



## Case report

*Pasteurella multocida* pneumonia with hemoptysis: A case report

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## ABSTRACT

*Pasteurella multocida*, which colonizes upper respiratory and digestive tracts, is a leading cause of respiratory diseases in many host species. Here, we describe a case of *P. multocida* pneumonia with hemoptysis. A 72-year-old female diagnosed with bronchiectasis with a 36-year history presented with a worsened infiltrative and granular shadow in the lower right lobe and lingular segment. Bronchial lavage fluid culturing suggested *Pasteurella* pneumonia. *P. multocida* was confirmed by 16S rRNA sequencing. The patient was readmitted to our hospital because of hemoptysis, and she was treated successfully with antibiotic therapy. The possibility of *P. multocida* infection must be considered in patients who own pets.

## 1. Introduction

*Pasteurella multocida*, a small gram-negative coccobacilli belonging to the *Pasteurellae* family, colonizes the upper respiratory and digestive tracts of several wild and domestic mammals [1,2]. *P. multocida* is also known to be a zoonotic agent in humans [3]. The commonest human infections caused by *Pasteurella* are local wound infections resulting from animal bites and scratches. This infection also has been reported to cause severe complications, such as septic arthritis, meningitis, peritonitis, sepsis, abscess, and pneumonia [1–3]. Pasteurellosis is also caused by licks on skin abrasions and due to contact with mucous secretions derived from pets. The respiratory tract is the second most common site of *P. multocida* infection; *P. multocida* is usually recognized as a commensal organism in patients with chronic pulmonary disease. However, in some cases of pulmonary pasteurellosis, serious respiratory tract infections can develop and can be fatal [1–4]. Here, we report the case of *P. multocida* pneumonia in a 72-year-old female with bronchiectasis and worsening hemoptysis.

## 2. Case report

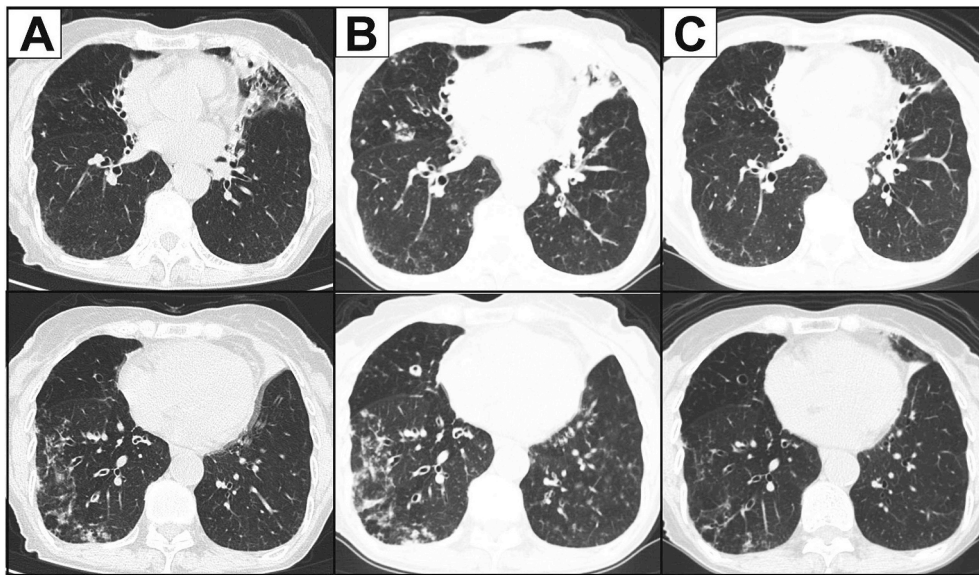
A 72-year-old Japanese female was admitted to Tsukuba University Hospital (Tsukuba, Japan) in September 2015 with aggravation of consolidation in the lingular segment. She had never smoked; however, she had a 36-year history of bronchiectasis in the lower right lobe and

lingular segment with several episodes of hemoptysis. She also received clopidogrel to maintain a stent inserted for cerebral aneurysm. She had pet cats and slept with them for almost 30 years.

Physical examination at admission was unremarkable. Laboratory findings, including white blood cell count and C-reactive protein levels, were normal. T-SPOT.TB test for tuberculosis and serum anti-*Mycobacterium avium* complex antibody level was negative. Chest computed tomography (CT) revealed worsened bronchodilation, bronchial wall thickness, centrilobular nodules, and air-space consolidation in the lower right lobe and lingula (Fig. 1A).

