case report

First report of *Gordonia terrae* from Iran soil

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ABSTRACT

Gordonia terrae is the aerobic actinomycete that is microflora in soil. This study is the first report of *Gordonia* species from Iran soil and accurate identification in level species was obtained with conventional tests and 16S rRNA gene sequencing.

Key words: 16S rRNA gene, *Gordonia terrae,* Iran, soil

INTRODUCTION

Gordonia spp. are a Gram-positive coryneform bacterium[1] that isolated of various environmental sources.[2] *Gordonia* was first described in 1971 by Tsukamura of soil, and this bacterium was in the genus *Rhodococcus* previously.[1,3] *Gordonia terrae* is one of the major pathogens in the genus *Gordonia*[4] and is cause various infections in human such as brain abscess,[5,6] skin infection with lymphadenitis,[7] granulomatous mastitis,[8] and metatarsal osteomyelitis.[9] In the current paper, we describe the first report of *G. terrae* that isolated from Iran soil and accurate identification was done with phenotypic methods and 16S rRNA gene sequencing.

MATERIALS AND METHODS

Isolation method

The soil samples were collected for a survey of *Nocardia* species diversity from Iran soil.[10-12] This strain was isolated by paraffin baiting method (this method is not specific for *Gordonia* isolation and was isolated in our study accidentally) from one soil samples from North Khorasan, Iran.

Microbiological analysis

Our isolate has orange colonies on glass rod containing paraffin. Pure colonial of this bacterium was sub-cultured on nutrient agar and sabouraud dextrose agar containing the cycloheximide.

Phenotypic tests

This bacterium has orange pigmented colonies [Figure 1] and was pleomorphic rods in Gram-positive and partially acid-fast and was negative for kinyoun acid-fast staining. Results of phenotypic tests was: not growth in lysozyme broth and at 45°C, negative for aerial hyphae, negative for hydrolysis of urea, gelatin, esculin, tyrosine, hypoxanthine, xanthine, casein, positive for nitrate reductase, utilization of citrate, Acid production from sugars was positive for rhamnose and sucrose and was negative for sorbitol, glucose, L-arabinose, D-xylose, galactose, mannitol, lactose, and maltose, raffinose. Our isolate was suspicious to *Gordonia* spp., *Rhodococcus* spp., *Tsukamurella* spp. and *Corynebacterium* spp.

DNA extraction

DNA genomic extraction was done the method described by Bafghi *et al*. previously.[13]

Full-length 16S rRNA gene sequencing

After DNA extraction from a pure culture of isolate for molecular accurate identification in the species level, sequencing, and

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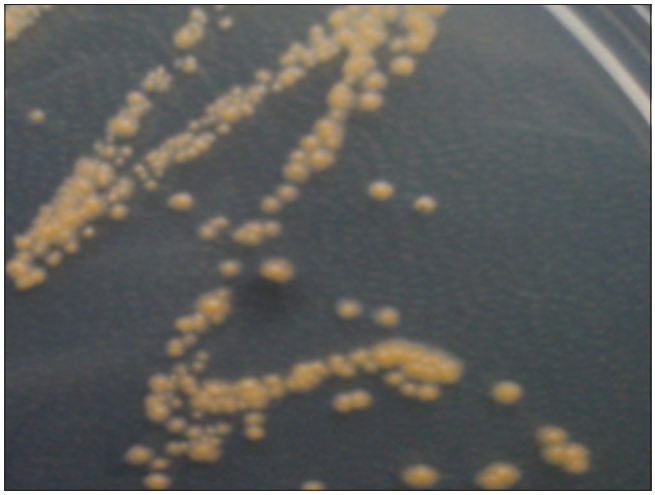

Figure 1: Orange colonial on nutrient agar medium

analysis of 16S rRNA gene was done. Universal primers used in this study include: 27f (AGAGTTTGATCMTGGCTCAG) and 1525r (AAGGAGGTGWTCCARCC).[14] Sequence was analyzed with jPhydit software and using BLAST search of the National Institutes of Health GenBank database. The accession number for the 16S rRNA gene sequence of our strain is KP234025.

DISCUSSION

The first time, Tsukamura described the genus *Gordona* in 1971.[1] In 1977 and 1997, respectively, Goodfellow and Alderson reclassified members of the genus *Gordona* into the genus *Rhodococcus* due to the similarity of phenotypic and morphologic characterization[15] and this genus was renamed as *Gordonia* by Stackebrandt *et al*.[16] *Gordonia* species are extensively distributed in the environment, especially in soil. Members of this genus are aerobic, catalase-positive, partially acid-fast, non-motile, and Gram-positive rods.[1] Recently, 38 species of *Gordonia* has been identified by phenotypic and molecular techniques (www.bacterio.net/gordonia.html). The genus *Gordonia* is an opportunistic pathogen in healthy individuals and particularly in patients with disorders of the immune system.[17,18] *Gordonia* spp. can be misidentified when examined using phenotypic tests alone[19,20] therefore, used the molecular methods such as 16S rRNA gene sequencing, HSP-RFLP, and *gyrB* gene sequencing.[21-24] Full-sequence 16S rRNA gene sequencing is suitable for accurate identification in the genus *Gordonia*. Drancourt *et al*. reported *G. terrae* of brain abscess and central nervous system in 1994 and 1997, respectively.[5,6] Gil-Sande *et al*. reported *G. terrae* of acute cholecystitis in 2006.[20] Grisold *et al*. in 2007 reported *G. terrae* from a patient with catheter-related bacteremia.[25] Blanc *et al*. isolated *G. terrae* of palpebral abscess in 2007.[19] Lai *et al*. reported fifteen cases of *Gordonia* spp. such as *Gordonia sputi* and *G. terrae* from Taiwan, in 2010.[21] All articles listed were used of 16S rRNA gene sequencing for molecular identification. *G. terrae* is one of this species that have been misidentified as *Rhodococcus* because both genera have similar biochemical characteristics and most species have red to orange-pigmented colonies and commercial kits have not introduced for different them from the similar genus (aerobic actinomycetes).[1,19,21,26] *Gordonia*, *Nocardia* and *Tsukamurella* are Gram-positive and partially acid-fast with non-*Mycobacterium tuberculosis*. The genus *Nocardia* growth in lysozyme broth and has aerial hyphae but *Gordonia* (*Gordonia amarae* and *Gordonia defluvii* exhibit aerial hyphae with microscopically), *Tsukamurella* and non-*M. tuberculosis* are negative for growth in lysozyme broth and aerial hyphae. Beta-galactosidase is positive in *Tsukamurella* and *Nocardia*.[20,27-33] In conclusion, we have two recommendation for microbiologists that interested for study in this genus, clinical laboratory and clinicians: (1) Environmental study of this pathogen is important in each region (transfer to human from environmental source) (2) isolation of this microorganism from clinical samples is difficult and rarely because this microorganism are similar to *Rhodococcus* spp. and *Nocardia* spp. in some features and need a skillful specialist and molecular works.

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Conflicts of interest

There are no conflicts of interest.

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