

NOVEL USE OF POLOXAMER 407 – ANTIBIOTIC COMPOUNDS TO TREAT ANTIMICROBIAL-RESISTANT SOFT TISSUE INFECTIONS IN DOGS

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ABSTRACT

Background: Veterinarians are diagnosing multiple-drug-resistant (MDR) infections in dogs with increasing frequency. High antibiotic concentrations are often needed for effective treatment. The use of thermoreversible poloxamer 407 gel for topical delivery of high concentrations of antibiotics in canine soft tissue infections has not been reported to the authors' knowledge.
Objective: To present a series of cases demonstrating successful treatment of MDR infections with topical poloxamer gel-antibiotic compounds.
Methods: Four canine patients with soft-tissue infections unresponsive to conventional therapy alone were treated with a topical compound consisting of poloxamer gel and an antibiotic (amikacin, clindamycin, and/or vancomycin).
Results: Case 1 (necrotizing fasciitis) and Case 2 (deep abscess from multiple dog bites) infections resolved after one application of poloxamer gel-antibiotic compound. Case 3 (infected skin graft) resolved infection after daily applications during bandage changes, and the graft healed. In Case 4 (MDR dermatitis and digital osteomyelitis), the compound was applied to the skin after digit amputation. The dermatitis resolved with subsequent negative cultures. No maceration of the skin was noted with these applications.
Conclusions: Poloxamer gel-antibiotic compounds can be used in conjunction with conventional therapy to successfully treat persistent MDR soft-tissue infections in dogs. Mechanical and antibiotic elution characteristics of poloxamer 407 are currently being explored.

Keywords: Poloxamer 407, Drug delivery, Antibiotic compound, Multiple-drug-resistant bacteria, Infection, Soft tissues

INTRODUCTION

Multiple-drug-resistant (MDR) infections pose a significant threat to patients in both human and veterinary medicine [1,2]. Like their counterparts in human medicine, veterinarians diagnose MDR infections in dogs with increasing frequency. The few antibiotics to which these infections are susceptible often have undesirable side effects, such as kidney damage with amikacin, when administered systemically, or are prohibitively expensive. Even with appropriate management and systemic antibiotics, these infections may fail to clear, leading to significant patient discomfort, removal of the affected tissues, and patient death.

To compound the problem, many pathogenic bacteria form biofilms, bacterial communities encased in and protected by a self-produced exopolysaccharide matrix, that further increase bacterial resistance to antimicrobial drugs [3-7]. Bacteria growing as biofilms require antibiotic minimal inhibitory concentrations (MIC) of 100-1,000 times more than that which is required to kill free-growing, planktonic bacteria [8,9]. Antibiotics given systemically (oral or intravenous) are unable to reach high enough concentrations at the infection site to be effective. Such increased concentrations can, however, be reached when high concentration antibiotics and other antimicrobials are applied topically. Successful treatment of human biofilm-infected wounds has been reported using a proprietary topical gel compounded with both antibiotics and antibiofilm agents [10,11].

One challenge for topical delivery of antibiotic drugs is containment of the drug at the site of infection long enough to be effective. Several agents have been used for this purpose, including polymethylmethacrylate beads, drug-impregnated dressings, and various forms of hydrogels [12,13]. Hydrogels have an additional benefit of promoting wound healing by maintaining a moist wound environment and promoting formation of granulation tissue [12,14]. Poloxamer-407 gel is a cross-