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Effects of repeated sunbed exposures on the human skin. In vivo measurements with confocal microscopy.

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ABSTRACT

BACKGROUND: Ultraviolet (UV) lamps used in commercial sunbeds are usually defined as UVA sources. Although it is well accepted that sunbed exposure significantly increases melanin pigmentation, its capacity to induce epidermal thickening is discussed controversially.

OBJECTIVES: The aim of this study was to assess non-invasively the effects of repeated sunbed exposures on epidermal thickness, cell size, and pigmentation by means of confocal laser-scanning microscopy (CLSM) in vivo.

METHODS: Eight volunteers had sunbed exposures six times in a 3-week period (cumulative dose: 126 J/cm² UVA).

During irradiation, a small site (2 cm x 2 cm) on the lateral aspect of the inner forearm was covered with a UV-opaque sheet (non-exposed site). CLSM was performed with the VivaScope (Lucid, Henrietta, NY, USA) 24 h after the last UVA exposure on non-exposed sites and UVA-exposed sites that were on the medial aspect of the inner forearm at a distance of 2 cm to the non-exposed measurement site.

The following parameters were assessed: thickness of the horny layer (DSC), minimal thickness of the epidermis (E(min)), minimal thickness of the viable epidermis (VE(min)), cell size of the granular layer (A(gran)), and the epidermal melanin content (MI). Additionally, colorimetric measurements have been carried out on non-exposed and UVA-exposed sites.

RESULTS: DSC of the UVA-exposed skin was significantly higher than the one of non-exposed sites (mean+/-SD: 15+/-2.9 microm vs. 12.8+/-3 microm).

Although E(min) was significantly higher in UVA-exposed sites (mean \pm SD: 40.4 \pm 3.6 microm vs. 39 \pm 2.9 microm), a slight but not statistically significant ($P>0.05$) decrease of VE(min) was observed (25.5 \pm 2.1 microm vs. 26.2 \pm 2.4 microm). The median of cell size of the granular layer (A(gran)) significantly ($P=0.008$) differed between non-exposed (752.1 microm²) and UVA-exposed sites (600 microm²).

MI was significantly ($P=0.014$) higher for the UVA-exposed skin (1.12 vs. 1.34). Accordingly, colorimetry revealed significantly ($P< 0.01$) lower skin brightness for UVA-exposed sites ($L^*=60.2\pm 4.3$) as compared with non-exposed sites ($L^*=63.4\pm 3.9$).

CONCLUSIONS: Sunbed exposures seem to induce photoadaptation not only by skin pigmentation but also by epidermal thickening that is predominantly due to an increase in thickness of the horny layer. Moreover, our data indicate that UVA radiation has an influence on the cell size of the granular layer. CLSM is a promising tool for photobiological studies in vivo.