Nocardiosis

By Delvin Jackson

Etiologic agent

The majority of reported cases (greater than 50%) are caused by the *Nocardia asteroides* complex, which consists of the following:¹

- *N. abscessus*
- *N. cyriacigeorgica*
- *N. farcinica*
- *N. Nova*

Other known pathogens include the following:¹

- *N. transvalaensis* complex
- *N. brasiliensis*
- *N. pseudobrasiliensis*

**Pathogenesis (transmission and reservoirs)** *Nocardia* is typically found in soils and organic materials and can be found in these reservoirs pretty much anywhere in the world.² “It is present as normal flora in healthy gingiva as well as in the periodontal pockets.”⁴ “Human infection typically occurs though the inhalation of air born bacilli or through traumatic inoculation of the organism into the skin.”² The infection is not transmissible from one individual to another.² Nosocomial infections are possible but rare.

**Characteristics and taxonomy** “The genus *Nocardia* is currently composed of 87 validly described species, of which 46 are medically relevant.”³ It belongs to the suborder Corynebacterineae of the phylum *Actinobacteria*.⁴ The microorganisms are filamentous rods that show right angle branching both in culture and in tissues. For culture they require aerobic conditions and tend to fragment into coccobacillary forms during the stationary phase.³ *Nocardia* is gram positive, however some strains can have a “faint beaded appearance with alternating positive and negative areas.

**Identification**

- Gram positive², Brown-Brenn modification of gram stain or Gomori methenamine stain³
- Acid fast stain² kinyoun method³ (it is mildly acid fast)
- Patterns of proteolytic hydrolysis²
• Acid fermentation of various substrates\textsuperscript{2}

• Non-motile\textsuperscript{4}

• Non-encapsulated\textsuperscript{4}

**Signs and Symptoms**

• Pulmonary Nocardiosis often presents with “subacute or chronic necrotizing pneumonia, which is frequently associated with cavitation. Local complications of Nocardia spp. pulmonary infections include pleural effusion, empyema, pericarditis, mediastinitis, superior vena cava obstruction and rarely development of chest wall and neck abscesses.” \textsuperscript{3}

• Disseminated Nocardiosis is defined as lesions containing *Nocardia* found at more than one body location. \textsuperscript{5} It is most often endogenous from a primary infection and in patients with pulmonary nocardiosis may result in brain and skin lesions. \textsuperscript{3}

• Cutaneous Nocardiosis can be subdivided into four clinical types. \textsuperscript{3} 1. Mycetoma

2. Lymphocutaneous infection

3. Superficial skin infection

4. Secondary cutaneous involvement with disseminated disease\textsuperscript{3}

• **History** The *Nocardia* genus was first identified by Prof. Edmund Nocard (a French veterinarian and microbiologist), in 1888. Edmund Nocard lived from 1850-1903, and was a highly regarded scientist in his time. \textsuperscript{6}

**Virulence factors** Nocardiosis is typically associated with immune-compromised patients, particularly those with T-cell dysfunctions, immunoglobulin deficiencies, or leukocyte abnormalities. Natural resistance for a normal healthy individual is very strong and is mediated by intact tissue membranes, and alveolar and tissue phagocytes. \textsuperscript{2} *Nocardia* species have been shown to act as facultative intracellular organism within macrophages, where they inhibit the fusion of phagosomes with the lysosomes.\textsuperscript{3} Resistance to oxidative killing mechanisms of phagocytes may be due to the production of super oxide dismutase and to increased levels of catalase. \textsuperscript{7}

**Control and Treatment** Six major classes of antibiotics are used clinically for the treatment of infections caused by *Nocardia*, sulfonamides, b-lactam/b-lactamase inhibitors, quinolones, macrolides, and tetracyclines. \textsuperscript{3} Sulfonamides are typically the preferred drug treatment for nocardiosis. In special cases such as pulmonary nocardiosis a combination drug such as
Trimethoprim-sulfamethoxzole, with better penetration into tissues in the lungs, pericardium, and mediastinum is the preferred choice.³ Treatment times range from 2-3 months for a minor infection to 1-3 years for major infections.²³

Prevention/Vaccine

No vaccine has been developed for *Nocardia*. Prevention is best practiced by using a dust mask when at risk for exposure and cleaning any traumatic injuries incurred quickly effectively.

Current outbreaks prevalence/incidence local

“In the United States it is estimated that 500-1000 new cases per year making the incidence rate 1 in 544,000. 60% of these cases are associated with pre-existing immune compromise.”¹ Men are at greater risk, for every one woman diagnosed three men are diagnosed.¹ There are no localized outbreaks based on geography.

Current outbreaks prevalence/incidence global

The only global statistics I could find were extrapolations based on the US statistics, I have chosen not to include them in this report as the data were deemed to be unrealistic.

Works Cited


