The Absence of an Early Calcium Response to Heavy-Ion Radiation in Mammalian Cells.

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Intracellular calcium is an important second messenger that regulates many cell functions. Recent studies have shown that calcium ions can also regulate the cellular responses to ionizing radiation. However, previous data are restricted to cells treated with low-LET radiations (X rays, γ rays and β particles). In this work, we investigated the calcium levels in cells exposed to heavy-ion radiation of high LET. The experiments were performed at the single ion hit facility of the GSI heavy-ion microprobe. Using a built-in online calcium imaging system, the intracellular calcium concentrations were examined in HeLa cells and human foreskin fibroblast AG1522-D cells before and after irradiation with 4.8 MeV/nucleon carbon or argon ions. Although the experiment was sensitive enough to detect the calcium response to other known stimuli, no response to heavy-ion radiation was found in these two cell types. We also found that heavy-ion radiation has no impact on calcium oscillation induced by hypoxia stress in fibroblast cells.