

3<sup>rd</sup> International Conference on  
**DERMATOLOGY AND COSMETOLOGY**

August 17, 2023 | Webinar

Received date: 29-04-2023 | Accepted Date: 02-05-2023 | Published Date: 25-08-2023

## Antioxidants and young skin

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A main reason for the skin aging process is the formation of free radicals due to solar radiation and stressful situations. Our human organism has developed a protective system against this in the form of antioxidants. We cannot form most of these antioxidants in the organism ourselves, but have to consume them with a healthy diet rich in fruit and vegetables. These substances can neutralize the free radicals before they can develop their damaging effect. A measuring system was developed at the Charité with which the antioxidants in human skin can be detected online and non-invasively for the first time. Since we did not know what to expect from this system, we tested it on our employees for over a year. It was shown that a healthy diet increases the antioxidants in our skin. On the other hand, all kinds of stress processes lead to a decrease in these antioxidants. This includes stress in professional and private life as well as the excessive consumption of nicotine and alcohol but also excessive amounts of sun exposure. It has been shown that 50% of free radicals are generated in the UV range of the sun. The other 50% are formed in the visible and infrared spectral range. If you now use a sunscreen, you are protected in the UV range. In the visible and infrared spectral range, however, the radicals continue to be formed, so that damage to the skin can occur. There are no light protection filters for the visible and infrared spectral range. Protection can be achieved with the help of antioxidants, which are added to sunscreens. Furthermore, the smallest particles, which act like micro mirrors in the skin, can reflect the sun's rays and prevent them from penetrating the skin.

Various examples are shown of how healthy foods rich in antioxidants strengthen our protective system in the skin. The extent to which this protection also affects skin aging was demonstrated in a study. For this purpose, subjects who were all 50 years old i.e., could already have a wrinkle and a furrow and who had not changed their lifestyle for decades, were examined in a study. Both the skin surface structure, i.e. the wrinkle density and wrinkle depth, as well as the antioxidative potential on a light-exposed skin area - the forehead - were determined. It was found that subjects with a high antioxidant potential had significantly fewer wrinkles and furrows than subjects with low values. Age did not play a role in this study as all subjects were the same age. The subjects with lots of wrinkles and furrows saw the study participants who showed younger skin and decided to lead a healthier life in the future. However, you cannot eat yourself young again. For the coming years of life, however, the skin can be significantly protected against aging.

That is why we went to a place where nutritional stress behavior is formed - to a school in Kassel with vocational training, where the young people could prepare their own food. In the first month, the students were measured without being told what their readings were. In the second month, they were asked to eat a healthy diet and the readings were shared with them. What they did not know is that we will be back after half a year to check the readings. We wanted to see if the attitude towards life had changed in the mind or if the measurements were just a game for the students.

### Recent publications:

1. Hugo Infante, Victor; Maria Maia Campos, Patricia; Darwin, Maxim et al. Cosmetic Formulations with Melaleuca alternifolia Essential Oil for the Improvement of Photoaged Skin: A Double-Blind, Randomized, Placebo-Controlled Clinical Study. Photochem Photobiol. 2023;99( 1):176.
2. Choe, ChunSik; Schleusener, Johannes; Ri, JinSong et al. Quantitative determination of concentration profiles of skin components and topically applied oils by tailored multivariate curve resolution-alternating least squares using in vivo confocal Raman micro-spectroscopy. J Biophotonics. 2023;16( 2):e202200219.

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3. Gehlich, Kerstin H; Koch, Georges; Köcher, Wolfgang et al. Spectroscopic biofeedback on cutaneous carotenoids: A powerful tool for primary prevention in advanced age. *J Biophotonics*. 2023;16( 7):e202200394.

4. Kröger, Marius; Schleusener, Johannes; Lademann, Jürgen et al. Tattoo Pigments Are Localized Intracellularly in the Epidermis and Dermis of Fresh and Old Tattoos: In vivo Study Using Two-Photon Excited Fluorescence Lifetime Imaging. *Dermatology*. 2023;239( 3):478.

**Biography**

Jürgen Lademann studied at the Quantum Electronics Department of the Physics, Moscow State University, Russia, where he completed his master's degree. In the year 2000, Prof. Lademann was appointed professor of dermatology at the Charité-Universitätsmedizin Berlin, Germany. He is editor of the international journal "Skin Pharmacology and Applied Skin Physiology" and board member of the German Federal Institute of Risk Assessment, Berlin, Germany.

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