

LIPEX[®] PreAct[™]: Effect of Topically Applied Lipids on Surfactant Irritated Skin

ABSTRACT

This in-vivo study investigated the protective effect of four different topical lipids on human skin irritated by sodium lauryl sulfate (SLS). Twenty one healthy volunteers received controlled SLS exposure on the volar forearm followed by treatment with hydrocortisone (H), petrolatum (P) as benchmarks and borage oil (BO), sunflower oil (SO), standard refined canola oil (CO), and LIPEX[®] PreAct[™] as lipid oils. Water (W) served as the control.

The endpoints included visual irritation scoring, transepidermal water loss (TEWL) and superficial skin blood flow. On normal skin, none of the lipids induced significant effects. On SLS irritated skin, hydrocortisone and LIPEX[®] PreAct[™] significantly reduced TEWL and blood flow, while visible irritation was markedly lower. Canola oil itself also reduced TEWL. Other lipids — borage oil, sunflower, and petrolatum — did not significantly influence irritation.

The findings indicate that certain lipids, particularly sterol rich fractions from canola oil, can support the skin in restoring barrier function after surfactant induced damage.

INTRODUCTION

Barrier Lipids and Irritation

The epidermal barrier depends on its intercellular lipid matrix (comprising ceramides, cholesterol, and free fatty acids) to maintain integrity and hydration. Lipid disruption from detergents such as SLS leads to impaired barrier function, increased TEWL, inflammation, and visible erythema. Restoring adequate lipids is therefore essential for recovering normal barrier function.

Topically Applied Lipids

Previous research has demonstrated that certain lipids, such as sunflower oil, can correct essential fatty acid deficiency, while petrolatum reduces TEWL by forming an occlusive phase. γ linolenic acid-rich oils (e.g., borage oil) have been explored for anti inflammatory properties. Unsaponifiable fractions, rich in sterols, have also been suggested to exhibit barrier supportive and anti inflammatory effects.

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Rationale

Because SLS removes stratum corneum sterols and fatty acids, and barrier disruption triggers increased endogenous sterol synthesis, supplementing the skin with sterol rich lipid fractions may support barrier repair. This study therefore evaluates whether different lipids influence irritation severity after controlled SLS agitation

LIPEX® PreAct™

LIPEX® PreAct™ (INCI: Canola oil) is a vegetable oil-based emollient with a high content of natural tocopherols (800-1300 ppm) and a fatty acid composition which is stable against oxidation. It is ideally suited for applications where a natural-based stable emollient is required, such as in body lotions and facial care products. The high concentration of Vitamin E makes it a candidate to be used in formulations where an added protection against UV induced skin damage is desired.

STUDY OBJECTIVES

A controlled comparative study to evaluate whether topically applied lipids can reduce visible irritation, transepidermal water loss, and superficial skin blood flow on SLS irritated human skin, relative to a water control.

EXPERIMENTAL

Testing Procedure

The experimental procedure involved twenty-one healthy volunteers ranging in age from 22 to 57 years, all with no visible skin disease. For the normal-skin test, test materials were applied to the right forearm of each participant using patch chambers and left in place for 48 hours.

To assess irritated skin, the left forearms were treated with a 14% solution of sodium lauryl sulphate for seven hours, after which the area was rinsed and allowed to dry. Following this, each test substance was applied to the treated area for 17 hours in randomized patch chambers.

Assessments were carried out 24 hours after removing the substances and included measurement of transepidermal water loss using an evaporimeter, evaluation of skin blood flow by laser Doppler flowmetry, and visual irritation scoring according to the following scale:

0 = no reaction

0.5 = barely perceptible very weak spotty erythema

1 = slight erythema, either spotty or diffuse

2 = moderate erythema

3 = intense erythema, infiltration, possible vesicles

Tested Materials

- Hydrocortisone
- Petrolatum
- Borage Oil
- Sunflower Oil
- Standard Refined Canola Oil
- LIPEX® PreAct™
- Water

All materials were used as pure substances.

