A Case of *Pasteurella multocida* Pneumonia, Bacteremia, and Septic Shock

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**Abstract**

*Pasteurella multocida* is a ubiquitous organism found in the oropharynx of healthy domestic animals, especially dogs and cats. It is most known as an animal pathogen, and rarely a cause of zoonotic disease, such as after animal bite incidents. In atraumatic infections, *Pasteurella* has been associated with patients in an immunocompromised state, such as those with Hodgkin’s lymphoma, patients with known cirrhosis, or those with preexisting cavitary pulmonary lesions. It is rare to isolate *Pasteurella* in an immunocompetent patient without known trauma. Here, we present a case of *Pasteurella multocida* pneumonia, bacteremia, and septic shock in an individual without a history of an animal bite, with a review of relevant literature.

**Keywords** *Pasteurella* · Pneumonia · Bacteremia

**Introduction**

*Pasteurella multocida* is a Gram-negative, facultative anaerobe, with coccobacilli morphology that is commonly found in the oropharynx of cats and dogs. The carriage rate in cats and dogs has been reported to be 70–90% and 20–50%, respectively [1]. The organism was first described by Louis Pasteur in 1880 [2]. Typically, the organism is introduced into the human body via cat/dog bites. Most common infections have been associated with skin and soft tissue infections such as cellulitis, with more serious infections escalating to septic arthritis, and osteomyelitis [3]. More severe infections have been associated with individuals with cirrhosis, hematological malignancies, or patients with a history of organ transplantation [4, 5]. In patients with *Pasteurella* bacteremia, mortality rates have been documented as high as 30% [6].

We describe a case of an immunocompetent patient, without a known history of a dog or cat bite, with resultant *Pasteurella* pneumonia, with subsequent bacteremia, and septic shock. The purpose of this article is to raise awareness that *P. multocida* may present with pulmonary manifestations and should be on the differential for patients with close contact with domestic animals.

**Case Presentation**

A 77-year-old male with multiple comorbidities including a history of left adrenal mass, disseminated histoplasmosis status post-left adrenalectomy and left nephrectomy, chronic pleural effusions, renal failure on hemodialysis, chronic obstructive pulmonary disease, and history of perforated diverticulitis—status post-colectomy in the recent past, presented to the emergency department with pain in the left side of his abdomen for the last 18 h. The patient stated that he worked in his garage throughout the day and as the day concluded, he noted some vague left-sided discomfort. He stated the pain seemed to be positional and seemed to be worsened by deep breathing or coughing. He denied any known injury that occurred during the day. The patient has had some chronic shortness of breath and cough due to ongoing histoplasmosis and a chronic left pleural effusion. The patient stated that at approximately 03:00 that morning he was awakened with some worsening pain. Again, he stated the pain seemed to be positional and worsened by deep breathing or coughing. The patient stated he felt somewhat bloated and had a bowel movement at that time which he
described as a normal bowel movement. The patient stated that his discomfort had persisted and it has led to his presentation. A CT scan of his abdomen/pelvis was subsequently performed given his history of perforated diverticulitis. This was read as non-acute, though the lung bases did show possible pneumonia. He was then discharged with instructions to follow up with his primary care provider. When he was taken back by his family, he was reported to be unresponsive in the car and was quickly brought back by the family to a different emergency department. Further history elicited from the family revealed that the patient lived with 2 cats, without any reported bites, scratches, or wounds.

