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Brown-Pigmented *Mycobacterium mageritense* as a Cause of Prosthetic Valve Endocarditis and Bloodstream Infection

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***Mycobacterium* spp. are a rare cause of endocarditis. Herein, we describe a case of *Mycobacterium mageritense* prosthetic valve endocarditis. This organism produced an unusual brown pigment on solid media. Cultures of valve tissue for acid-fast bacilli might be considered in some cases of apparently culture-negative prosthetic valve endocarditis.**

CASE REPORT

A 47-year-old woman with a past medical history of a rheumatic aortic stenosis, status post-mechanical aortic valve replacement 6 months prior to the onset of symptoms, presented for medical care with a chief complaint of severe headache and left-sided weakness. A computed tomography (CT) scan demonstrated a subarachnoid hemorrhage in the right parietal lobe. Magnetic resonance imaging (MRI) and angiogram did not reveal any vascular etiology for the stroke. Two sets of blood cultures were drawn upon admission (each set included two bottles): VersaTREK REDOX1 (aerobic) and REDOX2 (anaerobic) (TREK Diagnostic Systems, Cleveland, OH) and were negative after 5 days of incubation. The patient was restarted on anticoagulants and discharged.

Approximately 1 month later, she presented to an outside hospital with complaints of a severe, persistent headache. At this time, a CT scan illustrated multiple punctate 6- to 7-mm foci of intraparenchymal hemorrhage within the right frontal lobe. She was transferred to our institution for further workup and management. During this visit, a transesophageal echocardiogram demonstrated two mechanical aortic valve vegetations, an aortic root abscess, and a possible early valve dehiscence. One blood culture set was collected on day 2 posttransfer, and two sets were collected on days 3 and 4 posttransfer. The patient was started on an empirical regimen of cefepime, rifampin, vancomycin, and gentamicin for early prosthetic valve endocarditis.

After approximately 100 h of incubation, one bottle from each of two blood culture sets (the REDOX1 bottles) was positive with acid-fast bacilli (AFB). Four additional blood culture sets (all REDOX1 bottles) became positive over the next few days, all containing AFB and all incubating for approximately 100 h prior to signaling positive. There was no growth in any of the REDOX2 (anaerobic) bottles. Positive blood cultures were subcultured to Middlebrook 7H10 agar plates (Remel, Lenexa, KS) and Lowenstein-Jensen (LJ) agar slants (Becton Dickinson, Sparks, MD) and incubated at 35°C. Buff-colored colonies were present on both plates within 3 days of inoculation. A Kinyoun stain was performed to confirm that the isolate was an acid-fast bacillus (Fig. 1). Seven to 10 days after subculture onto the 7H10 agar, it was noted that the colonies appeared to have a dark brown pigment (Fig. 2). Cultures were sent to the Wisconsin State Laboratory of Hygiene for identification and susceptibility testing. The organism was identified as *Mycobacterium mageritense* by *rpoB* gene sequencing and was susceptible to amikacin, cefoxitin, ciprofloxacin, doxycycline, imipenem, linezolid, trimethroprim-sulfamethoxazole, and moxifloxacin and resistant to clarithromycin (MIC of 16 μg/ml after 4 days of incubation) and tobramycin. Upon identification of AFB in the blood cultures, the patient was started on amikacin, moxifloxacin, azithromycin, and imipenem. After the organism was identified and susceptibility testing was available, the antibiotic regimen was modified to doxycycline, moxifloxacin, and imipenem. Subsequent blood cultures were negative.

Approximately 6 weeks after admission, the patient underwent a valve replacement surgery without complication and was discharged 10 days later on doxycycline, moxifloxacin, and imipenem. Cultures of the valve, fluid, and aortic root were submitted for aerobic and anaerobic cultures and were negative for growth; no organisms were seen on the Gram stain of the specimen. The valve tissue was also submitted for AFB culture and was positive for the growth of AFB 4 weeks later. Again, the organism produced a brown pigment on 7H10 agar. The valve culture was sent to the Wisconsin State Laboratory of Hygiene for identification and was identified as *M. mageritense* by *rpoB* gene sequencing.

