

Shiseido Reveals that Red Light Has Proliferation-Promoting and Inflammation-Reducing Effects on Epidermal Cells

~A new technology to create beauty in harmonious coexistence with environment
and based on the wealth it provides~

Shiseido Company Limited (“Shiseido”) has revealed that red light has the effects of epidermal cell proliferation and reducing skin inflammation. By using 3D epidermal models and skin tissue culture models, we confirmed that red light enhances cell proliferation in the stratum basale of the epidermis, suggesting that red light is involved in maintaining epidermal homeostasis. In addition, our human study results showed that red light has an effect on reducing skin inflammation developed after barrier disruption of the stratum corneum. Some of these results were presented at the 40th Annual Meeting of the Japanese Society of Aesthetic Dermatology held on August 6 and 7, 2022.

Under the Human/Earth approach of our R&D philosophy “DYNAMIC HARMONY”, we are engaged in the development of “environmental harmony/co-existing technology” that aims to create beauty in positive harmony and coexistence with the environment. We will continue to elucidate the relationship between the skin and various environmental conditions including light, and strive to create new value to realize healthy beauty for each individual.

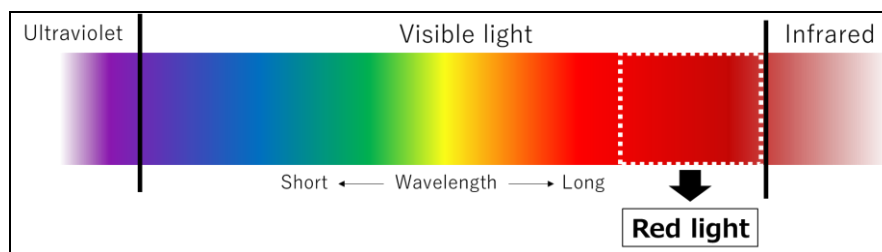


Figure 1. Red light

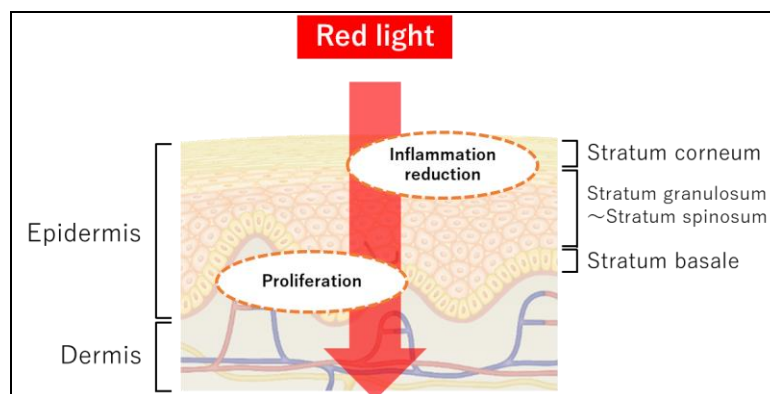


Figure 2. Effects of red light on epidermis (image)

Research background

We have conducted extensive research on the effects of light on the skin, including research on the UV-induced skin photoaging, and more recently, on the effects of blue light and infrared rays on the skin. The red light, which was the focus of this study, has a longer wavelength among visible light and penetrates deeper into the skin. Its cell proliferation promotive effect has been studied in various cells, however, the effects on the epidermis, the outermost layer of the skin, have not yet been clarified in detail. Thus, we investigated the effects of red light on the epidermis.

Effect of red light on cell proliferation in the stratum basale

First, we irradiated red light*¹ once on a 3D epidermal model and evaluated the factors involved in cell proliferation. As a result, we confirmed that the number of the positive cells for Ki-67, a protein that shows proliferative potential in the stratum basale, was significantly increased. We also performed the same evaluation by irradiating red light multiple times on a skin tissue culture model, and confirmed that the number of Ki-67 positive cells was also significantly increased. These results suggest that red light promotes cell proliferation in the stratum basale and is involved in the maintenance of epidermal homeostasis.

*¹ Red LED light with irradiation intensity equivalent to almost 4 times that of sunlight.

