Synopsis of Original Research Paper

Establishment of accurate and universal *in vitro* evaluation method of UV protection efficacies of sunscreens

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Concerns have increased for the establishment of reliable and reproducible *in vitro* evaluation method of UV protection efficacies of sunscreens, since it gives results more quickly, is less expensive and is more ethical. In this study, attempts were made to establish accurate and universal *in vitro* evaluation method of UV protection efficacies of sunscreens. Two subjects, hydrophilicity of the substrate surface on which sunscreens are applied and surface roughness of the cosmetic standard PMMA UV evaluation plates, were studied to analyze their influence on the value of *in vitro* UV protection efficacies.

Corona-discharge treatment was conducted on the quartz plate, and it was succeeded to make the surface super-hydrophilic to have a contact angle of water at 0 degree. The contact angle exponentially recovered to the initial value and its half life was around 5 d. Four types of commercially available sunscreens, water gel type, mist spray type, silicone/water type, and non organic UV absorber type, were applied onto the quartz plate exhibiting different hydrophilicity. It was found that the wettability of each sample differed and the values of *in vitro* UV protection efficacies drastically changed by changing the hydrophilicity of the surface.

Surface structures were analyzed for three cosmetic standard PMMA UV evaluation plates: Helioplates HD6 (Sa=6μm) and ISO plates (Ra=2 and 5μm). Solution of acrylsilicone resin was added dropwise onto the plates and the solvent was evaporated. The plates were cut and the cross section was analyzed using SEM-EDS. The maximum depth of penetrating of acrylsilicone resin was larger than Ra and cracks into which the acrylsilicone resin penetrated were observed. Clear solution type pseudo-sunscreen samples containing acrylsilicone resin were deposited on the plates. It was found that the addition of acrylsilicone resin drastically changed the UV transmission.