

Elucidation of photosensors involved in the breakdown of the skin intercellular barrier and development of prophylactic agents

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In this study, we focused on red light, which may have a protective effect against ultraviolet ray (UVB) light, a light associated with skin barrier dysfunction. Red LED light irradiation did not alter the expression level of tight junction barrier-related factor claudin-1 (CLDN1), cellular localization of CLDN1, or cell proliferation signals including Akt and ERK. Irradiation with red LED light significantly suppressed the increase in reactive oxygen species (ROS) production induced by UVB irradiation. Pre-irradiation with red LED light significantly suppressed the increase in *NFE2L2*, *SFN* and *PPAR- δ* mRNA expression induced by UVB irradiation. Moreover, red LED light also significantly ameliorated the UVB irradiation-induced suppression of *PPAR- γ* mRNA expression. Red light, which has been considered to have little biological effect, has been shown to enhance the skin stress response and to attenuate oxidative stress, one of the mechanisms by which red light can attenuate oxidative stress. In human epidermis-derived cells, irradiation with red LED light was also shown to reduce UVB-induced increase in ROS production, which is associated with skin barrier disruption.

The establishment of scientific evidence may lead to the future development of technologies and devices that use red light to enhance the skin's stress response. Since it is becoming clear that light has different physiological effects depending on its wavelength, it is expected that new concepts for cosmetic materials will be developed that maintain the positive effects of sunlight on the skin while preventing only the negative effects on the skin barrier.