

# Frequencies of Chromosomal Aberrations and Clone Formation in Splenocytes from Mice Continuously Irradiated with Low Dose-rate Gamma-rays

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## Abstract

Chromosomal aberrations and karyotypic clones in splenic lymphocytes of female specific pathogen free (SPF) C3H mice exposed to low dose-rates of  $^{137}\text{Cs}$ -gamma-rays (LDRs: 1 mGy/22h/day and 0.05 mGy/22h/day) continuously from 8 weeks of age to a maximum of about 700 days were analyzed. Splenic lymphocytes from irradiated and non-irradiated control mice were cultured for 46 h in the presence of LPS, Con A, and 2-ME to obtain metaphase spreads, and translocations and dicentric chromosomes were identified under a fluorescent microscope using the multiplex-fluorescence *in situ* hybridization (M-FISH) method. Significant increases in the frequencies of translocations and of dicentric chromosomes compared to age-matched non-irradiated controls were detected in mice exposed to 1 mGy/22h/day gamma-rays but not in mice exposed to 0.05 mGy/22h/day gamma-rays. Analysis of clones (at least three cells with the same aberrations) in irradiated and non-irradiated control mice showed that the clones with karyotypes described as  $\text{der}(\alpha)\text{t}(15;\alpha)$  were dominant in non-irradiated controls and in the mice irradiated at 0.05 mGy/22h/day but not in the mice irradiated at 1 mGy/22h/day. From these results, we concluded that chromosome aberrations are detectably induced at 1 mGy/22h/day, but not at 0.05 mGy/22h/day. These results will be helpful in the risk assessments for low-dose radiation exposures, as well as for establishing a biodosimetry method for long-term exposures at low dose rates.

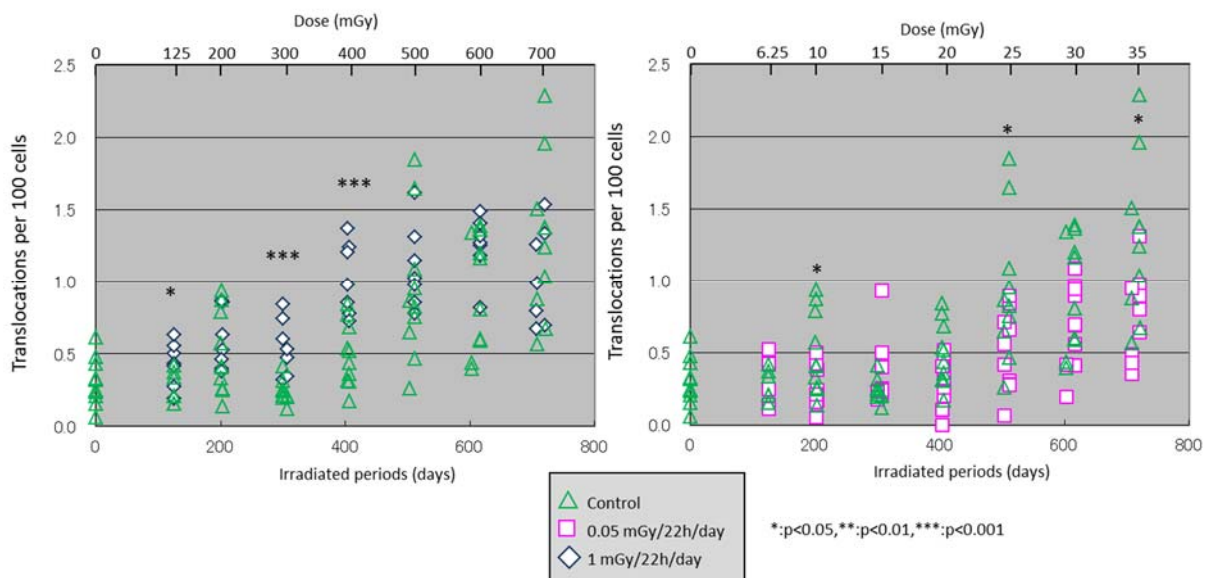


Fig. 1 Frequencies of chromosomal translocations in splenic lymphocytes from mice continuously irradiated with low dose-rate gamma-rays (1 mGy/22h/day and 0.05 mGy/22h/day). Each symbol indicates the value for an individual mouse.

