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Original Research

Open-Label Study Demonstrating Improvement in Atopic Dermatitis and Pruritus Resulting from the Use of an Oral Antioxidant-Enhanced L-Histidine Supplement with a Plant-Biotech Moisturizer and Unscented Soap

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Relevance

Atopic dermatitis (AD) is an inflammatory skin condition with a multifactorial pathophysiology. Standard treatment emphasizes topical corticosteroids (TCs), but there is growing interest in alternatives to TCs.

Objective

To evaluate the efficacy of a novel antioxidant-enhanced L-histidine supplement, a plant-biotech moisturizer, and an unscented soap on AD severity, pruritus, and skin biophysical properties.

Methods

An open-label trial was conducted including 35 subjects with moderate AD. At baseline and day 56, the SCORAD, pruritus, mood changes, and skin biophysical measures were assessed.

Results

Between D0 and D56, mean total SCORAD decreased by 93% ($p<0.0001$), mean oSCORAD decreased by 92.1% ($p<0.0001$), and mean p-NRS decreased by 97% ($p<0.0001$). By D56, TEWL decreased by 29% ($p=0.002$), hydration increased by 117% ($p<0.0001$), and desquamation index decreased by 83% ($p<0.0001$). In addition, when mood was assessed at D56 relative to baseline, there were significant reductions in overall negative affect ($p<0.05$).

Conclusion

The oral supplement, plant-biotech moisturizer, and unscented soap demonstrated improvement in skin barrier integrity and AD severity in 8 weeks, suggesting potential clinical efficacy of plant-biotech for AD management.

1. INTRODUCTION

Atopic dermatitis (AD) is a chronic inflammatory condition that can significantly impact quality of life.[1] Individuals with AD suffer from dry, itchy, irritable skin, and are more prone to developing anxiety and depression.[2,3] The pathophysiology of AD is multifaceted and includes genetic predisposition, immune dysregulation, and skin barrier disruption.[4]

Filaggrin is a protein encoded by the *FLG* gene and loss of function mutations in the gene are commonly seen in patients with AD.[5] FLG protein provides components of the natural moisturizing factor (NMF) in the stratum corneum (SC).[5] NMF is essential for maintaining SC hydration, barrier, desquamation, and plasticity.[6]

Standard treatment of AD includes topical corticosteroids (TC), and regular emollient use to inhibit water loss and restore skin barrier.[7] While TCs are efficacious in treating AD, prolonged TC use can cause loss of dermal connective tissue, specifically loss of stratum granulosum (SG), and SC thinning, leading to erythema, telangiectasia, or purpura.[8]

There is increasing patient interest in alternatives to TCs, and emerging research on plant-biotech topicals has demonstrated mechanisms that support the skin barrier.[9] For example, sunflower oil is rich in linoleic and oleic acids

and helps alleviate symptoms of a weakened skin barrier in AD and xerosis.[10,11] In addition, S*ymphytum officinale* plant cells contain rosmarinic acid to improve skin barrier function by decreasing skin surface pH, increasing ceramide formation, lowering water loss,[12] and having antibacterial activities against *Staphylococcus aureus*, which has been implicated in AD flares and severity.[13,14]

The appropriate selection of a cleansers (eg, soap) is another important component of a comprehensive AD management plan, as harsh cleansers can impair SC proteins, lipids, and NMF components, and in turn, interfere with skin barrier function.[15,16] To avoid irritation and barrier disruption, an ideal cleanser should be close to pH neutral, fragrance-free, and should support skin hydration and the skin microbiome.[17]

Nutraceuticals that support the skin barrier can also play a role in managing AD.[18] Specifically, the amino acid L-histidine has been found to enhance filaggrin processing in cultured human keratinocytes,[19] and to significantly reduce AD in both pediatric and adult clinical studies.[19-21] In addition, research suggests that oxidative stress can contribute to inflammation and play a significant role in the pathogenesis of AD, and that the use of antioxidants may be helpful.[22,23]

This open-label clinical pilot study investigates the effect of an integrative approach with the combined use of an antioxidant-enhanced L-histidine supplement, a moisturizer with plant-derived biotech actives, and an unscented soap on AD severity, pruritus, mood changes, and skin biophysical measures.

2. MATERIALS AND METHODS

2.1. INVESTIGATIONAL PRODUCT AND APPLICATION

The oral supplement is from Codex Labs as Antü™ Skin Barrier Support Supplement (San Jose, CA). It contains: L-histidine, Ethnicare M3 Powder Plus consisting of *Buddleja globosa*, *Aristotelia chilensis,* and *Ugni molinae* leaf extracts (M3Complex™, San Jose, CA), citric acid, organic and natural flavors, organic rice fiber, sea salt, stevia leaf extract.

