

Breaking the Dry Skin Cycle – Mechanisms for Intervention using a Novel High-Efficacy Body Moisturizer

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Introduction

In separate posters, we present (a) a new cyclical model describing the induction and propagation of dry skin [the “Dry Skin Cycle”], dependent upon stratum corneum barrier integrity and (b) data demonstrating an apparent gap between the physiological and consumer-perceived needs of body skin and technologies currently offered in the personal care arena.

This poster presents the results of studies designed to assess the efficacy of an innovative new moisturiser technology to address specifically the multiple endpoints involved in “breaking” the Dry Skin Cycle, namely stratum corneum (SC) hydration, enhancing SC desquamation, augmenting SC “Natural Moisturising Factors” (NMF) and, most importantly, repairing and augmenting SC barrier function.

Methods

Primary test product (High Efficacy Body Moisturizer, “HEBM”): Oil-in-water emulsion containing a unique combination of niacinamide, glycerin, d-panthenol and commercial NMF blend.

High-efficacy commercial moisturizer controls: Where appropriate, labelled high efficacy variants of leading mass market brands of moisturizing body lotions available in US / EU were included as benchmarks. In the exfoliation study, products with labelled “exfoliation” efficacy were used.

4-Week Dry Lower Leg Study

6 products, including HEBM, were applied twice-daily for 4 weeks to sites on the outer lower legs of 36 female subjects. Product treatments and an untreated control were allocated according to a pre-determined randomization in an incomplete Latin square design. Additionally, at the end of the treatment phase, areas within the treated sites were “challenged” by patching with 0.5% SLS. Barrier function was assessed by measuring Trans-Epidermal Water Loss (TEWL) via evaporimetry.

Exfoliation Study using “FLX”

The volar forearm skin of 48 female subjects was patched with 5.0% dansyl chloride to achieve full-thickness SC staining within pre-determined treatment sites. 7 products including HEBM were then applied twice-daily in a randomized incomplete Latin square design for 5 days to stained sites. Fluorescence was measured daily using a custom “Fluorescence Light Examiner” (FLX), a sensitive remittance fluorimeter. Fluorescence values were used to calculate the first order decay kinetics of dansyl chloride washout (providing an index of SC exfoliation rate).

NMF (free SC amino acids) Study

Free amino acids were sampled and determined from sites within the volar forearms of 22 female subjects. Subjects then washed their forearms for 7 days with a bar soap and water, after which the sites were sampled again. HEBM was then applied to one randomized forearm only, twice-daily for 7 days. Sites were then re-sampled 24h after the last application of HEBM and free amino acid content determined again.

Results

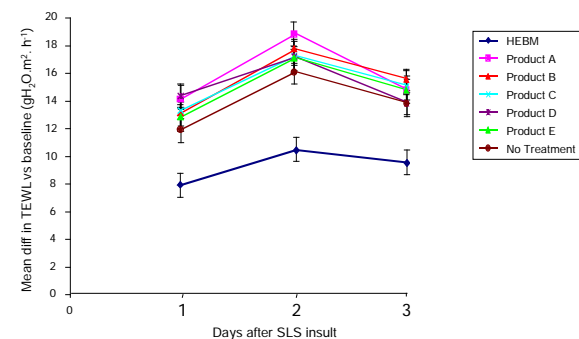


Figure 1: Change in TEWL in post-treatment phase after SLS insult (expressed as difference to pre-treatment baseline)

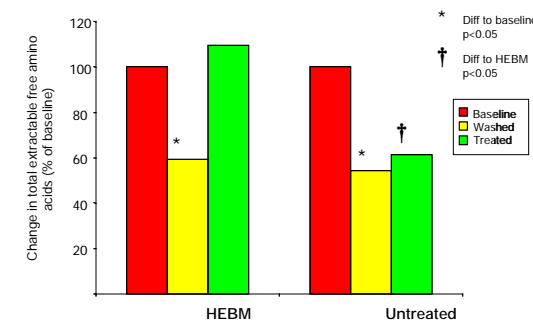


Figure 2: Effect of 1 week of washing and subsequent week of treatment with HEBM on total SC free amino acid content: HEBM treatment restored depleted free aa to a significantly (p<0.05) greater extent than untreated

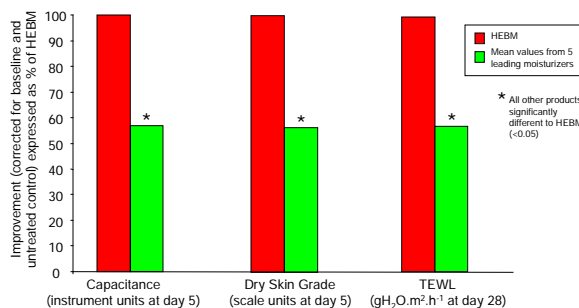


Figure 3: Improvement in SC hydration (capacitance), appearance (expert visual dry skin grade) and barrier function (TEWL); results corrected for pre-treatment baseline and untreated control and expressed as a % of HEBM (mean results taken from 5 leading moisturizers)

