The general population is aging and late onset neurodegenerative diseases affect millions of people.

Previous data show that neurodegenerative diseases have been correlated to metal accumulation such as Zn, Cu, Fe in amyotrophic lateral sclerosis (ALS) and Parkinson's disease (PD) (Yoshida et al., 2003; Campbell et al., 2001). The accumulation of metals increases with age and metal-mediated oxidative stress may lead to intracellular alterations and cell death (Campbell et al., 2001; Lee et al., 2004; Roomans and von Euler, 1996).

Therefore, it is of primary importance to understand whether the late onset in neurodegenerative disease can correlate to some characteristics of aging and injury such as metal accumulation in neurons with long axons as they are involved in motor function.

We hypothesize that metal accumulation (1) occurs in specific long neuronal tracts, (2) is increased during aging, (3) might be triggered by multiple injuries to the central nervous system (CNS).

Therefore, we analyzed differential mineral (Ca, Zn, Cu, Fe) accumulation between white and gray matter within spinal cord sections (T9 and T13 levels) of young control rats. Fresh rat spinal cord tissue was first fast frozen by immediate immersion in liquid nitrogen after resection from living aneasthetized animals. Cryostat sectioning (10 μm) was performed followed by freeze-dry procedure. At the BioCAT beam line, sample sections were scanned on the X-Ray fluorescence (XRF) microprobe using continuous scanning (20μm) and step scanning (5μm) of white matter and grey matter tissue of spinal cord sections.

Results show that we were able to unfold the freeze-dried sections and flatten them onto the plexiglass holders. However, we lost a lot of samples trying to unfold them and putting them on the holders. Therefore we developed new holders and new methodology using plexiglass as a support.

Scanning results were not quantitative due to the absence of available standards for the minerals analyzed. However, preliminary data show evidence of Ca++ and Zn+ co-localization within the white matter. Fe+ does not appear to be co-localized with the two previous minerals. There is no evidence of co-localization within the grey matter. Further scanning investigation should be performed with more flat samples and better focusing. The focus issue might have impaired the microscope ability to detect mineral co-localization within the grey matter.

Further experiments are being done using standards and new sample preparation at the beamline. These experiments include comparisons between control and spinal cord injured animals. Acknowledgements: This work was supported by NIH-ERDA grant 52457. RG, SH, TP were supported by NSF LS-AMP and NIH-MBRS-RISE R25 GM59218 grants. BRL at UIC and BioCAT at Argonne Natl Lab supported respectively animal preparation and beam line study. Authors thank Dr. J. Artwohl at UIC for facilitating the project.