3 - 84 Carbon Ions Beam Induced HepG2 Cell Apoptosis by Mitochondrial Oxidative Damage

Sun Chao, Wang Zhenhua, Yang Lina and Zhang Hong

As the powerhouse of eukaryocyte, mitochondria is also a killer organelle equipped with death effectors in controlling apoptosis, such as Cyt-c and ROS, which are released when mitochondrial dysfunction[1-3]. The aim of this study was to investigate whether the killing effects of $^{12}C^{6+}$ ions beam against a human liver carcinoma cell line HepG2 involves with the oxidative damage of mitochondria.

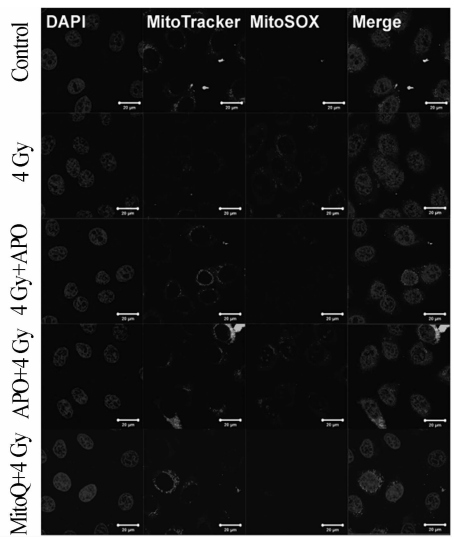

Fig. 1 Effects of $^{12}C^{6+}$ ion radiation on the mitochondrial superoxide generation were evaluated with the confocal microscopy.

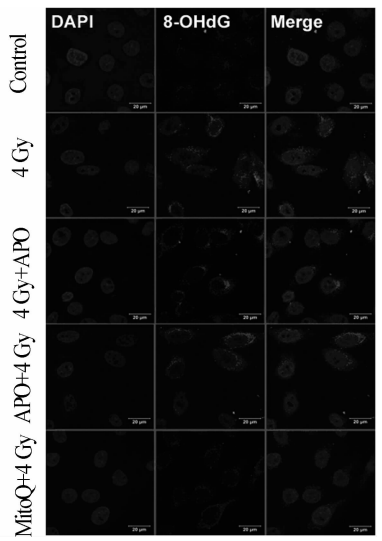

Fig. 2 Effects of $^{12}C^{6+}$ ion radiation on the mtDNA oxidative damage were evaluated with the confocal microscopy.

Our results showed that 4 Gy $^{12}C^{6+}$ ions radiation resulted in a increase on mitochondrial superoxide generation compared to untreated controls (Fig. 1). Meanwhile, the signal intensity of 8-OHdG positive cells was clearly increased at 12 h post-irradiation, with most of the immunoreactivity localized in the perinuclear region of the cytoplasm. The 8-OHdG content in mitochondria was much higher than that of nuclear fraction (Fig. 2). 4 Gy $^{12}C^{6+}$ ions radiation induced the serious oxidative damage of mitochondria. Apoptotic cells were quantified by Annexin V-FITC/PI double staining. As can be seen in Fig. 3, it revealed that 4 Gy $^{12}C^{6+}$ ions radiation could cause a large number of cell death by apoptosis. Thus, we propose that carbon ions could induce HepG2 cell apoptosis by the mitochondrial oxidative damage.

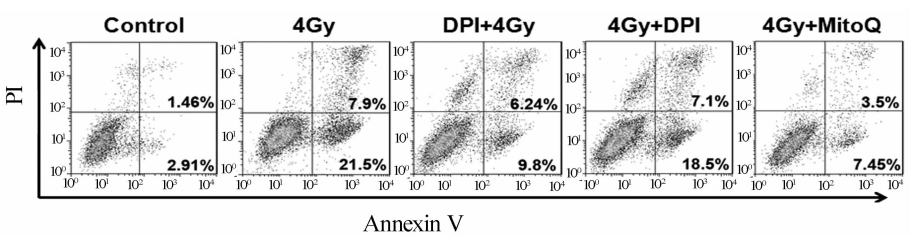

Fig. 3 Effects of $^{12}C^{6+}$ ion radiation on the HepG2 cell apoptosis were evaluated with a flow cytometer.

References

[1] R. S. Balaban, S. Nemoto, T. Finkel, Cell, 120, 4(2005)483.
[2] S. W. Ballinger, Free Radic Biol Med., 15, 38(2005)1278.
[3] S. W. Ballinger, C. Patterson, C. N. Yan, et al., Circ Res., 86, 9(2000)960.