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Statistical aspects in "Painting"-detected chromosomal aberrations induced by X-rays

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Chromosome painting has greatly extended the possibilities of cytogenetic population monitoring for environmental mutagenic influences. A three colour chromosome in situ (CISS) hybridisation technique was used for the examination of the interchromosomal distribution of breakpoints on three painted chromosomes (including chromosome #1, #2 and #4) on 88 peripheral blood samples of cancer patients before and after radiation therapy. Beside spontaneous and therapy induced aberration patterns also those induced by in vitro irradiation were analysed. 25 healthy control individuals served as basis of comparison. The numbers of breakpoints observed in each of the studied groups of individuals were compared by Chi-square test with the expected numbers estimated on the basis of relative chromosome length of the examined chromosomes. Chromosome 4 is apparently involved in radiation induced aberrations in significantly higher frequency than expected from this relative length (31.1-32.8% as compared to the expected 28.2%). In contrast chromosome 1 was slightly and chromosome 2 more distinctly underrepresented in this regard. This pattern of distribution proved to be not dependent on the various groups of exposure nor on the dose of in vitro X-radiation. As a result the selection of chromosomes may influence the quantitative outcome of rearrangement analysis using chromosome painting.