

Analysis of Gene Expression Profiles of Hematopoietic Stem Cells of Mice Exposed to Low-dose-rate Gamma-rays

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Abstract

Previous studies showed that continuous exposure to low-dose-rate (LDR) radiation is leukemogenic. We recently showed that hematopoietic stem cells (HSCs) in mice irradiated with LDR (20mGy/day) γ -rays were significantly decreased at day 400 of irradiation when compared with age-matched non-irradiated mice. In this study, we investigated the changes in gene expressions that may be related to the observed decrease in HSCs of mice exposed to LDR radiation. RNA extracted from HSCs of irradiated and non-irradiated mice was subjected to gene expression microarray, and the gene expression profiles were analyzed by bioinformatic methods with Ingenuity Pathway Analysis. We observed that less than 1% of the total analyzed genes were differently expressed in HSCs in LDR-irradiated versus non-irradiated mice. We predicted that bio-functions of “cell viability”, “cell survival”, and “maturation of cells” were promoted in irradiated HSCs. Surprisingly, contrary to high-dose-rate-irradiated HSCs, no bio-function associated with cell death, such as apoptosis, was altered in LDR-irradiated HSCs. These findings suggested that the decreases in HSCs observed in LDR-irradiated mice might be a result of cell differentiation.

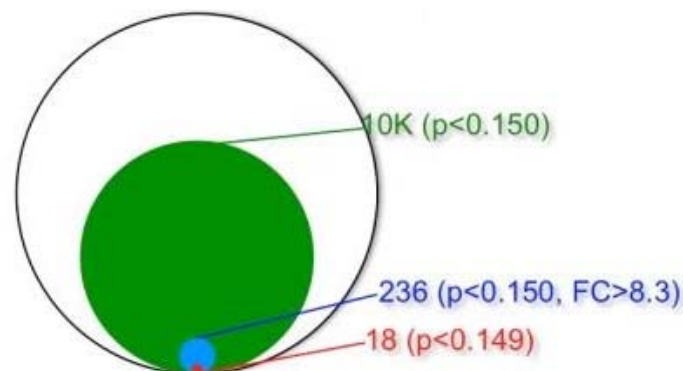


Fig. 1 Extraction of genes in non-irradiated and irradiated mice that were differently expressed in hematopoietic stem cells

Table 1 Bio-functions predicted to be altered in irradiated hematopoietic stem cells

Predicted Activation State	Functions Annotation	Category
Increased	cell survival	Cell Death and Survival
	survival of organism	Organismal Survival
	cell viability	Cell Death and Survival
	maturation of cells	Cellular Development
	quantity of tumor	Cancer
	cell viability of tumor cell lines	Cell Death and Survival
Decreased	apoptosis of cancer cells	Cell Death and Survival, Tumor Morphology
	Bleeding	Organismal Injury and Abnormalities
	malformation	Developmental Disorder
	activation of leukocytes	Cell-To-Cell Signaling and Interaction, Hematological System Development and Function, Immune Cell Trafficking, Inflammatory Response
	activation of lymphocytes	Cell-To-Cell Signaling and Interaction, Hematological System Development and Function, Immune Cell Trafficking, Inflammatory Response
	organismal death	Organismal Survival