

## Single Case

---

# *Butyricimonas virosa* Peritonitis in Peritoneal Dialysis Patient: A Case Report and Review

Siew Yan Lau<sup>a</sup> Boon Cheak Bee<sup>b</sup> Hin-Seng Wong<sup>b, c</sup>  
Ahneez Abdul Hameed<sup>d</sup>

<sup>a</sup>Department of Pharmacy, Selayang Hospital, Lebuhraya Selayang-Kepong, Malaysia;

<sup>b</sup>Department of Nephrology, Selayang Hospital, Lebuhraya Selayang-Kepong, Malaysia;

<sup>c</sup>Clinical Research Center, Selayang Hospital, Lebuhraya Selayang-Kepong, Malaysia;

<sup>d</sup>Department of Pathology, Selayang Hospital, Lebuhraya Selayang-Kepong, Malaysia

## Abstract

*Butyricimonas virosa* is a Gram-negative bacillus, which was first discovered in rat faeces in 2009. To date, only seven human infections have been reported in literature. To our knowledge, this is the first reported case of peritoneal dialysis (PD)-related peritonitis due to *B. virosa*. A 65-year-old Chinese man presented to the hospital with complaints of dizziness and vomiting. On admission, the drained peritoneal dialysate was cloudy. He was empirically treated as a case of PD-related peritonitis with intraperitoneal (IP) cefazolin, ceftazidime, and gentamicin. *B. virosa* was isolated from peritoneal fluid sample and the antibiotics were changed to IP imipenem and amikacin. Three weeks after completion of the antibiotics, the patient presented again with cloudy peritoneal dialysate and blood stained diarrhoea. IP imipenem and amikacin were recommenced. Multiple peritoneal dialysate samples were sent to the microbiology laboratory, but this time no microorganism was isolated. Colonoscopy examination revealed the presence of extensive rectosigmoidal ulcerations. IP imipenem was replaced with IP piperacillin-tazobactam when the patient developed imipenem-associated neurotoxicity at Day 9 of treatment. The patient recovered fully after completing 3 weeks of IP piperacillin-tazobactam and 2 weeks of IP amikacin. This is the first reported case of PD-related peritonitis due to *B. virosa*. Susceptibility data for *B. virosa* are scarce, but a 3-week course of IP piperacillin-tazobactam, imipenem, or meropenem could be potentially useful in treating PD-related peritonitis caused by this organism.

© 2022 The Author(s).  
Published by S. Karger AG, Basel

---

Correspondence to:  
Siew Yan Lau, [siewyan\\_7@yahoo.com](mailto:siewyan_7@yahoo.com)

## Introduction

*Butyricimonas virosa* is an anaerobic, non-pigmented, non-spore-forming, non-motile, Gram-negative bacillus [1]. It was first discovered in rat faeces in 2009 and was categorized as a member of the Porphyromonadaceae family based on 16S rRNA gene sequence analysis [1]. To date, there are seven species isolated as part of the *Butyricimonas* genus: *B. virosa*, *B. synergistica*, *B. paravirosa*, *B. faecihominis*, *B. phoceensis*, *B. faecalis*, and *B. vaginalis* [1–5]. *B. virosa* is the only pathogenic species within the genus. There have been seven reported cases of infection in which five occurred after abdominal surgery [6–12]. We reported a case of peritoneal dialysis (PD)-related peritonitis caused by *B. virosa*. Published literature on *B. virosa* infections was reviewed.

## Case Presentation

A 65-year-old Chinese man with the history of diabetes mellitus and end-stage kidney disease on PD presented to the hospital with dizziness and vomiting. Blood pressure on arrival to the emergency department was 91/57 mm Hg. Intravenous noradrenaline was initiated for septic shock. On admission, the total leucocyte was  $7.05 \times 10^9/L$  with 90.1% of neutrophils and the drained peritoneal dialysate was cloudy. The diagnosis of PD-related peritonitis was made, and dialysate samples were sent to microbiology laboratory for Gram stain, microscopy for cell count and culture. For culture, the dialysate samples were inoculated into aerobic and anaerobic blood culture broth and monitored continuously using the automated BACTECTM 9240 Instrumented Blood Culture System. Dialysate samples were also sent using a sterile screw-capped container, and the samples were directly inoculated on culture agar plate. Empirical therapy with intraperitoneal (IP) cefazolin, ceftazidime, and gentamicin were initiated. The initial sample of peritoneal dialysate was cloudy, with more than 1,000 cells/mm<sup>3</sup> (majority were lymphocytes). Abdominal pain resolved and peritoneal dialysate was clear with zero cell count on Day 4 of admission. The patient was discharged to complete 3-week course of IP cefazolin, ceftazidime and 2-week gentamicin as an outpatient on Day 9 of admission.

