Pasteurella multocida

Leora Mogilner, MD,* Cynthia Katz, MD*
**Icahn School of Medicine at Mount Sinai, New York, NY*

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Open the mouth of most dogs or cats and you will likely find the bacterium *Pasteurella multocida*. This nonmotile, non–spore-forming, gram-negative coccobacillus is part of normal animal respiratory flora and, therefore, is a common cause of wound infections due to animal bites.

The isolation and description of this organism was first made by Louis Pasteur in 1880, 3 years after it was discovered in birds with fowl cholera. In 1930, Kapel and Holm identified its first true human infection, which was secondary to a cat bite. Further classification of the bacterium over the years ultimately led to the name *Pasteurella multocida* in 1939. *Pasteurella multocida* is a facultatively anaerobic organism that grows on sheep's blood, chocolate, and Mueller-Hinton agar but has no growth on MacConkey medium. It is usually seen as a single bacillus but is sometimes seen in pairs, chains, or clusters. Just 10 minutes of direct exposure to sunlight kills the organism, but it can live in soil for up to 21 days and in water for up to 25 days.

Although *P multocida* can cause serious disease in a variety of animals, this review focuses on human infections. Commonly found in oral or nasal secretions of many animals, including lions, tigers, and buffalo, *P multocida* has been reported in as many as 90% of cats and 50% of dogs. Not surprisingly, human infections generally occur after cat or dog bites, or cat scratches or licks. No food or waterborne illness has been reported. Human-to-human transmission has been reported horizontally via contaminated blood products or from colonized humans via nasopharyngeal secretions, feces, and urine, and vertically from mother to neonate. Respiratory tract infections with *Pasteurella* have been seen in individuals who work with animals or who are involved in the processing of animal tissues.

Dog bites account for 80% to 90% and cat bites account for 5% to 15% of animal bites in the United States. However, only 5% to 10% of dog bites become infected, whereas some series report that up to 50% of cat bites become infected, 6% of which require hospitalization. Children, most commonly boys aged 5 to 9 years, are the victims in most dog bites, whereas adults are more likely to experience cat bites. Dog bites are more likely to present for medical attention and are, therefore, more frequently reported. One study found that 75% of dog bite victims sought medical attention within 24 hours of being bitten, whereas cat bite victims presented only after late complications surfaced. Unlike the slower progression seen with other organisms causing wound infections, the incubation period for bite wound infections with *P multocida* is usually less than 24 hours, and symptoms often progress rapidly. The symptoms noted most commonly are wound site swelling, erythema, tenderness, and discharge and may also include fever, chills, and lymphadenopathy. Complications of *Pasteurella* bite wound infections include abscesses, tenosynovitis, osteomyelitis, and septic arthritis, which may be caused by spread of the soft tissue infection or direct penetration.

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***Pasteurella multocida* Infections: Report of 34 Cases and Review of the Literature.** Weber DJ, Wolfson JS, Swartz MN, Hooper DC. *Medicine.* 1984;63(2):133–154

These complications are more likely to occur after cat bites due to the increased likelihood of deep penetration because of the sharpness of cats' teeth.

Clinical manifestations of respiratory infection with *P multocida* are varied and can include pneumonia, empyema, and lung abscess, typically in patients with underlying pulmonary disease or altered immune status. The most common site of infection after the respiratory tract is the abdomen, where appendicitis and peritonitis can be seen. Finally, *P multocida* can cause a variety of disseminated infections, including bacteremia, septicemia, meningitis, endocarditis, and ocular infections. *Pasteurella* bacteremia is more likely in patients with liver disease, organ transplants, and other immunodeficient states, as well as in neonates and the elderly. However, there have been cases of bacteremia reported in previously healthy people. *Pasteurella* infections in neonates, particularly sepsis and meningitis, have been reported after incidental, nontraumatic exposure, usually licking by a pet.

