

Measurement of Pu, U, and Am in Keratinoids Collected from Former Nuclear Workers

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A method for measuring the concentrations of ²³⁹Pu, ²³⁸U, and ²⁴¹Am, as well as the isotopic ratios ²³⁹Pu/²⁴⁰Pu, ²³⁵U/²³⁸U, and ²³⁶U/²³⁸U in keratinoid materials, such as hair and nails, was developed. A keratinoid sample was microwave digested and actinides were separated using vacuum-assisted extraction chromatography with TEVA, UTEVA, and DGA resins. After separation, the actinides were quantified by multi-collector ICP-MS. The method was used to measure actinides in hair and nails collected from former nuclear workers who voluntarily donated their bodies to the United States Transuranium and Uranium Registries postmortem. Weapon-grade plutonium, non-natural uranium isotope ratios, and americium were detected in the samples. The results demonstrate that ultra-trace levels of plutonium, uranium, and americium can be measured in hair and nails decades after exposure to these materials.

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