Measurement of Uranium Isotopes in Human Tissue Samples by TIMS

Chunsheng Li[1*], Nancy Elliot[2], Sergei Tolmachev[3], Stacey McCord[3], Tom Shultz[2], Youqing Shi[2], Gary H. Kramer[1]

[1]Radiation Protection Bureau, Health Canada, Ottawa, ON, Canada, [2]Chalk River Laboratories, Atomic Energy of Canada Limited, Chalk River, ON, Canada, [3]United States Transuranium and Uranium Registries, Richland, WA, USA

Although efforts have been devoted to developing improved instrumentation and sample preparation, accurate measurement of uranium isotopes in environmental and biological samples presents an analytical challenge. This is especially true when mass spectrometric techniques are used to detect minor isotopes such as ^{234}U and ^{236}U. This paper reports the measurement results of ^{234}U, ^{235}U, ^{236}U and ^{238}U by thermal ionization mass spectrometry in 20 human tissue samples from United States Transuranium and Uranium Registries Case 1028. This Registrant was occupationally exposed to enriched uranium during the 1940s - 1960s. The tissues were selected to give a best estimate of the total amount of uranium deposited in the body and to calculate the resulting internal radiation dose. For all of the tissue samples, ^{234}U is the dominant dose contributor, followed by ^{235}U, while the dose contributions from ^{236}U and ^{238}U are significantly smaller. These observations, together with the variation of uranium isotope abundances in different tissue/organ samples, clearly confirm that donor 1028 was occupationally exposed to highly enriched uranium via inhalation.

Keywords: human tissue, uranium isotopes, enriched uranium, TIMS, USTUR

*. Corresponding author: Li_Chunsheng@hc-sc.gc.ca

USTUR-0306A-11