TOCOGELS AS ANTI-INFLAMMATORY AGENTS

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Palm vitamin E is a tocotrienol-rich product. In cosmetic applications and in the treatment of cutaneous diseases, vitamin E helps to reduce the amount of water lost from the skin's surface, and to reduce the formation of free radicals following skin exposure to ultra violet A (UVA) rays and to other skin stresses (Nachbar and Korting, 1995). In our study, palm vitamin E was incorporated into TOCOGel formulations to reduce skin inflammation and irritation, and to reduce the amount of water loss from the skin.

TOCOGELS WITH PALM VITAMIN E

Palm vitamin E (*i.e.* Tocomin and Gold Tri-E) from two different sources was incorporated into the TOCOGel formulations. Tocomin was obtained from Carotech Sdn Bhd while Gold Tri-E was obtained from Sime Darby Bioganics Sdn Bhd. TOCOGels have pH ranging from 6.5 to 7.0. TOCOGel with Tocomin is deep orange in colour due to the presence of carotenoids in Tocomin (*Figure 1*), while TOCOGel with Gold Tri-E is yellowish.

SAFETY EVALUATION

In Vitro Dermal and Ocular Irritection Assay

TOCOGels with palm vitamin E were evaluated by the dermal and ocular irritection assay system that predicts their potential in causing dermal and ocular irritation. The results were compared against the reactions obtained from sodium lauryl sulphate (SLS), which is a known skin irritant, and a commercial product. The dermal irritection assay results indicate that TOCOGels may be classified as non-irritants (*Figure 2*). The ocular irritection assay results showed TOCOGels had minimal potential to cause ocular irritation (*Figure 3*).

Figure 1. TOCOGel with palm vitamin E.

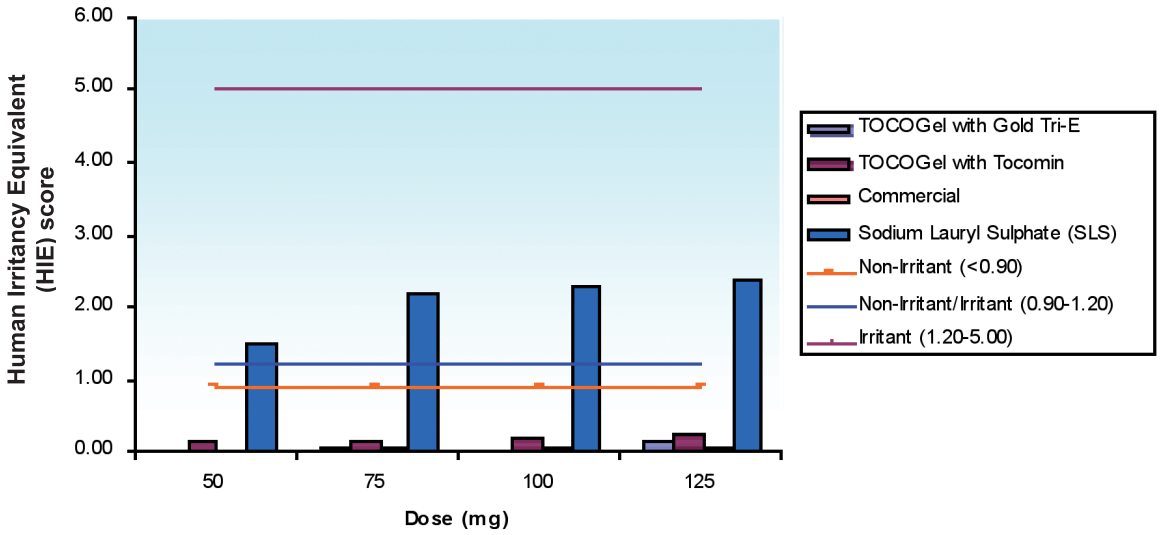

Figure 2. In vitro *dermal irritection assay of TOCOGels with palm vitamin E, a commercial product and SLS.*

