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Susceptibility testing of non-tuberculous mycobacteria: an audit of standard operating procedures at a national reference laboratory

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Background: In the United Kingdom, non-tuberculous mycobacterial (NTM) identification and susceptibility testing is performed at reference laboratories under the auspices of Public Health England (PHE), with the National Mycobacterial Reference Service - South (NMRS-S) in London providing this service to the south east of England. Each isolate sent by a referring laboratory is identified to species level where possible; susceptibility testing is performed on isolates which meet criteria defined in the laboratory standard operating procedures (SOP), informed by American Thoracic Society (ATS) criteria. Barts Health NHS Trust (BHNT) in East London provides hospital care to a population of 2.5 million people, including haematology, oncology and transplant services. In this study we audited the NMRS-S adherence to its own SOP for testing susceptibility using BHNT NTM isolates as the study group.

Material/methods: The BHNT Microbiology laboratory information management system (LIMS) was interrogated for all NTM isolates between 01/01/2011 and 31/07/15. The characteristics and clinical information for these isolates were manually tabulated along with susceptibility testing information obtained from the NMRS-S LIMS. Each isolate was assessed against the NMRS-S susceptibility testing SOP and outcomes compared with the real world data. The isolates for which the NMRS-S SOP was not followed were examined in more detail to establish ratios of unnecessary susceptibility testing to unperformed susceptibility testing.

Results: In total, 714 isolates were identified from 451 individual patients. Most common was *M. abscessus* (133 isolates, 18.6%); followed by *M. avium* (99 isolates, 13.9%); *M. chelonae* (93 isolates, 13%); *M. intracellulare* (86 isolates, 12%) and *M. kansasii* (69 isolates, 9.7%) with 19 other species making up the remainder. Susceptibility testing was performed for 196 isolates (27.5% of those received).

Utilising the NMRS-S SOP, 616 isolates (86%) were deemed to have had an appropriate decision made concerning susceptibility testing. Mixed cultures which could not be tested accounted for 28 isolates (4%); 61 isolates (8.6%) were not processed in accordance with the SOP. However, this number underestimated the non-conformity rate in pathogenic NTM species: for *M. abscessus* the rate was 14.9%; for *M. kansasii* 17.6%; and for *M. avium* and *M. intracellulare* 11.2% and 11.6% respectively.

The ratios of unnecessary and unperformed susceptibility testing were examined. For *M. abscessus* there was a near even split, 11:9; for other species unnecessary testing was more common than unperformed testing (*M. avium* 7:4; *M. intracellulare* 7:3; *M. kansasii* 8:4).

Conclusions: Overall the NMRS-S was adherent to its SOP in 91.4% of cases; however, this number overestimates the adherence for more pathogenic NTM species. When the SOP was not followed, the trend was towards over performance of susceptibility testing rather than its omission. These data suggest the potential for improved performance and cost savings within the NMRS-S.