An Evaluation of Whitening Effect of Concentre Anti-Tache Nuit against Solar Simulated Radiation-Induced Delayed Tanning

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A new whitening cosmetic essence, 'Concentre anti-tache nuit' (CAN) (Parfums Christian Dior), which contained 3% magnesium l-ascorbyl 2-phosphate, vitamin A, and an antisense compound (DNA Na), was evaluated against solar simulated radiation-induced delayed tanning (DT) in the unexposed upper arm skin of 12 healthy Japanese females, aged 20 to 55 years. Whitening effect was estimated by observation, photographs, and lightness at 6th week after irradiation of single 3 minimal erythema dose. CAN demonstrated greater whitening effects on the applied area than the non-applied area in 10 of the 12 subjects (83%) with the combination of observation and photographs. Ten of 12 subjects showed the gap of lightness (L* value) more than 0.5 between the CAN- and non-application areas. There was a significant difference of the absolute value of margin of L* from pre-irradiation site between CAN-applied and no-treatment areas. These results suggest that CAN has a whitening effect on solar simulated radiation-induced DT.

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Introduction

Hydroquinone monobenzylether had been used for the treatment of pigmented lesions in Japan. Recently, hydroquinone monobenzylether has been used under the strict direction of specialists in dermatology, since hydroquinone monobenzylether has severe irritability. Then, magnesium l-ascorbyl 2-phosphate (APC-3), hydroquinone-β-D-glucopyranoside, kojic acid, 4-α-butylresorcinol, and plant extracts have been developed as whitening cosmetics.

We have evaluated a new whitening cosmetic containing APC-3 against solar simulated radiation (SSR)-induced delayed tanning (DT) in Japanese skin.

Subjects and methods

Subjects

Twelve healthy Japanese females aged 20 to 55 years, who were receiving no medication, participated in this study which was carried out between September and November of 2000. Skin type was determined by the Japanese skin type classification.
and the classification of Japan Cosmetic Industry Association (JCIA)\(^1\). All the subjects were classified to J-II (burn moderately, tan moderately) in Japanese skin type classification and type II or III in JCIA classification. The untanned flexor site of the upper arm was used for the study. Informed consent was obtained.

**Testing substance**

A beauty lotion, ‘Concentre anti-tache nuit’ (CAN) (Parfums Christian Dior), was used. CAN contained 3% APC-3, vitamin A, and an antisense compound (DNA Na).

**Light Source**

The light source was a Multiple Solar Ultraviolet Simulator Model 601 (Solar Light Co., Philadelphia, USA), consisting of a 150 W xenon arc lamp, multiple mirrors, and filters. The intensity at the skin surface was measured with an Erythema UV & UVA Intensity Meter Model 3D-600 V2.0 (Solar Light Co.). The diameter of each irradiated site was 9 mm.

**Minimal erythema dose (MED)**

MED was defined as the smallest dose needed to produce an erythema with a sharp border in the abdomen at 24 h after irradiation. MED was determined by administering a series of 25% increments, beginning with 21.8 mJ/cm\(^2\).

**Delayed tanning (DT)**

**a. Induction of DT**

Three MED was exposed on 3 sites of the left upper inner arm. Three circles, 9 mm in diameter, of DT after the irradiation were used for the evaluation.

**b. Application of test substances**

The vehicle and CAN were applied on each DT site while a DT site was kept as a control with no application. Orders of the sites varied at random. Topical application of 2 substances began at 6 to 8 hours after the irradiation in the night of the day irradiated and being done 3 times a day for 6 weeks.

**c. Evaluation of whitening effects**

Whitening effect was evaluated by the combination of observation and photographs, and lightness (L* values) measured by Minolta Chroma Meter CR-221 (Minolta Co. Ltd., Tokyo)\(^2\) at 6 weeks after the irradiation. The results of evaluation with the combination of observation and photographs were classified into ‘very effective’ (markedly whitening compared with non-application area), ‘effective’ (moderately or slightly whitening compared with non-application area), no change (no difference of whitening from non-application area), and ‘uneffective’ (less whitening compared with non-application area). The three investigators (A. K., H.S., and M.A.) performed the evaluation with the combination of observation and photographs independently.

