

## Burkholderia Pseudo Mallei and Burkholderia Mallei, Two Potential Bioterrorism Agents, are Identified by their Clinical Features and Laboratory Findings

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### Abstract

Despite the fact that both organisms are now uncommon in Western nations, their distinct potential as agents of bioterrorism has recently piqued much interest. Because medical and laboratory personnel are less familiar with these organisms than they are with other selected bioterrorism bacterial agents, a greater awareness of Glanders and Melioidosis is essential for adequate emergency preparedness and response to the deliberate release of *B. mallei* and *B. pseudo mallei*. In the clinical laboratory, it is difficult to make a microbiological diagnosis for either species. The role of sentinel laboratories is emphasized in this review of the various difficulties and pitfalls associated with the clinical diagnosis of Melioidosis and Glanders.

**Keywords:** Melioidosis; Glanders; Identification; Bioterrorism; Preparedness; *Burkholderia mallei*; *Burkholderia pseudomallei*; Human infection

### Introduction

*Pseudomallei* are distinct organisms, but they share numerous similarities and should be considered together in the context of a deliberate release event. Medical and laboratory personnel are less familiar with *B. mallei* and *B. pseudomallei* than they are with other selected bioterrorism bacterial agents like *Bacillus anthracis*, *Yersinia pestis*, and *Francisella tularensis*. As a result, a greater understanding of Glanders and Melioidosis is essential for adequate emergency preparedness and response to the deliberate release of *B. mallei* or *B. pseudomallei* [2]. Acknowledgment of the standards of microbiological analysis of Glanders and Melioidosis is of most extreme significance, in settings with practically no involvement in these irresistible sicknesses. This audit will zero in on the clinical elements and demonstrative difficulties and entanglements related with these specialists in the clinical microbial science research facility.

### Melioidosis and glanders in overview

#### Melioidosis

Melioidosis is more common in the Northern Territory and Western Australia and Queensland than elsewhere in Australia. Melioidosis is also widespread in the northern part of Thailand. Animals and humans both suffer from Melioidosis [3]. The contaminated environment, particularly soil and water, serves as *B. pseudo mallei*'s primary reservoir. Melioidosis can infect a variety of animals, making them potential reservoirs for on-going epizootic infection. Human-to-human and creature to human transmission is thought of as very uncommon. *B. pseudomallei* exhibit significant surviving capabilities during its interaction with the immune system of its host, despite its saprophytic nature and ability to survive in a relatively hostile environment. Melioidosis is spread through percutaneous inoculation, inhalation, ingestion, and more rarely sexual transmission in humans and animals. Even in patients with pneumonic Melioidosis, the percutaneous route is thought to be the most common entry point [4]. However, pulmonary infection can occur directly through inhalation and has also been reported in the context of near-drowning following the Tsunami in Thailand. Nearly two-thirds of patients with naturally

occurring Melioidosis had identified risk factors, most notably diabetes mellitus, chronic renal or lung disease, and alcohol abuse. Host risk factors play a significant role in the development of Melioidosis. However, the natural history of *B. pseudomallei* exposure in a scenario of deliberate release is poorly understood. Supportive complications can affect virtually every organ in the body, and protean and primary infection is the clinical manifestations of Melioidosis. Septic shock is present in one fifth of Melioidosis cases, and bacteraemia accounts for a significant portion of the disease's mortality [5]. Melioidosis may be the most common cause of community-acquired pneumonia in endemic areas, and pneumonia is by far the most common syndrome associated with *B. pseudomallei* infection. Melioidosis pneumonia may look like acute pneumonia but also look like sub-acute or chronic tuberculosis pneumonia. Up to 30 years after the initial infection, pulmonary reactivation may occur infrequently. Melioidosis can affect every organ system in addition to the lungs, resulting in genitourinary infections like prostatic infection and supportive par otitis, various forms of central nervous system infections like osteomyelitis and septic arthritis, the formation of intra-abdominal abscesses mostly involving the liver, adrenals, or spleen, necrotizing skin infections, mycotic aneurysms, or pericarditis [6].

