



Case report

Dietzia cinnamea: An increasingly recognized human pathogenWilliam D. Brown^a, Nina Feinberg^a, Eleanor Stedman^b, Jean Dejace^{a,b}, Andrew J. Hale^{a,b,*}^a Larner College of Medicine at the University of Vermont, Burlington, VT, USA^b University of Vermont Medical Center, Burlington, VT, USA

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ABSTRACT

The authors present the case of a bloodstream infection and sepsis due to *Dietzia cinnamea* in a severely malnourished patient with small bowel obstruction and pelvic abscess. The organism was identified with matrix-assisted laser desorption ionization-time-of-flight mass spectrometry. The authors discuss the characteristics, diagnosis, treatment, and emerging scope of clinical infection caused by *Dietzia* species.

Introduction

With the advent of technological advances such as the matrix-assisted laser desorption ionization-time-of-flight mass spectrometry (MALDI-ToF MS), the isolation and identification of rare pathogens in clinical microbiology laboratories is increasingly common [1]. *Dietzia cinnamea* is a member of the Actinomycetales order of bacteria that closely resembles *Rhodococcus*. The pathogenic potential of this organism has been recognized [1] but its scope is poorly understood. We present a case of severe sepsis from *Dietzia cinnamea* bloodstream infection in a patient with small-bowel perforation and an associated pelvic abscess. We discuss the characteristics of *Dietzia* species and how they may be identified, the existing data regarding their clinical isolates and pathogenicity, and current state of knowledge on antimicrobial susceptibility.

Case presentation

A 57-year-old female with medical history including alpha-1 antitrypsin deficiency, chronic obstructive pulmonary disease on home oxygen, polysubstance use disorder on buprenorphine, severe malnutrition, and hemicolectomy/colostomy due to a large bowel obstruction two years prior, presented with acute abdominal pain, vomiting, constipation, generalized weakness, and slurred speech for 3–4 days, in the setting of 4 weeks of black stools. Social history was notable for ongoing tobacco use and the need for assistance with some activities of daily living. Home medications included clonidine, paroxetine, buprenorphine/naloxone, and albuterol/ipratropium inhaler. Initial vital signs showed a temperature of 36.6 °C, heart rate of 122

beats per minute, respiratory rate of 22 breaths per minute, blood pressure of 155/109 mmHg, and oxygen saturation of 100% on 3 L/minute O₂. She was severely cachectic with body mass index (BMI) 14 kg/m², her abdomen was exquisitely tender to light palpation, and her ostomy output was black appearing. Initial laboratory analysis was noteworthy for a peripheral white blood cell count of 27.1 × 10⁹ cells/L and a lactate of 3.7 mmol/L. Urine toxicology was positive for cocaine and buprenorphine. Fecal occult blood test was negative.

A computed tomography (CT) scan of the abdomen and pelvis with contrast showed diffuse small bowel dilatation suspicious for a small bowel obstruction (SBO). She was admitted to the surgery service and managed non-operatively, with initial improvement over the first three days. On hospital day 3 her WBC had decreased to 13.6 × 10⁹ cells/L. However, on hospital day 4 the patient had increasing clinical deterioration, and by hospital day 5 WBC count had increased to 22.4 × 10⁹ cells/L. A repeat CT abdomen and pelvis with contrast on hospital day 5 showed a pelvic abscess measuring 8.2 × 14.0 × 16.3 cm and persistent SBO. A percutaneous transgluteal pigtail catheter was placed within the pelvic abscess and 280 mL of purulent, malodorous fluid was immediately removed. Abscess cultures grew mixed flora, *Enterococcus faecium*, and *Candida dubliniensis*. She was given ampicillin/sulbactam 3 g IV q6h and micafungin 100 mg IV q24h for antimicrobials.

Repeat CT abdomen/pelvis on hospital day 8 showed the drainage catheter within the abscess, though now with more clear evidence of bowel rupture as the underlying cause of the abscess. The patient was initially felt to be a poor surgical candidate given her comorbidities, specifically severe malnourishment, so the transgluteal drain was upsized to improve drainage. After this drain manipulation, she became confused, hypothermic, tachycardic, and tachypneic, and was

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transferred to the intensive care unit (ICU) due to concern for sepsis. Blood cultures drawn at this time were positive for *Dietzia cinnamea*, as identified using the MALDI-ToF MS (BioMerieux). The same antimicrobials were continued. By hospital day 10 she had improved and repeat blood cultures were negative. On hospital day 14 she was taken to the operating room (OR) for jejunal enterotomy, jejunojejunal anastomosis, ileocolic anastomosis, abdominal washout, and removal of the transgluteal drain. Cultures obtained in the OR of soft tissue and the abscess revealed mixed organisms. Her post-operative course was complicated by confusion, deconditioning, and ongoing malnutrition. She completed antimicrobials after subsequent imaging showed resolution of the abscess, and was ultimately discharged on hospital day 58.

