Abstract

Ceramides are lipid components in the uppermost layer of the skin, *stratum corneum* and they are essential for correct function of a skin barrier. In the *stratum corneum*, ceramides with cholesterol and free fatty acids are in equimolar ratio. Ceramides contain sphingoid bases, which are amino alcohols sphingosine, phytosphingosine, dihydrosphingosine or 6-hydroxysphingosine. These sphingoid bases are *N*-acylated by non-hydroxylated, α-hydroxylated or ω-hydroxylated fatty acid, mostly by lignoceric (C24) acid.

The aim of this work was to study the permeability and microstructure of the model membranes containing non-hydroxylated ceramides. Moreover, we aimed to study the effect of additional α-hydroxyl group in ceramides including the effect of stereochemistry in position 2. We prepared model membranes based on Cer, free fatty acids (C_{16-24}), cholesterol and a small amount of cholesteryl sulfate (5 wt%). We investigated four permeability markers: electrical impedance, water loss through the membrane, flux of theophylline and flux of indomethacin. The microstructure and miscibility of ceramides with other lipids were studied by infrared spectroscopy and X-ray powder diffraction.

The results from experiments showed some differences between ceramides. For example the effect of the type of sphingoid base is greatly manifested in the water loss through the membrane or in flux of indomethacin. The effect of additional α-hydroxyl group in ceramides was discovered as very important in flux of theophylline. For all structure types of ceramides the effect of stereochemistry in position 2 was observed in some permeability markers. Differences between ceramides was reflected even in the microstructure of lipid model membranes. The most significant finding was discovering of long lamellar phase in membranes with ceramide containing 6-hydroxysphingosine and non-hydroxylated fatty acid. So we can conclude that every type of ceramides has unique properties and every change in their structure (type of sphingoid base, α-hydroxylation and stereochemistry) leads to differences in barrier function of model lipid membranes.