3 - 64 Effects of Carbon-ion Irradiation Combined with Autophagy Inhibitor on Apoptosis in HeLa Cells

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Autophagy is an evolutionarily conserved process that lysosomes degraded cytoplasm and cellular organelles to recycle amino acid and energy. It's main function is to maintain intracellular metabolic homeostasis[1]. In some conditions, autophagy is a survival pathway that response to nutrient deprivation and stressful stimuli, such as ionizing radiation[2]. Beclin 1 is part of phosphatidylinositol-3-kinase which is necessary for autophagy pathway. In this study, 3-methyladenine was used as an autophagy inhibitor to investigate the influence of autophagy on apoptosis in Hela cells under carbon-ion irradiation.

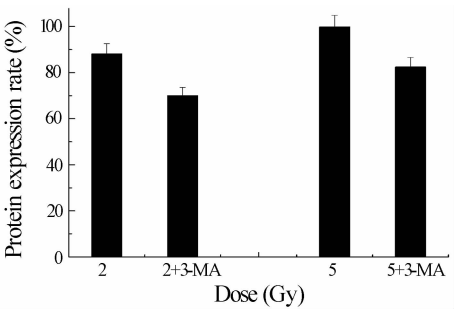

Fig. 1 The expression rate of Beclin1 in the condition of carbon-ion radiation combined 3-methyladenine treatment or by carbon-ion radiation alone.

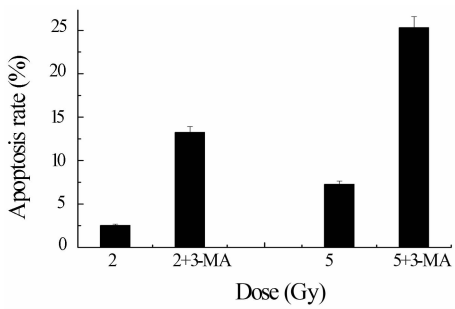

Fig. 2 HeLa cells apoptosis induced by carbon-ion radiation combined 3-methyladenine treatment or by carbon-ion radiation alone.

For analyzing the influence of 3-methyladenine on HeLa cells apoptosis induced by carbon-ion irradiation, HeLa cell samples were divided into two groups, one group samples were exposed to carbon ions (LET was 20 keV/μm) at the dose of 2 and 5 Gy directly, the other samples were treated with 5 mM 3-methyladenine 3 h and then exposed to carbon ions at the same dose. After irradiation, all samples were cultured normally for 24 h, and then replaced the medium with new medium without 3-methyladenine and cultured for another 24 h. Beclin 1 was detected by flow cytometry. Apoptosis was analyzed by acridine orange/ethidium bromide staining.

The results were showed in Figs. 1 and 2. Beclin 1 expression rates of HeLa cells in the two groups were increased, and they were lower in carbon-ion radiation combined 3-methyladenine treatment effects group than in carbon-ion radiation alone (Fig. 1), which indicated that carbon-ion radiation could induce autophagy and the autophagy was inhibited by 3-methyladenine in some degree. The apoptosis rates in both group samples increased with the radiation dose increasing, and they were higher in carbon-ion radiation combined 3-methyladenine treatment effects group than those in carbon-ion radiation alone(Fig. 2).

In summary, radiation can induced autophagy in Hela cells and 5 mM 3-methyladenine can increase the radio-sensitivity. Inhibite autophagy can promote apoptosis.

References

[1] H. Tseng, W. Liu, Y. Tyan, Chemico-Biological Interactions, 192(2011)201.
[2] H. Ito, S. Daido, T. Kanzawa, et al., Int. J. Oncol., 26(2005)1401.