The peritoneal dialysate that was inoculated into the BACTEC anaerobic blood culture bottle revealed Gram-negative bacilli on Gram staining on Day 5 of treatment. The organism grew on Schaedler agar and the colonies were identified as *B. virosa* using matrix-assisted laser desorption/ionization-time-of-flight mass spectrometry (MALDI-TOF MS). Antibiotic susceptibilities were determined by the E-test (Liofilchem, Italy) method, and the organism was susceptible to imipenem (minimal inhibitory concentration [MIC] <0.75 µg/mL) but resistant to ampicillin (MIC >256 µg/mL), metronidazole (MIC >256 µg/mL), and clindamycin (MIC >256 µg/mL) according to the breakpoints suggested for Gram-negative anaerobes by the Clinical and Laboratory Standards Institute [13]. Antibiotic regimen was modified to IP imipenem for 3 weeks and amikacin for 2 weeks.

Three weeks after completion of the antibiotics, the patient presented again with cloudy peritoneal dialysate and blood-stained diarrhoea. IP imipenem and amikacin were recommenced. Multiple peritoneal dialysate samples were sent to the microbiology laboratory, but this time no microorganism was isolated. Colonoscopy was performed and there were extensive rectosigmoidal ulcerations. On Day 5 of treatment, the dialysate fluid became clear. However, on Day 9 of treatment, the patient developed imipenem-associated neurotoxicity and IP imipenem was replaced with IP piperacillin-tazobactam. The patient was then discharged home on Day 14 of treatment and recovered fully after completing a total of 3 weeks of IP piperacillin-tazobactam and 2 weeks of IP amikacin as an outpatient.

## Discussion

*B. virosa* is the only species in the *Butyricimonas* genus known to cause infections in human. Seven cases of infection have been reported in the literature. Six out of seven reported infections were associated with abdominal disease. This is not surprising as the *Butyricimonas* genus is known to be a part of the human intestinal flora [14–16]. The first and second cases of *B. virosa* infection occurred after surgery for colonic and duodenal adenocarcinoma, respectively [9, 11]. The third case involved a patient who developed bone abscess after fasciotomy for posttraumatic acute compartment syndrome [7]. The other three cases were bacteraemia associated with either diverticulitis or intestinal perforation [6, 8, 10]. The most recent reported case was a surgical wound infection with *B. virosa* after pelvic lymph node excision [12]. Interestingly, all cases involved male patients. Characteristics of previous cases are summarized in Table 1.

*B. virosa* is an obligate anaerobic, non-pigmented, non-spore-forming, non-motile Gram-negative bacillus with an average size of  $0.7 \times 3.5 \mu\text{m}$  [1]. It is a slow-growing bacterium and is difficult to be identified with the conventional armamentarium. It is a fastidious microorganism, which requires at least 3–5 days incubating and producing visible colonies to the naked eyes [8, 10]. Some authors reported that identification of *B. virosa* from clinical specimens was only successful with 16S rRNA gene sequencing and not with the Vitek2 identification card for anaerobes or with MALDI-TOF MS [8, 11], whereas others have successfully identified *B. virosa* using MALDI-TOF MS [6, 9, 12]. As for our patient, *B. virosa* was isolated from peritoneal dialysate sample using the MALDI-TOF MS after 5 days of incubation. The susceptibility pattern for *B. virosa* is not yet defined, but clindamycin, piperacillin-tazobactam, metronidazole, imipenem, and meropenem were found susceptible in vitro in previous reports [6, 8, 11]. However, the strain isolated from our patient was only susceptible to imipenem but resistant to both clindamycin and metronidazole.

Even though peritonitis is most often due to intraluminal contamination, it can also result from transmural migration of microorganisms across the intestinal wall [14]. Pathology of the intra-abdominal organs, for example, gastric perforation, ischemic bowel, appendicitis, and diverticulitis, or diverticulosis can cause enteric peritonitis among PD patients [15, 16]. The *Butyricimonas* genus is comprised of Gram-negative bacilli belonging to the Porphyromonadaceae family and is found to colonize human or animal gastrointestinal tracts [1, 4]. The isolation of *B. virosa* from peritoneal dialysate culture, as for other anaerobic Gram-negative bacilli, should lead to the suspicion of an abdominal source of infection. Thus, when this patient presented with the second episode of peritonitis 3 weeks after completion of IP imipenem/amikacin, colonoscopy was performed with the suspicion of diverticulitis. However, he was found to have extensive rectosigmoid colonic ulcerations. Nevertheless, this could still be the cause of peritonitis due to transmural migration of *B. virosa* from the intestinal lumen into the peritoneal cavity. Dialysis patients, especially those with diabetes, may be more prone to gastrointestinal ulcerations secondary to hypomotility disorders [17].

