NORTHERN HEALTH RESEARCH CONFERENCE

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Investigating the biological effects of sub-background radiation in CGL1 cells

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ABSTRACT:
Radiation is ever present within our environment at low levels. This natural background radiation (NBR) can originate from sources such as UV rays from the sun or the decay of radioactive elements naturally found within the earth. It is already established that higher levels of radiation can damage DNA, however, recent findings show that at lower doses, less than 0.1 Gy, radiation may actually benefit cells. This low dose radiation (LDR) primes the cell and reduces the effects of damage induced by subsequent irradiations. A common way for cells to adapt to an environment or stress is to change the expression of genes through epigenetic mechanisms, such as changes to DNA methylation and miRNA expression. We postulate that the NBR is vital to cells and its removal should sensitize the cell to subsequent radiation challenge. We plan to grow the CGL1 cell line, a hybridization of HeLA cells with normal skin fibroblast cells, in the state-of-the-art SNOLAB laboratory located 2 km underground where the natural rock layers block solar radiation. The cells will be further housed in a lead-encased specialized tissue culture incubator (STCI) designed to remove background radon sources, thus creating sub-background radiation levels. The cells will then be grown for up to 6 months to allow adaptation to this environment. During the growth period, DNA, RNA, and protein will be periodically extracted to visualize any gradual adaptation via analysis of epigenetics, and DNA damage repair pathways. During each extraction, a subset of cells will be challenged with high dose radiation. At the completion of the study, we hope to prove our hypothesis that NBR is vital to cells. This study will also lead to key LDR miRNA and epigenetic biomarkers which may be useful when looking at patients undergoing various low radiation medical scans.