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LEGIONELLA MICDADEI PNEUMONIA MIMICKING MILIARY TUBERCULOSIS IN AN ELDERLY TRAVELLER: A DIAGNOSTIC CHALLENGE

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ABSTRACT

Introduction: *Legionella micdadei* is an uncommon cause of atypical pneumonia and may be underrecognized because routine diagnostic testing primarily identifies *Legionella pneumophila*. Clinical and radiologic manifestations are variable and, in rare instances, may mimic miliary tuberculosis, creating significant diagnostic uncertainty and potential delays in appropriate therapy.

Case description: A 77-year-old male presented with persistent headache, fatigue, decreased appetite, and unintentional weight loss following several weeks of flu-like symptoms after recent travel to Pakistan. Imaging demonstrated innumerable diffuse pulmonary micronodules concerning for miliary tuberculosis. The patient was placed in airborne isolation and empirically treated with anti-tuberculous therapy. Extensive microbiologic testing, including sputum studies and serologic evaluation, was negative. Because sputum samples could not be obtained, bronchoscopy with bronchoalveolar lavage (BAL) was performed. Molecular testing of BAL fluid identified *L. micdadei*. Anti-tuberculous therapy was discontinued and treatment with levofloxacin was initiated, resulting in rapid clinical improvement.

Conclusion: This case highlights a rare presentation of *L. micdadei* pneumonia with diffuse pulmonary micronodules mimicking miliary tuberculosis. Recognition of this atypical presentation and the use of advanced diagnostic techniques such as bronchoscopy and molecular testing are essential for establishing the correct diagnosis and guiding appropriate management.

KEYWORDS

Legionella micdadei, miliary pulmonary nodules, atypical pneumonia, bronchoalveolar lavage PCR, tuberculosis mimic

LEARNING POINTS

- *Legionella micdadei* pneumonia can rarely present with diffuse pulmonary micronodules mimicking miliary tuberculosis, leading to potential diagnostic misinterpretation.
- Standard urinary Legionella antigen testing primarily detects *L. pneumophila*; therefore, molecular diagnostics such as bronchoalveolar lavage polymerase chain reaction may be required to identify non-pneumophila species

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INTRODUCTION

Legionella species are recognized causes of atypical pneumonia, most frequently associated with *Legionella pneumophila*. However, other species within the genus, including *Legionella micdadei*, can also produce clinically significant pulmonary infections. First described during an outbreak among immunocompromised patients[1] and historically referred to as the "Pittsburgh pneumonia agent," *L. micdadei* is now considered the second most commonly reported Legionella species implicated in human disease. Despite this, it remains underdiagnosed because widely used diagnostic tools, particularly urinary antigen assays, primarily detect *L. pneumophila* serogroup 1.

Clinical manifestations of *L. micdadei* infection are often nonspecific and may resemble other forms of community-acquired pneumonia. Patients typically present with fever, cough, malaise, and constitutional symptoms. Radiographic findings are variable and may include focal consolidation, nodular infiltrates, cavitary lesions, or diffuse pulmonary disease.

In rare circumstances, *L. micdadei* infection may produce diffuse pulmonary micronodules resembling a miliary pattern. This imaging appearance is classically associated with disseminated tuberculosis, fungal infections, or metastatic malignancy, which can create diagnostic confusion and delay identification of the underlying pathogen. The diagnostic challenge becomes particularly pronounced in patients with epidemiologic risk factors such as recent travel to tuberculosis-endemic regions.

We report a case of *L. micdadei* pneumonia in an elderly traveller presenting with constitutional symptoms and diffuse pulmonary micronodules initially suspected to represent miliary tuberculosis. This case highlights the importance of maintaining a broad differential diagnosis and utilizing molecular diagnostic techniques when conventional investigations fail to identify the causative organism.

CASE DESCRIPTION

A 77-year-old male with a medical history of benign prostatic hyperplasia, asymptomatic cholelithiasis, gastroesophageal reflux disease, hyperlipidaemia, and erectile dysfunction presented to the emergency department on September 21, 2025 with persistent headache, fatigue, poor appetite, and unintentional weight loss following a 3-week history of flu-like illness characterized by intermittent fevers, chills, productive cough, and progressive weakness.

Approximately 2 months prior to presentation, the patient had travelled to Pakistan and returned without immediate health concerns. Shortly afterward, he developed symptoms consistent with a viral respiratory illness. Several household members experienced similar symptoms and subsequently recovered; however, the patient's symptoms persisted and gradually worsened. Over the following weeks he experienced progressive fatigue, persistent headaches, decreased oral intake, and an estimated weight loss of 2.2 to 4.5 kg.