Bronchoscopy was performed to confirm the pathogen identity. A large amount of purulent sputum was observed in the lingular segments (Fig. 2A). Cultures of wash specimens from the right B8a and lingular segments revealed gram-negative rods (Fig. 2B), which using Vitek 2 testing, were identified as *P. canis* with a 91% identification probability. In addition, culturing using MacConkey agar was negative for bacterial growth; isolated bacteria could not dissolve maltose and mannitol, but could dissolve ornithine. These results were consistent with those obtained for *P. canis*. Because *P. canis* quite rarely causes pneumonia, we performed 16S ribosomal RNA (rRNA) sequencing for confirming the diagnosis; the isolates were identified as *P. multocida* subsp. *septica* with a 99.9% probability (Fig. 2C). Based on these results, *P. multocida* pneumonia was finally diagnosed. While waiting for the rRNA sequencing analysis results, the patient suffered worsened hemoptysis and was readmitted to our hospital in October (Fig. 1B).

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**Fig. 1.** CT images indicate bronchodilation, thickness of the bronchial wall, centrilobular granular shadow, and consolidation in the lingular and right S8 segments (A). Both of these lesions became worse when the patient suffered hemoptysis (B) and then improved after antibiotic treatment.

Intravenous ampicillin/sulbactam (9.0 g/day) was administered for one week, followed by oral amoxicillin-clavulanic acid (750 mg/day) for another 30 days. After antibiotic therapy, the lower right lobe and lingular shadows were extremely improved (Fig. 1C). She was discharged on day 25 without any complications. Before discharge, we instructed her to strictly wash her hands after contact with her cats; we also instructed her to keep the cats away from her bed. We followed-up with her two years after her discharge, during which she had no symptoms of hemoptysis related to pasteurellosis. Written informed consent was obtained from the patient for publication of the case details and associated images.

