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Antipruritic Activity of Nutrashield and Skin Repair

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Pruritus, or itch, is a symptom associated with numerous skin diseases and skin lesions. The pruritic response in skin can be extremely intense, causing severe pain discomfort for long periods of time[1]. The prominent biochemical trigger responsible for pruritus is the degranulation of dermal mast cells and the subsequent release of histamine[2,3]. Histamine, or imidazolethylamine, is a biogenic amine present in numerous metachromatic granules in mast cells. When released, histamine acts on endothelial H1 nerve receptors and elevates the concentration of cyclic adenosine monophosphate in the primary neurons. An expansion of the capillaries occurs, along with local edema and an increase in the volume of the vascular bed. The cyclic adenosine monophosphate signaling pathway excites pruritic nerve C-fibers near the dermal epidermal junction, thus inducing pruritus[4,5]. Circulating histamine is eventually inactivated by the liver via several methylation and oxidation reactions.

In addition, secondary biochemical factors present in infected and inflamed skin lower the threshold for mast cell degranulation and potentiate the itch provoked by histamine. Prostaglandin E_2 is a biologically active carbon-20 unsaturated fatty acid and short range autocoid. Prostaglandin E_2 is a metabolite of arachidonic acid produced via the prostaglandin pathway[4,6]. Arachidonic acid is a polyunsaturated fatty acid derived from dietary sources and stored in the cell membrane fraction. The acid is primarily esterified to the phospholipids at the sn-2 position until phospholipase catalyzes its release[7,8]. Cyclooxygenase enzymes oxidize arachidonic acid along the prostaglandin pathway to form prostaglandin D_2, prostaglandin E_2 and prostaglandin F_2. Once released, prostaglandin E_2 dilates the local capillary system and lowers the threshold for histamine release[9].

Similarly, leukotriene C_4, leukotriene D_4 and leukotriene E_4 are all arachidonic acid metabolites and chemical mediators for inflammation. However, unlike prostaglandins, which can play important roles as biological regulators, the actions of leukotrienes appear to be exclusively of a pathological nature. Leukotrienes are synthesized by the enzymatic oxidation of arachidonic acid through the 5-lipoxygenase pathway[7,8]. Leukotrienes constitute a slow releasing substance discharged by dermal mast cells after an IgE-antigen reaction[10]. Leukotriene C_4, leukotriene D_4 and leukotriene E_4 bind to the cysteinyl leukotriene receptors cysteinyl leukotriene receptor-1 and cysteinyl leukotriene receptor-2, thus invoking inflammation. In particular, leukotriene B_4 agitates pruritic nerve C-fibers and lowers the threshold for mast cell degranulation[4,11].

Remedy Nutrashield™ and Remedy Skin Repair Cream™ from Medline Industries, Inc. contain several specialized nutrients that effectively modulate the biochemical abnormalities associated with pruritus. The anti-pruritic nutrients include hydroxytyrosol, or 3,4-dihydroxyphenyl ethanol, which is a simple phenol found predominantly in Olea europea, or the olive plant. Hydroxytyrosol is an extremely potent free radical scavenger that stimulates significant anti-inflammatory activity in skin[12].

Numerous studies have established that topically applied antioxidants substantially reduce pruritus by inhibiting the secondary biochemical factors present in infected and inflamed skin[13]. In particular, hyroxytyrosol inhibits leukotriene B_4 generation by modulating the enzymatic oxidation of arachidonic acid through the 5-lipoxygenase pathway[14,15]. Altogether, the phenolics found in hydroxytyrosol possess an array of "beneficial lipoxygenase-inhibitory, prostaglandin-sparing, antioxidant properties" [16].

In addition, Remedy Nutrashield™ and Remedy Skin Repair Cream™ provide aloe barbadensis leaf juice, niacinamide (vitamin B_3), pyridoxine (vitamin B_6), and retinyl palmitate (vitamin A). Aloe barbadensis leaf juice contains the glycoprotein alprogen, which has been found to inhibit multiple signals throughout the biochemical cascade responsible for mast cell degranulation. Most notably, alprogen inhibits histamine activity and prevents the release of leukotriene B_4[17,18]. Niacinamide (vitamin B_3) and pyridoxine (vitamin B_6) induce a similar inhibitory activity of mast cell degranulation and histamine release[19,20]. Furthermore, niacinamide has been shown to significantly inhibit cyclic adenosine monophosphate at the dermal-epidermal junction, thus reducing the excitation of pruritic nerve C-fibers[21]. Retinyl palmitate (vitamin A) reduces pruritic symptoms associated with vitamin A deficient inflammation. Numerous studies show that vitamin A deficiency aggravates the clinical manifestations of inflammatory reactions, thereby increasing the release of pruritic inducing prostaglandins and leukotrienes[22,23]. The topical application of retinyl palmitate prevents vitamin A deficiency and subsequently reduces inflammation and pruritus.

Remedy Nutrashield™ and Skin Repair Cream™ are composed of advanced silicones that prevent the excessive transepidermal water loss responsible for dry, irritated skin. Transepidermal water loss is a measure of cutaneous barrier function reflecting skin water content and is defined as grams of water lost per square meter of skin per hour[24]. Transepidermal water loss decreases stratum corneum hydration and activates a pruritic inflammatory response in the epidermis and dermis[25]. In addition, scratching dry, irritated skin further increases transepidermal water loss and intensifies the associated pruritus[26]. An independent *in vitro* study found that silicone-based Nutrashield™ and Skin Repair Cream™ significantly reduced excessive transepidermal water loss, conserving nearly four times the quantity of water as the control[27,28]. Reducing transepidermal water loss and conserving stratum corneum hydration is the key to reducing the dry, irritated skin responsible for inflammation and pruritus.

In conclusion, Remedy Nutrashield™ and Remedy Skin Repair Cream™ from Medline Industries, Inc. provide numerous beneficial nutrients that reduce the overall histamine activity associated with pruritus and inhibit the secondary biochemical factors present in infected and inflamed skin. Remedy Nutrashield™ and Skin Repair Cream™ are composed of advanced silicones that protect the stratum corneum against excessive transepidermal water loss, thus preventing irritation and pruritic inflammation. Treating pruritus with Nutrashield™ and Skin Repair Cream™ relieves patient pain and discomfort, allowing for a better quality of life.

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