

Niacinamide: A Multi-functional Cosmeceutical Ingredient



This non-irritating, water-soluble essential vitamin may benefit a variety of skin conditions.

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>> Niacinamide seems to be showing up in lots of topical skincare products. Niacinamide is marketed for anti-aging, to reduce redness, mitigate acne, and even reduce the appearance of hyperpigmentation. The question is: Can niacinamide live up to the hype? Niacinamide or vitamin B3 is a water-soluble essential vitamin. Niacinamide is a precursor to the co-factors NAD and NADP that play a key role in biochemical reactions, including cellular energy production, glucose metabolism, and the synthesis of lipids. The level of these co-enzymes decreases with age, and topical application of niacinamide helps to mitigate this loss.

Formulators value niacinamide because it is gentle and versatile. Unlike retinoids and hydroxy acids, niacinamide is non-irritating. It is known to improve barrier function and reduce transepidermal water loss by increasing ceramide and free fatty acid levels. It also increases production of epidermal proteins, including keratin, involucrin, and filaggrin. Niacinamide has broad anti-inflammatory activity. In vitro studies demonstrate niacinamide reduces secretion of cytokines, including interleukin-8, which is produced by keratinocytes in response to pathogens such as *C. acnes*. It also decreases lysosomal release and mast cell degranulation. Finally, niacinamide reduces UVB-induced PGE2 production by keratinocytes. With this broad anti-inflammatory activity and the ability to repair the skin barrier, niacinamide is a useful ingredient for many dermatologic conditions, including acne, rosacea, and eczema.

A unique benefit of topical niacinamide is that it reduces sebum production and pore size. Draelos et al reported that use of 2% topical niacinamide resulted in a significant reduction in sebum excretion rate and pore size in a

Japanese cohort and surface sebum levels in a Caucasian study group over four weeks. In addition to reducing sebum production, topical niacinamide may have bacteriostatic effects on *C. acnes*. A comparative study found that topical niacinamide gel 5% significantly improved acne vulgaris from baseline and resulted in a similar reduction in acne lesions as treatment with 2% clindamycin. Similar studies showed that 4% niacinamide gel is comparable in efficacy to 1% clindamycin for treating acne vulgaris. Niacinamide has significant advantages, including lack of dryness, irritation, and risk for antibiotic resistance.

The anti-aging benefits of niacinamide are due in part to its ability to increase intracellular NAD and NADP, whose reduced forms (NADH and NADPH) function as antioxidants. Topical niacinamide increases collagen production, inhibits deposition of excessive glycosaminoglycans, and prevents protein glycation. Glycation results in the cross-linking of collagen and elastin molecules, making them stiff and rigid, changing the viscoelastic properties of the skin. Glycated proteins are also responsible for sallowness seen in actinically damaged skin. In a double-blind, placebo-controlled, split-face clinical trial, 50 subjects used either a 5% niacinamide moisturizer or placebo twice daily for 12 weeks. Subjects in the test group saw an improvement in fine lines and wrinkles, hyperpigmented spots, texture, red blotchiness, and sallowness compared to control. The niacinamide moisturizer was well tolerated.

Niacinamide is an effective skin lightening agent. Niacinamide does not inhibit tyrosinase. It combats hyperpigmentation by preventing the transfer of melanosomes to epidermal keratinocytes and interfering with cell signaling pathways between keratinocytes and melanocytes.

Due to its unique mechanism of action, niacinamide is helpful when used in combination with other skin lightening ingredients. For example, niacinamide 4% cream with 0.5% desonide emulsion showed significant colorimetric improvement in axillary hyperpigmentation compared to desonide alone. Subjects in this study were Fitzpatrick skin types III-V. An eight week, double-blind, vehicle-controlled study of 42 Korean women evaluated a topical formulation with 2% niacinamide and 2% tranexamic acid for the treatment of irregular facial hyperpigmentation. The test formulation was significantly more effective at lightening hyperpigmentation compared to vehicle control. A skin brightening formula with retinol 0.5%, resveratrol 4.4%, and hexylresorcinol 1.1% improved mild to moderate hyperpigmentation with statistically significant improvement compared to baseline by week four.

Finally, niacinamide is known to have prophylactic benefits against non-melanoma skin cancer (NMSC). A large, one year, placebo-controlled clinical trial of 386 patients with a history of NMSC demonstrated that niacinamide 500mg taken twice daily resulted in a 23 percent reduction in the development of new NMSCs. Niacinamide protects against NMSC by preventing UV-induced depletion of ATP in keratinocytes. ATP is necessary for effective DNA repair. Niacinamide also has an inhibitory effect on poly-ADP-

ribose-polymerase (PARP)-1, helping to regulate the DNA repair processes. Topical niacinamide 1% applied twice daily versus vehicle resulted in a 21.8 percent reduction in actinic keratoses at three months compared to a 10 percent reduction with vehicle control. However, there was no difference between the groups at six months. Further studies to evaluate the usefulness of topical niacinamide in treating actinic keratoses are warranted. ■

Drs. Farris and Lain are co-founders of the Science of Skincare Summit, to be held October 28-30 in Austin, TX. For information: scienceofskincare-summit.com

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