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Analysis of Cell Cycle Status in Radiation Non-Targeted Hepatoma Cells Using Flow Cytometry: Evidence of Dose Dependent Response

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Abstract : Cellular irradiation incites complex responses including arrest of cell cycle progression. This article accentuates the effects of radiation on cell cycle status of radiation non-targeted cells. Human Hepatoma HepG2 cells were exposed to increasing doses of γ radiations (1, 2, 4, 6 Gy) and their cell culture media was transferred to non-targeted HepG2 cells cultured in other Petri plates. These radiation non-targeted cells cultured in the ICCM (Irradiated cell conditioned media) were the bystander cells on which cell cycle analysis was performed using flow cytometry. An apparent decrease in the distribution of bystander cells at G0/G1 phase was observed with increased radiation doses upto 4 Gy representing a linear relationship. This was accompanied by a gradual increase in cellular distribution at G2/M phase. Interestingly the number of cells in G2/M phase at 1 and 2 Gy irradiation was not significantly different from each other. However, the percentage of G2 phase cells at 4 and 6 Gy doses were significantly higher than 2 Gy dose indicating the IC50 dose to be between 2 and 4 Gy. Cell cycle arrest is an indirect indicator of genotoxic damage in cells. In this study, bystander stress signals through the cell culture media of irradiated cells disseminated the radiation induced DNA damages in the non-targeted cells which resulted in arrest of the cell cycle progression at G2/M phase checkpoint. This implies that actual radiation biological effects represent a penumbra with effects encompassing a larger area than the actual beam. This article highlights the existence of genotoxic damages as bystander effects of γ rays in human Hepatoma cells by cell cycle analysis and opens up avenues for appraisal of bystander stress communications between tumor cells. Contemplation of underlying signaling mechanisms can be manipulated to maximize damaging effects of radiation with minimum dose and thus has therapeutic applications.

Keywords : bystander effect, cell cycle, genotoxic damage, hepatoma
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