Estimation of minimum length of translocated chromosome tips detectable by FISH. 

A reciprocal translocation can be clearly seen as two bicolor chromosomes by the FISH method. Occasionally, however, only one bicolored chromosome is present, probably due to a near terminal breakage so that the translocated tip is not detectable. Among the 707 translocations detected by FISH painting of chromosomes 1, 2 and 4 (from a survey of 60 A-bomb survivors), 492 contained two bicolor chromosomes whereas 149 and 28 were devoid of one unpainted tip and painted tip, respectively. Simple mathematical calculations assuming that the chromosome breakpoints distribute randomly demonstrated that chromosome tips of 6.5 Mb length or less in the FTTC-painted chromosome and of 14 Mb length or less in the PI-counterstained chromosomes are not detectable, in order to account for the different yield of three types of exchanges. These values are close to the ones suggested by the G-band method (i.e., 5 - 10 Mb).


This study was undertaken to evaluate the effect of combining irradiation with X-rays of various energies and a Gd-based contrast agent on the induction of chromosome aberrations in peripheral lymphocytes. It was shown that an enhancement of the absorbed radiation dose caused by the presence of Gd-based contrast agent at irradiation induced increase of chromosome aberration frequencies. Efficiencies of I and Gd-based contrast agents in an enhancement of chromosome aberration induction were compared.

Induction of chromosome aberrations by a combined treatment with radiation and heat 
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A combined treatment with radiation and heat induces an interactive effect on cell killing. One of possible reasons for this phenomenon is that heat enhances frequency of radiation-induced chromosome aberrations. To evaluate this possibility, we studied chromosomal damage induced by a combined treatment with radiation and heat. G1-arrested human fibroblast cells were irradiated with X-rays and then exposed to heat at 42°C for 60 min. Cell survivals and chromosome aberrations at first mitosis were determined simultaneously. A dose-dependent interactive effect was observed in cell killing. However, the frequency of chromosome aberrations induced by the combined treatment with radiation and heat was similar to that induced by radiation only. The results suggest that chromosome aberrations at first mitosis are not responsible for an enhanced cell killing.