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Case Report

A case of *Raoultella ornithinolytica* urinary tract infection in a pediatric patient☆

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ABSTRACT

Raoultella ornithinolytica is a Gram-negative, non-motile, encapsulated, biofilm producing, facultative aerobic bacillus and is found in natural environment. Human infections with *R.ornithinolytica* is rare in children with only five cases having been reported previously. The present case report describes an urinary tract infection caused by *R. ornithinolytica* that was identified by MALDI-TOF MS and successfully treated with antibiotic therapy in a 6.5-year-old female child.

1. Introduction

Raoultella ornithinolytica is a Gram-negative, non-motile, encapsulated, biofilm producing, aerobic bacillus belonging to the *Enterobacteriaceae* family. It is formerly known as *Klebsiella ornithinolytica* [1,2] and it is reclassified according to the phylogenetic analyses on 16S rDNA and *rpoB* in 2001 [1]. *R. ornithinolytica* and *R. planticola* are the main pathogens that are responsible for human infections [3]. *R. ornithinolytica* is found in aquatic environments and can be isolated from hospital environments [4]. Despite human infections being uncommon, *R. ornithinolytica* may be associated with biliary tract infection, pancreatitis, peritonitis, urinary tract infections (UTIs), wound and skin infections, prosthetic joint infections, pneumonia and bacteremia especially in adults [3–5]. Furthermore a local or systemic infection caused by *R.ornithinolytica* is extremely rare in children. There have been only a few clinical reports on *Raoultella* spp. UTI in childhood and clinical characteristics of pediatric patients have not been determined [3,5].

We herein describe a very uncommon case of acute UTI caused by *R. ornithinolytica* infection in a 6.5-year-old girl with recurrent UTI and hydronephrosis.

2. Case report

A 6.5-year-old female child was brought to the emergency department because of fever reaching a maximum of 38.5 °C and abdominal pain. She had a medical history of hydronephrosis and recurrent UTI. Minimal abdominal tenderness and pain were noted on physical examination. No costovertebral angle tenderness was detected and the other physical findings were unremarkable. The laboratory investigations revealed a hemoglobin of 9.4 g/dL, platelet count of 333,000/μL and a white blood cell count of 6000/μL with normal liver enzymes and kidney function tests. Her erythrocyte sedimentation rate was 100 mm/h (normal: 0–20 mm/h) and C-reactive protein was 16.6 mg/dL (normal:0–0.8 mg/dL). Urinalysis revealed positive nitrites (normal: negative), positive leukocyte (normal: negative), positive blood (normal: negative), and 86 white blood cells/hpf (normal range: 0–5), 4 RBC/hpf (normal range: 0–3), a large number of bacteria and with the remaining parameters within normal limits. Renal ultrasound showed no radiologic finding concerning acute pyelonephritis and any acute pathology. Her urine was sent for culture and sensitivity and oral empiric treatment with cefixime (8 mg/kg/day) was initiated. The urine culture isolate was identified as *Raoultella ornithinolytica* by MALDI-TOF MS (Matrix-Assisted Laser

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Desorption/Ionization time of flight, Mass Spectrometry, Biomerieux, France). Gram-negative and aerobic bacillus was detected in the Gram-strain of the urine. The colony number was 100,000 cfu/mL on the % 5 sheep blood agar. Antimicrobial susceptibilities were tested on VITEK 2 (Biomerieux, France) with VITEK 2 GN ID card. The *R. ornithinolytica* demonstrated resistant to ampicillin and susceptibility to all other tested antibiotics including cefixime (Table 1). The patient was treated with a 14-day course of oral cefixime. The normal urinalysis and negative control urine culture was detected by the 18th day. At the 30th day, static renal scintigraphy was performed due the history of UTI. Left kidney with cortical irregularity compatible with parakim damage in upper pole and lateral upper part was shown.

3. Discussion

R. ornithinolytica is most frequently isolated from fish, ticks, termites and water and also rarely in human sputum [3]. Human infections related to *R. ornithinolytica* are exceedingly rare and the first human infection caused by *R. ornithinolytica* was reported in 2009 [6]. *R. ornithinolytica* is closely related to *Klebsiella oxytoca* and *R. ornithinolytica* rarity may be associated with underestimating due to difficulty to identify using traditional phenotypic methods in laboratories [2,4].

The most common reported *R. ornithinolytica* infections occurred in older age with an underlying comorbidity like immunosuppressive condition or who had invasive procedures done or had indwelling catheters [2,7]. The well-known virulans factors of *R. ornithinolytica* involves adhering to human tissues, producing histamine that can cause histamine poisoning after consumption and forming biofilms in urinary catheters [3,4].

Pediatric UTI is a common cause of presentation to clinicians. The incidence of pediatric UTI is at least 2% in boys and 7% in girls, in the first 6 years of life. *Escherichia coli* is the most common pathogen, in pediatric UTI [8] as well as *R. ornithinolytica* is an unusual pathogen [5]. In English literature, only five cases of *R. ornithinolytica* infections are reported in childhood up to now. These includes bacteremia, catheter-related blood stream infection, and UTI [5]. In these cases, only one case was reported for an UTI. This case includes an 8-month-old female infant who presented with a febril UTI proven to be caused by *R. ornithinolytica*, treated by cefpodoxime proxetil and detected vesicoureteral reflux after treatment [5]. As a result, clinical features, antimicrobial susceptibility, and prognosis of *R. ornithinolytica* infection have not yet been well described. Therefore, our case report is important to make a significant contribution to the literature [5].

Table 1
Antimicrobial susceptibility of *Raoultella ornithinolytica*.

