111 Genetic Effect of Low-Dose-Rate Radiation on Human Immortal Cells

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We introduced the hTERT gene into both normal and AT fibroblast cells to establish immortal cells. They are continuously growing beyond 100 PDN. These cells exhibited normal contact inhibition, and their karyotypes were in a diploid range. Induction of p53 and GADD45 proteins by X-ray in normal immortal cells was same as in the corresponding primary cells. In the normal cells, the survival after 5 Gy of high-dose-rate (HDR, 2 Gy/min) irradiation was 0.03, while that after low-dose-rate (LDR, 0.3 mGy/min) irradiation with the same dose was 0.3. However, in AT cells, both HDR and LDR irradiation resulted in the same survival. These results clearly show that the AT cells have a defect in the DNA repair system involved in cellular survival. We also studied induction of the HPRT mutation in normal cells. Mutation frequency after LDR irradiation was 1/8 of the HDR irradiation at the same dose. The mutation-induction after LDR irradiation was dose dependent.

112 Small dose pre-irradiation induced radio-resistance and longevity after challenging irradiation in splenectomized C57BL/6 mice

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We have reported that pre-irradiation with a small dose (0.3–0.5 Gy) induces radio-resistance (decreased bone marrow death) two weeks later in ICR and C57BL/6 mice. The spleen is well known as an important tissue for hemopoiesis in mice. Spleen dependency for the radio-adaptive response was examined by splenectomy in C57BL/6 mice. The 30-day survival rate after exposure to 6.75 Gy was significantly ($p<0.001$, Chi-square test) increased by the pre-irradiation, from 43.2% (19/44) to 88.4% (38/43). However, the increment by the pre-irradiation was smaller compared with that in the intact (not splenectomized) animals in the similar conditions. Effect of pre-irradiation on the life span was also examined. The median survival time was 121 (10-166) days for the control and 182 (127–146) days for the pre-irradiated group. The difference of the life span was significant both in generalized Wilcoxon's rank sum test ($p=0.0325$) and log rank test ($p=0.0278$). These results indicate that the priming irradiation favors both short-term survival rate shown as 30-day survival rate and long term survival time shown as lifespan in the splenectomized mice.

113 FISH examination of blood lymphocytes from Mayak nuclear workers

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We examined lymphocytes from 27 nuclear workers at the Mayak Production Association and two control individuals using FISH. Official doses varied from 0 Gy to 8.50 Gy. The mean (±SD) genome-equivalent translocation frequency (F_G) was 2.30±0.75% in the zero-dose group, and the best-fit equation of F_G (%) = 2.96 (±0.39) + 0.69 (±0.14)D + 0.12 (±0.05) A (D = dose in Gy, A = age centered at 67 years). In other words, more than 1 Gy was required to increase the F_G by 1%, and more than 3 Gy would be required to double the mean F_G observed in the zero-dose group. The estimated translocation-induction rate (0.69% per Gy) was somewhat lower than various estimates in vitro. Bone marrow stem cells may be more radioresistant than mature lymphocytes, may be subjected to a recovery (e.g., PLDR), or the estimated dose may be revised to decrease. In any event, precise dose estimation by FISH under chronic radiation exposure seems to be difficult as the background F_G is a few percent.