

## A Rare Case of Calculi-related Acute Pyelonephritis by *Raoultella ornithinolytica*

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**Abstract:** Complicated urinary tract infections (UTI's) are often associated with urolithiasis and gram-negative bacteria are the most common cause. A rare species of *Raoultella* enterobacteriaceae has been described as a potential pathogen in various infections but sporadic cases only associate *Raoultella* with UTI's in the literature. We present a rare case of a young female patient with acute non-obstructive, stone related pyelonephritis caused by *Raoultella ornithinolytica*. The patient was treated with empirical antibiotic therapy until sterile urine obtained and subjected to two sessions of Extracorporeal Shock-Wave Lithotripsy (ESWL).

**Keywords:** Complicated urinary tract infection, *Klebsiella*, *Raoultella ornithinolytica*, Urinary stone

### INTRODUCTION

Complicated urinary tract infection (UTI) is an infection associated with structural or functional abnormalities of the genitourinary tract or the presence of an underlying disease. A broad range of bacteria can cause a complicated UTI, such as *E. coli*, *Proteus*, *Klebsiella*, *Pseudomonas*, *Serratia* spp. and *Enterococci*. Especially, in cases of a complicated UTI related to urinary stones, urease-producing organisms are more often found in urinary cultures than other gram-negative pathogens. *Klebsiella* spp are also urease producers to a certain extent but are less common associated with urinary stones. In 2001, *Klebsiella* spp were reclassified based on histamine-producing stains and gene analyses, and the genus *Raoultella* was created including *R. ornithinolytica*, *R. planticola* and *R. terrigena* [1]. In worldwide literature, there are only sporadic cases that report *Raoultella* spp as pathogens responsible for human infections and most of them are not referred to urinary tract. We present a case of a young female patient with a complicated upper urinary tract infection caused by *Raoultella ornithinolytica*, associated with a small calyceal stone, treated with antibiotic therapy and Extracorporeal Shock-Wave Lithotripsy (ESWL).

### CASE REPORT

A 30-year-old Asian female patient presented in emergency department with mild symptoms of right renal colic and fever from 24hrs. On physical examination, the patient had normal blood pressure and heart-rate, a mild flank left kidney pain and no lower urinary tract symptoms. The temperature was 37.8°C. Routine blood test examination revealed a small increase of white blood cells (13.000 cells/ $\mu$ L) and

normal urea and creatinine serum levels. Urine dipstick was positive for blood/hemoglobin and Leucocytes and a midstream urinate sample was given for urinary culture. In the KUB X-Ray there was a small 1cm stone in the right kidney (Fig. 1).



Fig. 1: KUB X-ray with the small right kidney calculi of the patient

A urinary ultrasound was confirmed the stone inside the right kidney pelvis and revealed no pyelocalyceal dilation or other signs of urinary obstruction. The patient was treated conservatively with empirical antibiotic therapy (Ciprofloxacin 500mgX2 per os) and analgesics. 48 hours later the patient was considerably improved. The mid-stream urine culture

resulted a significant bacteriuria of *Raoultella ornithinolytica* pathogen by counts of  $\geq 10^5$ cfu/mL. The exact antibiogram is given in Table 1.

According to latest EAU classification for Urological Infections the patient had a PN-2U-Raoultella (a) disease [2].

The pathogen was ampicillin-resistant and produced class-A beta-lactamases, but it was sensitive to fluoroquinolones that were initially administrated as empirical therapy. A total of 14 days of antimicrobial therapy was administered to the patient until the repeat urine culture was sterile. Then the patient had two sessions of ESWL until she became stone-free. Unluckily, stone analysis investigation was not possible to perform.

