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Detection of *Mycobacterium abscessus* from Deep Pharyngeal Swabs in Cystic Fibrosis

To the Editor—The prevalence of nontuberculous mycobacteria (NTM) respiratory infection is increasing in cystic fibrosis (CF), particularly with rapidly growing mycobacterial (RGM) species such as *Mycobacterium abscessus*.[1,2] Because NTM infection, and *M. abscessus* in particular, is associated with poor clinical outcomes,[3] regular screening using specialized culture methods for acid-fast bacilli (AFB) on sputum has been recommended, even for stable patients with CF.[1,4] However, these screening methods are difficult to apply in young children who often cannot produce sputum, even with induction. Respiratory samples from these children are typically obtained using deep pharyngeal swabs (also called oropharyngeal or cough swabs), but published studies suggest that this sample may not be appropriate for AFB cultures.[5,6] In fact, the recent SHEA guidelines on infection prevention and control for cystic fibrosis patients specifically recommends against the use of oropharyngeal swabs to screen for these organisms, stating that individuals without clinical features of NTM pulmonary disease who are unable to spontaneously expectorate sputum do not require screening.[1]

Although the prevalence of *M. abscessus* infection is generally low at young ages, infection can occur as early as infancy and can be clinically significant even before school age.[7,8] Furthermore, the use of chronic macrolide therapy with CF is increasing in young children and is being studied in infants (clinicaltrials.gov NCT01270074), but this therapy is contraindicated with NTM respiratory infection due to the potential to induce resistance.[9] Thus, screening methods capable of early detection of these pathogens in young, non-expectorating children could have considerable value.

We recently reported a novel RGM culture method designed to facilitate recovery of rapidly growing mycobacteria such as *M. abscessus* from routine CF bacterial cultures using 14-day incubation of *Burkholderia cepacia* selective agar plates.[10] This study evaluated all respiratory samples from children and adults with CF over a 2-year period and included deep pharyngeal swabs, which allowed us to perform a retrospective analysis to assess the utility of this culture sample method for *M. abscessus* detection (IRB approval 11-0828). Of the 695 patients studied, 311 had at least 1 deep pharyngeal culture obtained during the study period, with a total of 1,708 total deep pharyngeal cultures (average 2.9 ± 1.9 deep pharyngeal cultures annually). As expected, patients who had at least 1 deep pharyngeal culture obtained were younger than those who did not have any deep pharyngeal cultures (9.9 ± 6.6 years vs 27.4 ± 11.8 years, $P < .001$).

Mycobacterium abscessus was recovered using the RGM culture method in 22 of 1,708 (1.2%) deep pharyngeal specimens, compared with 111 of 3,015 (3.7%) other sample types ($P < .001$). To estimate sensitivity, we identified all patients who had ≥3 positive cultures over the study period, which suggests persistent infection. A total of 10 patients who had deep pharyngeal swab cultures met these criteria, and all but 1 were intermittent sputum producers for whom results from sputum cultures were also available. Among these patients, *M. abscessus* was recovered from 18 of 44 RGM cultures of deep pharyngeal samples (40.9%), compared with 52 of 96 RGM sputum cultures (54.2%, $P = .20$). Standard AFB cultures were performed on most sputum samples, and *M. abscessus* was recovered from 57 of 94 of these cultures (57.4%, $P = .099$ vs RGM on deep pharyngeal swabs). Interestingly, while we observed a positive correlation between AFB smear positivity and AFB culture positivity ($R^2 = .78$, $P < .001$), there was no correlation between AFB smear positivity and deep pharyngeal RGM culture positivity ($R^2 = .02$, $P = .65$).

Although AFB cultures of deep pharyngeal swabs were not performed during RGM culture method study, review of data from a separate, longitudinal study[4] identified 11 instances in which AFB cultures were performed on deep pharyngeal swabs from 6 individual patients with persistent NTM infections (≥3 positive cultures). Of 11 AFB cultures from deep pharyngeal swabs, 5 (45.5%) were *M. abscessus* positive, compared with 45 of 69 AFB cultures of sputum from these patients (65.2%, $P = .31$). Recovery of *Mycobacterium avium* complex pathogens was not observed from any deep pharyngeal AFB or RGM cultures.

These findings suggest that *M. abscessus* can be recovered from deep pharyngeal swabs using standard AFB cultures or the newer RGM culture method. Sensitivity appears lower for deep pharyngeal swabs relative to sputum samples, although differences did not reach statistical significance in these small sample sets. The discrepancy between our findings and previous reports may relate to the large size of our study, in which we analyzed 1,708 deep pharyngeal swabs from 311 individual patients, as opposed to 9 swabs from 6 patients[5] or 145 swabs.[6]

Most patients with persistent infection were intermittent sputum producers, and it is possible that patients able to occasionally produce sputum provide higher-quality deep pharyngeal swabs that contributed to our ability to successfully detect *M. abscessus*. Conversely, our clinical experience suggests that sputum quality in these patients is often poor, which may explain

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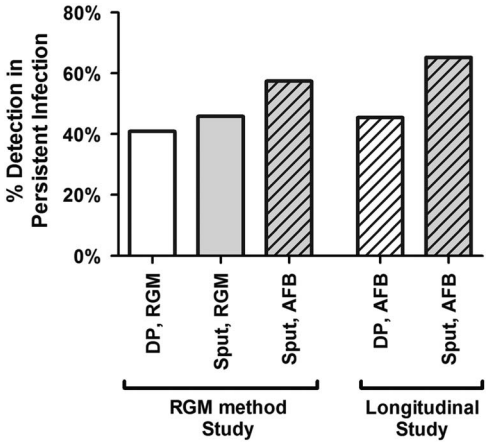

FIGURE 1. Frequency of detection of NTM by different samples and methods. Recovery of NTM in patients with persistent infection was assessed in deep pharyngeal (DP, white bars) or sputum (Sput, grey bars) using either the RGM culture method (solid bars) or AFB cultures (hatched bars) using data from two different studies: an assessment of the RGM culture method[10] and a longitudinal evaluation of NTM infection in CF.[4] Recovery of NTM from DP samples was generally lower than in sputum, although differences did not reach statistical significance.

why the ~45% recovery rate of *M. abscessus* was less in this subset of patients relative to the 65%–75% sensitivity for the RGM method estimated for the group as a whole.[10]

Notably, the results from this study are specific for rapidly growing mycobacteria from the *M. abscessus* complex and do not apply to the slower-growing pathogens from the *M. avium* complex. *Mycobacterium avium* complex bacteria cannot be recovered by the RGM culture method, nor have we observed *M. avium* from AFB cultures of deep pharyngeal swabs. While a limitation, *M. abscessus* and related pathogens appear to be more closely linked to negative clinical outcomes,[3,4] and recent studies suggest that these pathogens are increasing in frequency in CF.[1,2]

These findings suggest a role for deep pharyngeal swabs in the management of *M. abscessus* respiratory disease in CF, particularly in conjunction with the RGM culture method. The relative ease with which the RGM culture method can be implemented within regular microbiology work flows suggests that this approach could be utilized in routine screening for *M. abscessus* in children too young to produce sputum, for whom there are currently no effective screening methods. However, this approach should not be utilized to rule out NTM disease when it is clinically suspected given the lower sensitivity relative to other sample types and the inability to recover *Mycobacterium avium* complex pathogens.

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High Counts of Carbapenemase-Producing *Enterobacteriaceae* in Hospital Sewage

To the Editor—Carbapenemase-producing *Enterobacteriaceae* (CPE) are an increasing problem worldwide.[1] Because they are