Mycobacterium avium complex respiratory disease from aerosolized water exposure in spa workers in New Mexico

Stephanie Moraga-McHaley, MS, Janice Frustaglia, RN,BS,CCM,COHN-S and Michael Landen, MD MPH, New Mexico Department of Health

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The New Mexico Occupational Health Surveillance Program (NMCHSP) was notified of two cases of hypersensitivity pneumonitis (HP) with Mycobacterium avium complex (MAC) infection. The two cases were employed at a spa establishment with several outdoor tubs.

Hypersensitivity Pneumonitis (HP)
Intersitial lung disease - immune response to inhaled antigen particles
Acute: alveolar inflammation and flu-like symptoms
Chronic: pulmonary fibrosis and respiratory impairment

Mycobacterium Avium Complex
Ubiquitous organism found in water, soil & biofilms;
Impairment

We would like to acknowledge the following individuals: C. Mack Sewell, DrPH, MS, Heidi Krapfl, MS, Joan Baumbach, MD, Michael Landen, MD MPH, New Mexico Department of Health; Stephanie Moraga-McHaley, MS, Janice Frustaglia, RN,BS,CCM,COHN-S and Michael Landen, MD MPH, New Mexico Department of Health.

Methods
NMCHSP coordinated with the two regulatory entities having oversight: NM Occupational Health and Safety Bureau (NMCHSB) and NM Swimming Pool Program, both of the State Environment Department. Others involved included the Tuberculosis Program, Scientific Laboratory Division, other epidemiologists and translators within the Department of Health. We consulted with experts from NIOSH, University of New Mexico, and others.

Epidemiology
Chart review of known cases
Survey workers for symptoms and exposures
The number of symptoms for each employee was calculated and it was determined through ANOVA. The mean number of symptoms with exposure to MAC varied between exposure categories.
Other questions: other employment, home water source, recent travel.
Sputum samples cultured previously at NMDOH Scientific Laboratory.

Environmental sampling
1 L water samples + biosoluate

Swim and waters samples and swabs of biofilms from tubs and filters were collected for microbial analysis. PFGE matching to patient isolates was conducted at the Centers for Disease Control and Prevention (CDC) Environmental Microbiology Laboratory. Samples were plated 2-3 weeks growth. HPLC & PCR-Restriction Fragment Length Polymorphism was done to confirm patient isolates and ID water exposure categories. PFGE molecular typing was done on 13 samples and isolates.

Pool Inspection by ERD Swimming Pool Program

OSHA inspection by NMCHSB

Results

Exposure Results

<table>
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<th>Symptom</th>
<th>N (%)</th>
<th>Mean symptoms/worker</th>
<th>P Value</th>
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<tbody>
<tr>
<td>Tub cleaner</td>
<td>13 (22.8)</td>
<td>2.31</td>
<td>0.006</td>
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<td>Non-exposed</td>
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Symptoms by Exposure Category, 2010

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Survey workers for symptoms and exposures

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Mean number of MAC-associated symptoms by work exposure group, NM spa investigation, 2010

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<th>Group</th>
<th>Tub Cleaner</th>
<th>Non-Exposed</th>
<th>Q (95% CI)</th>
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<tr>
<td>1</td>
<td>2.31</td>
<td>0.29</td>
<td>1.56-3.08</td>
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Discussion

The cases of MAC in the two workers were found to be associated with spray cleaning of spa cartridge filters in a recently enclosed shed (filter deck). Further collaboration constituted in primary work practice recommendations, prevention recommendations, as well as strengthening communication between the agencies involved.

Recommendations
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 the washing waters enter the building to prevent aerosolized biofilms.
3. Prevent, or at a minimum, control the growth of biofilms in all parts of the spa culture system.
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 tubuculicide to treat surfaces coming in contact with spa water where biofilms tend to accumulate.
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 environment where further exposure could occur.

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