# PALM-BASED PRESERVATIVE IN COSMETIC AND PERSONAL CARE PRODUCTS

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472

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The use of good and effective preservatives in cosmetic and personal care products can ensure that the products will be free from contamination, and thus will have increased shelf-life. A good preservation system also protects the consumer from contaminants when using the products. Currently, almost all products in the market contain synthetic preservatives like phenonip, kahton CG, euxyl K400, germaben and dowicil 200. Monolaurin is a derivative of a palm-based fatty acid which is also used as a natural preservative in the food and cosmetic industries (*Figure 1*). Monolaurin is recognized as a GRAS (generally regarded as safe) food emulsifier and has no toxicity towards humans. It is effective against Gram positive bacteria, fungi, yeasts and certain viruses, but not against Gram negative bacteria. Its antimicrobial property has been further studied in the laboratory, and, in order to reinforce this property, phenonip (a synthetic preservative) has been added to the formulation.


*Figure 1. Monolaurin-phenonip preservative blends in oil-in-water cosmetics.*

Phenonip is included in the EU Cosmetic Directives Annex VI list of permitted preservatives. Phenonip is also permitted for use in the USA and Japan. It is biodegradable at low concentrations and is non-volatile; thus, there is no loss of this preservative even with prolonged storage. It has an excellent toxicological profile and it is non-irritant to the skin, eyes and mucous membranes when used under normal concentrations. However, when used at high concentrations it will cause irritancy and skin allergies, and there has been some reports that it may cause breast cancer (Darbre *et al.*, 2004). However, these reports have yet to be further confirmed. Phenonip is normally used at 0.75% concentration in cosmetic formulations and is effective at pH ranging from 3 to 8.

Based on our studies, blending monolaurin with phenonip as a preservative system for cosmetic and personal care products can hopefully decrease the negative effects of synthetic preservatives on consumers.

## MODE OF ACTION

It is suspected that monolaurin acts on the cell membrane and inhibits either of the two membrane-related processes involved in exotoxin production, namely signal transduction and secretion.

## MONOLAURIN IN THE COSMETIC FORMULATIONS

A minimal inhibitory concentration test was done in order to screen the synergism effect of the monolaurin-phenonip blend towards Gram positive and Gram negative bacteria (*Figure 2*). The effective concentration was then incorporated into the cosmetic formulations to undergo the microbial challenged test (MCT) in comparison with the commercial products which use 100% synthetic preservatives.

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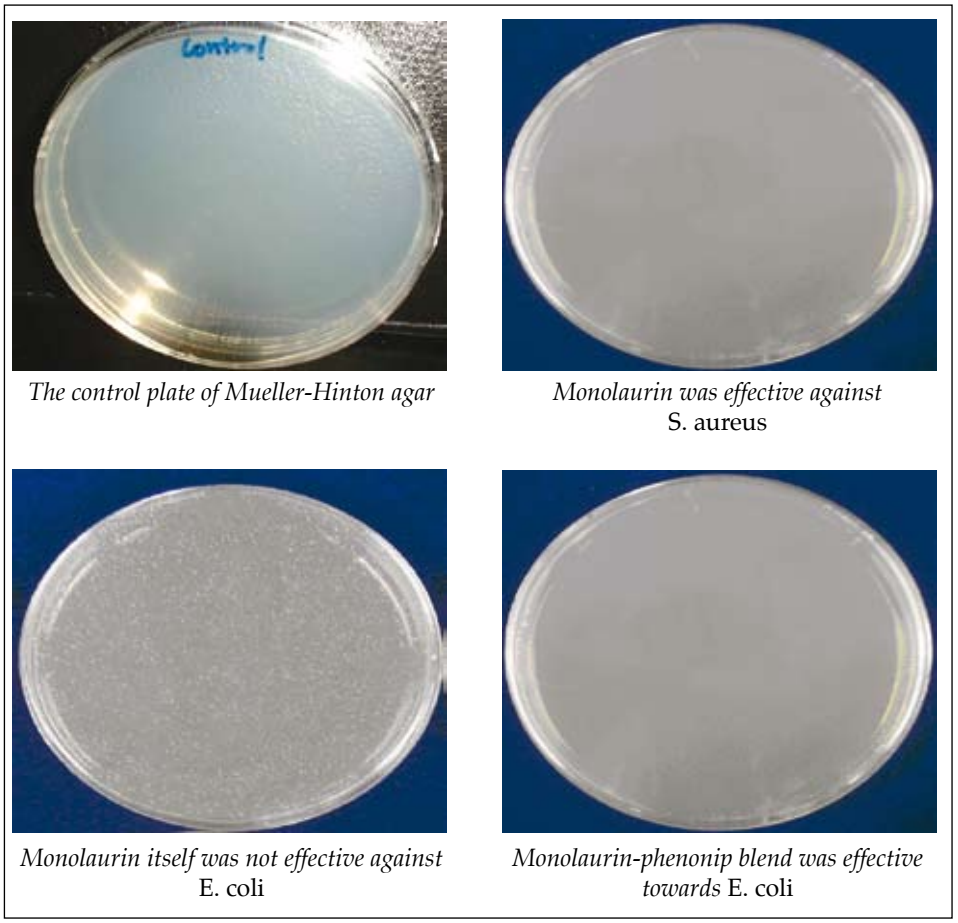


