

185 Analysis of Mutations in the Human *HPRT* Gene Induced by accelerated heavy-ion irradiation Yasuhiro KAGAWA^{1,2}, Fumio YATAGAI¹, Masao SUZUKI³, Youko KASE¹, Akiko KOBAYASHI², Masami WATANABE³, Fumio HANAOKA¹; ¹The Institute of Physical and Chemical Research, ²Toray Research Center Inc., ³Nagasaki University.

Mutational sequence alterations were determined for 18 mutations induced by accelerated carbon-ion (230keV/ μ m) irradiation in a cDNA of *hprt* gene of the human embryo cell. Deletions of exon6 were the most frequent mutational events (10 clones), and deletions of both exon6 and exon8 were next most frequent (6 clones), followed by base substitutions (2 clones). Genomic Southern analysis was carried out in order to investigate the mechanism of these deletions. The EcoRI- or PstI-digested genomic DNA of a particular mutant clone, showing deletion of both exons 6 and 8, was hybridized with ³²P labelled DNA probe involving exon6 region. From this Southern analysis, this mutant clone is suggested to represent, at least, the deletion of exon6 due to abnormal mRNA splicing. To determine whether the observed characteristic is specific to the effect of heavy-ion, we are also characterizing the spontaneous *hprt* mutation by the same analysis.

186 A Comparison of Biological Responses of Human Tumor Cells After Irradiation with Heavy Ions and Neutrons
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We have compared the cell survival, potentially lethal damage repair (PLDR) in plateau phase human osteosarcoma cells (MG-63), and spheroid cure in multicellular spheroids after irradiation at various positions in the plateau and spread-out Bragg peak of a 135 MeV/ μ carbon beam and with 13 MeV neutrons. Carbon beam had 4 cm range in water and a range filter was used to produce 3 cm extended-peak region. The neutrons were produced by bombarding a beryllium target with 30 MeV deuterons. The reference radiation was ¹³⁷Cs γ -rays. The cell survival of plateau phase cells was measured by 24 hr delayed plating. PLDR was evaluated by holding irradiated cells at 37°C for various periods before plating. The radiosensitivity of spheroids was measured by spheroid cure assay. The studies of the quality of the extended-peak of a carbon beam and fast neutrons suggest that the neutrons and 75-80 keV/ μ m carbon-ions of spread-out Bragg peak are about equal in biological efficacy.

187 An RBE study of a proton beam at the University of Tsukuba with LD₅₀ assay.

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An RBE study was performed on the middle portion of a 90 mm Spread Out Bragg Peak (SOBP) of a 500 MeV proton beam at the Proton Medical Research Center. Twelve weeks old female C₃H mice were given whole body irradiation with 5 mm thick lucite cases (used as bolus) without anesthesia. ⁶⁰Co γ -rays were used as a standard radiation. LD_{50/30} was analyzed by probit analysis.

This study showed the RBE values of 1.07 to 1.09. The RBE of a proton beam in the SOBP at the University of Tsukuba is not less than 1 by LD_{50/30} assay.