Isolation of *Mycobacterium massiliense* from a corneal biopsy in India

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**Introduction:** Rapidly growing mycobacteria (RGM) are ubiquitous and are usually considered saprophytes, and have been recovered from the environment, particularly in dust, watery soil and water distribution systems. However, *Mycobacterium massiliense* is a rare causative agent of ocular infection.

**Case presentation:** We report a case of *M. massiliense* in a 44-year-old female with signs and symptoms of a corneal ulcer. We carried out PCR-based DNA sequencing targeting the *hsp 65* gene for the identification of *M. massiliense*. To confirm the identification, we also performed PCR-based RFLP targeting the *hsp65* gene and PCR-based DNA sequencing targeting the internal transcribed spacer region, which showed 97 % nucleotide identity with *M. massiliense*.

**Conclusion:** To the best of our knowledge, this is the first study in India to report the detection of *M. massiliense* from a corneal biopsy.

**Keywords:** corneal biopsy; *Mycobacterium massiliense*; RGM.

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**Abbreviations:** ITS, internal transcribed spacer; RGM, rapidly growing mycobacteria

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**Introduction**

Rapidly growing mycobacteria (RGM) are ubiquitous and are usually considered saprophytes, and have been recovered from the environment, particularly in dust, watery soil and water distribution systems. RGM are currently gaining attention because of their emerging importance in both sporadic infection and outbreak settings (Adekambi et al., 2004). The most common RGM causing human diseases are *Mycobacterium abscessus*, *Mycobacterium chelonae* and *Mycobacterium fortuitum*. RGM are rare causative agents of ocular infection and are associated with ocular trauma, contact lens use and corneal procedures especially laser in situ keratomileusis, extracocular surgery including tear duct probing, scleral buckling and dacryocystorhinostomy intraocular surgery including cataract surgery, penetrating keratoplasty and intravitreal triamcinolone injection.

*Mycobacterium massiliense* is a rapidly growing *Mycobacteria* species sharing an identical 16S rRNA gene sequence with *Mycobacterium abscessus*. The species *M. massiliense* was proposed in 2004 and the name was validated in 2006 (Simmon et al., 2007). They are strictly aerobic, non-motile, non-spore-forming, acid-fast, Gram-positive rods. In contrast to *Mycobacterium tuberculosis*, there is no systematic reporting of non-tuberculous mycobacterial infections; thus, precise incidence data are lacking. To the best of our knowledge, this is the first report on the isolation of *M. massiliense* from a corneal biopsy in India.

**Case report**

A corneal biopsy specimen from a 44-year-old female with signs and symptoms of corneal ulcer was received in the microbiology laboratory for mycobacteriology investigations. Acid-fast staining by the Ziehl–Neelsen method showed the presence of acid-fast bacilli. Culture for acid-fast bacilli was done using a BACTEC Micro MGIT culture system (Becton Dickinson, Maryland, USA), which showed a positive signal after 5 days, and the bacteria were subsequently subcultured on to Löwenstein–Jensen (LJ) medium containing 4.5 % NaCl. The conventional biochemical tests for iron uptake, aryl sulphatase (3 days) and nitrate reductase were positive, whilst aryl sulphatase (7 days) was negative.

After the culture became positive, nested PCRs targeting the *MPB64* (Therese et al., 2005) gene and the IS6110 (Therese et al., 2005) region for detection of the *M. tuberculosis* genome were performed on the isolate and were negative, indicating that the isolate was a non-tuberculous mycobacterium.

To confirm the identification, PCR-based RFLP (Wang et al., 2004) using the enzymes BstEII and HaeIII targeting
the hsp65 gene and PCR-based DNA sequencing targeting the hsp65 and internal transcribed spacer (ITS) (Telenti et al., 1993) region were performed.

PCR-based RFLP using BstEII and HaeIII yielded fragments of 235 and 220 bp, and of 200, 70, 60 and 50 bp, respectively (Fig. 1). PCR-based DNA sequencing targeting hsp65 and the ITS region show 97 % nucleotide identity with M. massiliense reference strains deposited in GenBank and our M. massiliense sequence was deposited in GenBank. Antibiotic susceptibility testing was performed using the Kirby–Bauer method, and the isolate was found to be sensitive to cefoperazone, doxycycline, ceftaxime and clarithromycin and resistant to cefuroxime, ceftriaxone, ceftazidime and cefazolin.

