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The Sun's infrared-A is not detrimental to the skin

Recent scientific publications refute concerns regarding the infrared-A (IRA) component of the Sun's radiation. Specific protection against the Sun's infrared-A is therefore unnecessary. As far as ultraviolet in Sun's radiation is concerned, an adequate protection is still required.

Two new publications from the Berlin Charité and the University Medical Centre Mainz [1] and from the University of Stuttgart-Hohenheim [2] confirm earlier studies concerning the harmlessness of infrared-A [3] and its usefulness to humans. They refute concerns regarding possible detrimental effects of infrared-A, which is the main part of the Sun's thermal radiation. In the Earth's moderate climate zones, the infrared A-radiation reaches the Earth's surface after being filtered by the water vapour in the Earth's atmosphere, and is thus especially well tolerable.
The publication from the Charité Berlin and the Mainz University Medical Center has demonstrated numerous systematic methodological errors in publications claiming to show the dangers of the infrared-A component of the Sun's radiation. In cell culture studies, irradiances were partly used which were much more than 10-fold greater than that of the maximum possible infrared-A irradiance of the Sun in the moderate climate zones or even in the tropics.
These studies ignored the fact that cells in a cell culture (which are not covered by overlying skin cells and have no connection to a blood circulation) should not be exposed to the same level of irradiance as human skin (with an intact blood perfusion, a layer of overlying cells and a horny layer), if meaningful conclusions relevant to the situation in the skin of a person are to be drawn.
An earlier publication has also brought attention to the differences in effects seen when identical irradiances are used to irradiate inanimate material having no blood circulation (resulting in a surface temperature of approx. 100°C) and human skin capable of heat dissipation via the circulation (resulting in a surface temperature of approx. 38°C) [4].
In the studies in which supposed dangers were reported, no consideration at all was given to the fact that the results seen are dependent not only on the dose of irradiation, but also on the irradiance level: Effects seen following short exposures to very high irradiances can not be interpreted as suggesting that the same result will occur if irradiation is carried out over hours using a lower irradiance level.
Additionally, some of the studies were carried out using foreskin cells obtained from infants, which are known to behave differently to skin cells.
A specific effect of infrared-A exposure which was independent of a pure temperature increase could not be identified as the reason for effects interpreted as being undesirable in the critical studies. Instead, the publication from the University of Stuttgart-Hohenheim showed that certain effects could be seen in cell cultures even in the complete absence of infrared-A exposure when only the temperature of the water bath was increased, whereas these effects were not seen even with high infrared-A irradiance levels as long as the cells were maintained under physiological temperature conditions.
Ultimately, the interpretation of possible effects and the avoidance of miss- or overinterpretations are of considerable importance: Even when, as claimed in the critical reports, an upregulation of enzymes capable of degrading collagen (e.g., the matrix metalloproteinases) or their gene expression were to occur, this can not automatically be interpreted as being detrimental in the sense of a promotion of skin ageing or even more far-reaching skin changes, since these effects are also seen during other processes such as wound healing.
Even a purported increase in free radicals can not categorically be considered as being unfavourable; the ambivalent relevance of free radicals has already been pointed out in an earlier publication [5]: in the case of special white blood

cells (granulocytes), the generation of free radicals is an important mechanism of action in the defence against bacteria.

Consequently, there is no reason for specific measures against the Sun's infrared-A (e.g., in the form of special Sun protection products), especially when the fact that infrared-A has been shown to provide some protection against the unwanted effects of the Sun's ultraviolet radiation is considered [6]. At the same time, there is no cause for any reservations concerning the beneficial medical application of infrared-A (IRA) or water-filtered infrared-A (wIRA) radiation. However, the necessity for adequate skin and eye protection against ultraviolet (UV) in Sun's radiation remains valid, e.g., in the form of protection through textiles, sunglasses or sun protection products.

Publications:
[1] Piazena H, Kelleher DK. Effects of infrared-A irradiation on skin: discrepancies in published data highlight the need for an exact consideration of physical and photobiological laws and appropriate experimental settings. Photochem Photobiol. 2010; 86: 687-705. DOI: 10.1111 / j.1751-1097.2010.00729.x
[2] Jung T, Höhn A, Piazena H, Grune T. Effects of water-filtered infrared A irradiation on human fibroblasts. Free Radic Biol Med. 48; 2010: 153-160. DOI: 10.1016/j.freeradbiomed.2009.10.036
[3] Gebbers N, Hirt-Burri N, Scaletta C, Hoffmann G, Applegate LA. Water-filtered infrared-A radiation (wIRA) is not implicated in cellular degeneration of human skin. GMS Ger Med Sci. 2007; 5: Doc08. Online available from: www.egms.de/pdf/gms/2007-5/000044.pdf (PDF) and www.egms.de/en/gms/2007-5/000044.shtml (shtml).
[4] Mercer JB, Nielsen SP, Hoffmann G. Improvement of wound healing by water-filtered infrared-A (wIRA) in patients with chronic venous stasis ulcers of the lower legs including evaluation using infrared thermography. GMS Ger Med Sci. 2008; 6: Doc11. Online available from: www.egms.de/pdf/gms/2008-6/000056.pdf (PDF) and www.egms.de/en/gms/2008-6/000056.shtml (shtml).
[5] Meffert H. Antioxidants – friend or foe? GMS Ger Med Sci. 2008; 6: Doc09. Online available from: www.egms.de/pdf/gms/2008-6/000054.pdf (PDF) and www.egms.de/en/gms/2008-6/000054.shtml (shtml).
[6] Menezes S, Coulomb B, Lebreton C, Dubertret L. Non-coherent near infrared radiation protects normal human dermal fibroblasts from solar ultraviolet toxicity. J Invest Dermatol. 1998; 111(4): 629-33. DOI: 10.1046/j.1523-1747.1998.00338.x