HHS Public Access

Author manuscript

Zoonoses Public Health. Author manuscript; available in PMC 2017 September 01.

Published in final edited form as:

Zoonoses Public Health. 2016 September ; 63(6): 431–435. doi:10.1111/zph.12263.

Invasive *Pasteurella multocida* Infections – Report of Five Cases at a Minnesota Hospital, 2014

P. Talley[1,2], **P. Snippes-Vagnone**[3], and **K. Smith**[2]

[1]Epidemic Intelligence Service, Division of Science Education and Professional Development, Centers for Disease Control and Prevention, Atlanta, GA, USA

[2]Infectious Disease Epidemiology, Prevention and Control Division, Minnesota Department of Health, St. Paul, Minnesota, USA

[3]Public Health Laboratory, Minnesota Department of Health, St. Paul, MN, USA

Summary

During October 2014, the Minnesota Department of Health was notified of five Hospital A patients with *Pasteurella multocida* bacteraemia; three had died. Human soft tissue infection with *P. multocida* typically results from cat or dog bites or scratches. Invasive infection, defined as a *P. multocida* isolate from a usually sterile site, is rare. We evaluated *P. multocida* isolations at Hospital A, compared with other Minnesota hospitals to understand invasive infection trends. A case was defined as clinically confirmed *P. multocida* in a Minnesota resident during 2012–2014. All hospital laboratories were queried; Fisher's exact test was used for comparison. Medical charts were reviewed for 2014 Hospital A patients with *P. multocida* infections. The Minnesota clinical laboratories survey response rate was 79% (63/80). At Hospital A, proportion of *P. multocida* isolates from usually sterile sites increased from 0% (0/2) during 2012 to 11% (1/9) during 2013, and to 86% (5/6) during 2014. The proportion of patients with *P. multocida* isolated from sterile sites was 35% (6/17) at Hospital A compared with 10% (58/583) statewide during 2012–2014 combined ($P < 0.05$). Among 2014 Hospital A patients with invasive *P. multocida* infection, all five were men; median age was 70 (range: 44–78) years. Four were temporally clustered within a 33-day period; three of those had bacteraemia on admission, making hospital acquisition possible in only one. Among five bacteraemia patients, four had cirrhosis and/or skin ulcerations, and three died. The proportion of invasive *P. multocida* cases was substantially higher at Hospital A during 2014. No epidemiologic links between patients were found. Three had known pet exposure. Collaborative educational efforts of chronically ill pet owners by physicians and veterinarians can acknowledge the health benefits of pet ownership, while minimizing risk for serious invasive zoonotic infections, including those caused by *P. multocida*.

Correspondence: P. Talley. Minnesota Department of Health, 625 Robert St N., PO Box 64975, St. Paul, MN 55164-0975, USA. Tel.: 651-201-5193; Fax: 651-201-5082; Pam.Talley@state.mn.us.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Keywords

Pasteurella multocida; cat bites; *Pasteurella multocida* bacteraemia; invasive *Pasteurella multocida* infections; One health

Introduction

Fifty-six per cent of U.S. households own pets (AVMA, 2012). Evidence supporting health benefits of pet ownership continues to grow, including one study reporting increased post-myocardial infarction survival among pet owners independent of associated exercise (Friedmann et al., 2011). However, contact with animals does come with inherent risks. Estimates of the number of dog and cat bites annually in the United States include both owned pets and feral animals; approximately 5 million dog bite wounds are reported annually, with children being at the greatest risk (AVMA, 2015). Additionally, an estimated 400 000 cat bites occur annually in the United States, with adult women being at greatest risk (WHO, 2013). Dog bites are more common, but wounds are less likely to become infected than from cat bites; 3–18% infected wounds from dog bites, compared with 20–80% infected wounds from cat bites (Freshwater, 2008). *Pasteurella multocida*, a gram-negative coccobacillus, is normal oral and respiratory flora among certain animals, including up to 90% of cats and dogs (Freshwater, 2008); *P. multocida* is isolated from ~54% of cat bite wounds, whereas ~50% of dog bite wounds have different *Pasteurella* species, including 26% with *P. canis* and 12% with *P. multocida* (Talan et al., 1999; Abrahamian and Goldstein, 2011).

Pasteurella multocida is not a reportable disease in Minnesota; however, an astute clinician called the Minnesota Department of Health (MDH) to report a cluster of invasive *P. multocida* infections at Hospital A in Minnesota. During October 2014, MDH investigated the cluster, which occurred within a 33-day period, to assess for risk factors for invasive infection, possible epidemiologic links among these patients, and to exclude laboratory cross-contamination or nosocomial transmission; these results were compared with statewide data obtained from laboratories regarding *P. multocida* isolated during 2012–2014.