*The control plate of Mueller-Hinton agar*

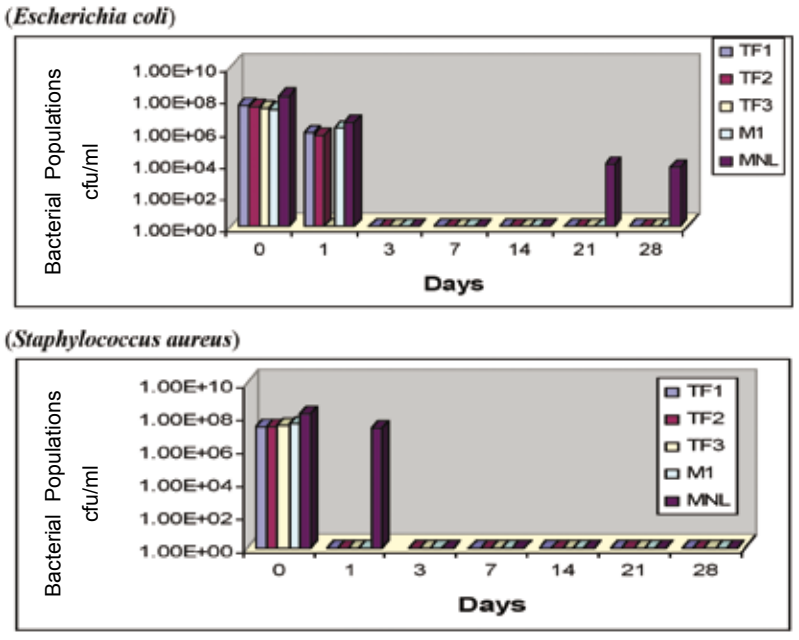
*Monolaurin was effective against* S. aureus

*Monolaurin itself was not effective against* E. coli

*Monolaurin-phenonip blend was effective towards* E. coli

*Figure 2. Results of the microbial challenged tests.*

Two formulations of oil-in-water (o/w) creams containing the monolaurin and phenonip blends, namely TF1 and TF2, were made. Formulation TF3 used phenonip (0.75%) as the preservative while M1 was the commercial formulation which used phenonip as its preservative. The TF1, TF2, TF3 and M1 formulations passed the criteria of MCT, showing reductions in bacterial population by 99.9% within seven days (*Figure 3*). The formulation with monolaurin (MNL) as preservative showed only a slight reduction in bacterial population when challenged with *E. coli* at day 21 and day 28.




