

Scientists devise new way to measure skin barrier function

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The skin is the primary physical barrier against harmful substances in the environment. But there is a significant difference in the protective capacity of the skin across individuals. Knowing the health of one's skin

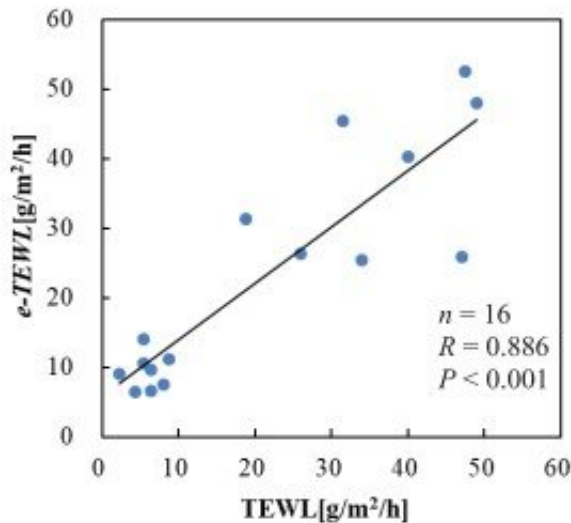
and using the right skin care products can therefore make a great difference in maintenance of the protective function of the skin.

The outermost layer of the skin, called the stratum corneum, is responsible for most of the skin's protective function. The healthy functioning of this skin layer is crucial to avoid allergies as well. Scientists have devised several ways of measuring the stratum corneum's 'skin barrier function', which refers to its ability to protect the body against invasion by external substances.

Most of these methods indirectly calculate skin barrier function using a proxy measure called transepidermal water loss (TEWL). TEWL refers to the amount of the body's water that passes through the stratum corneum and into the atmosphere and is calculated by placing a participant in a high-tech facility where a certain temperature and humidity are maintained constantly. The dependence on a heavily controlled environment is one of the primary limitations of this method of measurement.

A group of researchers from Japan have now developed a new model for the estimation of TEWL without the need for a tightly controlled environment. The method uses two measures for estimating TEWL—the thickness of the stratum corneum and the water content of the surface of the stratum corneum.

In their recent study, published in *Advanced Biomedical Engineering*, the researchers, Osamu Uehara from ALCARE Co., Ltd., and Toshimasa Kusuhara, and Takao Nakamura from Okayama University, demonstrated that their new model could accurately estimate TEWL. They verified these estimated values against measured TEWL.



Scientists from Japan have developed a new model for measuring the skin's protective capacity. The model estimates the transepidermal water loss (TEWL) as a measure of the skin protective function. Credit: *Advanced Biomedical Engineering* (2023). DOI: 10.14326/abe.12.1

"Quantitative evaluation of skin barrier function is very useful in areas like dermatology, nursing, and cosmetics development. Our new model has the potential to make the measurement of skin barrier function easier," says Prof. Nakamura.

To measure the thickness and water content of the stratum corneum, researchers used the confocal laser microscopy and confocal Raman spectroscopy techniques, respectively, where a probe is pressed against the skin to obtain microscopic images of the [skin surface](#).

This imaging data can be used to calculate measures related to water evaporation from the skin surface, which can be fed into the [mathematical model](#) devised by the researchers to provide an estimate of the TEWL, ultimately indicating the protective ability of the skin. The new model has several advantages. For instance, it can help uncover the

reasons underlying changes in TEWL.

"It may be possible to estimate whether the change in TEWL is a change in thickness of the stratum corneum or a change in water content of the surface of the stratum corneum," explains Mr. Uehara.

Another advantage is that since the model does not operate in an artificial environment, it provides a more realistic picture of water loss from the skin. Efficient ways to measure skin barrier function can help in developing better skin care products and help people make more informed choices about the products they use.

"In daily skin care, people will be able to choose products that match their [skin](#) conditions, such as the thickness of the stratum corneum and the water content of the surface of the stratum corneum. In addition, they will have a better idea of the optimum amount of product to be used," notes Dr. Kusuhara.

More information: Osamu Uehara et al, Transepidermal Water Loss Estimation Model for Evaluating Skin Barrier Function, *Advanced Biomedical Engineering* (2023). [DOI: 10.14326/abe.12.1](https://doi.org/10.14326/abe.12.1)

Provided by Okayama University

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