

# An Atypical Presentation of a *Pasteurella multocida* Infection Following a Cat Bite: A Case Report

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*Pasteurella multocida* is a bacterial organism that commonly causes cellulitis after animal bites, especially cat bites. We report an unusual vesiculopustular infection of the hand following a domestic cat bite. *Pasteurella multocida* and *Staphylococcus aureus* were cultured from the wound and the patient was treated with amoxicillin-clavulanate potassium. Further history revealed that the patient's cat had nibbled on her hand. *Pasteurella* usually is resistant to many of the typical empiric antibiotics used to treat skin infections. Amoxicillin-clavulanate potassium (500 mg 3 times daily) is the treatment of choice for patients who have an infected cat or dog bite with no known bacterial cause. A thorough patient history is needed to promptly arrive at a proper diagnosis for an atypical presentation of a common disease.

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**P***asteurella multocida* was first observed as the bacillus of fowl cholera by Perroncito in 1878 and was later isolated and described by Pasteur in 1880.<sup>1</sup> In 1886, Huelle first noticed that these organisms produced a distinctive disease in many different animals, which he coined hemorrhagic septicemia. In the following year, Trevisan suggested

the generic name *Pasteurella* for these organisms.<sup>2</sup> The first human case in which *P multocida* was isolated from a patient's blood was reported in 1913 by Brugatelli who described a farmer's wife with puerperal fever.<sup>3</sup> In 1930, Kapel and Holm<sup>4</sup> first described a *P multocida* infection resulting from a cat bite.

*Pasteurella multocida* (formerly *Pasteurella septica*) is a small, nonmotile, aerobic, facultatively anaerobic, gram-negative coccobacillus. It displays prominent bipolar staining and therefore may be mistaken for *Neisseria* species or *Haemophilus influenzae*. It is slow growing and grows readily on blood agar but not on MacConkey agar.

*Pasteurella multocida* is recognized as part of the normal oral flora of both healthy and diseased domestic and wild animals, with colonization rates as high as 70% to 90% in cats.<sup>5</sup> *Pasteurella multocida* causes a wide spectrum of localized and systemic infectious syndromes in both animals and humans.<sup>6</sup> However, *Pasteurella* species predominantly are pathogens associated with birds and animals.<sup>1</sup>

Infections caused by *P multocida* are manifested in one of several patterns: localized skin infection with adenitis following animal bites and scratches; septic arthritis, tenosynovitis, and osteomyelitis following animal bites, usually on the hands; respiratory tract infections or colonization; and systemic infections such as meningitis, bacteremia, or peritonitis.<sup>7-9</sup>

The most common localized infections caused by *P multocida* include a rapid-onset wound infection or cellulitis with marked local tenderness that generally develops within hours of inoculation.<sup>10</sup> *Pasteurella multocida* can cause opportunistic infections in patients with predisposing conditions such as diabetes mellitus, alcoholic cirrhosis, rheumatoid arthritis, chronic obstructive pulmonary disease, and neoplastic disease.<sup>7,8,11</sup> We describe a healthy patient with an atypical clinical manifestation secondary to *P multocida* infection.

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## Case Report

A 37-year-old woman presented with a painful rash on the palm of her left hand of 2 weeks' duration. The rash started at the periphery of the left palm with tiny vesicles and then developed into pruritic vesicopustules with a clear and milky discharge. The patient denied having any systemic symptoms such as malaise, anorexia, fever, chills, nausea, vomiting, diarrhea, dyspnea, palpitations, myalgia, or arthralgia. She was seen 1 day prior to presentation by her primary care physician and the lesions were cultured. She denied any history of hand dermatitis. According to the patient, the evaluating physician considered a bacterial infection and started her on cephalexin, topical bacitracin, and hydrocortisone valerate cream 0.2%, in addition to tramadol hydrochloride for pain and hydroxyzine hydrochloride for intense pruritus.

Physical examination by the dermatology department revealed an afebrile, well-developed, otherwise healthy woman, except for her left hand. The palmar surface had multiple unilocular and multilocular vesicopustules coalescing into bullae on an erythematous base. There was a clear weeping discharge. The dorsum was edematous with erosions on an erythematous base. The patient had full range of motion of her left hand.

A complete blood cell count with differential count, electrolyte count, and liver function tests were all within reference range. A rapid plasma reagin test was negative for syphilis. A Gram stain and culture of the vesicopustules was performed. The Gram stain showed few polymorphonuclear leukocytes and moderate, large, gram-negative rods. The bacterial culture revealed oxidase-positive, 3+ gram-negative rods, which was consistent with *P multocida* infection, along with gram-positive cocci in clusters consistent with *Staphylococcus aureus* infection. The patient was asked about pets, including cats, dogs, and mice. She mentioned having kittens who had been nibbling on her hands.

The patient had noted no improvement within 48 hours of initiating cephalexin. The cephalexin was discontinued and she was started on amoxicillin-clavulanate potassium (500 mg 3 times a day for 3 weeks). The pruritus and swelling dramatically decreased over the next few days and the rash had completely cleared within a few weeks. The patient tolerated the treatment well. She was advised not to allow her pet cats to bite her hands.

