

ABSTRACT

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Title of Thesis: Study on phase behaviour of selected lipid mixtures

Ceramides, cholesterol and fatty acids are the main components of the stratum corneum (SC) intercellular lipid matrix. These lipids play the major role in maintaining the skin barrier function.

The goal of this work is to study the SC lipid mixtures on the molecular level, characterization of their miscibility and their temperature phase behavior. For this purpose, lipid model systems imitating natural structure of the SC intercellular lipid matrix were prepared. The membranes contained one or more ceramides (CerAP, CerNP, CerNS), cholesterol, stearic acid and cholesterol sulfate. The mixtures were studied by infrared spectroscopy using a heated ATR-crystal. From the measured data, IR spectra and temperature dependency of the position of the particular IR-modes were evaluated.

The results showed the presence of hydrogen bindings within the ceramides. These bonds were also observable in the equimolar lipid mixture based on CerNP. Otherwise, lipid mixtures containing CerAP showed very good miscibility of the individual components. The two- and three- ceramide mixtures showed characteristic features of the one- ceramide mixtures. Using deuterated stearic acid, it was discovered that ceramides affect the arrangement of stearic acid in the mixture and move its phase transition to lower temperatures. These effects were found to work vice versa as well. Stearic acid affected both the hydrocarbon chains order of the other lipids in the mixture and the thermotropic phase behavior.