On admission, the patient was noted to be unresponsive and subsequently was intubated. A post-intubation chest X-ray was attained demonstrating bilateral widespread airspace disease (Fig. 1). His arterial blood gas would show pH 7.10, PCO2 69, PO2 65, and saturations at 82% on 100% FiO2. Given that his CT scan of the abdomen/pelvis had a concern of possible pneumonia, CT of the chest was performed with evidence of multifocal airspace disease within the lungs bilaterally (Fig. 2). Laboratory workup was significant for leukocytosis of 30.7 k/uL, BUN 51 mg/dL, creatinine 2.8 mg/dL (baseline 1.4), AST 522 U/L, ALT 627 U/L, alkaline phosphatase 77 U/L, and total bilirubin 1.4 mg/dL. Blood cultures from the first hospital visit would later result positive for Pasteurella multocida. Likewise, a bronchoalveolar lavage performed during hospitalization also later resulted positive for Pasteurella multocida. Gram stain of the samples demonstrated Gram-negative coccobacilli. The samples were cultured on blood and chocolate agar, with white appearing colonies, and without hemolysis. Matrix-assisted laser desorption/ionization with time of flight and mass spectrometry (MALDI-TOF MS) identified the organism as Pasteurella multocida, consistent with previous Gram stain features. Unfortunately, because there was minimal growth of the organism with few colonies, sensitivity/susceptibility testing was not able to be performed. The patient was hypotensive with blood pressures measuring 70 s/40 s and he was started on norepinephrine and vancomycin piperacillin/tazobactam. Fluid resuscitation was also performed with 2.2 L of crystalloid fluid provided. Later, the patient developed evidence of shock liver, acute kidney injury, profound lymphocytosis with neutropenia, and severe lactic acidosis. Nephrology, hematology, surgery, and infectious disease services were consulted. As the patient’s condition was deteriorating, piperacillin/tazobactam and vancomycin were discontinued and meropenem instead was started. The patient showed slow improvement during his stay in the ICU and was gradually able to be weaned from vasopressors and mechanical ventilation. Antibiotics were switched to ampicillin/sulbactam and the patient would be transferred to a medical/surgical unit from ICU. He was found to have a lower extremity deep vein thrombosis during this time, and an IVC filter was placed, given marked thrombocytopenia. Unexpectedly and after a few days in the medical/surgical unit, the patient once again developed respiratory failure and severe hypotension. The patient was reintubated and taken back to the ICU. Despite aggressive measures including continuous renal replacement therapy and vasopressors, the patient once more reentered a shock state with multiorgan dysfunction. Escalating pressor requirements, CRRT, and mechanical ventilatory support were all maximally applied. A family meeting was held and the family decided to pursue comfort care for the patient. The patient expired 2 days after the decision to pursue comfort care through pulseless electrical activity and asystole.
Conclusions

_Pasteurella multocida_ is common among domestic animals. According to the American Veterinary Medical Association, an estimated 31 million households own a cat, and an estimated 48 million households own a dog in the USA [7]. Dog or cat ownership in the USA is estimated to be approximately 30–40% [7]. In general, most human infections are a result of animal bites or scratches primarily involving the skin and soft tissue. An estimated 1% of all emergency department visits per year are associated with animal bites in the USA [8]. Although there are a few cases of _P. multocida_ implicated in more serious infections such as bacteremia, peritonitis, and meningitis, these are exceedingly rare [4, 5, 9–12]. Factors associated with systemic involvement include cavitary lung pathology, immunocompromised states, patients on dialysis, and patients with malignancy [13].

In this case report, we present an immunocompetent patient with _P. multocida_ infection, with no documented history of inciting bite/scratch, with subsequent pneumonia, bacteremia, and septic shock. We postulate that our patient was likely exposed to secretions from his two cats through the inhalation of his pet’s aerosols. This would later develop into pneumonia. However, the authors also acknowledge that systemic infection may also have occurred via contamination of wounds via animal licking that the patient may not have been aware of.

Because of the high mortality rate associated with _Pasteurella_ bacteremia, clinicians should be alerted to the possibility of severe infection in patients with exposure to cats and dogs, regardless of history of bite or scratch wounds. Likewise, clinicians should obtain a detailed animal exposure history toward the diagnosis of _Pasteurella_ pneumonia. In counseling patients, clinicians should advise their patients who may be immunocompromised, frail, or have an underlying chronic pulmonary disease to avoid close animal contact. However, in light that humans draw many benefits from having a pet, there may be alternative methods in controlling the risk of transmission. For example, owners could perform hygiene measures such as keeping dogs from living outdoors, avoiding animal licks, and selecting for male dogs as they may have a lower probability of _P. multocida_ carriage in oral flora [14].

Author Contributions W.T. and S.D. designed and conducted the research. J.G. provided the data. W.T. had primary responsibility for the final content. All authors read and approved the final manuscript.

Availability of Data and Material Not applicable.

Code Availability Not applicable.

Declarations

Ethics Approval and Consent to Participate Kettering Health Network Institutional Review Board oversees all scholarly activities across its facilities and determined that case reports meet the criteria for exempt review, and do not meet the definition of human research. Approval and consent provided.

Consent for Publication Consent to publish was obtained from the patient’s next of kin.

Conflicts of Interest The authors declare no competing interests.

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