The soap is from Codex Labs as Bia™ Unscented Soap (San Jose, CA). It contains sodium olivate, sodium cocoate, sodium shea butterate, aqua, *Daucus carota sativa* root extract, sodium castorate, sodium sunflowerate, sodium cocoa butterate, and *Calendula officinalis*.

The moisturizer is available from Codex Labs as Bia Eczema Relief Lotion (San Jose, CA). It contains: aqua, *Helianthus annuus* seed oil, propanediol, glyceryl stearate, glycerin, Lactobacillus ferment, C13-15 alkane, cetyl alcohol, *Calendula officinalis* meristem cell extract, *Haberlea rhodopensis* leaf cell extract, *Padina pavonica thallus* extract, *Symphytum officinale* leaf cell extract, *Cocos nucifera* fruit extract, *Butyrospermum parkii* butter, *Moringa oleifera* seed oil, *Limnanthes alba* seed oil, *Macadamia integrifolia* seed oil, *Cedrus deodara* wood oil, hydrogenated lecithin, phytosphingosine, hydrolyzed sodium hyaluronate, ceramide NP, sodium phytate, sclerotium gum, xanthan gum, sodium benzoate, potassium sorbate, citric acid, and 1% colloidal oatmeal to conform with monograph M016.

All investigational products were stored in a secured location at room temperature. Study participants were instructed to use the investigational products as described in Table 1.

2.2. INCLUSION AND EXCLUSION CRITERIA

The study included participants, ⩾18 years old with Fitzpatrick skin phototypes I to III. Subjects had moderate AD defined as a SCORing Atopic Dermatitis (SCORAD) score ranging from 25 to 50 (mean = 34.6). Exclusion criteria included women with childbearing potential, cutaneous pathology other than AD, interfering topical or systemic treatment during the previous weeks liable to interfere with the assessment of the cutaneous efficacy of the study product, surgery under general anesthesia within one-month, excessive exposure to sunlight or UV, and the use of antifungal or antibiotic treatments one month prior to or during the study. Participants were allowed to use their topical corticosteroids during the study if needed and were instructed that they must make note of the topical corticosteroid and number of applications if utilized in a daily log. However, there was no steroid use by the participants during the study duration. Participants were required to maintain their hygiene, cosmetics, and lifestyle habits for the duration of the study.

Participants were provided with products and instructed to use topicals at least once daily and oral supplements once/day. Compliance was documented with a study log and products were weighed before and after dispensation.

2.3. STUDY DESIGN AND RECRUITMENT

This was an eight-week, open-label clinical study conducted in Malbork, Poland, performed by EUROFINS Dermscan/Pharmascan (Gdańsk, Poland). It was conducted according to Helsinki Declaration (1964) and its successive updates. The Internal Bioethics Committee at Dermscan Poland approved the protocol. All participants provided written informed consent prior to enrollment. Individuals were screened for eligibility, and all study procedures were performed in Malbork, Poland. The study is registered on clinicaltrials.gov with identifier NCT06819709.

A wash-out period was implemented for all enrolled subjects using the unscented soap twice/day for 2-3 days prior to baseline (D0). Each participant served as their own control. This was accomplished by using a non-lesional reference site (no moisturizer applied) selected in close proximity to the lesional site for biophysical measurements. There were no changes to the methods or trial outcomes after the initiation of the study, and the study was stopped once enrolled participants completed the study. Study visits occurred at a standard interval (SI) screening, baseline (D0), week 4 (D28), and week 8 (D56).

The primary endpoints of this study included a dermatologist-assessed SCORAD at D0 and D56. Secondary endpoints included the comparative measurements of hydration, trans-epidermal water loss (TEWL), surface area of

squamae (SSS), and desquamation index (DI) recorded at the SI.

2.4. COMPARATIVE ANALYSIS OF THE ANTIOXIDANT PROPERTIES OF M3COMPLEX

Antioxidant capacity (ie, thermodynamic conversion efficiency of an oxidant probe) of the M3Complex was assessed using four assays: FRAP (Fluorescence recovery after photobleaching), ABTS((2,2′-azino-bis-(3-ethylbenzothiazoline-6-sulfonic) acid) compound), DPPH((2,2-Diphenyl-1-picrylhydrazyl) compound), and ORAC (Oxygen Radical Absorbance Capacity using peroxyl radicals). Trolox was the reference for all measurements. FRAP, ABTS, and ORAC were performed in an aqueous solvent, while DPPH was performed in 50:50 ethanol:water solvent. Additionally, antioxidant equivalents for M3Complex were measured for flavonoids in quercetin equivalent units and for phenolics in gallic acid equivalent units.

