

Artificial lipid membranes in penetration investigations

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SCIENCE & RESEARCH

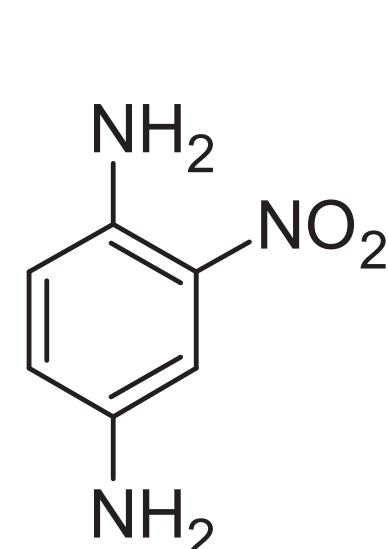
Introduction

Various in vitro methods that are used in research of active substances transepidermal transport are based on the penetration rate through standard membranes. Prepared human or animal skin or other synthetic membranes are used. The human skin is complex membrane. Intercellular cement of the stratum corneum constitute principal resistance to the penetration of molecules. Stratum corneum lipids create organized system of repeated double layers. Therefore, membranes mimicking liquid-crystal lipid structures have been used many times.

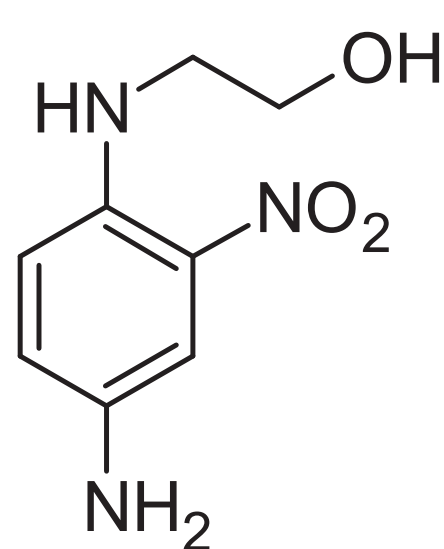
The object of study was to evaluate if the penetration coefficient values obtained while using artificial lipid membranes represent actual bioavailability of active substances. All values were compared to results obtained for membranes from porcine ear tissue, for which the absorbance values were proved to be similar to human skin.

Materials and methods

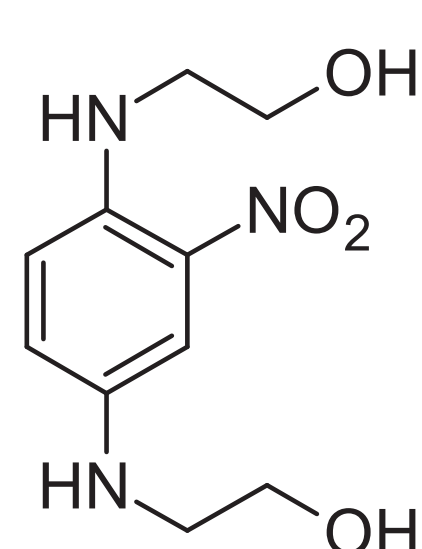
The study was conducted for two groups of compounds used as cosmetic raw materials (four compounds are used as hair dyes and four derivatives of parabens used as preservatives) characterized by different solubility, lipophilicity, molecular weight and ability to create hydrogen bonds. Tests were carried out using the side-by-side chamber (Flynn's chamber), and as membranes liquid-crystal lipid membrane (Cerasome 9005 Lipoid GmbH) and prepared porcine skin (according to the guidelines described by COLIPA) were used. As a donor and acceptor solutions 5% ethanol in phosphate buffer (pH=7,4) for hair dyes and 20% ethanol in phosphate buffer (pH=7,4) for parabens were used. The concentration of researched compounds was determined using spectrophotometer (Helios Gamma, Thermo Electron Corporation, USA).



