THE INDUCTION OF NUCLEAR DNA BREAKS IN HUMAN SKIN CELLS BY ULTRAVIOLET A (UVA) LIGHT

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The aim of this study was to determine the UVA dose dependence of incidence of nuclear DNA breaks in human skin cells. In recent years, there has been an increasing interest in using such light for biomedical purposes. UVA light is known to generate reactive oxygen species capable of causing single- and double- strand breaks of DNA.

The TUNEL method used in the study had been optimized in a preliminary study carried out using porcine colon samples as the research material. The UVA dose dependence was also estimated at that stage for porcine colon tissues.

In this study, we report on similar research performed for human skin cells. Immediately after resection, a skin sample was immersed in a saline solution and carried to the laboratory. After necessary processing, the tissue samples were irradiated with 337 nm light from a pulsed nitrogen laser or with 325 nm light from a helium-cadmium laser. The skin samples were irradiated consecutively with the following series of doses of UVA: 0.1, 0.5, 1, 15, 20, 40, 80, 120, 300, 500 and 1000mJ/cm^2. Skin samles not subjected to UVA light were used as controls. The TUNEL method was performed on 4μm cryosections. Fluorescein labelled nuclei were detected using an epifluorescence microscope (λ_{ex} 450-480nm; λ_{em} 515nm). The mounting medium contained DAPI and thus it was possible to visualize both labelled and unlabeled nuclei in examined area (λ_{ex} 366nm; λ_{em} 425nm). Firstly, fluorescein- and DAPI- labelled nuclei were counted and then the percentage of fluorescein-labelled nuclei was calculated.

On a basis of the results obtained so far it can reasonably be concluded that:

- UVA doses of up to 1000mJ/cm^2 do not efficiently induce breaks in the DNA of skin cells (at UVA band 1, the MED for skin type I is about 60J/cm^2).
- The data on the damaging effects of UV radiation obtained from studies of the skin cells are most probably not relevant to the cells of internal organs. Such a conclusion is important in the light of the increasing range of medical applications of UV radiation.