

## ***Pasteurella multocida* cellulitis and possible septic arthritis of the knee after exposure to dog saliva after a recent total knee arthroplasty**

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### **ABSTRACT**

*Prosthetic joint replacement occurs frequently. Complications of prosthetic joint replacements include bleeding, mechanical disruption, persistent pain, and infection. Infectious complications can occur early or late, measured in hours to days or months to years. The microorganism profiles vary depending on whether infection is early or late. Factors related to wound care have a significant role in the development of wound infection and coincident infection of the prosthesis. We report a wound infection and possible septic arthritis with septic shock due to *Pasteurella multocida*; symptoms and signs of joint involvement were noted but aspiration of the joint was declined by the orthopedic surgery service due to concerns about joint contamination from the overlying cellulitis. Blood cultures were sterile. The wound had been licked by her pet dogs on numerous occasions. Ultimately the infection was eradicated with antimicrobial agents, and the septic shock resolved.*

**Keywords:** Septic arthritis, prosthetic joint, *Pasteurella multocida*

### **INTRODUCTION**

A wide variety of conditions are caused by *Pasteurella multocida*, including cellulitis, abscess, osteomyelitis, septic arthritis, meningitis, and pneumonia. Since *P. multocida* is a part of the oral flora of wild and domestic animals, including dogs and cats, this pathogen may cause infection after animal bites. In spite of the widely known pathogenic potential of this organism, it is rarely reported and apparently often overlooked as a pathogen, and review of the medical literature reveals very few reported studies.<sup>1</sup> In this report we present a case of *Pasteurella multocida* cellulitis and possible septic arthritis with septic shock after exposure to dog saliva.

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### **CASE**

A 59-year-old Caucasian woman presented with fever, vomiting, diarrhea, and lower extremity pain, redness, and swelling of 9 hours' duration. Five months previously she underwent bilateral knee replacement complicated by sepsis, mechanical ventilation, and a prolonged ICU stay. Her medical history included hypertension, coronary artery disease, ulcerative colitis, chronic kidney disease (stage III), obesity, and osteoarthritis. Surgical history included appendectomy, cholecystectomy, and hysterectomy. Of note, she had allowed her two pet dogs to lick her legs, including her incision sites.

On the day of admission she was febrile (101.1° F) and hypotensive (95/40 mmHg). The right knee was erythematous, edematous, hot, and tender to palpation with limited range of motion due to severe pain. Purulent drainage was present from one of the previous surgical incision sites approximately 5 mm in diameter on the anterolateral upper tibia.

The leukocyte count was  $20,900 \times 10^3/\mu\text{L}$ . Her CRP was 30 mg/L, and the ESR was 86 mm/hour. Urinalysis showed moderate leukocyte esterase, 1+ bacteria, and 15-20 WBC/high powered field. Radiographs of the knee showed no abnormalities of the total knee arthroplasty; moderate suprapatellar joint effusion and edema of the lateral and anterior subcutaneous tissues of the knee were described.

She was admitted to the ICU, and a central venous line was inserted for crystalloid and vasopressor administration. Empiric antibiotic treatment included levofloxacin, piperacillin-tazobactam, and vancomycin. Her knee was evaluated by orthopedic consultants who advised against joint aspiration due to accompanying cellulitis of the overlying skin. Right lower extremity Doppler studies showed no evidence of deep or superficial venous thrombosis. A culture from the upper tibia wound revealed *Pasteurella multocida*, and her urine was positive for ESBL-producing *Escherichia coli*. Blood cultures revealed no growth of organisms. After a 14 day hospitalization, she was transferred to a Skilled Nursing Facility for continued and ultimately successful antibiotic treatment with IV linezolid and ceftriaxone.

