Topical Therapy

Advantages

- Achieve higher concentrations locally compared to serum concentrations when using systemic medications
- Effective as a sole therapy for most superficial infections, even with resistant bacteria
- Adjunctive topicals help reduce the duration of systemic medications

Disadvantages

- Labor intensive and may impact owner compliance
- Will the patient tolerate treatment?
- Some products may stain/bleach clothing or smell
- Can be absorbed percutaneously or ingested
- Adverse reactions (contact dermatitis)
    - Patches of erythema and papules, can progress to crusts, excoriations, hyperpigmentation, or lichenification
    - Should heal spontaneously when the irritant is removed

Formulations

- Shampoos
    - Remove scale, crusts, organisms, pollens, inflammatory mediators, and debris
    - Clip long-haired coats for better penetration (goal is to treat skin, not hair)
    - Can be used as soaks or in whirlpools
- Bathing a pet
    - Lather in the direction of hair growth
        - Aggressive lathering leads to ruptured hair follicles
        - Contaminated shampoo or water can lead to pseudomonas aeruginosa
        - Hemorrhagic papules, pustules, crusts and in severe cases pyrexia, lethargy, and neck/back pain
    - Allow at least 5-10 minutes of contact time prior to rinsing
    - Avoid contact with the eyes
- Sprays/mousses
    - Focal areas or the entire body
    - Mousses: lightly haired areas (belly, interdigital webs, ventral paws, concave pinna)
    - Sprays: larger areas, some are alcohol based which can sting
    - Common vehicle for antimicrobials, anti-inflammatory agents, and antiparasitics
- Whipes and Towelettes
    - Impregnated with a variety of antimicrobial agents
    - Variety of sizes

    - No rinsing required
    - Provide mechanical cleansing action
    - Ideal for intertrigo, (facial, vulvar, tail fold etc.) and interdigital spaces
- Powders
    - No longer commonly used in veterinary medicine
    - Neo-Predef with tetracaine powder
    - Create a thick, messy barrier
- Ointments and Creams
    - Small, focal non-haired lesions (nasal planum, paws, elbows, perianal region)
    - Impractical for large areas
    - Leaves residual film
    - Keeps drug in contact with stratum corneum
    - Maintains hydration and increases drug penetration
- Spot-on Formulation
    - Diffuse through the intracellular matrix and spread over the entire skin surface
        - Some are systemically absorbed
        - Some can be washed off
    - Common vehicle for flea/tick preventative or some topical moisturizers
- Dips/Rinses
    - Concentrated solution/powders diluted with water
    - Poured, sponged, or sprayed onto an animal
    - Should NOT be rinsed off
    - Generally inexpensive
    - Not absorbed well, effects are usually restricted to the surface of the skin

Drug	Class/MOA	Indication	Additional Information
Chlorhexidine	Antibacterial at any concentration Antifungal at concentrations 3% or higher Synergistic when combined with miconazole Fast acting, can have residual activity	Bacterial infection	Not effective against dermatophytes as a sole topical agent 4% or less is usually non-irritating Can delay healing/granulation tissue Toxic to the cornea!
Azole Antifungals (miconazole, ketoconazole, clotrimazole, climbazole, posazonazole)	Interferes with the production of ergosterol and impairs fungal cell walls	Malassezia dermatitis and dermatophytosis	Formulated in many otic products, shampoos, and mousses

	Miconazole destabilizes bacterial cell membranes and bactericidal at low concentrations		
Ethyl Lactate	Antibacterial and astringent Breaks down to ethanol and lactic acid Lowers the skin pH making it less hospitable for microorganisms to grow	Bacterial skin infections, *greasy* seborrhea	
Sodium Hypochlorite (Bleach)	Bactericidal, fungicidal, sporicidal, virucidal	Methicillin resistant staphylococcal infections Or an animal that is sensitive to chlorhexidine	1:10 to 1:20 dilution is well tolerated Inactivated by organic debris and sunlight Needs to be diluted prior to every application
Triz-EDTA	Chelates calcium and makes the walls of gram-negative bacteria more permeable Potentiates the effects of other antimicrobial agents	Pyoderma, otitis (especially with *Pseudomonas*)	No antibacterial properties when used alone Considered safe for the middle ear
Mupirocin	Topical antibiotic produced from *Pesudomonas fluorescens* Prevents bacterial protein synthesis by binding to bacterial isoleucyl transfer-RNA synthetase	Focal skin infections caused by susceptible S. aureus and S. psuedintermedius including beta-lactamase and methicillin-resistant strains, feline acne	Chemically unrelated to any other antibiotic (unique MOA limits cross resistance with other antibiotics) Excellent skin penetration Mostly gram+ activity Generally reserved for human medicine
Silver Sulfadiazine (SSD)	Sulfa-derived antibiotic with silver Damages cell membrane and cell walls Activity against yeast, gram negative and gram positive bacteria	Burns, ulcers, wounds, localized pyoderma, pseudomonas otitis externa	Promotes re-epithelialization
Aminoglycosides (Gentamicin Neomycin)	Topical Antibiotic	Best for gram-negative but has some gram-positive activity	Neomycin is the most common antibiotic to cause topical reactions Available OTC

