INDUCTION OF RADIATION HORMESIS WITH DIFFERENT KINDS OF IONIZING AND NON- IONIZING RADIATION IN MICE IN VIVO

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The purpose of our work is to study the activation of natural defenses reserve in mice after irradiation with low dose of various types of ionizing and non-ionizing radiation *in vivo* using previously developed technology of adaptive response (AR) induction. It is known that the AR is considered as an experimental detection of radiation hormesis. The AR phenomenon is that prior irradiation of an object in low adapting doses of low LET ionizing radiation (γ and X-ray) leads to reduction of sensitivity by 1.5-2 times the subsequent revealing effects of large doses of the same or different exposure. We have previously obtained data, that the induction of an AR depends on various conditions: the magnitude and dose rate of adapting dose, the time between the adapting and revealing doses, the radiation quality, and also the individual sensitivity of the biological object. As adapting treatment, in this study we used X-rays, carbon ions, infrared light, He-Ne laser and low-intensity femtosecond laser radiations. The following tasks were set: assessment of cytogenetic damage using a micronucleus test, the weight index of lymphoid organs (thymus and spleen) and the level of ROS production in whole blood through the method of luminol dependent zymosan-induced chemiluminescence. Experiments were performed with male outbred albino SHK mice (body weight 26–30 g) at an age of two months. SHK mice were irradiated according to the scheme of AR. The conditions of exposure for adaption of animals were the following: ionizing radiation – carbon ions with the energy of 450 MeV/nucleon at a dose of 0.1 Gy (uniform pulse beam, 1 times in 8 sec, release duration 0.8 s) and non-ionizing radiation (IRL diode matrix – irradiation of the whole body of the animal for 10 min (850 nm, 22 mW/cm2) and He-Ne laser radiation – for 15 and 100 sec (632.8 nm, 0.7 mW, 0.16 mW/cm2), at which the nose of the animal was irradiated; irradiation of mice at nose with low-intensity femtosecond laser radiation for 10 and 50 sec (525 nm, 200 fs, pulse frequency 70 MHz, 0.5 mW, 10.4, and 52 mJ/cm2). One day after the treatments, all groups of animals were additionally irradiated with carbon ions or X-rays at doses of 1.5 Gy according to the earlier used scheme (0.1 Gy + 1.5 Gy). At least 5 mice were used for each experimental group. Analysis of data on the number of cytogenetic damages in bone marrow showed that pretreatment of the animals with all investigated treatments and subsequent exposure to X-rays or carbon ions at a dose of 1.5 Gy has led to a decrease in radiosensitivity compared to the non-adapting animals. Similar results were observed when analyzing weight index of lymphoid organs. Determination of level of ROS production has shown that the activation index calculated according to the relation of induced to spontaneous light area, was significantly higher in all groups of mice, indicating activation of the natural defenses reserve as compared to the group exposed only at a dose of 1.5 Gy. The obtained results confirm the assumption of revealing activation of the natural defense of the organism using of the radiation hormesis induction.