IDCases 8 (2017) 9–11

Contents lists available at ScienceDirect

IDCases

journal homepage: www.elsevier.com/locate/idcr

Case report

A rare case of *Raoultella planticola* urinary tract infection in an immunocompromised patient with multiple myeloma

William Paul Skelton IV[a,*], Zachary Taylor[a], Jack Hsu[b]

[a] Department of Internal Medicine, University of Florida, 1600 SW Archer Road, Gainesville, FL 32610, United States
[b] Division of Hematology and Oncology, Department of Internal Medicine, University of Florida, 1600 SW Archer Road, Gainesville, FL 32610, United States

ARTICLE INFO

Article history:
Received 27 November 2016
Accepted 7 February 2017

Keywords:
UTI
Immunocompromised
Multiple myeloma

ABSTRACT

Introduction: Raoultella planticola is a gram-negative rod associated with soil and aquatic environments that has rarely been associated with human infections.
Presentation of case: We present the case of a 73 year old female with multiple myeloma and recurrent *Clostridium difficile* infection who was found to have a urinary tract infection with *Raoultella planticola*, which has only been reported to cause 29 cases of human infections and 2 cases of urinary tract infections.
Discussion and conclusion: Our case and literature review suggest that immunocompromised patients are predisposed to developing *Raoultella planticola* infection, and that this is a potential emerging pathogen.

Introduction

Raoultella planticola is a gram-negative, non-motile rod that was first described in the 1980s as *Klebsiella planticola* and *Klebsiella trevisanii* [1]. It was reclassified into a new genus in 2001, along with *Raoultella ornithinolytica*, and *Raoultella terrigena* [2]. This organism is associated with soil, plant, and aquatic environments, and is a very rare human pathogen. Save for two cases of *Klebsiella trevisanii* in 1986 [3], no other human infections had been reported in the medical literature until 2007 [4], and only 29 cases have been reported to date (with only 7 in the United States). Here, we present a case of *Raoultella planticola* urinary tract infection in an autologous stem cell transplant recipient.

Case presentation

The patient is a 73 year old female with a history of stage IIIA IgA kappa multiple myeloma who was treated with four cycles of cyclophosphamide/bortezomib/dexamethasone and subsequently underwent an autologous stem cell transplant following melphalan conditioning. She demonstrated relapse of her multiple myeloma three years thereafter and was treated with two cycles of lenalidomide and dexamethasone, three cycles of carfilzomib on a Southwest Oncology Group study, and three cycles of vincristine/BCNU/cyclophosphamide/prednisone. She underwent another autologous peripheral blood stem cell transplant following melphalan conditioning with her post-transplant course complicated by posterior reversible encephalopathic syndrome (PRES) diagnosed by MRI, hypertension, atrial fibrillation, and *Clostridium difficile* diarrhea treated with oral vancomycin. She presented to the hospital with a fever of 102.7 and no other symptoms other than mild loose stools which she stated she had for months.

Her initial vital signs were pertinent for hypotension to 94/66 mm Hg, tachycardia of 108 bpm, and leukocytosis to 10.1 thou/mm^3 (baseline 3–5 thou/mm^3). She was started on intravenous vancomycin, cefepime, metronidazole, and oseltamivir. Her oral vancomycin was continued. Two sets of blood cultures and a respiratory viral panel were negative, but *Clostridium difficile* PCR was again positive. Other stool studies including Giardia, Cryptosporidium, Vibrio, Yersinia, and ova & parasites were negative. Fidaxomycin was not started. She was continued on oral vancomycin 125 mg every 6 h with plans for a prolonged vancomycin taper and eventually defervesced. Seven days later she became febrile to 102.2 F with associated dysuria.

Urinalysis was positive for nitrite and 230 white blood cells/hpf. She was started on empiric cephalexin awaiting culture results. Urine cultures finalized as >100,000 col/ml *Raoultella planticola* sensitive to amikacin, cefoxitin, ciprofloxacin, levofloxacin, meropenem, nitrofuration, piperacillin/tazobactam, and trimethoprim/sulfamethoxazole. It was resistant to ampicillin, cefazolin, ceftazidime, ceftriaxone, gentamicin, and tobramycin. This was confirmed with a Vitek 2 biochemical identification system with a 99% probability.

