3 - 73 Increase of Polyploidization in Metaphase HeLa Cells after Exposure to High-LET Carbon Ion Irradiation

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Polyploidy, an increased number of chromosome sets, is a surprisingly common phenomenon in nature, particularly in plants and fungi. In humans, polyploidy often occurs in specific tissues as part of terminal differentiation. Changes in ploidy can also result from pathophysiological events that are caused by viral-induced cell fusion or erroneous cell division. Polyploidization can lead to genome instability and may contribute to tumorigenesis. In our work, the responses of polyploidy to high-LET carbon ions were investigated in human cervix adenocarcinoma HeLa cells.

We examined HeLa cells for the presence of polyploidy phenotype at 20 and 44 h after irradiation (50 keV/(m carbon ions, 5 Gy) and drug release. After double staining with an antibody against α-tubulin and staining nuclear DNA with DAPI, a vast pattern of aberrant nuclears were observed, including micronuclei and multinucleated giant cells in the irradiated cells following drug release (Fig. 1). At 20 h after irradiation and drug release, cells upon the combined treatments displayed the phenotypes of majority of binucleation. Cells treated by Noco alone also produced binucleated cells, but the statistical analysis showed that the effect of the combined treatment exceeded in cytokinesis failure. The level of binucleation in the irradiated cells was close to that of the untreated cells. The proportion of micronucleated and multinucleated cells increased with time after the combined treatments as the fraction of binucleated cells decreased by 44 h. And the proportion reached up to ~35% and ~13% respectively, which was statistically higher than that upon other treatments. By 44 h, the ratio of polyploidization occurrence in the cells irradiated alone was on the rise while the cells treated by Noco only were going the opposite way. These results imply that the potential of Noco in polyploidy induction is acute and transient, but the effect of high LET radiation is relatively chronic and profound.

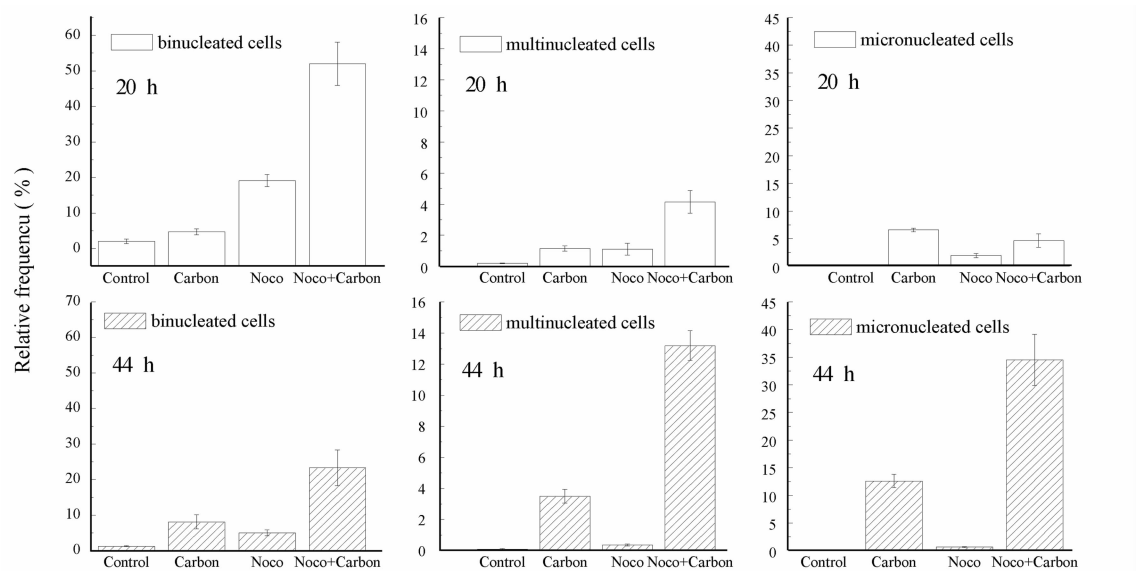

Fig. 1 Increased outcome of polyploidy induced by high-LET carbon ions.

Reference

[1] Z. Storchova and C. Kuffer, Journal of Cell Science, 121,23(2008)3869.