A multi-collector ICP-MS method for quantification of plutonium, uranium, and americium in hair and nails of occupationally or medically exposed individuals

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The ^{239}Pu, ^{238}U, and ^{241}Am concentrations and ^{239}Pu/^{240}Pu, ^{235}U/^{238}U, and ^{236}U/^{238}U atom ratios were measured in the hair and nail samples using a new method utilized TEVA, UTEVA, and DGA extraction chromatography and multi-collector ICP-MS. Samples were collected from individuals who donated their bodies to the United States Transuranium and Uranium Registries. The concentration of ^{239}Pu ranged from 0.22 to 15.8 ng/kg. The ^{240}Pu/^{239}Pu isotopic ratios ranged from 0.026 to 0.127 which is consistent with weapons-grade plutonium. Concentration of uranium fell between 1.84 µg/kg and 29.5 µg/kg and ^{235}U/^{238}U ratios ranged from 4.8×10^{-3} to 7.6×10^{-3}. Elevated ^{236}U/^{238}U atom ratios were measured in two cases and ranged from 5.0×10^{-6} – 2.4×10^{-5} indicating exposure to spent or reprocessed uranium material. The concentration of ^{241}Am was measured in four hair samples and ranged from 0.02 to 0.21 ng/kg.

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