On the Reportability of Nontuberculous Mycobacterial Disease to Public Health Authorities

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Abstract

Nontuberculous mycobacteria (NTM) are environmental pathogens that are an increasingly common cause of pulmonary and extrapulmonary disease. Electronic laboratory-based reporting is a straightforward mechanism for identifying NTM infections and for monitoring trends in disease. Oregon was the first state to make NTM reportable, although at this time the reporting requirement is limited to extrapulmonary infection. This has assisted authorities in detecting outbreaks and healthcare-related infections. However, further consideration should be given to the reportability of pulmonary NTM disease. Pulmonary NTM disease is more common than tuberculosis in the United States and is of emerging public health concern. Although the direct public health action that would be triggered by a pulmonary NTM disease report is not clear, without surveillance, public health is missing an opportunity to better understand pulmonary NTM disease trends and reasons for its increasing recognition within our population. We believe state health authorities should conduct surveillance for pulmonary NTM, either by mandating reporting of laboratory isolates or by other mechanisms as we have done in Oregon.

Keywords: nontuberculous mycobacterium infections; *Mycobacterium avium*; public health; public health administration; public health programs

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Mycobacterial diseases have historic importance in the United States and worldwide. Although disease due to *Mycobacterium leprae* has always been comparatively rare, disease due to *Mycobacterium tuberculosis* (TB) has remained one of the most important communicable diseases tracked and controlled by public health authorities. *M. tuberculosis* spreads person to person, is curable if diagnosed and treated, and infection can be prevented by taking appropriate public health action around cases (e.g., case isolation and treatment). Without required clinician and laboratory reporting of suspected and confirmed TB cases, public health action would be hindered, allowing for TB transmission from cases to contacts. There is strong rationale for why TB is a "reportable" disease. What to make, then, of TB's nontuberculous mycobacterial "cousins"?

Nontuberculous mycobacteria (NTM) are a diverse group of organisms, some of which are almost always associated with disease when found in human specimens (e.g., *Mycobacterium abscessus*) and others that are almost always nonpathogenic (e.g., *Mycobacterium gordonae*). Like *M. tuberculosis*, NTM can cause either pulmonary or extrapulmonary disease (including disseminated manifestations), and treatment can suppress or sometimes cure the disease. Furthermore, tuberculosis and NTM disease often declare themselves clinically with overlapping symptoms and objective findings and frequently confuse the clinician or laboratorian, such that TB "suspect cases" may actually be NTM cases. This confusion can lead to unnecessary diagnostic tests, treatment, isolation or evaluation of contacts, and other resource use within our TB control infrastructure.

In the United States, NTM-related disease incidence substantially exceeds TB incidence, and the incidence of NTM-related disease appears to be rising in many regions of the world (1–3). In contrast to TB, NTM-related disease does not (or very rarely) spread from person to person, so standard case investigation and contract tracing, paramount to controlling TB, are generally not necessary. However, investigations of clusters of NTM disease have led to identification and elimination of point sources (4, 5). In addition, NTM are similar to a variety of other environmental pathogens that are reportable and fulfill at least some of the criteria for why we believe public health authorities could consider making NTM disease a reportable condition.

Reasons Diseases Are Made Reportable

The most obvious reason for mandating disease reporting is to facilitate control of the spread of infectious diseases. This concept within the United States dates back to 1743, when the Rhode Island colony passed broad laws requiring the reporting of smallpox, yellow fever, and cholera (6). Today, the list of reportable diseases is much longer than it was in 1743 and includes both infectious and noninfectious diseases and conditions. Aside from the desire to eliminate a point source, or to stop person-to-person or environment-to-person spread of infection, other considerations compel mandatory disease reporting. These include the need to monitor trends in disease incidence or prevalence, understand the burden or cost of a condition, identify new populations or risk factors for a disease or condition, or evaluate changes in clinical practice or public policy (6). The need for timely recognition of emerging agents and bioterrorism can also lead to mandatory reporting of certain diseases or pathogens.

The Case for Reporting Extrapulmonary NTM Infection

In 2014, the state of Oregon became the first public health authority in this country to make isolation of NTM reportable by law from laboratories to public health officials (7). However, this extended only to extrapulmonary NTM isolates, where we believe the case for requiring reporting is more easily made than that for pulmonary NTM. Given the high likelihood that extrapulmonary isolates (non-stool) represent true disease and that they could represent a contaminated surgical, cosmetic, or other procedure or product in which public health action could prevent more cases, we deemed the group of NTM species a reasonable candidate for reportability.

In the first year of the requirement, 41 isolates were reported. Subsequent investigation determined the median age of case patients was 50 years (range, 1–75 yr). Of those individuals, 21 (51%) were women, 16 (39%) were hospitalized, and 2 died. Fourteen isolates were *Mycobacteria avium* and 11 were among the *Mycobacteria fortuitum* complex. Reporting facilitated detection of at least one outbreak involving *M. fortuitum*–contaminated orthopedic procedures. Other sporadic cases of disease frequently involved contaminated procedures or situations that triggered some sort of public health intervention, leading us to conclude that reporting extrapulmonary NTM can facilitate public health action that likely prevents additional, sometimes morbid and costly, cases (5, 8).

A variety of recent healthcare- or product-associated outbreaks from around the United States, including an outbreak of chronic intravascular and disseminated NTM (*Mycobacterium chimaera*) infections linked to heating-cooling units used in cardiac surgery operating rooms (9), further highlight the potential for public health action to control these infections. In our opinion, the ability to understand the scope of the national *M. chimaera* outbreak, to identify potential cases, and ultimately prevent further cases has been hindered by the lack of reportability of extrapulmonary NTM around the country.

What about Reporting Pulmonary NTM Disease?