Mycobacterium mageritense was first characterized in 1997 (1). Five nonpigmented, rapidly growing strains were isolated from human sputum from patients from two different medical centers between 1987 and 1989 in Spain. Biochemical analyses and partial gene sequencing demonstrated that *M. mageritense* had similarities to both *Mycobacterium smegmatis* and *Mycobacterium fortuitum*. Additional studies on six strains from the United States (three isolates from Texas, one from New York, one from Louisi-

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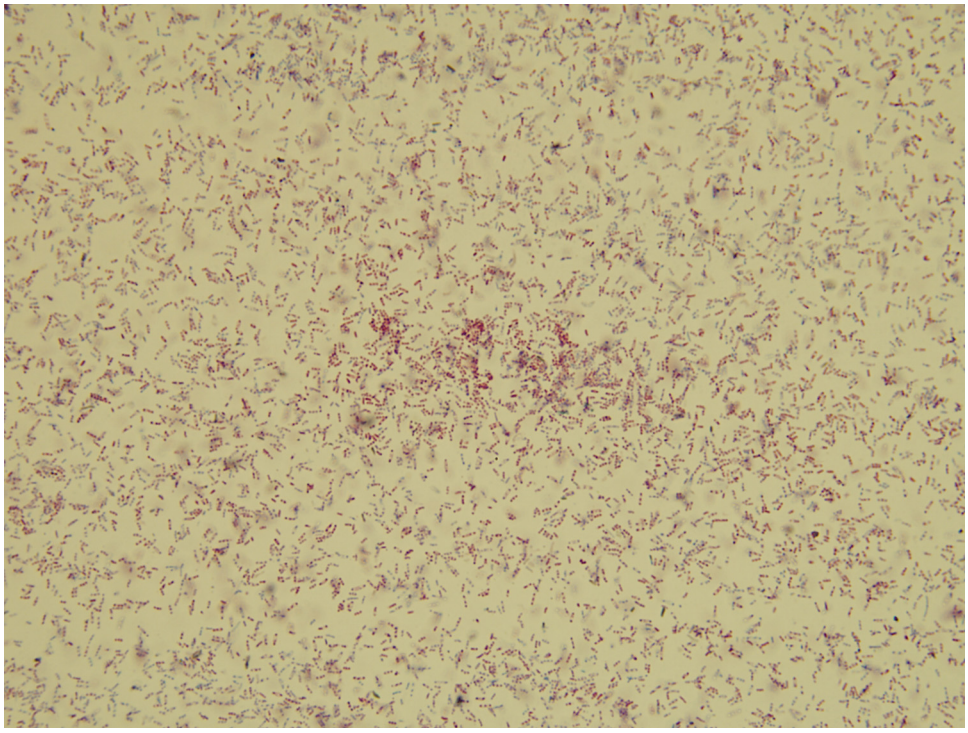

FIG 1 Kinyoun stain of patient isolate cultured on 7H10 agar at 35°C. Magnification, ×1,000.