Materials and Methods

Hospital A is a 300-bed general medical and surgical hospital. Medical charts were reviewed for all 2014 hospitalized patients from Hospital A with *P. multocida* infection. We evaluated demographic, epidemiologic and clinical data, including age, sex, specimen source(s), animal exposure history, medical comorbidities and outcomes. To identify an isolate as *P. multocida*, laboratory identification at Hospital A was performed using Vitek® MS (bioMérieux, Incorporated, Durham, NC, USA) matrix assisted laser desorption/ionization time-of-flight mass spectrometry.

Invasive infection was defined as that isolated from a usually sterile site, in this case blood or peritoneal fluid. To determine statewide proportions of all clinical *P. multocida* isolates that are from usually sterile sites, all Minnesota clinical laboratories performing complex microbiology ($n = 80$) were surveyed through the Minnesota Laboratory System (MLS).

MLS is a collaboration among the MDH Public Health Laboratory and all laboratories that serve Minnesota patients, including individual hospitals, health systems and private commercial laboratories. Laboratories provided total number of *P. multocida* isolates and source during 2012–2014. Fisher's exact test was used for comparison. Demographic data and outcomes were not queried.

Results

Hospital A laboratory identified six *P. multocida* isolates during 2014; five isolates were from hospitalized patients with invasive *P. multocida* infections, and one was from an outpatient with *P. multocida* isolated from a localized foot ulcer. Table 1 summarizes the five hospitalized patients with invasive disease.

Patient 1

A man aged 78 years was admitted 5 February 2014, with cellulitis of the left medial thigh. Wound and blood cultures collected on admission both yielded *P. multocida*. His comorbidities included type 2 diabetes, cirrhosis and a venous stasis ulcer of the right ankle. He had a cat in the home, denied a bite or scratch, but acknowledged possible licking of the chronic lower extremity ulcer by the cat. He developed sepsis and died on February 15.

Patient 2

A man aged 70 years was admitted 8 September 2014, with right calf cellulitis and peritonitis. Blood and peritoneal fluid samples on admission both yielded *P. multocida* by culture. His comorbidities included cirrhosis with hepatic encephalopathy and a sacral ulcer. Pet exposure history was not obtained. He experienced sepsis and died on September 13.

Patient 3

A man aged 44 years was admitted 11 September 2014, with obstructive jaundice who underwent endoscopic retrograde cholangiopancreatogram (ERCP). On hospitalization day 2 (post-ERCP), he experienced fever and sepsis, and a cultured blood sample grew *P. multocida*. The patient's comorbidities included cirrhosis, chronic pancreatitis and type 2 diabetes. He owned a dog, but reported no contact during the month before admission. No wounds or other potential portals of entry on examination were noted. He recovered and was discharged September 24.

Patient 4

A man aged 62 years was admitted 27 September 2014, with sepsis, left calf cellulitis and a periosteal reaction identified on radiographs that was indicative of possible osteomyelitis. Blood samples obtained on admission for culture grew *P. multocida*. A gram stain of a sputum sample showed gram-negative coccobacilli, but *P. multocida* was not isolated. The patient's comorbidities included cirrhosis. Pet exposure history was not obtained. He died on October 4.

Patient 5

A man aged 75 years was admitted 11 October 2014, with myocardial infarction, pneumonia and sepsis. Blood samples obtained on admission for culture grew *P. multocida*. His comorbidities included a chronic foot ulcer that did not appear infected, and polymyalgia rheumatic treated with daily low-dose oral steroids. He reported a cat that had died six weeks earlier, and two new cats were in the home that slept with him. He recovered and was discharged on October 18.

Summarizing the 2014 Hospital A patients with invasive *P. multocida* infection, all five were men; median age was 70 (range: 44–78) years. Four of the five were temporally clustered within a 33-day period. However, three of those four had bacteraemia on admission and were separated in time such that laboratory cross-contamination should not have been possible; hospital acquisition or laboratory cross-contamination was therefore possible only in the one individual who developed bacteraemia on hospital day 2 after ERCP. Therefore, a full environmental assessment was not carried out, but the hospital was put on alert for future cases. Of five patients with invasive *P. multocida* infection, four had cirrhosis, three had lower extremity or sacral ulcerations, and three died. Three reported pet exposures, but denied bites or scratches. No pet exposure history was obtained from the other two patients.

