

# X-ray-induced long-lived radicals causing mutation and carcinogenesis

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## 【 Outline of survey 】

Many researcher studying in area of radiation biology have been believed that active short life-time radicals such as OH and H radicals, play an important role to express genotoxic effects of radiations in cells, such as mutation and cancer induction. However, we found a new type of radicals with long life-time ( $T_{1/2} > 20\text{hr}$ ) in gamma ray irradiated golden hamster embryo (GHE) cells at room temperature by using ESR spectroscopy . It may be more important in mutation induction than the active short-live radicals. When Vitamin C (AsA) is added to the gamma- or X- irradiated cells at 20 min or 6 hr after the irradiation, respectively, LLR are scavenged by them simultaneously with the drastic suppression of genotoxicity such as mutation and transformation. Therefore, we have proposed that LLR must be responsible radicals for inducing mutation, and probably important for the genotoxicity in the irradiated mammalian cells. In this study, we focus on the mechanistic elucidation of the LLRs on mutation and transformation in cells.

## 【 Expected results 】

If this study succeeds, mechanism of radiation-induced mutagenesis and carcinogenesis may become clear. Because treatment by vitamin C 0.2 ~ 12hrs after irradiation can scavenge the long-lived radicals efficiently, it may reduce the frequency of mutation and carcinogenesis. These results suggest that we can establish a useful method to inhibit mutagenesis and carcinogenesis after cancer therapy by radiation.

## 【 References by the principal researcher 】

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Kumagai, J., Masui, K., Itagaki, J., Shiotani, M., Kodama, S., Watanabe, M. and Miyazaki, T.: Long-lived, mutagenic radicals induced in mammalian cells by ionizing radiation are mainly localized to proteins. *Radiat. Res.* **160** (1): 95-102, 2003.

【 Term of project 】 FY 2004 - 2008

【 Budget allocation 】 77,900,000 yen

【 Homepage address 】 <http://www.ph.nagasaki-u.ac.jp/lab/radio/housha/housha1j.html>