

## Early and late chromosome damages in human lymphocytes induced by gamma rays and Fe ions

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Chromosomal translocations and inversions are considered stable, and cells containing these types of chromosome aberrations can survive multiple cell divisions. An efficient method to detect an inversion is multi-color banding fluorescent *in situ* hybridization (mBAND) which allows identification of both inter- and intrachromosome aberrations simultaneously. Post irradiation, chromosome aberrations may also arise after multiple cell divisions as a result of genomic instability. To investigate the stable or late-arising chromosome aberrations induced after radiation exposure, we exposed human lymphocytes to gamma rays and Fe ions *ex vivo*, and cultured the cells for multiple generations. Chromosome aberrations were analyzed in cells collected at first mitosis and at several time intervals during the culture period post irradiation. With gamma irradiation, about half of the damages observed at first mitosis remained after 7 day- and 14 day- culture, suggesting the transmissibility of damages to the surviving progeny. Detailed analysis of chromosome break ends participating in exchanges revealed a greater fraction of break ends involved in intrachromosome aberrations in the 7- and 14-day samples in comparison to the fraction at first mitosis. In particular, simple inversions were found at 7 and 14 days, but not at the first mitosis, suggesting that some of the aberrations might be formed days post irradiation. In contrast, at the doses that produced similar frequencies of gamma-induced chromosome aberrations as observed at first mitosis, a significantly lower yield of aberrations remained at the same population doublings after Fe ion exposure. At these equitoxic doses, more complex type aberrations were observed for Fe ions, indicating that Fe ion-induced initial chromosome damages are more severe and may lead to cell death. Comparison between low and high doses of Fe ion irradiation in the induction of late damages will also be discussed.