* Corresponding author.
E-mail addresses: William.Skelton@medicine.ufl.edu (W.P. Skelton), Taylor@medicine.ufl.edu (Z. Taylor), Jack.Hsu@medicine.ufl.edu (J. Hsu).

http://dx.doi.org/10.1016/j.idcr.2017.02.002

She was started on a 7-day course of nitrofuration 100 mg twice daily and her symptoms resolved. She was successfully discharged from the hospital on the remainder of her course of nitrofuration and oral vancomycin taper for her *Clostridium difficile*.

Discussion

This patient developed dysuria on the twelfth day of hospitalization while being treated with antibiotics for recurrent *Clostridium difficile* infection. Further workup revealed that this was due to a *Raoultella planticola* urinary tract infection, the third case reported thus far in the medical literature [5,6]. This rare pathogen has been isolated from soil and aquatic environments, but has not been commonly associated with human infections. *Raoultella planticola* infections have been most frequently reported in patients with malignancy [7–12], or were otherwise immunocompromised (diabetes [13,14], dialysis-dependent renal failure [15], and post-transplant [16]).

A comprehensive literature search reveals a total of 29 published cases of *Raoultella planticola* infections in humans (Table 1). *Raoultella planticola* has been associated with four cases of pneumonia [3,7,8,17], five cases of conjunctivitis [18,19], two cases of urinary tract infection [5,6], one case of cystitis [20], two cases of prostatitis [16,21], four cases of cholangitis [9–11,22], two cases of cholecystitis [14,23], one case of peritonitis [15], one case of necrotizing fasciitis [13], one case of cellulitis [24], one case of pancreatitis [4], two cases of soft tissue post-surgical infection [8,25], and three cases of bacteremia [3,12,26]. Of the 29 reported cases, three patients died (10.3%), 22 had full recovery, and four patients had unknown outcomes. In addition, it is interesting to note that epidemiologically, 7 cases (24.1%) occurred in the United States, with 4/7 in the northeast. This particular case of *Raoultella planticola* infection marks the first reported case in the Southeastern United States.

The earliest reported human infection with *Klebsiella trevisanii* (later classified as *Raoultella planticola*) was in 1986, bacteremia in a 69 year old patient [3]. The first human infection after genus reclassification to *Raoultella planticola* was in 2007, pancreatitis in a 45 year old male [4]. While the number of cases have relatively been on the rise recently, this cannot be explained on its reclassification from a Klebsiella genus to Raoultella genus as this change occurred in 2001, and the Vitek 2 biochemical identification system is highly sensitive in differentiating between Raoultella and Klebsiella.

Upon isolating this organism on urine culture, further conversation with the patient revealed that although she did occasionally garden, she did not have any open wounds, did not handle soil, did not ingest or wash her clothes with well or stream water, or have any other risk factors which would have predisposed her to a *Raoultella planticola* UTI. She worked with a consulting business and did not have any occupational exposures. Although no urine culture was performed on admission, the fact that she did not develop dysuria until 12 days after admission (along with continuing her course of oral Vancomycin for *Clostridium difficile*) suggests that this infection was not present on admission.

It is likely that immunosupression (due to her chemotherapy as well as autologous peripheral stem cell transplant within the past 3 months) gives a possible explanation as to why this patient was predisposed for this specific infection, either as a dormant colonizer or opportunistic infection, as has been postulated in the literature [14]. As there is limited data regarding this pathogen, especially in humans, the mechanism of its pathogenesis remains unclear. Additionally, in the aforementioned 29 cases of human infection, a variety of organ systems are affected, with no predilection for a particular organ system.

Table 1
Summary of reported cases of *Raoultella planticola* human infections.