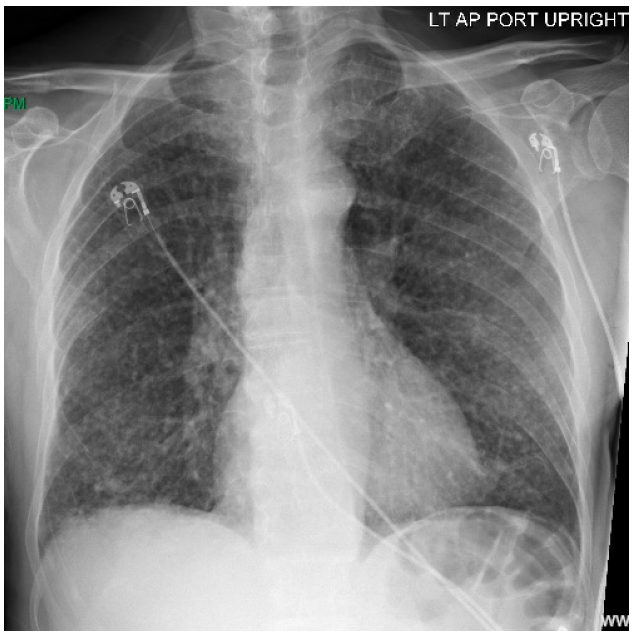


Figure 1. *Chest radiograph showing diffuse bilateral micronodular opacities in a miliary pattern.*

Five days before hospital admission, he was evaluated by his primary care physician and was found to be hypotensive, which improved with oral fluid intake. Despite this intervention, his symptoms continued to progress, prompting further evaluation.

On presentation, vital signs were stable with a temperature of 36.6°C, heart rate of 78 beats per minute, respiratory rate of 18 breaths per minute, blood pressure of 167/85 mmHg, and oxygen saturation of 99% on room air. Physical examination revealed a cachectic appearance with generalized weakness.

Laboratory testing demonstrated leucocytosis (white blood cell count 14.59 $\times 10^3$/µl), anaemia (haemoglobin 9.7 g/dl), thrombocytosis (platelets 746 $\times 10^3$/µl), and markedly elevated inflammatory markers including C-reactive protein of 112 mg/l and erythrocyte sedimentation rate of 69 mm/hr. Mild transaminitis was present with aspartate aminotransferase 49 U/l and alanine aminotransferase 64 U/l. Iron studies were consistent with anaemia of chronic inflammation. Viral respiratory testing was negative.

Chest radiography revealed diffuse small nodular opacities throughout both lung fields *(Fig. 1)*.

Computed tomography (CT) imaging demonstrated innumerable pulmonary micronodules distributed throughout both lungs *(Fig. 2)*. CT imaging of the abdomen and pelvis also showed multiple pulmonary micronodules at the lung bases without evidence of malignancy or significant lymphadenopathy.

Given the patient's travel history, constitutional symptoms, weight loss, and imaging findings, miliary tuberculosis was strongly suspected. The patient was placed in airborne isolation in a negative-pressure room and admitted for further evaluation.