Polymyxin B	Topical Antibiotic	Best for gram-negative bacteria	Available OTC
Bacitracin	Topical Antibiotic	Best for gram-positive bacteria	Available OTC

Moisturizing Agents

- Emollients: usually lipid-based
  - Improve skin barrier function, cell membrane fluidity, and keratinocyte cell-signaling
  - Examples: ceramides, essential fatty acids, cholesterol, etc.
- Humectants: Non-oily, hygroscopic agents
  - Bind to corneocytes and attract water (from the dermis and/or environment)
  - Examples: oatmeal, glycerin, sorbitol, urea, propylene glycol, lactic acid, amino acids, etc.
- Topical Fatty Acids
  - Emollients, also decrease inflammation and pruritus
  - Examples: Omega-6's (gamma-linoleic acid, etc.) and omega-3's (EPA, DHA, etc.)
  - Indications: Adjunctive therapy for atopic dermatitis, sebaceous adenitis, keratinization disorders (seborrhea)
- Colloidal Oatmeal
  - Helps restore skin barrier (lipid layer), antipruritic, humectant, mildly anti-inflammatory
  - Indications: maintenance topical for allergic dermatitis; seborrhea sicca
  - Must be colloidal, not homemade

Anti-seborrheic agents

- Keratolytic (remove excess scale): decrease cohesion between corneocytes, facilitates desquamation and shedding, softens the stratum corneum
- Keratoplastic (reduces scale production): attempts to renormalize keratinization and epidermal cell-turnover
- Follicular flushing: helps remove follicular secretions and bacteria and decrease follicular hyperkeratosis
- Some are antiseborrheic "degreasing" by inhibiting/reduction sebum production and clearing glandular ducts
  - Benzoyl Peroxide
    - Antibacterial, keratolytic, degreasing

        - Indications: pyoderma, seborrheic disorders, follicular casts, comedones, demodicosis
        - Can be irritating and drying to the skin
        - Bleaches hair and clothing
    - Salicylic acid
        - Keratoplastic, keratolytic, cerumenolytic, bacteriostatic and follicular flushing effects
        - Increases the ability of corneocytes to absorb water (humectant)
        - Synergystic keratolytic effects when combined with sulfur
        - Indications: excessive scaling, feline acne

Topical Glucocorticioids

- Anti-inflammatory, anti-pruritic, immunomodulating
- Should be used sparingly, not for long-term maintenance therapy
- Can be absorbed systemically and suppress the hypothalamic-pituitary-adrenal axis
- Various creams, sprays, otic ointments
- Indications: Adjunctive treatment of localized pruritic or inflammatory conditions
- Ex: pododermatitis, pyotraumatic dermatitis
    - Anamax
    - GenOne Spray
- Adverse effects *duration and strength-dependent
    - Cutaneous atrophy
    - Prominent dermal vasculature
    - Striae
    - Comedones
    - Superficial follicular cysts
    - Alopecia

Tacrolimus

- Calcineurin inhibitor (like cyclcosporine)
- Inhibits T-lymphocyte activation and release of inflammatory cytokines and mediators from mast cells and basophils
- Pros: no cutaneous atrophy or metabolic effects
- Cons: Slow onset of action, expensive, dogs might try to lick it off
- Indications: localized atopic dermatitis, canine perianal fistulae, discoid lupus erythematosus

Lime Sulfur

- Antifungal, antiparasitic, keratolytic, keratoplastic
- Calcium + sulfur mix
- Available in rinses and dips
- May cause skin irritation and dryness
- Can cause mucous membrane ulcers (avoid eyes, nose, mouth)
- Prevent grooming post-application, don’t let pet roam
- Wear gloves
- Staining (yellow/green) skin, coat, fabric, jewelry, porous surfaces