As the second episode of peritonitis developed within 4 weeks upon completion of previous course of antibiotics and it was culture-negative, this was most probably a relapsed peritonitis caused by *B. virosa*. As the patient developed imipenem-induced neurotoxicity, the antibiotic regimen was changed to IP piperacillin-tazobactam and amikacin since the organism has been reported to be susceptible to piperacillin-tazobactam [6, 8]. In the absence of susceptibility data and a favourable clinical evolution, we continued piperacillin-tazobactam for 3 weeks and amikacin for 2 weeks.

**Table 1.** Characteristics of patients with *Butyrivimonas virosa* infections

Age, years	Types of infection	Identification test	Susceptibility		Antibiotic regimen	Treatment outcome
			S	R		
72	Bacteraemia post-aortic aneurysm surgery with adenocarcinoma of colon [11]	16S rRNA gene sequencing	Amp Ams Tzp Ipm Mem Cli Mtz	Van Kan Cst	IV meropenem and colistin	Septic shock and later died due to with <i>Acinetobacter septicemia</i>
81	Bacteraemia post Whipple procedure for adenocarcinoma of duodenum [9]	MALDI-TOF	-	Van Kan Cst	No antibiotic was given	Recovered without antibiotics
30	Bone abscess following a posttraumatic open radial fracture [7]	-	-	-	SC ertapenem for 3 months with PO metronidazole for 1 month followed by clindamycin	Recovered
69	Bacteraemia secondary to diverticulitis [6]	MALDI-TOF	Tzp Mtz	Pen Ctx	PO ciprofloxacin and metronidazole for 2 weeks	Recovered prior to initiation of oral antibiotic therapy
90	Bacteraemia secondary to perforated appendicitis [8]	16S rRNA gene sequencing	Tzp Mem Cli Mtz	Pen	IV piperacillin-tazobactam for 3 days followed by oral metronidazole and trimethoprim-sulphamethoxazole	Recovered
68	Bacteraemia with peritonitis following intestinal perforation [10]	MALDI-TOF and 16S rRNA gene sequencing	-	-	IV doripenem for 3 weeks	Recovered
78	Subcutaneous infection mimicking necrotizing fasciitis [12]	MALDI-TOF	-	-	IV vancomycin for 9 days and piperacillin-tazobactam for 12 days	Recovered

amp, ampicillin; ams, ampicillin/sulbactam; cli, clindamycin; cst, colistin; ctx, ceftriaxone; ipm, imipenem; kan, kanamycin; MALDI-TOF MS, matrix-assisted laser desorption/ionization time-of-flight mass spectrometry; mem, meropenem; mtz, metronidazole; pen, penicillin; R, resistant; S, susceptible; tzp, piperacillin/tazobactam; van, vancomycin.

## Conclusions

Molecular identification technologies such as MALDI-TOF have led to the recognition of microorganisms such as *B. virosa* that were previously considered rare or were not known to be pathogenic. Incubation for at least 3–5 days is necessary to recover and identify this organism. To our knowledge, this is the first reported case of PD-related peritonitis due to *B. virosa*. Susceptibility data for *B. virosa* are scarce, but a 3-week course of IP piperacillin-tazobactam, imipenem, or meropenem could be potentially useful in treating PD-related peritonitis caused by this organism.

## Statement of Ethics

The Ministry of Health Medical Research Ethics Committee, Malaysia does not require ethical approval for reporting individual cases or case series. Research registration number with Malaysian National Medical Research Register: NMRR-21-1911-59892. Written informed consent was obtained from the patient for publication of the details of his medical case.

## Conflict of Interest Statement

The authors have no conflicts of interest to declare.

## Funding Sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Author Contributions

Siew Yan Lau had full access to all of the data in the study and takes responsibility for the integrity of the data. Drafting of the manuscript: Siew Yan Lau. Critical revision of the manuscript for important intellectual content: Ahneez Abdul Hameed (microbiology section of the manuscript); and Boon Cheak Bee and Hin-Seng Wong (clinical section of the manuscript). Revision and approval of the final version of the manuscript: Siew Yan Lau, Ahneez Abdul Hameed, Boon Cheak Bee, and Hin-Seng Wong. Supervision: Boon Cheak Bee and Hin-Seng Wong.

## Data Availability Statement

Patient-related data were extracted from medical records in Selayang Hospital, Malaysia, and so are not publicly available. All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

## References

- 1 Sakamoto M, Takagaki A, Matsumoto K, Kato Y, Goto K, Benno Y. *Butyricimonas synergistica* gen. nov., sp. nov. and *Butyricimonas virosa* sp. nov., butyric acid-producing bacteria in the family “Porphyromonadaceae” isolated from rat faeces. *Int J Med Sci*. 2009;59(Pt 7):1748–53.

