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# Final Identification of Nontuberculous Mycobacteria (NTM) Matters

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# COI-I have no disclosures

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# Topics

- Toolbox 1 – specimen
- Toolbox 2 – positive culture
- Good news – bad news
- Pulmonary NTM
- National Jewish Health algorithm
- National Jewish Health laboratory data
- Beyond routine testing
- Patient centered approach

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# Toolbox-1

- ✓**Specimen – sputum, CSF, formalin-fixed tissue**
  - AFB microscopy
  - Solid & broth-based media
  - **NAAT-D** (TB complex)
  - **NAAT-R** (RIF, INH and more)
  - **Direct AST**

**Molecular TB Testing 7 Days a Week**

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# Toolbox-2

- ✓**AFB positive culture (broth-, solid-based media)**
  - **TB Yes/No** (final identification within TB complex)
  - **NAAT-R**
  - Broth-based AST
  - Agar-based AST
  - Minimal Inhibitory Concentration (MIC)

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# Good News – Bad News

**NTM Detected…**

***Good news for TB Control*** – No contact investigation, etc.

**… and clinically significant…**

***Bad news for the patient*** – cure rates for *M. avium* complex or *M. abscessus* range from 50-75% but relapses are common and exogenous reinfection is a major challenge

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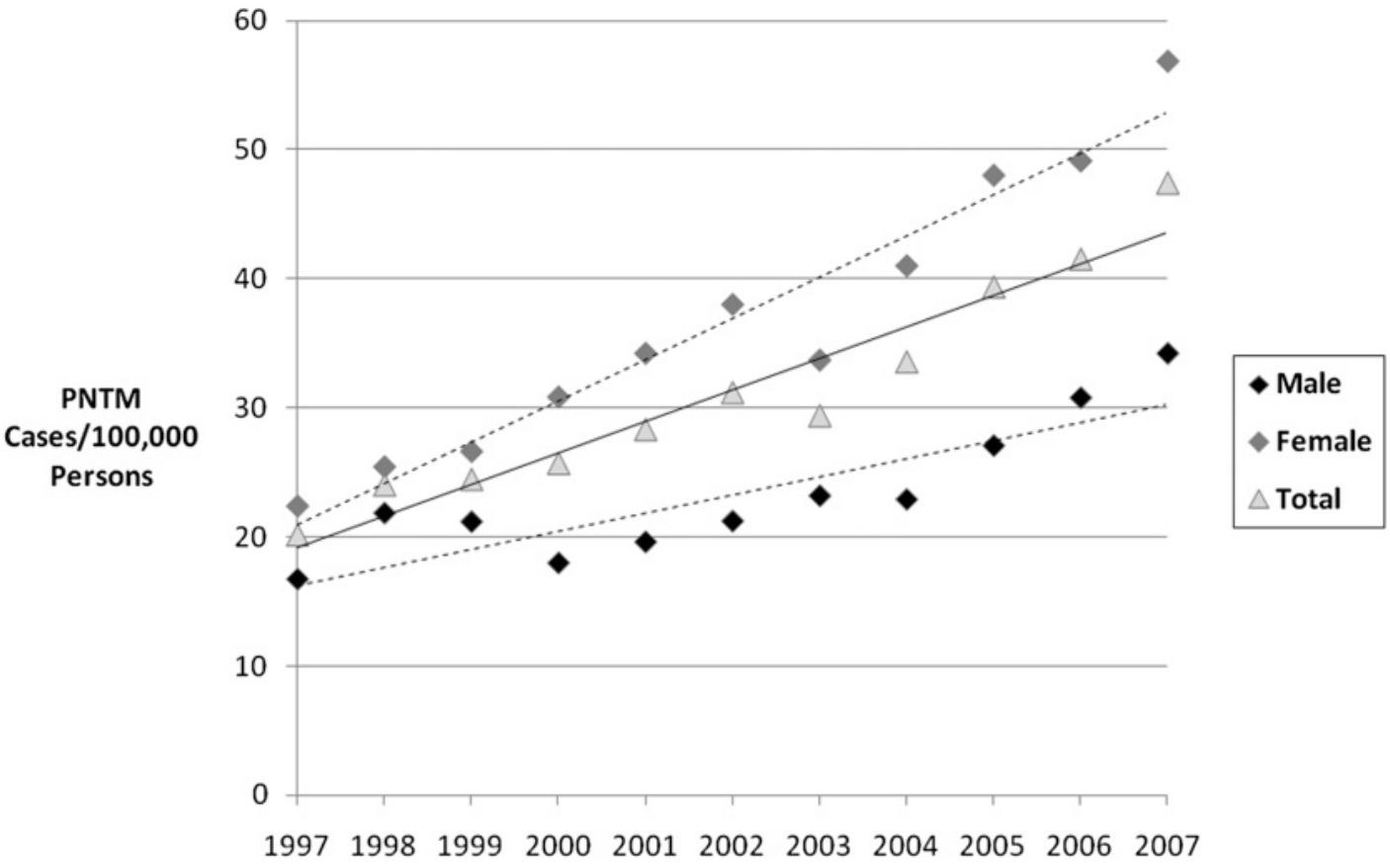
# PNTM Medicare Part B




