

CASE REPORT

Skin infection caused by *Burkholderia thailandensis*: Case report with review

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ABSTRACT

Burkholderia thailandensis is genetically closed to *Burkholderia pseudomallei*, which causes melioidosis. The bacterium inhabits the environments of tropical regions including those in Southeast Asia and the Northern part of Australia. *B. thailandensis* is considered avirulent and extremely uncommon to cause disease. We report the first case of foot abscess with skin cellulitis and ankle swelling caused by *B. thailandensis* in Malaysia. *J Microbiol Infect Dis* 2016;6(2): 92-95

Key words: *Burkholderia thailandensis*, Skin, ST77, MLST

Burkholderia thailandensis kaynaklı cilt enfeksiyonu: Derleme ile Olgu sunumu

ÖZET

Burkholderia thailandensis genetik olarak *Burkholderia pseudomallei*'ye yakın, melioidosis etkenidir. Bakteri Güneydoğu Asya'da ve Avustralya'nın kuzey kesimi de dahil olmak üzere tropik bölgelerin ortamlarında yaşar. *B. thailandensis* avirulan ve son derece nadir hastalık nedeni olarak kabul edilir. Biz, Malezya'da *B. thailandensis* kaynaklı ayak bileği şişliği ve selülitli olan ayak apseli ilk olguyu bildirdik.

Anahtar kelimeler: *Burkholderia thailandensis*, cilt, ST77, MLST

INTRODUCTION

The *Burkholderia* genus belongs to the class Beta-Proteobacteria, order Burkholderiales and family Burkholderiaceae, and encloses more than 30 species [1]. *Burkholderia thailandensis* is nonpathogenic soil-dwelling bacteria which is genetically closed to few pathogenic species, such as *B. cepacia*, *B. mallei* and *B. pseudomallei* that cause severe diseases to humans and animals (2). As other relatives, *B. thailandensis* inhabits the environments of tropical regions and is nonpathogenic for human and animals [1]. We have reported the first case of foot abscess with skin cellulitis and ankle swelling caused by *B. thailandensis* in Malaysia.

CASE

A 42-years old male was admitted to the emergency unit of the hospital of University Sains Malaysia (HUSM). He was presented with generalized mild

fever, excoriated skin, superficial skin crepitus, 2.0 X 3.0 cm ulcer and swelling pus discharge from right foot heel and erythema extended to the right ankle that became swollen because of abscess formation. Three days prior to admission, symptoms began with pain over the foot, which was progressively increased. On the review of activity history of the patient, he declared that he got stabbed by fish bone break at the site of injury while was walking on the beach. On admission, patient was conscious and alert, his blood pressure was 151/79 mmHg and the pulse rate was 100 bpm. Pus was collected from the damaged site and was sent for culture and sensitivity. Peripheral blood was withdrawn from the patient and was sent for blood investigation and blood sugar. The patient was sent to the Operation Theater next day of admission for incision and drainage of the abscess, appropriate wound debridement, dressing and cleaning with H₂O₂ and povidone iodine. Intravenous (IV) metronidazol 500 g TDS and IV cloxacillin 500 g were empirically administered

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while waiting for culture results and steroid was given to reduce swelling.

Cumulative blood sugar HbA1C was 9.5% (normal value less than 6.1%) and recorded as newly diagnosed type two diabetes mellitus. Total white blood cell count was 8×10^3 cell/ μ l. Culture revealed mixed bacterial growth but predominated with whit colonies on blood agar that were Gram negative rods on microscopy, oxidase positive, produced a neutral-alkaline reaction on triple sugar iron, amotile, grew on 42 °C and able to assimilate arabinose. Biochemical characteristics were also given by API NE ® system (bioMérieux, France) and gave the final identification as *B. thailandensis*. To exclude diabetic foot with mixed microbial infection, repeated culture episodes had revealed constant growth of *B. thailandensis*. Further molecular investigations were done to confirm the biochemical test results. A desired volume of pus specimen was subjected for DNA extraction using DNeasy tissue kit (Qiagen, Germany) and the purified DNA was introduced for discriminative in-house polymerase chain reaction targeting type three secretion systems (TTS1 PCR) (Zueter et al. unpublished protocol). In addition, multi-locus sequence typing (MLST) was performed as described previously [2]. TTS1-PCR didn't amplify *B. thailandensis* beside the presence of *B. pseudomallei* positive control. *B. thailandensis* was successfully identified by MLST and assigned with genotype ST77 (Strain MUNA; ID number 3717) and deposited in mlst database (<http://bpseudomallei.mlst.net>). As the blood culture result was negative, the final case description was determined as non-bacteremic localized skin infection presented with ankle swelling, skin cellulitis and foot abscess caused by *B. thailandensis*. Upon complete diagnosis, the current antimicrobial treatment was ceased and IV ceftazidime 2 g was started. Subsequent management of the wound in orthopedic ward was taken a place for daily dressing with chrohexidin solution, after 10 days of sufficient dressing and granulation of the wound closure with split skin graft was done and the patient was discharge with good condition.

