

## THE EFFECT OF LOW DOSES OF IONIZING RADIATION ON THE EXPRESSION OF GENES AND NON-CODING RNA IN NORMAL AND MALIGNANT HUMAN CELLS

V. F. Mikhailov<sup>a, \*</sup>, L. V. Shulenina<sup>a</sup>, N. F. Raeva<sup>a</sup>, I. M. Vasilieva<sup>b</sup>, D. V. Saleeva<sup>a</sup>,  
M. V. Neznanova<sup>a</sup>, and G. D. Zasukhina<sup>b, \*\*</sup>

<sup>a</sup>*Burnazyan Federal Medical Biophysical Center, Federal Medical-Biological Agency, Moscow, 123098 Russia*

<sup>b</sup>*Vavilov Institute of General Genetics, Russian Academy of Sciences, Moscow, 119991 Russia*

<sup>\*</sup>*e-mail: vfmi@mail.ru*

<sup>\*\*</sup>*e-mail: Zasukhina@vigg.ru*

The effect of X-ray radiation (0.1 Gy) on the expression of a number of genes and regulatory RNA (miRNA and long non-coding RNA) in human lymphocytes and T-lymphoblastic cells (Jurkat line) was studied. After 1 h after the action of a low dose of radiation, lymphocytes showed activation of P53 expression and a decrease in the level of mature miR-27a and miR-181a, having as a target mRNA of the P53 gene, as well as inhibition of NFκB activity, tested to reduce the mRNA content of RHO-A genes, cdc42 and IL6. By 4 h, normalization of the parameters was observed. In contrast, an increase in the content of the mRNA of the NFκB(p65) gene and the mRNA of its IL6 gene target was noted in the Jurkat cell line during this period. The repeated irradiation of cells at a dose of 5 Gy carried out after 4 h showed the presence of a radiation adaptive response (AR) according to the criterion of survival in lymphocytes and its absence in Jurkat cells. The survivors after 20 hours of lymphocytes for the differences between the groups of 5 Gy and (0.1 Gy + 5 Gy) revealed indicators characteristic of AR (mRNA of the *P53* gene, NEAT1, miR-181a, miR-107). The results indicate the activation of various intracellular systems after the stress of low doses of radiation on lymphocytes and Jurkat cells. This approach can be used to optimize the efficacy of radiation therapy when pre-irradiated with a low dose of radiation, which increases the radioresistance of normal tissues surrounding a tumor.

**Keywords:** radiation adaptive response, long non-coding RNA, small doses of ionizing radiation, miRNA, NFκB, P53