Author	Date reported	Clinical manifestation	Culture site	Age/Sex	Region	Outcome
Freney et al. [3]	1986 May	Bacteremia	Blood	69	France	Recovered
Freney et al. [3]	1986 May	Pneumonia	Blood, sputum	57	France	Recovered
Alves et al. [4]	2007 May	Pancreatitis	Peritoneal fluid	45/M	Brazil	Recovered
Castanheira et al. [8]	2009 December	Pneumonia	Blood	83/F	Ohio	Died
Castanheira [8]	2009 December	Soft-tissue	Blood	64/M	New Jersey	Died
O'Connell et al. [28]	2010 August	Cellulitis	Wound	30/M	Ireland	Recovered
Wolcott and Dowd [25]	2010 August	Soft-tissue	Unknown	66/M	Texas	Unknown
Yokota et al. [9]	2012 March	Cholangitis	Blood	65/M	Japan	Improved, transferred
Kim et al. [13]	2012 March	Necrotizing fasciitis	Abdominal fluid	66/M	South Korea	Recovered
Teo et al. [23]	2012 May	Cholecystitis	Gallbladder fluid	62/F	UK	Recovered
Hu et al. [10]	2012 October	Cholangitis	Blood	59/M	Ontario, Canada	Recovered
Olson et al. [5]	2013 February	UTI	Urine	89/M	New Mexico	Recovered
Puerta-Fernandez et al. [26]	2013 May	Bacteremia	Blood	63/M	Spain	Recovered
Koukoulaki et al.[16]	2014 June	Prostatitis	Urine	67/M	Greece	Recovered
Lam and Salit [12]	2014 July	Bacteremia	Blood	56/F	Ontario, Canada	Recovered
Zuberbuhler et al.[18]	2014 October	Conjunctivitis	Conjunctival swab	58/F	UK	Recovered
Salmaggi et al. [11]	2014 November	Cholangitis	Blood	70/M	Italy	Recovered
Ershadi et al. [14]	2014 December	Cholecystitis	Biliary fluid	49/M	Connecticut	Recovered
Gonzalez-Gonazlez et al. [22]	2015 March	Cholangitis	Unknown	Unknown	Unknown	Unknown
Xu et al. [7]	2015 April	Pneumonia	Sputum	60/M	China	Died
Gangcuangco and Saul [6]	2015 October	UTI	Urine	92/F	Connecticut	Recovered
Yoon et al. [20]	2015 October	Cystitis	Urine	1/M	South Korea	Recovered
Kim et al. [15]	2015 December	Peronitis	Peritoneal fluid	65/M	South Korea	Recovered
Cho et al. [17]	2016 January	Pneumonia	Sputum	58/M	South Korea	Recovered
Vassallo et al. [19]	2016 April	Conjunctivits	Conjunctival swab	88/F	Malta	Recovered
Vassallo et al. [19]	2016 April	Conjuncivitis	Conjunctival swab	71/M	Malta	Unknown
Vassallo et al. [19]	2016 April	Conjunctivits	Conjunctival swab	15/F	Malta	Unknown
Vassallo et al. [19]	2016 April	Conjunctivits	Conjunctival swab	69/F	Malta	Recovered
Gian and Cunha [21]	2016 May	Prostatitis	Prostatic fluid	53/M	New York	Recovered
Skelton		UTI	Urine	73/F	Florida	Recovered

Conclusion

In conclusion, *Raoultella planticola* is a rare human pathogen which can cause a variety of infections. Patients who are exposed to contaminated soil products or are immunocompromised are at increased risk to developing this infection. While it is unclear why the number of human *Raoultella planticola* infections are on the rise, it is prudent to be aware of this potential pathogen in this patient population, and like all human pathogens, closely monitor its patterns of antibiotic resistance.