DISCUSSION

B. thailandensis was firstly proposed upon comprehensive 16S rDNA-based phylogenetic analysis of *B. pseudomallei*-like species [3]. *B. thailandensis* is saprophytic Gram-negative amotile bacteria. The organism grows at temperatures ranging from 25 to 42 °C and produces siderophore, lipases, lecithinases and proteases at both 25 and 37 °C [4]. On

modified Ashdown's selective medium, the colonies are smooth and glossy with a pink pigmentation. Its API 20NE biochemical profiles is similar to that for *B. pseudomallei*, except the ability of *B. thailandensis* to assimilate L-arabinose, 5-keto-gluconate and adonitol and the inability to utilize erythritol and dulcitol as sole carbon sources. *B. thailandensis* is naturally resistant to aminoglycosides but sensitive to tetracycline, ceftazidime and trimethoprim [5].

B. pseudomallei is responsible for disease in both humans and animals; in human, *B. pseudomallei* causes melioidosis, which is a broad spectrum disease associated with high incidence of mortality even when vigorous chemotherapeutic intervention was implemented [1,6]. On the contrary, *B. thailandensis* is avirulent due to absence of virulence factors, in particular, type three secretion system-I (TTS-I) which acts as a toxin gun. In addition, *B. thailandensis* inhabits the environments of tropical areas, but unlike pathogenic species, it is very uncommon to be isolated from clinical specimen [7]. However, the infection with *B. thailandensis* seems to be opportunistic and the organism dose not caused infection sign unless being in high dose inside the host. This finding was confirmed by virulence studies that compared the lethal doses of different *Burkholderiae* administered to animal models and found that a higher bacterial inoculum was required for *B. thailandensis* to cause mild symptoms [8]. In a study, *B. thailandensis* demonstrated a >105 fold decrease in virulence relative to *B. pseudomallei* strains in Syrian golden hamsters animal model for acute melioidosis [4]. Even though, a single report had documented a case of melioidosis-like infection caused by *B. thailandensis*. In the United States, a healthy 2-years old boy was exposed to motor vehicle accident and developed aspiration pneumonitis during hospital admission. Respiratory flora and unidentified gram-negative rods were frequently isolated from his respiratory secretions and patient was treated with cefuroxime and tobramycin. Days after, the same unidentified gram-negative rods were isolated from repeated blood cultures and caused high-grade fever. Treatment was changed to ceftazidime and trimethoprim-sulfamethoxazole after that isolate was identified as *B. pseudomallei*. However, the blood isolate from that patient was submitted to the Centers for Disease Control and Prevention (CDC) for confirmatory identification and was identified as *B. thailandensis*. Further molecular confirmation was done using real-time PCR, 16S rRNA sequencing, DNA-DNA hybridization and MLST, which assigned the strain type as ST73 [9].