Antimicrobial	MIC (μg/mL)	Susceptibility interpretation
Ampicillin	16	R
Gentamicin	< = 1.0	S
Amoxicillin clavulanate	< = 2.0	S
Piperacillin tazobactam	< = 4.0	S
Cefuroxime	< = 1.0	S
Amikacin	< = 2.0	S
Ciprofloxacin	< = 0.25	S
Ertapenem	< = 0.12	S
Imipenem	< = 0.25	S
Meropenem	< = 0.25	S
Trimethoprim Sulfametoxazol	< = 20.0	S
Ceftazidime	< = 0.12	S
Cefixime	< = 0.25	S
Cefuroxime axetil	< = 1.0	S
Phosphomycin	32	S
Nitrofurantoin	< = 16.0	S
Cefoxitin	< = 4.0	S
Ceftriaxone	< = 25.0	S

Abbreviations: MIC, minimum inhibitory concentration. *BioMerieux France.

The identification method of *R. ornithinolytica* is important. With the implementation of MALDI-TOF MS for routine bacterial identification, MALDI-TOF MS has been used to correctly identify *R. ornithinolytica* isolates compared to 16S, rpoB gene sequencing [4]. MALDI-TOF MS is a reliable method for the identification of *R.ornithinolytica*. The differentiation between *K. oxytoca* and *R. ornithinolytica* is difficult with biochemical methods but the Vitek 2 GN card (bioMerieux, Marcy-l'Etoile, France) was reported to provide acceptable identification of *R. ornithinolytica* [9]

The pathogenicity risk of *R. ornithinolytica* isolates in human disease has become increasingly important [4]. Raoultella are naturally resistant to aminopenicillins, which are connected with the production of chromosomally coded beta lactamases (class A) so it expresses β-lactamase, which provides resistance to commonly used antibiotics [3,10]. Our strain was susceptible to beta-lactams (except ampicillin). *R. ornithinolytica* is usually antibiotic sensitive including third generation cephalosporins, carbapenems, fluoroquinolones, amoxicillin with clavulanic acid, trimethoprim/sulfamethoxazole and tigecycline, but it can rapidly acquire resistance [2,3]. In the literature, multi-drug-resistant *R. ornithinolytica* was isolated both from natural environments and clinical material and mortality due to *R. ornithinolytica* infections has been described [2,4]. Seng et al. have shown that the proportion of *R. ornithinolytica* isolates resistant to antibiotics was relatively high: 4% of isolates were resistant to ceftriaxone, 6% to quinolones, and 13% to co-trimoxazole. Furthermore, *R. ornithinolytica* is an emerging hospital-acquired infection in recent years.

In conclusion, this case of *R. ornithinolytica* UTI in a child is reported to raise awareness of *R. ornithinolytica* as a potential cause of UTI in children and be careful for different antibiotic resistance patterns. Further larger studies should be needed to understand the features of *R. ornithinolytica* in childhood.

Conflicts of interest

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References

[1] Drancourt M, Bollet C, Carta A, Rousselier P. Phylogenetic analyses of Klebsiella species delineate Klebsiella and Raoultella gen. nov., with description of Raoultella ornithinolytica comb. nov., Raoultella terrigena comb. nov. and Raoultella planticola comb. nov. Int J Syst Evol Microbiol 2001;51(Pt 3):925–32. https://doi.org/10.1099/00207713-51-3-925.

[2] Abbas A, Ahmad I. First report of neonatal early-onset sepsis caused by multi-drug-resistant Raoultella ornithinolytica. Infection 2018;46(2):275–7. https://doi.org/10.1007/s15010-017-1098-9.

[3] Sekowska A. Raoultella spp.-clinical significance, infections and susceptibility to antibiotics. Folia Microbiol 2017;62(3):221–7. https://doi.org/10.1007/s12223-016-0490-7.

[4] Seng P, Boushab BM, Romain F, Gouriet F, Bruder N, Martin C, et al. Emerging role of Raoultella ornithinolytica in human infections: a series of cases and review of the literature. Int J Infect Dis 2016;45:65–71. https://doi.org/10.1016/j.ijid.2016.02.014.

[5] De Petris L, Ruffini E. Roultella ornithinolytica infection in infancy: a case of febrile urinary tract infection. CEN case rep 2018. https://doi.org/10.1007/s13730-018-0333-2.
[6] Morais VP, Daporta MT, Bao AF, Campello MG, Andres GQ. Enteric fever-like syndrome caused by Raoultella ornithinolytica (Klebsiella ornithinolytica). J Clin Microbiol 2009;47(3):868–9. https://doi.org/10.1128/JCM.01709-08.
[7] Chun S, Yun JW, Huh HJ, Lee NY. Clinical characteristics of Raoultella ornithinolytica bacteremia. Infection 2015;43(1):59–64. https://doi.org/10.1007/s15010-014-0696-z.
[8] Schmidt B, Copp HL. Work-up of pediatric urinary tract infection. Urol Clin 2015;42(4):519–26. https://doi.org/10.1016/j.ucl.2015.05.011.
[9] Haruki Y, Hagiya H, Sakuma A, Murase T, Sugiyama T, Kondo S. Clinical characteristics of Raoultella ornithinolytica bacteremia: a case series and literature review. J Infect Chemother 2014;20:589–91. https://doi.org/10.1016/j.jiac.2014.05.005.
[10] Nakasone ES, Kaneshiro R, Min K, Tokeshi J. Emergence of Raoultella ornithinolytica on O'ahu: a case of community-acquired R. ornithinolytica urinary tract infection. Hawai'i J Med Public Health 2015;74(5):174–5.