**Statistical analysis**

Using Wilcoxon’s rank-sum test, the means of L* were analyzed statistically.

**Results**

**Study population and MED**

All the subjects were classified to J-II (burn moderately, tan moderately) in Japanese skin type classification and type II or III in JCIA classification (Table 1). Mean of MED and standard deviation (SD) was 87.1±24.8 mJ/cm\(^2\). Mean of L* values and SD in the unirradiated upper arm was 62.61±1.15.

**Whitening effect against DT**

In the CAN-applied area, 10 (83%) of the 12 sub-

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| mean ± SD | 87.1±24.8 | 62.61±1.15 |

Japanese skin type (JST), Japan cosmetic industry association (JCIA), minimal erythema dose (MED), irradiated dose, and lightness (L*) in unirradiated site.
jects showed 'very effective' or 'effective' compared with non-applied area (Table 2), whereas 4 (33%) subjects did in comparison with that of the vehicle. A case with 'very effective' on the CAN-applied area was shown in Figure 1. In the CAN-applied area 10 (83%) of the 12 subjects showed the gap of L* value more than 0.5 from non-applied area. This result from L* values supports the result by the combination of observation and photographs. The absolute value of margin of L* value in tested area from unirradiated site was demonstrated in Table 3. If the whitening effect were bigger, the absolute value of margin would be smaller. At 6 weeks after the application a significant difference (p<0.05) was found between CAN-applied and non-applied areas (Table 3). However, the vehicle-applied area did not differ significantly from non-applied area or CAN-applied area (Table 3). This result in Wilcoxon's rank-sum test indicates that CAN has a significant whitening effect compared with non-application using the measurement of L* value.

Discussion

Suppression of melanogenesis by ascorbic acid, e.g. APC-3, is caused by the inhibition of tyrosinase and the function of superoxide scavenger. Ascorbic acid also has an ability of reduction of oxidized melanin. In 10 (83%) of 12 Japanese female subjects in this study, CAN had whitening effects against SSR-induced DT with the measurement of L* and the combination of observation and photographs. The margin of L* from unirradiated site in CAN-applied area significantly differed from that of non-applied area. Therefore, CAN containing APC-3 was demonstrated to have a whitening effect against SSR-induced DT. The margin of L* from unirradiated site in vehicle-applied area differed from that of non-applied area without no significance. Hence, the vehicle in this study had some whitening effects that were less than CAN. It is possible that inflammation of UVB-induced erythema may have been reduced by the liquid vehicle following decrease of DT, since the substances were first applied on the night of the day of irradiation.

L* values indicates lightness expressed as a percentage of reflectance. Kawada reported that L* values are useful for the evaluation of DT disappearance at 2 months after a single 3 MED exposure. We have analyzed the margin of L* values from unirradiated site as a parameter in this study and demonstrated a significant whitening effect of the product. Previous reports used this parameter in the evaluation of whitening effects against chloasma, but they did not show significant differences. This parameter could be useful in evaluating whitening products against UV-induced DT.
References


一研 究一

Concentre Anti-Tache Nuitのソーラーシュミレーター光による遅延型色素沈着に対する美白効果の検討

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キーワード：美白剤、リン酸Lアスコルビルマグネシウム、遅延型色素沈着、
ソーラーシュミレーター光、明度

新規美白剤であるConcentre Anti-Tache Nuit（Parfums Christian Dior）のソーラーシュミレーター光による遅延型色素沈着に対する美白効果を6週間の外用によって検討した。被験者は12人の本邦健康人女性で、被験部位は上胸内側を用い、基剤塗布部位と非塗部部位を対照とした。判定は3人の皮膚科医師の肉眼と写真による総合判定と色彩色差計のL*値によって行った。その結果、本剤は12人中10人において非塗布部位に対して効果が認められた。また本剤はL*値において非塗布部位に対して有意に効果が認められた。基剤も非塗布部位よりも効果は認められたが、L*値においては有意な差は認められなかった。（皮膚、43：5－9，2001）