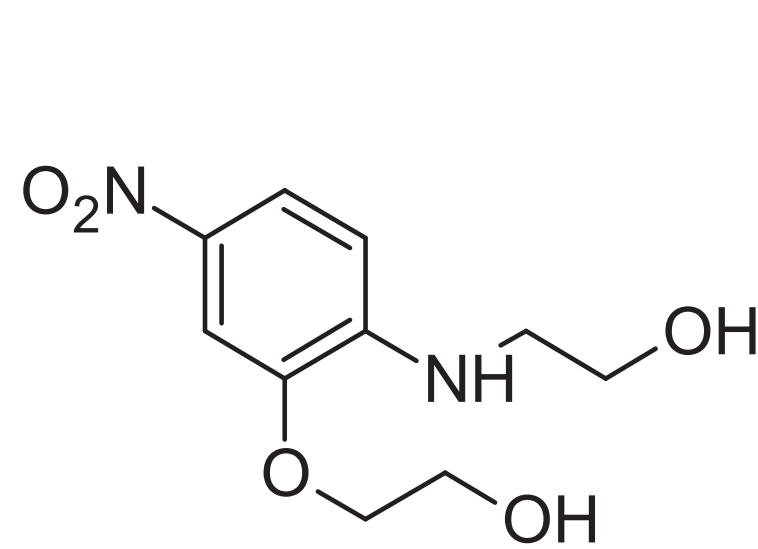
HUCOL 2NP



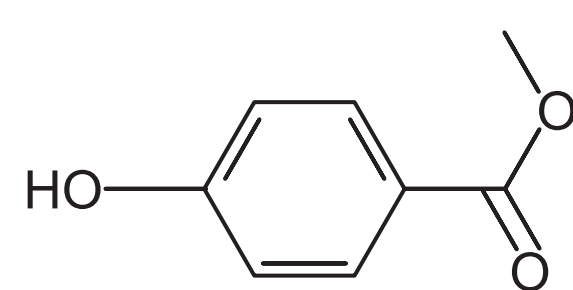
HC RED 3



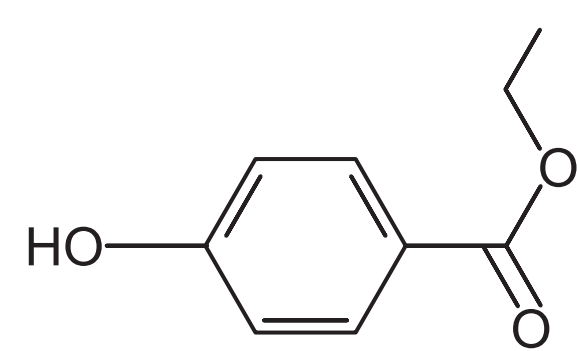
HC VIOLET 1,4BIS



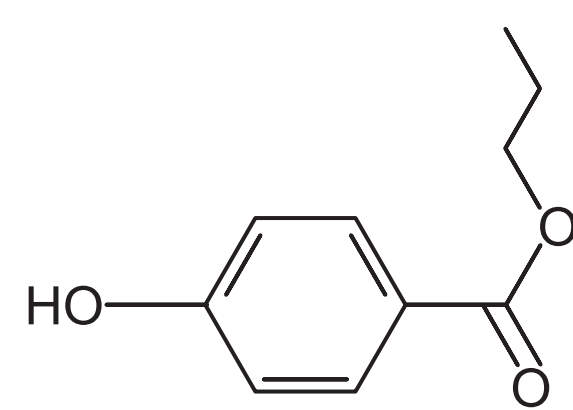
HUCOL 2A5N



