

# A CASE OF HOT TUB LUNG

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## Introduction

Hypersensitivity pneumonitis (HP) may be caused by a wide variety of inhaled allergens. We report a case resembling HP in association with *Mycobacterium avium intracellulare* (MAC). The source of the organism was thought likely to be an outdoor spa, from where it was isolated. MAC has been found in aerosol-generating household hot water sources, and is known to cause a condition mimicking HP, called "hot tub lung".

## Description of Case

A 41-year-old man presented with progressive dyspnoea on exertion and dry cough for 3 weeks. He was a smoker, worked in a limestone quarry for the last decade and had previously worked with talc dust. He kept about 20 pigeons for meat and some years earlier, had worked in a chicken factory. He had worked with mushroom compost a month prior to presentation. There was no apparent benefit following treatment with 2 courses of oral antibiotics and a short course of prednisolone. At presentation, he was hypoxemic with PaO<sub>2</sub> 47mmHg while breathing room air. His fingers were not clubbed. There were fine crackles at the lung bases. Systemic examination was otherwise unremarkable.

Chest radiograph revealed hyperinflated lung fields and scattered areas of ground glass opacities were noted on Computed Tomography (CT). Pulmonary function tests showed expiratory airflow limitation with a significant acute bronchodilator response; diffusing capacity was within normal limits. Fungal and avian precipitins, respiratory infective serology and connective tissue disease screens were negative. Fibre-optic Bronchoscopy revealed no endo-bronchial lesions. Broncho-alveolar lavage (BAL) fluid revealed normal cell counts with no malignant cells and smears were negative for pathogens. Transbronchial biopsies yielded non-caseating granulomas and a lymphocytic interstitial infiltrate suggestive of HP; stains for acid fast bacilli (AFB) and fungi were negative. Although AFB were not seen on the initial smear of BAL fluid, MAC was cultured after 2 weeks.

The isolation of MAC in the setting of HP led to a search for the source; it was noted that he had acquired a spa 6 months earlier. A visit to his house was undertaken; the spa was inspected and tested. MAC was isolated in significant numbers from the water and filter samples, confirming the source.

Initial treatment was with moderate dose prednisolone as for HP but upon the isolation of MAC, anti-Mycobacterial therapy with 3 agents was also instituted. The spa was treated appropriately to ensure avoidance of ongoing exposure. He responded well.

## Key Questions for Discussion

### 1. Is this a common manifestation of disease caused by MAC?

Pulmonary disease due to MAC usually occurs in middle-aged or elderly people with impaired cellular immunity or chronic lung disease such as chronic obstructive pulmonary disease and bronchiectasis. The spectrum includes cavitory disease, opportunistic infection and nodular disease associated with bronchiectasis. Patients may present with features similar to, but generally milder than typical Tuberculosis. Less common manifestations include interstitial lung infiltrates and pulmonary nodules. MAC disease presenting with features resembling HP is uncommon, but known to occur following exposure to aerosol-generating contaminated hot water sources such as hot tubs and is referred to as "hot tub lung"<sup>1,2</sup>.

### 2. Are the manifestations related to infection or hypersensitivity to MAC antigen?

The pathology of hot tub lung is poorly understood and although the various manifestations maybe related to MAC infection, a hypersensitivity reaction or both, available evidence seems to favour hypersensitivity to MAC antigen as the likely mechanism<sup>3,4</sup>.

### 3. What is the role of identifying the source of the inciting agent in a patient with HP?

When facing a patient with HP, identification of the source of the inciting agent is important to avoid ongoing exposure to the offending environment. Treatment with corticosteroids without taking the patient away from the offending environment results in sub-optimal control and the distinct possibility of recurrence once treatment is tapered or ceased.

In our patient, if the source had not been identified, he would have had ongoing exposure to the spa, with poor response to treatment, raising questions about adherence to the treatment regimen, efficacy of medications, emergence of drug resistance etc. The illness could also have been mistakenly attributed to his occupational environment, resulting in a need to seek alternative employment and social disruption.

### **Relevant Literature Review**

Although MAC is usually pathogenic only in patients with underlying chronic lung disease or compromised immunity, it may also cause a hypersensitivity reaction resulting in a condition resembling HP in immuno-competent hosts. Affected individuals often have a history of exposure to hot water aerosols from hot tubs / spas, showers and indoor swimming pools; the resultant condition has been referred to as "hot tub lung". In a series of 21 patients<sup>3</sup>, the mean age of patients was 46 years and all patients described ongoing exposure to hot tubs. The most common symptoms were dyspnoea and cough; hypoxemia was noted in 48% of the patients. The most common findings on CT are centrilobular nodules, areas of ground-glass attenuation and air trapping on expiratory images<sup>5</sup>. Lung biopsies usually reveal well-formed granulomas without necrosis. Avoidance of additional exposure to the offending environment is the cornerstone of therapy. Corticosteroids maybe helpful in the treatment of severely affected patients; in contrast to true MAC infection, the role of anti-mycobacterial treatment is controversial. Both the public and clinicians need to be made aware of this condition to allow for prevention, early diagnosis and treatment.

### **Issues of Interest in the Case**

1. The identification and demonstration of the inciting agent from lung tissue or respiratory secretions from patients with HP is uncommon in clinical practice
2. This is an uncommon presentation of disease due to MAC
3. Back to the basics - the importance of eliciting a detailed history, including details of the patient's environment. Although the patient had several risk factors for HP, once MAC was identified, knowledge of the patient having a spa became crucial
4. The case illustrates the importance of going the extra mile - identification of MAC from the water and filters in the spa to identify the source
5. Public Health importance – the need for educating the community regarding proper maintenance of spas and household water sources

### **Key References**

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