5 - 40 Chromatin Decompaction Induced by Histone Acetylation Influences the Sensitivity of DNA to Ionizing Radiation

Shen Cheng[1], Wu Ruqun[1], Liu Wenjing[1], Guo Jinlong[1], Mao Guangbo[1,2], Zhao Can[1], Mou Hongjin[1,2], Zhang Lei [1,2] and Du Guanghua[1,2]

([1]Institute of Modern Physics, Chinese Academy of Sciences, Lanzhou 730000, China;
[2]University of Chinese Academy of Sciences, Beijing 100049, China)

The DNA molecules of eukaryotes are densely packed and exist within the nucleus as chromatin. Chromatin organization is highly dynamic and plays a crucial role in the repair of DNA damage caused by ionizing radiation, associating with acetylation of lysine residues in histones H3 and H4.

In this work, Trichostatin A (TSA) was utilized to boost histone acetylation in HT-1080 cells, and we found that the number of nuclear nucleosome clusters increased significantly after the TSA treatment, indicating that the high-density chromatin structure decompacted and diffused to the surrounding area as a result of the histone acetylation (Fig. 1(a)). Meanwhile, the livecell imaging experiments following the heavy ion irradiation showed a negative correlation with TSA concentration and a positive correlation with the LET of ions in regards to the XRCC1 recruitment rate constant. This indicates that acetylation treatment resulted in a decrease in DNA damage density (Fig. 2(b)). These results suggest that acetylation treatment led to decompaction of chromatin structure, and reduced the sensitivity of DNA to ionizing radiation.

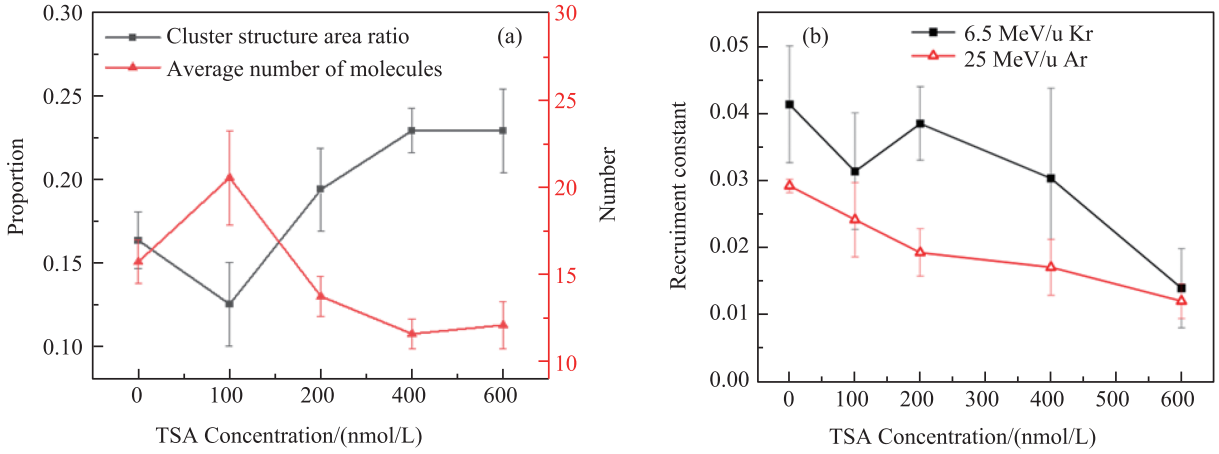

Fig. 1 (color online) The decompaction of chromatin structure as a result of the TSA treatment. (a) The ratio of the total area of the chromatin nanocluster structure within the nucleus to the nuclear area, as well as the average number of fluorescent molecules in a single nuclear cluster structure, (b) Changes in the recruitment rate constant of XRCC1 after Kr ion and Ar ion irradiation under different concentrations of TSA treatment.