

Effect of Indigenous Bacterium and Cosmetics on the Kinetics of Free Fatty Acids in Skin Surface Lipids

Akira Kotani

School of Pharmacy, Tokyo University of Pharmacy and Life Science

Free fatty acids (FFAs) in skin surface lipids function as a barrier to diseases caused by bacteria and keep the surface acidity constant. In this study FFAs in human skin surface lipids were determined by HPLC with electrochemical detection (HPLC-ECD). The electrochemical detection of FFAs was based on electrochemical reduction of quinone, 2-methyl-1,4-naphthoquinone (vitamin K3, VK3) in unbuffered solution. The HPLC-ECD system was composed of a mobile phase of acetonitrile-ethanol (80:20), an ODS column, a sample injector, 6 mmol/L VK3 solution containing 76 mmol/L LiClO₄ which was mixed with eluate, and an electrochemical detector.

The peak heights for lauric, myristic, palmitic, palmitoleic, stearic, oleic, linoleic, linolenic, and arachidonic acids at a detection potential of -415 mV vs. a saturated calomel electrode (SCE) showed a linear relation to acid amounts in the range of 50-1600 pmol. FFAs from about 1 mg of skin surface lipids absorbed on oil absorbing paper 5 mm x 5 mm in size were extracted with 200 μ L of ethanol-acetonitrile (20:80) to prepare the test solution, of which 20 μ L was injected on the ODS column. This method requires small sample amounts and the procedure is quite simple without derivatization of FFAs, leading to a considerable reduction in analysis time. Since the lipid sample size was very small for the analysis by the method, it is easy to investigate the distribution of FFAs on a human face or scalp. Determination of FFAs in skin surface lipids at 50 points on the head of a male volunteer was carried out and FFA distribution on his face and scalp was mapped out. It has become apparent that oleic, linoleic, and palmitoleic acids are distributed at relatively high concentrations on the forehead and nose, and that stearic acid mainly distributed on the cheeks.

The sampling using a piece of oil absorbing paper can be applied to a human subject with skin trouble, as well as men and women of all ages. Furthermore, it is possible to determine the amounts of FFAs on human skin at pathological sites such as acne. Thus, the present method should be very useful in the cosmetic and clinical fields.