## DISCUSSION

### Microorganism and infection

*P. multocida* is a tiny non-acid-fast gram-negative rod that is facultatively anaerobic. It shows marked bipolar staining and may be arranged singly, in pairs, or in small bundles.<sup>2</sup> Of the more than 17 species of *Pasteurella* known, *P. multocida* is among the most common human pathogens. It may also become part of the normal respiratory tract flora in humans, as it has been found in healthy veterinary students and animal handlers without any pulmonary symptoms.<sup>3</sup> The highest oropharyngeal colonization rate by *P. multocida* in domestic animals is in cats. Even though dog bites are more common, there is a higher chance to isolate *Pasteurella* spp. from cat bites. This is probably due to the sharp teeth of the cat which result in deep inoculation of bacteria. The teeth of dogs are broader and thus not as sharp and therefore give rise to lacerated skin with ulcers that are easier

to disinfect.<sup>4</sup> *Pasteurella multocida* infections do not necessarily follow animal-related trauma, as they may occur without physical contact (fomites) or from contact with animal secretions, i.e., licks.<sup>2</sup>

### *P. multocida* cellulitis and complications

*P. multocida* cellulitis is characterized by rapid onset of inflammatory signs. Erythema, edema, and pain frequently develop within hours of the exposure (range: a few hours to 3 days). In most cases the infection remains localized with tendon sheath involvement and abscess formation being the most common reported complications.<sup>5</sup> However, if the inoculum site is the hand, there is an increased potential for osteomyelitis.<sup>6</sup> More dangerous outcomes include bacteremia which can occur in previously healthy people but usually occurs in immune-compromised patients with cirrhosis, corticosteroid treatment, and malignancy.<sup>7</sup> In one report, infection resulted from a dog licking limbs with gouty tophi.<sup>8</sup>

In this case, due to the site of cellulitis on a knee with recent joint replacement, septic arthritis became a concern. It has been estimated that septic arthritis by this bacteria in normal or diseased joints accounts for 6% of all *P. multocida* infections.<sup>13</sup> Most commonly it affects a single joint, usually the knee.<sup>5,10</sup> An arthrocentesis was not performed in this case due to concerns over secondary joint contamination. Therefore, septic arthritis was not confirmed, but a short course therapy for two weeks resulted in cure without extended antibiotic administration. A postoperative wound infection by *P. multocida* is a potential complication of close contact with pets that may result in severe morbidity.<sup>11</sup>

Removal of infected hardware is always preferred for an ideal outcome but may not be practical in all cases. Antibiotic treatment without removal of an infected prosthesis may be successful when: 1) infection is acute (< 4 weeks); 2) a highly susceptible microorganism is isolated; 3) antibiotic delivery and penetration are ensured; 4) serious antibiotic toxicity is minimal; and 5) the prosthesis does not have mechanical problems such as loosening.<sup>6</sup> In cases of septic implant loosening, removal of the prosthesis is recommended with either a one-stage or two-stage

revision surgery with exchange of implants and use of antibiotic impregnated bone cement.<sup>13</sup>

### Treatment

Current guidelines recommend the empiric use of amoxicillin/clavulanic acid for treatment of animal bites and scratches, due to its activity against not only *P. multocida* but also other organisms commonly found in these types of infections.<sup>14</sup> If *P. multocida* is cultured from the wound and there is early clinical evidence of infection, the antibiotic recommendation is penicillin, 500 mg orally every 8 hours or doxycycline in persons who are penicillin allergic.<sup>2,6</sup> It is important to perform antibiotic susceptibility tests on all isolates because *P. multocida* shows variable susceptibilities, including resistance to penicillin.<sup>15</sup> Perez-Garcia demonstrated that resistance is mediated by the expression of an ROB1 plasmid that codifies for beta-lactamase.<sup>9</sup> The addition of a  $\beta$ -lactamase inhibitor, such as sulbactam or clavulanic acid, reduces MICs of those *P. multocida* strains 64 fold.<sup>14</sup> Many second and third generation cephalosporins have shown excellent *in vitro* activity against this organism, and in one report the use of aztreonam was suggested as an option when other drugs are contraindicated.<sup>8</sup>

Besides antibiotic therapy, local wound care is important, including immediate and abundant washing, surgical excision of all necrotic tissue (if necessary), tetanus prophylaxis, and rabies prophylaxis (if indicated).<sup>7</sup> Although one study recommends a 3 to 5 day prophylactic treatment for all cat bites examined by a physician within eight hours from the event, there is no solid clinical information to support or refute the use of prophylactic antibiotics.<sup>1,15</sup>

