Study of cytogenetic effects induced by accelerated 12C ions with energy of 200 MeV/n in Mice

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In present work we investigated the cytogenetic effects induced by accelerated ^{12}C ions with energy of 200 MeV/n on mice. Dose dependence, ability of the adaptive response (AR) induction and genetic instability in the generation F1 were studied by the micronucleus test in polychromatic erythrocytes (PCE) of bone marrow. Two-month-old males of SHK mice were irradiated by ^{12}C ions with energy of 200 MeV/n ("Nuclotron", Joint Institute for Nuclear Research, Dubna, Russia). A control group was exposed to X-rays. The dose dependences of the frequency of PCE with micronucleus (MN) induced with doses of 10, 15, 50 100 and 150 cGy of both types of radiation were studied. For adaptive response detection mice were exposed to irradiation according to the following scheme: an adapting doses of 10 cGy of ^{12}C ions, followed after a day by a challenging dose of 1.5 Gy of X-rays (1Gy/min). To obtain generation F1, 15 days after the irradiation, males from the irradiated and control groups were mated in separate cages with unirradiated females for two weeks. This period of time was chosen because it is sufficient for the formation of spermatides, which then take part in the impregnation of the ovule. Dendants of irradiated and unirradiated parents were exposed to additional X-radiation with a dose of 1.5 Gy or by the scheme of AR to reveal the genetic instability. Bone marrow specimens for calculating micronuclei were prepared by the conventional method. The experiments demonstrated that: 1) at low doses (0-50 cGy) both dose-dependencies of cytogenetic damage induction can be fitted by a linear regression and almost coincide, i.e. RBE value is equal 1; at higher doses RBE value rises to 1.4; 2) irradiation of mice with dose of 10 cGy of accelerated ^{12}C ions induces AR as X-radiation; and 3) the levels of spontaneous and radiation-induced PCE with MN in mice born from both males irradiated with a dose of 10 cGy of accelerated ^{12}C ions and unirradiated animals is the same. The F1 generation born from irradiated males is unable to induce the AR, as distinct from their parents. The offsprings of unirradiated males reserves this ability. Obtained data indicate the genetic instability in F1 generation born from ^{12}C-irradiated males. These findings may be used to assess the delayed radiation effect from low-dose of high-LET radiation and for developing basic foundation of adaptive medicine.

Article published by EDP Sciences and available at http://www.radioprotection.org or http://dx.doi.org/10.1051/radiopro:2008609