NORTHERN HEALTH RESEARCH CONFERENCE

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Adult mental health implications of late-gestational ionizing radiation exposure using BALB/c mice

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ABSTRACT:
INTRODUCTION: The neurobehavioural effects of late prenatal exposure to low-dose ionizing radiation (LDIR) have not been thoroughly investigated. Late-gestation is a sensitive period for neuronal growth, differentiation, and pathways. LDIR exposures occur primarily through diagnostic procedures and have been proposed to induce damage through reactive oxidative species (ROS) and stress-pathways.

AIM: To examine potential effects, radiation-sensitive BALB/c mice were exposed late-gestation. We hypothesized predispositions to depression and anxiety in the BALB/c mice at the high threshold, compared to lower doses.

METHODS: On gestational day 15, pregnant mice were randomly assigned to either a sham control, or exposed to either 50, 300, or 1000mGy doses by placing cages equidistant from a radiation source. Offspring were raised to adulthood and underwent testing designed to measure depression, general anxiety, and social anxiety (Porsolt swim test, the open field test, and the social anxiety test). Genes associated with neurogenesis and ROS were analyzed by RT-qPCR from RNA extracted from pre-frontal cortices, hippocampi, and the cerebella.

RESULTS/CONCLUSIONS: Analyses shows a treatment main effect in the social anxiety task: $F_{balb/c}(4, 22) = 5.835$, $p = 0.002$, $\lambda = 0.485$, $\eta^2 = 0.515$. Animals expressed an inhibition to depressive-like behaviours compared to sham controls in the Porsolt Swim Task: $F(2, 20) = 0.6347$, $p = 0.007$, $\lambda = 0.612$, $\eta^2 = 0.388$. Significant gene dysregulation involved in inflammation, oxidative stress, and synaptic plasticity was shown in a sex-specific and a region-specific manner for the animals. The doses used in this study have indicated an anti-depressant effect on the BALB/c animals, complimentary to other research, radiation within a threshold range may induce protective, rather than adverse, actions.