Statewide, the MLS survey [response rate 79% (63/80)] reported that at other Minnesota hospitals during 2012–2014, 10% (58/583) of *P. multocida* isolates were from usually sterile sites. At Hospital A, proportion of *P. multocida* isolates from usually sterile sites increased from 0% (0/2) during 2012 to 11% (1/9) during 2013, and to 86% (5/6) during 2014. The proportion of patients with *P. multocida* isolated from sterile sites was 35% (6/17) at Hospital A compared with 10% (58/583) of all other Minnesota hospital isolates during 2012–2014 combined ($P < 0.05$).

Discussion

Hospital A had an increase in the number of invasive *P. multocida* cases during 2014. However, despite clustering in time and place, no evidence exists to indicate epidemiologic links, laboratory cross-contamination or nosocomial transmission at Hospital A.

This case series and laboratory study support and add to the existing literature by demonstrating (i) invasive *P. multocida* infections remain relatively rare, but severe with high case fatality rates; (ii) serious non-bite-related invasive *P. multocida* infections can occur in the absence of recognized bites or scratches; (iii) chronically ill persons, especially with cirrhosis, skin ulcerations or immunocom-promising conditions are at particular risk for invasive disease; (iv) non-bite exposures (e.g. pets licking wounds in one of the cases) appear to be a possible risk factor for invasive disease among chronically ill persons with ulcerations that can serve as entry portals; and (v) proportion of *P. multocida* isolates from usually sterile sites in Minnesota was ~11% during 2012–2014; this provides new baseline data for future use by other institutions or jurisdictions facing similar increases in absolute numbers or temporal clustering of invasive *P. multocida* infections.

Invasive *P. multocida* infection in humans can occur in usually sterile sites (e.g. blood, meninges, peritoneal fluid, joints and cardiac valves). Although not considered a sterile body site, the respiratory tract can be infected as well causing *P. multocida* pneumonia and empyema. A single case of probable human-to-human transmission was reported in a neonate with meningitis whose grandmother's respiratory tract was colonized with *P. multocida*, while neither the mother's reproductive nor respiratory tracts were colonized (Siahanidou et al., 2012). No other human-to-human or nosocomial transmission has been documented. However, infection through exposure to contaminated human hands has been hypothesized in a neonate with meningitis whose brother frequently played with the family cat then allowed the neonate to suck on his finger to calm him (Wade et al., 1999). In another case, a renal transplant patient with *P. multocida* bacteraemia was believed to have been infected by his cat licking the venous stasis ulcers on his legs (Christenson et al., 2015).

Immunocompromised pet owners are at greater risk for certain zoonotic infections, often manifesting more severe illness than immunocompetent persons (Elad, 2013). Published case series describe invasive disease caused by zoonotic bacterial pathogens, with cirrhosis of the liver noted repeatedly as a risk factor for invasive infection (Weber et al., 1984; Christidou et al., 2005), but no data have been published regarding proportion of infections that are isolated from usually sterile sites, compared with the total number of isolates, including those from the more common soft tissue infections.

Potential limitations to this study exist. First, infected wounds are often treated empirically without a wound culture; therefore, there are likely many more wounds infected with *P. multocida* that are unidentified and thus the true proportion of infections that are invasive is likely over-estimated at 11%. Second, no isolates from hospital A were available for the public health laboratory to perform further molecular characterization, such as pulsed-field gel electrophoresis (PFGE). Matching PFGE patterns might have indicated whether two patients hospitalized at the same time had related isolates, which would have supported nosocomial acquisition or a pseudo-outbreak via laboratory cross-contamination. Finally, two of the patients who died did not have pet exposures documented in the medical record, so other, unknown routes of infection cannot be ruled out.

The health benefits of pet ownership are clear, but awareness of the associated risk for zoonotic diseases, particularly among vulnerable populations, is needed. Recommendations for pet acquisition and ownership by immunocompromised persons have been published, including having a potential new pet examined by a veterinarian before adoption and regularly thereafter, careful handling of pet waste, frequent handwashing and refraining from face and mouth contact with the animal (Elad, 2013). More specific health education of the chronically ill and their caregivers including (i) careful hand hygiene by all caregivers, particularly pet owners; (ii) avoid pets licking wounds; and (iii) to thoroughly wash wounds if they are licked by the pet could prevent additional infections, particularly in persons with open wounds or indwelling medical devices, which could serve as entry portals for infection.

Acknowledgments

Joshua Rhein MD, John Holter MT (ASCP) and members of the Minnesota Laboratory System.

