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CHARACTERIZING THE EFFECTS OF SIMULATED MICROGRAVITY ON CYTOTOXICITY OF HUMAN NATURAL KILLER CELLS

Abstract

Characterizing the effects of simulated microgravity on cytotoxicity of human Natural Killer cells Immune dysregulation has been reported in astronauts as a result of spaceflight. Microgravity is a major factor that may have a significant impact on immune cells, including Natural Killer (NK) cells. NK cells are important components of innate immunity, as they kill both virus-infected and malignant cells. However, the cellular and molecular mechanisms for spaceflight-associated immune dysfunction remain largely unclear. Given the limitations of conducting research in space, microgravity can be modelled on Earth through rotating cell culture in a Òrotary cell culture systemÓ at a slow, constant velocity on a horizontal axis. This introduces laminar flow into the culture vessel which randomizes the gravity vector, thereby modelling microgravity. This study uses this cell culture system to expose human NK cell lines to simulated microgravity. Specifically, this study is focused on quantifying NK cell cytotoxicity with and without exposure to simulated microgravity, by using the chromium release assay. Additionally, expression of cytolytic molecules, perforin and granzymes A/B, and cytokines, IFN-y and TNF-a, have also been assessed. NK cells are an important cell type to study in this context, given that viral reactivation is seen as a result of spaceflight, and increased radiation dosage in space increases risk for cancer development in astronauts. This research also has the potential to provide insights into the understanding of immune dysregulation on Earth.