**Adjemian et al AJRCCM 185:881-886(2012)**
**PNTM = pulmonary nontuberculous mycobacteria**

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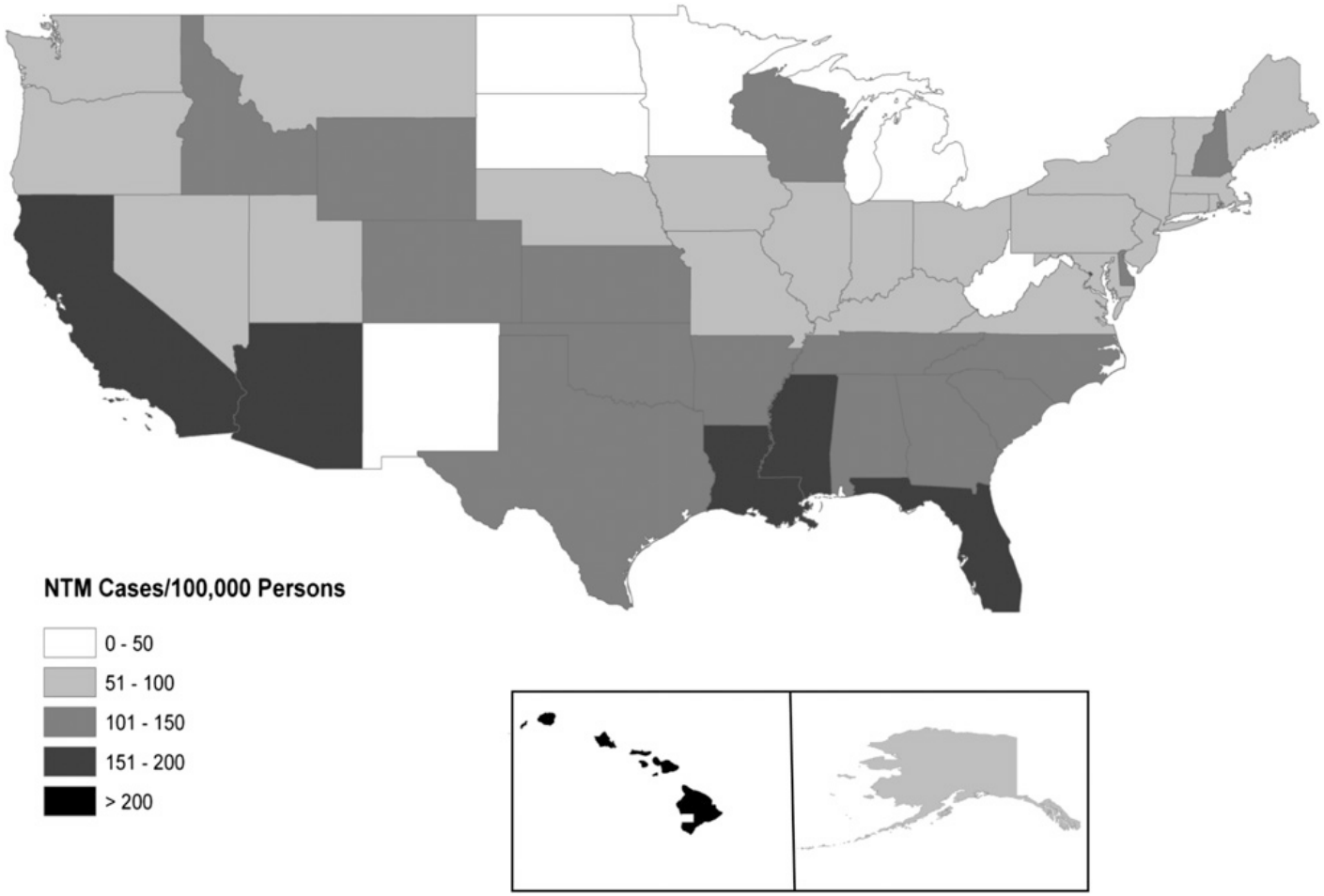
# PNTM Medicare Part B




