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CONTRADICTIVE STANDPOINTS ON SOLAR UV EXPOSURES: HOW TO ATTAIN HARMONY?

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As is well known high energy ultraviolet (UV) photons initiate a variety of photochemical reactions in skin that produce positive or negative health effects depending on the accepted UV dose. Recent years just the problem of UV overdose was much investigated especially in view of stratospheric ozone depletion.

However, proper amount of UV light is beneficial for people initiating Vitamin D_3 synthesis in skin, and the link between sun exposures, vitamin D levels and bone disease is well established. Nevertheless, little attention is still given to definition of the lowest healthy UVB (280-315 nm) doses that are necessary to provide the vitamin D requirement for most of the world's population. Taking into account that Vitamin D deficiency became an unrecognized epidemic in most adults who are not exposed to adequate sunlight, permanent monitoring of the vitamin D synthetic capacity of sunlight demands particular care. This is especially important in view of recent findings on the protective role of UVB sunlight against many types of cancers associated with vitamin D synthesis.

For more than ten years dermatologists have been urging the public to avoid the sunlight, but the challenge is to promote a sensible attitude to sun exposure that safely balances the inherent risks and benefits of UV radiation. Ideally, global UV mapping as well as daily UV forecasts should consider both erythemic and "antirachitic" solar UV indices. It is essential to find harmony and avoid both either UV deprivation or acute and chronic UV injury.

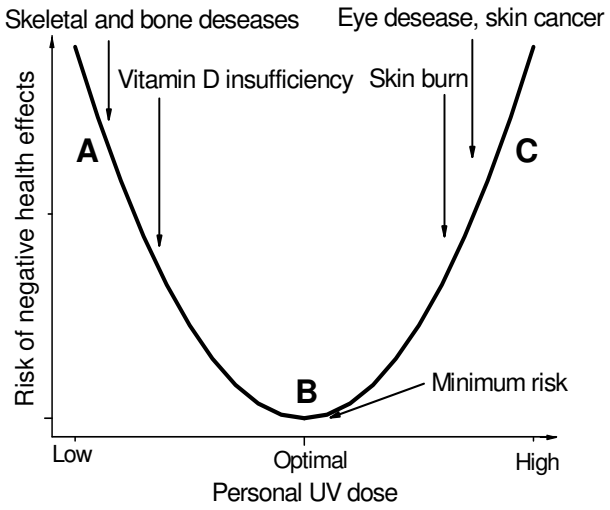

Fig.1. Illustration of weighed approach to UV exposure to maximize the beneficial effects while minimizing the deleterious effects.

The graph in Fig.1 shows three different areas **A**, **B**, and **C** with different health effects depending on the accepted UV dose. The urgent question is how to determine quantitatively the boundaries nearby area **B,** i.e. to determine the so-called "comfort UV dose"?

The problem is the vitamin D synthetic capacity of sunlight is very changeable, and in view of strong wavelength dependence of vitamin D synthesis, the specification of UV exposure in radiometric units is of limited value if no account is taken on the spectral content of sunlight. Moreover, in view of the mismatch between the CIE erythema and vitamin D synthesis action spectra most of broad-band UV detectors (which spectral sensitivity corresponds to the CIE erythema action spectrum) are unsuitable for monitoring the Vitamin D synthetic capacity of sunlight.

Obviously, for adequate detection of the 'antirachitic' UV exposures the relative response of a device to different wavelengths should resemble the action spectrum of vitamin D synthesis. To achieve this goal we have developed personal UV biodosimeter employing 7-Dehydrocholesterol (provitamin D_3) molecules as photosensitive material for controllable detection of the accepted "antirachitic" UV dose during an out-door activity, heliotherapy or phototherapy procedure.