

Assessment of biological effect of tritiated water by using hypersensitive system

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An exposure of human or animals to tritium radiation from nuclear fusion reactor is expected to be at low dose and with low dose-rate. We are focusing on the biological effects of tritiated water (HTO) given at low dose or with low dose rate. Hypersensitive assay systems for radiation biological experiments by using cultured mammalian cells or by using transgenic mice have been established and their availability for assessment of biological effects of HTO were tested. In this presentation, we first summarize those hypersensitive assay systems which are adopted for assessment of biological effects of low level of HTO. Then our recent results obtained by experiments using a hypersensitive detection system for somatic mutation in cultured mammalian cells will be presented.

A hypersensitive detection system for mutagenesis at *Hprt* locus was established by using hamster cells carrying a human X-chromosome [1]. The cells present more than 50-fold sensitivity for *Hprt*-deficient mutation, and this allowed us to detect a significant elevation of mutation frequency by radiations at the dose of less than 0.2 Gy.

Because the reverse dose rate effect has been reported for mutation induction by high LET radiation such as neutrons, we first tested whether the reverse dose rate effects could be seen for HTO (tritium beta-rays) or not. No significant change in mutation frequency by HTO was observed in the range of dose rates between 0.05 cGy/h and 4.4 cGy/h, whereas clear reverse dose rate effects was observed in the case of fission neutrons or carbon beam [2]. The result suggests that the reverse dose rate effect does not apply in the case of mutation induction by HTO. In addition, mutation spectrum in the mutants induced by HTO was similar to those in spontaneously induced mutants, suggesting that exposure to a certain level of HTO could enhance spontaneous mutagenesis.

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[1] Tauchi H. et al. *Fusion Sci. & Technol.* 41, 413-416, 2002.

[2] Tauchi, H. et al. *J. Radiat. Res.* 50, 441-448, 2009.