Superficial microbial infections incite a host of local immune responses that begin with activation of neutrophils and include the expression of matrix metalloproteinases (MMPs), recruitment and activation of phagocytes, production of antimicrobial proteins/peptides (AMPs), generation of cytokines, and recruitment of T-helper cells. Hydrolytic MMPs produce tissue destruction, including collagen depletion, and may lead to free-radical generation that produces further inflammation. The epidermal barrier, which had already failed to block entry of the offending microbes, becomes further weakened by these tissue-damaging effects. For minor infections, typical manifestations of these inflammatory processes include mild erythema, scaling, oozing, and pruritus. Patient scratching causes more significant physical trauma to the skin, including excoriations and abrasions, and may further disrupt the barrier. In more serious infections, these inflammatory processes can lead to more significant inflammation and, in severe cases, the development of wounds.

In light of the numerous molecular activities taking place at the infection site, therapy for superficial cutaneous infections should be aimed not only at targeting the pathogenic microbes with topical therapy but also at reducing sub-clinical inflammation and repairing cutaneous injury. Traditional strategies for managing microbial infections, specifically fungal infections, had focused almost exclusively on eradicating pathogens and had not often considered the importance of cutaneous repair. Consider that patients with tinea pedis or tinea cruris were often advised to keep the site of involvement as dry as possible and were prescribed antifungal powders and/or aerosol sprays for treatment. Yet, a dry environment is not optimal for tissue repair, and instructions to maintain dry skin preclude the use of moisturizers or other topical adjuncts recognized to promote skin repair.

Slowly over the past few years, the approach to management of superficial microbial infections has been changing. Advancements in vehicle development have yielded new formulations with potent antimicrobial effects that also support epidermal barrier repair. A novel formulation of iodoquinol 1.25% with aloe polysaccharides 1% (Aloquin™ gel, marketed by Ferndale Laboratories) is an example of a broad-spectrum antimicrobial formulation in a vehicle that helps to calm sub-clinical inflammation and repair cutaneous injury.

**Actives**

Aloquin™ gel contains iodoquinol, a broad-spectrum antimicrobial agent shown to have greater antimicrobial activity than either ciclopirox or clotrimazole. In vitro studies demonstrate its efficacy against *Propionibacterium acnes*, methicillin-resistant *Staphylococcus aureus* (MRSA), *Pseudomonas aeruginosa*, *Corynebacterium aquaticum*, *Trichophyton mentagrophytes*, *Malassezia furfur*, *Microsporum canis*, *Candida albicans*, *Trichophyton rubrum*, or *Epidermophyton floccosum*. The mechanism of action of iodoquinol, which has an established historical safety and efficacy for the management of superficial microbial infections, involves the chelation of metals in the membranes of fungi and bacteria, inhibiting their ability to synthesize nutrients and thus to proliferate.

Aloe polysaccharides have been investigated for a host of potential effects, including wound healing, antifungal activity, hypoglycemic or antidiabetic effects, anti-inflammatory, anticancer, immunomodulatory and gastroprotective properties. Among the most studied and most common applications of aloe polysaccharides is in wound healing, as they are shown to promote proliferation of human fibroblasts in vivo and to confer anti-inflammatory effects against macrophages. The immunomodulatory effects of aloe polysaccharides have been recognized and studied for some time.

Aloquin™ gel features a patented aloe polysaccharide that is highly purified from aloe and is water soluble. **In vivo** murine studies showed that aloe polysaccharide was a more effective stimulator of immune response than whole aloe or aloe glucans. In nude mouse skin, UV light exposure caused...
immunosuppression (measured by reactivity to antigens). Application of aloe polysaccharide 1% immediately after exposure restored immune function to about 80 percent of that of normal skin. By contrast, whole aloe gel or pure glucan, achieved only about 20 and 15 percent, respectively, of normal skin immune function. Efficacy of aloe polysaccharide was proportionate to the concentration. However, even at 0.05% concentration, aloe polysaccharide surpassed whole aloe or aloe glucan, restoring function to about 30 percent of normal.