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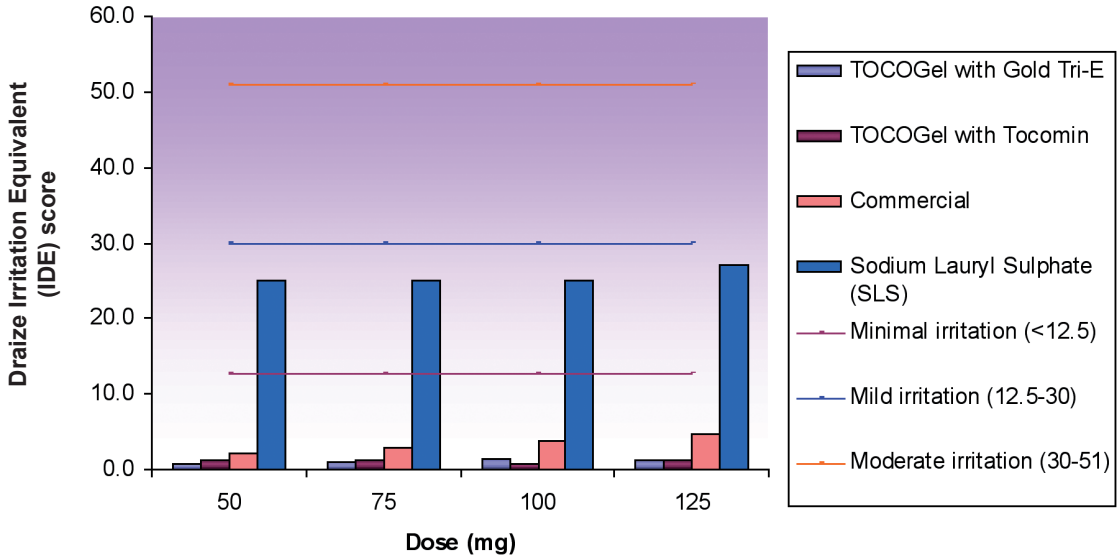

Figure 3. In vitro *ocular irritection assay of TOCOGels with palm vitamin E, a commercial product and SLS.*

Patch Test

A total of 20 volunteers, comprising seven males and 13 females, aged between 21 and 42 years (average age: 33.0 years), with good health and free from skin diseases, participated in the patch test study. TOCOGels with different sources of palm vitamin E were patched for 48 hr on the back of each volunteer, and clinical evaluation was done after patch removal. Based on the results obtained by clinical observations, the occlusive application of the products for 48 hr on the 20 healthy volunteers with an empty Finn Chamber as the control did not induce any irritative or allergic reactions related to the presence/activity of common allergens.

Human Repeated Insult Patch Test (HRIPT)

A total of 25 volunteers, comprising 10 males and 15 females, participated in the human repeated insult patch test (HRIPT). The objective of this study was to determine the incidence and seve-rity of cumulative irritation and allergic contact dermatitis by the use of predictive patch test techniques. TOCOGels with different sources of palm vitamin E were applied daily over 21 days. This was followed by a rest period of two weeks, and then followed by a challenge with the test material at the naïve patch test site. Any reactions were then recorded at 48 hr and 96 hr post-application. The results obtained by clinical observations showed that the products fall under Category 1, which is probably mild with normal use, and may not induce significant skin irritations or sensitisation according to the classification of observed responses based on the work by Berger and Bowman (1982).

