A Case of Urinary Tract Infection Caused by *Aerococcus urinae*

**Abstract**

*Aerococcus urinae* is often misclassified in routine diagnostic laboratories. *A. urinae* shares features with *staphylococci*, *streptococci* and *enterococci* as the bacterium grows in clusters, displays a-haemolysis when grown on blood agar, and is resistant to sulphonamide. We report here, a case study of *A. urinae*, which initially was misdiagnosed. Identification and susceptibility testing were performed with automatic Vitek 2 system (bioMérieux). *A. urinae* was identified, with susceptibility to Penicillin G, Levofloxacin, Tetracycline and Vancomycin and resistance only to Gentamycin and Trimethoprim-Sulfamthoxazole (SXT).

**Keywords:** *Aerococcus urinae*; UTI; Diagnosis; Antibiotic resistance

**Introduction**

*Aerococcus urinae* (*A.urinae*) is a newcomer to clinical and microbiological practice. This bacterium is mainly associated with urinary tract infections (UTI) especially in elderly patients with predisposing conditions. *A. urinae* naturally is isolated from dust, air, vegetation, and hospital environments. According to a new study, the incidence was demonstrated to be 33 cases of aerococcal bacteriuria per 100,000 inhabitants per year [1]. Presumably, the diagnosis of infections caused by *A. urinae* is still misdiagnosed in many laboratories around the world mainly because its resemblance to *streptococcus viridans* [2].

**Case Presentation**

A man of Greek origin, 85 years old, came in for outpatient urine culture due to lower urinary tract symptoms, mainly dysuria. The patient was submitted to surgery for prostatectomy five years ago. The patient is suffering also from diabetes type 1. Urinalysis showed white blood cells-leukocytes (WBC) too numerous to count, a few red blood cells/high power field (HPF) and few bacteria. The urine culture was inoculated onto Mc No 2 and Blood agar (BioMérieux) and the plates were incubated at 37˚C under aerobic conditions for 24h. Despite the large amount of leukocytes the urine culture was negative. A few days later the patient came back for a second urine analysis, since the symptoms insisted. This time the culture was incubated for 48h. After this incubation period, small, gray, alpha-hemolytic colonies with concentration > 10^5 cfu/ml were observed on blood agar, whereas no growth was observed on Mc 2 (Figure 1). Gram staining revealed the presence of gram (+), catalase (-) coccoids arranged in pairs or clusters (Figure 2). Identification and susceptibility testing were performed with automatic Vittek 2 system (BioMérieux). *A. urinae* was identified, with susceptibility to Penicillin G, Levofloxacin, Tetracycline and Vancomycin and resistance only to Gentamycin and Trimethoprim-Sulfamthoxazole (SXT).

**Discussion**

The *Aerococcus* genus now includes eight species of which *A. viridans* (1953) was the one originally described. In the last two decades additionally six species have been included in the genus: *A. urinae* (1992), *A. christensenii* (1999), *A. urinae hominis* (2001), *A. sanguinicola* (2001), *A. urinae equi* (reclassification of *Pediococcus urinae equi*, 2005), *A. suis* (2007), and *A. vaginalis* (2014) [3]. All species, except *A. suis* (from pigs), *A. urinae equi* (from horses) and *A. vaginalis* (from beef cow), have been found as pathogens in human clinical situations such as urogenital infections [4], bacteraemia/septicaemia and infective endocarditis [5]. In addition single cases of soft tissue infections (phlegmon and balanitis), spondylodiscitis, hip abscess, lymphadenitis, acute pyelonephritis and peritonitis have been reported [6]. *A. urinae* may be a possible reason for malodorous urine [7]. They may also appear as contaminants in clinical cultures. Studies from Europe have found a prevalence of *A. urinae* strains of 0.3-0.8% [1] of urine specimens examined and most recently Guilarte et al. [8] observed a prevalence of 4% [8].
Our patient had predisposing conditions, namely advanced age and the history of prostatectomy. A retrospective review by Kelsey Shelton-Dodge et al. [9] on 92 patients showed that 66 isolates of A. urinae were obtained from urine cultures whereas the majority of male patients had underlying prostatic disease (63%) [9].

The first report on A. urinae was published in 1989 and the name designated in 1992 [6]. Isolates of A. urinae may easily be mistaken for staphylococci in gram stain, because they appear as gram-positive cocci that are arranged in tetrads or clusters. Colonies on blood agar on the other hand, may be mistaken for Streptococcus viridans, because of the alpha-hemolysis and the catalase negative reaction. Primary identification is based upon gram stain of alpha-hemolytic colonies which are catalase negative. Aerococcus species will appear as gram-positive cocci in clusters, which differentiates these species from streptococci and enterococci. The final identification is performed using the Vitek system [10]. Using the Vitek 2 system, A. urinae can be misidentified as a Granulicatella [11]. So, the gold standard for species determination of Aerococcus relies on sequencing of the gene encoding 16S rRNA. These sequences safely identify species and separate them from other genus and from each other [12].

