Cystic Fibrosis our focus

Mycobacterium abscessus

Recommendations for infection prevention and control

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Report of the Cystic Fibrosis Trust *Mycobacterium abscessus*
Infection Control Working Group

Cystic Fibrosis Trust *Mycobacterium abscessus* Infection Control Working Group

Chair
Professor Andrew Jones
Consultant in Respiratory Medicine, University Hospital South Manchester NHS Trust

Members
Dr Eliza Alexander
Consultant Microbiologist, Public Health England

Dr Olly Allen
Consultant Microbiologist, Papworth Hospital, Cambridge

Dr Keith Brownlee
Director of Impact, Cystic Fibrosis Trust

Dr Miles Denton
Consultant Microbiologist, Leeds Teaching Hospitals NHS Trust

Professor Andres Floto
Consultant in Respiratory Medicine, Papworth Hospital, Cambridge

Dr Andrew Jones
Consultant in Respiratory Medicine, Royal Brompton Hospital, London

Dominic Kavanagh
Patient Representative

Professor Paul McNamara
Professor in Child Health and Consultant in Paediatric Respiratory Medicine, Alder Hey Children's Hospital, Liverpool

Dr Deborah Modha
Consultant Microbiologist, University Hospitals of Leicester

Lisa Morrison
Clinical Specialist Physiotherapist, Queen Elizabeth University Hospital, Glasgow

Dr Cecilia O'Kane
Consultant Physician, Queen's University Belfast

Dr Ranjan Suri
Paediatric Respiratory Consultant, Great Ormond Street Hospital, London

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Grading scheme for recommendations used in *M. abscessus*

The criteria for the grading of recommendations in this document are based upon a paper by Petrie et al (1995) published on behalf of the Scottish Intercollegiate Guidelines Network.

Much of the data in the document is derived from observational studies where randomisation is not appropriate or possible, however a lot is also from peer reviewed scientific studies. The above grading is therefore not always appropriate.

Levels of evidence

Level	Type of evidence (based on AHCPR, 1992)
Ia	Evidence obtained from meta-analysis of randomised controlled trials.
Ib	Evidence obtained from at least one randomised controlled trial.
IIa	Evidence obtained from at least one well designed controlled study without randomisation.
IIb	Evidence from at least one other type of quasi-experimental study.
III	Evidence obtained from well-designed, non-experimental, descriptive studies, such as comparative studies, correlation studies or case control studies.
IV	Evidence obtained from expert committee reports or opinions and/or clinical experience of respected authorities.

Grading of recommendations

Grade	Type of recommendation (based on AHCPR, 1992)
A (levels Ia, Ib)	Requires at least one randomised controlled trial as part of the body of literature, of overall good quality and consistency, addressing the specific recommendation.
B (levels IIa, IIb, III)	Requires availability of well conducted clinical studies but no randomised clinical trials on the topic of the recommendation.
C (level IV)	Requires evidence from expert committee reports or opinions and/or clinical experience of respected authorities. Indicates absence of directly applicable studies of good quality.

References

- Petrie GJ, Barnwell E, Grimshaw J, on behalf of the Scottish Intercollegiate Guidelines Network. Clinical guidelines: criteria for appraisal for national use. Edinburgh: Royal College of Physicians, 1995.
- Agency for Health Care Policy and Research (AHCPR). Acute pain management, operative or medical procedures and trauma 92-0032. Clinical practice guidelines. Rockville, Maryland, USA: Agency for Healthcare Policy and Research Publications, 1992.

Summary of main recommendations

- All cystic fibrosis (CF) services must have a local infection control guideline that addresses *M. abscessus*.
- All CF services must routinely screen for non-tuberculous mycobacteria (NTM) and forward *M. abscessus* isolates to an appropriate reference laboratory for sub-speciation and strain typing.
- All patients with *M. abscessus* colonisation/infection must be segregated.

Key references

- US Cystic Fibrosis Foundation and European Cystic Fibrosis Society consensus recommendations for the management of non-tuberculous mycobacteria in individuals with cystic fibrosis. Thorax 2016; 71: i1-i22.
- British Thoracic Society Guidelines for the Diagnosis and Management of Non-Tuberculous Mycobacterial Pulmonary Disease (NTM-PD). Thorax 2017; 72: ii1-ii64.

