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Case Report

An unusual urinary tract infection caused by *Vibrio fluvialis*

Jinan Usta[1], George Farah Araj[2], Rim Taleb[3]

[1] *Department of Family Medicine, American University of Beirut Medical Center, Beirut, Lebanon*
[2] *Department of Pathology and Laboratory Medicine, American University of Beirut Medical Center, Beirut, Lebanon*
[3] *Faculty of Medicine, Beirut Arab University, Beirut, Lebanon*

Abstract

We describe an unusual case of a urinary tract infection (UTI) in a 52-year-old woman caused by *Vibrio fluvialis*. To our knowledge, this is the first report of this organism causing such an infection. The source of the organism could be the highly contaminated water she is using at home.

Key words: *Vibrio fluvialis*; urinary tract infection; *Vibrio* species.

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Introduction

Vibrio fluvialis, which in Latin means "pertaining to a river", is an enteric human pathogen of escalating public health concern that was first identified in Bahrain in 1975 [1-3]. It is one of the foodborne bacteria, and the culprit of sporadic cases as well as outbreaks of diarrhea in different areas of the world, especially in areas with poor sanitary conditions [1,4]. There are several serotypes of *V. fluvialis* that have been isolated [1]. The light is currently shed on this organism because its clinical manifestations as gastroenteritis highly resemble those of *V. cholerae* [1,5]. In addition, *V. fluvialis* has been reported to cause infection in various body sites but not in urinary tract (UT) [2]. Thus, the recovery of *V. fluvialis* from urine warranted this present communication.

Case Presentation

The patient is a 52-year-old menopausal female who underwent total abdominal hysterectomy with bilateral oophorectomy around 2 years prior to presentation because of fibroid uterus and kept on estrogen replacement therapy since then. She presented in November 2016 with 2.5 months' history of foul smelling urine, urgency, dysuria, and frequency. Since 2009, she has been having recurrent urinary tract infections with 10 different urine specimens yielding bacterial species including *Escherichia coli* (once Extended Spectrum Beta Lactamase producer), *Klebsiella pneumoniae*, *Citrobacter freundii*, and mixed growth predominated by diphteroids. Evaluation for repeated urinary infections including ultrasound of kidneys and bladder was negative.

During the current presentation, her urine analysis showed positive leukocyte esterase, qualitative hemoglobin of 2+, numerous white blood cells, and 4-6 red blood cells per high power field. Her urine culture on cysteine lactose electrolyte deficient (CLED) medium (Figure 1), grew *V. fluvialis* 100,000 organisms/mL as identified by Matrix-Assisted Laser Desorption/Ionization Time of Flight (MALDI-TOF) system (Bruker Daltonik, GmbH, Bremen, Germany) with a score 2.22 (green flag), as well as by the Vitek 2 system (BioMérieux, Marcy L'Etoile, France), bionumber 5425611150541200 (99% probability).

Antimicrobial susceptibility testing indicated susceptibility to amikacin, aztreonam, cefixime, ceftazidime, imipenem, norfloxacin, trimethoprim/sulfamethoxazole, cefamandole, levofloxacin, tetracycline, amoxicillin-clavulanate, cefepime, cefuroxime, ciprofloxacin, gentamicin, nitrofurantoin, piperacillin/tazobactam, and resistance to ampicillin. The susceptibility testing of this pathogen was done based on CDC recommendation for *V. cholerae* [6], which included testing for the following antimicrobial agents: chloramphenicol, ampicillin, furazolidone, trimethoprim-sulfamethoxazole, tetracycline and nalidixic acid. What we tested and interpreted for the others was based on the Clinical and Laboratory Standards Institute (CLSI) disk diffusion

results for *Enterobacteriaceae*, just for the interest of finding how this *V. fluvialis* reveals its susceptibility profile. The susceptibility testing was controlled using the quality control *E. coli* strain, ATCC 25922.

Based on these results, the patient was given ciprofloxacin 250 mg orally twice daily for 5 days, and became symptom free since then. She denied preceding gastroenteritis, eating raw fish, swimming in river or sea water or having pets. She reported a history of travel to Iraq five months earlier. Her stool culture was negative for *V. fluvialis*. However, two cultures from her home tapwater coming from a well in a coastal area of Beirut revealed heavy growth (Most Probable Number > 240 organisms/mL), of mixed flora: *Escherichia coli, Serratia plymuthica, Enterococcus casseliflavus, and Chryseobacterium indologenes* (based on the standard multiple-tube fermentation test procedure).

Discussion

V. fluvialis is a motile, flagellated, gram negative bacterium having slightly curved rod cell morphology [1,2] (Figure 2). It is a halophilic organism that requires a salt-rich environment to grow and survive [1,2]. It lives in aquatic milieu, mostly in the seas and brackish water, and flourishes more in temperature higher than 18 °C [1,2,7].

It is usually identified by isolation on thiosulfate-citrate-bile salts-sucrose agar (TCBS) [2], followed by a mandatory series of biochemical tests that confirm the classification and avoid the false labeling of *V. fluvialis* as *V. cholerae* or *Aeromonas* species [2].

