

§27. A New Approach for Estimation of the Biological Effects of Low Level Tritium Radiation

Sasatani, M. (RIRBM, Hiroshima Univ.), Umata, T. (Occupational & Environ. Health. Univ.), Tauchi, H., Tachibana, A. (Fac. Sci., Ibaraki Univ.), Kobayashi, J. (Rad. Biol. Cntr, Kyoto Univ.), Suzuki, M. (Tohoku Univ. Grad. School Med), Shimura, T., Magae, J. (National Institute of Public Health), Sugihara, S. (Kyusyu Univ.), Nishimura, K.

Tritium is planned to be as fuel for nuclear fusion reactions. In order to estimate the relative radiation risk from nuclear fusion plants, it is critical to understand the biological effects of low dose rate tritium exposure. However, the estimation of tritium risk has not been elusive. Therefore, the present study is focused on, i) analysis of biological effects of tritium by using genetically engineered animal model, ii) analysis of the biological effects of tritium by using culture cell line, iii) analysis of the molecular mechanism of tritium radiation-induced DNA damage response. The following presents a part of the results

i) Analysis of biological effects of tritium by using genetically engineered animal model

It has been reported that the relative risk of radiation-induced leukemia is much higher than those of solid tumors. In this study, we used a transgenic mouse, which is known as leukemia model mouse, to estimate the risk of radiation-induced leukemia. Leukemia model mice and wild-type mice were subject to γ -irradiation four times at a weekly interval, starting at the age of 4 weeks. Our data showed that leukemia model mice developed thymic lymphoma in a shorter period than the wild-type mice. This suggests that this leukemia model mouse might be a useful model system for estimating the tritium risk.

ii) Analysis of the biological effects of tritium by using culture cell line

We have established a hypersensitive experimental system in which a whole human X-chromosome is transferred into the *Hprt*-deficient hamster cells previously. This system shows about more than 50-fold sensitive compared to the conventional system that uses endogenous *Hprt* gene. In this study, we explored to detect the mutation frequency induced by tritiated water at low dose rate. We could detect the induced the mutation frequency at the low dose rate (8.64mGy/ day) lower than 12mGy/ day

iii) Analysis of the molecular mechanism of tritium radiation-induced DNA damage response

Our previous study showed that cyclin D1 is accumulated after long-term fractionated radiation exposure not after acute radiation exposure in human cancer cell lines. In this study, we investigated whether cyclin D1 is a useful marker for monitoring the effects of low dose (rate) radiation by using human normal fibroblast. Our data showed that cyclin D1 is accumulated following low-dose fractionated exposures (0.01Gy/ fraction)

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