

# Pulmonary Brucellosis: Insights into Pathogenesis and Clinical Implications

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## Abstract

Brucellosis, caused by the intracellular bacteria of the genus *Brucella*, is a zoonotic infection commonly associated with febrile illness, joint pain, and fatigue. While its pulmonary involvement is infrequently reported, it presents unique challenges in diagnosis and management. This article provides a comprehensive overview of pulmonary brucellosis, focusing on its pathogenesis, clinical presentations, diagnostic approaches, challenges in diagnosis, clinical implications, treatment, and preventive measures. The pathogenesis of pulmonary brucellosis involves inhalation of infected aerosols, leading to diverse clinical presentations. Diagnostic methods encompass serological tests, blood cultures, and radiological imaging. Challenges in diagnosis arise from its resemblance to other respiratory illnesses and low clinical suspicion. Early and accurate diagnosis is crucial to prevent complications, including dissemination. Treatment involves a combination of antibiotics, with the duration of therapy varying based on severity. Improved awareness among healthcare professionals and continued research into this aspect of brucellosis are imperative to enhance clinical management and patient outcomes.

**Keywords:** Pulmonary brucellosis; Pathogenesis; Clinical presentations; Diagnosis; Challenges; Treatment

## Introduction

Brucellosis, a zoonotic infection caused by bacteria of the genus *Brucella*, primarily affects animals such as cattle, goats, and sheep, but can also be transmitted to humans through direct contact with infected animals or consumption of contaminated dairy products. While brucellosis is commonly associated with fever, joint pain, and fatigue, its involvement in pulmonary manifestations is often overlooked. Pulmonary brucellosis, though relatively rare, presents unique challenges in diagnosis and treatment due to its diverse clinical presentations and potential to mimic other respiratory diseases [1].

Brucellosis is a worldwide re-emerging zoonosis caused by organisms belonging to the genus *Brucella*, which are Gram-negative, nonspore-forming, facultative intracellular bacteria. The incidence of the disease in Turkey is 0.59 per 100,000 persons per annum, and worldwide there are 500,000 new cases of brucellosis reported annually. The primary mode of transmission is through consumption of nonpasteurized milk or cheese from infected goats, sheep or cows, the consumption of contaminated meat or by direct contact with infected animals [2]. Characteristic symptoms such as undulant fever and malaise are seen in most patients. Focal manifestations are found in the joints and bones, in the respiratory tract, in the cardiovascular system, the nervous system, the urogenital system as well as in the liver, spleen and skin.

## Pathogenesis of pulmonary brucellosis

The pathogenesis of pulmonary brucellosis involves the inhalation of infected aerosols or particles containing *Brucella* organisms. Once inhaled, the bacteria can localize in the respiratory tract, leading to a range of pulmonary manifestations. The bacteria's ability to evade host immune responses by residing within macrophages contributes to the chronicity and complexity of the disease [3].

## Clinical presentations

Pulmonary brucellosis can present in various ways, making diagnosis challenging. Patients may exhibit non-specific symptoms such as cough, chest pain, and shortness of breath. Additionally, they might present with atypical symptoms, including night sweats,

weight loss, and low-grade fever. These vague symptoms often lead to misdiagnosis or delayed diagnosis, as they overlap with other common respiratory infections.

## Diagnostic approaches

Accurate and early diagnosis of pulmonary brucellosis is critical to prevent complications and initiate appropriate treatment. Diagnostic tests include blood cultures, serological tests, and molecular techniques like polymerase chain reaction (PCR). Radiological imaging, such as chest X-rays and computed tomography (CT) scans, plays a pivotal role in identifying pulmonary involvement, revealing patterns of nodules, consolidations, and pleural effusions [5, 4].

## Challenges in diagnosis

Despite the availability of diagnostic methods, pulmonary brucellosis remains a diagnostic challenge due to its similarity to other respiratory diseases. The lack of awareness among healthcare professionals about the possibility of pulmonary brucellosis further contributes to delayed or missed diagnoses. Moreover, the disease's rarity in certain regions may lead to low clinical suspicion.

## Clinical implications

Pulmonary brucellosis can lead to severe complications if not treated promptly and appropriately. Dissemination of the infection beyond the lungs can occur, involving other organs like the heart, liver, and spleen. Chronic respiratory symptoms can significantly affect patients' quality of life, and mismanagement of the disease can result in relapses [7, 6].

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## **Treatment and management**

The cornerstone of treating pulmonary brucellosis is a combination