

Topical Therapy for Drug-Resistant Pyoderma in Small Animals

James G. Jeffers, VMD

KEYWORDS

- Methicillin-resistant • Chlorhexidine • Benzoyl • Hypochlorous • Nisin • Mupirocin
- Liposomes • Barrier

KEY POINTS

- Methicillin- and multidrug-resistant staphylococcal skin infections are becoming more prevalent in small animal dermatology.
- Topical therapy is increasingly important for the treatment and prevention of bacterial skin infections.
- An expanding number of different topical antibacterial ingredients are available for use in small animal practice.
- Success in the topical treatment of bacterial skin infections hinges on choosing not only the correct ingredient but also the appropriate vehicle for application.
- Many of the topical antibacterial skin products contain ingredients that prolong the longevity of antimicrobial ingredients.

Topical treatment of bacterial skin infections has been an important part of veterinary dermatology since its inception. However, it was often relegated to elective adjunctive treatment with oral antibiotics positioned as primary therapy. The recent emergence of methicillin- and multidrug-resistant staphylococcal skin infections has necessitated a dramatic change in philosophy of oral antibiotic treatment (see articles by Gortel and Cain elsewhere in this issue). It has also heightened the need for a new approach to topical antibacterial treatment, not only as adjunctive treatment with empirically chosen or culture-based antibiotics, but also as primary therapy for multidrug-resistant strains. Topical antibacterial therapy also serves as the benchmark for prevention of future infections, especially because antibiotic resistance can occur after 1-pass antibiotic treatment.¹

Strategies for effective topical antibacterial treatment include choosing both the ingredient as well as the vehicle used to deliver it. Ideally, the applied topical treatment

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Animal Dermatology and Behavior Clinics, Inc, 9039 Gaither Road, Gaithersburg, MD 20877, USA

E-mail address: 000927@comcast.net

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has to be effective, adequate delivery vehicle, proper contact time, and residual activity. These 4 variables determine the success of treatment.

SHAMPOO/LEAVE-ON CONDITIONER THERAPY

There are many compounds or combination products that have antibacterial activity, such as iodine and triclosan, present in a shampoo vehicle. However, the most widely used and effective are benzoyl peroxide, chlorhexidine (also available in a leave-on conditioner, spray, or wipe), or ethyl lactate (in combination with other antibacterial ingredients propylene glycol, lactic acid, and benzalkonium chloride). Studies have been undertaken in dogs to prove the efficacy of each shampoo in killing *Staphylococcus* bacteria on the skin surface as sole therapy.²⁻⁷ However, it is difficult to compare these studies to determine the best product and ideal protocol for use. The materials and methods of each were unique to that study, especially those involving chlorhexidine because the percentage tested ranged from 0.5% to 4%, with different chlorhexidine products (gluconate or acetate) used.⁸ One study did directly compare the in vitro potencies of the 3 ingredients and found chlorhexidine to be superior in activity. However, in the skin, both benzoyl peroxide and ethyl lactate break down to a more effective state so that study may have underestimated their true in vivo potency.⁹

- Ethyl lactate (10%) is lipid soluble and penetrates all skin layers, including hair follicles and sebaceous glands. In the skin, ethyl lactate is hydrolyzed into ethanol and lactic acid, which exerts both its bacteriostatic and bacteriocidal action.^{10,11} Its ability to diffuse through all skin layers contributes to its efficacy.
- Benzoyl peroxide (2.5%–3%) is an oxidizing agent that disrupts the bacterial cell wall membrane by increasing permeability or causing its rupture.⁸ If used frequently, benzoyl peroxide shampoo can be drying and irritating to some animals. It also has a shorter shelf life and poor lathering compared with other shampoo ingredients.
- Chlorhexidine (0.5%–4%) kills bacteria by coagulating bacterial cytoplasmic proteins and deteriorating bacterial cell membranes.¹⁰ An in vitro study¹² found that the concentration of chlorhexidine has a linear relationship with the degree of *Staphylococcus* bacteria kill; thus, higher concentration chlorhexidine products are recommended for treatment. An adequate dose of 2% chlorhexidine shampoo needed to kill *Staphylococcus* bacteria has been established as the amount of shampoo covering 1 US quarter coin on the area of a dog covered by 2 open adult hands.¹³

Shampoo therapy is best used for cases of generalized bacterial skin infections, particularly those affecting the torso and on patients with medium to long and/or thick coats. Ideally, bathing should be done as frequently as possible, even daily, if an infection is overtly present or to establish its efficacy as a preventative treatment. Afterward, the frequency of bathing can be decreased slowly and gradually over time but to no less often than every 7 to 14 days. To be most effective, dogs with thick or long coats should be clipped short. For larger dogs, inexpensive premedicated shampoo bathing removes grease, dirt, and debris for better contact time with the medicated product, with less product used and therefore less expense. It is ideal to have 10 to 15 minutes of contact time before rinsing.¹⁴ In climates with temperate weather, it can be done outside, with dogs walked during the 10- to 15-minute contact time needed before rinsing. If undertaken inside in a shower or bathtub, a timer is needed and ideally some form of distraction for the patient. Peanut butter or squeeze cheese (aerosolized semisolid processed cheese product) can be spread around the tub or shower at the pet's head level to offer distraction. Once the contact time has

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