

Kinetics of selected substances in dermal exposure (polycyclic aromatic hydrocarbons)

Skin is one of the largest human body organs and its proper functioning is vital for human body. Dermal exposure represents one of the most important pathways of exogenous substances into the body. Data on kinetics of transdermal absorption of polycyclic aromatic hydrocarbons (PAH) have been yet so far insufficient. Present estimates of health risks level connected to dermal exposure to PAHs, are loaded with great deal of uncertainty.

The aim of the dissertation thesis was employment and validation of appropriate testing method of transdermal absorption of substances *in vitro* and the use of this method to obtain new findings on the influence of concentration, dissolvent and form of application, on the measure of dermal absorption of selected PAH representatives.

For the testing of transdermal absorption of substances *in vitro*, the method using static Franz vertical diffusion cell was chosen. As an absorption membrane, full leather of rear surface of the auricle of a domestic pig was used. Content of analytes in samples of receptor fluid was analyzed by gas chromatography with mass spectrometry (GC-MS) and by high performance liquid chromatography with fluorescence detection (HPLC), for which a new methods was developed and validated. From the collected data, the values of the fundamental characteristics of the transdermal absorption of PAHs were calculated (flux and lag time). For the calculations, a new computer model was created that determine the characteristics of transdermal absorption significantly more accurately.

The dissertation thesis brings new findings in the field of basic characteristics of the transdermal absorption of PAHs *in vitro*. These findings can be used in specification of level estimation of health risks of dermal exposure to PAHs.

It has been proven that even relatively low donor concentrations of PAHs can fill the capacity of transport pathways in skin. From the point of view of the factors affecting the overall measure of transdermal transport of PAHs, the size of exposed skin has larger influence than the concentration of PAHs in the applied solution. PAHs with low molecular weight were absorbed faster and in larger amount than PAHs with higher molecular weight.

The measure of dermal absorption of PAHs depended significantly on the character of the dissolvent. The use of oil dissolvent resulted (compared to the use of standard acetone dissolvent) in lower value of dermal absorption measure. Real exposures to PAHs in the life and working environment are usually connected with fat (oil) bases (environment). It is probable that in cases where the "standard acetone data" are used for health risks estimate of dermal exposure to PAHs, the estimate risk has overestimated (conservative) character.

The form of the substance application was influencing significantly the measure of dermal absorption of PAHs (individual/blend application). In all experiments, the lower measure of dermal absorption was found in the application of PAH blend (compared to individual application). With regard to the fact that PAHs occur in the life and working environment almost exclusively in blends, the risk level of dermal exposure to PAH blend, estimated on the basis of the data obtained in individual application, will have overestimated character.