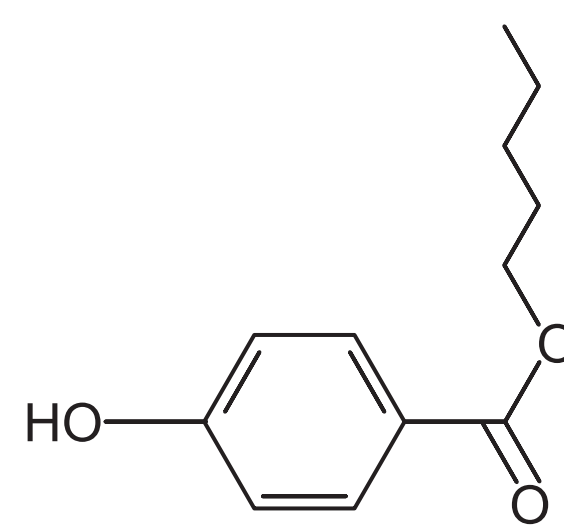
METHYLPARABEN



ETHYLPARABEN



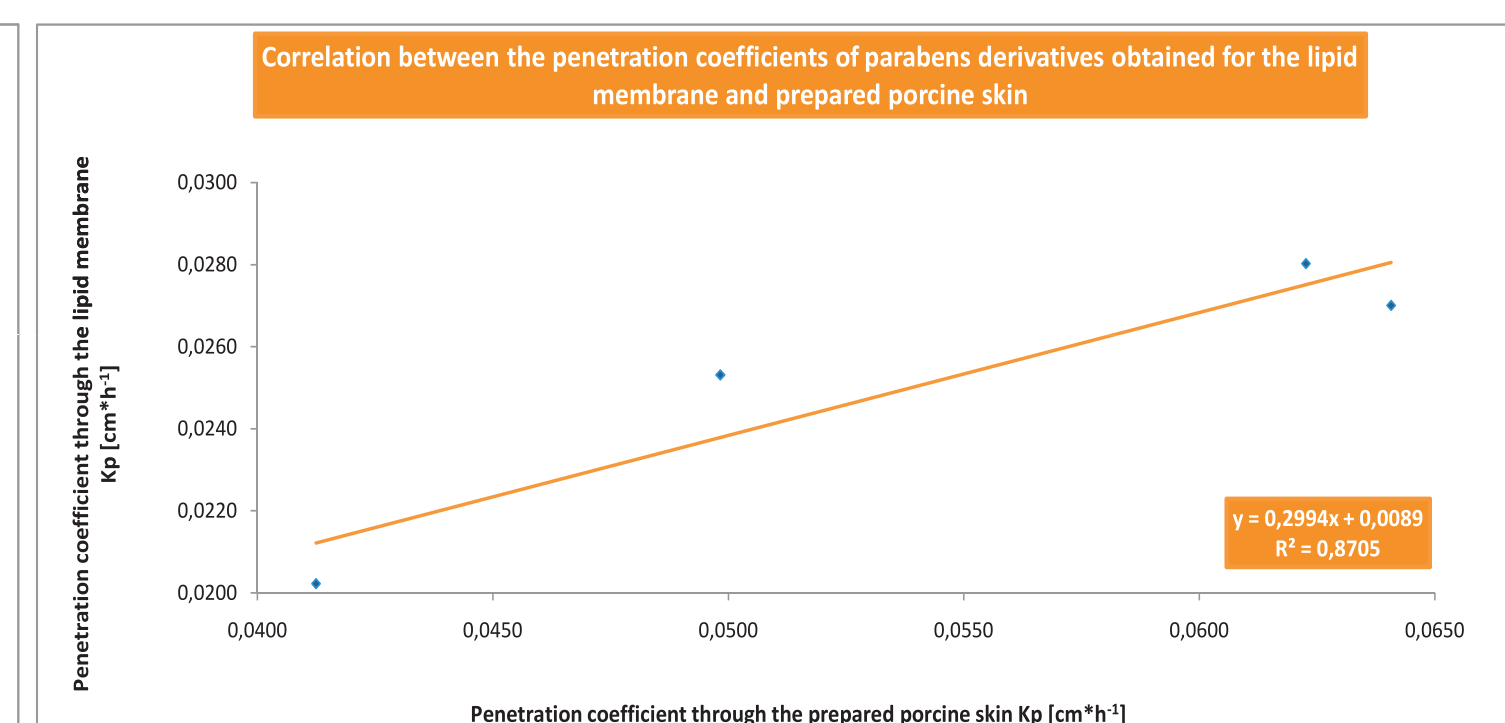
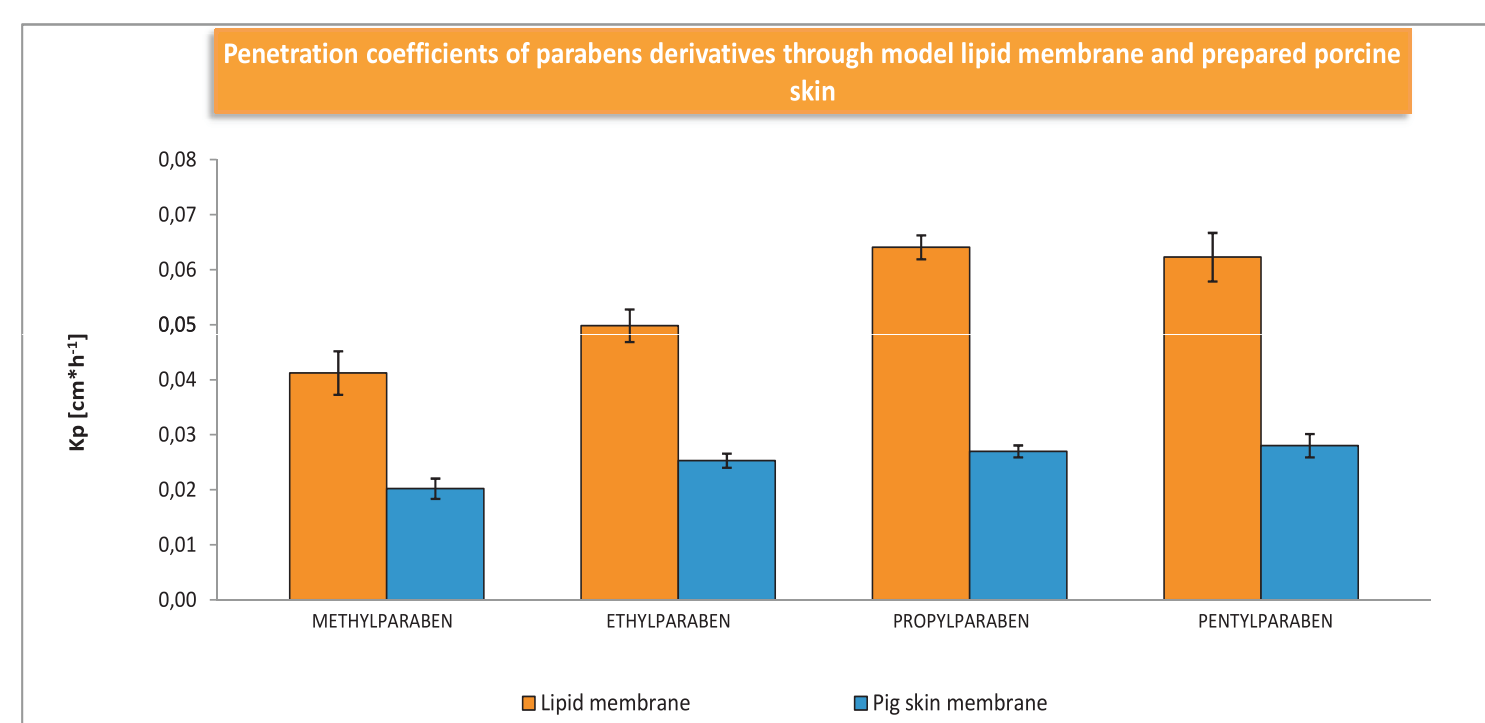
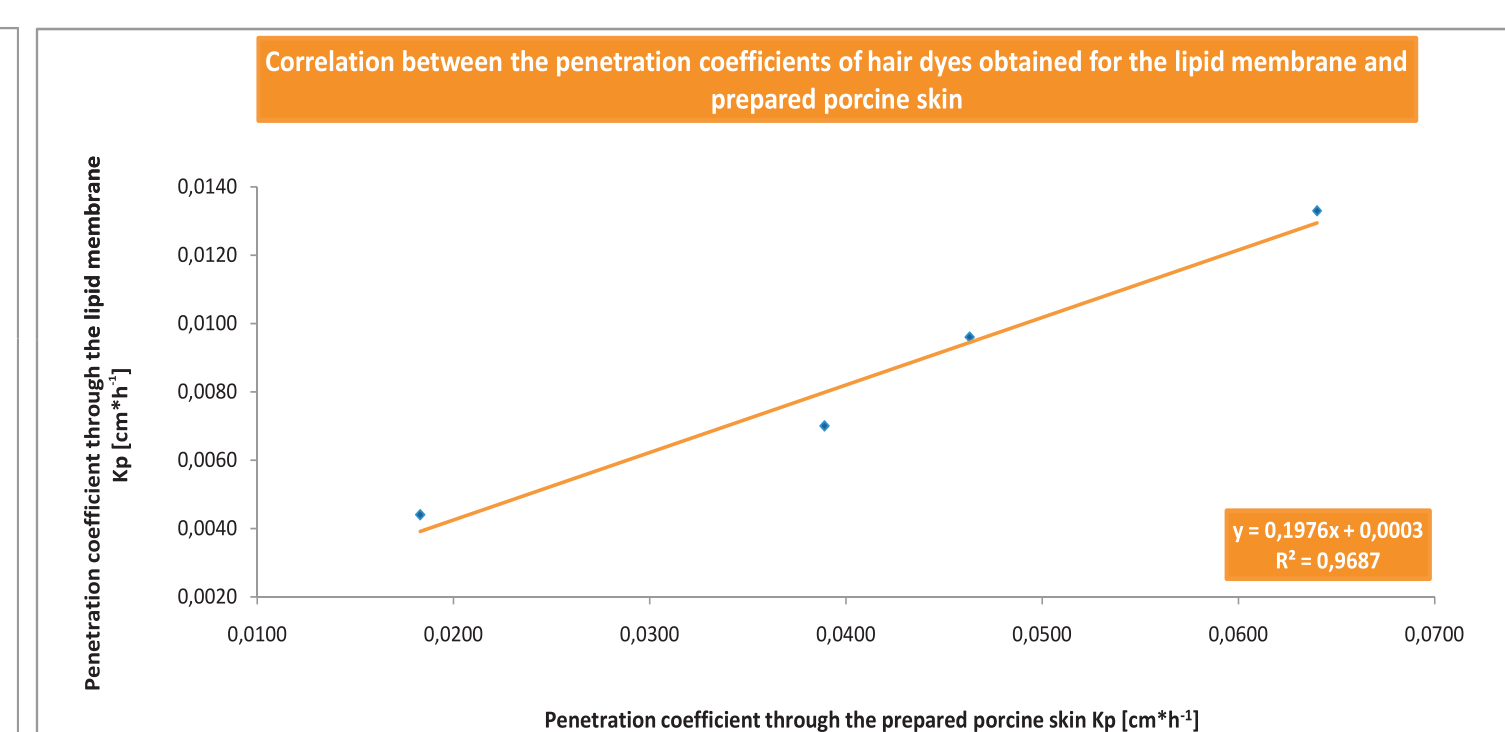
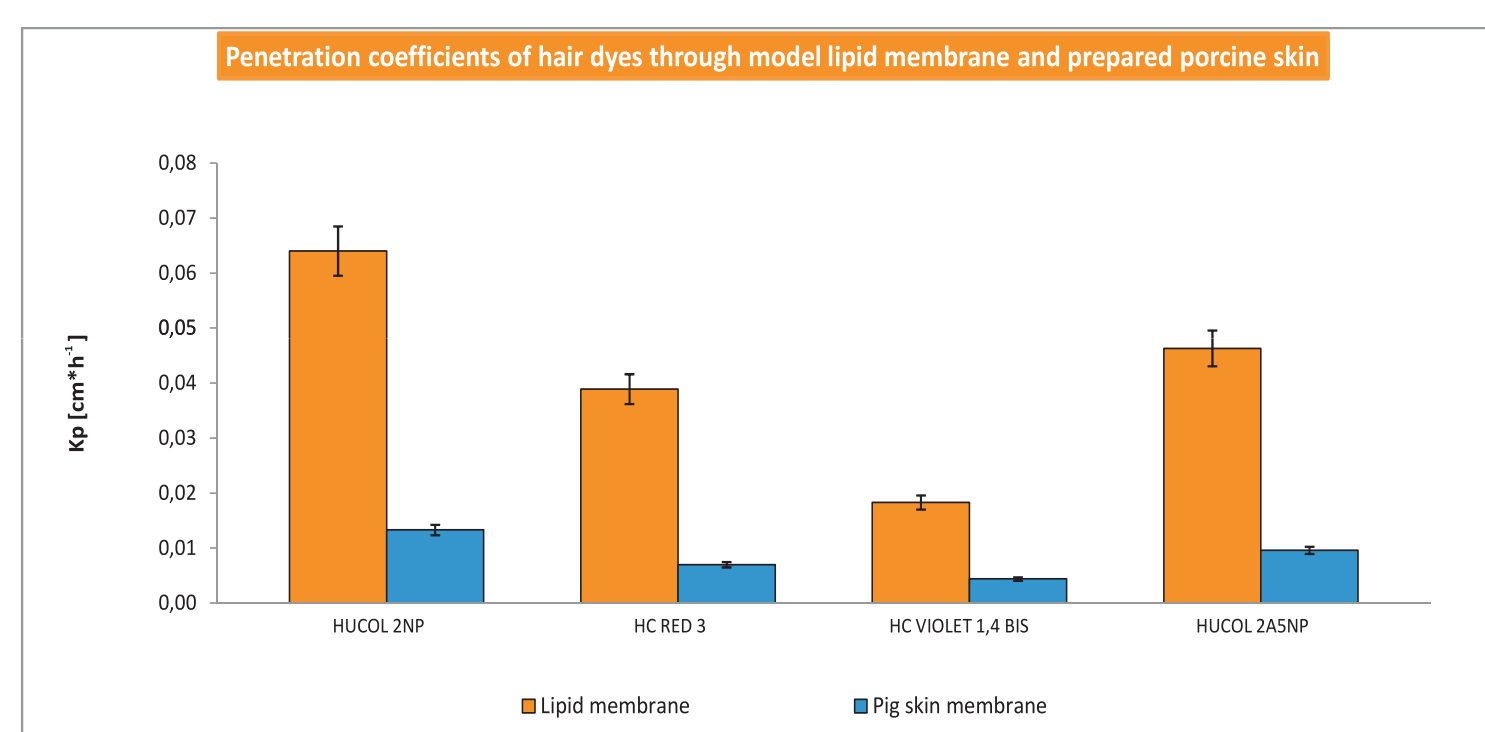
PROPYLPARABEN



PENTYLPARABEN

Results and discussion

The penetration coefficient through the lipid membrane is higher than the values obtained through the porcine skin. However, observed correlation between the results obtained for porcine skin and the lipid membrane was linear. The correlation coefficient for hair dyes is $R = 0.98$ while for the derivatives of parabens is $R = 0.93$.



Conclusion

Conducted research shows that lipid constructed membranes; similar to those in stratum corneum represent good tool for evaluation of actual bioavailability of active substances. The obtained results has allowed to extend the range of tests for lipid membranes for subsequent substances.

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