

Topical Antibacterial Products for Canine Pyoderma

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Mechanism of Action	Advantages	Disadvantages
ACETIC ACID (2%) + BORIC ACID (2%) Available in Shampoo, Solution, Wipes		
<ul style="list-style-type: none"> • Antibacterial effect at 2.5% to 5% • <i>In vitro</i> and <i>in vivo</i> studies have indicated that cutaneous pH can affect growth of skin microbiota. • In general, a pH < 4 or 5 prevents microbial growth.¹ 	<ul style="list-style-type: none"> • A study of acetic acid/boric acid solution indicated synergistic activity of the ingredients and eradication of <i>Staphylococcus pseudintermedius</i> (acetic acid, 0.5%; boric acid, 5%)² • An <i>in vitro</i> study evaluating Malactic Otic solution (dechra-us.com; originally DermaPet) demonstrated inactivation of <i>S pseudintermedius</i> within 30 min of incubation.³ 	<ul style="list-style-type: none"> • In the most recent study, <i>in vitro</i>, acetic acid/boric acid shampoos were ineffective for both staphylococci and <i>Pseudomonas</i>.⁴
BENZOYL PEROXIDE (2.5%–5%) Available in Gel, Shampoo, Wipes		
<ul style="list-style-type: none"> • This oxidizing agent damages bacterial membranes.⁵ 	<ul style="list-style-type: none"> • Antibacterial effect can persist for 48 H • Has keratolytic, antipruritic, and degreasing properties • Increases transepidermal water loss • Decreases glandular secretions • Has a follicular flushing action • Helpful for dogs with greasy seborrhea⁵ 	<ul style="list-style-type: none"> • May need to transition to milder product to prevent over-drying as skin condition improves • Can cause cutaneous drying, erythema, and pruritus • Compared to chlorhexidine, benzoyl peroxide shampoo required a longer incubation period (30–60 min) for bacterial eradication.⁴ • A recent clinical study demonstrated that benzoyl peroxide, when used as sole therapy for canine superficial pyoderma, was clinically and microbiologically inferior to chlorhexidine.⁶
CHLORHEXIDINE (2%–4%) Available in Scrub, Shampoo, Solution, Spray, Wipes		
<ul style="list-style-type: none"> • Synthetic biguanide antiseptic with broad-spectrum activity • Rapidly effective against most gram-positive and gram-negative bacteria • Causes cytoplasmic protein coagulation and damages bacterial cytoplasmic membranes⁵ 	<ul style="list-style-type: none"> • Works in the presence of organic debris, is rarely sensitizing, and has good residual activity even after 29 H on the skin • Antimicrobial activity is superior to povidone iodine and ethyl lactate, and is nondrying compared to benzoyl peroxide.⁵ • Recent <i>in vitro</i> study of chlorhexidine shampoos (2%, 3%, 4%) demonstrated equivalent and excellent minimum bactericidal activity against <i>S pseudintermedius</i> (methicillin-susceptible and methicillin-resistant) at 10 min incubation time.⁴ 	<ul style="list-style-type: none"> • Can potentially irritate the skin, especially with more concentrated products
CHLOROXYLENOL Available in Shampoo, Solution		
<ul style="list-style-type: none"> • A halophenol antiseptic • Mechanism of action has been little studied; however, due to its phenolic nature, it would be expected to have an effect on microbial membranes.⁷ 		<ul style="list-style-type: none"> • <i>In vitro</i>, chloroxylenol shampoos were ineffective for both staphylococcal and <i>Pseudomonas</i> bacteria, and viable bacteria could be isolated from all shampoo dilutions at most timepoints.⁴
ETHYL LACTATE (10%) Available in Shampoo		
<ul style="list-style-type: none"> • Penetrates hair follicles and sebaceous glands, where it is hydrolyzed by bacterial lipases into lactic acid and ethanol • This action decreases skin pH, inhibits bacterial lipases, and produces a bacteriostatic and bactericidal effect.⁵ 	<ul style="list-style-type: none"> • Less likely to cause undesirable side effects compared to benzoyl peroxide 	<ul style="list-style-type: none"> • Some studies have shown it to be less effective than chlorhexidine or that it supports bacterial growth. • <i>In vitro</i>, ethyl lactate shampoo required an incubation period of 30 to 60 min for bacterial killing.⁴

(Table continues next page.)

Topical Antibacterial Products for Canine Pyoderma (continued)

Mechanism of Action	Advantages	Disadvantages
IODINE Available in Shampoo, Solution, Scrub		
<ul style="list-style-type: none"> Is thought to affect protein structure by oxidizing sulfur-hydrogen (S-H) bonds of cysteine and methionine, reacting with the phenolic groups of tyrosine and NH groups in amino acids, such as arginine, histidine and lysine, to block hydrogen bonding Also reacts with bases of nucleotides, such as adenine, cytosine, and guanine, to prevent hydrogen bonding Alters membrane structure by reacting with carbon=carbon (C=C) bonds in fatty acids, which results in cell death⁷ 	<ul style="list-style-type: none"> Excellent antibacterial properties 	<ul style="list-style-type: none"> Poor residual activity of 4 to 8 H Higher potential for contact sensitization compared to other topicals⁵
Mupirocin (2%) Available in Ointment		
<ul style="list-style-type: none"> Causes decreased bacterial intracellular isoleucine depletion and subsequent halting of RNA and bacterial protein synthesis⁵ 	<ul style="list-style-type: none"> Bactericidal within 24 to 48 H of application to most gram-positive bacteria⁵ Helpful in treatment of localized canine pyodermas, such as nasal or mucocutaneous pyoderma, interdigital granulomas, canine acne, and pressure-point pyoderma 	<ul style="list-style-type: none"> Not effective for <i>Pseudomonas</i>
Oxychlorine Compounds Available in Spray		
<ul style="list-style-type: none"> Hypochlorous acid damages bacterial cellular membranes in a similar mechanism of action as the neutrophil oxidative burst (critical antimicrobial mechanism of neutrophils, which involves rapid generation and release of reactive oxygen intermediates) 	<ul style="list-style-type: none"> Nonirritating, water-based spray Anecdotally helpful when used Q 12 H in cases of canine pyoderma In cases of methicillin-resistant pyoderma, is often used as adjunct therapy to bathing and conditioners +/- systemic antibiotics 	<ul style="list-style-type: none"> No controlled studies available
Silver Sulfadiazine (1%) Available in Cream, Solution (Baytril Otic, bayerdvm.com)		
<ul style="list-style-type: none"> Binds to cell components, including DNA, inhibiting transcription Interacts with thiol groups in bacterial enzymes and proteins Precipitates proteins Interferes with bacterial metabolism⁷ 	<ul style="list-style-type: none"> Broad-spectrum activity Excellent effectiveness against <i>Pseudomonas</i> Effective <i>in vitro</i> at 0.1% In addition to antimicrobial activity, has a beneficial effect in wound therapy by increasing epithelialization⁸ 	
Triclosan Available in Shampoo		
<ul style="list-style-type: none"> Bisphenol bactericidal agent Specific mode of action is unknown, but it has been suggested that the primary effects are on the cytoplasmic membrane In studies with <i>Escherichia coli</i>, triclosan at subinhibitory concentrations inhibited uptake of essential nutrients, while higher, bactericidal concentrations resulted in rapid release of cellular components and cell death.⁷ 		<ul style="list-style-type: none"> Less effective against <i>S. pseudintermedius</i> than benzoyl peroxide Not effective against <i>Pseudomonas</i>⁸

References

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