

SPATIALLY RESOLVED AND BULK ZINC ANALYSIS IN
BIOLOGICAL SAMPLES OF PATIENTS AT DIFFERENT
STAGES OF ALZHEIMER'S DISEASE BY HIGH RESOLUTION
INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY

Jiang Dong

Dr. J. David Robertson, Dissertation Supervisor

ABSTRACT

One hypothesis that has gained considerable attention in the pathogenesis of Alzheimer's disease (AD) is trace element toxicity, and various elements, including zinc, have become the foci of renewed interest.

The first study is analysis of spatially resolved zinc from senile plaques (SP) and neurofibrillary tangles (NFT) using laser ablation high resolution inductively coupled plasma mass spectrometer (LA-HR-ICPMS). By using matrix matched thin film standards, zinc was quantified in SP, NFT and adjacent neuropils in subjects with mild cognitive impairment (MCI). In addition, zinc was quantified in neuropils from age-matched normal control (NC) subjects. There are significant increases of zinc in MCI SP and MCI NFT compared to surrounding neuropils, suggesting a role of zinc in the pathogenesis of AD.

The second study is bulk zinc analysis in human serum, cerebrospinal fluid (CSF) and brain tissues from subjects with mild cognitive impairment (MCI), early AD (EAD), late-stage AD (LAD) and age-matched normal control (NC) subjects using HR-ICPMS. There are significant changes in zinc levels from subjects with MCI compared to subjects from NC group. The studies indicate that zinc homeostasis is altered early in the progression of AD and may play a role in the pathogenesis of AD.