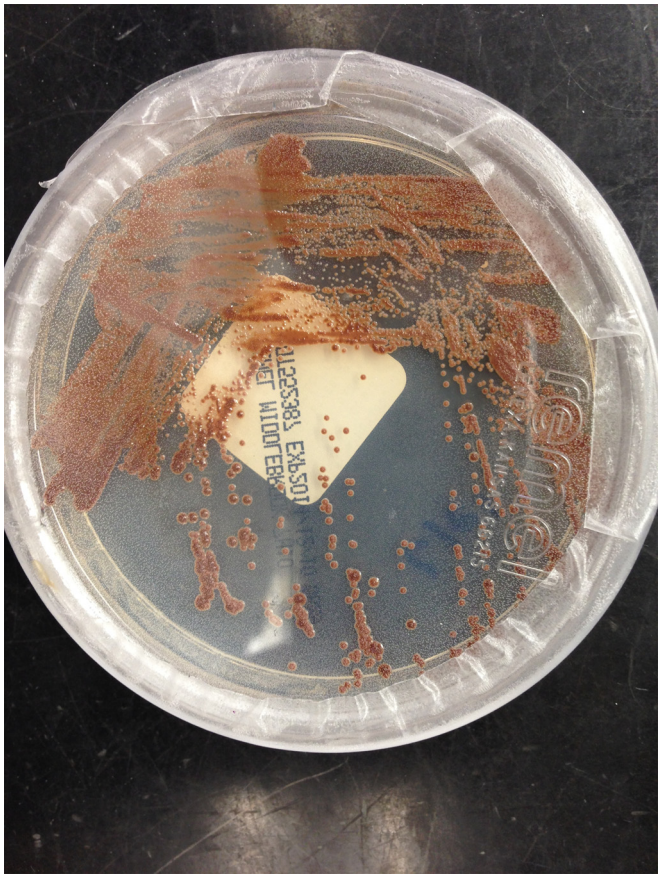

FIG 2 Patient isolate at 35°C 7 days post-subculture.

ana, and one from Florida) were performed in 2002 (2). These isolates were recovered from sputum, bronchial wash, blood, sinus drainage, and surgical wound infections. Like the Spanish isolates, it was reported that the U.S. isolates produced nonpigmented colonies on both Trypticase soy agar and 7H10 agar at both 30 and 35°C, with variable growth at 45°C. All isolates were determined to be susceptible to ciprofloxacin and resistant to clarithromycin. Five of the six U.S. isolates also tested as resistant to tobramycin, while all of the Spanish isolates were susceptible. The disease presentation, antimicrobial susceptibility, and biochemical profile of the U.S. isolates were determined to be similar to those of the *M. fortuitum* third biovariant complex. Studies including partial gene sequencing and high-performance liquid chromatography (HPLC) and restriction fragment length polymorphism (RFLP) analyses have demonstrated that the *M. fortuitum* third biovariant complex includes *Mycobacterium septicum*, *Mycobacterium houstonense*, *Mycobacterium bonickei*, and *M. mageritense* (2, 3). More recent phylogenetic analyses interrogating multiple genes, including 16S rRNA gene sequencing, classify *M. mageritense* as closely related to *Mycobacterium wolinskyi*, *Mycobacterium goodii*, and *Mycobacterium smegmatis* (4). The *M. mageritense* isolate in our case had growth of smooth, buff-colored colonies within 3 days following subculture at both 30 and 35°C. At 42°C, the culture had a rough, dry colony morphology that was buff colored. The isolate also grew well on both blood and chocolate agars. One week after subculturing, the isolate incubated at 35°C produced a brown pigment that became darker over time (Fig. 2). Four days later, the culture incubated at 30°C began to produce a faint brown pigment that became dark brown by 14 days post-subculture. Matrix-assisted laser desorption ionization–time of flight mass spectrometry (MALDI-TOF MS) analyses was performed to further characterize the isolate using previ-

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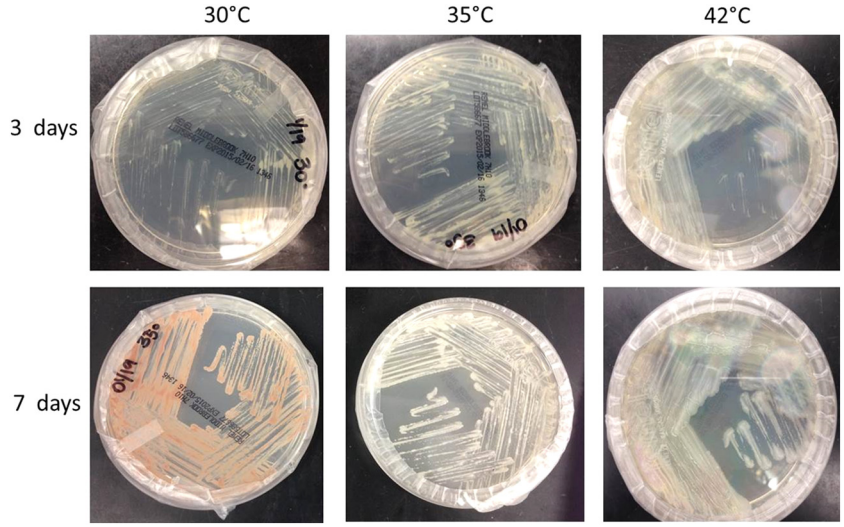

