

DETERMINATION OF TRACE ELEMENTS LEVELS IN HUMAN PLASMA AND RADIATED MOUSE TONGUE BY INDUCTIVELY COUPLED PLASMA-MASS SPECTROMETRY (ICP-MS)

GANG LI

Dr. J. David Robertson, Dissertation Supervisor

ABSTRACT

An analytical method that uses a minimum 150 μL of human plasma samples for the trace elements Fe, Cu, Zn, Mg and ultratrace elements Mn, Co, Cd, Pb was developed. The method was evaluated using both high resolution sector field (ICP-SFMS) and quadrupole (ICP-QMS) inductively coupled plasma mass spectrometry to analyze trace elements in Seronorm[®] quality control materials. This analytical method was used to analyze 1900 plasma samples for trace elements and ultra-trace elements in a blinded study conducted by the National Cancer Institute (NCI). Most trace and ultratrace elements were close to reference values. Possible reasons of elevated Mn and Pb levels in the plasma samples were investigated.

A laser-ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) method was developed to investigate the effects of total body irradiation (TBI) on trace elements in mouse tongue. Our hypothesis was that trace element levels in tongue mucosa change with different radiation dose and duration. Matrix-matched chicken tissue standards were developed for quantification of trace elements in tongue samples. Significant decreases of Fe, Cu, and Zn as a function of radiation dose at 1 hour and 24 hours after radiation was observed. These results suggest that trace elements in the tongue mucosa could be employed as a non-invasive biomarker for acute, total body irradiation exposures.