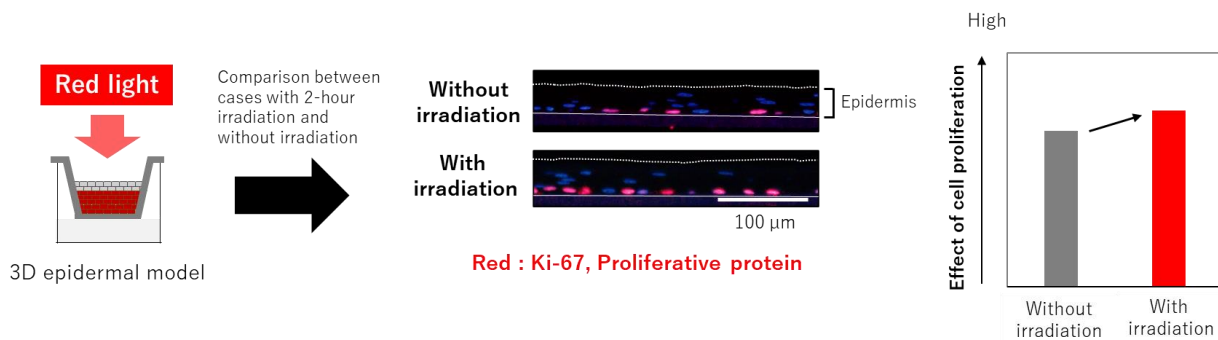


Figure 3. Evaluation with 3D epidermal models revealed that red light irradiation enhances cell proliferation in the stratum basale.

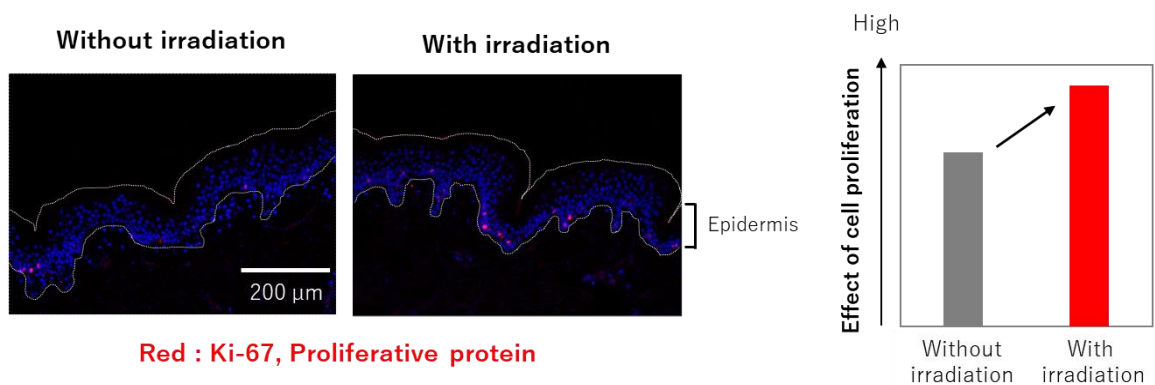


Figure 4. Evaluation with skin tissue culture models revealed that multiple red light irradiations enhance cell proliferation in the stratum basale.

Effect of red light on skin inflammation developed after barrier disruption

Regarding the effects of red light, in order to observe phenomena that cannot be fully grasped in culture experiment, we investigated the effects of red light on the skin after barrier disruption of the stratum corneum in a human study. With the subjects in their 20s and 30s, we disrupted barrier of the stratum corneum by tape stripping and then irradiated with red light to observe changes in the inflammatory state caused by barrier disruption. The results showed that after one hour from irradiation, the redness score, which is increased by barrier disruption, was reduced in the area with red light irradiation compared to the area without irradiation, confirming that red light has the effect of reducing skin inflammation caused by barrier disruption.

In addition, with the aim of delivering more red light to the skin, we challenged ourselves with the development of a base that promotes the transmission of red light while preventing UVA and UVB, which have a significant adverse impact on the skin. Consequently, the newly developed sunscreen base with higher red light transmission enhanced the transmission by approximately 1.2 times compared to our existing sunscreen base with low red light transmission (Figure 6).

