



## Inflammation and Infection

# *Aerococcus urinae*: An Emerging Cause of Urinary Tract Infection in Older Adults with Multimorbidity and Urologic Cancer

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## ARTICLE INFO

## Article history:

Received 27 January 2017

Received in revised form

9 March 2017

Accepted 16 March 2017

## Keywords:

Urinary tract infection

Bladder cancer

Geriatrics

Multimorbidity

## ABSTRACT

*Aerococcus urinae* is a rare organism isolated from urine cultures. We present a case of an 80 year-old male with bladder cancer and multimorbidity who developed *A. urinae* infection. *A. urinae* may cause simple and complicated UTIs, bacteremia, and endocarditis in older adults with multimorbidity, chronic urinary retention, or indwelling catheters. *A. urinae* treatment should employ penicillin, amoxicillin, and nitrofurantoin. Due to increasing antibiotic resistance, urine culture should include antibiotic susceptibility testing. Prompt and culture-specific treatment is critical to avoid clinical progression of the infection.

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## Introduction

*Aerococcus urinae* is a rare pathogen previously thought to be a urinary contaminant lacking clinical significance. First reported in 1967, the organisms belonged to a loosely associated bacterial group referred to as *Aerococcus*-like organisms (ALO). This group—previously found in breweries, meat-curing brines, lobsters, and horse urine—caused opportunistic endocarditis and urinary tract infections (UTI). RNA sequencing permitted identification of *A. urinae* from within ALO bacteria. Since discovery, several UTI studies estimate *A. urinae* incidence as 0.15–0.8%, though this is likely an underestimate due to misclassification of *A. urinae* for *Staphylococcus*, *Streptococcus*, or *Enterococcus*.<sup>1</sup> We describe a case of an elderly bladder cancer patient with multimorbidity who presented to clinic with variable symptoms and ultimately had *A. urinae* positive urine culture.

## Case presentation

An 80 year old male with high grade papillary urothelial carcinoma presented to clinic 8 days after intravesical Bacillus Calmette-Guerin (BCG) instillation with complaints of urinary

urgency, frequency, pain, and difficulty voiding. He has a past medical history of B cell lymphoma, type 2 diabetes mellitus, chronic obstructive pulmonary disease, chronic kidney disease (stage III), coronary artery disease, and chronic urinary retention. Urinary symptoms continued to worsen and he developed confusion and weakness, ultimately leading to a fall at home and subsequent hospital admission. Upon admission, initial dipstick urinalysis demonstrated large protein, large blood, negative nitrites, and large esterase. Urine culture grew *A. urinae* and he was started on a course of intravenous ampicillin for complicated UTI. Blood cultures were negative throughout his hospitalization. After 3 days of intravenous therapy, he was transitioned to oral amoxicillin at discharge for a total of 14 days of antibiotics. His chronic urinary retention worsened after discharge, requiring use of clean intermittent catheterization. The patient developed another UTI within 2 months of discharge; however, this culture grew *E. coli*.

## Discussion

This case adds to the growing literature focusing on *A. urinae* (Table 1). In our case, the patient was elderly, multimorbid, and being treated for bladder cancer. He had type 2 diabetes mellitus, coronary artery disease, chronic obstructive pulmonary disease, chronic kidney disease, and chronic urinary retention. His symptoms of dysuria, urgency, and difficulty voiding escalated into a complicated UTI with associated mental status changes. Urinalysis demonstrated protein, blood, and esterase but was negative for

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

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**Table 1**  
Clinical characteristics of patients with *A. urinae*.<sup>1–4</sup>

Author, year	Number of Cases	Comorbidities	Treatment/Susceptibilities
Zhang, 2000	2	Coronary artery disease, cerebrovascular accident, dementia, hypothyroidism	Ciprofloxacin, tetracycline
Sierra-Hoffman, 2005	32	Diabetes, renal disease, heart disease, institutionalization, urologic disease, urinary catheter	Ceftriaxone, levofloxacin, penicillin, tetracycline, ad vancomycin
Senneby, 2012	16	Cerebrovascular accident, chronic lymphocytic leukemia, chronic obstructive pulmonary disease, colon cancer, dementia, ischemic heart disease, myelodysplastic syndrome	Amoxicillin, cefadroxil, cefuroxime, cefotaxime, ciprofloxacin, clindamycin, erythromycin, gentamicin, imipenem, levofloxacin, meropenem, penicillin, piperacillin-tazobactam
Rasmussen, 2013	24	Alcoholism, aortic stenosis, atrial fibrillation, atrial septal defect, chronic obstructive pulmonary disease, colon cancer, congestive heart failure, dementia, diabetes mellitus, Down's syndrome, ischemic heart disease, mitral regurgitation	Amoxicillin, ceftriaxone, cefotaxime, clindamycin, fosfomycin, penicillin, piperacillin, vancomycin
Senneby, 2014	64	N/A – epidemiology study	Ampicillin, cefalotin, ciprofloxacin, mecillinam, nitrofurantoin
Yasukawa, 2014	44	Cerebrovascular accident, chronic renal disease, chronic urinary retention, diabetes mellitus, dementia, malignancy (bladder, colon, prostate, chronic lymphocytic leukemia)	Amoxicillin, cefazolin, clindamycin, penicillin, tetracycline, trimethoprim-sulfamethoxazole, vancomycin

nitrites. Culture grew an isolated strain *A. urinae*. Treatment was successfully completed with amoxicillin.