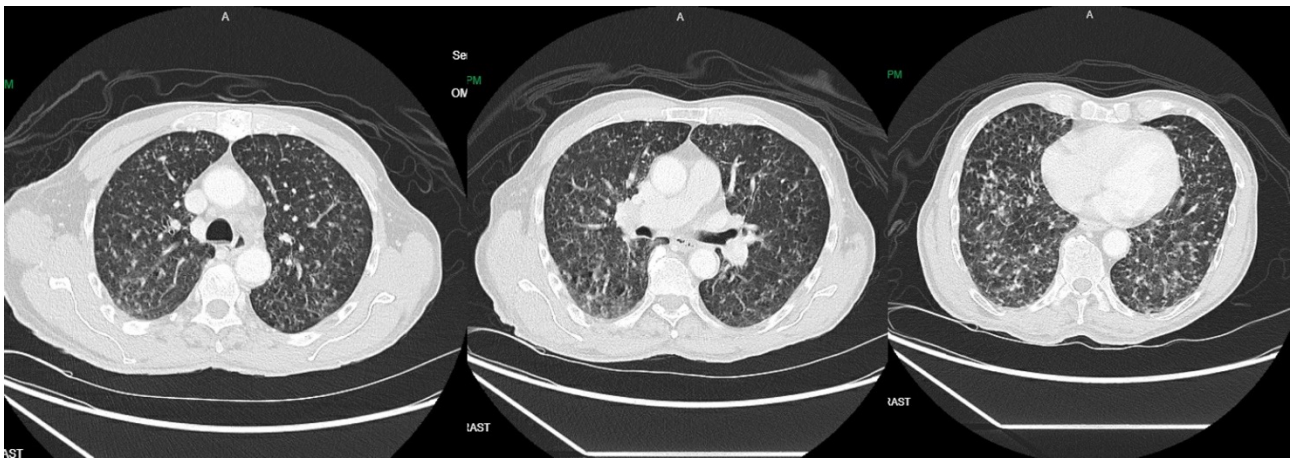


Figure 2. Computed tomography of the chest demonstrating diffuse bilateral micronodular opacities consistent with a miliary pattern.

An extensive infectious workup was initiated including QuantiFERON-TB Gold testing, sputum cultures for acid-fast bacilli, mycobacterial blood cultures, *M. tuberculosis* polymerase chain reaction (MTB PCR) testing, human immunodeficiency virus serology, respiratory cultures, fungal testing, urinary antigens for *Legionella* and *Streptococcus pneumoniae*, Histoplasma and Blastomyces antigen testing, methicillin-resistant *Staphylococcus aureus* screening, and next-generation sequencing (Karius test). Empiric antimicrobial therapy with ceftriaxone and doxycycline was started.

Because the patient was unable to produce sputum samples, pulmonology was consulted and bronchoscopy with bronchoalveolar lavage (BAL) was performed on September 25, 2025.

Given the strong suspicion for tuberculosis, empiric anti-tuberculous therapy with isoniazid, rifampin, pyrazinamide, ethambutol, and pyridoxine was initiated on September 23, 2025.

BAL fluid testing was negative for bacterial cultures, fungal cultures, acid-fast bacilli staining and culture, MTB PCR, Xpert MTB/RIF assay, Pneumocystis PCR, cytology, and Aspergillus antigen. However, Legionella PCR performed on BAL fluid returned positive for *L. micdadei*, establishing the diagnosis.

Anti-tuberculous therapy was discontinued, and antimicrobial treatment was transitioned to intravenous levofloxacin 750 mg every 48 hours, later continued orally.

The patient demonstrated progressive clinical improvement with resolution of fatigue, headaches, weakness including respiratory symptoms. He was discharged on September 26, 2025, with a 3-week course of oral levofloxacin. At outpatient follow-up, his symptoms had resolved, and functional status had significantly improved.

DISCUSSION

L. micdadei, historically known as the "Pittsburgh pneumonia agent," represents the second most commonly reported Legionella species associated with human infection after *Legionella pneumophila*[1]. Unlike *L. pneumophila*, which is frequently detected using urinary antigen testing, infections caused by *L. micdadei* may remain undetected because standard diagnostic assays are less sensitive for non-pneumophila species[1,2].

Radiologic manifestations of *L. micdadei* infection are variable and may include nodular infiltrates, cavitary lesions, or diffuse pulmonary disease[1,3]. In rare instances, the infection can produce a miliary pattern of pulmonary nodules that closely resembles disseminated tuberculosis or fungal infection[2,4]. Only a limited number of cases describing this presentation have been reported in the literature, highlighting the diagnostic complexity associated with this organism.

Our case demonstrates several diagnostic challenges. The patient's travel history, constitutional symptoms, and diffuse pulmonary micronodules strongly suggested miliary tuberculosis, leading to early initiation of anti-tuberculosis therapy prior to microbiologic confirmation. In addition, the inability to obtain sputum samples delayed definitive diagnosis and necessitated bronchoscopy with bronchoalveolar lavage.

Another important feature of *L. micdadei* is its potential to exhibit weak acid-fast staining properties, which can occasionally lead to confusion with mycobacterial organisms during cytologic evaluation[5]. This characteristic further complicates differentiation from tuberculosis in patients with compatible clinical and radiologic findings.

Conventional urinary antigen testing for *Legionella* primarily detects *L. pneumophila* serogroup 1 and therefore may fail to identify infections caused by other *Legionella* species such as *L. micdadei*[1,6]. Consequently, molecular diagnostic methods including PCR-based testing and next-generation sequencing are increasingly important tools for identifying atypical pathogens in patients with unexplained pulmonary disease.

In this patient, PCR testing of BAL fluid ultimately established the diagnosis and allowed prompt modification of therapy, resulting in rapid clinical recovery. Increased awareness of atypical radiologic presentations of Legionella infections, along with improved diagnostic assays capable of detecting multiple *Legionella* species, may facilitate earlier recognition of these uncommon infections.

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