RESULTS

General Observations

On normal skin, none of the applied lipids produced meaningful irritation. Only minor, transient erythema appeared in a few subjects after exposure to water, petrolatum, or sunflower oil. Hydrocortisone caused temporary blanching immediately after patch removal, but no lasting effect was visible at the 24 hour evaluation.

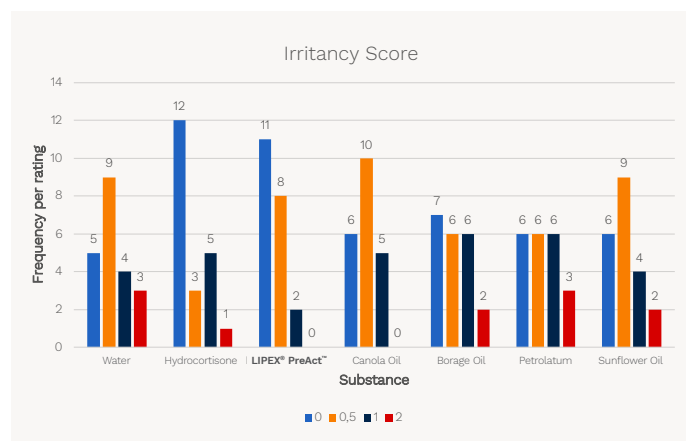
In contrast, when applied to SLS irritated skin, clear differences emerged between treatments, seen both instrumentally (TEWL and skin blood flow) and through clinical scoring.

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Clinical Irritation Scores

Product / Score	0	0.5	1	2	3
Water	5	9	4	3	0
Hydrocortisone	12	3	5	1	0
LIPEX® PreAct™ *	11	8	2	0	0
Canola oil	6	10	5	0	0
Borage oil	7	6	6	2	0
Petrolatum	6	6	6	3	0
Sunflower oil	6	9	4	2	0

* Significantly different from water.



Visual assessments conducted 24 hours after treatment confirmed the instrumental data:

- Hydrocortisone and LIPEX® PreAct™ produced the lowest irritation scores, with most assessments falling in the 0 or 0.5 categories and none reaching scores 3.
- Canola oil also shifted reactions toward lower irritation categories, though less consistently.
- All other lipids — borage oil, sunflower oil, and petrolatum — showed irritation patterns similar to the water control.

Overall, LIPEX® PreAct™ was the only lipid treatment that consistently and significantly improved irritation outcomes across TEWL, blood flow measurements, and clinical scoring.

Barrier Function

SLS exposure markedly increased transepidermal water loss in the control (water treated) sites. [See table below.](#)

Several lipid treatments reduced TEWL to varying degrees:

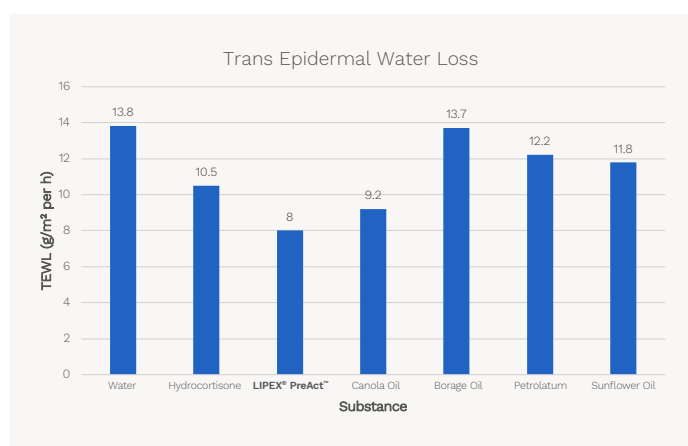
- Hydrocortisone, canola oil, and LIPEX® PreAct™ each produced a statistically significant reduction in TEWL compared with water.
- LIPEX® PreAct™ showed the strongest effect, lowering TEWL to levels approaching those of hydrocortisone.
- Borage oil, sunflower oil, and petrolatum did not significantly change TEWL values compared with water.