2.5. CLINICAL MEASURES: SCORAD AND PRURITUS

Total and objective SCORAD scores were evaluated by a dermatologist at D0 and D56. The total SCORAD was calculated using the formula: A/5 + 7B/2 + C, where A is the extent score, B is the intensity score, and C is the final symptom score. The objective SCORAD removed the subjective component and was calculated by A/5 + 7B/2.

Pruritis was measured in three ways at D0 and D56. The mean itch intensity was rated by the subjects using the numerical rating scale (NRS) where 0 = minimum and 10 = maximum itch. Pruritus improvement was assessed with the 4-point reduction in NRS, the proportion of subjects that achieved a NRS of 0 or 1 and the proportion that achieved a NRS of 0. The third way used a global assessment of itch scale where 0 = no, 1 = mild, 2 = moderate, and 3 = severe itch.

2.6. MEASUREMENTS OF THE BIOPHYSICAL PROPERTIES OF THE SKIN

All biophysical measurements were collected at the SI after acclimation to ambient conditions.[24] The biophysical properties of two predetermined areas (treated area with active lesion and non-treated reference area without lesion) were measured: TEWL using a Tewameter® (Courage + Khazaka, Köln, Germany), skin hydration using a Corneometer® (Courage + Khazaka, Köln, Germany), and SSS/DI using D-Squame® (Clinical and Derm LLC, Dallas, TX, USA).

2.7. POSITIVE AND NEGATIVE AFFECT SCHEDULE (PANAS)

PANAS is a validated, patient-oriented questionnaire that measures positive and negative affect.[25] Subjects were asked to report these affects over the past week on a 5-point scale ranging from 1 (very slightly or not at all) to 5 (extremely): Interested, Distressed, Excited, Upset, Strong, Guilty, Scared, Hostile, Enthusiastic, Proud, Irritable, Alert, Ashamed, Inspired, Nervous, Determined, Attentive, Jittery, Active, and Afraid. PANAS was administered on the SI.

2.8. STATISTICAL ANALYSIS

Differences in SCORAD, pruritis, TEWL, hydration, SSS, and DI were analyzed using paired student t-tests, while non-parametric data such as patient global assessments and PANAS were analyzed with a Wilcoxon rank-sum analysis. A p-value of < 0.05 was considered statistically significant. All comparisons were within group (baseline data served as controls).

3. RESULTS

3.1. ANTIOXIDANT COMPLEX CAPACITY

The M3Complex demonstrated higher FRAP (9655.50) and ORAC (8566.00) capacity and comparable ABTS (4371.60) and DPPH (4463.60) to ascorbic acid (vitamin C), curcumin, black tea, and green tea (Figure 1A) and showed the broadest ability to perform in all four assays. M3Complex showed the highest phenolic equivalent at 422.60 (Figure 1B) and comparable flavonoid equivalent to vitamin C at 609.10 vs 645.80 (Figure 1C).

3.2. CLINICAL STUDY AND SCORAD

Thirty-five participants were enrolled into this study, with 86% being female (n = 30) and 14% being male (n = 5). The mean age was 45 years (range, 19-73). Of all participants, 80% (n = 28), 17% (n = 6), and 2.9% (n = 1) had Fitzpatrick skin types II, III, and I, respectively. The average total SCORAD at D0 was 34.6 (range = 26-46). The flow of participants throughout the study is shown in Figure 2. Thirty-three subjects completed the study.

At D56, there were significant reductions (all $p < 0.0001$) in scores A (extent), B (intensity), C (subjective scores), and total SCORAD by 94%, 92%, 94%, and 93%, respectively (Figure 3A). The mean SCORAD scores at D0 and D56 were 34.6 and 2.6 (Figure 3B).

The mean oSCORAD scores at D0 and D56 were 25.9 and 2.0, representing a 92.1% reduction ($p < 0.0001$, Figure 4A). At D56, 100%, 88%, 64%, and 64% of participants achieved oSCORAD50 (50% reduction in oSCORAD compared to D0), oSCORAD75, oSCORAD90, and oSCORAD100, respectively (Figure 4B).

3.3. PRURITUS

The mean pruritus NRS reduced from 5.9 to 0.2 ($p < 0.0001$) between D0 and D56 (Figure 5A). The proportion of subjects at D56 that achieved a 4-point NRS reduction was 85%, an NRS of 0 or 1 was 94%, and an NRS of 0 was 91% (Figure 5B). The global assessment of their pruritus revealed a reduction at both D28 and D56 (Figure 5C).