Aloe polysaccharide is shown to promote wound healing. In mouse models, wounds induced via punch biopsies were randomized to treatment with aloe polysaccharide or no treatment. The aloe polysaccharide-treated sites demonstrated significantly greater healing compared to controls.9

The Vehicle
Aloquin™ gel delivers aloe polysaccharides via a biopeptide complex (Biopeptide Aloe Complex or BAC). The biopeptide consists of Palmitoyl linked with amino acids Gly-Hys-Lis (glycyl-L-histidyl-L-lysine-Cu2+ or GHK-Copper peptide) and is both water- and lipid-soluble, which enhances absorption. GHK is shown to increase collagen content in wounds. In vivo mouse models show that GHK-Cu induced significant collagen synthesis compared to untreated controls. At day 7, collagen accumulation in peptide-treated patients measures 0.70±0.36 versus 0.49±0.11 in controls. At day 21, peptide-treated mouse collagen measured 20.28±2.28 versus 9.45±2.20 for controls, which was statistically significant.9

In addition to the collagen promoting benefits of GHK, the Biopeptide complex enhances penetration of aloe polysaccharides. The penetration enhancing effects of the biopeptide complex were demonstrated in studies using radiolabeled carnosine, an amino acid. At all time points from 0.5 to six hours, biopeptide/carnosine demonstrated significantly greater penetration into the stratum corneum and epidermis compared to carnosine alone. At three hours, peptide delivery achieved 12-times the penetration of carnosine to the stratum corneum and more than eight-times the penetration of carnosine to the epidermis compared to non-peptide delivery.

The aqueous gel vehicle of Aloquin™ is suitable for application to numerous anatomic sites, including the axillae and the face. The gel may also be easily applied to certain hair-bearing areas and may be quickly applied to larger surface areas, as well. It is useful for management of cutaneous candidiasis/yeasts, tinea versicolor, seborrheic dermatitis, or tinea faciale/ringworm on the face.

Another Option
Aloquin™ provides broad-spectrum antimicrobial, anti-inflammatory, and healing properties for the treatment of many different superficial microbial infections. When patients require more significant anti-inflammatory effects, Alcortin® A, (iodoquinol 1%, hydrocortisone acetate 2%, and aloe polysaccharides 1%; marketed by Ferndale Laboratories) may be appropriate. Aloe polysaccharides and hydrocortisone acetate were shown to have additive effects in reducing cutaneous inflammation of wounds in vivo. Combination therapy yielded a greater reduction in edema compared to either agent alone or to saline controls.10 Furthermore, aloe polysaccharides appear to counteract the skin weakening effects of hydrocortisone. Measurement of wound tensile strength showed that, while application of topical hydrocortisone acetate decreased tensile strength, application of hydrocortisone acetate plus aloe polysaccharides increased tensile strength, possibly by maintaining collagen and elastin production at the treated sites.11

A Multi-targeted Approach
The therapeutic approach to management of superficial microbial infections should have as its goal the inhibition of pathogens and the repair of cutaneous injury at the infection site. By helping to calm inflammatory processes and repair epidermal damage, such treatment ensures the integrity of the skin and the epidermal barrier. Aloquin™ may be a useful addition to the topical treatment portfolio for microbial infections. It is safe and effective when used as directed. It should not be used internally (advise patients to use caution around the mouth, nose, eyes, vagina, and anus) or under occlusion, in order to minimize the likelihood of systemic exposure; oral ingestion of large therapeutic doses of iodoquinol caused blindness. Aloquin™ is steroid-free and is therefore a suitable option for use in younger patients and older adults who may have thinner skin. Prolonged use may result in overgrowth of non-susceptible organisms.

When more significant inflammation is noted clinically, Alcortin® A offers the benefits of Aloquin™ along with the well-known benefits of a mild corticosteroid.


12% Iodoquinol-1% Aloe polysaccharides

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