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Case study

A case of pulmonary infection due to *Mycobacterium paraffinicum* from the Amazon Region

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ABSTRACT

M. paraffinicum, a slow-growing scotochromogenic mycobacterium that uses paraffinic hydrocarbons other than methane, i.e. inorganic carbon sources, was originally isolated from soil samples, but only in 2010 definitely achieved the species status. We have described here the first report of pulmonary disease due to *M. paraffinicum* in Amazon Region.

Case report

An 86-year-old female patient, weighing 28.6 kg, was admitted to the Pulmonology Service at the University Hospital in 2014. The patient presented complaints of dyspnea on minor exertion, marked emaciation, ventilatory-dependent chest pain in right hemithorax and productive cough with mucopurulent sputum. She had no fever or hemoptysis, reported a history of smoking with the daily use of tobacco pipe for 53 years and exposure to smoke from wood stoves and charcoal. The HIV test was negative. Chest images by high-resolution computed tomography (HRCT) are presented in Fig. 1. She was initially diagnosed with pulmonary tuberculosis, based on sputum smear microscopy, and treated with regimen of rifampin, isoniazid, ethambutol and pyrazinamide, however, she remained with positive AFB smears between the 5th and 6th month of treatment. Nontuberculous mycobacteria (NTM) was repeatedly isolated from her sputum samples and identified as *Mycobacterium paraffinicum* (Fig. 2), by partial 16S rRNA and *hsp65* gene sequencing [1,2]. Patient started an oral empirical regimen including rifabutin, clarithromycin and ciprofloxacin, which was discontinued after 15 days in consequence of dyspeptic complains.

Due to persistence of respiratory symptoms, the patient received 250 mg of oral azithromycin three times per week with good tolerance and clinical improvement (reduction of cough and dyspnea) after three months of therapy, remaining persistently acid-fast bacilli (AFB) smear-positive sputum. Her sputum samples exhibited a mucoid aspect in that time. Antibacterial susceptibility testing results were not available at the time of treatment initiation. Determination of minimum inhibitory concentrations (MIC) was performed by broth microdilution method according to Clinical Laboratory and Standards Institute [3], using alternatively susceptibly breakpoint for first and second line drugs recommended for *M. kansasii*. Isolates exhibited sensitivity to clarithromycin (MIC 16 μg/mL), moxifloxacin (MIC 2 μg/mL) and sulfamethoxazole-trimethoprim (MIC 2/38 μg/mL); and resistance to ciprofloxacin (MIC 16 μg/mL), rifampicin (MIC 4 μg/mL), amikacin (MIC 32 μg/mL) and ethambutol (MIC 10 μg/mL).

The patient abandoned treatment due to undesirable side effects caused by therapeutic regimen proposed and her clinical follow-up was lost. Until then we had no news of her return to the Pulmonology Service.

Discussion

M. paraffinicum, a slow-growing scotochromogenic mycobacterium that uses paraffinic hydrocarbons other than methane, i.e. inorganic carbon sources, was originally isolated from soil samples, but only in 2010 definitely achieved the species status. It exhibit resistance to ethambutol and susceptibility *in vitro* to amikacin, rifabutin, clarithromycin and linezolid [4,5].

There are rare reports in clinical settings on *M. paraffinicum* infections, including a pseudo-outbreak described in a tertiary hospital,

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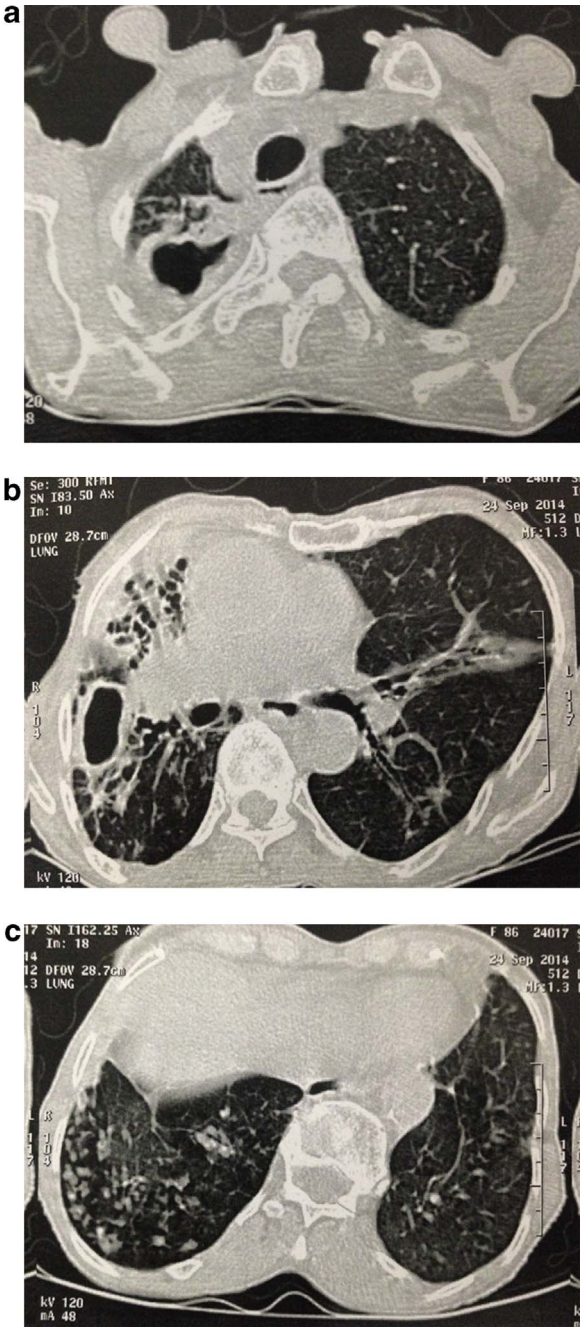

