

INVESTIGATION OF MYCOBACTERIUM AVIUM COMPLEX RESPIRATORY DISEASE IN SPA WORKERS



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Objectives

- Describe an investigation of *M. avium* complex in spa workers led by the New Mexico Occupational Health Surveillance Program, EHEB, ERD, NMDOH
- Describe the multi-agency collaborative effort that developed from the investigation
- Discuss how collaboration has continued since the investigation

New Mexico Occupational Notifiable Conditions

- (a) asbestosis;
- (b) chronic beryllium lung disease;
- (c) coal worker's pneumoconiosis;
- (d) heavy metal poisoning;
- (e) **hypersensitivity pneumonitis;**
- (f) mesothelioma;
- (g) noise induced hearing loss;
- (h) occupational asthma;
- (i) occupational pesticide poisoning;
- (j) silicosis;
- (k) other illnesses related to occupational exposure

February, 2010

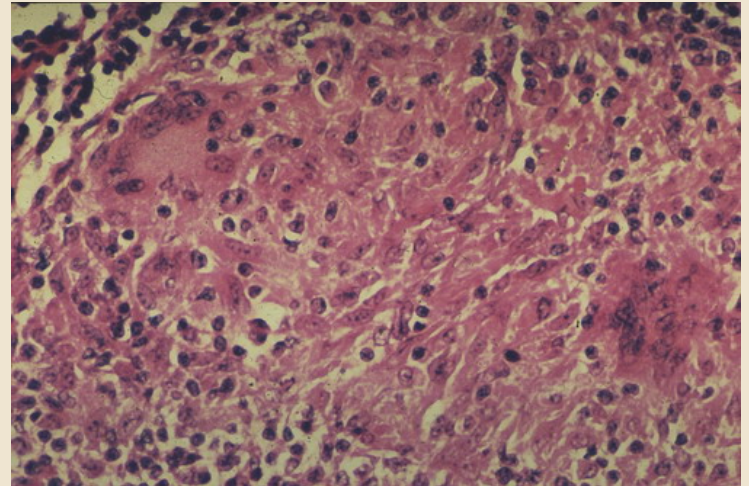
- Notified of two cases of hypersensitivity pneumonitis (HP) with *Mycobacterium avium* complex (MAC) infection
- Two workers
 - ▣ Same employer
 - ▣ Same job
 - ▣ Related

Hypersensitivity Pneumonitis (HP)

- Interstitial lung disease - immune response to inhaled antigen particles – often fungal
- Acute: alveolar inflammation and flu-like symptoms
- Chronic: pulmonary fibrosis and respiratory impairment

Mycobacterium avium complex

- Ubiquitous organism
 - Water, soil & biofilms
 - Thrives in hot water
- Acquired via inhalation, ingestion, or direct inoculation
- No human-to-human transmission
- Dramatic ↑ in MAC isolates



<http://granuloma.homestead.com/index.html>



Investigation

Coordination of Investigation

□ **NMDOH**

- TB Program
- Scientific Laboratory Division
- Epidemiology Division
- Occupational Health Surveillance
- Other epidemiologists and translators

□ **NMED**

- OSHA – worker protection regulatory authority
- EHD – regulates swimming pools and spas

□ **Expert consultants**

- NIOSH, UNM, others

□ **CDC environmental laboratory**

Investigation Strategy

- Epidemiology
 - ▣ Chart review of known cases
 - ▣ Survey workers for symptoms and exposures
- Collection of biological evidence
- Pool inspection
- OSHA inspection

Case finding issues

- Gain the cooperation of employer
- Sensitivity to workers
 - ▣ Several are Spanish speaking – translation and interpreters needed
 - ▣ Resident status not known
- How do we provide services if we discover new cases?

Microbiological evidence

- Sputum samples cultured at NMDOH Scientific Laboratory
- Environmental sampling
 - ▣ 1 L water samples + thiosulfate
 - ▣ Swabs of biofilms and slime from filters

CDC Environmental Microbiology Laboratory

Centers for Disease Control & Prevention, National Center for Emerging Zoonotic and Infectious Disease, Division of Healthcare Quality Promotion, Clinical and Environmental Microbiology Branch, Environmental and Applied Microbiology Team

- Samples plated 2-3 week growth
- HPLC & PCR-Restriction Fragment Length Polymorphism to confirm patient isolates and ID water as MAC (+)
- PFGE molecular typing on 13 samples and isolates

Survey

Symptoms

- Dry cough
- Cough with phlegm
- Wheezing
- Chest tightness
- Shortness of breath
- Fever
- Chills
- Ache
- Tiredness or fatigue
- Unexplained weight loss

