

THE BIOLOGICAL EFFECTIVENESS OF ACCELERATED PARTICLES FOR THE INDUCTION OF CHROMOSOME DAMAGE: TRACK STRUCTURE EFFECTS AND CYTOGENETIC SIGNATURES OF HIGH-LET EXPOSURE

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Track structure models predict that at a fixed value of LET, particles with lower charge number, Z will have a higher biological effectiveness compared to particles with a higher Z . In this report we investigated how track structure effects induction of chromosomal aberration in human cells. Human lymphocytes were irradiated *in vitro* with various energies of accelerated iron, silicon, neon, or titanium ions and chromosome damage was assessed in using three color FISH chromosome painting in chemically induced PCC samples collected a first cell division post irradiation. The LET values for these ions ranged from 30 to 195 keV/ μ m. Of the particles studied, Neon ions have the highest biological effectiveness for induction of total chromosome damage, which is consistent with track structure model predictions. For complex-type exchanges 64 MeV/u Neon and 450 MeV/u Iron were equally effective and induced the most complex damage. In addition we present data on chromosome exchanges induced by six different energies of protons (5 MeV/u to 2.5 GeV/u). The linear dose response term was similar for all energies of protons suggesting that the effect of the higher LET at low proton energies is balanced by the production of nuclear secondaries from the high energy protons. All energies of protons have a much higher percentage of complex-type chromosome exchanges than gamma rays, signifying a cytogenetic signature for proton exposures.