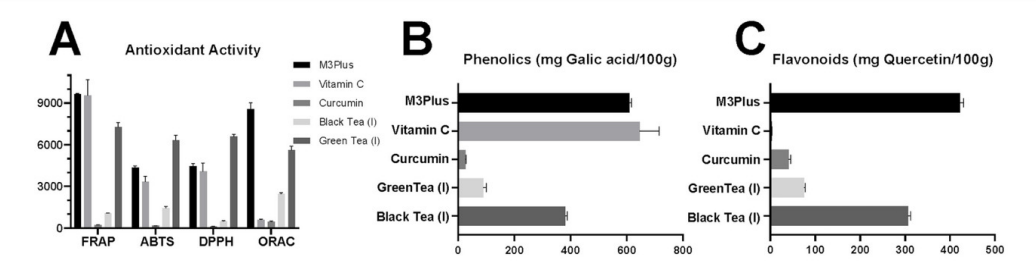

Figure 1. A) The antioxidant activity of the M3 Complex compared to common antioxidants.* B) The phenolics equivalent of the M3 Complex compared to common antioxidants. C) The Flavonoids equivalent of the M3 Complex compared to common antioxidants.

*FRAP (Fluorescence recovery after photobleaching), ABTS((2,2′-azino-bis-(3-ethylbenzothiazoline-6-sulfonic) acid) compound), DPPH((2,2-Diphenyl-1-picrylhydrazyl) compound), and ORAC (Oxygen Radical Absorbance Capacity using peroxyl radicals)

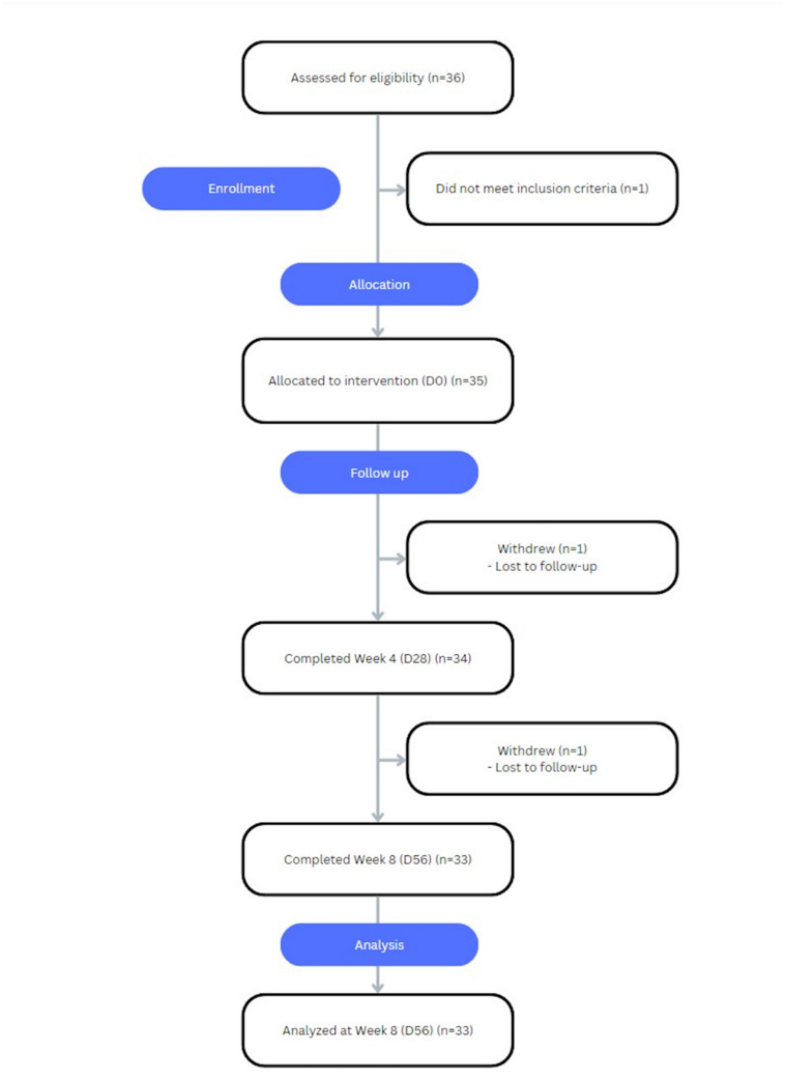

Figure 2. CONSORT (Consolidated Standards of Reporting Trials) Flow Diagram.

