

Variable sensitivity of chromosomes 2, 8 and 14 in human peripheral blood lymphocytes exposed to heavy ions

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Purpose: To investigate by FISH the distribution of radiation-induced chromosomal aberrations in chromosomes 2, 8 and 14 of 6 donors. Methods: Irradiation of blood from 6 healthy donors (4 male and 2 female) was performed at the accelerators at the Joint Institute for Nuclear Research in Dubna (Russia). Whole blood samples were irradiated with 3 Gy of protons (Phasotron), 3 Gy of ¹²C-ions (Nucletron), 4 Gy of ⁷Li-ions and 3Gy of ¹¹B-ions (Cyclotron U400M). At the position of the samples the beams energy and LET values were following: protons - 170 MeV/n and LET \approx 0.5 keV/ μ m; ¹²C - 480 MeV/n and LET = 10.6 keV/ μ m; ⁷Li - 30 MeV/n and LET \approx 20 keV/ μ m; ¹¹B - 32 MeV/n and LET \approx 55 keV/ μ m. Chromosome aberrations were analyzed in prematurely condensed G2-cells harvested after 48 in culture using calyculin A. Chromosomes 2, 8 and 14 were painted in different colors and aberrations scored with the help of an image-analysis system. Results: Chromosome 2 was generally less sensitive than expected on the basis of its DNA content. A higher than expected frequency of exchanges was found in chromosome 8, however, variable results were obtained for stable and unstable aberrations. The translocation frequency was higher and dicentric frequency was lower than expected. Chromosome 14 revealed the opposite tendency: for stable exchanges we found a lower sensitivity whereas the frequency of unstable exchanges was higher than expected. Generally, chromosome 14 was found to be less radiosensitive than expected. Conclusion: Chromosome 2 appears to be less sensitive to protons as well as to heavy ions than chromosomes 8 and 14. This result is in line with recent results of a study on the sensitivity of chromosomes 2, 8 and 14 to gamma rays.