Case Report

Anaerobic urinary tract infection caused by *Veillonella parvula* identified using cystine-lactose-electrolyte deficient media and matrix-assisted laser desorption ionization-time of flight mass spectrometry

Byron M. Berenger a,c, Linda Chui b,c, Amy Borkent e, Mao-Cheng Lee b,d,*

* Department of Medical Microbiology and Immunology, 6-020 Katz Group Centre, University of Alberta, Edmonton, Alberta T6G 2E1, Canada
* Department of Laboratory Medicine and Pathology, 481.121 Walter Mackenzie Centre, University of Alberta Hospital, Edmonton, Alberta T6G 2B7, Canada
* Alberta Provincial Laboratory for Public Health, Walter Mackenzie Centre, University of Alberta Hospital, Edmonton, Alberta T6G 2B1, Canada
* DynaLIFE, Laboratory Services, #200, 10150, 102 Street, Edmonton, Alberta T5J 5E2, Canada
* Family MD’s, 10134 111 Avenue NW, Edmonton, Alberta T5G 0B3, Canada

**A R T I C L E   I N F O**

* Corresponding author at: #200, 10150, 102 Street, Edmonton, Alberta T5J 5E2, Canada. Tel.: +1 780 451 3702x8365; fax: +1 780 454 2845.

E-mail addresses: berenger@ualberta.ca (B.M. Berenger), linda.chui@albertahealthservices.ca (L. Chui), AlkBorkent@shaw.ca (A. Borkent), Mao-Cheng.Lee@albertahealthservices.ca (M.-C. Lee).

**A B S T R A C T**

We report a case of *Veillonella parvula* causing a urinary tract infection. The organism was isolated from urine using cystine-lactose-electrolyte deficient media and identified using matrix-assisted laser desorption ionization-time of flight mass spectrometry confirmed by 16s RNA. This case highlights important clinical and microbiological considerations for urinary tract infections.

© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

**Case report**

A 47-year-old female presented to her general practitioner on January 14, 2013, with increasing confusion and weakness since being discharged from hospital that day and a urine culture was sent. Co-morbidities included organic brain disease secondary to a stroke ten years prior, possible past seizures, bipolar and borderline personality disorder, gastroesophageal reflux disease, dyslipidemia, hypertension, hypothyroidism and a past history of substance abuse.

She was admitted to hospital on December 1, 2012 due to confusion caused by high levels of valproate. During her admission she developed urinary retention and was catheterized. Subsequently, she developed multiple urinary tract infections (UTI) (Table 1). After her confusion improved, she developed fever and leukocytosis 10 days into admission that was attributed to a bowel micro-perforation indicated by a small amount of extraluminal air on CT abdomen. A cystogram done to rule out enterovesiculic fistula was normal. Her fever and WBC count resolved 2 days after treatment with vancomycin, ciprofloxacin and metronidazole, which were continued for ten days. She required intensive rehabilitation and continued to require intermittent catheterization up until discharge on January 14th, 2013.

Before discharge, a urine culture was submitted to our laboratory on January 9th. As per routine protocols, the urine was submitted in a sterile container and dipped at the point of collection using the Uricult® Trio dip slide culture method with MacConkey medium, a β-glucuronidase-producing *Escherichia coli* detection medium, and CLED medium. Pure 10^8 cfu/ml gram-negative cocci, grew only on the CLED media after 24 h of incubation and the organism failed to grow for identification by routine aerobic culture methods. At the direction of the medical microbiologist, the isolate was further plated onto other types of media to rule out other uropathogens, including
Table 1
Urine culture results using Uriflux™ Trio.