### Diagnosis in clinical laboratories

#### Initial treatment

*B. mallei*, *B. pseudomallei*, and *B. cepacia* are the three main human pathogens that belong to this group. Rare taxa like *B. fungorum*, *B. gladioli* (previously *B. cocovenenans*), and *B. thailandensis* can

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infect humans. Burkholderia species are high-impact, non-spore-forming, gram-negative bacilli. Due to the presence of polar flagella, all species, with the exception of *B. mallei*, are motile. All appear as non-fermenters when they grow on MacConkey agar [7]. Attributable to their capacity to make due in unfriendly conditions, standard example assortment and transport standards are adequate for recuperating Burkholderia species in clinical practice. Techniques based on culture, antibodies/antigens, and molecular can be used to isolate and identify Burkholderia. All species may appear similar on gram stain; however, while *B. mallei* may appear as coccobacilli, *B. pseudomallei* may exhibit the typical bipolar staining and safety-pin appearance. All organisms thrive on MacConkey, blood, and chocolate agars, though *B. mallei* may not thrive on MacConkey because they are pickier. In addition, because growth occurs within less than five days in standard blood culture bottles, there is no need for prolonged incubation. 90% of *B. pseudomallei* strains grew within 48 hours using the BacT/Alert system. Melioidosis outcomes have been shown to be correlated with blood bacterial count. On the other hand, when a patient first presents *B. mallei* is rarely isolated from blood. The Ashdown agar medium, which includes crystal violet, neutral red, tryptic soy agar with glycerol, and gentamicin, can be used to improve *B. pseudomallei* isolation. Ashdown medium might be particularly valuable for examples from non-sterile locales like throat or rectum as well as sputum. There are now more recent modified agar media available. For bedside sample inoculation, an enrichment broth containing Ashdown medium can also be used. Sputum-negative and sputum-positive patients are equally sensitive to the diagnosis of Melioidosis, according to a recent study assessing the value of throat cultures in the diagnosis of the disease. Selective broth had a higher recovery rate than selective agar. More current proposed media for *B. pseudomallei* separation incorporate the *B. pseudomallei* particular agar and *B. cepacia* medium. The particular agar is remembered to advance development of mucoid *B. pseudomallei* provinces when contrasted with the Ashdown medium. In laboratories outside of endemic regions, neither is frequently utilized [9]. All three selective media were found to be equally sensitive in a comparison study, with the exception of Ashdown agar colonies becoming significantly smaller after 24 hours. *B. cepacia* medium produced the highest number of colonies. The least selective of all the media was *B. pseudomallei* selective agar. It's important to note that *B. cepacia* medium can also be used to isolate *B. mallei*, so it might be best for diagnosing an intentional release incident. In the first two days of growth, *B. pseudomallei* produce smooth colonies with a pungent odor and sometimes yellow to orange pigmentation. After a few days, the colony becomes dry and wrinkled, resembling *Pseudomonas stutzeri*. The odor of growing organisms is distinctively earthy and musty. Deep pink colonies can be found on Ashdown medium. The ability to grow at 42°C, motility, oxidase activity, and nitrate reduction is important phenotypic characteristics if *B. pseudomallei* are suspected. *B. mallei*, on the other hand, does not move, does not flagellate, does not grow at 42 degrees Celsius, and has varying oxidase activity. The smooth, grey,

and translucent *B. mallei* colonies lack any distinctive pigment or odor. *B. pseudomallei* can be separated from *P. stutzeri* by number of flagella and arginine hydrolase action that is positive just with *B. pseudomallei* [10].

## Conclusions

The majority of efforts are focused on the effectiveness and safety of laboratory-based diagnosis of Melioidosis and Glanders because the actual risk of deliberate release of *B. mallei* or *B. pseudomallei* is unknown, at least to the public. Due to physicians' lack of awareness of the clinical manifestations of Melioidosis and Glanders, microbiologists' lack of experience outside of endemic areas, the lack of appropriate media and identification systems in the typical sentinel laboratory, and the biosafety conditions required to process these organisms, diagnosing *B. mallei* and *B. pseudomallei* in the clinical laboratory is currently extremely challenging. Isolates that are compatible with *B. mallei* or *B. pseudomallei* should be immediately referred to a reference laboratory until new or improved diagnostic modalities are made available at the level of the sentinel laboratory. The bare minimum of phenotypic and biochemical tests that point to this diagnosis should be part of the sentinel laboratory workup.

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