Evaluation of the Soothing Effects of E3 Topical Cream (ExoBlue™) in an SDS-Induced Irritation Model Using Reconstructed Full-Thickness Human Skin

SUMMARY: A topical formulation containing estriol (E3) 0.3% in ExoBlue was evaluated for its soothing effects using an SDS-induced irritation model in reconstructed full-thickness human skin. Histological analysis showed that treatment improved tissue morphology and restored epidermal integrity compared to irritated tissues. Additionally, IL-1α levels were reduced by 81%, demonstrating strong anti-inflammatory and soothing effects.

Introduction:

PCCA ExoBlue is a new, advanced dermatological base that combines exosomal signalling with precision peptide delivery and synergistic metal cofactors. This innovative blend includes *Centella asiatica* leaf extract exosomes, copper tripeptide-1, acetyl hexapeptide-8 and zinc hydrolyzed hyaluronate which work synergistically to enhance cellular communication, promote dermal remodelling, improve hydration and strengthen skin barrier function, offering a comprehensive approach to optimal skin performance beyond conventional topical products. Given these properties, a topical formulation including estriol (E3) 0.3% in ExoBlue (PCCA Formula #15843) was selected to assess its soothing effects on irritated skin and its ability to promote skin recovery.

Methodology:

The topical formulation was evaluated using a reconstructed full-thickness human skin model (EpiDerm™ FT) subjected to sodium dodecyl sulfate (SDS)-induced irritation. SDS is a widely known surfactant that disrupts skin barrier integrity by affecting lipids and proteins, leading to increased permeability and irritation characterized by dryness, erythema, scaling and inflammation, with effects increasing in a dose-dependent manner.

The skin tissues (EFT-400, MatTek) were divided into three groups, as follows: negative control tissues treated with 25 µL of Hanks' Balanced Salt Solution (HBSS); positive control (irritation) tissues treated with 25 µL of 0.2% SDS (L3771, Millipore Sigma); and treatment (test) tissues receiving a combination of 12.5 µL of 0.4% SDS and 12.5 µL of E3 0.3% in ExoBlue. Testing was done in duplicate, two tissues for each group. All tissues were incubated for 24 hours at 37°C in a humidified atmosphere containing 5% CO_2.

Following incubation, culture media were collected for quantification of the pro-inflammatory cytokine interleukin-1 alpha (IL-1α) using an ELISA assay kit (BMS243-2, ThermoFisher Scientific). In parallel, tissues were fixed, embedded, sectioned and stained with hematoxylin and eosin (H&E) to evaluate epidermal morphology, with emphasis on the integrity of the stratum corneum and viable cell layers.

Results and Discussion:

The histological evaluation (H&E staining) revealed distinct differences among the three groups of skin tissues, as shown in Figure 1. The negative control tissues (A) displayed normal architecture, characterized by a compact and intact stratum corneum. In contrast, tissues exposed to SDS (positive control) (B) showed clear signs of damage, including a loosened stratum corneum, disruption of viable epidermal layers and the presence of vacuoles, confirming the expected irritation. On the other hand, SDS-induced irritation and treatment with E3 0.3% in ExoBlue Cream (test tissues) (C) resulted in a marked improvement in tissue morphology, with restoration of epidermal structure and overall integrity.

These structural observations were supported by cytokine analysis (Figure 2). SDS exposure led to a significant increase in IL-1α secretion, indicating a strong inflammatory response. In contrast, tissues treated with the ExoBlue formulation showed a substantial reduction in IL-1α levels, with an 81% decrease compared to the irritation group. This finding demonstrates the formulation's pronounced anti-inflammatory and soothing effects. Together, these findings demonstrate that the ExoBlue formulation provides both protective and restorative benefits, addressing acute inflammation while promoting longer-term skin repair.