1. Introduction

This document provides guidance on infection control measures for *Mycobacterium abscessus* in cystic fibrosis. A separate working group (jointly representing the European Cystic Fibrosis Society and North American Cystic Fibrosis Foundation) has published guidelines on screening and treatment for non-tuberculous mycobacteria (NTM).[1] Guidance from the British Thoracic Society on the diagnosis and management of NTM is also available.[2]

2. Background

Recent research has found evidence for cross-infection by *M. abscessus*.[3-5] Cross-infection outbreaks have been reported at a US CF centre involving five patients[3] and at a UK CF centre involving 11 people with CF, despite having infection prevention policies and guidelines based on best practice at the time.[4] Another UK study found no clear evidence of direct cross-infection.[6] A study published in 2016 provided evidence of shared strains of *M. abscessus* species among patients with CF across a number of CF centres worldwide.[5] At present, the mode of transmission is unclear.

At the US CF centre that reported the cross-infection outbreak, no further new cases were detected after implementation of infection control measures comprising staff and patient education, environment sterilisation and patient isolation.[7]

A suspected M. abscessus outbreak was reported involving 9 of 19 patients at a joint adult/paediatric clinic in Hawaii. The source of the outbreak was not identified but an investigation revealed potential issues with adherence to local infection control guidance for cleaning and maintenance of shared equipment, including bronchoscopes and spirometers.[8]

Data from the UK CF Registry show that the prevalence of *M. abscessus* colonisation/infection has remained relatively static between 2014 and 2016 (table 1).[9]

Table 1

	2014 (n=9532)	2015 (n=9587)	2016 (n=9695)
***M.abscessus* prevalence**	*300 (3.1%)*	*321 (3.3%)*	*337 (3.4%)*

Specialist CF care has been shown to be beneficial, with improved clinical outcomes for people with cystic fibrosis.[10, 11] Avoiding clinic attendance due to concerns about *M. abscessus* infection is likely to be harmful as it may seriously interfere with medical care, which will far outweigh any potential risk of acquiring *M. abscessus* infection.

3. Definition of patients with *M. abscessus* colonisation/infection for the purpose of infection control measures

A patient is defined as having M. abscessus colonisation/infection if they fall in to one or more of the following groups.

1. Patients who have had *M. abscessus* isolated from sputum or bronchoalveolar lavage (BAL) cultures within the last 12 months (whether or not they are symptomatic for *M. abscessus* infection).
2. Patients who are currently prescribed treatment for *M. abscessus.*
3. Patients who have completed treatment for *M. abscessus* within the last 12 months.

For the above patients to be subsequently considered free of *M. abscessus*, quarterly sputum samples must have tested negative for mycobacteria when a patient is not receiving treatment, with an interval of one year between the first negative sample and last negative sample. For instances where sputum cannot be obtained, a negative BAL one year off treatment would suffice.

Current evidence suggests that in applying infection control recommendations there should be no distinction between smear positive and smear negative cases of *M. abscessus* colonisation/infection.[4]

3.1 Recommendations

- The patient should be kept informed of their infection status [C].
- If subsequent sputum samples become negative for *M. abscessus*, the patient should still be regarded as a potential carrier from the date of the first negative sample for a total of at least twelve months. A minimum of four negative sputum samples are required during this twelve-month period, with the final negative sample at least twelve months after the first negative sample. For instances where sputum cannot be obtained, a negative BAL one year off treatment would suffice [C].
- For infection control, there should be no distinction between smear positive and smear negative cases of *M. abscessus* colonisation/infection [C].

4. Screening of patients with CF for *M. abscessus* infection

Screening for NTM is an important part of the care of patients with cystic fibrosis. The US Cystic Fibrosis Foundation/European Cystic Fibrosis Society consensus guidance[1] on NTM screening for people with cystic fibrosis is published and accessible via this link: http://thorax.bmj.com/content/71/Suppl_1.toc.

4.1 Recommendations

- Routine screening for NTM is recommended at least once a year for all individuals able to produce sputum, with microbiological processing of samples [C].
- Cough swabs should not be used [C].
- Consider induced sputum or BAL for patients unable to produce sputum at will (where there is clinical suspicion of infection) [C].
- For CF centres where cross-infection with *M. abscessus* is suspected, more frequent sampling for NTM should occur [C].
- All *M. abscessus*-positive patients must have an isolate referred to the appropriate reference laboratory for sub-speciation and strain typing [C].

5. Preventing spread

The mode of transmission of *M. abscessus* in cross-infection outbreaks is unclear. General infection control measures should be adhered to.[11]

5.1 Recommendations

- Each CF service must have its own local infection control guideline that covers *M. abscessus* and its use by regular audit is recommended [C].
- The specialist CF centre/CF clinic and local infection control team should know the incidence and prevalence of *M. abscessus* in their CF population [C].
- Current inpatient and outpatient facilities should be evaluated for their present air exchange and air flow and measures taken to optimise this wherever possible [C].

