

161 **Effects of Accelerated Carbon-Ion on the Induction of Dominant Lethality in the Medaka, *Oryzias latipes* (I)**

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We have studied the genetic effects of heavy ions on the male germ cells of the teleost fish, *Oryzias latipes*, by using dominant lethal test system. Sexually mature males were irradiated with carbon-ion (135 MeV/u) accelerated by the RIKEN ring cyclotron. The fish were exposed to heavy ion of 2, 5 and 10 Gy at the mid position of spread-out Bragg peak (dose average LET = 70 keV/μm) and then mated with a non-irradiated laying female. The fertility and hatchability of eggs were observed in each pair for 30 days.

The fertility of the eggs reduced as the doses irradiated within 30 days after irradiation. The hatchability of eggs laid within 1-3 days after irradiation decreased markedly and the increase of hatchability of eggs was observed in each dose group during the period of the succeeding 6 days. From this hatchability data, the dose-dependent effects on production of the dominant lethality were observed in each spermatogenetic cell stage in medaka after heavy ions irradiation. Mature sperm was the most sensitive among the various stages of spermatogenetic cells.

162 **Biological data for heavy-ion radiation therapy**

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A construction of HIMAC (Heavy Ion Medical Accelerator in Chiba) has almost finished and a beam test will start soon for a heavy-ion radiation therapy. In order to start clinical trials of the heavy-ion radiation therapy, biological data for the heavy-ion beams have been accumulated since middle of 1980s using NIRS cyclotron and RIKEN ring cyclotron beams. It is important to arrange the many experimental data for the radiation therapy.

RBE and OER of the experimental cell survival curves for spread-out Bragg peak agreed well with the theoretical calculations. Comparisons of the experimental data for neutron and heavy-ion irradiations are also discussed. Then, the simulation of the biological responses for the therapeutic heavy-ion beams are discussed.

163 **The effects of cell death and mutation induction irradiated with accelerated carbon ion beams with spread out Bragg peak.**

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We investigated the effects of cell death and mutation induction in human embryo (HE) cells irradiated with carbon ion beams, which Bragg peak was spread out, generated by RIKEN ring cyclotron. HE cells were irradiated at 4 spread out positions (average LET = 35 keV/μm, 83 keV/μm, 93 keV/μm, 130 keV/μm). Mutation frequency was determined to measure the 6-thioguanine resistant colony forming ability.

The results showed that cell death was dependent on average LET. The RBE at 10% survival level relative to ¹³⁷Cs gamma rays was 1.73 at 35 keV/μm, 2.00 at 83 keV/μm, 2.10 at 93 keV/μm and 2.77 at 130 keV/μm. On the other hand, the induction of HPRT deficient mutation was no difference at 4 spread out positions. We have studied the relationship between these biological effects and average LET in DNA level using PCR method.