On mandatory reporting of pulmonary NTM isolates, the case is less clear than for extrapulmonary NTM. We believe strongly that pulmonary NTM is an important public health disease and that a case can be made for its surveillance; however, as with all diseases of public health significance, mandatory reporting of isolates or disease is but one of several possible ways to accomplish surveillance. Because respiratory isolates of NTM are relatively common, and in some cases represent contamination or colonization (and not true disease), reporting pulmonary NTM isolation has not gained traction.

The Oregon Health Authority conducted a special project to better understand the burden of NTM disease (both pulmonary and extrapulmonary) among Oregonians from 2005 to 2012. This project showed that pulmonary NTM was much more common than TB, disproportionately affected women and the elderly, and had increased slightly in incidence over the time period (1, 3, 8, 10, 11).

Although this surveillance project ultimately provided the impetus for making extrapulmonary NTM isolates reportable within the state, pulmonary isolates of NTM were not made reportable. At present, other than monitoring trends in surveillance, Oregon public health authorities at both state and local levels lack available staff and resources to follow up and investigate reports of pulmonary NTM isolates. Given their relatively high number and the possibility that they do not represent disease, it is unclear what public health action could be undertaken with such reports that would prevent additional cases of pulmonary NTM disease. If effective environmental control or mitigation methods were to be developed that prevented acquisition from the environment, there would be a more justifiable and active role for public health investigation after such reports.

Conversely, by not tracking pulmonary NTM, public health officials may be missing an opportunity to better understand disease trends and reasons for continued spread within the population. Abundant evidence demonstrates that exposure to public water systems is a common source of infection. In this regard, pulmonary NTM represents an environmental health problem that municipal water supply systems could potentially control (12, 13). The U.S. Environmental Protection Agency has recognized *M. avium* complex as a contaminant of water supplies in this regard, and reportability could facilitate projects attempting to better understand environment-to-human transmission (14). It is possible also, like its water and soil-born cohabitant *Legionella*, that patients acquire NTM from potting soil or other soil exposure (15, 16).

The lack of surveillance for pulmonary NTM hinders the ability to test these hypotheses and ultimately prevent infection. In addition, during the last 2 years, at least three potential person-to-person outbreaks of pulmonary NTM have been identified within centers treating patients with cystic fibrosis (16, 17). These outbreaks highlight the fact that among certain hosts (i.e., patients with cystic fibrosis), person-to-person spread can occur such that public health intervention could be useful and necessary. Furthermore, outbreaks of pulmonary disease have been linked to environmental sources within healthcare facilities (similar to legionellosis) (17–19). These factors support an argument that public health agencies should consider making pulmonary NTM disease

reportable. Currently, there are a small number of state authorities in the United States, and at least one abroad in Queensland, Australia, that require such reporting (20–24).

How to Report NTM: Laboratory-based Reporting

NTM isolates can be reported directly to public health agencies by laboratories, without requiring reporting by clinicians. For extrapulmonary NTM disease, the Oregon Health Authority's case definition can be followed (7). All NTM isolates from extrapulmonary sites (aside from stool, a site that does not represent disease or infection) are expected to be reported electronically by laboratories. Similarly, pulmonary NTM isolates can also be directly reported by laboratories, and, despite the fact that these can represent contamination or disease, these reports can be used for public health surveillance.

Several years ago, using statewide surveillance data for respiratory isolates of NTM, we found that roughly 50% of patients with at least one pulmonary NTM isolate actually meet the full American Thoracic Society/Infectious Diseases Society of America disease criteria for pulmonary NTM disease. Furthermore, we found that nearly 90% of those meeting the microbiological criteria of this case definition (either one bronchoalveolar lavage or two sputa positive for NTM with the nonpathogenic *M. gordonae* excluded) met the full American Thoracic Society/Infectious Diseases Society of America disease criteria (25). Accordingly, it is possible to use lab-reported isolate data to follow trends in disease and to find cases with high validity. The positive predictive value of laboratory data has been validated beyond Oregon in health-plan data within the United States as well as in other public health data from Ontario (26–28). Laboratories performing mycobacteriology are already reporting acid-fast bacilli–positive smears and acid-fast bacilli cultures with *M. tuberculosis*, and it is likely relatively straightforward to add NTM isolates to these usually electronic reports.

NTM Reporting in the Future?

We believe that both extrapulmonary and pulmonary NTM represent important environmental pathogens of potentially increasing public health importance. We believe that both merit public health surveillance by one means or another to better understand trends in incidence, risk factors for acquisition, environmental reservoirs of infection, and potential approaches to prevention. We believe the case for mandatory reporting of extrapulmonary NTM isolates is strong and have acted on this by implementing mandatory reporting in Oregon by laboratories whenever NTM is isolated from an extrapulmonary source. We urge other state health departments in the United States to take similar action.

On the other hand, the case for mandatory reporting of pulmonary NTM disease is less compelling, and, for now, the Oregon Health Authority has chosen not to require it. However, we plan to continue to monitor pulmonary NTM disease in Oregon through alternative methods, including voluntary reporting of pulmonary isolates by laboratories supplemented by intermittent surveys and special surveillance projects, as we have done in the past. As the population ages, crude pulmonary NTM disease incidence is likely to grow, and surveillance will remain important.

Although the authors of this report do not unanimously agree regarding the decision to forgo mandatory reporting of pulmonary NTM in Oregon, the authors continue to agree unanimously on the importance of all forms of NTM and the need for continued surveillance. Together, we recommend other public health agencies make extrapulmonary NTM reportable and monitor trends in pulmonary disease either by mandatory reporting or by alternative methods, like we have done in Oregon. ■

Author disclosures are available with the text of this article at www.atsjournals.org.

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