DOSE RESPONSE FOR CHROMOSOME ABERRATIONS IN HUMAN LYMPHOCYTES AND FIBROBLASTS AFTER EXPOSURE TO VERY LOW DOSES OF HIGH LET RADIATION

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The relationship between biological effects and low doses of absorbed radiation is still uncertain, especially for high LET radiation exposure. Estimates of risks from low-dose and low-dose-rates are often extrapolated using data from Japanese atomic bomb survivor with either linear or linear quadratic models of fit.

In this study, chromosome aberrations were measured in human peripheral blood lymphocytes and normal skin fibroblasts cells after exposure to very low dose (0.01 – 0.20 Gy) of 170 MeV/u ^{28}Si- ions or 600 MeV/u ^{56}Fe-ions, including doses where on average less than one direct ion traversal per cell nucleus occurs. Chromosomes were analyzed using the whole-chromosome fluorescence *in situ* hybridization (FISH) technique during the first cell division after irradiation, and chromosome aberrations were identified as either simple exchanges (translocations and dicentrics) or complex exchanges (involving >2 breaks in 2 or more chromosomes).

The responses for doses above 0.1 Gy (more than one ion traverses a cell) showed linear dose responses. However, for doses less than 0.1 Gy, both ^{28}Si ions and ^{56}Fe ions showed a dose independent response above background chromosome aberrations frequencies. Possible explanations for our results are non-targeted effects due to aberrant cell signaling [1], or delta-ray dose fluctuations [2] where a fraction of cells receive significant delta-ray doses due to the contributions of multiple ion tracks that do not directly traverse cell nuclei where chromosome aberrations are scored.

REFERENCES

[1] Cucinotta, F.A. and Chappell, L.J. (2010) *Mutat Res* 687, 49-53.
[2] Cucinotta, F.A. et al (1999) *Radiat Environ Biophys* 38, 81-92.