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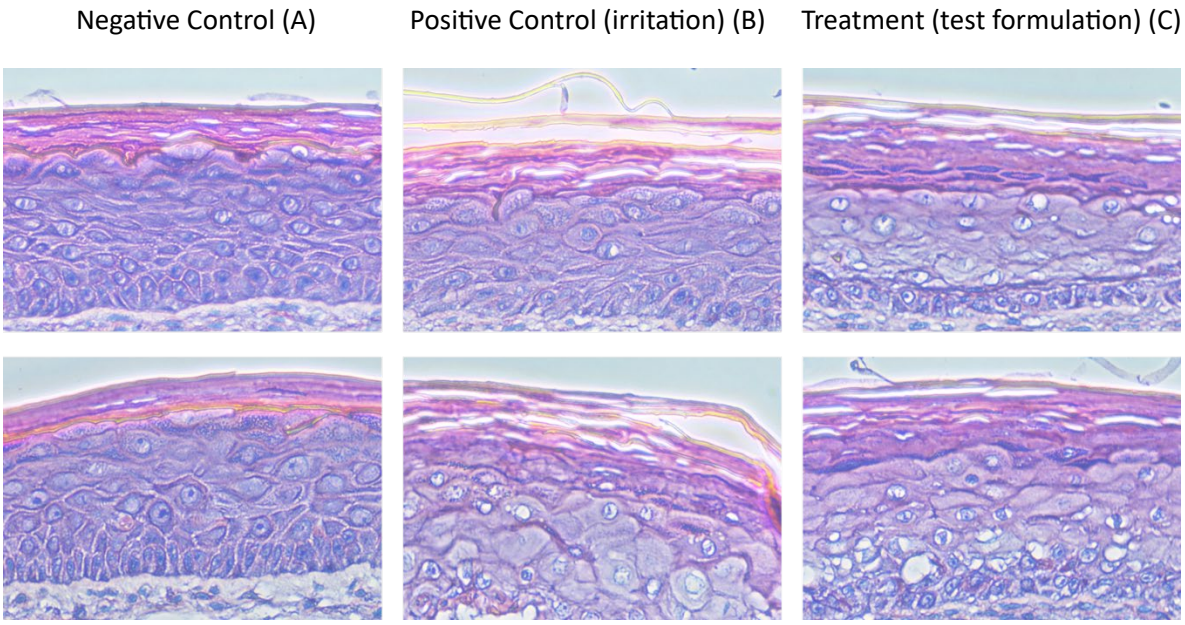

Figure 1. H&E-stained skin tissues (A, B, C) following SDS-induced damage (B,C) and treatment with E3 in ExoBlue Cream (C).

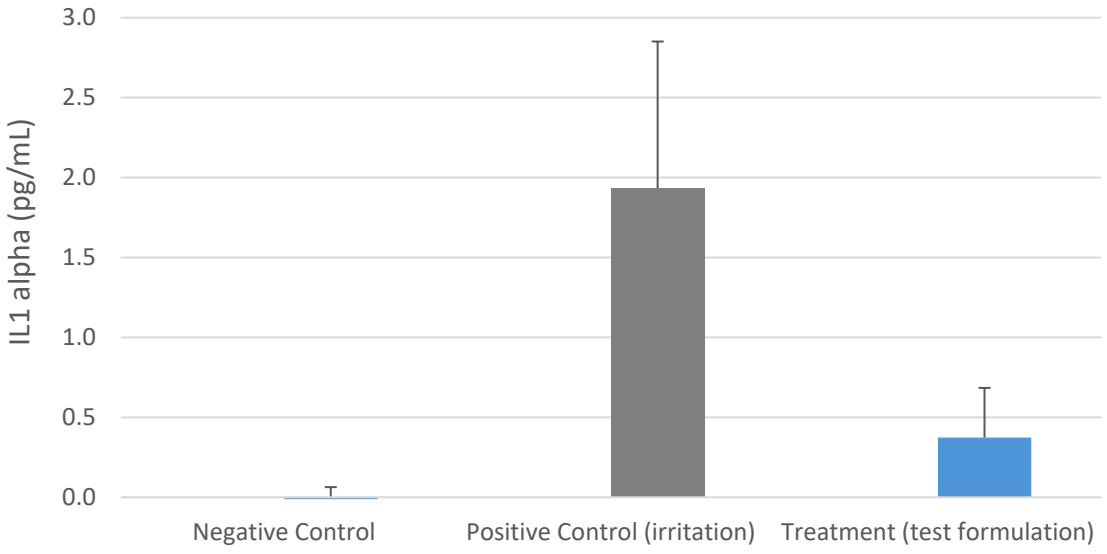

Figure 2. Quantification of the pro-inflammatory cytokine IL-1α across the three groups of skin tissues.