FIG 3 Growth characteristics of the *M. mageritense* isolate incubated at different temperatures at 3 and 7 days of incubation.

ously described methods (5). The isolate was identified as *M. mageritense* with the Vitek MS platform and Saramis database. No identification was obtained using the Bruker Biotyper using the mycobacteria library version 1.0 (although this species is in the Biotyper database).

Mycobacterium spp. are an unusual cause of endocarditis, with the majority of cases attributed to rapid growing mycobacteria. There have been 13 published case reports between 1975 and 2012 of *M. fortuitum*-associated endocarditis in four patients with native valves and nine patients with prosthetic valves (6, 7). The range of clinical onset was between 1 and 12 months. Most of the cases also had positive blood cultures, and two out of four patients who underwent echocardiography showed the presence of vegetations. Other rapidly growing mycobacteria causing endocarditis include *Mycobacterium chelonae* and *Mycobacterium abscessus* and have been reported in 10 patients with prosthetic valves (7–9). Thirteen cases of endocarditis in Serbia were traced to prosthetic valves that were contaminated with *M. chelonae* during the manufacturing process (10). There have been two published cases of *Mycobacterium neoaurum* endocarditis, both in intravenous drug users, and one reported case of prosthetic valve endocarditis caused by *M. goodii* (11–13).

The prognosis of patients with endocarditis from rapid growing mycobacteria is poor, with mortality rates of 85 to 100% in patients with prosthetic valves (7, 8). Selection of antimicrobials for treatment varies, depending on organism identification, and susceptibility testing and surgical removal of the valve are frequently recommended (8).

To our knowledge, our case provides only the second published report in the literature describing a brown-pigmented mycobacterium. In 1976, Hawkins and Falco (14) published a study examining one mycobacterial isolate from sputum that produced rough colonies with a dark brown pigment on LJ and 7H10 agar. Like our isolate, the colony began growing within 3 to 7 days, with brown pigment being produced 7 to 13 days after subculture. Unlike our isolate, the isolate described in this original paper had a rough texture. The isolate was identified to be most closely related to *M. fortuitum* by three independent laboratories using biochemical analyses. Comparison of biochemical data for the brown-pigmented *M. fortuitum* and *M. mageritense* isolates described by Domenech et al. (1) demonstrate that the brown-pigmented isolate is very similar to *M. mageritense*, except for Tween hydrolysis and catalase production at 68°C. To further characterize our isolate, we incubated it at three different temperatures (30, 35, and 42°C) for 14 days (Fig. 3). Buff-colored growth was present at all three temperatures after 3 days of incubation, with smooth colonies present at 30 and 35°C and rough colonies at 42°C. Dark brown pigmentation was present after 7 days at 30°C, and a very light brown pigmentation was visible at 35°C. Again, the colonies were smooth. At 7 days, there was no visible brown pigment at 42°C. By 14 days, the culture incubated at 35°C had a brown pigment similar to the culture incubated at 30°C.

In summary, to our knowledge, our patient is the first case of *M. mageritense*-associated endocarditis. Additionally, we report the second case in the literature of brown-pigmented mycobacteria. As *M. mageritense* is a newly described species, we hypothesize that the prior case may have also been *M. mageritense*, although this cannot be confirmed in the absence of sequence-based data. It is important for clinical microbiology laboratories to have awareness of brown-pigmented mycobacteria (such that a mycobacterium would not be ruled out based on this phenotype) and also to consider mycobacterial cultures in unusual cases of endocarditis.

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