Discussion

M. massiliense has recently been identified as a new species of non-tuberculous RGM causing human infections. Recently, reports on RGM infections in various clinical situations have markedly increased, and in these reports, M. abscessus infection is the most frequently encountered. Moreover, nearly 95 % of soft-tissue infections caused by RGM are M. chelonae–M. abscessus complex infections (Simmon et al., 2007). M. chelonae–M. abscessus group taxonomy has undergone several updates due to the discrimination of new species by sequencing multiple housekeeping genes and, to a lesser extent, by the evaluation of phenotypic characteristics. M. massiliense is a newly proposed species that is closely related to members of the M. abscessus–M. chelonae group, and consequently should be considered part of the same group.

M. massiliense was first reported to cause human infection by Adekambi et al. (2004) following its isolation from the lower respiratory tract of a 50-year-old woman with haemoptoic pneumonia. Kim et al. (2007) reported an outbreak of M. massiliense infection associated with intramuscular injections administered at a local clinic in Korea, and carried out a comparative sequence analysis of the 16S rRNA, rpoB and hsp65 genes by PCR-based DNA sequencing and also constructed phylogenetic trees obtained from the rpoB and hsp65 sequences. Simmon et al. (2007) described the isolation and identification of M. massiliense in the USA associated with invasive infections, and sequenced portions of the rpoB, sodA and hsp65 genes to gain a better understanding of the frequency of detection of M. massiliense or Mycobacterium bolletii among clinical isolates identified as being M. chelonae/M. abscessus by 16S rRNA and ITS assays. Recently, Cristina et al. (2008) suggested a newer classification of M. chelonae–M. abscessus group that included M. chelonae, Mycobacterium immunogenum and M. abscessus with M. abscessus subsp. abscessus and M. abscessus subsp. massiliense using both phenotypic identification (biochemical tests, high-performance liquid chromatography and drug susceptibility testing) and genotypic identification (DNA sequencing and phylogenetic analysis using the hsp65 and rpoB genes, PCR/restriction enzyme analysis for hsp65, and RFLP analysis of the 16S rRNA gene) (Cristina et al., 2008). In our study, we carried out PCR-based DNA sequencing targeting the hsp65 gene for the identification of M. massiliense. To confirm the identification, we also performed PCR-based RFLP targeting hsp65 and PCR-based DNA sequencing targeting the ITS region showing 97 % nucleotide identity with M. massiliense. In conclusion, we believe that this is the first report on the isolation of M. massiliense from a corneal biopsy in India, and M. massiliense should be considered an emerging pathogen, but further studies should be made to understand the pathogenic mechanism of this organism.

**Fig. 1.** PCR RFLP patterns of M. massiliense digestion with Haelll and BstEII. (a) Haelll digestion. Lanes: 1, M. tuberculosis H37RV ATCC (160, 140, 70 bp); 2, M. fortuitum ATCC 1529 (155, 135 bp); 3, M. chelonae TMC 1542 (160, 60 bp); 4, M. abscessus laboratory isolate (160, 60 bp); 5, M. massiliense isolate from corneal biopsy (this study; 200, 70, 60, 50 bp); 6 and 7, M. massiliense isolate from non-ocular specimens (not included in this paper); 8, 100 bp molecular weight ladder. (b) BstEIl digestion. Lane: 1, M. tuberculosis H37RV ATCC (245, 120, 80 bp); 2, M. fortuitum ATCC 1529 (245, 125, 80 bp); 3, M. chelonae TMC 1542 (245, 220 bp); 4, M. abscessus lab isolate (245, 220 bp); 5, M. massiliense isolate from corneal biopsy (235, 220 bp); 6 and 7, M. massiliense isolate from non-ocular specimens (not included in this paper); 8, 100 bp molecular weight ladder.
References


