

Identification of *Nocardiosis dassonvillei* in a Blood Sample from a Child

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Abstract: *Nocardiosis dassonvillei* is an environmental aerobic actinomycete producing a funguslike mycelium and aerial hyphae. Here we report the first *Nocardiosis dassonvillei* isolated from a blood sample from a 3-year-old child hospitalized with fever, respiratory difficulty and cough. To the best of our knowledge this is the first time this organism has been detected in the BacT/Alert system. This *Nocardiosis* was designated *Nocardiosis dassonvillei* based on morphological and physiological tests.

Key words: *Nocardiosis*, Blood Sample

INTRODUCTION

In 1976 Meyer described the *Nocardiosis* genus [1]. This new genus was characterized according to its mode of sporulation, molecular genetic studies, numerical taxonomic and chemotaxonomic analysis [1-6]. *Nocardiosis* genus is an aerobic actinomycete that includes several species [2, 5-8]. *Nocardiosis dassonvillei* is one of the species and it was originally named *Streptothrix dassonvillei*, changed to *Nocardia dassonvillei*, or *Actinomadura dassonvillei* and finally *Nocardiosis dassonvillei*. This genus resembles fungi and has been isolated from soil, water and organic matter. Not many members of the *Nocardiosis* genus have been involved with human pathogenesis. *Nocardiosis dassonvillei* is to a certain extent an exception and few reports describe its involvement in human pathogenesis. It has been implicated in a case of cellulitis of the arm [9] and in cases of alveolitis or suppurative pulmonary infection [10, 11]. Here we report the first *Nocardiosis dassonvillei* isolated from a blood sample from a 3-year-old child hospitalized with fever and respiratory difficulty. This uncommonly pathogen was recovered in a pediatric blood culture bottle in the BacT/Alert system (Organon Teknika). To the best of our knowledge this is the first time this organism has been detected in the BacT/Alert system and in a blood sample from a child.

CASE REPORT

A 3-year-old child was hospitalized with fever and some signs of respiratory distress with a productive cough. A blood sample was sent to the laboratory and bacterial growth was detected after 5 days in the BacT/Alert system (Organon Teknika). Microscopic analysis demonstrated a gram-positive filamentous bacterium with long hyphae and acid-fast negative. The only isolate was subcultured on nonselective media,

including blood, chocolate and Sabouraud's dextrose agar. Macroscopic analysis showed very dry and dissimilar crinkled colonies, yellowish to brown pigmentation and a soil-like odor. After further incubation, part of the colonies turned white. The aerial hyphae were long and branched with a zigzag aspect. The sporulation was complete and fragmented into spore chains of various sizes.

There is not a guideline for susceptibility tests for *Nocardiosis dassonvillei*. Primarily, the disk diffusion technique in both plates Mueller Hinton agar and Muller Hinton agar supplemented with blood was used for susceptibility tests for a broad range of antibiotics and later the Etest strip (a quantitative susceptibility test, trademark of AB Biodisk, Solna, Sweden) was used to establish the minimal inhibitory concentration for trimethoprim and gentamicin. The organism showed complete susceptibility on Etest strips to trimethoprim and aminoglycosides, but total resistance to cephalosporins and quinolones. Initially, an empirical therapy for bacterial infection was started with erythromycin. This course of therapy was changed after bacterial growth and susceptibilities were determined. Accordingly, trimethoprim and gentamicin were added to his antimicrobial regimen for 2 weeks with subsequent improvement in his clinical status. The treatment was kept under submaximal dosage for another 3 months.

Several tests were performed to characterize this organism. The bacterium tested positive for urease, gelatin hydrolysis and sensitive to lysozyme. Inoculation on adenine, casein, tyrosine, xanthine and hypoxanthine media resulted in hydrolysis. Acid formation from different carbohydrates and other characteristics tested are summarized in Table 1-3 in comparison to closed-related organisms.

DISCUSSION

Nocardiosis dassonvillei is an environmental aerobic actinomycete and its medical importance was initially

Table 1: General Characteristics

Organism	Cell-wall type	Cell-wall lipid Nocardio-mycolic acid	Acid-fast	Lysozyme
<i>Nocardioopsis dassonvillei</i>	III/C; meso-DAP, No characteristic sugar	Absent	(-)	Susceptible
<i>Nocardia</i>	IV; meso-DAP, Arabinose, galactose	Present	(+)	Resistant
<i>Actinomadura</i>	III/B; meso-DAP, Madurose	Absent	(-)	Susceptible
<i>Streptomyces somaliensis</i>	I; II-DAP, glycine, No characteristic sugar	Absent	(-)	Susceptible (Variable)

Table 2: Decomposition of Media

Organism	Adenine	Casein	Tyrosine	Xanthine	Hypoxanthine	Gelatin	Urea
<i>Nocardioopsis alba</i> ^(A)	(+)	(+)	(+)	(+)	(+)	(ND)	(+)
<i>Nocardioopsis dassonvillei</i>	(+)	(+)	(+)	(+)	(+)	(+)	(+)
<i>Nocardioopsis</i>	(+)	(+)	(+)	(+)	(+)	(ND)	(+)
<i>Synnemataformans</i> ^(A)							
<i>Nocardia brasiliensis</i>	(+)	(+)	(+)	(-)	(+)	(+)	(+)
<i>Actinomadura madurae</i>	(ND)	(+)	(+)	(-)	(+)	(+)	(-)
<i>Streptomyces somaliensis</i>	(ND)	(+)	(+)	(-)	(-)	(+)	(-)