Job duties

Exposures

- Pool chemicals
- Diesel exhaust
- Cleaners
- Pesticides
- Mold, bird droppings, pollen, dust
- Other work
- Travel
- Hobbies
- Water source in home
- Tub use



Results

Chart reviews

□ Case #1

- Cough, hemoptysis, dyspnea
- 10 mm ppd
- Culture (+) for MAI
- CT scan: scattered areas of ground-glass infiltration within all lobes

□ Case #2

- Worsening cough and other respiratory symptoms
- Had pneumonia diagnosis
- Culture (+) for MAC

Epidemiology

- 56 employees (67%) + 1 former employee
- Ratio of male to female ~ 1:1
- Mean age 37 (Range 21 to 65 years)
- Length of employment 4.7 years (range <1 – 23 years)
- Work time/week: 33.4 hours (range 12 – 55 hrs)
- 20 had other employment (no association)

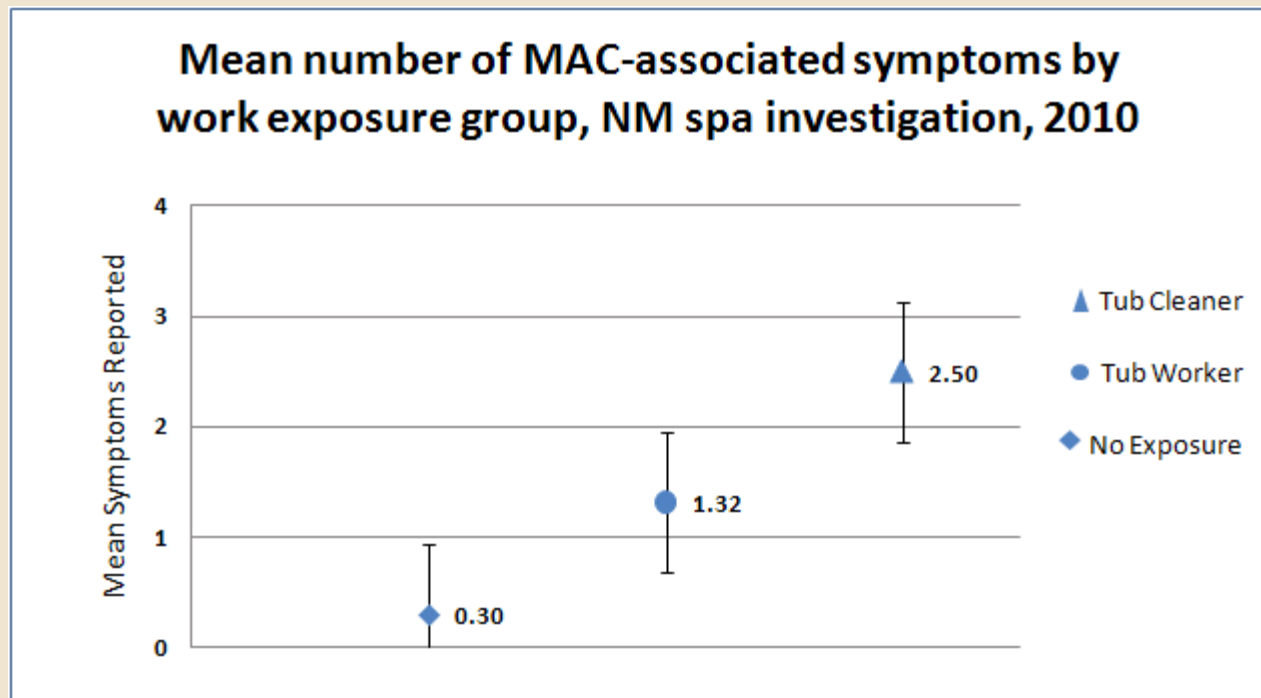
Job categories

- 12 “Tub cleaners”
 - ▣ Clean pumps, filters, tubs, check water chemistry
- 23 “Tub workers”
 - ▣ Clean areas around spas, check temperature
- 21 Non-exposed employees
 - ▣ no contact with tubs

Epidemiology contd.

