

Effect of whole body proton irradiation on hematological and gastrointestinal damagesJ.-Y. Shim^a, J.-Y. Ahn^a, J.Y. Yi^b, C.-M. Kang^c, Y.-S. Yun^a and J.-Y. Song^a^a*Laboratory of Radiation and Cancer Science, Korea Institute of Radiological & Medical Sciences, 215-4 Gongneung-dong, Nowon-gu, 139-706 Seoul, Republic of Korea;*^b*Lab. of modulation of radiobiological responses, Korea Institute of Radiation and Medical Sciences, 215-4, Gongneung-dong, Nowon-Gu, 139-706 Seoul, Republic of Korea;*^c*Laboratory of Cytogenetics and Tissue Regeneration, Korea Institute of Radiological & Medical Sciences, 215-4 Gongneung-dong, Nowon-gu, 139-706 Seoul, Republic of Korea*
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With increasing the chance of cancer radiotherapy or spaceflight with mission or simple trip, a considerable concern about the absorbed amount of radiation and its deleterious effect on physiological system has been increased. Many efforts have been contributed to estimate the risk, however, there is little known about the spectrum of radiations during the flight as well as the effects of low-dose radiation. Here, we aimed to investigate the effect of whole body proton irradiation at a recommended dose limit of occupational (20mGy per year) and the standardized radio-therapeutic fraction dose (2Gy) on gastro-intestinal damages, and hematological variables compared with gamma irradiation. Exposure to low dose radiation has not shown any distinctive changes on hematological (the number of bone marrow cells and peripheral blood cells) and gastrointestinal damages whatever the source of radiation is proton or gamma ray. However, the therapeutic dose of radiation significantly decreased the number of spleen cells and white blood cells about 1.5- and 4-fold, respectively. Especially the number of lymphocytes was only 20% of the untreated control mice. The frequency of micronuclei in bone marrow cells was not affected in proton irradiated mice in contrast to that of gamma irradiation. The apoptosis of intestinal crypts confirmed by TUNEL assay was markedly increased by the therapeutic dose of radiation, and the magnitude of the apoptosis in gamma irradiated mice was severer than that of proton. The degree of damages with gamma irradiation seemed to be more profound than proton even the same total dose of radiation, suggesting that the physiological effects were dependent on the characteristic of the source of radiation.