Investigating the Effect of Gamma Irradiation on Vinblastine-Induced Aneuploid L929 Cell Lines Using Micronucleus Assay on Binucleated Cells

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Abstract

Cancer, as one of the most important concerns of human health, is an illness with genetic cause. There are various theories to explain how it originates. Genetic and phenotypic instability are two known features of cancer cells, but their cause is not clear. Genetic instability can be brought about in two different levels. In a small number of tumor cases this instability is noticed at nucleotide level. While in many cancer cases the instability observed is at chromosome level, consisting of loss or gain of complete chromosomes (aneuploidy) and structural anomalies. Identifying the reason for the occurrence of such instabilities and the understanding of the importance of each one of those chromosomal incidence, can open new doors in coping with this problem. For this reason the present study was carried out with the purpose of studying the influences of gamma radiation, as one of the known clastogenic factors, on vinblasteine-induced aneuploid L929 cells. The L929 cells were treated with three doses (0.5, 1.5 and 2 ng/ml) of vinblasteine for 24 hours. Cells treated with 0.5 ng/ml of vinblasteine were harvested 24, 48 and 72 hours post treatment. The cells were exposed to 1Gy of gamma radiation after 72 hours of vinblasteine treatment. In all part of the experiment cells were harvested 24 hours after cytochalasin B treatment. Induced-chromosomal damages were investigated using micronucleus assay in binucleated cells. The frequency of micronuclei was calculated in the harvested cells. The best concentration for vinblasteine was specified to be 0.5 ng/ml. It was observed that 72 hours after treatment with vinblasteine the frequency of micronuclei decreased to the base line. Gamma-irradiation of the cells treated with 0.5 ng/ml of vinblasteine and recovered 72 hours post treatment, revealed a significant decrease in the frequency of micronuclei in comparison to the cells exposed only to gamma radiation. The results indicate that the excessive occurrence of aneuploidy among cells, as a result of treatment with vinblasteine, an aneugen factor, has not predisposed them to clastogenic damages caused by gamma radiation. This issue highlights the important and independent role of aneuploidy in causing cancer, as compared to genetic mutations or chromosomal damages. The results also indicate that treatment of L929 cells with vinblasteine had a protective effect against structural damages caused by gamma radiation.

Keywords: Aneuploidy, L929 Cells, Micronucleus Assay, Gamma Radiation, Vinblastine

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