Data on in vitro susceptibility of A. urinae shows that A. urinae isolates exhibit an antimicrobial susceptibility pattern similar to that of β-haemolytic streptococci with susceptibility to β-lactames and vancomycin and low level resistance towards aminoglycosides. A. urinae is further susceptible to clindamycin, teicoplanin, chloramphenicol, nitrofurantoin, and mupirocin and resistant to sulfonamides, colistin, mecillinam, and fosfomycin [13]. In our case the isolate was sensitive to benzylpenicillin (MIC ≤ 0.06), levofloxacin (MIC=0.5), vancomycin (MIC=0.5), tetracycline (MICs 0.25) and resistant to gentamycin 120 μg/disc antibiotic and sulfamethoxazole/trimethoprim. These findings correlate with the results of the research of Cattoir et al. [13], where among 350 non-entercoccal Streptococcaceae species isolated from urinary specimens, 30 (8.6%) Aerococcus spp. strains were recovered and tested for susceptibility using Vitek 2 system. All aerococcal isolates were susceptible to amoxicillin, vancomycin, and teicoplanin and showed a low-level resistance to gentamicin. Most A. urinae isolates were resistant to co-trimoxazole [13]. In another study that was conducted in southern Sweden, concerning isolates of Aerococcus urinae species, low MIC values were recorded for penicillin and vancomycin, whereas MICs for gentamycin ranged between 0.5 and 32 mg/L [11].

**Conclusion**

Aerococcus urinae is an uncommon urinary tract pathogen that causes infections predominately in elderly people with local or general predisposing conditions, such as malignancy, prostatic diseases, diabetes mellitus, dementia.

Aerococcus urinae is a slow-growing bacteria, so it is very important to extend the incubation period of urine cultures, especially when urinalysis has shown pyuria, before we proceed to differential diagnosis of aseptic pyuria.

The final identification of Aerococcus urinae is performed using the Vitek system and though correct identification is possible, sequencing of the 16S rRNA gene remains the confirmatory test for identification. Nowadays the increased awareness of aerococcal infections, combined with improved tools to identify aerococci, will lead to a more correct appreciation of them as human pathogens.

**References**

1. Senneby E, Peterson AC, Rasmussen M (2015) Epidemiology and antibiotic susceptibility of aerococci in urinary cultures. Diagn Microbiol Infect Dis 81(2): 149-151.

2. Zhang Q, Kwoh C, Attorri S, Clarridge JE (2000) Aerococcus urinae in Urinary Tract Infections. JCM 38(4): 1703-1705.

3. http://www.bacterio.cict.fr/indexhtml.

4. Christensen JJ, Korner B (1996) Aerococcus urinae: A newcomer in clinical and microbiological practice. Antimicrobics and Infectious Diseases Newsletter 15: 78-80.

5. Christensen JJ, Jensen IP, Faerø J, Kristensen B, Skov R, et al. (1995) Bacteremia/septicaemia due to Aerococcus-like organisms: report of seventeen cases. Danish ALO Study Group. Clin Infect Dis 21(4): 943-947.

6. http://www.antimicrobe.org/

7. Lehner N, Berndt A, Ritz N, Rudin C (2014) Aerococcus urinae: a possible reason for malodorous urine in otherwise healthy children. Eur J Pediatr 173(8): 1115-1117.

8. Guillart E, Tanguay R, Lupo A, Endimiani A (2014) Prevalence and characteristics of fluoroquinolone-resistant Aerococcus urinae isolates detected in Switzerland. Int J Antimicrob Agents 43(5): 474-475.

9. Shelton Dodge K, Vetter EA, Kohnner PC, Nyre LM, Patel R (2011) Clinical significance and antimicrobial susceptibilities of Aerococcus sanguinicola and Aerococcus urinae. Diagn Microbiol Infect Dis 70(4): 448-451.

10. De Jong MF, Soetelrouw R, Ten Kate RW, Veenendaal D (2010) Aerococcus urinae: Severe and Fatal Bloodstream Infections and Endocarditis. J Clin Microbiol 48(9): 3445-3447.

**Figure 2:** Culture of *Aerococcus urinae* on Blood agar showing alpha-haemolysis.
11. Senneby E, Petersson AC, Rasmussen M (2012) Clinical and microbiological features of bacteraemia with *Aerococcus urinae*. Clin Microbiol Infect 18(6):546-550.

12. Rasmussen M (2013) *Aerococci* and aerococcal infection. J Infect 66(6):467-474.

13. Cattoir V, Kobal A, Legrand P (2010) *Aerococcus urinae* and *Aerococcus sanguinicola*, two frequently misidentified uropathogens. Scand J Infect Dis 42(10):775-780.