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### Authors

Karani, Rajiv  
Imani, Ghasem  
Tapiero, Shlomi  
[et al.](#)

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# Stone Culture Positive *Veillonella* in Analysis of Calcium-Based Stones: A Case Report

Rajiv Karani, BS, Ghasem Imani, MD, Shlomi Tapiero, MD, and Ralph V. Clayman, MD

## Abstract

**Background:** Calcium-based urinary stones rarely grow bacteria on stone culture. The presence of an anaerobic bacteria is even more uncommon. We present a case of *Veillonella* growth from a primarily calcium phosphate-based urinary stone culture.

**Case Presentation:** A 56-year-old Caucasian woman presented with urosepsis and bilateral nephrolithiasis. A nephrostomy tube was emergently placed in the left kidney. After resolution of her urosepsis, she underwent a left percutaneous nephrolithotomy. The stone culture grew *Veillonella*, a gram-negative anaerobe.

**Conclusion:** Growth of anaerobic bacteria, such as *Veillonella*, on stone culture of a calcium-based stone is a rare occurrence; the mechanism of this association remains unexplained.

**Keywords:** *Veillonella*, stone, culture

## Introduction

THE PRIMARY MECHANISM of calcium-based stone formation is supersaturation of the urine with calcium oxalate and calcium phosphate. However, correction of elevated supersaturation with dietary recommendations and medications at times fails to prevent stone recurrence, indicating that additional factors play a role in stone formation. Although urease-positive bacteria are known to lead to the formation of struvite stones, bacteria may also play a role in calcium-based stone formation. We present a case of percutaneous removal of a calcium phosphate (hydroxy- and carbonate-apatite) stone, the culture of which produced *Veillonella*, a gram-negative anaerobe.

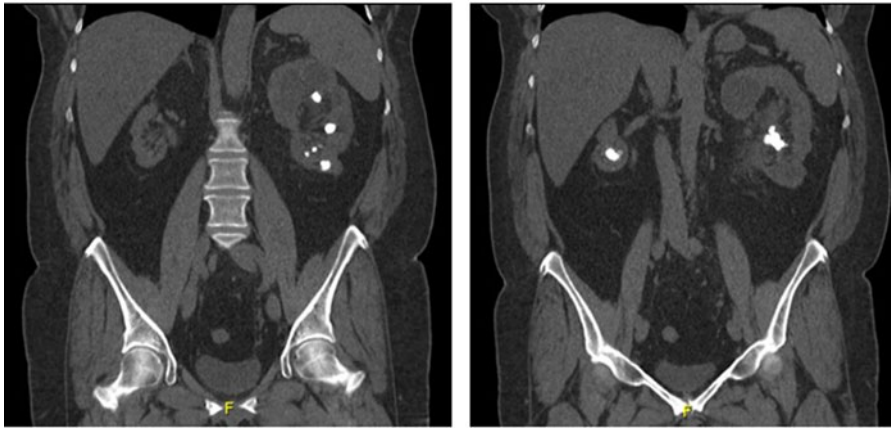
## Case Report

The patient is a 56-year-old woman with a prior history of bilateral nephrolithiasis requiring bilateral percutaneous nephrolithotomy (PCNL) and bilateral shockwave lithotripsy. In April 2020, she presented to the hospital with urosepsis and new onset atrial fibrillation. CT scan revealed a 22×16×19 mm right lower pole stone; the left kidney was markedly hydronephrotic and contained multiple stones (Fig. 1) along with an obstructed dilated upper pole calix containing small pockets of air consistent with emphysematous pyelitis (Fig. 2). She was started on intravenous antibiotics and underwent emergent left upper pole nephrostomy tube placement; her atrial fibrillation resolved spontaneously as soon as the col-

