

〈Regular Article〉

**Evaluation of Skin Permeation Order of Cosmetic Active Compounds
from Commercially Available Cosmetic Products with Different Dosage Forms
Using a Three-Dimensional Cultured Human Skin Model**

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Abstract

In vitro skin permeation experiments are useful to evaluate which formulations have a higher skin permeation and/or concentration. However, the high variability in the permeation rate of chemicals is often a concern in the experiments using excised human skin. Then, three-dimensional (3D) cultured human skin models have gained interest as alternative membranes to evaluate skin permeation of chemicals, although they have a weak barrier function in the stratum corneum. In the present study, 3D cultured human skin models, such as LSE-high and EpiDerm 606X, were selected, and the permeation rates of cosmetic active compounds through the skin models were evaluated from commercially available cosmetic products with different dosage forms (lotion, milk, and cream). Following formulations containing different lipophilicities of cosmetic active ingredients (tranexamic acid, nicotinic acid amide, and 4-butylresorcinol) were used. We found that the order of skin permeation rate from different dosages through 3D skin models corresponded with that obtained through excised human skin, independent of the lipophilicity of the cosmetic active ingredients. In addition, a moderate relationship, but not a 1 : 1 slope, was confirmed between the logarithm of permeability coefficients of chemicals obtained from human skin and those obtained from 3D skin models. The results indicated that 3D skin models have potential for use in evaluating which formulations or products exhibit high permeability.

Key words: *in vitro* skin permeation experiment, three-dimensional cultured human skin model, cosmetic active ingredients, complex formulation.