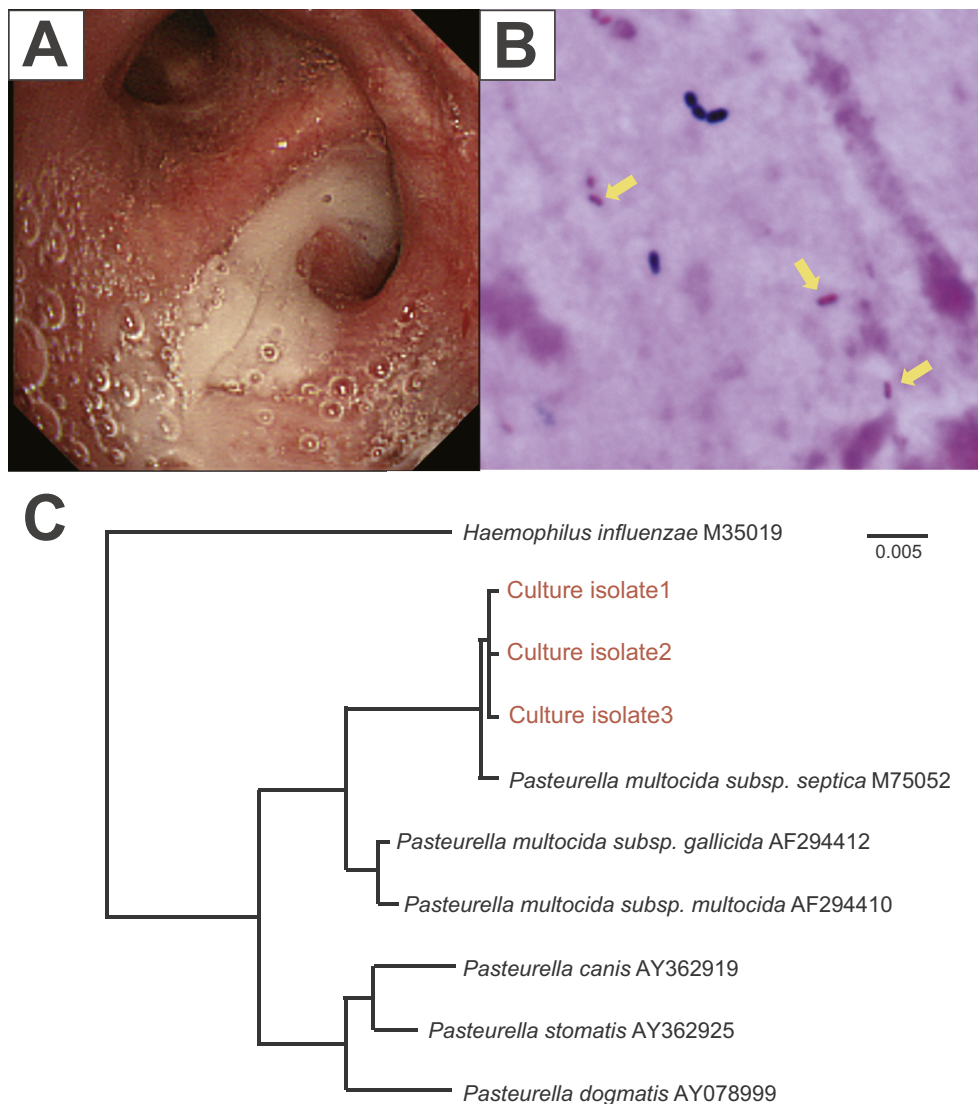
### 3. Discussion

*Pasteurella* species is highly prevalent among animal populations. Previous literature has suggested that 20–30 human deaths occur every year worldwide because of pasteurellosis [2]. Although *P. multocida* occasionally colonizes immunocompetent patients, pneumonia due to *P. multocida* is rare [2,5,6]. In 1993, Kopita et al. studied the characteristics of 108 patients (mean age, 62 years; 65% male) with *Pasteurella* pleuropulmonary infection [1]. The common primary illnesses were pneumonia (45.3%), tracheobronchitis (34%), empyema (23%), and lung abscess (3%) [1]. Most of the patients had underlying pulmonary diseases, including chronic obstructive pulmonary disease, bronchiectasis, lung carcinoma, and pulmonary fibrosis [1]. The mortality rate of patients with *Pasteurella* pleuropulmonary infection was documented as 30% [1]. Complications of hemoptysis have not been noted frequently. To the best of our knowledge, only three hemoptysis cases have been reported in the literature; most of these patients had a lung abscess with *P. multocida* infection [7–9]. Because our patient had a history of bronchiectasis and because culture samples obtained from separate bronchial washings revealed *P. multocida* infection at both sites, chronic *Pasteurella* infection may have affected the hemoptysis episodes.

However, the identification of clinical *Pasteurella* isolates by Vitek 2 is controversial. Zangenah et al. reported that Vitek 2 could only identify 48.5% of *Pasteurella* isolates correctly and failed to identify *P. multocida* in more than 50% of the cases [10]. Although Vitek 2 is a rapid and useful diagnosis system, a different confirmation approach is recommended before final diagnosis. *P. multocida* isolates are classified into five capsular types and eight lipopolysaccharide (LPS) types [11,12]. Multiplex PCR for capsular and LPS typing, is a fast, simple, and cheap method for genotyping [11,12]. Although the mechanism by which these type differences affect strain virulence and host immunity remains unclear, rapid and accurate species identification can contribute to epidemiological tracing of outbreak strains [13].

*P. multocida* is not susceptible to dicloxacillin, cephalexin, erythromycin, and clindamycin [2]. Of note, combination treatment with amoxicillin and  $\beta$ -lactamase inhibitor clavulanic acid is effective [2]. Although the treatment duration should be decided based on disease severity, at least 10–14 days of antibiotic treatment is recommended [1]. A previous study has reported that there is no correlation between length of exposure and disease severity [1]. However, a recent study has suggested that pet owners who have more frequent close contact with dying animals are at risk for invasive *P. multocida* infection [4]. Because disease severity was thought to be associated with underlying disease, the education of elderly or high-risk patients might be useful to avoid fatal pasteurellosis and its complications. In our case, *P. multocida* pneumonia was successfully treated with  $\beta$ -lactam antibiotics for 5 weeks. We also educated the patient to avoid close contact with her pets and thereby successfully prevent recurrent hemoptysis.

In conclusion, we described a rare case of *P. multocida* pneumonia with hemoptysis. The patient was successfully treated with antibiotic therapy. The number of elderly persons who own domestic animals is increasing in Japan. It is important to consider the possibility of *P. multocida* infection and to check whether patients keep household pets.



**Fig. 2.** Bronchoscopy indicates a large amount of purulent sputum from the lingular segments (A). Gram staining revealed gram-negative rods in the bronchial wash specimen (B). Phylogenetic relationship of the *Pasteurella* species isolated from the culture (C). The partial 16S rRNA gene sequences from culture isolates were compared with the GenBank database using BLAST searches. In 1354 base pairs of the 16S rRNA gene sequences, the isolates showed a 99.9% identity match with the GenBank sequence M75052 (*P. multocida* subsp. *septica*). Bar = 0.5% sequence divergence.

### Conflicts of interest

The authors declare no potential conflicts of interest.

### Acknowledgement

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