THE COMPLEXITY OF LOW DOSE RADIATION HEALTH EFFECTS:
UNDERSTANDING NON-TARGETED RADIATION EFFECTS

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Abstract: Unexpected events like the Fukushima Daiichi incident demonstrated the possibility that military personnel could potentially be exposed to low dose radiation (LDR). LDR cancer risks are uncertain and research has yet to establish cancer risks at LDRs because LDR epidemiological studies are difficult to conduct. Understanding LDR cancer risks is critical since it is difficult to predict the long-term consequences of Fukushima, or of any future accidental or terrorist-based large-scale radiological event. LDR involves non-targeted radiation effects (NTEs) which occur in unirradiated cells with an unknown effect on radiation risk assessment. A novel in vitro/in vivo NTE model was used to explore the bone marrow microenvironment and induction of leukemia in LDR exposures scenarios including repeated or chronic exposures. In this model, murine hematopoietic myeloid progenitor cells (FDC-P1) are monitored for their neoplastic transformation both in vitro (transformation assay) and in vivo (development of acute myeloid leukemia (AML)). For in vitro NTE assessments, FDC-P1 cells were co-cultured with LDR-irradiated murine bone marrow to observe critical interactions, i.e., transformation, epigenetic alterations. To establish an in vivo NTE murine model, FDC-P1 cells were injected into LDR mice and development of leukemia was monitored. Mechanistic studies are critical to an understanding of LDR exposure impact, and potential mechanisms i.e., epigenetic, are being evaluated in this model.

Keywords: Low Dose Radiation, non-targeted radiation effects, leukemia

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