

# Volume Preface

- *I generate knowledge*
- *We do not sell knowledge*
- *With relevant knowledge one could market better products*

From “Dialogs of the Scientist and CEO” (Paolo Giacomoni, in preparation)

People lacking a particular gene have larger chances for multiple skin cancers. Black and Latino skins are more efficient than Asian and Caucasian in repairing DNA and removing damaged cells. The immune system of the skin needs specifically designed protection. Singlet oxygen is perhaps the single most damaging reactive oxygen species generated by solar radiation, and our skin has no defense against it.

These and other striking results are described in this monograph of the European Society for Photobiology, which summarizes the recent progress of our knowledge on the consequences of the exposure of healthy skin to solar radiation.

The ESP publishes monographs describing the progress in different fields of photobiology. In 2001 the monograph, *Sun Protection in Man*, summarized the known positive and negative effects of ultraviolet radiation, the biochemical responses of human skin, the physiological and artificial defenses at hand, the relevant experimental models and the physics of solar radiation.

*Biophysical and Physiological Effects of Solar Radiation on Human Skin* takes on where *Sun Protection in Man* left off. Notwithstanding the wealth of knowledge accumulated in the second half of the nineteenth century and in the twentieth century, twenty-first century photo-biology has already produced striking observations leading to the discovery of new paradigms. To our knowledge of the short-term effects of acute exposure and to the epidemiological observation of the effects of chronic exposure to UV, we have added the results relative to the effects of repeated sub-erythemal doses which are enlightening (no pun intended) to understanding the etiology of the many effects of chronic exposure to solar radiation, particularly as far as the different aspects of UV-induced inflammation are concerned.

Twenty-first Century photobiology has extended our knowledge on the effects of solar radiation to non-Caucasian populations, has investigated the relationship between genetic background and the onset of skin cancer, has provided paradigms to understand photo-induced immune-depression, has

fostered investigations to unveil the physiological role of visible light and tackles the difficulties in understanding the mechanisms leading to the formation of age spots. Up until now one might have believed that we knew everything about the UV-induced generation of DNA damage and oxidative stress. We now have learned that, *via* energy transfer mechanisms, UV-A can provoke the production of cyclo-butane pyrimidine dimers and that lipid peroxides can trigger the oxidation of proteins. We already knew about the mechanisms of DNA repair and of removal of damaged proteins, we now have learned about the interplay between UVA and UVB and about “inducible” mechanisms providing protection against UV.

On the 10th Anniversary of the proposal of the micro-inflammatory model for skin aging by Giacomoni and D’Alessio within the European Network for Molecular Gerontology (*Molecular Gerontology* [Rattan & Toussaint editors] Plenum Press 1996), the evidence gathered *in vivo* and with cells in culture about photo-aging, confirms the predictions. The consequences of the oxidative burst and of the protease cascade after UV which multiply the initial photo-damage lead to the eventual disorganization of structural proteins in the dermis and in the basement membrane with the concomitant loss of elasticity and resilience.

This monograph is intended to be a “must read” both for the scholar and for the educated layman. It has been written with a historical perspective and avoids discussing transient knowledge. What has been learned in photobiology will have wide scientific, technological and industrial applications and will have remarkable behavioral consequences as well.

Describing the role of individual genes in the response to the different exposures to solar radiation could be a formidable task. This will allow one to tackle the even wider question, of the interplay of different genes and the role of the individual genetic background after solar challenge. Pharmacological tools containing DNA repair enzymes, presently developed to accompany and alleviate the consequences of inherited diseases such as *Xeroderma pigmentosum*, will inspire the scientists to develop future therapies. New technologies will be developed to accelerate the repair of sun-induced damage other than DNA damage, and a sophisticated fine tuning will be added to the present-day quite unspecific protection offered by sunscreens against UVB and UVA.

Skin care technologies will take advantage of these new findings in photobiology to tailor new products, and it can be expected that the Chinese, Indian and South American markets will find cosmetic and pharmacological products fitting their needs.

In the Western world, sun-worshipping will probably come to an end. A tan will no longer be considered a fashionable indicator of health and wealth, and, when exposed to solar radiation, we will use umbrellas and long-sleeved dresses, thus mimicking the behavior of our ancestors in the late nineteenth century rather than that of our grandparents 50 years later.

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