| Date        | Source | Organisms                        | Urine microscopy | Antibiotic dates | Antibiotics     |
|-------------|--------|----------------------------------|------------------|------------------|-----------------|
| First admission |       |                                  |                  |                  |                 |
| Dec 1       | MSU    | No growth                        | Not done         |                  | Ciprofloxacin   |
| Dec 4       | In and out | E. coli 10⁶                     | RBC + Bacteria   | Dec 4–9          |                 |
| Dec 5       | In and out | E. faecalis 10⁶                    | RBC, WBC, Bacteria | Dec 9–20        | Vancomycin²     |
| Dec 11      | Unknown | Gram-negative bacilli 10⁶          | RBC, WBC, Bacteria | None             |                 |
| Dec 12      | Unknown | Yeast 10⁶                         | RBC, WBC, Bacteria | None             |                 |
| Dec 13      | Indwelling | E. faecalis 10⁸                    | RBC + WBC        | None             |                 |
| Dec 14      | Unknown | C. glabrata                       | 1–5 RBC          | Dec 17–23        | Fluconazole     |
| Dec 23      | Unknown | C. glabrata                       | WBC + Bacteria   | Dec 17–23        | Fluconazole     |
| Jan 1       | Catheter NS | No growth                     | WBC + Bacteria   | Dec 25–31        | Ciprofloxacin   |
| Jan 5       | Unknown | No growth                        | WBC + Bacteria   | None             |                 |
| Jan 9       | Unknown | Gram-negative cocci 10⁸           | WBC + Bacteria   | None             |                 |
| Jan 12      | In and out | V. parvula 10⁶                   | Not done         | Jan 14–20        | Metronidazole   |
| Second admission |       |                                  |                  |                  |                 |
| Jan 20      | MSU    | Lactobacillus 10⁸                 | 11–25 WBC        | Jan 20–24        | Ceftriaxone     |
| Jan 20      | MSU    | Other Gram positive 10⁶           | 1–5 RBC WBC      | None             |                 |
| Jan 30      | In and out | NG                             | 11–25 WBC        |                 |                 |
|             |        |                                  | 1–5 RBC WBC      |                  |                 |

Colony forming units per ml are denoted next to the organism name and were determined based on the manufacturer's estimates of the number of colonies growing on the slide that correspond to the colony forming units per ml. For urine microscopy, most had too many cells to perform accurate cell counts. When cell count was performed, numbers denoted are per high-powered field microscopy. MSU, midstream urine; In-and-out, catheter was asexually inserted to collect urine and removed afterwards. Catheter NS, not specified if urine was collected from an indwelling catheter or from an in-and-out; WBC, white blood cells; RBC, red blood cells.

² Continued in addition to ciprofloxacin and metronidazole for 10 days to treat query microperforation and E. faecalis in the urine.

Haemophilus and Neisseria species, but no growth was observed (Table 2). Considering the possibility of an anaerobic UTI, the January 12 and 14 isolates were cultured anaerobically. Anaerobic gram-negative cocci grew in 48 h under these conditions (Table 2).

Suspecting an anaerobic UTI, the medical microbiologist notified the general practitioner about the possibility and advised appropriate antimicrobial coverage with metronidazole. The patient was treated with metronidazole 500 mg twice daily starting January 14, but was readmitted in the hospital on January 20 due to her persistent delirium. While waiting for antimicrobial susceptibility results on the anaerobic gram-negative cocci, the infectious diseases service started empiric coverage for a UTI with intravenous ceftriaxone 2 g daily. Head CT and MRI, both revealed a subacute right-sided pontine infarct not present on her last CT head (December 3rd), which was associated with no new focal neurological exam findings and no significant findings on stroke work up.

Using the Vitek MS (bioMérieux, Marcy L’Etoile, France), the isolate was identified as Veillonella parvula with 99.9% certainty. Molecular confirmation using 16s rRNA sequencing was later done with primers 16S-5′-AGAGTTTGATCATGGCTCAG-3′ and 16S-R (5′-GGACTACGGTGATCCTAAT-3′) [1]. A 624 bp product confirmed the identity with 99% sequence homology based on the GenBank database using the Basic Local Alignment Search Tool algorithm (http://blast.ncbi.nlm.nih.gov/Blast.cgi).

The isolate was sensitive to ceftriaxone, tetracycline, imipenem, meropenem, ertapenem, penicillin, and metronidazole (Clinical Laboratory Standards Institute breakpoints) and was tested by E-test (bioMérieux) on Brucella agar with laked blood (Dalynn Biologicals) [2].

Discussion

Veillonella species are conventionally part of the normal oral and genital flora [3]. Only one other publication describes a Veillonella spp. UTI, which is a report of pyelonephritis with bacteremia in a pregnant woman caused by an unspecified species of Veillonella [4]. In this case, V. parvula was isolated as a pure culture in three separate in and out catheter urine collections at 10⁶ cfu/ml and subsequent urine cultures after treatment no longer grew V. parvula nor any other uropathogen. With treatment
of the UTI, the patient's delirium improved within 10 days of antibiotic therapy. This was despite the presence of a subacute (based on imaging characteristics) pontine infarct that could have occurred at any point between head CTS on December 3rd and January 20th. Often, an episode of delirium may persist for weeks, months, or even years especially if the underlying inciting etiology causes permanent physio-neurological damage, as in the case of an infarct [5]. The reversibility of delirium, at the same time, is often directly dependent on whether its underlying cause can be promptly diagnosed and is treatable [5]. Due to the rapid improvement of this patient's delirium following appropriate antimicrobial therapy, her initial cognitive decline was postulated to be most likely due to an UTI caused by *V. parvula* and not to the infarct. This case exemplifies the difficulty in diagnosing an UTI in patients presenting with atypical symptoms (i.e. confusion/delirium), which is typically seen in the elderly population.