**Preservatives tested:**

| | | |
|---|---|---|
| TF1 and TF2 | : | monolaurin-phenonip blends at different concentrations |
| TF3 | : | phenonip at 0.75% |
| M1 | : | commercial product using phenonip as preservative |
| MNL | : | oil-in-water cream formulation using monolaurin as preservative |

*Figure 3. Microbial challenged test on monolaurin-phenonip blends, commercial preservatives and monolaurin as preservatives in a cosmetic formulation against* E. coli *and* S. aureus.

## EFFICACY TEST

The efficacy tests on monolaurin-phenonip blends in the formulations TF1, TF2, TF3, M1 and MNL were carried out in order to observe the dermal and ocular irritancy potential of the blends in the formulations. The monolaurin-phenonip blend formulations showed non-irritancy in the dermal irritancy test and minimal irritancy potential in the ocular irritancy test (*Figures 4* and *5*).

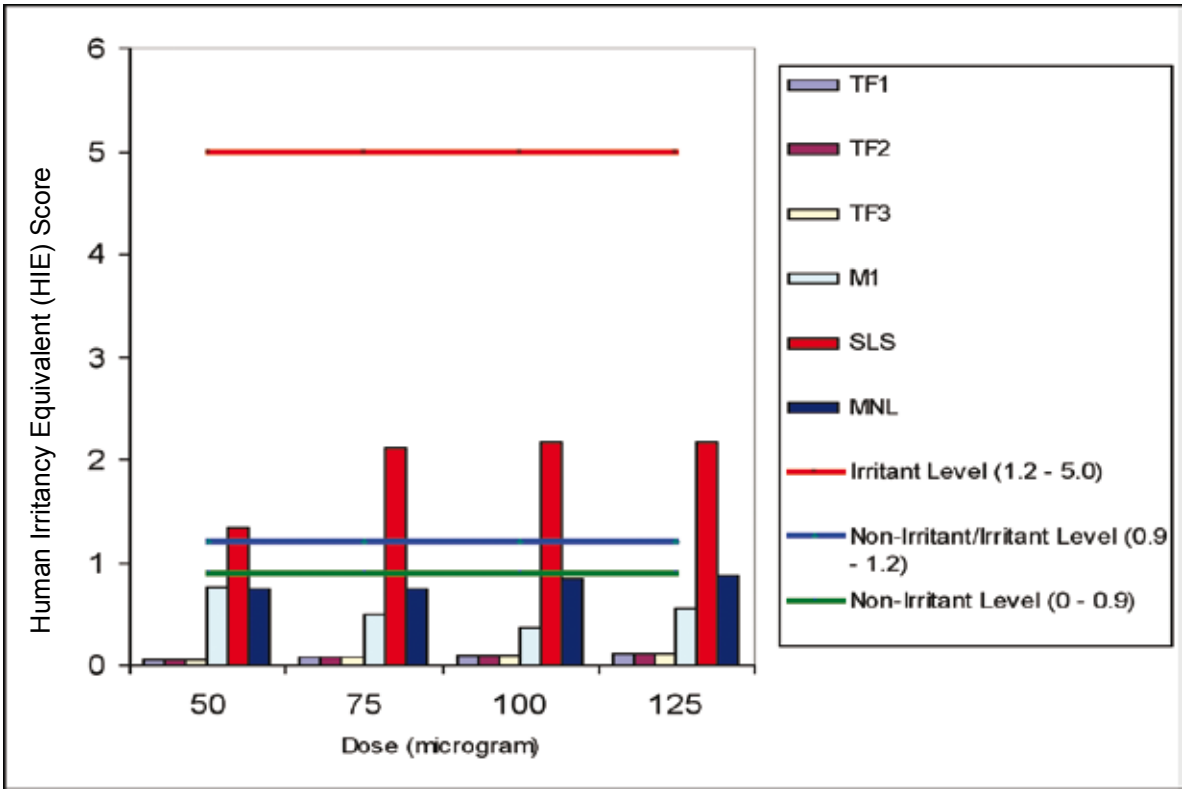



*Figure 4. Dermal irritancy test.*

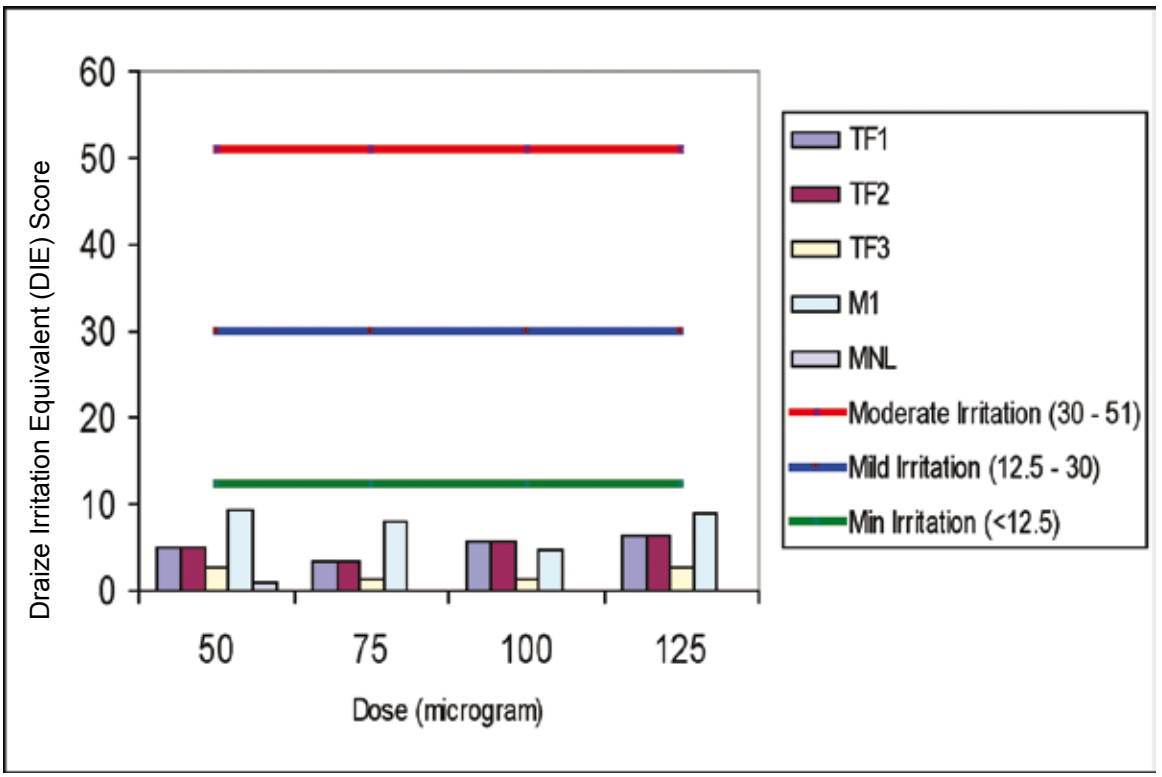



*Figure 5. Ocular irritancy test.*

## ECONOMIC ANALYSIS

Payback period : 4 years
Return on investment (ROI) : 25%

## CONCLUSION

The monolaurin-phenonip blends were found to be capable of preserving the o/w cosmetic products. Its incorporation can help reduce the amount of synthetic preservatives currently used in o/w cosmetic and personal care products. All formulations developed with the monolaurin-phenonip blends were non-irritant to dermal and ocular membranes.

## REFERENCE

DARBE, P D; ALIARRAH, A; MILLER, W R; COLDHAM, N G; SAUER, M J and POPE, G S (2004) Concentrations of parabens in human breast tumours. *J. Applied Toxicology, 24:*1, 5-13.

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