

## Shiseido Establishes Lymphatic Vessel Visualization Technology

- Succeeds in observing how lymphatic vessels collect waste products -

Shiseido Company, Limited (“Shiseido”) has succeeded in visualizing the lymphatic vessels of human skin in three dimensions by combining stereoscopic technology and an optical clearing technique that makes skin tissues transparent. In addition, by applying a new technology that performs precise and continuous tomography, we have successfully captured 3D images at the electron microscope level of how waste products are transported into the lymphatic vessels.

With the establishment of this visualization technology, it becomes possible to examine the structure and phenomena inside the skin more thoroughly than ever before. Going forward, Shiseido will further utilize skin visualization technology, which is our strength, to elucidate the relationship between the body and skin functions based on blood vessels and lymphatic vessels, leading to the development of innovative products.

### Research background

Shiseido has made many discoveries through studies on various phenomena that occur inside the skin and subcutaneous tissues using its prominent technology that visualizes the inside of the skin. Meanwhile, although it has been well known that lymphatic vessels are abundant in the skin and play an important role as an initial step in collecting waste products, the details of their structure were not clarified academically. Furthermore, lymphatic vessels were often considered to exist in the deeper layer of the skin, and it was believed that strong stimulus such as massage is required to improve lymphatic flow. This time, in order to understand how lymphatic function is related to epidermal homeostasis in particular, we developed a technique to visualize cutaneous lymphatic vessels, and as a result of observation, we confirmed some findings of interest.

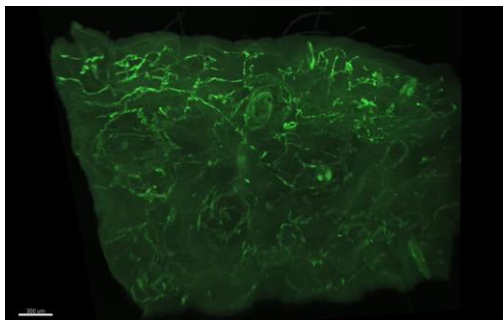


Figure 1. Lymphatic vessel structure observed by combination of optical clearing technique and 3D technology (green parts)

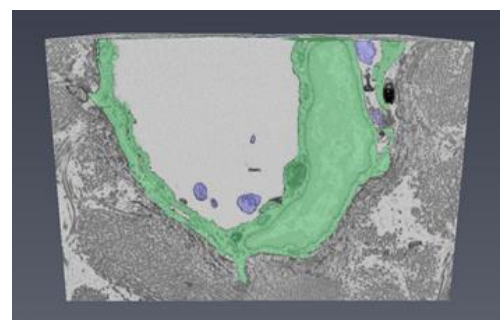


Figure 2. Moment when lymphatic vessels collect waste products (green: lymphatic vessels, blue: waste products)

### Establishment of lymphatic vessel visualization technology

#### (1) Visualization via combination of optical clearing technique and 3D observation technology

In pursuit of the observation of the skin lymphatic structure, we combined Shiseido's optical clearing technique and 3D technology and successfully visualized cutaneous lymphatic vessels in three dimensions for the first time. From this observation result, it was confirmed that lymphatic vessels are present through just beneath the epidermis forming a fine network of lymphatic capillaries (Figure 1). Furthermore, we achieved capture of the point when lymphatic vessels start to collect waste products.

#### (2) Visualization of cutaneous lymphatic vessels with new tomography technology

Technology which performs precise and continuous tomography of skin tissues has enabled us to observe the fine lymphatic structure at the electron microscope level. With this new technology, we have successfully witnessed in three dimensions the moment when lymphatic vessels collect waste products (Figure 2).

### Future research

With multiple visualization technologies now established, it becomes possible to examine the structure and phenomena inside the skin more thoroughly than ever before. By utilizing various skin visualization technology, which is our strength, Shiseido will elucidate the relationship between the body and skin functions based on blood vessels and lymphatic vessels, leading to the development of innovative products.

### Reference: Related press releases

Shiseido Succeeds in In Vivo Visualization of Dermal Capillaries (2017)

<https://corp.shiseido.com/en/news/detail.html?n=0000000002271>

Shiseido Succeeds in 3D Visualization of Vascular Malformation in Pigmented Skin (2018)

<https://corp.shiseido.com/en/news/detail.html?n=0000000002498>