lection was drained. Urine collected from the left kidney grew *Veillonella* and *Escherichia coli*. After antibiotic therapy with ceftriaxone rendered her urine sterile, she underwent a left PCNL using the previous nephrostomy tract. A combined antegrade and retrograde approach was used for the PCNL, as is the routine procedure at our institution. This approach allows for controlled collecting system puncture and tract dilatation under direct observation. The stones were fragmented with the holmium laser (Cook Medical, Inc., Bloomington, IN) and extensively basketed both antegrade and retrograde. Stone analysis showed 30% calcium oxalate monohydrate, 10% calcium oxalate dihydrate, and 60% calcium phosphate (hydroxy- and carbonate-apatite). Urine culture from her kidney at the time of the procedure showed no growth; however, the stone culture grew both *E. coli* and *Veillonella*, an anaerobe. An uneventful second-look left ureteroscopy and a right PCNL, utilizing the same approach as the left, were performed two months later. The right stone culture grew *Enterococcus faecalis* and viridans streptococci but was unfortunately not sent for anaerobic culture.

## Discussion

*Veillonella* is an anaerobic gram-negative diplococci normally observed in oral, gastrointestinal, and genital flora.<sup>1</sup> Clinically, *Veillonella* spp. are commonly associated with bite wounds but are considered to be generally harmless. *Veillonella* is uncommonly cultured from the urine; indeed, to the best of



**FIG. 1.** CT scan images showing the stone burden.

our knowledge, only two reports exist in the literature that link *Veillonella* spp. to infections of the urinary tract.<sup>1,2</sup>

The majority of calcium stone cultures have no bacterial growth; however, *E. coli* is the most frequent bacteria associated with calcium-based urolithiasis. A study by Dornbier et al. analyzing the stone culture of 52 nonstruvite stones reported *Enterobacteriaceae*, *Pseudomonas*, *Streptococcus*, *Corynebacterium*, *Haemophilus*, *Lactobacillus*, *Bifidobacterium*, *Proteus*, and a solitary instance of *Veillonella* growth.<sup>3</sup>

Calcium-based stones have historically been considered noninfectious; however, recent evidence suggests that bacteria may play a role in their formation. Several mechanisms regarding stone formation with associated bacteriuria have been explored. Bacteria such as *Klebsiella* and *E. coli* have been observed to aggregate around calcium oxalate crystals.<sup>4</sup> Also, many bacteria, including *Klebsiella* and *E. coli*, produce citrate lyase and thereby may decrease urinary citrate, a known inhibitor of calcium stone formation. In addition, *E. coli* has been found to increase the expression of stone matrix proteins in the renal tubular epithelium. The ability of anaerobic bacteria in particular to facilitate stone formation has yet to be investigated.

*Veillonella* spp. are most notable for their lactate fermenting ability, forming propionate, acetic acid, and carbon dioxide and

hydrogen gas as a result. They do not metabolize citrate, which is counterintuitive to their potential ability to facilitate stone formation. In addition, *Veillonella* spp. are nonmotile, convert nitrates to nitrites, and produce indole. It is unknown how any of these characteristics might contribute to stone formation.

*Veillonella* is susceptible to a wide range of antibiotics, most commonly penicillins and cephalosporins. The two urinary tract infections linked with *Veillonella* reported in the literature were treated with ampicillin and ceftriaxone, respectively.<sup>1,2</sup> *Veillonella* has not been associated with emphysematous pyelitis, whereas *E. coli* is the most common causative pathogen. As such, in our case, *E. coli* was likely the cause of emphysematous pyelitis.

In general, anaerobic infections in the urinary tract are associated with abscesses rather than urinary tract infections or infection stones. Anaerobic organisms are rarely associated with stone formation, although commonly, stone cultures do not include a search for anaerobic bacteria. Our case indicates that anaerobic culture may warrant inclusion when performing a stone culture.

## Conclusion

The presence of the anaerobic bacterium *Veillonella* in a calcium-based stone appears to be a rare event. The mechanism of stone formation and the frequency of anaerobic bacteria in calcium stone formers has yet to be explored.

## Disclosure Statement

No competing financial interests exist.

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**FIG. 2.** CT scan showing left upper pole fluid collection and air.

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Address correspondence to:

*Rajiv Karani, BS*  
*Department of Urology*  
*University of California Irvine Medical Center*  
*101 The City Drive S*  
*Orange, CA 92868*  
*USA*

*E-mail: karanirb@mail.uc.edu*

**Abbreviations Used**

CT = computerized tomography  
PCNL = percutaneous nephrolithotomy

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