**Table 1: Antibiogram of Raoultellaornithinolytica in mid-stream urine culture**

Antibiotic	Sensitivity	MIC µg/ml
Ampicillin	Resistance (R)	$\geq 32$
Ampicillin+Sulbactam	Sensitivity (S)	$\leq 2$
Ticarcillin	Resistance (R)	$\geq 128$
Ticarcillin + Clavulanicacid	Sensitivity (S)	$\leq 8$
Piperacillin	Resistance (R)	16
Piperacillin + Tazobactam	Sensitivity (S)	8
Cefuroxime	Sensitivity (S)	4
Ceftriaxone	Sensitivity (S)	$\leq 1$
Cefepime	Sensitivity (S)	$\leq 1$
Cefotaxime	Sensitivity (S)	$\leq 1$
Ceftazidime	Sensitivity (S)	$\leq 1$
Aztreonam	Sensitivity (S)	$\leq 1$
Meropenem	Sensitivity (S)	$\leq 0.25$
Tetracycline	Sensitivity (S)	$\leq 1$
Chloramphenicol	Sensitivity (S)	4
Colistin	Sensitivity (S)	$\leq 0.5$
Imipenem	Sensitivity (S)	$\leq 0.25$
Amikacin	Sensitivity (S)	$\leq 2$
Gentamicin	Sensitivity (S)	$\leq 1$
Ciprofloxacin	Sensitivity (S)	$\leq 0.25$
Levofloxacin	Sensitivity (S)	$\leq 0.12$
Ofloxacin	Sensitivity (S)	$\leq 0.25$
Nitrofurantoin	Intermediate (I)	64
Trimethoprim+Sulfonamide	Sensitivity (S)	$\leq 20$

## DISCUSSION

Enterobacteriaceae is a large family of Gram-negative bacteria that includes, along with many harmless symbionts, many of the more familiar pathogens, such as Salmonella, *Escherichia coli*, *Yersinia pestis*, Klebsiella, Shigella, Proteus, Enterobacter, Serratia, and Citrobacter. Klebsiella spp and especially *Klebsiella pneumoniae* is the 3<sup>rd</sup> most common pathogen that has a causal relationship with urinary tract infections. Klebsiella was initially specified as a histamine-producing microorganism using commercial histamine-based biochemical identification systems. Research, of histamine-production capacity in conjunction with molecular gene analysis led to re-classification of formerly Klebsiella histamine-producing species to *R. ornithinolytica*, *R. planticola* and *R. terrigena*, by Drancourt et al in 2001 [1].

Raoultella is originally associated with histamine fish poisoning (HFP), a disease caused due to high levels of histamine production in scombroid fishes, after raw consuming [3]. It is not well specified if Raoultella is a saprophytic bacterium for humans or can cause infections. There are only few case reports that indicate its causal relationship with specific infections except in the case of HFP. These cases mainly include biliary infections with or without systematic bacteremia [5], enteric fever syndrome [4], chronic conjunctivitis [6], visceral heterotaxy [7], diabetic foot infection [8] and one case of acute prostatitis [9], with the majority of them regarding in immunosuppressed patients. There is also no indication of relationship between these infections and nutritional habits of the patients. Raw or spoiled fish consumption, as reported in our case by the Chinese-origin patient, can only be a potential risk factor. No other case has been reported so far that associates Raoultella infection with a complicated UTI due to kidney stone, to our knowledge.

As mentioned before *Raoultella* is primarily a histamine-producing bacterium that was misclassified as *Klebsiella* spp the past years due to commercial stain systems based on histamine-production. *Klebsiella ornithinolytica*, as an ornithine-positive pathogen was identified in 1989[10], but it was renamed later in 2001 as *Raoultella ornithinolytica*. Typically *Raoultella* spp produce class-A beta-lactamases and are ampicillin resistance in principle [11], as found in the urinary culture of our case. Finally, no evidence support *Raoultella* infection as a risk factor for stone formation, infectious or not (Magnesium ammonium phosphate, Carbonate apatite, Ammonium urate).

### CONCLUSION

*Raoultella ornithinolytica* represents a rare uropathogen and its causal relationship as a urolithiasis factor is rather unlikely. Wide-spectrum antibiotics are usually sufficient for therapy considering the ampicillin resistance status.

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