



# Susceptibility testing of non-tuberculous mycobacteria:

## An audit of standard operating procedures at a national reference laboratory

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### Introduction

Non-tuberculous mycobacteria (NTM) cause a variety of clinical syndromes<sup>1</sup>. In the United Kingdom, NTM identification and drug susceptibility testing (DST) are carried out almost exclusively by the Public Health England National Mycobacterial Reference Service (NMRS) – NMRS South (NMRS-S) provides this service to the South of England.

NMRS-S identifies each isolate received to species level; DST is performed using CLSI methodology<sup>2</sup> on isolates which meet criteria defined in the laboratory standard operating procedures (SOP), informed by American Thoracic Society (ATS) criteria<sup>3</sup>.

Barts Health NHS Trust (BHNT) provides hospital care, including haematology, oncology and solid organ transplant services, to a population of 2.5 million people in East London. In this study we audited NMRS-S adherence to its own SOP for testing susceptibility using BHNT NTM isolates as the study group.

### Methods

All NTM isolates from BHNT Microbiology between 01/01/11 and 31/07/15 were identified, with clinical information and DST information obtained from the NMRS-S. The processing of each isolate was assessed against the NMRS-S SOP (Table 1).

Table 1. NMRS-S Drug Susceptibility Testing Standard Operating Procedure

Species	<i>M. avium</i> <i>M. intracellulare</i> <i>M. malmoense</i> <i>M. xenopi</i> <i>M. scrofulaceum</i>	<i>M. fortuitum</i> <i>M. abscessus</i> <i>M. chelonae</i> <i>M. peregrinum</i> <i>M. mucogenicum</i>	<i>M. kansasii</i> <i>M. szulgai</i>	All other species
Respiratory	Perform on first sample if: Cystic Fibrosis, HIV or other immunosuppressing condition  Paediatric patient  All other patients: Perform on second positive sample then if >3 month interval	Perform on first sample if: Cystic Fibrosis  All other patients: Perform on second positive sample then if >3 month interval	Perform on first sample if: Cystic Fibrosis, HIV or other immunosuppressing condition  Paediatric patient  All other patients: Perform on second positive sample then if >3 month interval	Do not perform routinely
Lymph node	Perform on all samples	Perform on first positive sample then if >3 month interval	Perform on second positive sample then if >3 month interval	
Blood / Bone Marrow / CSF			Perform on all samples	
Urine / Environmentals	Do not perform routinely			
Other tissues / fluids	Perform on second positive sample then if >3 month interval			

### Results

706 isolates were identified from 451 patients. Commonest was *M. abscessus*, followed by *M. avium*, *M. chelonae*, *M. intracellulare* and *M. kansasii*, with several other species making up the remainder (Figure 1). Susceptibility testing was performed for 196 isolates (27.8%).

616 isolates (87.3%) were adherent to the SOP; unprocessable mixed cultures numbered 28 isolates (4%). The remaining 61 isolates (8.6%) were non-adherent to the SOP – however, the non-adherence rates in significant pathogenic NTM species were higher than this: 14.9% for *M. abscessus*; 17.6% for *M. kansasii*; 11.2% for *M. avium* and 11.6% for *M. intracellulare*. Of the non-adherent cases, 38 (62.3%) had DST performed unnecessarily and 23 (37.7%) incorrectly did not have DST performed (Figure 2). For *M. abscessus* there was a near even split; for other major species the trend was towards over performance of DST (Figure 3).

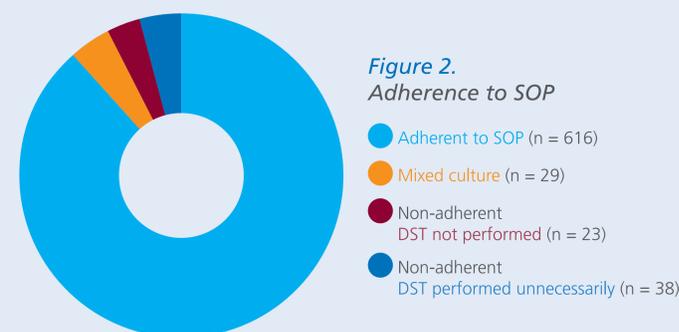
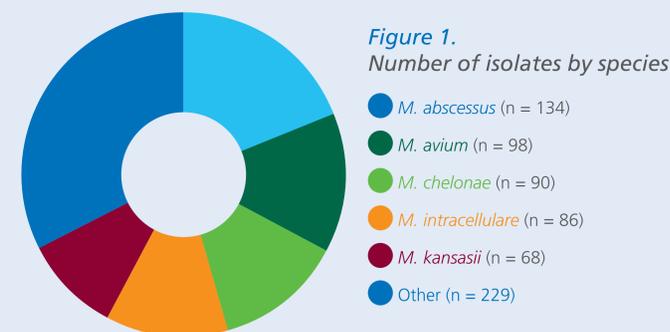
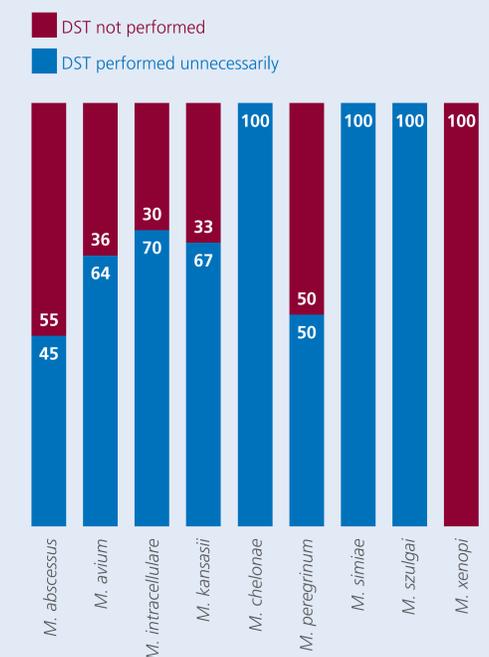


Figure 3. Non-adherence to SOP by species



### Conclusions

Overall adherence to the NMRS-S DST SOP was 91.4%. However, adherence in common pathogenic NTM species was lower, in some species less than 90%. Omission of testing occurred uncommonly; unnecessary drug susceptibility testing was more common. Increased adherence could therefore both provide more clinical information and lead to efficiency and cost savings within the laboratory.

<sup>1</sup> - Ahmed, I., Jabeen, K. and Hasan, R., Identification of non-tuberculous mycobacteria isolated from clinical specimens at a tertiary care hospital: a cross-sectional study, *BMC Infectious Diseases* 2013; 13:493  
<sup>2</sup> - Clinical Laboratory Standards Institute, M24-A2 – Susceptibility testing of Mycobacteria, Nocardiae and other aerobic Actinomycetes; Approved Standard – Second Edition, 2011 (ISBN 1-56238-746-4)  
<sup>3</sup> - Griffith et al., An Official ATS/IDSA Statement: Diagnosis, Treatment and Prevention of Nontuberculous Mycobacterial Diseases, *American Journal of Respiratory and Critical Care Medicine* 2007; 175:367-416