**Effects of Low-Dose Ionizing Radiation on Cataractogenesis and Lens Protein Expression in Voles (*Myodes glareolus*) from the Chornobyl Exclusion Zone**

1Paul Grzegorczyk, 1Colin Seymour, 2David Williams, 3Michael Wood, 4Sergii Garshchak, 5Cath Barnett, 1Aftab Taiyab, 1Carmel Mothersill

1McMaster University, Hamilton Ontario, Canada, 2University of Cambridge, UK, 3University of Salford, UK, 4Chornobyl Center for Nuclear Safety, Ukraine, 5UK Centre for Ecology & Hydrology

Radiation-induced cataracts were historically believed to have high dose thresholds for formation. However, recent evidence from the atomic bomb survivors has prompted a reassessment of these limits, with the International Commission on Radiological Protection (ICRP) lowering the threshold for acute exposures to the eye to 0.5 Gy in 2012. Despite epidemiological data suggesting that even low-dose radiation can contribute to cataractogenesis, the mechanisms underlying this process remain poorly understood. The objective of this study was to investigate cataract formation in the lenses of voles collected from the Chornobyl Exclusion Zone (CEZ). Animals were collected in 2018 along trap lines from several areas in the CEZ as part of a major investigation of the environmental effects of radiation in the CEZ. Extensive data concerning ambient and internal dose to the animals is available as well as gross pathology, blood work and other health indicators. This part of the project is aimed at assessing the effects of low-dose ionizing radiation on lens morphology and lens protein distribution to enhance understanding of radiation-induced ocular changes. Eyes of voles from CEZ were fixed in formalin, processed and embedded in paraffin and sectioned. The ocular sections were stained with hematoxylin and eosin (H&E) to assess lens morphology. Immunohistochemistry was performed to evaluate the expression of alpha A (αA) and alpha B (αB) crystallin. Fluorescence intensity and lens measurements were analyzed to investigate the relationship between radiation dose and lens protein expression. Our very preliminary data based on a limited number of samples suggests that compared to control animals collected from background dose areas, animals collected from low-dose radiation areas had internal doses in the range 5.5-7.5 µGy/h and was associated with morphological changes, including a reduction in lens diameter and an increased width of the germinative zone, along with more densely distributed αA-crystallin staining. Animals collected from high-dose radiation areas had internal doses ranging from 363.8-370.9 µGy/h. This resulted in further morphological changes and greater alterations in crystallin staining patterns, including asymmetric distribution of αA-crystallin, disorganized fiber cells, and increased αB-crystallin expression. These initial findings if confirmed with analysis of further samples and robust statistical analysis could support the suggestion that cataract formation may not strictly adhere to a dose-threshold model, as even low levels of radiation may be initiating molecular and structural alterations associated with the development of cataracts.