A More Effective Sunscreen: Just add Water...

UvA research shows that sunscreen embedded in a polar environment decreases chance on skin damage.

- **Game-changing approach for development of sunscreens with improved photoprotective properties.**
- **Potential to optimize composition of sunscreens.**
- **Detailed and comprehensive insight into various dissipation routes.**

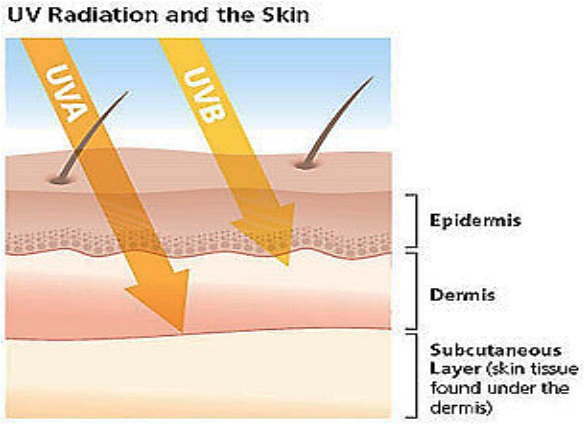
Skin Damage | UV Radiation | Improved Photo-Protective Properties | Sunscreens

Background

Exposure to UV radiation from the sun is one of the primary factors that contributes to the development of skin cancer in the world. In order to protect the skin against these photodamaging effects large efforts have been put into developing more efficient sunscreens.

A wide range of wavelengths are radiated by the sun. These wavelengths, invisible to the human eyes, are classified as UVA, UVB and UVC rays. Unlike UVC rays, UVA and UVB rays reach the surface of the earth and cause photodamaging effects to the skin.

The UV absorption is generally well documented, however several steps that determine how photon energy is dissipated in sunscreens are yet to be understood in detail. The FDA has shown its concerns concerning sunscreens, and feels there is a need to look into the filters' safety more carefully.



Know How

At the basis of the development of sunscreens is a full understanding of their excited-state dynamics. Unfortunately, studies of the excited-state properties of regularly used sunscreen agents are scarce.

Researchers from the Molecular Photonics group of the University of Amsterdam have now shown that such studies have a major added value, and lead to a paradigm shift in improving sunscreens. Such studies revealed, for example, that one of the commonly used protective ingredients in sunscreens (octylmethoxycinnamate (OMC) molecule), reacts differently to UV radiation than previously assumed.

The molecule has proven to stay in its excited state for 30 ns, which is 10000 times longer than had been assumed. Such an excited molecule can transfer energy to other molecules such as oxygen, producing very reactive singlet oxygen that may lead to oxidation of dna bases/dna damage. As a result, the efficacy of the sunscreen is reduced and light-induced harmful side effects may occur.

Novel microsolvation studies of sunscreen chromophores with water demonstrated that under such conditions, this bottleneck is no longer present. These observations could be a first step toward the development of more effective sunscreens with improved photochemical properties and less toxic effects.

The Technology

The UvA makes use of advanced laser spectroscopic techniques to elucidate the dissipation pathways of the absorbed photon energy, including the conversion into harmless heat but in particular also the production of unwanted photoproducts in sunscreens.

The Project

Currently, the UvA is setting up an extensive research program on various commercially employed sunscreen agents. In this program, the UvA will be teaming up with the Molecular Structure and Dynamics group of prof. dr. Jos Oomens at the Radboud University, The Netherlands to develop a shared and unique power house of experimental techniques , such as high-end mass-spectrometric techniques but also free electron lasers that give access to wavelength regions that normally are not available for spectroscopic studies. In this combined research programme, the UvA will investigate how the photoactive compounds that are employed in sunscreens dissipate the energy of UV photons. Thereby paving the way for a potentially game-changing approach for the rational development of sunscreens.

Join this project?

The University of Amsterdam is looking for partners to participate in the development of more effective sunscreens with improved photoprotective and non-toxic properties.

Inventors

Prof. Dr. W.J. (Wybren Jan) Buma, Molecular Photonics Group, University of Amsterdam

Key publications

E.M.M. Tan, M. Hilbers & W.J. Buma (2014). Excited-State Dynamics of Isolated and Microsolvated Cinnamate-Based UV-B Sunscreens. The Journal of Physical Chemistry Letters, 5 (14), 2464-2468. doi: 10.1021/jz501140b

Want to know more?

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