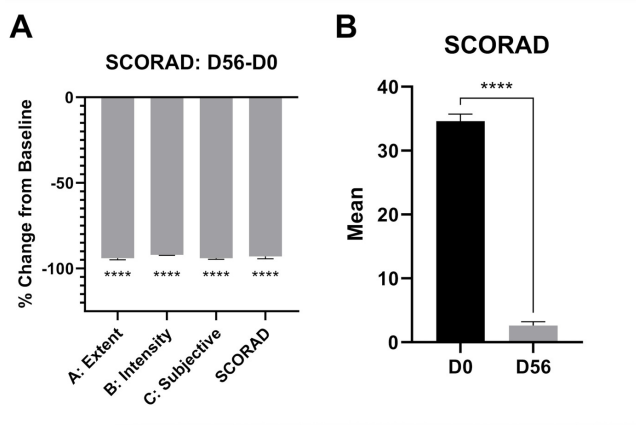

Figure 3. A) Percent change in A: Extent, B: Intensity, C: Subjective, and overall SCORAD (SCORing Atopic Dermatitis) from baseline to week 8 (D56). B) Mean SCORAD scores at D0 and D56.

**** = p < 0.0001

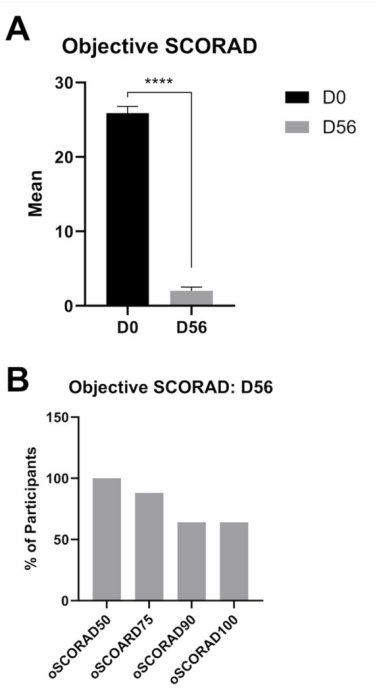

Figure 4. A) Mean objective SCORAD (oSCORAD) scores at D0 annd D56. B) Percent of participants achieving oSCORAD50 (50% reduction in oSCORAD compared to D0), oSCORAD75, oSCORAD90, and oSCORAD100 at D56.

**** = p < 0.0001

3.4. SKIN BIOPHYSICAL PARAMETERS

3.4.1. TEWL

The TEWL decreased significantly in lesional skin by 25% (p = 0.03) and 29% (p = 0.002) at D28 and D56. On non-lesional skin, TEWL increased by 8% at D28 and by 34% at D56 (p = 0.03). See Figure 6A.

3.4.2. SKIN HYDRATION

On lesional skin, the skin hydration increased significantly by 85% (p < 0.0001) and 117% (p < 0.0001) at D28 and D56, respectively. On non-lesional skin, skin hydration only increased by 9% at D28 and by 14% at D56 (p = 0.0006). See Figure 6B.

3.4.3. DESQUAMATION MEASURES

SSS (in mm^2) in lesional skin decreased significantly by 65% (p < 0.0001) and 82% (p < 0.0001) at D28 and D56. On non-lesional skin, SSS decreased by 38% at D28 and 56% (p = 0.01) at D56. See Figure 6C.

The desquamation index in lesional skin decreased significantly by 67% (p < 0.0001) and 83% (p < 0.0001) at D28 and D56. On non-lesional skin, the desquamation index decreased by 39% at D28 and 57% (p = 0.01) at D56. See Figure 6D.

3.5. POSITIVE AND NEGATIVE AFFECT SCHEDULE (PANAS)

The overall score and individual components of positive affect did not change significantly over the study. However, the overall negative affect score reduced significantly at D56 (p < 0.05). Three components of negative affect improved: scared (p < 0.02), and nervous (p = 0.001) at D56, and ashamed (p = 0.03) at D28. See Figure 7.

3.6. ADVERSE EVENTS

Five participants experienced an adverse event throughout the study. Adverse events included throat infection, headache, and toothache and all these events were self-limiting. None of these adverse events led to an interruption in study protocol or withdrawal. None of these were deemed related to the studied products.

4. DISCUSSION

The combination of an oral supplement, plant-biotech moisturizer, and unscented soap led to significant improvements in AD severity, pruritus, TEWL, skin hydration, and negative affect after 8 weeks. Skin biophysical improvements occurred as early as D28 with continued improvement to D56.