- Patients with CF with *M. abscessus* colonisation/infection must be segregated from each other and from all other people with cystic fibrosis. The methods used to segregate patients should be determined by local guidelines and must take into account communal areas such as pharmacy and radiology [C].
- CF centres should educate staff, patients and visitors in the need to adhere to cross infection prevention measures within all areas of the CF centre and the wider, communal areas of the hospital [C].
- A high standard of hygiene should be practised by staff, in particular hand washing; alcohol gels or other suitable preparations must be available in every room [C].
- If CF clinics suspect they have cross-infection with *M. abscessus*, advice from the local infection control team should be sought [C].
- Patients must be seen in well-ventilated rooms [C].
- Rooms must be left with the door closed, with at least an hour (amended depending on knowledge of air flow/exchange) between patients to allow for dispersion of possible airborne contamination and then cleaned according to local infection control guidelines [C].
- Gloves and aprons/gowns must be worn and hand washing with soap and water must be performed before and after contact with each patient with *M. abscessus* colonisation/infection and/or their immediate environment [C].
- Staff may wish to wear masks when in contact with patients with *M. abscessus* colonisation/infection. There is currently insufficient evidence to recommend the routine use of masks by healthy staff. Staff should follow local policies [C].
- Patients may wish to wear masks. There is currently insufficient evidence to recommend the routine use of masks by patients, but local policies should be followed [C].
- Patients must wash their hands with soap and water before use of a spirometer or other handheld apparatus [C].
- Spirometry should be performed in the patient's own room. Other respiratory function tests should be performed in a well-ventilated room away from other patients [C].
- Collection of respiratory samples must take place in the patient's own room [C].
- Sputum pots should be covered and soiled tissues must be disposed of in the clinical waste bin immediately after use. Sputum should not be expectorated down toilets, sinks, washbasins or in showers [C].
- Airway clearance techniques and any other physiotherapy procedures must be carried out in the patient's own room [C].
- Equipment must be single-patient use where possible [C].
- Patients should be encouraged to use their own possessions and equipment in hospital [C].
- All other equipment and surfaces must be cleaned and dried between patients, according to local infection control guidelines [C].
- After a room is vacated by a patient with *M. abscessus* colonisation/infection it should undergo terminal cleaning as per local hospital guidance [C]. An example from the CF centre in Papworth can be found in **Appendix 1**.
- Inpatients should have well-ventilated single rooms with their own bathroom. Negative pressure rooms should be used where available [C].
- Exercise should be performed in a patient's own room with the door closed and any equipment appropriately decontaminated after use. If exercise is performed in a communal area this must be on an individual basis, at the end of the day and the room terminally cleaned after use [C].
- Disinfection of bronchoscopes, irrespective of the purpose they are used for, should comply with the national policy 'Management and decontamination of flexible endoscopes (HTM 01-06)' [C]. The policy is accessible via this link: https://www.gov.uk/government/publications/management-and-decontamination-of-flexible-endoscopes.

6. Future recommendations for cystic fibrosis clinic facilities

6.1 Recommendations

- Any new facilities for patients with CF must take into account the potential for cross-infection with *M. abscessus*. This must include the provision of enhanced ventilation for both inpatient and outpatient care and adequate ventilation in other areas [C].
- Any new facilities should consider the space required for integration of exercise equipment into inpatient rooms [C].

7. References

1. US Cystic Fibrosis Foundation and European Cystic Fibrosis Society. Consensus recommendations for the management of non-tuberculous mycobacteria in individuals with cystic fibrosis. Thorax 2016; 71: i1-i22.

2. British Thoracic Society. Guidelines for the Diagnosis and Management of Non-tuberculous Mycobacterial Pulmonary Disease (NTM-PD). Thorax 2017; 72 suppl. 2: ii1-ii64

3. Aitken ML, Limaye A, Pottinger P, Whimbey E, Goss CH, Tonelli MR, Cangelosi GA, Dirac MA, Olivier KN, Brown-Elliott BA, McNulty S, Wallace RJ Jr. Respiratory outbreak of Mycobacterium abscessus subspecies massiliense in a lung transplant and cystic fibrosis center. Am J Respir Crit Care Med 2012; 185: 231-232.

