# CONCURRENT EXPOSURE TO CHRONIC IRRADIATION AND/OR SIMULATED MICROGRAVITY ALTERS SPLENIC IMMUNE CELLS PHENOTYPE AND FUNCTION

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NASA's Human Research Roadmap (HRR) has clearly outlined that concurrent and continuous exposure to altered weightlessness (microgravity) and low dose-rate ionizing radiation (chronic irradiation [CIR]) during deep-space missions (beyond the Earth's magnetic field) might affect the astronaut's immune system negatively. Therefore, assessing the risk of immune dysregulation from co-exposure to microgravity and CIR, and developing a preventive or mitigative pharmacological countermeasure are needed for making human deep-space missions safer. Because performing real human spaceflight experiments is unrealistic before the proposed deep-space missions, ground-based research using pre-clinical models are critically important.

We subjected single-housed 8-week C57BL/6 female mice to chronic γ-irradiation (CIR) at a dose rate of 0.0029 Gy/h and/or hind-limb unloading (HLU), a NASA-approved rodent model of simulated microgravity (SMG) for 29 days. Mice subjected to HLU underwent to training sessions before exposure to radiation, this enables the mice to adapt and operate effectively in SMG conditions. Body weight, food consumption, and water intake were recorded 3 times per week for 4 weeks and spleen tissues were collected after 29 days of singular or co-exposure to determine the change in immune cells phenotype by flow cytometry, functional changes in isolated CD4+/CD8+ following activation with CD3/CD28 for 24 h by ELISA, functional change in B-cells following activation with LPS for 24 h by ELISA, and alteration in cell type by immunohistochemistry.

We observed co-exposure altered immune cell phenotype; functions of CD4+/CD8+ cells and B cells; cellular architecture to a greater extent than the singular treatments or sham exposure.

We acknowledge that γ-rays do not exactly mimic space radiation in terms of their radiation quality. However, currently no facility is available that exactly mimics long-term continuous exposure to the ionizing radiation found in deep space. Studies in our facility can provide much-needed insight in immune function during and after chronic exposure to ionizing radiation with concurrent SMG.

**References**

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