Pathology in Practice

History

An 18-month-old 5.18-kg (11.4-lb) neutered male domestic shorthair cat kept predominantly indoors was evaluated because of lameness and unwillingness to jump of 5 days’ duration. Extensive swelling of the right pelvic limb from the hip region to the digits was evident. A 6-cm-diameter abscess (containing 3 mL of purulent fluid) was present in the lateral and caudal thigh area, affecting the biceps femoris, semitendinosus, and semimembranosus muscles and overlying skin. A foreign body was not identified on surgical exploration of the abscess. The cat’s vaccination status was reportedly current, including vaccination against FeLV. Three days later, a second abscess (5 cm in diameter) was detected over the right dorsolateral portion of the sacrum. Surgical exploration of the second abscess revealed similar purulent exudate and absence of a foreign body. Two days later, the swelling in the right limb worsened, and the cat was anorexic and its mentation was obtunded. Given the worsening clinical signs and lack of response to treatment (surgical debridement, drain placement, and antimicrobial administration), the owners elected euthanasia. Treatment likely failed because of the advanced state of disease at the time of veterinary examination and the rapid progression of the disease. The cat was euthanized by IV injection of pentobarbital and submitted to the Utah Veterinary Diagnostic Laboratory for necropsy.

Gross Findings

The cat was in good body and postmortem condition. At necropsy, the skin overlying the right biceps femoris muscle was thick and red and the underlying muscle was pale, friable, and necrotic (Figure 1). Blood-tinged fluid thickened the subcutis, muscle bundles, and tendon sheaths of the entire limb, resulting in severe generalized swelling. There were no other noteworthy gross lesions.

Formulate differential diagnoses from the history, clinical findings, and Figure 1—then turn the page →
Histopathologic and Microbiological Findings

Microscopic examination of affected tissues revealed ulcerative and suppurative dermatitis and necrosuppurative and abscessing cellulitis and myositis, with intralesional colonies of small, rod-shaped, gram-negative bacteria (Figures 2 and 3). Aerobic bacterial culture of affected muscle tissue yielded *Serratia marcescens*. Bacterial identity was confirmed by results of 16S ribosomal RNA sequencing performed at National Veterinary Services Laboratories, Ames, Iowa. No bacteria were isolated on anaerobic culture of affected muscle tissue.

Morphologic Diagnosis and Case Summary

Morphologic diagnosis: severe, subacute fibrinosuppurative and necrotizing dermatitis, cellulitis, and myositis, with intralesional rod-shaped bacteria.

Case summary: dermatitis, cellulitis, and myositis caused by *S marcescens* infection in a cat.

Comments

*Serratia marcescens* is a gram-negative, medium-sized, rod-shaped bacterium in the family Enterobacteriaceae that is saprophytic and widely distributed in the environment (water and soil).<sup>1</sup> The bacterium can survive and replicate in adverse environmental conditions, sometimes even in the presence of disinfectant.<sup>1</sup> Some serotypes of *S marcescens* produce prodigiosin, a red pigment. Pigment production is associated with low virulence (environmental origin).<sup>2</sup> *Serratia marcescens* secretes several extracellular products including DNase, proteases, hemolysin, lipase, and lecithinase, which contribute to its pathogenicity, as well as a surfactant that allows the bacterium to adhere to and grow on surfaces.<sup>1,2</sup> It is generally considered an opportunist pathogen and has been associated with nosocomial infections in humans and other animals, especially in immunosuppressed or debilitated patients.<sup>2–4</sup>

Sporadic opportunistic infections by *S marcescens* in birds, reptiles, amphibians, and mammals have been reported.<sup>5–14</sup> Septicemia as a result of *S marcescens* infection was diagnosed in an immunosuppressed blue and gold macaw<sup>5</sup> and in a swallow-tailed hummingbird.<sup>6</sup> Environmental stress and debilitation are believed to have predisposed a dwarf crocodile<sup>7</sup> and an amphibian (*Ambystoma mexicanum*)<sup>8</sup> to fatal *S marcescens* infections. In cows, artificial insemination equipment contaminated with *S marcescens* is suspected to have caused placentitis and subsequent abortion in 2 animals<sup>9</sup> and organic bedding<sup>10</sup> contaminated with *S marcescens* is suspected to have caused an epizootic of mastitis in a large dairy herd.<sup>10</sup> In horses, *S marcescens* infections may cause endocarditis,<sup>11</sup> abortion,<sup>12</sup> and septicemia.<sup>13</sup> Enteritis, icterus, hyperthermia, and death occurred in 14 cats that received *S marcescens*–contaminated blood transfusions.<sup>14</sup>

In veterinary medicine, most cases of abscessing myositis and cellulitis are attributable to direct bacterial inoculation.
via puncture or bite wounds. Bacteria associated normally with such infections in cats include *Pasteurella multocida* subsp *multocida*, *Bacteroides* spp, *Prevotella* spp, *Prophyromonas* spp, and β-hemolytic streptococci.15 Cases of primary myositis (eg, not due to extension from infected joints or tendons) attributed to aerobic gram-negative bacteria, and specifically *S. marcescens*, are uncommon among humans and other animals. *S. marcescens* was the predominant isolate in several cases of cellulitis in humans following iguana bites,16,17 and there is a single report18 of *S. marcescens* myositis in a human with multiple myeloma. The bacterium caused necrotizing myositis in a kidney transplant recipient also.19

In the cat of this report, it is likely that *S. marcescens* was an environmental contaminant that gained access to the subcutis and skeletal muscle by direct inoculation, such as through a bite wound. The infection was well established prior to the initial evaluation, ruling out a nosocomial infection. The cat was young and lacked known immunosuppressive factors or infections. This case is unique because, to the authors’ knowledge, cellulitis and myositis in a domestic cat due to *S. marcescens* infection have not been reported previously.

References