Genomic instability in mice long term after radiation exposure at low dozes

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In this study we measured frequency of lymphocytes bearing mutation at T-cell receptor locus (TCR) and frequency of micronucleated erythrocytes in peripheral blood of mice. Experiments were conducted with male CBA strain of mice which irradiated at 0,2 Gy of γ-rays using Co^{60}. Blood sampling was made 3 and 6 months after the irradiation. As it was shown with Mann-Whitney test the frequencies of TCR-mutant cells in exposed and control unexposed groups were not significantly different ($p>0,05$). According to results of 3 independent experiments medians of TCR mutant cell frequency were 11,7 x 10^{-4}. in the controls and 12,5 x 10^{-4} in exposed group 3 months after the irradiation ($p>0,05$). Medians increased slightly in both groups 6 months after radiation exposure: 13,8 x 10^{-4} and 15,5 x 10^{-4} in control and exposed groups accordingly ($p> 0,05$). 95% confidence intervals for TCR mutant cell frequency were calculated in control groups. About 15 % of exposed mice had frequencies of the mutant cells exceeding upper boundary of this interval 3 month after the irradiation. The proportion of exposed mice with high TCR mutant cell frequencies increased up to 21% 6 months after the irradiation ($p <0,05$ in comparison to control group, Fisher's test). Mean frequencies of micronuclei in normochromic erythrocytes of peripheral blood of control and exposed mice were not significantly different 3 and 6 months after irradiation. In addition we estimated frequency of micronucleated reticulocytes in number of mice with the high frequency of TCR-mutant cells 6 months after the irradiation. For the control we took 6 unexposed mice that had casually been chosen on the same term. Mean frequencies of micronucleated reticulocytes were not different: (3,1$\pm$1,1) x 10^{-3} and (3,2$\pm$1,0) x 10^{-3} in control and exposed groups accordingly. Thus, genomic instability over 3 and 6 months after the irradiation was observed in proportion of mice on gene level and was not found on chromosomal level. It is arguable that the mechanisms underlying formation of genomic instability after low-LET radiation exposure at low doses in vivo involve, as a rule, only little changes in DNA structure (single-strand break, base substitution, etc.), that lead to formation of mainly gene mutations. It is possible also, that elimination of cells with micronuclei occurs more intensively, than cells with TCR mutations.

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