

## CASE REPORT

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# Necrotizing and cavitory pneumonia due to *Bordetella bronchiseptica* transmission from a cat: A case report

Pranav Kumar, Lavieen Uthayakumar

## ABSTRACT

**Introduction:** *Bordetella bronchiseptica* is an animal-associated respiratory pathogen. Human infection is uncommon but can be severe, especially in older people or those with comorbidities.

**Case Report:** A 75-year-old woman presented with fever, dyspnea, and productive cough. Imaging showed necrotizing cavitory pneumonia. *B. bronchiseptica* was isolated on respiratory culture, and close daily exposure to a coughing pet cat was the likely source. She improved with intravenous piperacillin-tazobactam and oral ciprofloxacin, with near-complete radiological resolution at six weeks.

**Conclusion:** This case highlights the need to consider zoonotic pathogens in atypical pneumonia, to obtain an exposure history, and to target antibiotics based on microbiology and susceptibility results.

**Keywords:** *Bordetella bronchiseptica*, Cavitory pneumonia, Necrotizing pneumonia, Zoonosis

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## INTRODUCTION

*Bordetella bronchiseptica* is a close relative of *B. pertussis* and *B. parapertussis* but remains largely an animal pathogen that colonizes the respiratory tracts of dogs, cats, and pigs, producing kennel cough and bronchitis [1, 2]. Human infections are infrequent but increasingly recognized, particularly among older adults and individuals with chronic illness or impaired immunity [3–5]. Clinical manifestations range from mild bronchitis to severe necrotizing and cavitory pneumonia, empyema, and even systemic disease [6, 7]. Transmission to humans is most often linked to close contact with infected animals or exposure to respiratory secretions and contaminated surfaces [2, 8]. The present case is notable for occurring in a patient with multiple comorbidities but no overt immunosuppression, and for the severity of necrotising cavitory pneumonia.

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## CASE REPORT

A 75-year-old woman presented with a six-day history of progressive dyspnea, productive cough, and right-sided pleuritic chest pain. She also describes intermittent fevers and fatigue in this period but denies any hemoptysis or recent weight loss.

## Past Medical History

Her medical background included type 2 diabetes mellitus, hypertension, hyperlipidemia, asthma, stage 3 chronic kidney disease, and a history of pulmonary embolism managed with long-term anticoagulation. She was a lifelong non-smoker. She reported daily close contact with her pet cat, which had recently developed intermittent coughing.

## Examination

On admission, she was febrile (38.2 °C), tachycardic (102 bpm), tachypneic (26 breaths/min), and hypoxemic (oxygen saturation 90% on room air, improving with 2 L

oxygen). Her blood pressure was 138/72 mmHg. Chest auscultation revealed coarse inspiratory crackles and reduced breath sounds over the right upper and middle zone.

## Investigations

Laboratory results showed a neutrophilic leukocytosis ( $13.5 \times 10^9/L$ ), a C-reactive protein level of 38 mg/L, and normal liver and renal function. Chest radiograph demonstrated right middle lobe consolidation (Figure 1). Computed tomography (CT) chest revealed necrotizing cavitory lesions in the posterior segment of the right middle lobe with surrounding ground-glass opacity and a small pleural effusion (Figure 2). Sputum culture grew *B. bronchiseptica*, confirmed by standard biochemical testing. Nasopharyngeal polymerase chain reaction (PCR) was positive for rhinovirus. Blood cultures were negative. A good-quality respiratory specimen was collected before antibiotic escalation and processed in the hospital microbiology laboratory using routine methods. Samples were plated onto standard media (including blood and chocolate agar) and incubated at 35–37 °C. *B. bronchiseptica* was identified using standard biochemical/automated identification, and antimicrobial susceptibility testing was performed using standard methods in line with local laboratory protocols. Contamination was considered unlikely given predominant growth of the organism and concordant clinical and radiological findings.

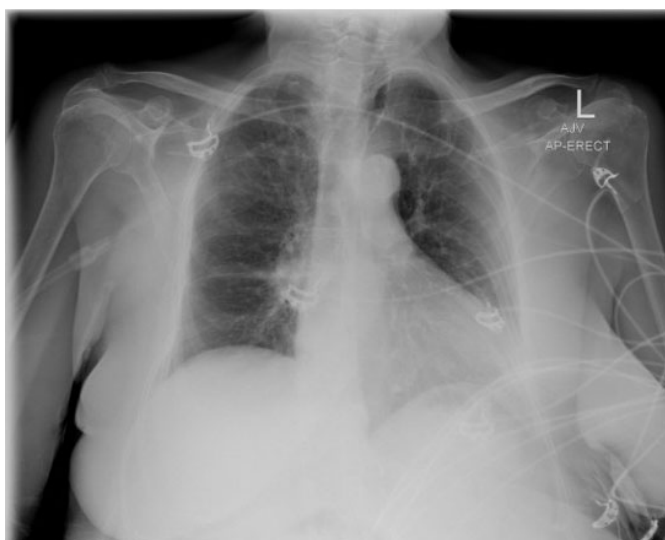


Figure 1: Chest X-ray showing right middle lobe consolidation.