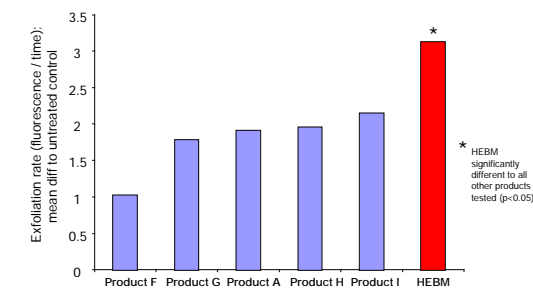


Figure 4: Exfoliation rate (fluorescence value measured by FLX / time) of HEBM vs other leading moisturizers claiming exfoliation benefits

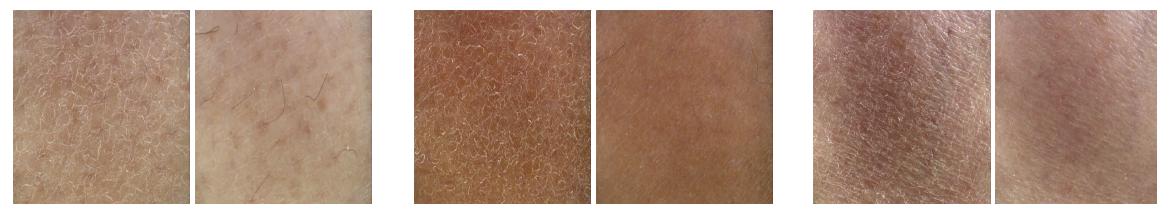


Figure 5: Representative visible light macrograph pairs (approx 10x) of lower leg skin before treatment (left images) and corresponding macrographs after 3 weeks treatment with HEBM (right images)

Conclusions

A cyclical model of dry skin has been proposed in which stratum corneum (SC) barrier function and integrity is pivotal at every step. To truly impact this self-perpetuating degenerative process, therefore, an intervention is required that targets the barrier itself, not merely dry skin symptoms.

There is general agreement that the most convenient and reliable measure of SC barrier function is an assay of Trans-Epidermal Water Loss (TEWL; Loden, 2003). A robust protocol for assessing true barrier function is to use a challenge “probe” (such as SLS), accompanied by a TEWL measure, to assess the inherent ability of the barrier to withstand exogenous insult (Loden & Lindberg, 1994).

In the long-term clinical study presented, treatment with HEBM gave significant reductions in basal TEWL throughout the treatment and post-treatment phases, relative to both no-treatment controls and all other products tested. To address the critical insight above, however, challenge testing was also performed at the end of the treatment phase, using classic chemical insult (SLS). Whilst all other products tested provided no apparent effect on the ability of the barrier to withstand SLS challenge in this study, HEBM drove a significant reduction in TEWL relative to no-treatment control and all other products tested, at all time-points shown after the insult.

Importantly, HEBM was also able to restore SC NMF components lost as a result of daily cleansing. These filaggrin breakdown products play a crucial role in maintaining SC flexibility and plasticity – another central prerequisite of proper barrier function.

Whilst barrier augmentation and repair is the primary target in breaking the dry skin cycle, other targets present themselves, such as the characteristic impairment of desquamatory enzyme activity and stratum corneum exfoliation. Effect on SC exfoliation rate was measured using an improvement of the dansyl chloride staining technique, and it was found that HEBM provided a significant increase in this rate vs both no-treatment control and all other high-efficacy moisturizers tested.

Lastly, HEBM delivered excellent efficacy against SC hydration and visual dry skin grade endpoints, significantly greater than both untreated control and all other high-efficacy moisturizers tested.

In conclusion, therefore, the unique formulation and combination of materials in the HEBM moisturiser technology drives a significant, fundamental repair and augmentation of basal SC barrier, with accompanying benefits. It is this ability that allows it to break the “Dry Skin Cycle” to bring outstanding relief to this universal consumer skin condition.

References

- Loden, M., Role of topical emollients and moisturizers in the treatment of dry skin barrier disorders, *Am J Clin Dermatol*, 4(11):771-88, 2003
- Loden, M & Lindberg, M., in, “Bioengineering of the skin: water and the stratum corneum”, eds., Elsner, P., Beradesca, E. and Maibach, H.I., CRC Press, 275-289, 1994