- 2 Sakamoto M, Tanaka Y, Benno Y, Ohkuma M. *Butyricimonas faecihominis* sp. nov. and *Butyricimonas paravirosa* sp. nov., isolated from human faeces, and emended description of the genus *Butyricimonas*. [Int J Med Sci](#). 2014; 64(Pt 9):2992–7.
- 3 Le Roy T, Van der Smissen P, Paquot A, Delzenne N, Muccioli GG, Collet JF, et al. *Butyricimonas faecalis* sp. nov., isolated from human faeces and emended description of the genus *Butyricimonas*. [Int J Syst Evol](#). 2019;69(3): 833–8.
- 4 Togo AH, Diop A, Dubourg G, Nguyen TT, Andrieu C, Caputo A, et al. *Butyricimonas phoceensis* sp. nov., a new anaerobic species isolated from the human gut microbiota of a French morbidly obese patient. [New Microbes New Infect](#). 2016;14:38–48.
- 5 Bordigoni A, Lo CI, Yimagou EK, Nicaise B, Diop K, Raoult D, et al. Two new bacteria isolated from vagina of a patient with vaginosis: *Atopobium massiliense* sp. nov. and *Butyricimonas vaginalis* sp. nov. [New Microbes New Infect](#). 2020;38:100771.
- 6 Enemchukwu CU, Ben-Faras H, Gialanella P, Szymczak WA, Nosanchuk JD, Madaline TF. *Butyricimonas virosa* bacteraemia and bowel disease: case report and review. [New Microbes New Infect](#). 2016;13:34–6.
- 7 Ferry T, Laurent F, Ragois P, Chidiac C; Lyon BJI Study Group. Post-traumatic chronic bone and joint infection caused by *Butyricimonas* spp, and treated with high doses of ertapenem administered subcutaneously in a 30-year-old obese man. [BMJ Case Rep](#). 2015;2015:bcr2015212359.
- 8 García-Agudo L, Nilsen E. *Butyricimonas virosa*: a rare cause of bacteremia. [Anaerobe](#). 2018;54:121–3.
- 9 Mehta SR, Estrada J, Basallo C, Farala A, Fierer J. *Butyricimonas virosa* bacteraemia identified by MALDI-TOF. [New Microbes New Infect](#). 2015;8:127.
- 10 Ogawa Y, Sato M, Yamashita T, Nakano R, Mochizuki S, Kasahara K, et al. Polymicrobial anaerobic bacteremia caused by *Butyricimonas virosa* and *Brachyspira pilosicoli* in a patient with peritonitis following intestinal perforation. [Ann Lab Med](#). 2018;38(1):71–3.
- 11 Ulger Toprak N, Bozan T, Birkan Y, Isbir S, Soyletir G. *Butyricimonas virosa*: the first clinical case of bacteraemia. [New Microbes New Infect](#). 2015;4:7–8.
- 12 De Donder L, Uyttendaele O, Van Cleven S, Berrevoet F. A subcutaneous infection mimicking necrotizing fasciitis due to *Butyricimonas virosa*. [Acta Chir Belg](#). 2020;120(6):425–8.
- 13 CLSI. Clinical and Laboratory Standards Institute. [Performance standards for antimicrobial susceptibility testing; eighth informational supplement, CLSI document M100-S27](#). Wayne, PA: Clinical and Laboratory Standards Institute; 2020.
- 14 Chao CT, Lee SY, Yang WS, Chen HW, Fang CC, Yen CJ, et al. *Citrobacter* peritoneal dialysis peritonitis: rare occurrence with poor outcomes. [Int J Med Sci](#). 2013;10(9):1092–8.
- 15 Harwell CM, Newman LN, Cacho CP, Mulligan DC, Schulak JA, Friedlander MA. Abdominal catastrophe: visceral injury as a cause of peritonitis in patients treated by peritoneal dialysis. [Perit Dial Int](#). 1997;17(6):586–94.
- 16 Yip T, Tse KC, Lam MF, Cheng SW, Lui SL, Tang S, et al. Colonic diverticulosis as a risk factor for peritonitis in Chinese peritoneal dialysis patients. [Perit Dial Int](#). 2010;30(2):187–91.
- 17 Piraino B, Bernardini J, Brown E, Figueiredo A, Johnson DW, Lye WC, et al. ISPD position statement on reducing the risks of peritoneal dialysis-related infections. [Perit Dial Int](#). 2011;31(6):614–30.