As illustrated by this case, *A. urinae* can have vastly different clinical manifestations. The typical patient is elderly—median age of 79 years, higher than the median age of UTIs associated with *E. coli* (69 years) or *Enterococcus* (66 years).<sup>2</sup> Both sexes are equally affected, and chronic diseases and indwelling catheters are risk factors.<sup>2</sup> Symptoms associated with the infection include dysuria, frequency, nocturia, hematuria, groin pain, fever, and altered mental status.<sup>3</sup> Typical urinalyses in isolated *A. urinae* UTI are negative for nitrites but may be positive for esterase and protein.<sup>4</sup>

Several case series have looked at comorbid conditions associated with *Aerococcus* UTI. A 2011 series of 45 *A. urinae* UTI patients showed that 16% had prostate disease (either benign prostatic hypertrophy or prostate cancer), 58% were institutionalized, and 16% were catheterized. Another series of sixteen patients by Senneby et al showed that 56% had urinary tract diseases (prostatic hyperplasia, or urologic cancer including prostate, bladder, kidney, or penis), 38% had long-term catheters, 38% had dementia or stroke, and 19% had ischemic heart disease. Similar to these studies, our series had multiple comorbid conditions such as bladder cancer, diabetes mellitus, heart disease, and chronic renal failure.

Distinguishing *A. urinae* from *Staphylococcus*, *Streptococcus*, and *Enterococcus* is particularly important for appropriate antibiotic treatment. *A. urinae* is Gram positive, alpha-hemolytic, catalase negative cocci unable to reduce nitrate that grows in clusters of pairs or tetrads. Biochemically, it is pyroglutamic acid arylamidase negative, arginine dihydrolase negative, and  $\beta$ -glucuronidase positive. This biochemical profile differentiates *A. urinae* from *Aerococcus viridans*.<sup>1</sup>

In addition to the aforementioned physiologic and biochemical characteristics, the antibiotic sensitivities of *A. urinae* can aid identification. *In vitro*, *A. urinae* is susceptible to amoxicillin, cefotaxime, ceftriaxone, doxycycline, linezolid, meropenem, penicillin, rifampin, trimethoprim-sulfamethoxazole, and vancomycin. It had variable resistance to clindamycin, erythromycin, and levofloxacin.<sup>5</sup> Several other studies have indicated that it is also resistant to

sulfonamides and it may have variable resistance to vancomycin and trimethoprim-sulfamethoxazole.<sup>1</sup> The susceptibility of other bacteria identified from urine cultures should be incorporated into antibiotic choice.

## Conclusion

We describe a case of *A. urinae* UTI in elderly, multimorbid bladder cancer patient. Previously, *A. urinae* was frequently mistaken for other types of bacteria; however there is increasing recognition of the importance of this organism as a cause of UTI in older adults with multimorbidity. Should *A. urinae* be suspected or proven to be the cause of the UTI, we recommend treatment with beta-lactam antibiotics as the organism is often resistant to sulfonamides and fluoroquinolones.

## Patient consent

The patient gave his permission to have his cases presented and documented.

## Conflict of interest statement

None.

## References

- Rasmussen M. Aerococci and aerococcal infections. *J Infect*. 2013;66(6):467–474. <http://dx.doi.org/10.1016/j.jinf.2012.12.006>.
- Senneby E, Petersson AC, Rasmussen M. Epidemiology and antibiotic susceptibility of aerococci in urinary cultures. *Diagn Microbiol Infect Dis*. 2015;81(2):149–151. <http://dx.doi.org/10.1016/j.diagmicrobio.2014.11.009>.
- Senneby E, Petersson AC, Rasmussen M. Clinical and microbiological features of bacteraemia with *Aerococcus urinae*. *Clin Microbiol Infect*. 2012;18(6):546–550. <http://dx.doi.org/10.1111/j.1469-0691.2011.03609.x>.
- Zhang Q, Kwok C, Attorri S, Clarridge JE. *Aerococcus urinae* in urinary tract infections. *J Clin Microbiol*. 2000;38(4):1703–1705.
- Humphries RM, Hindler JA. In vitro antimicrobial susceptibility of *Aerococcus urinae*. *J Clin Microbiol*. 2014;52(6):2177–2180. <http://dx.doi.org/10.1128/JCM.00418-14>.