

## Shiseido Establishes New Evaluation Method for Intercellular Lipids Structure

- Confirmation of unique ingredient that remains in skin even after rinsing, maintains strong barrier function in stratum corneum -

Shiseido Company, Limited (“Shiseido”) and the Research Institute for Electronic Science at Hokkaido University have succeeded in jointly establishing a new method for evaluating intercellular lipids in the stratum corneum, which are strongly related to the barrier function of the skin. With this method, we have confirmed that a uniquely developed ingredient, EPDMEs, improves the structural ordering<sup>\*1</sup> of intercellular lipids and maintains barrier function<sup>\*2</sup>. Furthermore, the unique ingredient remains in the stratum corneum after being applied to the skin and washed off. Shiseido has promoted the development of cleansing products that cleanse without removing the essential moisture necessary for healthy skin, and going forward, we will strive to develop unprecedented high value-added cleansing products with the application of this technology.

<sup>\*1</sup> Term for the structure of intercellular lipids. When the structure is disordered, the stratum corneum is considered to be loosely organized, whereas with a well-ordered structure, it is considered to be well organized.

<sup>\*2</sup> Umino Y et al. Skin Research and Technology. 2021 Jan 7. Online ahead of print.

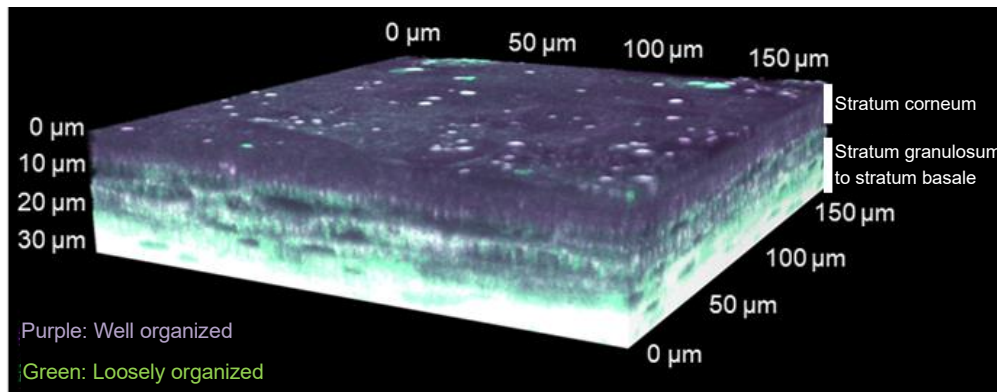


Figure 1: Analysis of structural ordering of intercellular lipids using new evaluation method

### Structure and role of intercellular lipids

The stratum corneum, the outermost layer of the skin, is composed of stratum corneum cells and intercellular lipids filling the gaps between the cells, and plays an important barrier function role to protect the skin from external stimuli and prevent moisture evaporation, as well as a moisturizing function to retain moisture in the skin. Intercellular lipids are regularly ordered in the stratum corneum of healthy skin and form a well-organized layer structure after being released from the stratum granulosum, which is the lower layer of the stratum corneum. However, on the surface of the stratum corneum, the structure can be disrupted by external factors such as dryness and UV rays. Prior research has already revealed that this layer structure has a close relationship with the condition of the skin, and when the structure is disrupted, the barrier function deteriorates.

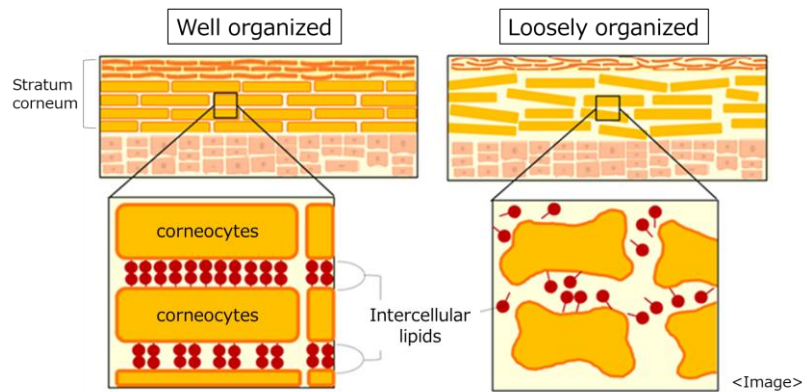


Figure 2: Structure of intercellular lipids (Image)

### Development of new evaluation method

In the search for approaches to maintain skin barrier function, we developed a new evaluation method in collaboration with the Research Institute for Electronic Science of Hokkaido University to analyze the structural ordering of intercellular lipids, which could not be fully examined by conventional methods. Through experiments using a 3D cultured epidermal model and multiphoton microscopy, we successfully evaluated the ordering of intercellular lipids numerically, which enabled us to conduct more detailed analysis than before. Furthermore, by constructing a 3D image based on the results of numerical evaluation, it has become possible to visualize intercellular lipid ordering.

### Effect of proprietary ingredient EPDMes on improvement of intercellular lipid ordering

We applied our uniquely developed ingredient EPDMes, water, and common moisturizing ingredients to a 3D epidermal model and analyzed them with the new evaluation method. As a result, we found that the proprietary ingredient EPDMes improved intercellular lipid ordering in the stratum corneum, especially near the surface, compared to when water and common moisturizers are applied. This implies an expectation of improved barrier function.

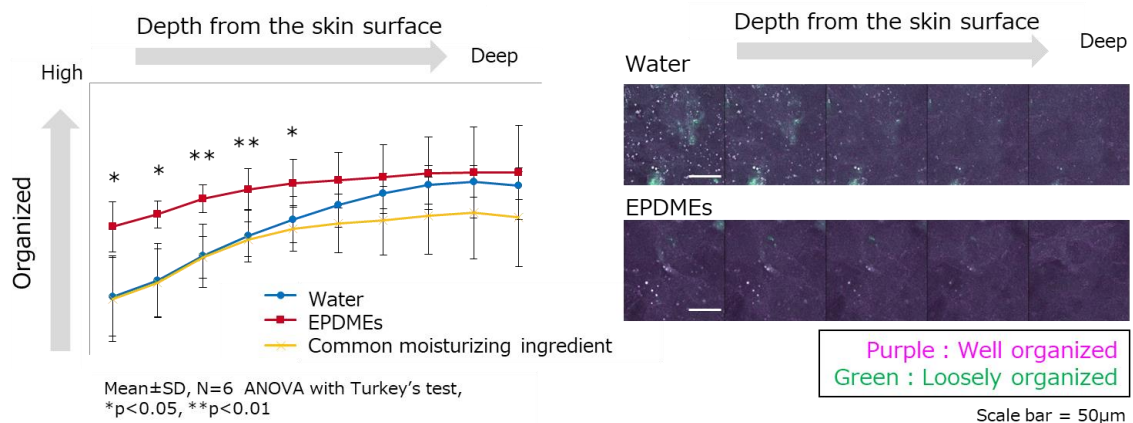


Figure 3: Evaluation of ingredients' effect on intercellular lipid ordering with new evaluation method

In addition, it has been confirmed that this unique ingredient remains in the stratum corneum after being applied to the skin and washed off. In other words, the potential was revealed for an approach, through this technology, to achieve both capabilities of cleansing and improving skin barrier function simultaneously.

Going forward, Shiseido will further deepen its dermatological research, which is a strength of the company, and conduct research to help consumers nurture healthy skin and achieve their own individual and natural beauty.