INFLUENCE OF RED LIGHT ON IN VITRO CELLS UNDER THE ACTION OF «FOTOLON» PHOTOSENSITIZER

Pochapinskyi Alexey Dmitrovich
postgraduate student
State Institution «National Research Center for Radiation Medicine of the National Academy of Medical Sciences of Ukraine», Ukraine

Supervisor: Lavrenchuk Galina Yosifovna
Doctor of Biological Sciences, Professor
State Institution «National Research Center for Radiation Medicine of the National Academy of Medical Sciences of Ukraine», Ukraine

Photodynamic therapy is based on the interaction of certain wavelength light on photosensitized molecules. Products of such interaction are cytotoxic agents (singlet oxygen and free radicals) that strike cancerous tissue. Presence of oxygen is critical in development of photochemical reaction.

Aim: to test the influence of different concentrations of the photosensitizer "Fotolon" on normal human cells test system for further use in photodynamic therapy.

Experimental studies were performed on a monolayer culture of human fibroblasts of 6th passage, which were obtained from the umbilical cord. Cells were cultured in full Advanced DMEM/F12 (Gibco) medium with 2% calf embryo serum (Gibco), 1% Pen Strep Glutamine (Gibco). Cells were grown at a constant temperature of 37 ° C and 5% CO_2 in 50 ml vials with an surface area of 25 cm². Five days old cells were selected for the study. After 24 hrs of planting in growth medium, a photosensitizer "Fotolon" (Belarus) was added to the cells in the concentrations of 0.25 µg/ml, 0.50 µg/ml, 1.25 µg/ml and 5 µg/ml. The active component of "Fotolon" is chlorine E6, which prefers to accumulate in pathological tissues (benign and malignant formations of different genesis and localization) and under light with a wavelength of 630-670 nm leads to destruction of such formations. The cells were irradiated with red light produced by Barva-LED/630 (single LED).

Study showed that at the applied concentrations of 0.25 to 5.00 µg/ml the drug does not cause significant changes on proliferative activity of normal human cells (Fig. 1). At the same time, irradiation of these cells with light (630 nm) at a dose of 45 J/cm² (25 mW/cm² for 30 min) resulted in the death of 80% of cells in normal cell culture at a concentration of "Fotolon" of 5.00 µg/ml. Under concentration of 0.25 µg/ml of "Fotolon" death rate decreased to 17%. For "Fotolon" concentrations of 0.5 and 1.25 µg/ml, 42 and 51% of fibroblasts died, respectively. In the culture of normal
fibroblasts irradiated with red light in the presence of a photosensitizer were found atypical cells with an odd number of nuclei and micronuclei. Their number increases significantly with increased concentration of photosensitizer, which may indicate a genotoxic effect on cells of the combination of red light and "Fotolon".

**Fig. 1.** Morphofunctional parameters in the culture of human fibroblasts on the 5th day of cultivation in the control, under the action of red light (RL) and under the combined influence of RL and photosensitizer "Fotolon" in different concentrations.  
Note: * - significantly significant difference between control indicators and experimental variants, p <0.05.

**Conclusion:** it was found that the damaging effect of the photosensitizer "Fotolon" (Belarus) in the concentration range of 0.50-5.00 µg/ml increases sharply when combined with light irradiation in the red range of 630 nm (25 mW/cm² for 30 min). Under these conditions, the proliferative and mitotic activity of cells decreased significantly, atypical bi- and trinuclear cells and cells with micronuclei appeared in cell culture, which indicates damage to the genetic material of cells. Thus, the combined effect of optical light (630 nm) and the photosensitizer "Fotolon" causes the death and damage of genetic material not only in malignant but also in normal human proliferating cells.