

Fourier transform infrared microspectroscopy and imaging of the outerlayer of the skin

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To achieve control of the internal environment, animals and humans require a permeability barrier at body surfaces in contact with the external world. In humans, one in the average 20 μm thin layer, play the role of this barrier and protects the body of desiccation. In addition to this, it shields the human body against mechanical and chemical impacts. This layer is the outermost part of the skin and is called the stratum corneum (SC). Physically, the SC consists of an array of flat, polygonal, keratin-filled cells embedded in a matrix of lamellar lipids [1,2].

Materials that penetrate through the SC do so by passive diffusion through the intercellular spaces. Therefore, it is the lamellar lipid matrix that determines the quality of the barrier and prevents so water loss of the underlying tissue.

Skin tissue is analysed by Fourier transform infrared microspectroscopic imaging. The SC was obtained from a hairless Yucatan pig. Using a cryostat, skin section were frozen and sliced to a thickness of 5 μm . Alternatively SC has been obtained by a biochemical procedure [3].

Images were generated from spectra collected on a BIO-Rad "Sting-Ray" instrument consisting of a step-scan interferometer coupled to a 64 x 64 mercury-cadmium-telluride focal plane array detector. The Stingray is a chemical imaging system, and combines spectroscopy's chemical identification and quantification abilities, with both high spatial resolution (6-10 μm) and the power of visualisation, in a tool to precisely characterize compositional changes across the sample.

This new technique allows us to map a sample area of 400 μm x 400 μm , generating 4096 spectra, one from each element of the array. A number of infrared images were then generated from these large data sets by measuring and plotting the integrated area of particular spectral components, such as the amide band of proteins, in each of the 4096 spectra. With this procedure we can image the distribution of each chemical species through the SC [4,5].

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