Conflict of interest statement

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Funding statement

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

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

References

[1] Bagley ST. Habitat association of Klebsiella species. Infect Control 1985;6 (February (2)):52–8.
[2] Drancourt M, Bollet C, Carta A, Rousselier P. Phylogenetic analyses of Klebsiella species delineate Klebsiella and Raoultella gen. nov., with description of Raoultella ornitholytica comb. nov., Raoultella terrigena comb. nov. and Raoultella planticola comb. nov. Int J Syst Evol Microbiol 2001;51:925–32.
[3] Freney J, Gavini F, Alexandre H, Madier S, Izard D, Leclerc H, et al. Nosocomial infection and colonization by Klebsiella trevisanii. J Clin Microbiol 1986;23 (May (5)):948–50.
[4] Alves MS, Riley LW, Moreira BM. A case of severe pancreatitis complicated by Raoultella planticola infection. J Med Microbiol 2007;56(May (5)):696–8.
[5] Olson DS, Asare K, Lyons M, Hofinger DM. A novel case of Raoultella planticola urinary tract infection. Infection 2013;41(February (1)):259–61.
[6] Gangcuangco LM, Saul ZK. A novel case of Raoultella planticola urinary tract infection in a female: comment on 'Nosocomial pneumonia caused by carbapenem-resistant Raoultella planticola: a case report and literature review'. Infection 2015;43(October (5)):621–2.
[7] Xu M, Xie W, Fu Y, Zhou H, Zhou J. Nosocomial pneumonia caused by carbapenem-resistant Raoultella planticola: a case report and literature review. Infection 2015;43(April (2)):245–8.
[8] Castanheira M, Deshpande LM, DiPersio JR, Kang J, Weinstein MP, Jones RN. First descriptions of blaKPC in Raoultella spp. (R. planticola and R. ornithinolytica): report from the SENTRY Antimicrobial Surveillance Program. J Clin Microbiol 2009;47(December (12)):4129–30.
[9] Yokota K, Gomi H, Miura Y, Sugano K, Morisawa Y. Cholangitis with septic shock caused by Raoultella planticola. J Med Microbiol 2012;61(March (3)):446–9.
[10] Hu AY, Leslie KA, Baskette J, Elsayed S. Raoultella planticola bacteraemia. J Med Microbiol 2012;61(October (10)):1488–9.
[11] Salmaggi C, Ancona F, Olivetti J, Pagliula G, Ramirez GA. Raoultella planticola-associated cholangitis and sepsis: a case report and literature review. QJM 2014;107(November (11)):911–3.
[12] Lam PW, Salit IE. Raoultella planticola bacteremia following consumption of seafood. Can J Infect Dis Med Microbiol 2014;25(July (4)):83–4.
[13] Kim SH, Roh KH, Yoon YK, Kang DO, Lee DW, Kim MJ, et al. Necrotizing fasciitis involving the chest and abdominal wall caused by Raoultella planticola. BMC Infect Dis 2012;17(March (12)):59.
[14] Ershadi A, Weiss E, Verduzco E, Chia D, Sadigh M. Emerging pathogen: a case and review of Raoultella planticola. Infection 2014;42(December (6)):1043–6.
[15] Kim SW, Kim JE, Hong YA, Ko GJ, Pyo HJ, Kwon YJ. Raoultella planticola peritonitis in a patient on continuous ambulatory peritoneal dialysis. Infection 2015;43(December (6)):771–5.
[16] Koukoulaki M, Bakalis A, Kalatzis V, Belesiotou E, Papastamopoulos V, Skoutelis A, et al. Acute prostatitis caused by Raoultella planticola in a renal transplant recipient: a novel case. Transpl Infect Dis 2014;16(June (3)):461–4.
[17] Cho YJ, Jung EJ, Seong JS, Woo YM, Jeong BJ, Kang YM, et al. A case of pneumonia caused by Raoultella planticola. Tuberc Respir Dis 2016;79 (January (1)):42–5.
[18] Zuberbuhler B, Abedin A, Roudsari A. A novel case of chronic conjunctivitis in a 58-year-old woman caused by Raoultella. Infection 2014;42(October (5)):927–9.
[19] Vassallo J, Vella M, Cassar R, Caruana P. Four cases of Raoultella planticola conjunctivitis. Eye 2016;30(April):632–4.
[20] Yoon JH, Ahn YH, Chun JI, Park HJ, Park BK. Acute Raoultella planticola cystitis in a child with rhabomyosarcoma of the bladder neck. Pediatr Int 2015;57 (October (5)):985–7.
[21] Gian J, Cunha BA. Raoultella planticola chronic bacterial prostatitis with prostatic calcifications: successful treatment with prolonged fosfomycin therapy. Int J Antimicrob Agents 2016;47(May (5)):414.
[22] Gonzalez-Gonzalez L, Alvarez-Otero J, Lamas Fereiro JL, de la Fuente Aguado. Cholangitis and bacteremia caused by Raoultella planticola. Med Clin 2015;144(March (5)):231–2.
[23] Teo I, Wild J, Ray S, Chadwick D. A rare case of cholecystitis caused by Raoultella planticola. Case Rep Med 2012;2012(May):1–3.
[24] O'Connell K, Kelly J, Niriain U. A rare case of soft-tissue infection caused by Raoultella planticola. Case Rep Med 2010;2010(August):1–2.
[25] Wolcott R, Dowd S. Molecular diagnosis of Raoultella planticola infection of a surgical site. J Wound Care 2010;19(August (8)):329–32.
[26] Puerta-Fernandez S, Miralles-Linares F, Sanchez-Simonet MV, Bernal-Lopez MR, Gomez-Huelgas R. Raoultella planticola bacteraemia secondary to gastroenteritis. Clin Microbiol Infect 2013;19(May (5)):236–7.