This pilot study demonstrated > 90% reduction in pruritus NRS, and > 90% subjects experienced minimal pruritus at D56. These improvements may be attributed to the anti-inflammatory effects of fucoidans from *Padina pavonica,*[26] the anti-inflammatory and emollient effect of allantoin in *Symphytum Officinale,* which has been shown to relieve eczema,[27] and the anti-inflammatory and anti-pruritic effects of avenanthramides from colloidal oatmeal in the lotion.[28]

Pruritus is a main driver for reduced quality of life in those with AD,[29] and stress is elevated in people with inflammatory dermatoses more than those with tumors.[30] Therefore, the significant improvements in negative affect

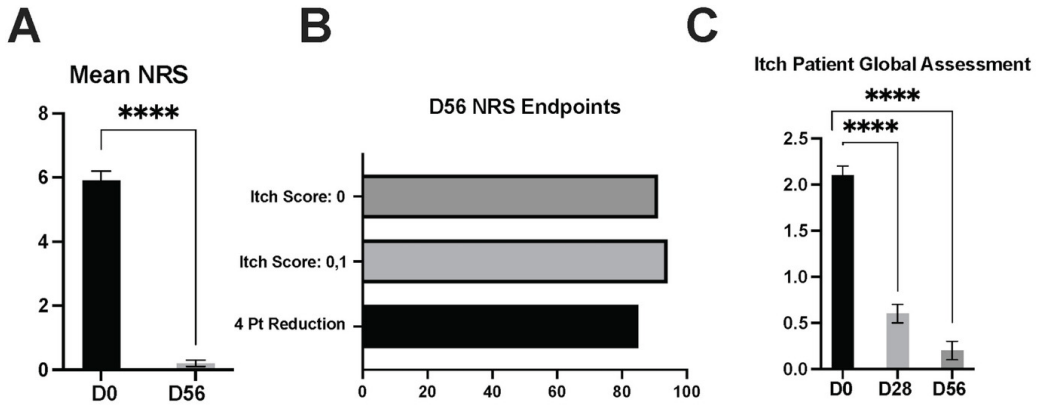

Figure 5. A) Mean itch numerical rating score (NRS) depicted at D0 and D56. B) NRS endpoints at D56 for 4-point reduction in itch NRS, an itch NRS of 0 or 1, and an itch NRS of 0. C) Subject global assessment of itch for D0, D28, and D56.

**** = $p < 0.0001$

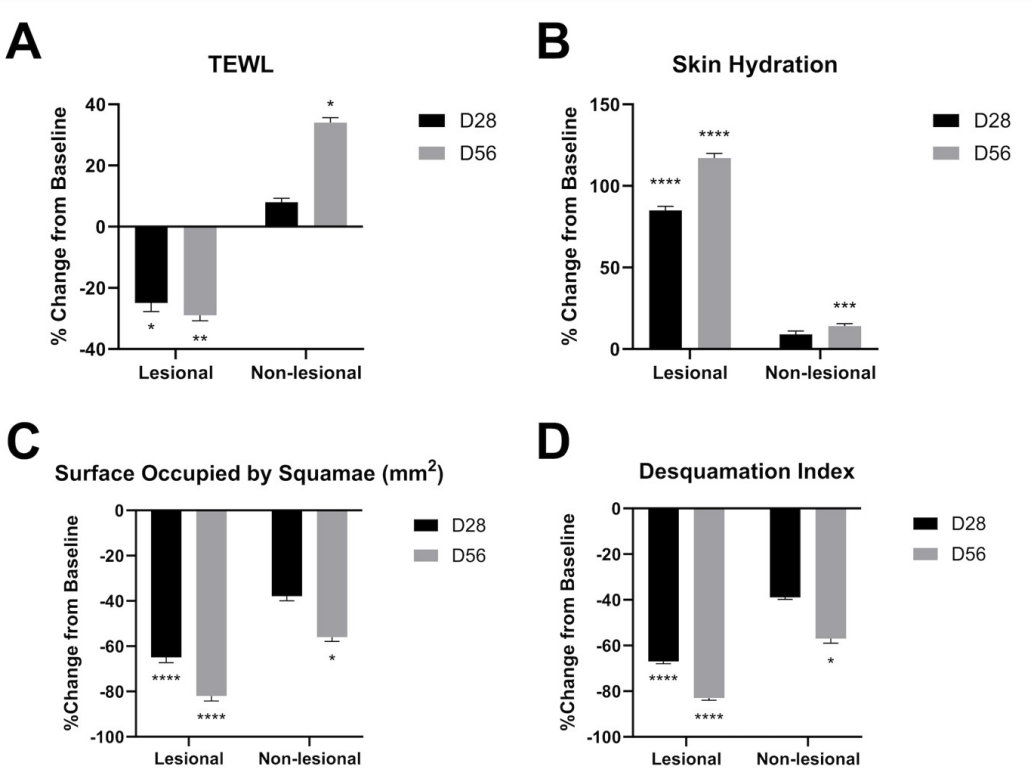

Figure 6. Percent changes from baseline (D0) to week 4 (D28) and week 8 (D56) on treated lesional and non-treated non-lesional skin for A) trans-epidermal water loss (TEWL); B) skin hydration; C) surface occupied by squamae (in mm^2); and D) desquamation index.

* = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, **** = $p < 0.0001$

demonstrated in the study may have resulted from reduced pruritus, and from reductions in the severity of AD.

Moreover, pruritus has also been positively correlated with TEWL and inversely correlated with skin hydration, so the reduction in itch may also be related to the effects of various plant-biotech actives and the L-histidine in the regimen that decrease TEWL and support hydration by strengthening the skin barrier.

For example, myconoside in *Haberlea*, a plant-biotech active in the lotion, stimulates extracellular matrix synthesis, thereby improving skin barrier cohesion, while laminarins, fucoidans, and alginic acids in *Padina pavonica* can moisturize the skin and decrease inflammation.[31,32] The lotion also included hyaluronic acid, omega-6-linoleic-acid from sunflower oil, and ceramide NP to fortify atopic skin because in AD, there is a significant decrease in ceramide

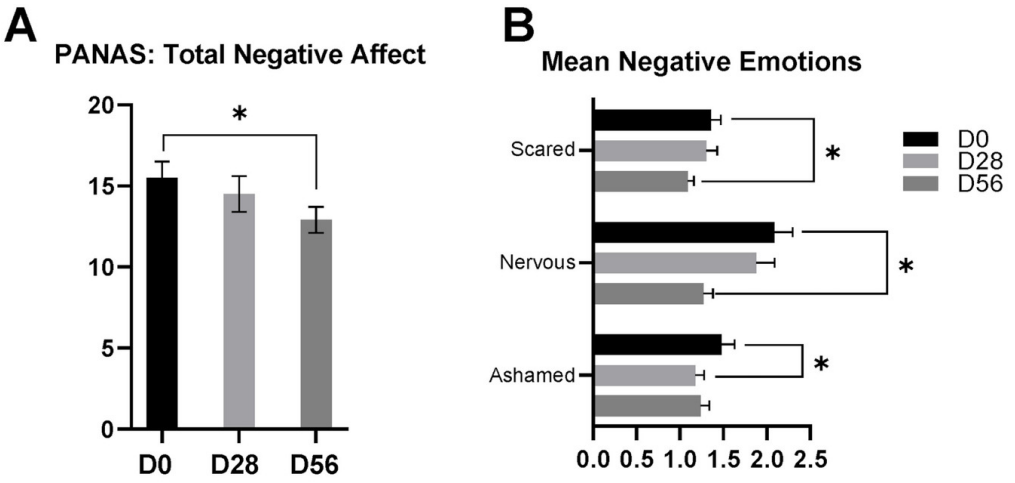

Figure 7. A) Results of Negative Affect Schedule (PANAS) tracked for negative responses at D0, D28, and D56. B) Individual responses for negative emotions with significant change.

* = $p < 0.05$

content and abnormally low levels of omega-6 fatty acids which correlate to increased TEWL.[33] Skin hydration was also supported by the high glycerin content of the soap, which serves as a humectant and may help reduce barrier impairment during washing.[34-37]

While a significant decrease in TEWL was observed in lesional skin, non-lesional skin demonstrated a significant increase in TEWL at day 56, despite significant improvements in hydration. We attribute the divergence in these TEWL results to be related to the timing of the study. The study first began during the spring season and ended in the summer—this environmental change was associated with more sweating in the participants which likely affected the accuracy of the TEWL measures during this time. Future research with more stable environmental factors over time will be needed to better understand the effect of the study products on the TEWL in lesional and non-lesional skin areas.

With regards to total SCORAD, the reductions demonstrated are also attributed to the topical ingredients highlighted and their effects in combination with daily 4 g of L-histidine in the supplement. L-histidine has been found to support filaggrin, a skin barrier protein, and in separate research with L-histidine as the main study intervention at 4 g/day in adults with mild to moderate AD, a significant reduction in SCORAD has been demonstrated by 32% in 8 weeks.[19]

We believe that efficacy has been optimized in this study to a 93% reduction in total SCORAD in 8 weeks by combining the L-histidine with a regimen that addresses the various causes and contributors to AD, including oxidative stress. Oxidative stress has been implicated in AD, and research has found that markers of oxidative stress are altered in those with AD, especially during disease exacerbation.[38,39]