Wound management of animal bites focuses on prevention of infection and begins with obtaining a thorough history and inspecting the wound. Wounds should be vigorously irrigated with normal saline and debrided as necessary, with surgical consultation as needed. It is essential to evaluate for damage to underlying structures, to assess neurovascular integrity, and to determine the need for tetanus or rabies postexposure prophylaxis. The literature presents conflicting recommendations regarding whether closing bite wounds via primary repair, delayed repair, or secondary intention leads to decreased risk of infection and better outcomes. However, certain wounds are considered to be at higher risk for infection and are generally not sutured: cat bites, puncture wounds, minor hand or foot wounds, wounds noted when delay in seeking care (>12 hours), and wounds in immunosuppressed individuals. Primary closure is recommended for facial wounds to optimize cosmetic outcomes. These wounds present a low risk of infection due to adequate blood supply.

Another area of controversy in bite wound care is the use of prophylactic antibiotics. Neither of 2 discrete meta-analyses has provided convincing evidence to recommend antibiotic prophylaxis uniformly. However, antibiotic prophylaxis should be considered for deep cat bites; wounds sutured prematurely; older bites (>8 hours) with evidence of crush injury or edema; wounds with risk of damage to bones, joints, or tendons; bites to the face, hands, and feet; and wounds with early signs of infection. When prescribed, the duration of antibiotic prophylaxis is 3 to 5 days, unless progression of infection indicates longer treatment.

When choosing antibiotics for patients presenting with infections after cat or dog bites, scratches, or licks, it is important to have a high index of suspicion for infection with *P multocida* because many oral antibiotics targeting skin and soft tissue infections will not be effective against this organism. Because many bite wound infections are polymicrobial, it is also imperative that initial treatment cover other bacteria commonly implicated in animal wound infections, including *Staphylococcus aureus, Streptococci*, and anaerobes. Oral amoxicillin-clavulanate and, for severe infection, intravenous ampicillin-sulbactam, piperacillin-tazobactam, and ticarcillin-clavulanate are appropriate choices. For the penicillin-allergic patient, an extended-spectrum cephalosporin and trimethoprim-sulfamethoxazole plus clindamycin are alternatives.

Diagnosis of *P multocida* infection can be made definitively only by culture, either of wound drainage or of other sites of infections, such as cerebrospinal fluid, pleural fluid, or joint fluid. The drug of choice for known *P multocida* is penicillin, but rare β-lactamase–producing strains have been isolated. Oral agents that usually are effective against *P multocida* include amoxicillin, cefuroxime, cefixime, cefpodoxime, doxycycline, and fluoroquinolones. Antistaphylococcal penicillins and first-generation cephalosporins are less effective and, therefore, should not be first-line agents. *Pasteurella* resistance to vancomycin, clindamycin, erythromycin, and aminoglycosides is common. Azithromycin and trimethoprim-sulfamethoxazole may be used as alternatives in penicillin-allergic patients. Depending on allergy history, second- or third-generation cephalosporins should be considered. Once the bacterium has been identified and antibiotic sensitivity is known, the choice of antibiotic can be adjusted accordingly. Local infections are typically treated for 7 to 10 days, and severe infections are treated for 10 to 14 days. Bone and joint infections typically require a longer duration of treatment, often 4 to 6 weeks, and surgical intervention is often indicated.

Given the potential for serious infections due to *P multocida*, teaching families about preventive measures is recommended. Limiting contact with wild animals and proper handling of domestic animals, including preventing pets from licking infants and young children, may help. It is also important to advise families to thoroughly clean bites and scratches and to seek prompt medical attention if the wound shows any signs of infection.

COMMENT: Dog and cat bites are common presentations to health care providers, and the severity can range from trivial to life-threatening. Although prevention is key, I have found it critical to provide good strategies for families with small children to minimize morbidity from dog and cat bites. Yet this can sometimes be difficult as my experience has supported that families love their pets and the comment I frequently hear is that the pet would never hurt their child. Even when a bite has already occurred! As outlined in this thorough *In Brief,* pediatric health care providers need to understand the importance of thorough cleaning of the wounds, knowing when suturing and prophylactic antibiotics are warranted, and assessing the tetanus vaccine status of the patient. In addition, it is important to obtain a history of the animal as to whether owned by the family or a known neighbor, the apparent health of the animal, and whether the attack was provoked as important questions in evaluating for the need for rabies prophylaxis. Consultation with the local health department is warranted for strays or if the animal cannot be recovered because it cannot be observed for 10 to 14 days regarding rabies risk.

– Janet Serwint, MD
Associate Editor, *In Brief*

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