



Functional medicine

Urinary tract infection with rare pathogen *Raoultella Planticola*: A post-operative case and review

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Introduction

Raoultella Planticola is a gram-negative, non-motile, anaerobic bacterium of the Genus *Raoultella* most commonly found in water, soil, and aquatic environments¹ Originally classified as a member of the genus *Klebsiella*, it was reclassified as *Raoultella* spp. in 2001 based on 16S rRNA and *rpoB* gene sequencing.¹ This bacterium is a rare source of infection in humans; current literature provides few serious cases. The first *Raoultella* invasive human infection was found in 1984 in a patient with sepsis.² Most reported cases since then have been associated with bacteremia.

We present a case of *R. Planticola* in a patient with UTI, as well as a review of prior reported cases of *R. Planticola* associated with cystitis. There is weak evidence for susceptibility to *R. Planticola* cystitis; risk factors include immunosuppression, invasive procedures, and contaminated equipment^{3–5}, Table 2.

Case report

A 50-year old woman with lupus and a medical history of dysphagia, degenerative disc disease with lumbar-sacral spinal stenosis, and peripheral neuropathy underwent a total vaginal hysterectomy with bilateral salpingectomy, uterosacral ligament suspension, anterior and posterior repair, and cystoscopy for stage 4 utero-vaginal prolapses. Preoperatively she was on methotrexate. Her postoperative course was notable for failing her post-operative day one void trial and being discharged home with a foley catheter. She re-presented to our outpatient office on postoperative day 5 and subsequently passed the void trial. Two weeks later she presented with intermittent dull pain in her right lower quadrant, which had persisted for five days. The patient had also noticed small amounts of brown discharge. Her macroscopic urinalysis revealed she was positive for blood, nitrites, and +3 leukocyte esterase. Urine culture was positive for *Raoultella Planticola*, sensitive to most antibiotics but resistant to Tetracycline. She was treated with Nitrofurantoin.

The patient returned for her routine post-operative appointment one month following surgery, shortly after being treated for UTI. She had completed the macrobid and her UTI symptoms had resolved. Her

repeat culture showed no growth, confirming clearance of the bacteria.

Discussion

In recent years *Raoultella* spp. strains have been recognized as important emerging pathogens and should be seriously considered in cases of infection. Most recently, *R. Planticola* was discovered in a case of bacteremia-induced fatal septic shock following a burn injury. Cystitis is the most common type of infection associated with *R. Planticola*. According to a 2015 retrospective review over a five-year period, 50% of *R. Planticola* infections were UTIs (Table 2). We identified 32 serious cases of human infection associated with *Raoultella* spp. reported between 1984 and 2018, of which 6 were associated with UTI (Table 1). Other clinical infections resulting from *R. Planticola* growth have included septicemia, pancreatitis and retroperitoneal abscess, pneumonia, cellulitis, cholangitis, necrotizing fasciitis, gastroenterocolitis, peritonitis, conjunctivitis, prostatic, appendicitis, surgical site infection, and catheter-related bacteremia (Table 2).

The cause of *R. Planticola* infection cystitis is not well understood. According to a review of the literature, 4 out of 6 cases (Table 1) were attributed to immunosuppression. Immuno-compromised infection occurs when systemic impairment of the host immune system enables dormant colonizers to become invasive (Table 2). The fifth case was reported in 2016 when a 57-year old man with end-stage renal disease and diabetes mellitus presented with dysuria, fever, chills, and suprapubic tenderness following urodynamic testing. The patient was diagnosed with cystitis by *R. Planticola*, and the infection was attributed to contaminated urodynamic testing equipment, in addition to immunosuppression.⁴ The sixth case occurred in 2017 when a 56-year-old woman presented with recurrent urinary tract infections over a span of 4 months. Though the cause was unknown, it was hypothesized that seafood consumption and a history of urinary stress incontinence may have caused the infection (Table 2).

In our case, similar to other case reports, the patient developed an infection with *R. Planticola* due to immunosuppression from her lupus in the post-operative setting one week after catheter use. It is well documented that people with urinary catheters are at higher risk of developing a urinary tract infection. Catheter-related bacteremia results

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<https://doi.org/10.1016/j.eucr.2018.11.004>

Received 8 October 2018; Received in revised form 5 November 2018; Accepted 7 November 2018

Available online 08 November 2018

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Table 1
Previous case reports of Raoultella Planticola UTI.

