Continuous Exposures to Low-Dose-Rate Gamma-Rays Induce Premature Menopause and Adiposity in Female Mice

Shingo NAKAMURA, Satoshi TANAKA, Ignacia BRAGA-TANAKA III, Yoichi OGHISO
Department of Radiobiology

Abstract

We previously reported significant body weight gain and development of adiposity in B6C3F1 female mice continuously exposed to low-dose-rate (20 mGy/22h/day) γ-rays. In this study, we examined processes for body weight gain, tissue adiposity, and ovarian dysfunction in B6C3F1 female mice continuously irradiated under SPF or CV conditions at low-dose-rate (SPF: 20 mGy/22h/day; CV: 20, 40, 80 & 120 mGy/22h/day) γ-rays from 9 weeks of age. Significant body weight gain due to tissue adiposity was observed from 30 to 44 weeks of age (total doses: 2.9-4.9 Gy) in SPF mice continuously irradiated with 20 mGy/22h/day as compared to those of non-irradiated mice. Histopathological analysis of ovaries and vaginal smears revealed that premature menopause due to radiation-induced depletion of living oocytes occurred with body weight gain at the same time in SPF mice continuously irradiated at 20 mGy/22h/day. Excessive body weight gain and premature menopause occurred at the same time in the 4 groups of CV mice continuously irradiated at 4 different dose-rates (20, 40, 80 or 120 mGy/22h/day), and higher dose-rate irradiation induced faster premature menopause and excessive body weight gain. We propose a hypothesis that premature menopause links to body weight gain and adiposity in B6C3F1 female mice continuously irradiated at low-dose-rate γ-rays.

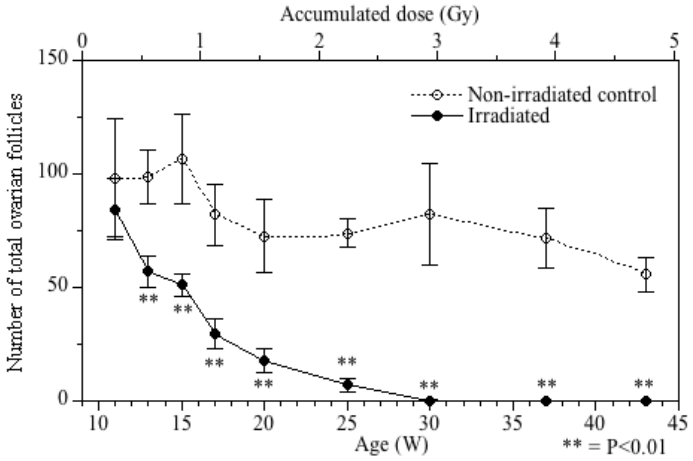

Fig. 1 Time course for alternations of oocyte number during exposure period

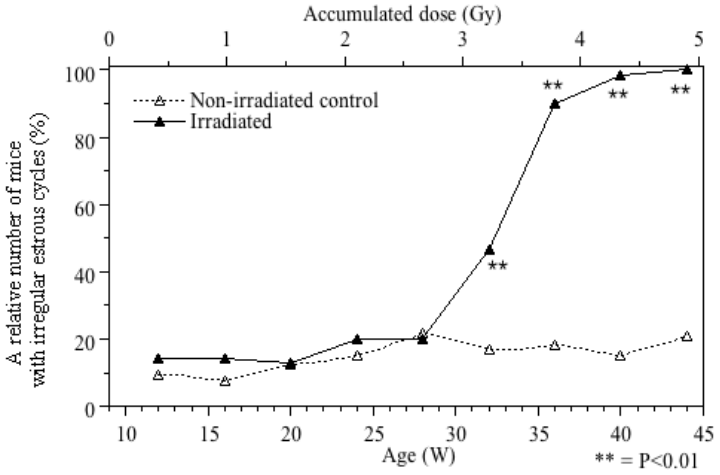

Fig. 2 Time course for ratios of mice with irregular estrus cycles during exposure period

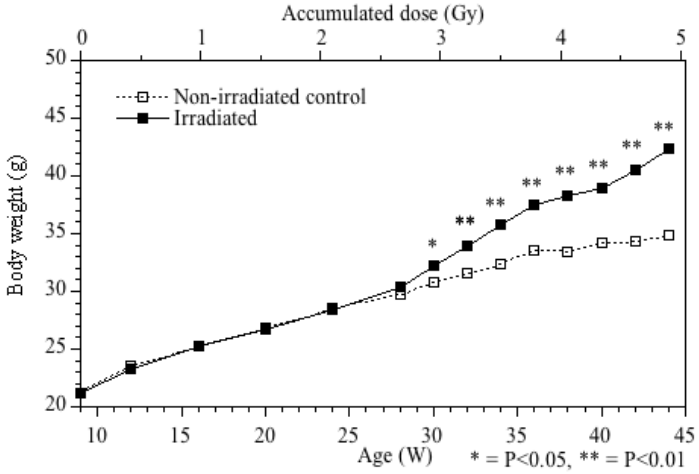

Fig. 3 Time course for alternations of body weight during exposure period