## Comment

Each year approximately 1 to 2 million Americans are bitten by animals,<sup>12</sup> with an estimated 400,000 bites caused by cats.<sup>13</sup> The vast majority of animal bite injuries are inflicted by dogs

(80%–90%) followed by cats (5%–15%).<sup>14,15</sup> Cat bites are more than twice as common as dog bites to cause clinical infection; however, most victims seldom seek medical attention because most cat bites result in only minor injuries.<sup>16</sup> Approximately 28% to 80% of cat bite wounds become infected versus 3% to 18% of dog bite wounds.<sup>17</sup> Approximately 63% of wound infections that develop from cat bites are polymicrobial<sup>17</sup> with a mean of 2.8 to 3.6 isolated organisms.<sup>18–20</sup> Aerobic species such as staphylococci and streptococci are much more commonly cultured than anaerobes, which rarely are isolated but must be considered because some anaerobes produce  $\beta$ -lactamase.<sup>21</sup> The major pathogen isolated from cat bite wounds is *P multocida*; it is recovered from 75% of cat bite wounds.<sup>7</sup> Most clinical infections in humans caused by *P multocida* are due to direct inoculation through cat bites and scratches.<sup>22</sup> In a prospective study of 57 patients with cat bites, Talan et al<sup>17</sup> reported that 63% (36/57) of cat bites occur on the hands, 23% (13/57) on the arms, and 9% (5/57) on the legs.

Local infections caused by *P multocida* usually occur within 24 to 48 hours after inoculation and are characterized by intense pain, inflammation, and swelling.<sup>23</sup> Bite wounds typically appear as areas of cellulitis, with or without a purulent or serosanguineous discharge.<sup>24</sup> Low-grade fever occurs in few patients.<sup>11</sup> Cellulitis may be delayed or rapidly and extensively progress with associated lymphangitis and regional adenopathy.<sup>25</sup> A variety of complications can result from animal bite wounds. Osteomyelitis, tendonitis, tenosynovitis, and septic arthritis can occur within the first few days following a penetrating injury in which organisms are introduced beneath the periosteum or into a joint space.<sup>26,27</sup> Less frequent complications include abscess formation, meningitis, pneumonia, orbital cellulitis, endocarditis, sepsis, renal failure, and death.<sup>5,7,28</sup>

Initial management of cat and dog bites should incorporate treatment of the immediate injury and management of the risk for acute infection. Most therapy for cat and dog bites is empirical, and wound swabs, preferably deep, for Gram stain and aerobic and anaerobic cultures should be obtained for each infected wound prior to therapy.<sup>29</sup> Steps should include: (1) taking a culture; (2) performing a Gram stain; (3) cleansing the wound; (4) irrigating the wound with normal saline; (5) if necessary, debriding devitalized tissue; (6) immobilizing and elevating the wound; and (7) if possible, leaving the wound open.<sup>13,15,23,30</sup> Examination should include evaluation of possible injury to tendons, periosteum, or joints. The tetanus immune status must be evaluated

and appropriately treated.<sup>31</sup> Rabies prophylaxis should be considered for wild animal bites, especially raccoon, skunk, and bat bites.<sup>32</sup> Decisions on antibiotic use should include the bite history as well as culture and Gram stain results.<sup>21</sup> Antibiotics are indicated as prophylaxis in wounds that are of high risk for infection and for treatment of already established infection.<sup>23</sup> Even with this diligent treatment, some patients will still be at risk for severe *P multocida* infections.<sup>24</sup>

*Pasteurella multocida* is sensitive to amoxicillin-clavulanate potassium, fluoroquinolones, and trimethoprim-sulfamethoxazole, but preferred treatment is amoxicillin-clavulanate potassium in patients who have an infected cat or dog bite with no known bacterial cause. The agent is active against *P multocida* as well as oral anaerobes and most strains of *S aureus*, which may be copathogens.<sup>18,33</sup> In patients with a prior reaction to penicillin, trimethoprim-sulfamethoxazole with clindamycin are the medications of choice for empiric treatment of an infected bite wound.<sup>33</sup> Doxycycline and fluoroquinolones also are effective, and alternative treatments of *P multocida* infections include ciprofloxacin, amoxicillin, ampicillin, cefuroxime, clarithromycin, azithromycin dihydrate, and chloramphenicol.<sup>7,18,19,34-37</sup> *Pasteurella multocida* is resistant to many typical empiric antibiotics, such as cephalexin, used in the treatment of skin infections<sup>38</sup>; our patient also experienced treatment failure with cephalexin. *Pasteurella* species have been shown to produce  $\beta$ -lactamase and are resistant to dicloxacillin, oxacillin, cephalexin, cefadroxil, erythromycin, clindamycin, and penicillin (A).<sup>37,39,40</sup> Intravenous therapy is recommended for serious infections and includes penicillin G versus second- or third-generation cephalosporins.<sup>18</sup> Follow-up care must be maintained with daily inspection of the wound.

## Conclusion

Our case illustrates the importance of a thorough patient history to promptly arrive at a proper diagnosis for an atypical presentation of a common disease. *Pasteurella multocida* is a common inhabitant of the oral cavity of animals, especially cats, and should always be considered in the differential diagnosis of any local wound infection following a cat bite or scratch.

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