Fig. 1. High-resolution computed tomography images from patient with *M. paraffinicum* pulmonary disease, showing (A) cavitary lesion in right upper lobe; (B) cavitary lesion in right lung and bilateral bronchiectasis; and (C) centrilobular nodules in right lower lobe.

where the species was identified in clinical specimens from 21 patients over 2.5-year period. Epidemiological and environmental analysis established an ice machine located in the hospital unit as infection source [6]. Beside this, there is the report of the first *M. paraffinicum* lung disease case in 2014, in an 85-year-old patient with the nodular bronchiectasis form. Isolates exhibited sensitivity to ciprofloxacin, clarithromycin, linezolid and doxycycline; and resistance to ethambutol, streptomycin, amikacin and imipenem. The patient was treated with azithromycin, ciprofloxacin and linezolid, which was discontinued due to nausea and vomiting symptoms [7].

Comparing results in susceptibility tests with *M. paraffinicum* reports, we have found different susceptibility profiles, which point to the need of performing susceptibility tests for each isolate with the objective of verifying the *in vivo* behavior of different drugs and thus aid in the therapeutic conduct.

In this context, NTM treatment remains a challenge and related to several matters including: (I) profiles on drug susceptibility *in vitro* testing in NTM may be both species and strain-dependents, (II) correlation between *in vitro* susceptibility tests and *in vivo* response are not always possible, (III) few drugs available for NTM treatment, (IV) regime may vary according to severity of disease or oral medication tolerability, and (V) limited number of publications with data on *in vitro* susceptibility or even reports of experiences of empirically established therapeutic schemes accompanied by clinical outcomes for rarely isolated or newly established species, such as *M. paraffinicum*. All those factors difficult the definition of therapeutic protocols or recommendations to aid clinicians in selection of appropriate therapeutic regimen.

Similarly to Chan et al. [7], our case also occurred in an elderly female patient, but with chronic cavitary form, who was not able to tolerate to treatment due to gastric symptoms. We prescribed azithromycin as an immunomodulatory agent, despite the risk of developing monotherapy-related resistance in the treatment of NTM [8–10]. In addition, azithromycin administration could bring some benefits to the patient's qualities of life, since studies have shown that prolonged use of macrolides is associated with a reduction of the number of infectious exacerbations in patients with non-fibrocystic bronchiectasis [11–14]. Currently, macrolides are indicated to patients with three or more infectious exacerbations per year, colonization by *Pseudomonas aeruginosa* and in those with less frequent exacerbations and significant impairment of the quality of life [15].

Conclusion

Although it was initially described only in pseudo outbreak *M. paraffinicum* is capable of causing symptomatic lung disease and should be considered as NTM species with pathogenic potential.

Disclosure statement

The authors declare that they have no competing interests.

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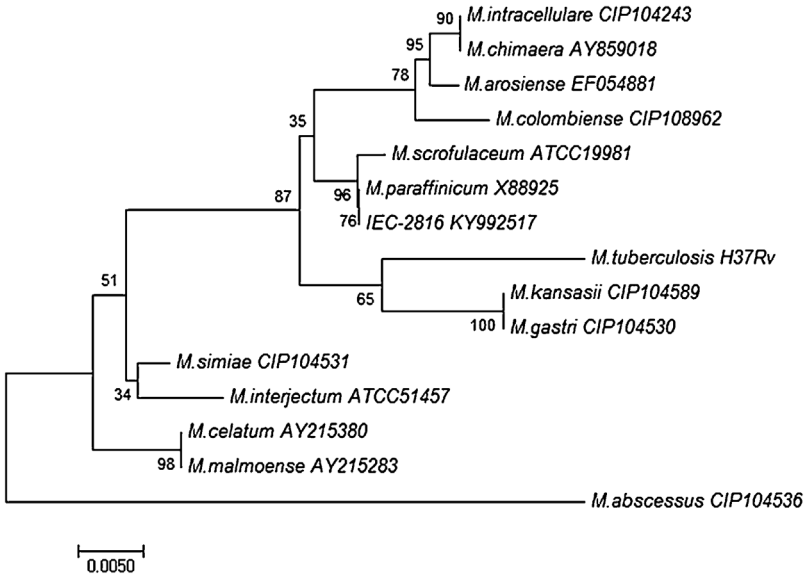

Fig. 2. Relationships between sequences from some reference strains of slowly growing mycobacteria and IEC-2816 strain inferred from the partial 16S rDNA gene. The phylogenetic tree was constructed using the Neighbor-Joining method and Kimura-2-parameter distance correction model. The numbers at the nodes indicate bootstrap values obtained in 1000 repetitions (expressed in percentages). *M. abscessus* was used as outgroup. The 16S rDNA gene sequence was deposited in GenBank under accession number KY992517.

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