References

Abrahamian FM, Goldstein EJ. Microbiology of animal bite wound infections. Clin Microbiol Rev. 2011; 24:231–246. [PubMed: 21482724]

American Veterinary Medical Association. US pet ownership statistics. 2012. Available at: https://www.avma.org/KB/Resources/Statistics/Pages/Market-research-statistics-US-pet-ownership.aspx (accessed 3 September 2015)

American Veterinary Medical Association. Dog bite fact sheet. 2015. Available at: https://www.avma.org/News/PressRoom/Pages/Dog-Bite-Fact-Sheet.aspx (accessed 3 September 2015)

Christenson E, Ahmed H, Durand C. *Pasteurella multocida* infection in solid organ transplantation. Lancet Infect Dis. 2015; 15:235–240. [PubMed: 25467649]

Christidou A, Maraki S, Gitti Z, Tselentis Y. Review of *Pasteurella multocida* infections over a twelve-year period in a tertiary care hospital. Am J Infect Dis. 2005; 1:107–110.

Elad D. Immunocompromised patients and their pets: still best friends? Vet J. 2013; 197:662–669. [PubMed: 23820136]

Freshwater A. Why your housecat's trite little bite could cause you quite a fright: a study of domestic felines on the occurrence and antibiotic susceptibility of *Pasteurella multocida*. Zoonoses Public Health. 2008; 55:507–513. [PubMed: 18811910]

Friedmann E, Thomas S, Son H. Pets, depression and long term survival in community living patients following myocardial infarction. Anthrozoos. 2011; 24:273–285. [PubMed: 21857770]

Siahanidou T, Gika G, Skiathitou A, Oikonomopoulos T, Alexandrou-Athanassoulis H, Koutouzis E, Syriopoulou V. *Pasteurella multocida* infection in a neonate – evidence for a human-to-human horizontal transmission. Pediatr Infect Dis J. 2012; 31:536–537. [PubMed: 22198826]

Talan D, Citron D, Abrahamian F, Moran G, Goldstein E. Bacteriologic analysis of infected dog and cat bites. N Engl J Med. 1999; 340:85–92. [PubMed: 9887159]

Wade T, Booy R, Teare L, Kroll S. *Pasteurella multocida* meningitis in infancy – a lick may be as bad as a bite. Eur J Pediatr. 1999; 158:875–878. [PubMed: 10541939]

Weber D, Wolfson M, Swartz M, Hooper D. *Pasteurella multocida* infections – report of 34 cases and review of the literature. Medicine (Baltimore). 1984; 63:133–154. [PubMed: 6371440]

World Health Organization. Animal bites fact sheet. 2013. Available at: http://www.who.int/mediacentre/factsheets/fs373/en/ (accessed 3 September 2015)

Impacts

- *Pasteurella multocida* infections are typically soft tissue infections associated with cat or dog bites or scratches; 11% of 600 clinical *P. multocida* isolates in Minnesota during 2012–2014 were from usually sterile sites, including blood and peritoneal fluid.
- Patients with comorbidities (e.g. cirrhosis and lower extremity ulcerations) appear to be at greater risk for invasive *P. multocida* infections.
- Veterinarians and healthcare providers can encourage chronically ill persons with pets to take appropriate precautions to prevent *P. multocida* infections, including hand hygiene after handling pets and not permitting pets to lick open wounds.

Table 1

Inpatients with Pasteurella multocida invasive disease at Hospital A – Minnesota, 2014

Patient	Age (years), Sex	Specimen collection date	Specimen source(s)	Animal exposures in home	Diagnoses	Comorbid conditions	Outcome
1	78 M	Admission 5 February	Blood wound (thigh)	Cat	Sepsis wound infection	Cirrhosis, diabetes, LE ulcer	Death
2	70 M	Admission 8 September	Blood, peritoneal fluid	Unknown	Sepsis peritonitis, Cellulitis (calf)	Cirrhosis, sacral ulcer	Death
3	44 M	Hosp day 2 11 September	Blood	Dog	Obstructive jaundice	Cirrhosis, diabetes, pancreatitis	Recovered
4	62 M	Admission 27 September	Blood	Unknown	Sepsis, cellulitis (calf)	Cirrhosis	Death
5	75 M	Admission 11 October	Blood	Cats	Sepsis, myocardial infarction, pneumonia	Chronic steroid use PMR, Foot ulcer	Recovered

M, male; LE, lower extremity; PMR, polymyalgia rheumatica; Hosp, hospitalization.