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Case Report

Empedobacter falsenii: a rare non-fermenter causing urinary tract infection in a child with bladder cancer

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Abstract

Empedobacter falsenii is a rarely encountered gram-negative non-fermenting (NF) bacterium. It is most often misidentified due to limitations of conventional culture based identification methods and the true significance of its isolation remains obscure. However, in present times, the identification of NFs has become quick and reliable with the use of matrix-assisted laser desorption ionization time-off-light mass spectrometry (MALDI-TOF). *E. falsenii*, which was formerly known as *Wautersiella falsenii*, is the only species of the genus. There are no definite guidelines for the antibiotic susceptibility testing and empirical therapy for this multidrug resistant agent. Till date in the world literature, only one case of urinary tract infection (UTI) by *E. falsenii* has been reported in a one-year-old child with pyelonephritis. Here, we report the first case of *E. falsenii* associated UTI from India which was identified using MALDI-TOF.

Keywords: *Empedobacter falsenii*, Non-fermenter, MALDI-TOF, Urinary Tract Infection, India

Introduction

The members of family *Enterobacteriaceae* are the most common etiological agents implicated in urinary tract infections (UTI), followed by gram-positive organisms such as *Staphylococci* and *Enterococci* [1]. UTI due to non-fermenters (NFs) have also seen an upsurge over the past few years. *Pseudomonas* holds a significant place in this group, due to easy identification by virtue of its pigment and odour, followed by *Acinetobacter* spp. Other rare NFs which have been reported to cause UTI include *Alcaligenes, Flavobacter, Oligella, Flavimonas, Agrobacter, Weeksiella, Chryseobacterium, Achromobacter* and *Elizabethkingia* [2,3]. Earlier, identification of these NF was labor-intensive and technically demanding which led to their misidentification as contaminants or isolates of doubtful significance. However, the identification of these organisms has now become reliable and rapid with the advent of rapid automatic identification methods like MALDI-TOF. Here, we report a case of UTI in a child caused by *Empedobacter falsenii,* a rare non fermenting, multidrug resistant NF, which was identified by MALDI-TOF. *Empedobacter falsenii*, belongs to family *Flavobacteriaceae*, which produces yellow colored pigment. There are no definite guidelines for the antibiotic susceptibility testing and treatment for this organism.

Case Report

A 5-year-old boy presented with ailments of fever, burning micturition while receiving radiotherapy for management of bladder cancer (rhabdomyosarcoma). A midstream urine sample was subjected to culture sensitivity to rule out urinary tract infection (UTI). Wet mount microscopic examination of uncentrifuged urine revealed 2-3 RBCs, abundant pus cells and bacteria per high power field. Semi-quantitative culture of the urine sample done on cysteine lysine electrolyte deficient (CLED) agar yielded significant bacterial growth (colony count >10^5 CFU/mL) of a yellow pigment-producing bacterium. The colonies were pale yellow, translucent, with entire edges on CLED medium and the organism could grow on MacConkey agar plate showing pale, yellow pigment producing translucent colonies. Figure 1, Gram stain of the isolate showed noncapsulated, nonsporing gram-negative bacilli. On conventional biochemical tests, it was catalase positive, oxidase positive, non-motile, produced indole and was negative for amino acid (lysine, ornithine, and arginine) decarboxylase, urease, and citrate utilization. This isolate was confirmed as *Empedobacter falsenii*, by matrix-assisted laser

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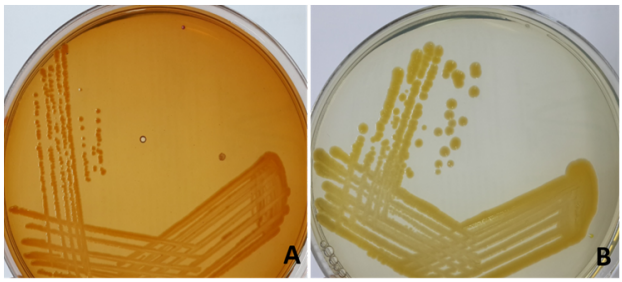

Figure 1: Culture plates showing the growth of *E. falsenii* on (A) MacConkey agar and (B) Nutrient agar showing yellow pigment colony with morphology.

