Radical reactions and active oxygens (61-67)

61 Local Environment Analysis of Long-Lived Radicals Which Cause Mutation and Transformation in γ-irradiated Golden Hamster Embryo Cells as Studied by Electron Spin Echo Envelope Modulation Spectroscopy

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The local environment of long-lived radicals produced in γ-irradiated GHE (Golden Hamster Embryo) cells, those are responsible for introducing mutation and transformation, is investigated by the analysis of electron spin echo envelope modulation (ESEEM) spectroscopy. Most of organic radicals are produced where many water molecules surround them by the irradiation, although they decay very rapidly at room temperature. On the other hand, the long-lived radicals in GHE cells are produced in inside of biopolymers where water molecules are hard to reach. Our ESEEM analysis suggests that active oxygen species in the irradiated cells do not play an important role for producing the long-lived radicals.

62 Biological effect of radiation-induced long life radicals

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We previously reported that radiation induces long life radicals whose half life is 20 h and that ascorbic acid (AsA) efficiently scavenges those radicals. Recently, we have demonstrated that AsA suppresses the induction of mutation and malignant transformation without changes in cell lethality and chromosome aberration induction by radiation, suggesting a unique biological effect of the long life radicals. To clarify the action mechanism of such biological effect, we studied the more defined suppressive effect of AsA on mutation induction by X-irradiation using G_1-arrested synchronous cultures. After G_1 arrested cells were irradiated with 3 Gy of X-rays, we released the cells from G_1 arrest and treated them with 5mM AsA for 2 h before DNA replication started (6-8 h from the release) or after most of DNA replication completed (48-50 h from the release). We found that X-ray-induced mutation frequency was reduced with treatment of AsA not only before but also after DNA replication. The result suggests that the mutation may not be fully fixed during the first DNA replication after X-irradiation.