Analysis of the Mutagenic and Apoptotic Effects of Tritiated Water on Spleen T Lymphocytes on Wild type and *p53*-deficient Mice

T. Umata[a,*], and T. Norimura[b]

[a]*Radioisotope Research Center, and* [b]*Department of Radiation Biology and Health, School of Medicine, University of Occupational and Environmental Health, Japan, 1-1 Iseigaoka, Yahatanishi-ku, Kitakyushu-city 807-8555, Japan*

Development of nuclear fusion energy is constantly advancing and it is expected to be utilized as an alternative energy source in the future. A large amount of tritium is required as the fuel source for the deuteron-tritium nuclear fusion reaction putting workers at a great risk for internal radiation exposure. As a result, one of the major issues arising in the development of the fusion reactor is the assessment of the biological effects of tritium released from nuclear fusion power plants during routine operation or accidents. In the present study, the mutagenic effect of tritiated water at low dose-rate was investigated using wild type and *p53*-deficient mice, then compared that of ^{137}Cs γ rays. We injected tritiated water into mice intraperitonealy. Simulation-irradiation was initiated at a dose–rate of 0.71 mGy/min and at the terminal points, a dose-rate was 0.09 mGy/min. The mice received a cumulative absorbed dose of 3 Gy protracted over a 7 day period. Then we analyzed mutation 19 days after injection of HTO or the start of γ irradiation. In *p53*-deficient mice, induced variant fraction by HTO was higher than that by simulation-irradiation. When compared on the basis of the induced TCR variant fractions in *p53*-deficient mice at 3 Gy, tritium β rays appear to be 1.7 times more mutagenic than γ rays. On the other hand, in wild type mice, HTO injection increased variant fraction significantly, but simulation-irradiation did not increase at all as was expected. To clarify the different result, we investigated the apoptotic activity of T lymphocyte from mice exposed with tritium β rays and ^{137}Cs γ rays. Apoptotic activity of T lymphocyte from mice exposed with tritium decreased significantly.