Substance	TEWL (g/m ² per h)	P value	Significance	Skin blood flow (AU)	P value	Significance
Water	13.8 (8.6–21.5)	—	—	30.1 (16.3–50.0)	—	—
Hydrocortisone	10.5 (8.6–13.6)	0.0003	S	14.2 (11.6–18.7)	0.0031	S
LIPEX® PreAct™	8.0 (6.9–12.1)	0.0003	S	15.0 (11.7–19.4)	0.0004	S
Canola oil	9.2 (8.3–16.3)	0.0054	S	21.8 (7.1–34.9)	0.0560	NS
Borage oil	13.7 (9.9–17.0)	0.8212	NS	20.2 (15.9–30.2)	0.6142	NS
Petrolatum	12.2 (10.1–18.7)	0.9307	NS	25.1 (17.0–42.7)	0.8620	NS
Sunflower oil	11.8 (7.8–18.3)	0.0476	NS	19.0 (16.0–38.4)	0.0250	NS

NS = not significant; S = significant

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This indicates that only specific lipid compositions — particularly those rich in sterols — improve barrier recovery after surfactant damage.



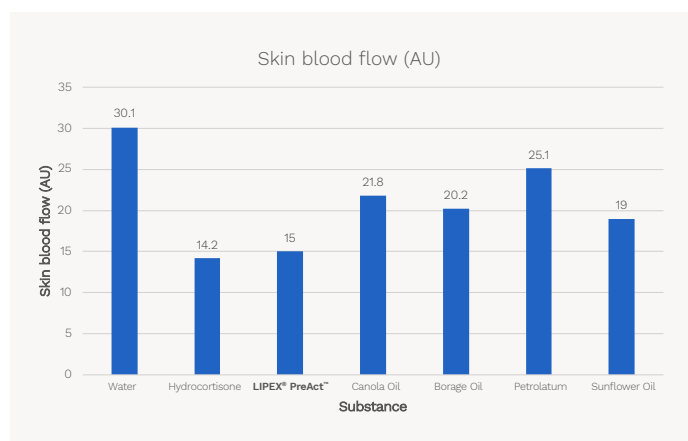
Inflammation (Skin Blood Flow)

Laser Doppler measurements revealed elevated blood flow at the irritated control sites. Only two treatments significantly reduced this inflammatory response:

- Hydrocortisone
- LIPEX® PreAct™

Canola oil showed a trend toward reduced blood flow, but the change was not statistically significant. All other lipid treatments performed similarly to water.

These results align closely with the TEWL findings, reinforcing that the sterol rich canola fraction exerts a measurable anti inflammatory effect.



DISCUSSION

Sterol-rich Fractions Promote Recovery

Exposure to SLS strips cholesterol, fatty acids, and sphingolipids from the stratum corneum, disrupting the skin's protective barrier. Restoring this barrier depends on the renewed synthesis of these key components. The sterol-enriched fraction of canola oil appears to support this repair process by providing essential sterols needed for rebuilding the membrane bilayer.

Why Other Lipids Did Not Perform

Although borage oil, and sunflower oil are recognized for their biological benefits in other settings, they did not alleviate SLS-induced irritation in this study. This may be because their lipid profiles do not match the skin's immediate needs for effective barrier repair following surfactant exposure.

Hydrocortisone Comparison

Hydrocortisone was used as a reference for pharmacological efficacy. Notably, LIPEX® PreAct™ demonstrated results close to hydrocortisone in reducing blood flow, lowering TEWL, and improving visible irritation. These findings suggest that LIPEX® PreAct™'s effects go beyond simple occlusion, highlighting its biological relevance in skin recovery.

CONCLUSION

This study demonstrates that canola oil and especially its sterol enriched unsaponifiable fraction, LIPEX® PreAct™, significantly reduce irritation, TEWL, and blood flow after SLS induced barrier damage. These lipids likely support the replenishment of sterols removed by surfactant exposure, assisting the skin's natural repair processes.

Other commonly used lipids—including borage oil, sunflower oil, and petrolatum—did not meaningfully impact irritation under these experimental conditions.

Targeted lipid supplementation, particularly with sterol rich fractions, may offer a meaningful strategy for mitigating surfactant induced skin irritation.