Table 3: Acid Formation from

Organism	Cellobiose	Xylose	Arabinose	Inositol	Maltose	Mannitol	Lactose
<i>Nocardioopsis alba</i> ^(A)	(+)	(-)	(ND)	(-)	(+)	(-)	(ND)
<i>Nocardioopsis dassonvillei</i>	(+)	(+)	(+)	(-)	(-)	(+)	(-)
<i>Nocardioopsis</i>	(+)	(+)	(ND)	(+)	(+)	(+)	(ND)
<i>Synnemataformans</i> ^(A)							
<i>Nocardia brasiliensis</i>	(-)	(-)	(-)	(+)	(ND)	(+)	(-)
<i>Actinomadura madurae</i>	(+)	(+)	(+)	(+/-)	(ND)	(+)	(+)
<i>Streptomyces somaliensis</i>	(-)	(-)	(-)	(-)	(ND)	(-)	(-)

(-)= Negative (+)= Positive ND=Not done ^(A)= Data compiled from literature

related to mycetoma [12, 13]. In addition, it has been involved in cutaneous and pulmonary infections [9-11]. This organism may cause some difficulties in identification because of its close characteristics to other organisms. Other reports have identified *Nocardioopsis dassonvillei* on the basis of its cell wall fatty acid analysis and 16S rRNA gene sequence [2, 5-8, 14-16], but these methods are not generally available in the routine laboratory. Here, the *Nocardioopsis* was designated *Nocardioopsis dassonvillei* using morphological and several physiological tests.

Previous publication has reported the first *Nocardioopsis dassonvillei* in a blood isolate from a 60-year-old man presented with cholangitis [16]. The organism was detected using the BACTEC aerobic bottle in the BACTEC automated instrument. Our isolate was the first pediatric isolate retrieved from a blood sample. In addition, to the best of our knowledge this is the first time this organism has been detected in the BacT/Alert system. Apparently, this organism is not a common contaminant of blood samples and not a saprophytic organism in the human body. Since there was no other medical evidence to explain the illness and no other

etiological agent was isolated, we have attributed the illness condition to this organism.

Nocardioopsis dassonvillei is part of the dust-borne bacteria in schools, children's day-care centres and especially in animal sheds [17, 18]. The present child lives in a rural village, in an environment with precarious hygienic conditions; thus, the possibility that this organism was contracted from the soil is likely to be reasonable. On the other hand a less probable, but still possible way of contraction of the spores is through a familial member working in an animal shed. Precarious hygiene conditions may be predisposing factors to acquire infection. Furthermore, as discussed in Andersson *et al.*, [17], endotoxin from gram-negative bacteria and cell wall components of actinomycetes may be the causative agent for farmers' lung [18]. This is possible when assuming that inhalation of the bacteria from the soil is sufficient to induce hypersensitivity and pneumonitis. The hypersensitivity condition favors the establishment of the bacteria that can be propagated to the bloodstream leading to bacteremia.

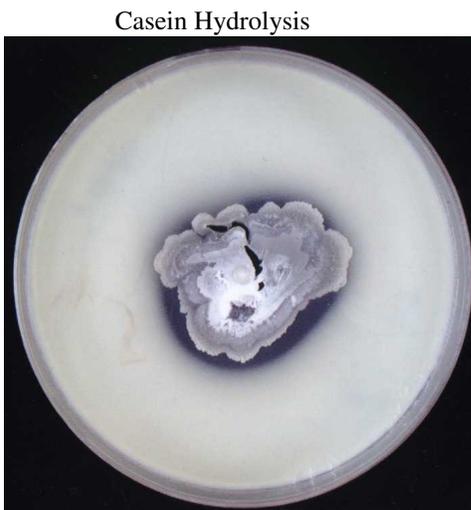
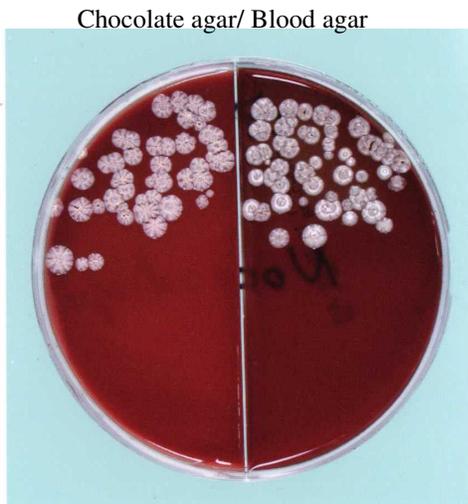


Fig. 1: Macroscopic Appearance of *Nocardiosis dassonvillei* and Hydrolysis of Different Substrates

Nocardiosis dassonvillei is not a human pathogen commonly retrieved from a blood sample and most of the routine laboratories are not familiar with aerobic actinomycetes. Furthermore, identification of this organism in a routine clinical laboratory is rare, since it cannot be identified by regular routine tests and a series of extra tests should be performed. In the future when molecular techniques will be accessible to diagnostic laboratories, the differentiation between this and other closely related organisms should shed light on a wide range of medically important pathogens by leading to a more detailed understanding of relations between pathogen and illness.

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