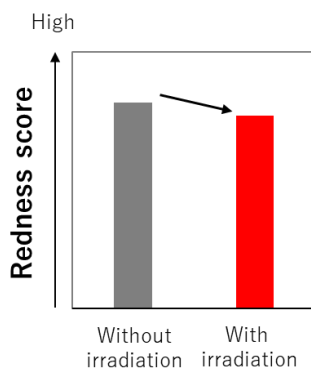


Figure 5. Red light irradiation improves redness score 1 hour after barrier disruption.

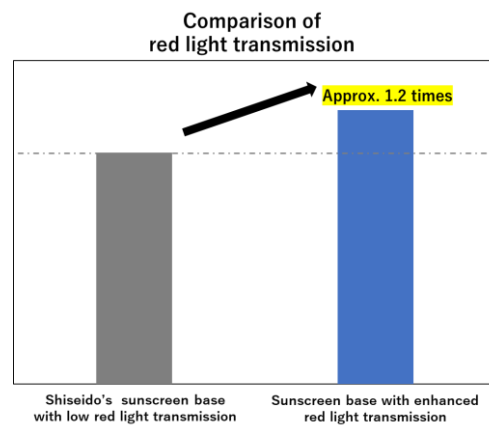


Figure 6. Comparison of red light transmission

Future prospects

In today's society, where global climate and lifestyles are changing undeniably, we will continue to develop innovative "environmental harmony/co-existing technology" that turns the diverse natural elements into the power of beauty, while hoping to help people live in harmonious coexistence with nature.

Reference: Shiseido's initiatives on "environmental harmony/co-existing technology"

Shiseido is working on the development of "environmental harmony/co-existing technology" that turns various elements in the rapidly-changing external environment into the power of beauty, with the aim of "creating beauty through positive harmony and coexistence with the environment". Following the announcement of technology focused on "UV rays"^{*2} in 2021, this year, we presented technologies focusing on "dryness (low temperature and low humidity)"^{*3} and "humidity"^{*4}.

^{*2} Shiseido Develops Innovative Technology to Convert Ultraviolet Light into Light that Brings About Beneficial Effects on the Skin (2021)

<https://corp.shiseido.com/en/news/detail.html?n=0000000003256>

^{*3} Shiseido Elucidates Skin's Adaptation Mechanism to Dry Environment (2022)

<https://corp.shiseido.com/en/news/detail.html?n=0000000003402>

^{*4} Shiseido Develops Technology to Spontaneously Control Moisture Permeation in Response to the External Humidity (2022)

<https://corp.shiseido.com/jp/news/detail.html?n=0000000003507> (Japanese only)

Shiseido's R&D Philosophy "DYNAMIC HARMONY"

Shiseido Formulates its Unique R&D Philosophy "DYNAMIC HARMONY" (2021)

<https://corp.shiseido.com/en/news/detail.html?n=0000000003252>

The DYNAMIC HARMONY special website:

<https://corp.shiseido.com/en/rd/dynamicharmony/>

<Reference>

Researchers' challenges

■ Pursuing what is good for the skin

The epidermis, or stratum corneum, which covers the outermost layer of the skin, has a barrier function of limiting the absorption of foreign substances and moisture retention and is influenced by various environmental factors and physical stimuli. In recent years, we have been conducting research on light with various wavelengths, and clarified the details of light of wavelengths that pose an adverse impact particularly on the skin. In this study, we started our research, aiming to explore the influences that the epidermis receives from the outside, not only the negative effects, but also the positive effects. Based on our previous in-house research and external findings, we thought that red light could have potentially positive effects on the epidermis, and pursued our research.



Researcher, Yuki Umino

■ Wishing people fulfilling lives

In conducting experiments using 3D epidermal models and skin tissue culture models, we examined various cases while overcoming many failures by closely tuning experimental methods and verifying under what conditions to irradiate light, etc. In the process, we often utilized Shiseido's research experience and expertise and successfully revealed the effects of red light on the epidermis. Going forward, we would like to continue our research on various environmental factors and the effects of light on the skin while identifying positive and negative effects, and help people lead fulfilling lives in this ever-changing environment.