The virulence factors of *V. fluvialis* are not well understood [1]. Hemolysin is considered to be an important virulence factor contributing to bloody diarrhea and septicemia through tissue damage, increase in intestinal secretion, and destruction of red blood cells and some types of white blood cells [1,2,4].

In general, immunosuppressed people, especially those having chronic liver diseases, are more likely to have vibrio infections [7]. Target systems for *V. fluvialis* infection are usually gastrointestinal tract and wounds [8]. It is famous to cause gastroenteritis manifested by nausea, vomiting, abdominal cramps, hemorrhagic diarrhea, fever, and dehydration [1,2]. Outbreaks of food poisoning were reported to be caused by *V. fluvialis* alone or concomitantly with other *Vibrio* species [2]. A wide range of other infections were reported by this pathogen including wound infection by exposure of the patient to contaminated water [1], cellulitis [9], endophthalmitis [2], otitis [2], cerebritis [9], and abdominal infections such as cholangitis and peritonitis [2]. Until this report, *V. fluvialis* has not been reported to cause UTIs.

Factors involved in the spread of *V. fluvialis* infections include poor hygiene and inadequate sanitary conditions partly due to human activities resulting in water contamination [1]. Transmission of *V. fluvialis* to humans can be through ingestion of contaminated water or food, mainly raw sea food products [1,2,4] such as shellfish [1], mussels, oysters [2] and others, or through the exposure of skin lesions such as wounds or cuts to contaminated water or aquatic animals [8]. It can also be spread by person-to-person contact [1].

A possible hypothesis for the urine infection caused by *V. fluvialis* in this case report is the highly contaminated home water, as suggested by the multiple organisms cultured including *E. coli*. Indeed, there are several reports about wastewater contaminating the wells and underground water in Lebanon [10].

Figure 1. *V. fluvialis* colony appearance on cysteine lactose electrolyte deficient medium 48 hours.

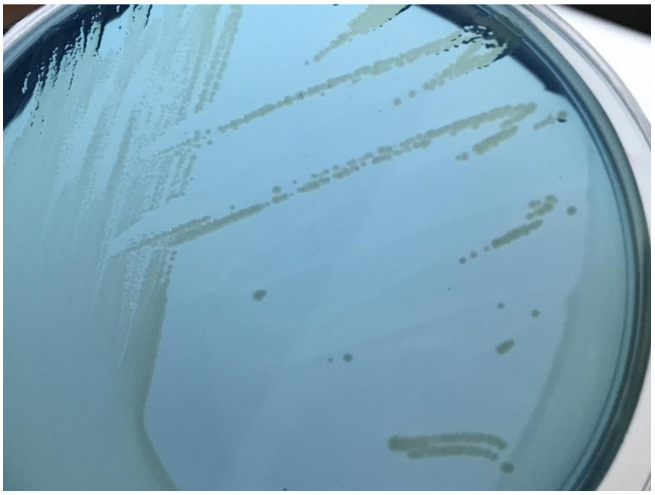
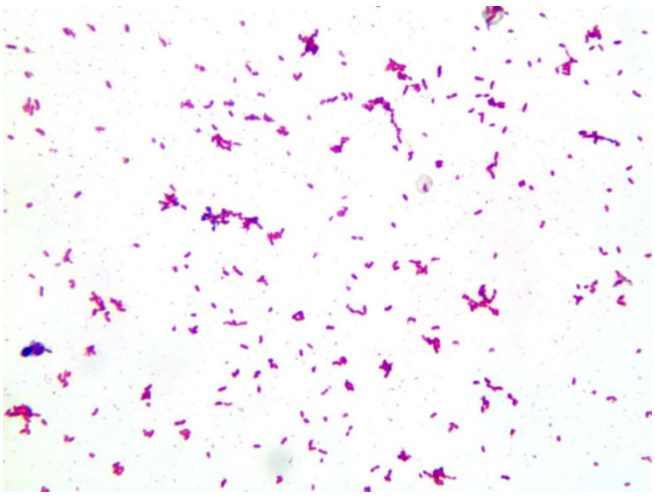


Figure 2. *V. fluvialis* microscopic appearance using Gram stain.



Additionally, a report published in 2014 indicated that groundwater is mixed with sea water in Lebanese coastal areas increasing its salt concentration [11]. The delayed rainy season in this year most likely contributed to the increased salinity and possibly to the concentration of pathogens in the contaminated wells and groundwater, thus, leading to a higher risk for human infection as the case in this report.

Conclusion

This case report adds urinary infection to the list of infections caused by *V. fluvialis*. It is to be considered as a causative agent for urine infection especially in repeated ones in areas of the world where groundwater can get contaminated by sewage or mixed with sea water.

Authors contribution

JU: Concept and design; Critical revision of the article; Final approval of the article; GFA: Recovery, identification and susceptibility testing of the pathogen; Critical revision of the article; Final approval of the article; RT: Data collection; Writing the article; Final approval of the article.

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Corresponding author

Rim Taleb, MD, MHPE
Senior Lecturer of Family Medicine
Faculty of Medicine, Beirut Arab University, Tarik El Jadida, P.O. Box 11 - 50 - 20 Riad El Solh 11072809, Beirut, Lebanon.
Phone: +9611300110 ext. 2613
Fax: +9611300110 ext. 2597
Email: r.taleb@bau.edu.lb

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