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Comparison of the stratum corneum thickness measured in vivo with confocal Raman spectroscopy and confocal reflectance microscopy

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ABSTRACT

Background: Thickness measurement of the outermost layer of the skin, the stratum corneum (SC), is essential for in-vivo measurement of the cutaneous bioavailability of topically applied drugs and cosmetics. Our aim was to compare SC thickness calculated from confocal Raman spectroscopy (CRS) data with results of SC thickness based on confocal laser scanning microscopy (CLSM) measurements and with literature data, to validate CRS data with CLSM data and vice versa. **Methods:** SC thickness was measured with two non-invasive devices, confocal Raman spectroscopy and confocal laser scanning microscopy, on four different areas of the body: volar forearm, leg, face and palm in 18 healthy adult subjects. **Results:** Comparable results of SC thickness were obtained with both methods, structure analysis of CLSM images, and computation of Fick's first law on water gradients measured with CRS: 20 μ m and 19 μ m (volar forearm), 21 μ m and 22 μ m (lower leg), and 13 μ m with both methods (cheek), respectively.

Discussion: For the first time it was possible to accurately determine the thickness of SC with CRS and CLSM and to validate both systems against each other and with results of literature data.

Conclusion: Both methods, CRS and CLSM, were found to be suitable to measure SC thickness correctly. Therefore, when using CRS, for example to obtain detailed information about the molecular composition of the skin, it is additionally possible to accurately measure SC thickness with the same device to have an orientation in which skin layer molecules are found.