Synopsis of Original Research Paper

"Quality" of water in stratum corneum investigated with terahertz spectroscopy

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Although the moisture content in the skin is of major interest in cosmetology and dermatology, the roles and functions of water are yet to be understood at a molecular level. Over more than half a century, physicochemical and biophysical studies have emphasized the importance of hydration water that surrounds biological macromolecules to prompt their native functions, but such a "quality" of water has been overlooked in biological samples due to experimental difficulty in characterizing the free/hydration water content in vivo. To settle this issue, in this study we constructed a homebuilt terahertz time-domain attenuated total reflection spectroscopy system and developed a theoretical algorithm to derive the depth profile of free water in living skin. Our results showed that the free water content in the stratum corneum of a hairless mouse is kept at particularly low level, but applying pure water and a cosmetic lotion substantially increases the population of free water albeit temporarily. Interestingly, the cosmetic lotion (sekkisei) was found to have a greater ability in retaining free water for a longer period, compared to pure water.