

MC-ICP-MS ANALYSIS OF URANIUM AND PLUTONIUM IN KERATINOUS SAMPLES FOR THE
PURPOSES OF NUCLEAR FORENSIC AND BIOMARKER ESTABLISHMENT

John W N Brown IV

Dr. J. David Robertson, Committee Chair

ABSTRACT

Human hair and nail are used as effective biomonitors for exposure and intake of numerous trace-elements and potential toxins. The objective of this work was to investigate the hypothesis that the isotopic ratio composition of U and Pu in human hair and nail are reflective of exposure to special nuclear materials.

Fingernail, toenail, and hair samples were collected from volunteers from national labs (Idaho, Oakridge, LLNL, Y-12) who self-reported exposure to either U or Pu, under the purview of a DOE CENTRAL IRB and control samples were collected from individuals living in the Columbia, MO region who had no exposure to enriched or depleted uranium or plutonium. Both the concentration and U and Pu isotopic composition was determined using the analytical procedure developed as part of this work.

Average uranium recovery was $105 \pm 4\%$. ^{242}Pu recovery ranged from 65-101%. Both ^{235}U and ^{236}U isotope ratios indicated exposure to special nuclear materials in several occupationally exposed volunteers. ^{234}U isotope ratios were not correlated between controls or exposed workers. Four volunteers had measurable amounts of ^{239}Pu in their hair, nails, or toenails.