

## Abstract

Charles University, Faculty of Pharmacy in Hradec Králové

Department of Pharmaceutical Technology

Author: *Roksolana Kulhánková*

Supervisor: *doc. PharmDr. Andrej Kováčik, Ph.D.*

Title of diploma thesis: ***Study of topically administered ceramides***

The human stratum corneum (SC) is the uppermost layer of the epidermis, which is made up of several layers of corneocytes. The space between the corneocytes is filled with barrier lipids, i.e., ceramides, cholesterol, and fatty acids, which are represented in an equimolar ratio. The arrangement of intercellular lipids has a significant effect on the barrier properties of the skin. Damaged skin barrier (e.g., in atopic dermatitis) is associated with a lack of lipids in the SC lipid matrix, which is reflected in increased trans-epidermal water loss and deterioration of skin quality (e.g., severe dryness, flaking, and cracks). One of the potential ways to restore the skin barrier is the topical administration of barrier lipids, especially ceramides (Cer).

The goal of this work was to study the effect of topically administered Cer (very long-chain Cer AP alone or in combination with ultra-long-chain Cer EOS) on model-damaged SC and their effect in the process of restoring barrier function. Several topically administered formulations (creams) were prepared, which were evaluated for the effects of hydrophilic liquids, viscosity additives, and especially the nature of emulsifiers, i.e., sorbitan monostearate, glycerol monostearate, and polysorbate 80. Prepared formulations with barrier lipids were evaluated by X-ray diffraction and optical microscopy. The effect of barrier lipids on the restoration of the damaged skin barrier was evaluated using permeation experiments on a model-damaged SC. Barrier properties and arrangement of barrier lipids in SC have been described by trans-epidermal water loss (TEWL), electrical impedance, and infrared spectroscopy. From the results of this work we found out that the application of a topical formulation based on a hydrophilic and hydrophobic emulsifier containing a mixture of Cer AP + Cer EOS statistically decreases the permeability of SC to water. The obtained results are a suitable basis for further study of the possibilities of restoring the damaged/diseased skin barrier, which could find application in the treatment of skin diseases (e.g., atopic dermatitis) or other pathophysiological processes in the skin.