Determination of UVA Protection Factor with SPEX SkinSkan

Akira Kawada1*, Hiroko Kameyam1, Yoshiko Sangen1, Yoshinori Aragane1, Tadashi Tezuka1, and Ikuko Hamagami2

1Department of Dermatology, Kinki University School of Medicine, Osaka, Japan
2Atago Bussan Co. Ltd., Tokyo, Japan

SPEX SkinSkan is a newly developed spectrofluorometer that can calculate transmission of UVA on the surface of human skin as a non-invasive method. We have investigated UVA protection factors (PFA) of Japanese over-the-counter sunscreens using SPEX SkinSkan. This non-invasive method is useful to know UVA protection of sunscreens in vivo.

key words: sunscreen, UVA, protection

INTRODUCTION

SPEX SkinSkan is a newly developed spectrofluorometer that can calculate transmission of UVA on the surface of human skin as a non-invasive method1-3. We have investigated of UVA protection factors (PFA) of Japanese over-the-counter sunscreens using SPEX SkinSkan.

MATERIALS AND METHODS

Subjects were 10 healthy Japanese who were all J-II in Japanese skin type classification (Satoh and Kawada, 1986) [4-6]. J-I subject easily burns and tans minimally, J-II burns moderately and tans moderately, and J-III burns minimally and tans markedly and long-lastingly after 3-MED exposure (about 1 hour) of sunlight at noon of summer days. Tested site was the flexor site of forearm. Firstly, transmission of nine over-the-counter sunscreens in the range of UV-A was determined using SPEX SkinSkan. Second, protection factors of UV-A were calculated. Applied area was 5×5 cm in size on the flexor site of the unexposed forearm. Application dose was 2 µg/cm² for cream or 2 g/cm² for lotion.

SPEX SkinSkan (Jobin-Yvon Inc, New Jersey) is an in vivo fiber-optic spectrofluorometer designed specifically for skin-fluorescence measurements. It has a quartz fiber bundle that selectively delivers UV radiation to the subject and collects the resulting fluorescence. There’s need for sample preparation, cuvettes, or adaptations. This spectrometer designs the fluorescence signal from strong scattered backgrounds. Wavelength scanning is fast that minimizes the time of measurement and exposure to excitation light.

RESULTS

An average PFA value for each product was calculated for each subject. The PFA values calculated for each subject were averaged. UVA-PFs were 5.3, 6.5, 5.3, 4.9, 6.8, 4.0, 4.7, 5.9, and 3.2 for Products No. 1 (SPF 50+, PA+++), 2 (SPF 50+, PA+++), 3 (SPF 50+, PA+++), 4 (SPF 50, PA+++), 5 (SPF 40, PA+++), 6 (SPF 40, PA++), 7 (SPF 35, PA++), 8 (SPF 30, PA++), and 9 (SPF 30, PA++), respectively.

DISCUSSION

The measurement method used in this study was an in vivo non-invasive method of determination of UVA sunscreen effectiveness. It took about two minutes for each measurement that was very short. This method may be more accurate and reproducible than other in vivo methods. Moreover, each continuous spectrum can be seen with application and without application of sunscreens that show more precise features of UV-A absorption of sunscreens.

UVA-PF is a measure for UVA protection of sunscreens proposed by Japan Cosmetic Industry Association. Most sunscreens sold in Japan have a label of PA determined by UVA-PF. We also compared UVA-PF and PFA. There were differences between UVA-PF and PFA. UVA-PF is calculated by determination of immediate tanning that is also induced by visible light of sunlight. Then, PFA may be more appropriate than UVA-PF as a measure of protective activity of sunscreens against UVA.

REFERENCES


