## Vertebrate Model to Examine the Biological Effectiveness of Different Radiation Qualities

Authors : Rita Emília Szabó, Róbert Polanek, Tünde Tőkés, Zoltán Szabó, Szabolcs Czifrus, Katalin Hideghéty Abstract : Purpose: Several feature of zebrafish are making them amenable for investigation on therapeutic approaches such as ionizing radiation. The establishment of zebrafish model for comprehensive radiobiological research stands in the focus of our investigation, comparing the radiation effect curves of neutron and photon irradiation. Our final aim is to develop an appropriate vertebrate model in order to investigate the relative biological effectiveness of laser driven ionizing radiation. Methods and Materials: After careful dosimetry series of viable zebrafish embryos were exposed to a single fraction whole-body neutron-irradiation (1,25; 1,875; 2; 2,5 Gy) at the research reactor of the Technical University of Budapest and to conventional 6 MeV photon beam at 24 hour post-fertilization (hpf). The survival and morphologic abnormalities (pericardial edema, spine curvature) of each embryo were assessed for each experiment at 24-hour intervals from the point of fertilization up to 168 hpf (defining the dose lethal for 50% (LD50)). Results: In the zebrafish embryo model LD50 at 20 Gy dose level was defined and the same lethality were found at 2 Gy dose from the reactor neutron beam resulting RBE of 10. Dose-dependent organ perturbations were detected on macroscopic (shortening of the body length, spine curvature, microcephaly, micro-ophthalmia, micrognathia, pericardial edema, and inhibition of yolk sac resorption) and microscopic (marked cellular changes in skin, cardiac, gastrointestinal system) with the same magnitude of dose difference. Conclusion: In our observations, we found that zebrafish embryo model can be used for investigating the effects of different type of ionizing radiation and this system proved to be highly efficient vertebrate model for preclinical examinations.

Keywords : ionizing radiation, LD50, relative biological effectiveness, zebrafish embryo

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