GENETICS AND GENODERMATOSES

A SEMI-QUANTITATIVE BIOPHYSICAL MODEL OF THE INTERACTIONS BETWEEN GEL PHASE LAMELLAR LIPIDS AND COMPROMISED STRATUM CORNEUM

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Introduction: In healthy skin stratum corneum (SC) barrier function resides in the extra-cellular lipid matrix. The disruption of SC lipid organization, whether due to intrinsic or extrinsic factors, results in compromised skin barrier function. This work describes our further development of a biophysical Fourier transform infrared (FTIR) spectroscopy method to characterize barrier lipid molecular organization in isolated SC, and demonstrates that this method can be used semi-quantitatively to measure damage to SC lipid organization. The method is then used to demonstrate that topically applied gel-phase lamellar lipids are able to help restore key aspects of SC lipid organization as measured via changes in the SC lipid phase transition temperature (Tm).

Material/methods: FTIR spectroscopy experiments measured intra-molecular lipid organization in isolated SC by determing the Tm of SC lipids and comparing damaged and healthy SC. Repeatable and quantifiable changes in SC lipid organization, as determined from changes in Tm, were quantified. Damaged SC was then topically treated with gel phase lamellar lipids under controlled dosing, application and rinsing conditions

Results: The data from topically treated SC, following damage induced by high pH, indicated a major shift in internal SC lipid organization back towards that of undamaged healthy SC. This was quantified by determining the Tm which indicated a change of ~10°C upon damage could be reduced to 5°C with topical lamellar lipids.

Conclusions: The studies indicate that topically applied lamellar lipids intercalate into the SC helping return lipid organization towards that of healthy SC. The spectroscopy method is general and can be used to semi-quantitatively measure the restoration of internal SC lipid organization upon topical application of lamellar lipids, regardless of the external stress. Restoring internal lipid organization will lead to improved mechanical and barrier properties. The use of in vitro models provides an initial screening approach prior to clinical studies.