

A New Cytogenetic Screening Methodology to Evaluate Individual Susceptibility to Radiation SensitivityG. Terzoudi^a, V. Hatzi^a, K. Barszczewska^a, G. Iliakis^b and G. Pantelias^a^a*NCSR 'Demokritos', Ag. Paraskevi Attikis, 15310 Athens, Greece;* ^b*University of Duisburg-Essen Medical Radiobiology, Hufelandstr 55, 45122 Essen, Germany*
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Measurement of dicentric chromosomes in human lymphocytes has been applied to assess dose received by potentially overexposed people and estimate risk for health effects. Since the dicentrics in exposed people decrease with time, the introduction of fluorescent in situ hybridization (FISH) enables to measure stable translocations for biodosimetry and address old or long-term exposures. In addition, premature chromosome condensation (PCC), which enables analysis in interphase, offers several advantages for biodosimetry. However, dose and risk estimates derived using cytogenetics and adequate calibration curves are based on the assumption that all individuals respond equally to radiation. Since increased radiosensitivity has been associated with cancer proneness, there is particular interest for risk assessment at the individual level. Towards this end, the efficiency of dynamics that govern DNA repair and apoptosis, as well as the conserved cellular processes that have evolved to facilitate DNA damage recognition using signal transduction pathways to activate cell cycle arrest and preserve genomic integrity, are being investigated. Recent work in cancer cytogenetics and on the modulation of radiation effects at the chromosome level using changes in gene expression associated with proteins or factors such as caffeine, amifostine, or heat treatment during G2 to M-phase transition, reconfirmed the importance of G2-checkpoint in determining radiosensitivity and of the cdk1/cyclin-B activity in the conversion of DNA damage into chromatid breaks. G2-chromosomal radiosensitivity offers therefore a basis for the identification or testing of key genetic targets for modulation of radiation effects, and a new screening method to detect intrinsic radiosensitivity is presented.