EFFICACY EVALUATION

Skin Barrier Recovery after Sodium Lauryl Sulphate (SLS) Application

A skin barrier recovery study after exposure to sodium lauryl sulphate (SLS) application was carried out on 20 volunteers. The objective of the study was to evaluate the potential of TOCOGels with palm vitamin E for repairing the barrier function in SLS-treated human skin in comparison to a placebo and a commercial product. Disruption of the skin barrier at five different sites on the upper forearm of each volunteer was induced by applying 1% SLS solution in occlusive patch test chambers for 24 hr. Four of the SLS-treated areas were then applied with TOCOGel Gold Tri-E, TOCOGel Tocomin, a gel placebo and a commercial product, respectively. The remaining area was left treated with SLS only. A control which was an untreated area was also monitored. Measurements of transepidermal water loss (TEWL) were carried out before SLS application, 24 hr after SLS application, and then 1 hr, 24 hr, 48 hr, 72 hr and 144 hr after product application.

Figure 4 shows the results of TEWL. Application of SLS for 24 hr disrupted the skin barrier, hence a higher amount of water evaporated from the skin and this was significantly higher by 200%-250% according to the TEWL data. Based on *Figure 4*, the results indicated that 144 hr after TOCOGel applications on SLS-treated areas, there was a decrease in TEWL with 44.9% of variation for TOCOGel with Gold Tri-E and 47.4% for TOCOGel with Tocomin compared with the gel placebo (64.5%), the commercial product (84.7%) and SLS-treated only

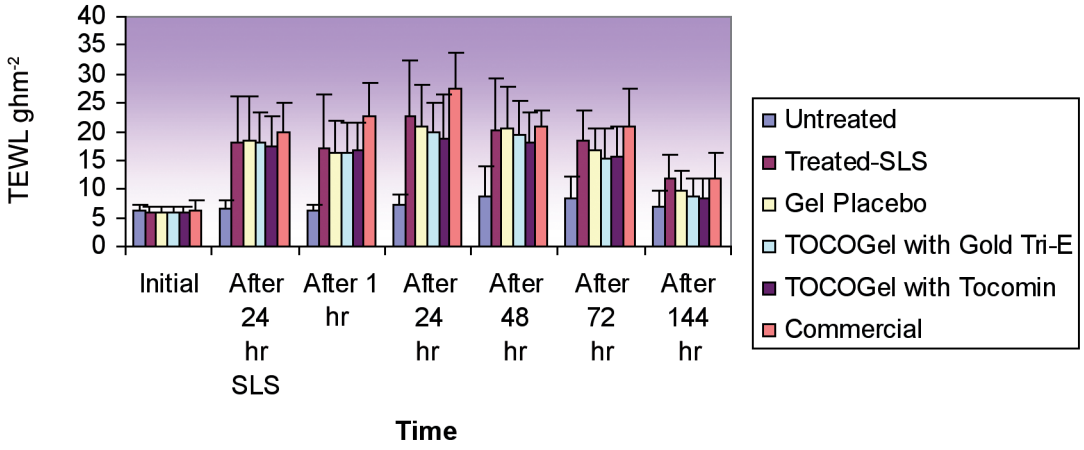

Figure 4. Average transepidermal water loss (TEWL) measurements.

(96.5%) areas. Analyses of variance (ANOVA) did not detect any significant difference ($P>0.05$) in the TEWL data between the untreated area and the areas applied with TOCOGels, whereas there were significant differences between the area which was SLS-treated only and the area applied with the commercial product against the untreated area ($P<0.05$) after 144 hr. This means that application of TOCOGels helped to reduce the barrier damage in SLS-treated areas compared with the purported healing or repair-property of the commercial product.

CONCLUSION

TOCOGels with palm vitamin E, *i.e.* Tocomin and Gold Tri-E, were classified as non-irritants, having minimal potential to cause ocular irritation. Skin barrier recovery after the SLS application test that was carried out on 20 volunteers indicated that TOCOGels with palm vitamin E helped to improve the skin barrier of damaged skin.

ECONOMIC ANALYSIS

Internal Rate of Return (IRR)	=	40%
Payback period	=	3 years
Net Present Value (NPV) @ 20%	=	RM 29 192.74
Estimated selling price	=	RM 7.00/15 g
Capital expenditure (CAPEX)	=	RM 68 000.00

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