

## Phenotypic and Molecular Properties of the *Nocardia* Species

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### Dear Editor,

*Nocardia* spp are gram-positive aerobic, partially acid fast and filamentous bacteria that cause Nocardial infections (nocardiosis) in human. The genus *Nocardia* has slow-growth on various media and lives in environment such as soil, dust, sand and air (1-3). *Nocardia* identification at the species level is very important for four reasons: 1) to predict antimicrobial and anti-bacterial susceptibility 2) for epidemiological studies 3) to determine the final diagnosis that is necessary for treatment and 4) for geographic repartition (3-5). These bacteria cause infections in patients with immune disorder disease and immune-competent individuals. Course of treatment in these patients is long (6) so correct identification of species is important. There are two methods for species identification in the genus *Nocardia*: 1) phenotypic and biochemical methods 2) molecular techniques. Phenotypic methods include factors such as colony morphology, Gram and partially acid fast staining, growth in lysozyme broth, growth at 45°C, hydrolysis of casein, xanthine, hypoxanthine, esculin, adenine and gelatin, and the utilization of citrate, acetamide and various sugars (2, 5). The uses of phenotypic methods are time consuming, laborious and analysis of phenotypic tests needs skilled personals (4). The number of *Nocardia* spp are increasing, so accurate identification using phenotypic characteristics is difficult (6). In the recent years (1990s), various molecular methods such as 16S rRNA-restriction fragment length polymorphism (RFLP), HSP gene-RFLP, PCR-sequencing such as 16S rRNA (1500 regain), 65 kDa heat shock proteins (TB11 and TB12 primers), *gyrB* (GYRBF1 and GYRBR1 primers) and *sod* (Z205 and Z212 primers) genes were used for more accurate identification of *Nocardia* species. For 16S rRNA-RFLP and HSP gene-RFLP analysis, restriction

enzyme analysis (REA) is used, such as *HinPII*, *SphI*, *BstEII*, *HindIII*, *DpnII*, *BsaHI*, *Hinfl* and *MspI* (1-3, 6, 7). The results of several molecular techniques with phenotypic methods have been reported to be acceptable and appropriate for *Nocardia* species (7, 8). Wallace et al. during 1986, reported antimicrobial typing (six types) for some of the species. In this report various antimicrobial agents were used for *Nocardia* specious identification (2, 9). In summery the use of phenotypic and molecular methods is nessesary for *Nocardia* spp identification, specially *Nocardia* group complex.

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### Authors' Contribution

Mehdi Fatahi Bafghi contributed in designing, conducting and writing the manuscript; Parvin Heidarieh, designing and Writing the manuscript; Shadi Habibnia, conducting literature review the manuscript; Masoumeh Rasouli Nasab, conducting literature review the manuscript; Davood Kalantar Neyestanaki, conducting literature review the manuscript; Davoud Afshar, conducting literature review the manuscript; Seyyed Saeed Eshraghi, contributed in designing, conducting and Writing the manuscript.

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