**Adjemian et al AJRCCM 185:881-886(2012)**
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# PNTM Disease, Ontario

Five-year prevalence of pulmonary nontuberculous mycobacterial disease, Ontario, Canada, 1998–2002 and 2006–2010*

| Isolate | 1998–2002 | 2006–2010 | p value |
|---|---|---|---|
| *M. avium complex* | 18.0 | 26.5 | <0.0001 |
| *M. xenopi* | 7.4 | 9.5 | <0.0001 |
| *M. fortuitum* | 0.63 | 1.2 | 0.01 |
| *M. abscessus* | 0.63 | 1.2 | <0.0001 |
| Other nontuberculous *Mycobacterium spp.* | 1.8 | 3.0 | <0.0001 |
| All nontuberculous *Mycobacterium spp.* | 29.3 | 41.3 | <0.0001 |

**Emerg Infect Dis 2013 19:1889-1891**

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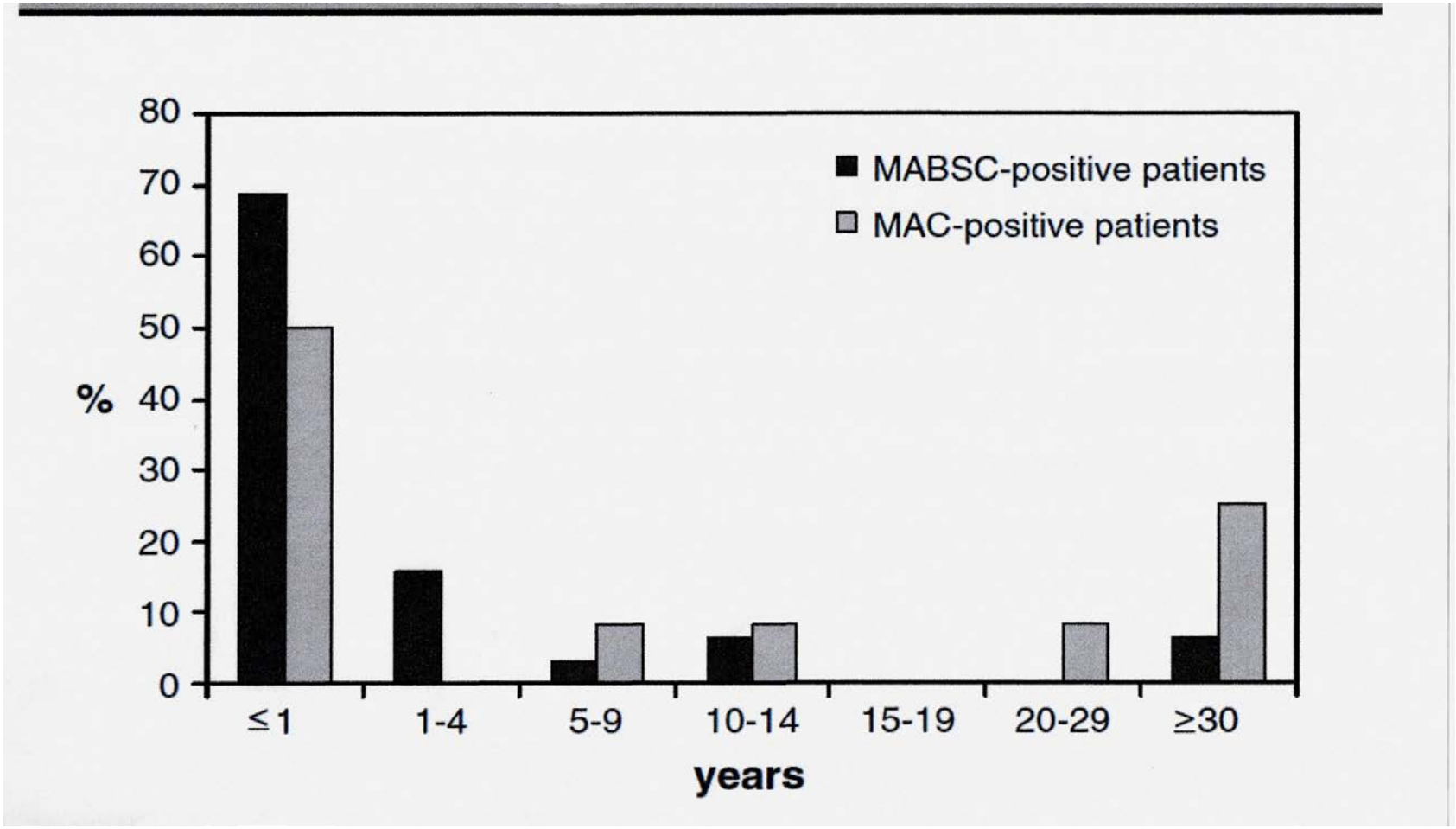
# NTM in CF Patients