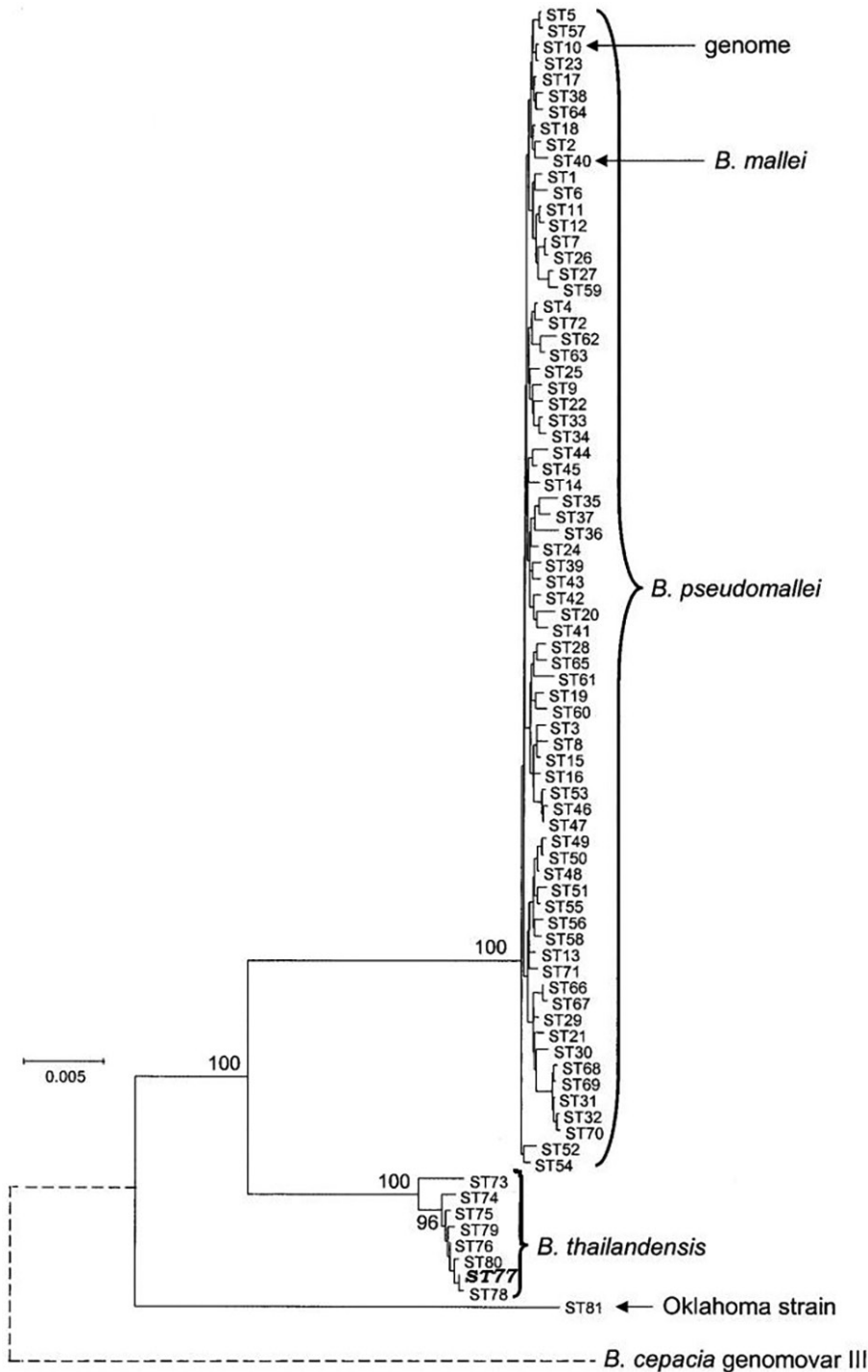


Figure 1. Multilocus sequence typing. The neighbor-joining phylogenetic tree was derived from concatenated allele sequences for each MLST locus. Analysis of concatenated sequences was done per Godoy et al. (2) using MEGA 3.1 (Kimura 2-parameter, 1,000-step bootstrap) (<http://www.megasoftware.net/>) and showed the topographic location of ST77 inside the cluster of *B. thailandensis* and its complete discrimination from *B. pseudomallei*.

The environmental persistence of *B. thailandensis* provides an evidence for acquiring the infection once the injured tissue exposed to contaminated elements [1]. In this report, the fish bone was most probably contaminated with *B. pseudomallei* and gained access through the damaged tissue.

The infection was nonbacteremic and was localized at soft tissue with usual manifestations of skin infection caused by *B. pseudomallei*. However, no major complications occurred due to low bacterial virulence. Results of MLST assigned our isolate with strain type ST77; same strain-type carrying

isolate (strain E125) was isolated previously from the environment of Thailand in 1991 and was typed by MLST2 and demonstrated the genetic relationship of ST77 within the cluster of *B. thailandensis* and how far it was from other *Burkholderia species* (Figure 1).

In conclusion, the emergence of environmental neglected bacteria as opportunistic pathogens upon exposure must be considered in endemic regions. These clinical situations emphasize the importance of definitively identifying the causative organism of disease. In our case report, arabinose assimilation proved to be useful method for identification. In addition, *B. pseudomallei*-specific PCR assays and MLST can differentiate between *B. pseudomallei* and *B. thailandensis*.

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