## Management and Outcome

She was started on intravenous ceftriaxone with oral doxycycline for presumed community-acquired pneumonia. After *B. bronchiseptica* was identified and she continued to deteriorate clinically, treatment was changed to intravenous piperacillin-tazobactam with

oral ciprofloxacin. She improved within 72 hours with defervescence and better oxygenation. She completed a 10-day inpatient course, then a short oral course of ciprofloxacin after discharge. At six-week review she was asymptomatic and repeat CT showed near-complete resolution of the cavitory changes (Figure 3).

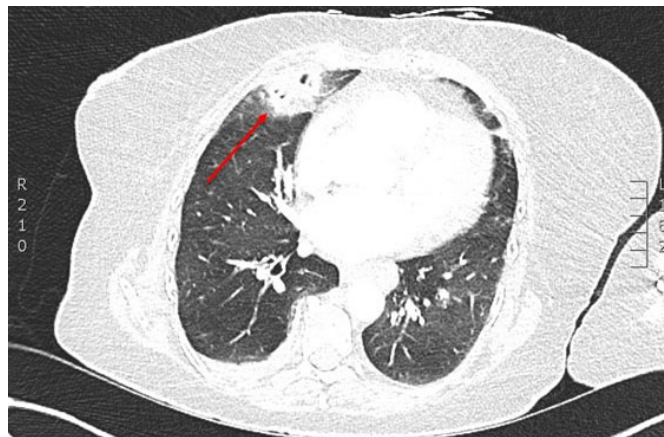


Figure 2: Computed tomography pulmonary angiogram showing a necrotizing cavitory lesion in posterior aspect of right middle lobe, with adjacent ground-glass opacity and a small pleural effusion.

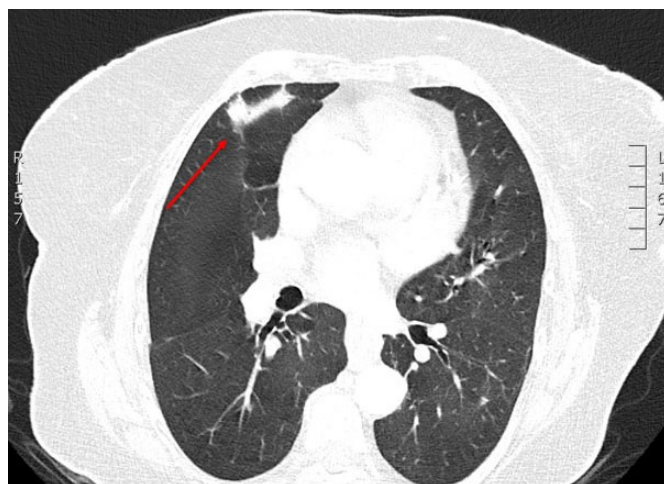


Figure 3: Follow-up chest CT showing resolution of cavitory lesion (red arrow).

## DISCUSSION

The main reservoirs of *B. bronchiseptica* are domestic and farm animals [2, 8], which present a source for human transmission through close contact, respiratory droplets, or contaminated fomites. Typically, this organism manifests in immunocompromised patients with predisposing conditions, although cases of immunocompetent patients infection in immunocompetent hosts has also been reported [3, 9].

Human *B. bronchiseptica* infection may present as tracheobronchitis, necrotizing pneumonia, empyema, or bacteremia [6, 7, 10, 11]. Relapse and persistent airway colonisation have been described, particularly in people

with impaired immunity [4, 12]. This case demonstrates that severe necrotizing cavitary pneumonia can occur in older patients with comorbidities. The concurrent rhinovirus detection may have contributed by impairing host defences [11].

Diagnosis requires a high index of suspicion, particularly when there is close pet exposure. Culture and/or PCR can confirm the organism. There is no consensus on radiological or laboratory criteria for diagnosis [5, 13]. There are no formal human treatment guidelines for *B. bronchiseptica* infection. Therapy is typically guided by susceptibility testing, and agents with good intracellular penetration (for example, fluoroquinolones or tetracyclines) are commonly used [6, 7, 12, 14]. In this case, intravenous piperacillin-tazobactam with an oral switch to ciprofloxacin was associated with a favourable response, consistent with published reports [9, 10].

## CONCLUSION

*Bordetella bronchiseptica* is a zoonotic respiratory pathogen which can cause severe necrotising and cavitary pneumonia in the elderly or comorbid patients, especially in those with known contact with animals. Workup for this organism necessitates a detailed pet exposure history, and confirmation via microbiological culture is crucial. Antibiotic therapy is determined on a case-by-case basis and depends on the sensitivities and resistances of the isolated organism.

## Learning Points

- Zoonotic pathogens such as *Bordetella bronchiseptica* must be considered when taking detailed patient history, including pet ownership and farm animal exposure.
- Severity of the disease can range from mild respiratory tract infections to severe cavitary pneumonia, hence necessitating prompt diagnosis with microbiological assays.
- Though there is a lack of consensus on appropriate therapeutics, intravenous (IV) piperacillin-tazobactam and oral ciprofloxacin elicited a favorable response in this case.

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## Author Contributions

Pranav Kumar – Conception of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Lavieen Uthayakumar – Acquisition of data, Interpretation of data, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Written informed consent was obtained from the patient for publication of this article.

**Conflict of Interest**

Authors declare no conflict of interest.

**Data Availability**

All relevant data are within the paper and its Supporting Information files.

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