**Catherinot et al J Cystic Fibrosis 2013; 12:74-80**

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# NJH Algorithm

- AFB positive
- Rule out *M. tuberculosis* complex
- Sequence *rpoB* gene
  - if *M. abscessus* group, then
  - erm(41) and *hsp65*

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# NTM ID-26 mos.

**> 8,800 isolates were analyzed using *rpoB* gene sequencing**

Seven *Mycobacterium* species accounted for ~80% of all isolates tested

| | | |
|---|---|---|
| 24.4% | *M. abscessus* group | |
| 19.9% | *M. avium* | 42.3% |
| 16.4% | *M. intracellulare* | |
| 6.0% | *M. chimaera* | |
| 5.1% | *M. fortuitum* | |
| 3.8% | *M. gordonae* | |
| 3.7% | *M. chelonae* | |

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# *erm*(41)


***M. massiliense*** **is positive for the *erm*(41) gene but contains a 273-bp deletion within the gene rendering the gene nonfunctional.**

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# N=2,058

| Species | Number identified | Percentage |
|---|---|---|
| *M. abscessus* | 1,470 | 71.7% |
| *M. massiliense* | 420 | 20.5% |
| *M. bolletii* | 110 | 5.4% |
| *other* | 58 | 2.4% |

# Final ID Matters

Treatment response rates to combination antibiotic therapy including clarithromycin were much higher in patients with *M. massiliense* lung disease than those with *M. abscessus* lung disease.

**Koh et al Am J Respir Crit Care Med 183:405-410 (2011)**

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# Outcomes

| Outcomes | *M. abscessus* (n=24) | *M. massiliense* (n=33) | P value |
|---|---|---|---|
| Symptoms | | | |
| Improved | 18 (75%) | 32 (97%) | 0.04 |
| Unchanged | 4 (17%) | 1 (3%) | |
| Worsened | 2 (8%) | - | |
| HRCT Findings | | | |
| Improved | 10 (42%) | 27 (82%) | 0.003 |
| Unchanged | 7 (29%) | 5 (15%) | |
| Worsened | 7 (29%) | 1 (3%) | |
| Sputum conversion | | | |
| Converted | 6 (25%) | 29 (88%) | <0.001 |
| Relapsed | 4 (17%) | 3 (9%) | |
| Failed | 14 (58%) | 1 (3%) | |

**Koh WJ et al. AJRCCM. 2011;183:405-410**

# Pulmonary NTM

## Signs and Symptoms:

**Cough (chronic); Fatigue; Weight Loss; Hemoptysis; Dyspnea**

## Radiology

Fibrocavitary – ***M. avium* complex**
Nodular & interstitial nodular infiltrates – ***M. avium* complex**
Fibrocavitary – ***M. kansasii***
Multi-lobar, reticulonodular or mixed reticulonodular-alveolar opacities – ***M. abscessus* group**

**The NTM species is identified by the laboratory!**

Daley CL: Nontuberculous mycobacterial infections *Eur Respir Mon* 2011 52:115-129

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# Beyond Routine Testing

- ✓Combination MIC
- ✓Extended MIC concentrations for inhaled Amikacin
- ✓Surgery

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# Dr. John Mitchell

***"Surgical evaluation in nontuberculous mycobacterial (NTM) infections plays an essential role as part of multidisciplinary management of this complex pulmonary process.*** *Resection of damaged lung parenchyma combined with appropriate antimicrobial therapy may interrupt a cycle of disease progression and relapse in select patients."*

**Thorac Surg Clin. 2012 Aug;22(3):277-85**

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# Patient Centered Approach

- ✓ **Pulmonary/ID Expert**
- ✓ **Expert Laboratory**
- ✓ **Experienced Surgeon**

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# Questions?


**Mycobacteriology & Pharmacokinetics staff (5 not present)**

# Thank you!

**Email: salfingerm@njhealth.org**