### CONCLUSIONS

Infections with *Pasteurella multocida* have a wide variety of outcomes, including severe morbidity and mortality. Regarding cellulitis due to animal contact, not all infected injuries cause clinical symptoms, but the incidence is probably higher than reported.<sup>1</sup> A high index of suspicion is appropriate when there is a history of a recent animal-associated infected wound.<sup>10</sup>

Increased awareness of the infective potential of this pathogen is needed. Special attention is warranted in patients with chronic diseases, with congenital or acquired immunodeficiency, or with artificial valves or orthopedic arthroplasties. Patients who own pet cats or dogs need to be informed that serious problems may arise not only from obvious bites or scratches but also from allowing pets to lick their skin or wounds or even by deposition by aerosols contaminated with their saliva. Careful instructions on the management of surgical wounds, including the need to minimize physical contact with pets, should be strongly considered.<sup>12</sup>

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### REFERENCES

- Francis D, Holmes M, Brandon G. *Pasteurella multocida* infections after domestic animal bites and scratches. *JAMA* 1975; 233:42-45.
- Arons M, Fernando L, Polayes I. *Pasteurella multocida*- the major cause of hand infections following domestic animal bites. *J Hand Surgery* 1982; 7(1): 47-52.
- Chen H, Hulten K, Clarridge J. Taxonomic subgroups of *Pasteurella multocida* correlate with clinical presentation. *J Clin Microb* 2002; 40(9):3438-3441.
- Westling K, Farra A, Cars B, Gerber Ekblom A, Sandstedt K, Settergren B, Wretling B, Jorup C. Cat bite wound infections: A prospective clinical and microbiological study at three emergency wards in Stockholm, Sweden. *J Inf* 2006; 53:403-407.
- Weber D, Wolfson J, Swartz M, Hooper D. *Pasteurella multocida* infections. Report of 34 cases and review of the literature. *Medicine (Baltimore)* 1984; 63(3):133-54.

6. Heym B, Jouve F, Lemoal M, Veil-Picard A, Lortat-Jacob A, Nicholas-Chanoine M. *Pasteurella multocida* infection of a total knee arthroplasty after a “dog lick”. *Knee Surg Sports Traumatol Arthrosc* 2006; 14:993-997.
7. Brue C, Chosidow O. *Pasteurella multocida* wound infection and cellulitis. *Int J Derm* 1994; 33:471-473.
8. Chang K, Siu L, Chen Y, Lu P, Chen T, Hsieh H, Lin C. Fatal *Pasteurella multocida* septicemia and necrotizing fasciitis related with wound licked by a domestic dog. *Scand J Inf Dis* 2007; 39:167-192.
9. Perez Garcia J, Candel Gonzalez F, Baos Muñoz E, Gonzalez Romo F, Picazo J. Cellulitis after cat bite. *Rev Esp Quimioter* 2009; 22(4):221-223.
10. Kumar A, Kannampuzha P. Septic arthritis due to *Pasteurella multocida*. *Southern Med Journal*. 91992; 85:329-330.
11. Chun M, Buekers T, Sood A, Sorosky J. Postoperative wound infection with *Pasteurella multocida* from a pet cat. *Am J Obstet Gynecol* 2003; 188:1115-1116.
12. Octavio J, Rosemberg W, Conte J. Surgical wound infections with *Pasteurella multocida* from pet dogs. *New Engl J Med* 2001; 345:549.
13. Heydemann J, Heydemann JS, Antony S. Acute infection of a total knee arthroplasty caused by *Pasteurella multocida*: a case report and comprehensive review of literature in the last 10 years. *Int J Inf Dis* 2010; 14S:242-245.
14. Winner J, Gentry C, Machado L, Cornea P. Aztreonam treatment of *Pasteurella multocida* cellulitis and bacteremia. *Ann Pharmacotherapy* 2003; 37:392-394.
15. Bradariae N, Milas I, Luksiae B, Bojeiae M, Karanoviae J. Erysipelas-like cellulitis with *Pasteurella multocida* bacteremia after a cat bite. *Croat Med Jour* 2000; 41(4):446-449.