Abstract

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Title of diploma thesis: **Study of sphingosine, dihydrosphingosine and phytosphingosine in skin barrier models**

The *stratum corneum* (SC), the uppermost layer of the skin, localized in the uppermost part of the epidermis, represents the skin barrier of the organism. SC is composed of corneocytes and an intercellular lipid matrix, which is formed by ceramides (Cer), free fatty acids (FFA), and cholesterol (Chol) in an equimolar ratio. Substances from the group of sphingolipids – Cer, are sphingoid bases (for example, sphingosine (S), dihydrosphingosine (dS), phytosphingosine (P)) acylated with a fatty acid (for example, lignoceric acid (LIG)). In the lipid matrix, the metabolic products of Cer (free sphingoid bases) are also present, but their role in SC barrier functions is not clear. Some studies show that Cer with different sphingoid bases, and increased presence of free sphingoid bases, can lead to a change in the permeability of the skin barrier.

This work aimed to study the effect of permeability of sphingoid bases on the model membrane permeability. Nine types of membranes were prepared; they differed both in the presence of Cer (Cer NS vs. NdS vs. NP) but also in the presence of free sphingoid bases (S vs. dS vs. P). In each membrane, there was always a mixture of FFA (C_{16} – C_{24}), Chol, and 5 % wt proportion of cholesteryl-sulfate. The first control series contained Cer NS or Cer NdS or Cer NP. In the second series, there were metabolic products of Cer (free sphingoid base) and appropriate molar amount of LIG, and the third series was a model where Cer, its free base, and LIG were found in the same molar ratio. The individual permeation markers, water loss, electrical impedance, and the flux of two different permeants – theophylline (TH) and indomethacin (IND), permeability properties of the model membranes were evaluated.

All S-containing membranes showed lower (compared to dS and P) permeability to water but not to ions. The hypothesis saying that "breaking" of Cer increases the permeability of model membranes was confirmed only for membranes containing S. It is also interesting that in the presence of free dS increased the permeability for model permeants, but in the case of free P their permeability decreased. The results of the experiment showed that for each type of Cer, there is a different permeability for water, ions, TH, and IND. The work contributed to the understanding of the importance of free sphingoid bases on the permeability of model membranes, which could be useful in the study of complex models simulating a healthy/diseased skin barrier.