- 35 asymptomatic
- Average symptoms = 2 (range 1 – 8)
 - 13 cough with phlegm
 - 12 dry cough
 - 9 wheeze
 - 8 tiredness
 - 7 chills
 - 6 shortness of breath
 - 5 weight loss
 - 4 chest tightness
 - 4 fever
 - 3 aches

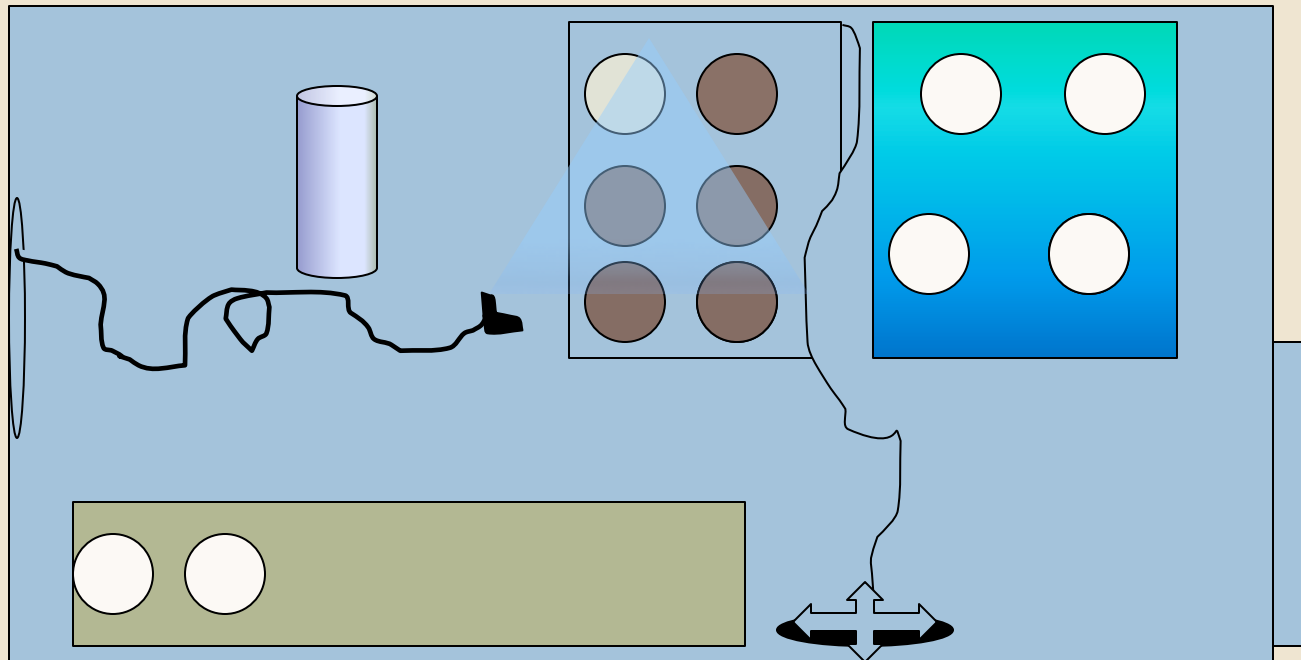
Epidemiology, contd.



