# Induction of Intracellular Glutathione and Activation of Immune Functions by Low-Dose γ-Ray Irradiation

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We first examined whether the increase of glutathione level induced by low-dose γ-ray irradiation is involved in the appearance of enhanced natural killer (NK) activity and antibody-dependent cellular cytotoxicity (ADCC), leading to delayed tumor growth in Ehrlich solid tumor (EST)-bearing mice. NK activity in ICR mouse splenocytes was significantly increased from 4 h to 6 h after a single whole-body γ-ray irradiation at 0.5 Gy, and thereafter decreased almost to the zero-time level by 24 h post-irradiation. ADCC was also increased significantly in a similar way. Reduced glutathione exogenously added to splenocytes obtained from normal mice enhanced both NK activity and ADCC in a dose-dependent manner. The inhibitory effect of the radiation on tumor growth was then examined in EST-bearing mice. Repeated low-dose irradiation (0.5 Gy, four times, before and within an early time after the inoculation) significantly delayed the tumor growth. Finally, the effect of single low-dose (0.5 Gy), whole-body γ-ray irradiation on immune balance was examined in order to elucidate the mechanism underlying the anti-tumor immunity. The percentage of B cells in blood lymphocytes was selectively decreased after the radiation, concomitantly with an increase in that of helper T cell population. The IFN-γ level in splenocyte culture prepared from EST-bearing mice was significantly increased 48 h after the radiation, though the level of IL-4 was unchanged. IL-12 secretion from macrophages was also enhanced by the radiation. These results suggest that low-dose γ-rays induce Th1 polarization and enhance the activities of tumoricidal effector cells, leading to a delay of tumor growth.