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Delivery of hydro- and lipophilic antioxidants to the skin measured by in vivo Electron Paramagnetic Resonance (EPR) spectroscopy

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The intake of nutritional supplements such as vitamins and antioxidants is popular but still controversially discussed. Manufacturers of these supplements are advertising their products with efficient quenching of free radicals and, therefore, the reduction of premature skin ageing. However, the question arises as to whether these active ingredients are delivered to the skin and if they can unfold their beneficial properties in the skin.

Besides resonance Raman spectroscopy, which determines carotenoids non-invasively in the skin, EPR spectroscopy was utilized for the first time to determine the skin antioxidative capacity in vivo before and after the intake of nutritional supplements. The antioxidative capacity was determined by applying a reactive test radical to the skin, measuring the decline of the test radical and by the determination of the rate constant. Moreover, Raman spectroscopy was utilized for the determination of skin carotenoids. 55 volunteers (5 groups) were included in the study and randomly assigned one of the following products: Aronia energy, a natural chokeberry peel extract, containing mainly hydrophilic antioxidants, Lutex, a natural extract from curly kale, containing mainly lipophilic antioxidants (carotenoids), pure vitamin C and dextrose or sugar capsules as placebo.

The radical scavenging activity of the skin was enhanced after supplementation in all verum groups, the decrease in TEMPO was faster and the rate constant increased. No differences could be found in the placebo groups. The rate constant increased in all verum groups by approximately 23% after 4 weeks intake. An increase in skin carotenoids was only observed for lipophilic antioxidants from Lutex. EPR spectroscopy is a versatile tool for the evaluation of beneficial effects of natural extracts. Besides the detection of topically applied antioxidants, EPR spectroscopy and the application of test radicals also allow the detection of systemically applied antioxidants. In order to characterize the skin barrier function that matures during the first year of life it is important to study external effects, such as skin care and contact with water. In this clinical study, we researched the effects of a baby lotion, applied to the skin after baby swimming, on the skin barrier function of infants.