ANOVA p value=0.008

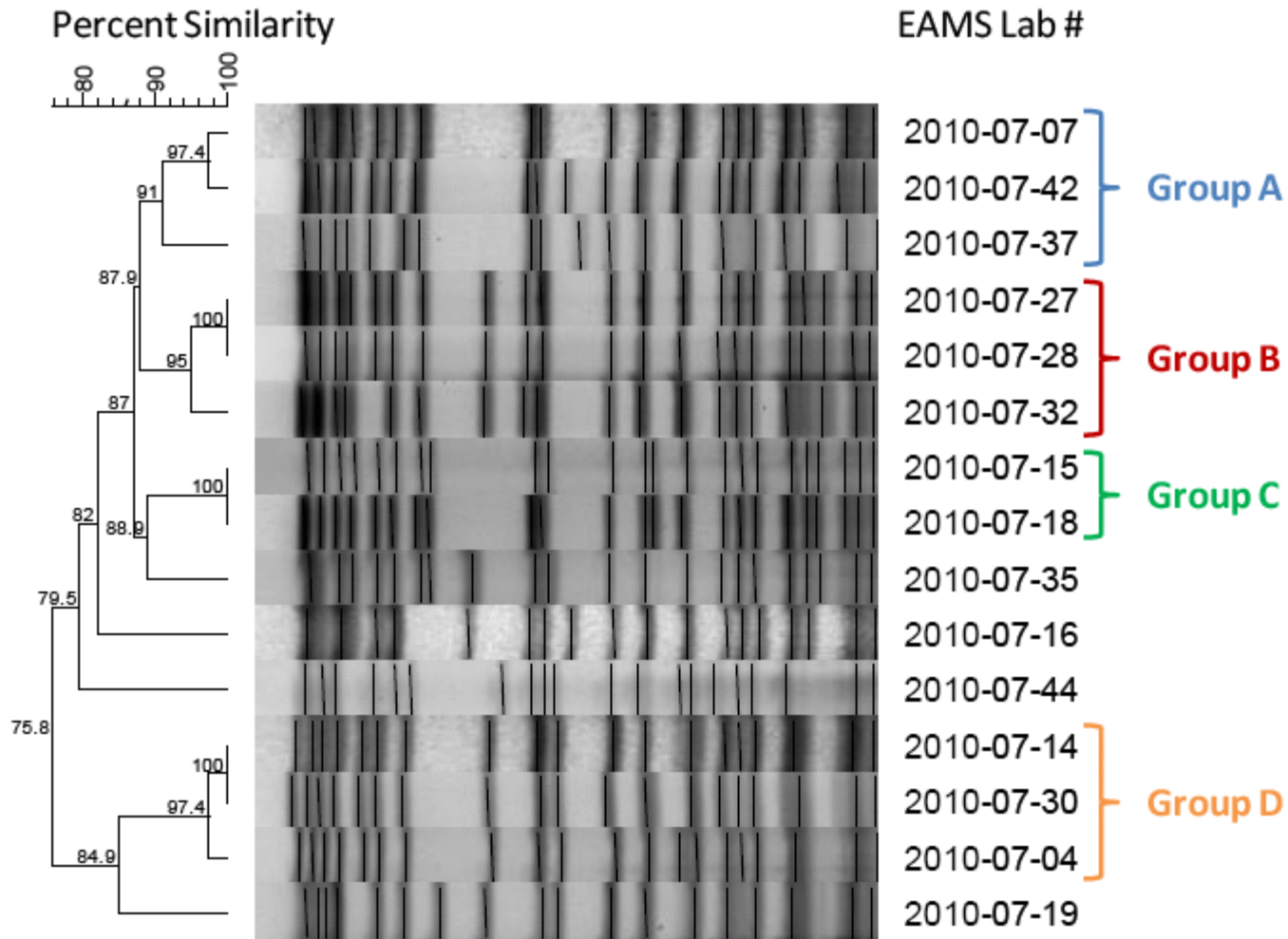
Observations - NMDOH

- Focus on the “filter deck”



Cartridge Filters





Group A: 2010-07-07 Cartridge filter swab, 2010-07-42 Patient 1 isolate, 2010-07-37 Cold-plunge tub

OSHA Enforcement

1. No hazard assessment for personal protective equipment (PPE)
2. No PPE training
3. No respiratory training protection program
4. No medical evaluation for respiratory PPE
5. No fit testing
6. Unsanitary respirators
7. Improper respirator storage
8. No annual respirator training
9. No respirator consult with employees
10. No information/training on chemicals

NM Environmental Dept. Inspection/ Actions

- ❑ Collecting water samples at plumbing ports – not in spas
- ❑ Commingling of filters - rotation between tubs
- ❑ Excess disinfectant ($>75\text{ppm H}_2\text{O}_2$)
- ❑ Flow rate not monitored in some tubs
- ❑ Bather load signs missing
- ❑ Incomplete water chemistry logs

Recommendations - NMDOH

- 1. Conduct an independent industrial hygiene assessment of the filter deck and adopt ventilation recommendations.
- 2. Assure that respiratory protection is worn when filters are being washed and while power washing tubs to protect against aerosolized biofilms.
- 3. Prevent, or at a minimum, control the growth of biofilms in all parts of the spa circulation system.

Recommendations, contd.

- 4. Discontinue use of wooden tubs where biofilms may accumulate.
- 5. Discontinue the use of hydrogen peroxide as a disinfectant.
- 6. Use halogen disinfection.
- 7. Use an EPA-approved tuberculocide to treat surfaces coming into contact with spa water where biofilms tend to accumulate.

Recommendations for HCPs

- 8. For aerosol-exposed patients/workers diagnosed with atypical pneumonia, submit biological specimens for laboratory testing for MAC.
- 9. Report all potential occupational cases of MAC to the NM DOH as per New Mexico Administrative Code 7.4.3.
- 10. Remove MAC positive workers from work environments where further exposure could occur.

Study limitations

- Not all processes were observed or sampled.
- MAC quantification in aerosol samples was not performed.
- Measurement of aerosolization radius in relation to breathing zones was not measured.

Continued partnership with OSHA

- Reassessment of the MOA between the NMOHSP and NM-OSHA
- Development of procedures for communication between the two agencies
- Regular meetings, communications
- OSHA participation in NMOHSP Strategic Planning
- Collaboration on health care worker project

Outcomes

- Visibility with Public Health Division
- Reporting from Infectious Disease Bureau
 - ▣ Led to increased reports to OSHA
- Gained knowledge of how to work with NM Scientific Laboratory Division and CDC Laboratories
- Utilization of NIOSH expertise

- Swimming pool program...

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<http://nmhealth.org/eheb/documents/ERMAC040411.pdf>

Go to URL above to find the NM Epidemiology Report
Mycobacterium avium complex Infection among Spa Workers
in New Mexico, April 1, 2011