, F; female, PD; peritoneal dialysis, CAPD; continuous ambulatory peritoneal dialysis, CCPD; continuous cyclic peritoneal dialysis, APD; automated peritoneal dialysis, NIPD; nocturnal intermittent peritoneal dialysis, NR; not reported, Gram (-) rod; gram negative rod-shaped bacterium.

The number of dialysis cases in Japan is approximately 325,000, only 3% of which are treated by PD. However, PD comprises approximately 90% of the total number of dialysis cases in children. The number of PD cases in Japan relative to other regions of the world is currently small but is likely to increase in the future. The ownership rate of dogs and cats in Japan is approximately 16% with an increasing yearly trend. Pets ownership are increasing in the West [31]. Therefore, PD peritonitis caused by pets appears to be on the rise, and *P. multocida* peritonitis is a significant issue. It is important to inform patients undergoing PD regarding the potential for transmission of diseases from pets, and the importance of maintaining local environmental hygiene.

#### 4. Conclusion

PD peritonitis may be fatal. PD peritonitis can occur despite the isolation of equipment, as in this case, it is preferable to completely avoid having pets if possible. But, there is the benefit of pets which heal the minds of humans with a chronic illness. We propose that it is preferable for patients undergoing PD to keep pets away from rooms where they store PD equipment and perform PD.

#### Conflict of Interest

All the authors do not have any possible conflicts of interest.

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