

Poster Session 08: Bystander and other Low Dose Effect

Response of 5 hpf zebrafish embryos to low-dose microbeam protons

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The microbeam irradiation system (single-particle irradiation system to cell, acronym as SPICE) at the National Institute of Radiological Sciences (NIRS), Japan, was employed to irradiate dechorionated embryos of the zebrafish, *Danio rerio*, at 5 h post-fertilization (hpf) by protons each having an energy of ~3.4 MeV. Either 1 or 10 positions on the cells were irradiated with different number of protons. The levels of apoptosis in zebrafish embryos at 25 hpf were quantified through terminal dUTP transferase-mediated nick end-labeling assay. Triphasic dose–responses were obtained (Fig. 1), including (i) a subhormetic zone with an increase in apoptotic signals for a small number of irradiated protons per position, (ii) a hormetic zone with a reduction in the apoptotic signals below the spontaneous level for a larger number of irradiated protons per position and (iii) a toxic zone with an increase in apoptotic signals again if the number of irradiated protons per position was further increased.

Clinical Trial Registration number if required: None

Keywords: protons; dose–response; zebrafish embryos

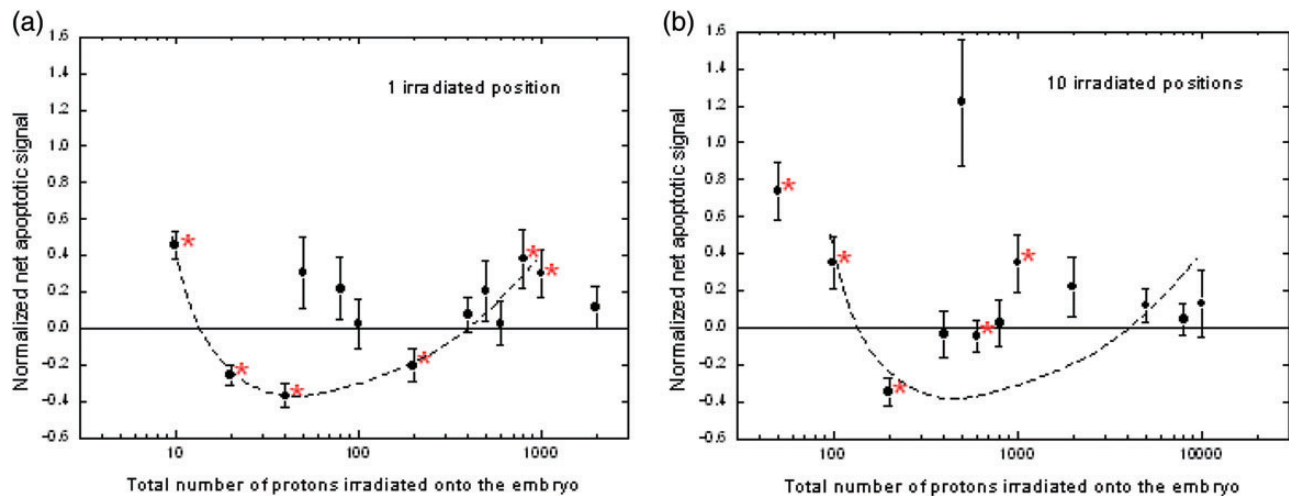


Fig. 1. Relationship between normalized net apoptotic signals on 25 hpf zebrafish embryos and the total number of protons irradiated onto the zebrafish embryos at 5 hpf. Asterisked points: significant differences cf. control samples (t -tests: $P \leq 0.05$). (a) Data for irradiation at 1 position. Broken line: trend shown by asterisked points. (b) Data for irradiation at 10 positions. Broken line: same as the one shown in (a) for comparison.