Author	Patient (age/gender)	PMH	Relevant Symptoms	(Hypothesized) Source of Infection	Treatment	Recovery
Olson Jr. et al., 2012	89/male	Biventricular heart failure, chronic kidney disease, coronary artery disease, obesity, hypertension, anemia, atrial fibrillation, penicillin allergy	Fever, hypotension, tachypnea, tachycardia, somnolence, leukocytosis	Immunosuppression	Ciprofloxacin x 14 days	Full recovery
Yoon et. Al. 2014.	16 months/male	Embryonal rhabdomyosarcoma in the bladder neck unresolved with two courses of chemotherapy.	Voiding difficulty	Immunosuppression	Cefotaxime, Ampicillin/ Subactam, Cefpodoxime x 10 days	Full recovery from R. P., subsequent UTI developed 6 weeks later due to E. Coli.
Tugcu et al., 2016	57/male	End-stage renal disease, diabetes mellitus	Dysuria, fever, chills, supra-pubic tenderness	Contaminated urodynamic testing equipment, immunosuppression	Ceftriaxone 1gq12h x 7 days	Full recovery, live kidney transfer recipient 1 month later.
Skelton IV et al., 2016.	73/female	Stata IIIA IgA kappa multiple myeloma, two autologous stem cell transplant treatments following melphalan conditioning, hypertension, atrial fibrillation, clostridium difficile diarrhea	Fever, loose stools, dysuria	Immunosuppression, autologous peripheral stem cell transplant, hospital contamination.	Nitrofurantoin 100mg x 7 days	Full recovery
Brito, J. et. Al. 2016	56/female	Urinary stress incontinence, foodborne illness, recurrent UTI	Recurrent UTI, hematuria	Seafood consumption, Urinary stress incontinence	Ceftriaxone IV 2g x 4 weeks	After four weeks overall improvement, confirmed test of cure with negative urinary culture
Howell, Fakhoury 2017	2 months/female	Resolved hyperbilirubinemia, Hematochezia	Hematochezia, loose stools, fever, diminished appetite, oliguria, intermittent cough, rhinorrhea, and dehydration.	Unknown, no significant concurrent medical history.	Ceftriaxone, Cefalexin x 10 days	Symptoms resolved, anticipated full recovery

Table 2
References.