Discussion

The *Dietzia* genus of bacteria is a recently described member of the Corynebacteriaceae family [1,2]. *Dietziae* are aerobic, Gram positive, non-acid-alcohol fast, non-sporing, catalase-positive actinomycetes [2]. They form cocci, which then germinate into short rods exhibiting snapping division and V shapes. On agar, they form circular, raised or convex, orange to red colonies with smooth rounded edges [2]. *Dietzia* strains are increasingly isolated from both environmental and clinical samples, and it is hypothesized that they are prevalent in the environment and that the genus has yet to be completely speciated [2].

As knowledge of *Dietzia* and methods for its identification improve, its pathogenic potential has been increasingly noted [3–6]. Previously classified as *Rhodococcus* species, *Dietziae* continue to be misidentified under this genus with many commercially available biochemical testing methods, due to their close phenotypic resemblance [2]. *Dietziae* grow slowly, require incubation temperatures of < 37 °C, and are easily missed if cultures are incubated for periods less than 48–72 h [2]. It has been suggested therefore that infections caused by *Dietziae* are often either misidentified, dismissed as contaminants, or not identified as pathogens [2,7]. *Dietzia* species were initially described as skin flora, though have now been identified in the gastrointestinal tract as well [2, 8,9]. Newer technologies, such as MALDI-ToF MS, as well as improving clinical microbiology laboratory techniques, have led to improvements in pathogen isolation and identification [10]. In this case, bacterial identification was achieved using MALDI-ToF MS (BioMerieux).

To date, there are at least eight descriptions of *Dietzia* species causing infections in humans [3–6,9,11–14]. *D. maris* has been described as pathogenic on numerous occasions, including in a bloodstream infection in an immunocompromised patient with septic shock and in a patient with prosthetic hip infection [4,14]. *D. maris* has also been identified in a case of aortitis [13] and in a patient with a bone marrow infection [15]. *D. papillomatosis* was isolated in a case of confluent and reticulated papillomatosis [9] and in a bloodstream infection [6]. *Dietzia cinnamea* has rarely been isolated from humans, and with variable clinical significance; the first two clinical isolates of this species were not clearly identified as pathologic [8,15], however a third case established *D. cinnamea* as the causal organism of an empyema in a patient undergoing chemotherapy [5]. Subsequently, it was identified in 10 clinical samples collected in Spain over 25 years. Of these, 3 were isolated from blood, 1 from spinal fluid, and 4 from the hospital environment [16].

Collectively, these reports demonstrate the pathogenic potential of *Dietzia* species, particularly in immunocompromised hosts. The case presented here is one of the first describing *Dietzia cinnamea* bloodstream infection as a likely cause of sepsis. For our patient, her severe cachexia with BMI of 14 likely predisposed her to infection, as severe malnutrition is a known cause of secondary immunodeficiency [17–20].

Comprehensive studies have not yet been performed to assess antimicrobial susceptibilities of *Dietzia* species. However, one study of 286 *Actinobacteria* isolates from clinical samples in Spain identified 18 as *Dietzia* species, of which 10 were *D. cinnamea* [16]. All *Dietziae* were tested against eight antimicrobials, including amoxicillin/clavulanic acid, cefotaxime, trimethoprim/sulfamethoxazole, amikacin,

erythromycin, ciprofloxacin, linezolid and imipenem, and were found to be susceptible to all agents except for 100% resistance to trimethoprim/sulfamethoxazole and 44.4% resistant to erythromycin [16]. In a prior study with 26 clinical and type isolates, 10 were resistant to trimethoprim/sulfamethoxazole [7]. In our case, susceptibility studies were not performed. However, our patient was treated with ampicillin-sulbactam with subsequent clinical improvement and resolution of her bloodstream infection.

Conclusion

We present a case of *Dietzia cinnamea* bloodstream infection in a patient with gastrointestinal perforation and severe malnutrition. This organism, often misclassified with standard culture techniques, was identified by MALDI-ToF MS, and may be routinely missed in standard clinical practice. This case adds to the growing body of literature demonstrating that *Dietzia* species, including *Dietzia cinnamea*, have pathogenic potential particularly in immunocompromised patients.

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.

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CRediT authorship contribution statement

William Brown: Conceptualization, Patient care, Writing – original draft, Writing – review & editing. **Feinberg:** Writing – original draft, Writing – review & editing. **Stedman:** Writing – original draft, Writing – review & editing. **Dejace:** Writing – original draft, Writing – review & editing. **Hale:** Conceptualization, Patient care, Writing – original draft, Writing – review & editing.

Conflict of interest statement

None of the authors report any conflicts of interest.

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