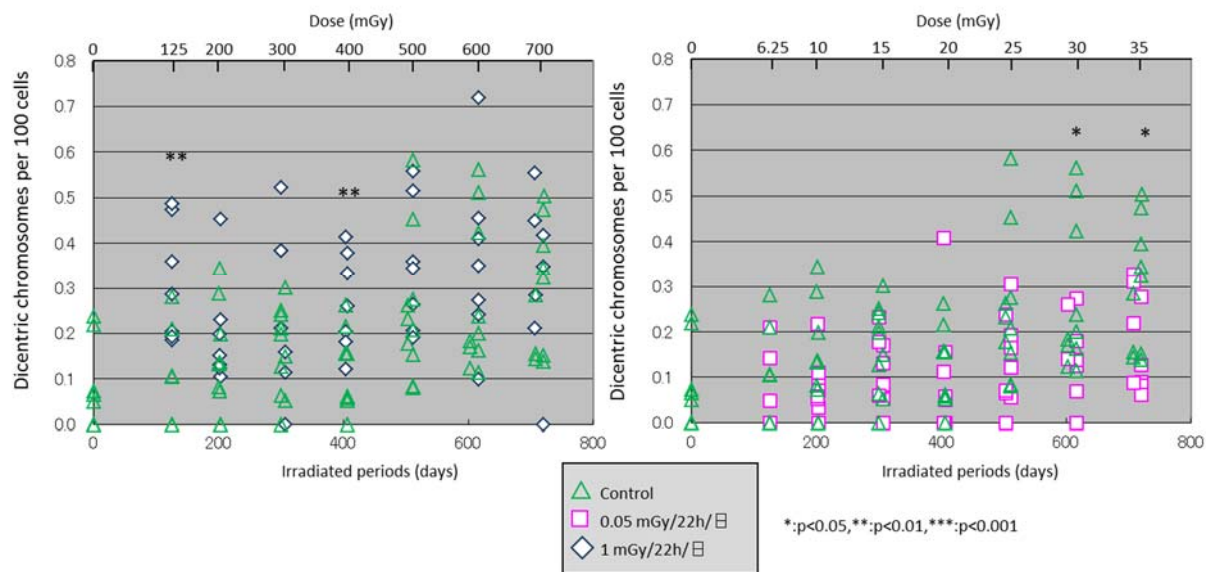


Fig. 2 Frequencies of dicentric chromosomes in splenic lymphocytes from mice continuously irradiated with low dose-rate gamma-rays (1 mGy/22h/day and 0.05 mGy/22h/day). Each symbol indicates the value for an individual mouse.

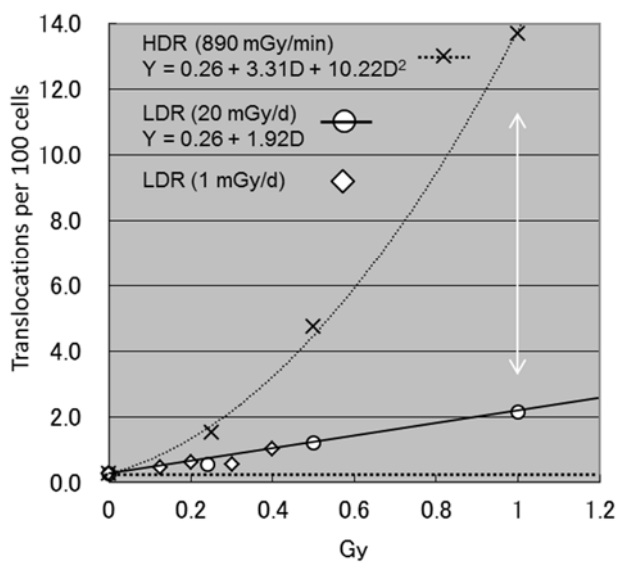


Fig. 3 Frequency of translocations in relation to total dose.

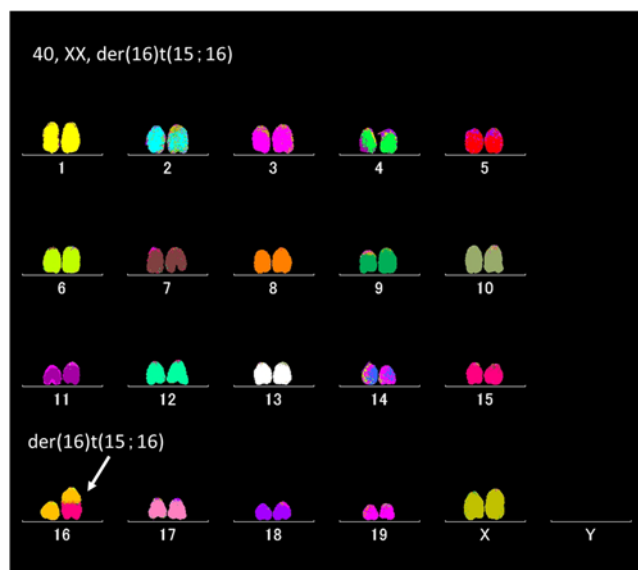


Fig. 4 An example of characteristic karyotypic clones [der( $\alpha$ )t(15 ;  $\alpha$ )]. In this clone,  $\alpha$  is chromosome 16.