Author (s)	Title	Journal	Year of publication	Volume (issue)	Page number
Adidoh, C., D'Ivernois, C., Leysene, D., Berneau, J., Hemery, Y.	A Cardiac implantable device infection with <i>Raoultella planticola</i> in an immunocompromised patient	JMM Case Reports	2017	4	
Allon, M.	Dialysis catheter-related bacteremia: Treatment and prophylaxis	American Journal of Kidney Diseases	2004	44 (5)	779–791
Alves, MS, Riley, LW, Moreira, BM.	A case of severe pancreatitis complicated by <i>Raoultella planticola</i> infection	Journal of Medical Microbiology	2007	56 (5)	696–698
Boattini, M., Almeida, A., Cardoso, C., Cruz, CS, Machado, C., Vesza Z., Tosatto, V., Maia, D., Cardoso, S., Pinto, M., Moura, RB, Garcia, T., Guerreiro, A. S.	Infections on the rise: <i>Raoultella</i> spp. Clinical and microbiological findings from a retrospective study, 2010–2014	Infectious Diseases	2015	48 (1)	87–91
Brilo, J., Bhayani, N., Nikhil, K, Scriven, R.	Recurrent cystitis due to <i>Raoultella planticola</i> infection	Infectious Diseases in Clinical Practice	2016	24 (6)	e93–e94
Castanhiera, M., Deshpande L.M., Dipersio Jr., Kang, J., Weinstein, MP., Jones, RN.	First descriptions of blaKPC in <i>Raoultella</i> spp. (R. <i>Planticola</i> and R. ornithinolytica): Report from the SENTRY antimicrobial surveillance program	Journal of Clinical Microbiology	2009	47 (12)	4129–4130
Drancourt, M., Bollet, C., Carta, A., Rousselet, P.	Phylogenetic analyses of <i>Klebsiella</i> species delineate <i>Klebsiella</i> and <i>Raoultella</i> gen. nov, with description of <i>Raoultella ornithinolytica</i> comb. nov, <i>Raoultella terrigena</i> comb. nov. and <i>Raoultella planticola</i> comb. nov.	International Journal of Systematic and Evolutionary Microbiology	2001	51 (3)	925–932
Eshsadi, A., Weiss E., Verduzco, E., Chia, D, Sadigh, M.	Emerging pathogen: a case and review of <i>Raoultella planticola</i>	Infection	2014	42 (6)	1043–1046
Kim, SH., Roh KH, Yoon, YK, Kang, DO., Lee DW., Kim, MJ., Sohn, JW.	Necrotizing fasciitis involving the chest and abdominal wall caused by <i>Raoultella planticola</i>	BMC Infectious Diseases	2012	12 (59)	
McKinnell, J., Stollenwerk, N., Jung, C., Miller, L.	Nitrofurantoin compares favorably to recommended agents as empirical treatment of uncomplicated urinary tract infections in a decision and cost analysis	Mayo Clinical Proceedings	2011	86 (6)	480–488
Naganathan, G., Amin, NK.	<i>Raoultella planticola</i> associated necrotizing appendicitis: a novel case report	International Journal of Surgery	2018	44	38–41
Nicolle, L. E.	Catheter associated urinary tract infections	Case Reports	2018	44	38–41
O'Connell, K., Kelly, J., Niriain, U.	A rare case of soft-tissue infection caused by <i>Raoultella planticola</i>	Antimicrobial Resistance and Infection Control	2014	3 (23)	
Povlow, MR., Carrizosa, J., Jones, A.	<i>Raoultella planticola</i> : Bacteremia and sepsis in a patient with cirrhosis	Case Reports in Medicine	2010	ID: 134086	
Puerta-Fernandez, S., Miralles-Linares, F., Sanchez-Simonet, MV., Bernal-Lopez, MR, Gomez-Huelas, R.	<i>Raoultella planticola</i> bacteraemia secondary to gastroenteritis	Cureus	2017	9 (7)	E1508
Rodriguez, M., Olmedo, R., Plaza, M.	Bacteremia with <i>Raoultella planticola</i> in the setting of acute pancreatitis complicated with acute cholangitis	Clinical Microbiology and Infection	2013	19	E226–E237
Salmaggi, C., Ancona, F., Olivetti, J., Pagliula, G., Ramirez, GA.	<i>Raoultella planticola</i> associated cholangitis and sepsis: a case report and literature review	Revista Española de Enfermedades Digestivas	2017	109 (6)	479
Sekowska, A.	<i>Raoultella</i> spp. – clinical significance, infections, and susceptibility to antibiotics	QJM: An International Journal of Medicine	2014	107 (11)	911–913
Sia, CS., Wilson, S., Ananda-Rajah, M., Mills, J., Aung, AK.	Refractory <i>Raoultella planticola</i> peritonitis in an HIV positive patient	Nephrology	2016	21 (11)	979–980
Skeleton IV, W., Taylor, Z., Hsu, J.	A rare case of <i>Raoultella planticola</i> urinary tract infection in an immunocompromised patient with multiple myeloma	IDCases	2017	8	9–11
Tseng, S., Wang, J., Liang, C., Lee, P., Chen, Y., Po-Liang, L.	First report of blaIMP-8 in <i>Raoultella planticola</i>	American Society for Microbiology	2013	58 (1)	593–595
Vassallo, J., Cassar, R., Vella, M., Caruana, P.	Four cases of <i>Raoultella planticola</i> conjunctivitis	Eye	2016	30 (4)	632–634
Wolcott, R., Dowd, S.	Molecular diagnosis of <i>Raoultella planticola</i> infection of a surgical site	Journal of Wound Care	2010	19 (8)	329–332
Yokota, K., Gomi, H., Miura, Y., Sugano, K., Morisawa, Y.	Cholangitis with septic shock caused by <i>Raoultella planticola</i>	Journal of Clinical Microbiology	2012	61	446–449
Yoon, JH., Ahn, YH., Chun, JI., Park, HJ., Park, BK.	Acute <i>Raoultella planticola</i> cystitis in a child with rhabdomyosarcoma of the bladder neck	Pediatrics International	2015	57 (5)	985–987
Yumoto, T., Naito, H., Ihoriya, H., Tsukahara, K., Ota, T., Watanabe, T., Nakao, A.	<i>Raoultella planticola</i> bacteremia-induced fatal septic shock following burn injury	Annals of Clinical Microbiology and Antimicrobials	2018	17	19

from bacterial biofilm that forms in the catheter lumen. When organisms adhere to the film, they are essentially protected from host defenses (Table 2). Due to the immune-compromised state of our patient, catheterization both in and out of the hospital may have made her susceptible to this infection. Interestingly, this particular bacterium is usually found in aquatic environments, and she developed this in an urban setting. It is unclear where she may have been exposed to such a bacteria; however, we do practice in a metropolitan hospital where patients come from afar and possible cross-contamination could have occurred.

Treatment for UTI with *R. Planticola* consists of a single course of antibiotics. In each case antibiotics have led to full recovery and resolution of symptoms. Antibiotics that have successfully treated *R. Planticola* UTI's include Ciprofloxacin, Ceftriaxone, Cefotaxime, Nitrofurantoin, Cephalexin, Cefpodoxime, and Ampicillin/Sulbactam. In our case report, we chose to treat with Nitrofurantoin, given its high sensitivity to most uropathogens (Table 2).

R. Planticola is an emerging pathogen in UTIs in immunosuppressed patients. It is imperative to consider this in the potential differential in such patients and understand treatment options including Nitrofurantoin as an affective agent to clear such infections.

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