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### Prevention of skin cancer: UV protection or light protection?

Without solar radiation, human life on the earth would not be possible. The positive effects of sun exposure include well-being and vitamin D synthesis. Excessive doses of sunlight can also cause negative effects including sunburn, photo aging, immunosuppression and even skin cancer. To avoid damages by solar radiation, the human body must be protected above all by adhering to the respective codes of conduct, covering one's skin with textile materials and using sunscreens. Recently it could be demonstrated that 50% of the free radicals induced by the solar light is generated in the visible and infrared spectral regions. As meanwhile highly efficient sunscreens are commercially available, people stay much longer in the sun than they would do without sun protection. In this case, the visible and infrared radiation induces amounts of free radicals which can easily exceed a critical concentration thus starting to destroy cells and cell compartments. Consequently, modern sunscreens with high SPF values must provide protection both in the UV and in the visible and infrared spectral regions. In the absence of filter substances that can be used in the visible and infrared spectral regions, the natural mechanisms, which protect the human body from radiation in these spectral regions, must be imitated and integrated into sunscreen products.

Our natural protective mechanisms against solar radiation in the visible and infrared spectral regions are hyperkeratosis and melanin production. Both these effects are based on an increased absorption and scattering of the photons of the UV light. In addition, the human body has an antioxidant protection system capable of neutralizing free radicals before they can start their destructive action. These mechanisms of absorption, scattering and neutralization can be reproduced by adding pigments, especially TiO<sub>2</sub> and antioxidants to the sunscreens. The pigments are responsible for absorption and scattering, while the antioxidants are in charge of neutralizing the free radicals. In a study based on electron paramagnetic resonance (PER) measurements, the protection efficiency in the infrared spectral region of the sun was investigated. Additionally the optical properties of the sunscreen were investigated by spectrometric measurements. It was found that the protection efficacy in the infrared spectral region of sunscreens can be strongly increased by pigments and antioxidants. While the pigments must be incorporated in the sunscreens, the antioxidants can be added by topical and/or systemic application. The accumulation of these antioxidants by nutrition and their destruction by UV-light can be easily measured by resonance Raman spectroscopy. It will be demonstrated that a high antioxidant level is an efficient protection against skin damage by sunlight also in the visible and infrared spectral region. The measuring techniques used for characterizing the efficiency of sunscreens in the visible and infrared spectral regions are discussed.

### Biography

J. Lademann is currently working as a Professor at Charité – Universitätsmedizin Berlin, Germany and he has experience mainly in the fields of Dermatology, Venerology and Allergology.

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