desorption ionization time of flight mass spectrometry (MALDI-TOF, Bruker Daltonics, Bremen, Germany) with a score of 2.1. A repeat urine culture with all aseptic measures was advised to rule out any chance of contamination. The repeat urine culture also grew the same organism which was again confirmed by MALDI-TOF. Antimicrobial susceptibility was performed using the Kirby-Bauer disc diffusion method for: ampicillin (10µg), ampicillin-sulbactam (10µg), meropenem (10µg), ceftazidime (30µg), amikacin (30µg), cotrimoxazole (25µg), ciprofloxacin (5µg), gentamicin (10µg), imipenem (10µg), piperacillin-tazobactam (100/10µg), ceftriaxone (30µg), ampicillin (10µg) and colistin (300U) using previously published studies for reference due to the non-availability of CLSI guidelines [4,5]. The isolate showed sensitivity to gentamicin, amikacin, ceftriaxone and ceftazidime. The patient was started on intravenous amikacin and responded well to the treatment. The follow-up urine culture repeated after 2 weeks of therapy was sterile.

Discussion

E. falsenii is a gram-negative bacillus, belonging to family *Flavobacteriaceae*, which produces yellow colored pigment, grows aerobically at 37° C, and is catalase and oxidase positive. Indole is produced but the organism doesn't reduce nitrates and utilize citrate. It has weak-to-strong gelatinize activity. *Empedobacter* usually produces acid from glucose and maltose and comprises of two genomovars 1 and 2, which are phenotypically very similar [6,7]. Not a lot is known about epidemiology, clinical correlation and antimicrobial susceptibility of *Empedobacter*. The first clinical isolation of *Empedobacter* was described in a one-year-old child with complicated UTI in Netherlands in 2012. The organism was identified using MALDI-TOF and confirmed using 16s DNA PCR-sequencing [1]. Another case of *E. falsenii* was described by Traglia GM *et al*, in an 18-year-old female, who presented with cervical abscess associated with otitis media. The organism was identified by MALDI-TOF and confirmed by whole genome sequencing [2]. Recently in 2016, it has been isolated from a respiratory sample of a thirty two year old immunocompromised male having leukemia and was identified by MALDI-TOF [8]. The first two isolates were sensitive to ciprofloxacin, cefepime, gentamicin, cotrimoxazole and amikacin. But the isolate from the respiratory sample of leukemia patient showed resistance to many antibiotics like amikacin, ampicilin-clavulanic acid, ampicillin-sulbactam, cefotaxime, ceftazidime, doripenem, gentamicin, imipenem and piperacillin-tazobactam and it was sensitive only to cefepime and cotrimoxazole. Our isolate was susceptible to gentamicin, amikacin, ceftriaxone, ceftazidime was intermediately susceptible to piperacillin-tazobactam, ciprofloxacin, imipenem and meropenem and was resistant to ampicillin, ampicillin-sulbactam and colistin. It's interesting to observe that previous isolates of other studies showed resistance to cephalosporins, whereas our isolate was sensitive to both ceftazidime and ceftriaxone. Exposure to antibiotics varies in different settings across the geographical regions. However, the exact reasons can better be evaluated by carrying out further studies to understand the resistance mechanisms that the organism adopts.

Empedobacter has earlier been reported from a patient with cystic fibrosis and prosthetic joint infection by 16s PCR. No significant clinical association was established as the organism was not isolated on culture [9]. The organism can also exist in rodent skin, soil, pollution sediments, machining facilities and even hospital carpets [10,11]. This implies that despite isolation, establishing a cause-effect relationship is difficult.

Conclusion

We report for the first time from India, *E. falsenii* causing UTI in a child with bladder cancer. Till date, there is only one other case report of *Empedobacter* causing UTI, which was seen in a one-year-old girl with pyelonephritis. As both these patients had an underlying illness, it can be hypothesized that prior instrumentation or previous surgery on genitourinary tract can predispose to such infections. The present report also emphasizes the significance of MALDI-TOF in the identification of these rare NFs. The increased isolation and identification of these NFs requires the attention of clinicians to understand and appropriately treat these organisms. With inadequate clinical associations, lack of susceptibility breakpoints, diverse susceptibility profiles, and absence of definite therapy regimens, it's challenging to deal with these emerging, uncommon non-fermenters. This study also highlights the necessity to formulate explicit guidelines for the antibiotic susceptibility testing of such uncommon NFs. Further studies are essential to understand the significance of this organism in human ailments as a colonizer and/or infecting agent.

Contributor Statement

NT, BM conceived the idea and edited the manuscript. KZ, PG, VK undertook the literature search, data extraction, and drafted the report. KZ, PG, VK assisted in interpretation and critical revision of the report. All the authors contributed equally. All the authors have read and approved the manuscript.

Declaration of Interests

The authors declare that they have no conflicts of interest.

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