Antioxidant compounds including flavonoids from *Calendula* (found in the lotion and soap), vitamin A and E from *Limnanthes alba* (found in the lotion), and beta-carotene from carrots (found in the soap) were used to counter ROS, which can impair the skin barrier.[22,40-42] In addition, the L-histidine supplement was enriched with a blend of 3 powerful antioxidant plant leaf extracts (*Buddleja globosa*, *Aristotelia chilensis,* and *Ugni molinae*) as demonstrated by the comparative analysis of their antioxidant properties and separate scientific literature.[43] For example, the leaves of *Ugni molinae,* also known as murta, have been found to contain antioxidant compounds including flavanols, myricetin, quercetin, epicatechin, and gallic acid.[44]

Emerging research also demonstrates an association between AD and gastrointestinal comorbidities such as irritable bowel syndrome,[45] inflammatory bowel disease,[46] increased intestinal permeability,[47] and gut dysbiosis.[48] Furthermore, a significant bidirectional relationship has been found between IBD and AD,[46] and research suggests that the degree of intestinal permeability may correlate to eczema severity.[49,50] Matico *(Buddleja globosa)* leaf extract is rich in stigmasterol, which has been found to help protect the gut mucosa and reduce colonic inflammation in IBD.[51, 52] While more research is needed to elucidate the relationship between intestinal barrier permeability and inflammation, and skin barrier permeability and inflammation, it is possible that compounds from the oral supplement contributed to reductions in AD through their effects on the gut-skin axis.

This study has several limitations. While this was an open-label study, which increases the potential for bias, the skin biophysical data is quantitative, making the results agnostic to the open-label status of the study and limiting observer bias. While there was no placebo or control group, each participant served as their own control for the skin biophysical measures- treated lesional skin was compared

to untreated non-lesional skin in the same subject. This makes the biophysical data less vulnerable to the lack of a control group. This study also had a relatively small sample size, with mostly female participants, so the findings are not gender-agnostic. Future studies in an expanded population with a placebo-controlled randomized double-blind design will be needed before definitive causal relationships can be established. Furthermore, the study was limited to participants with Fitzpatrick skin phototypes I to III in Poland; future research is needed to investigate the effect of these study products on Fitzpatrick types IV to VI, and to be conducted in other locations to allow for more global generalizability. A comparative study of this study regimen against corticosteroids would elucidate relative safety and efficacy for patients interested in alternative options to TCs.

This study was focused on multiple components to offer a multi-factorial approach to the treatment of AD and is not informative of singular ingredients. However, many pre-existing studies on the actives have been published, and this work builds on those previous results. Finally, this study was limited to moderate AD and no conclusions can be made about the impact of this regimen on those with mild or severe AD.

5. CONCLUSION

In conclusion, an eight-week integrative regimen including an antioxidant-enhanced L-histidine supplementation with a topical plant-biotech product and high-glycerin soap was effective in reducing AD severity, pruritus, negative affect, and improved skin biophysical properties in participants with moderate AD. Further research with larger sample sizes is needed to better understand the numerous mechanisms of the study interventions and their role in the multifactorial pathophysiology of AD. This study offers an effective regimen for moderate AD.

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None

AUTHOR DISCLOSURES

JM reports serving as a consultant for Codex Labs (stockholder). PAL reports being on the speaker's bureau for AbbVie, Arcutis, Eli Lilly, Galderma, Hyphens Pharma, Incyte, La Roche-Posay/L'Oréal, Pfizer, Pierre-Fabre Dermatologie, Regeneron/Sanofi Genzyme, Verrica; reports consulting/advisory boards for Alphyn Biologics (stock options), AbbVie, Almirall, Amyris, Arcutis, ASLAN, Bristol-Myers Squibb, Burt's Bees, Castle Biosciences, Codex Labs (stock options), Concerto Biosci (stock options), Dermavant, Eli Lilly, Galderma, Janssen, LEO Pharma, Lipidor, L'Oréal, Merck, Micreos, MyOR Diagnostics, Regeneron/Sanofi Genzyme, Sibel Health, Skinfix, Suneco Technologies (stock options), Soteri Skin (stock options), Theraplex, UCB, Unilever, Verdant Scientific (stock options), Verrica, Yobee Care (stock options). In addition, Dr. Lio has a patent pending for a Theraplex product with royalties paid and is a Board member and Scientific Advisory Committee Member emeritus of the National Eczema Association. RKS reports serving as an advisor for LearnHealth, Arbonne, and Codex Labs, and Trace Minerals and has served as a consultant or speaker for Burt's Bees, Novozymes, Almirall, Novartis, Incyte, Lilly, Sanofi, Bristol Myers Squibb, Pfizer, Nutrafol, Galderma, Abbvie, Leo, UCB, Sun, and Regeneron Pharmaceuticals.

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