It is more common to find anaerobes associated with abscesses of the urinary tract than with UTIs [6]. When urine is cultured anaerobically, the isolation of anaerobic bacteria is rare (<1%) and the patients are often asymptomatic [7]. There are however, case reports demonstrating the ability of anaerobic bacteria to cause cystitis and pyelonephritis, especially in patients such as ours with a recent history of catheterization and/or instrumentation (i.e. cystoscopy) [8–10].

Due to the rare occurrence of UTIs caused by anaerobes, microbiology laboratories have discontinued routine urine culture for them; consequently, clinicians must be aware that laboratories may not culture anaerobes unless specifically requested. In this case, the urine dip slide method with CLED media allowed for isolation of the *V. parvula*. Clinically significant anaerobes including *Veillonella* can be aerotolerant [11], therefore we hypothesize that because the dip slide is incubated in a sealed container, the oxygen content is low enough to permit growth of *V. parvula*. Additional nutrients such as cysteine found in CLED media may have also provided additional growth support.

We report on *V. parvula*’s role in UTIs and illustrate how *V. parvula* can be reliably identified in the clinical laboratory. Our case highlights several clinical and laboratory pitfalls for consideration including the need for consultation with the medical microbiologist to investigate for anaerobic and fastidious organisms when a patient presents with a clinical picture consistent with recurrent or persistent UTIs.

**Acknowledgements**

We are grateful to the staff in the Department of Microbiology at *DynaLIFEn*, and in the Bacterial Typing Unit at the Alberta Provincial Laboratory for Public Health for all the laboratory work performed behind this case.

**References**

[1] Stackebrandt E, Goodfellow M. Nucleic acid techniques in bacterial systematics. New York, NY: John Wiley & Sons Ltd.; 1991.

[2] Clinical Laboratory Standards Institute. Performance Standards for Antimicrobial Susceptibility Testing. Twenty-Second Informational Supplement 2012;32:1–188.

[3] Yaghashi YY, Arakaki YY. Acute pyelonephritis and secondary bacteremia caused by *Veillonella* during pregnancy. BMJ Case Rep 2012. pii:bcr-2012-007364.

[4] Song Y, Finegold SM, Peptostreptococcus, Finegoldia, Anaerococcus, Peptophilus, *Veillonella*, and other Anaerobic Cocci. In: Versalovic J, Carroll KC, Jorgensen JH, Funke G, Landry ML, Warnock DW, editors. Manual of Clinical Microbiology, 10th ed., vol. 1. Washington, DC: American Society for Microbiology; 2011. p. 803–16.

[5] Josephson SA, Miller BL. Harrison's Principles Of Internal Medicine. In: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson J, Loscalzo J, editors. Confusion and delirium. 18th ed., New York, NY: McGraw-Hill; 2012 [chapter 25].

[6] Brook I. Urinary tract and genito-urinary suppurative infections due to anaerobic bacteria. Int J Urol 2004;11:133–41.

[7] Headington JT, Beyerlein B. Anaerobic bacteria in routine urine culture. J Clin Pathol 1966;19:573–6.

[8] Sutton R, Cheetham P, Bullock DW, Munson KW. Urinary tract infection with anaerobic bacteria following endoscopic urethral instrumentation. Br J Urol 1987;59:353–7.

[9] Aling B, Brandberg A, Seeberg S, Svanborg A. Aerobic and anaerobic microbial flora in the urinary tract of geriatric patients during long-term care. J Infect Dis 1973;127:34–9.

[10] Sapico FL, Wideman PA, Finegold SM. Aerobic and anaerobic flora in bladder urine of patients with indwelling urethral catheters. Urology 1976;7:382–4.

[11] Tally FP, Stewart PR, Sutter VL, Rosenblatt JE. Oxygen tolerance of fresh clinical anaerobic bacteria. J Clin Microbiol 1975;1:161–4.