New detailed molecular map of skin layer creates pathways for treatments

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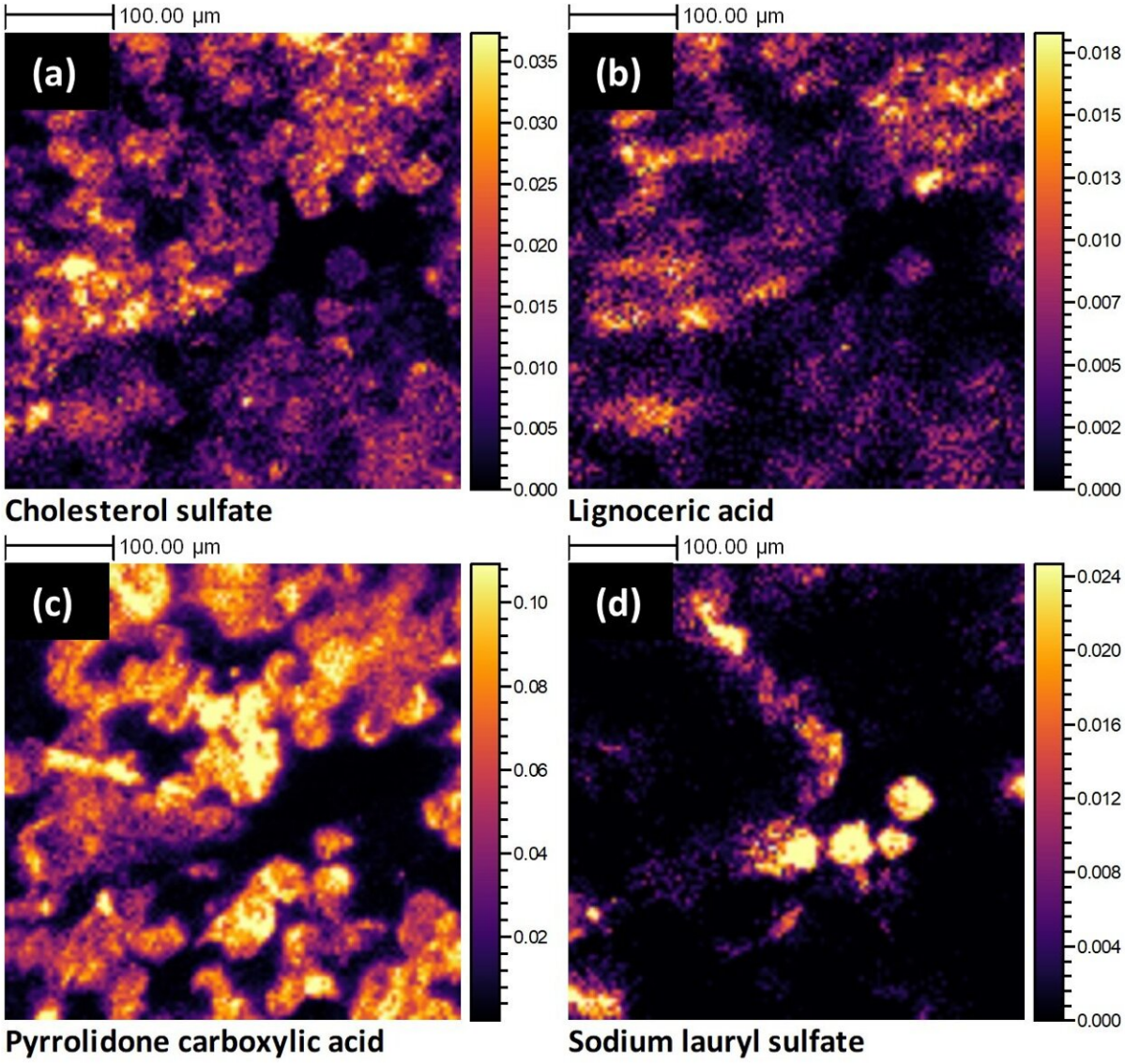

Images of the skin surface chemistry from study. Credit: University of Nottingham

Scientists have accurately analyzed the tough barrier layer of the skin, giving the most detailed molecular map of its structure, which will help in the development of new skin products and treatments.

Researchers from the University of Nottingham used the latest three-dimensional mass spectrometry imaging technique to analyze human skin tissue from the stratum corneum to reveal its molecular chemistry in unprecedented detail. These new findings provide increased fundamental understanding in skin biology and enable the development of new skin products and treatments. These research findings have been published today in *PNAS*.

The University of Nottingham was the first university in the world to own and operate the 3D OrbiSIMS instrument used in this research. The technology facilitates an unprecedented level of molecular analysis for a range of materials including biological tissues, such as human skin. Importantly, its high-mass resolving power, chemical specificity and high sensitivity allow it to be used to analyze in situ human skin samples to accurately map the molecular structure of the skin.

Researchers used ex vivo full-thickness human skin tissue samples and a single gas cluster ion beam to both sputter through the skin and generate secondary ions, which were analyzed using the Orbitrap to generate a depth profile. This process showed the range of chemistries and 3D distributions within the stratum corneum and indicate how these relate to fundamental biological processes such as the cholesterol sulfate cycle.

David Scurr, Principal Research Fellow in the School of Pharmacy, led

the research and said, "This research gives the chemical structure detail of the stratum corneum never seen before. The information we were able to gather on the complex chemistry of this tough barrier layer has the potential to benefit research into fundamental biological processes, such as those associated with aging and disease, in addition to improving the efficacy of topical delivery."

This research is part of a collaboration with No7 Beauty Company, and the analysis done as part of this study has also shown the penetration profile of the stratum corneum. The team were able to accurately track the penetration of No7's peptide blend Super Matrixyl 3000 Plus (a trademark of Sederma) following topical application to the skin surface, and detected the peptides responsible for targeting invisible photo-damage that occurs early in the aging process.

Mike Bell, Head of Science Research at No7 Beauty Company, said, "Commercially this research is very significant as this technique can offer an improved understanding of topical delivery and therefore lead to the development of more effective peptide-based anti-aging products."

More information: Elucidating the molecular landscape of the stratum corneum, *Proceedings of the National Academy of Sciences* (2022). DOI: 10.1073/pnas.2114380119.

Provided by University of Nottingham