Quantification and Characterization of irradiation induced radical production in different skin models by EPR spectroscopy

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Introduction: Our skin is daily exposed to sun irradiation throughout out life. Sun irradiation is indispensable for our health. However, a too high exposure can cause skin damage, such as erythema, immunosuppression, premature skin aging and skin cancer. Additionally, the whole spectrum range of the sun irradiation induce free radicals in the skin. The measurement of the free radical formation is of huge interest in medical science, as it supplies information about the amount of oxidative stress in the skin which is important for the development of possible protection strategies.

Materials and Methods: The irradiation induced radical production was investigated in different skin models: murine (SKH-1), porcine, human and artificial reconstructed human (RHS) skin, which are frequently used in scientific research. The radical production was quantified with the spin probe PCA during a moderate sun irradiation. The concentration of OH* and CH_3 radicals were characterized with the spin trap DMPO. The measurements were performed using electron paramagnetic resonance (EPR) spectroscopy during simulated sun irradiation (305-2200 nm).

Results: The highest amount of radicals was found in RHS > murine = porcine > human skin during irradiation. RHS shows a comparable radical production as *in vivo* human skin. More OH than CH_3 radicals were found in all skin models except in murine skin. In murine skin a crossing point and in human skin an approach of CH_3* and OH* radicals were found at increasing dose

Conclusion: With the EPR technique, the radical production could be characterized and quantified. Both methods show comparable results in the order of the amount of the radical formation for RHS, porcine and human skin. The developed methods could also be adapted to investigate the induced radical production by other oxidative effects such as Nano carrier treatment.