4. Bryant JM, Grogono DM, Greaves D, Foweraker J, Roddick I, Inns T, Reacher M, Haworth CS, Curran MD, Harris SR, Peacock SJ, Parkhill J, Floto RA. Whole-genome sequencing to identify transmission of Mycobacterium abscessus between patients with cystic fibrosis: a retrospective cohort study. Lancet 2013; 381: 551-1560.

5. Bryant JM, Grogono DM, Rodriguez-Rincon D, Everall I, Brown KP, Moreno P, et al. Emergence and spread of a human-transmissible multidrug-resistant nontuberculous mycobacterium. Science 2016; 354: 751-757.

6. Harris KA, Underwood A, Kenna DTD, Brooks A, Kavaliunaite E, Kapatai G, Tewolde R, Aurora P, Dixon G. Whole-Genome Sequencing and Epidemiological Analysis do not Provide Evidence for Cross-transmission of Mycobacterium abscessus in a Cohort of Pediatric Cystic Fibrosis Patients. Clin Infect Dis 2015; 60: 1007-1016.

7. Kapnadak SG, Hisert KB, Pottinger PS, Limaye AP, Aitken ML. Infection control strategies that successfully controlled an outbreak of Mycobacterium abscessus at a cystic fibrosis center. Am J Infect Control 2016; 44: 154-159.

8. Johnston DI, Chisty Z, Gross JE, Park SY. Investigation of Mycobacterium abscessus outbreak among cystic fibrosis patients, Hawaii 2012. J Hosp Infect 2016; 94: 198-200.

9. The UK Cystic Fibrosis Registry Annual Data Report 2015.

10. Mahadeva R, Webb K, Westerbeek RC, Carroll NR, Dodd ME, Bilton D, et al. Clinical outcome in relation to care in centres specialising in cystic fibrosis: cross sectional study. BMJ 1998; 316: 1771-1775.

11. Cystic Fibrosis Trust. Standards for the Clinical Care of Children and Adults with cystic fibrosis in the UK. Second edition, 2011.

12. Cystic Fibrosis Trust. Laboratory Standards for Processing Microbiological Samples from Patients with Cystic Fibrosis. Report of the UK Cystic Fibrosis Trust Microbiology Laboratory Standards Working Group, 2010.

Appendix 1: Example of terminal cleaning protocol from Papworth Hospital		
	M. abscessus* + ve in-patient (LOS 1 night +) plus post bronchoscopy day cases and any patients isolated with pink precautions	**Ambulatory *M. abscessus* care episode (no overnight stay) CTBI***
Stage 1	**Nursing staff** Dispose to clinical waste any disposable items/ items that cannot be cleaned. Dispose of any bed linen into red water soluble bag and then into a white plastic laundry bag. **Domestic staff/PEA** Dispose to orange bag (offensive waste stream) any disposable curtains from room. **Leave room for an hour before taking any further action.**	**Ventilate the room as soon as the patient vacates the room (open door and window)** **Nursing staff** Dispose to clinical waste any disposable items/ items that cannot be cleaned. **Domestic staff/PEA** Dispose to orange bag (offensive waste stream) clinical waste/curtains from room. **Ventilate the room for one hour prior to cleaning.**
Stage 2	**Nursing staff** Wearing Personal Protective Equipment (long-sleeved gown, gloves, surgical mask, eye protection) and taking care not to splash, use bottle brush or sponge stick to clean sink and shower outlets ensuring all visible gunk rinsed away. Flush shower and sink outlets with tap water for five minutes.	**Nursing staff** Use a chlorine based product (Tristel™ product, with the appropriate contact time as provided by the manufacturer) to clean all surfaces and medical equipment.
Stage 3	**Nursing staff** Use a chlorine based product (Tristel™ product, with the appropriate contact time as provided by the manufacturer) to clean all surfaces and medical equipment.	**Domestic staff/PEA** Complete final exit clean.
Stage 4	**Domestic staff** Complete final exit clean	
Stage 5	**Nursing staff** Contact ISS through operational support to arrange HPV clean.	**Re-introduce room for clinical use.**
Stage 6	**Nursing staff** If the room is being swabbed please contact trained nursing staff for environmental sampling.	
Stage 7	**Re-introduce room for clinical use**	

Cystic Fibrosis Trust
2nd Floor
One Aldgate
London EC3N 1RE

020 3795 1555
enquiries@cysticfibrosis.org.uk
cysticfibrosis.org.uk

The information included in this publication is not intended to replace any advice you may receive from your doctor or CF multidisciplinary team and it is important that you seek medical advice whenever considering a change of treatment.

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