THE ANALYSIS OF FREE RADICAL MEDIATED PROCESSES IN SKIN INDUCED BY OXIDATIVE STRESS AND DEPLETED BY ANTIOXIDANTS

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Oxidative stress of the skin is responsible for the generation of Free Radicals/ROS. It can be differentiated in an external and internal part. The external part is mainly characterized by physical and chemical environmental influences like electromagnetic radiation (UV,VIS,IR), mechanical(US)- and chemical stress. Microbiological organisms from the environment act as a further external cause of oxidative stress. The internal stress is correlated with inflammations, autoimmune reactions, dysregulation of metabolism and ischemia. The skin is the meeting point of the organisms internal and external influences.

Substances existing in or applied on skin can work as protector or booster for free radicals and can be characterized by Electron Spin Resonance (ESR) spectroscopy using the **R**adical **S**kin Protection **F**actor (RSF) [1].

Antioxidants applied on skin neutralize free radicals as a defense line and results in RSF > 1. A natural defense line is melanin. The existence of melanin in skin is strongly correlated with the prevention of free radicals generated by UV radiation. Especially in the skin melanin (mainly eumelanin) ensures the only natural UV protection by eliminating the generated free radicals and results in an RSF > 1.Chemical treatment of skin by various surfactants and detergents can lead to lipid disorders in the skin and can enhance the free radical injury during sun exposure. Detergents, shampoos and conditioners cause RSF values < 1, typically for radical boosters . The topical application of self tanner formulations like Dihydroacetone (DHA) or Erythrulose results in a tanning of the skin. This process runs via a Maillard reaction and is correlated with the generation of free radicals. An additional UV irradiation of the skin leads to an explosion of the free radical concentration which is characterized by RSF « 1.

Free radical reactions in the skin are an excellent indicator for the effect of environmental stress on one side. On the other side, using an appropriate ESR method it is possible to characterize topical applied substances regarding their protective or promoting effects on free radical processes in skin.

[1] Herrling, T; Jung, K; Fuchs,J. Measurements of UV-generated free radicals/reactive oxygen species (ROS) in skin. Spectrochim Acta A Mol Biomol Spectrosc. 2006,63(4):840-5.