

Analytical Needs of the US Transuranium and Uranium Registries

R. E. Toohey, R. L. Kathren*, J. F. McInroy+, and R. H. Filby~*

**US Transuranium and Uranium Registries, Washington State University, Richland, WA 99352; +Los Alamos National Laboratory, Los Alamos, NM 87545; ~Department of Chemistry, Washington State University, Pullman, WA 99164*

The mission of the US Transuranium and Uranium Registries (USTUR) is to develop improved understanding of the biokinetics of the actinides and other radionuclides in man so as to develop better models for use in radiation protection. The primary research method is to compare the radionuclide contents of tissue samples obtained at autopsy with body contents predicted from measurements in vivo, such as urinalysis. Because of the normal adequacy of workplace controls on radioactive materials, tissue concentrations are frequently quite low and demand exacting radiochemistry. Current methods for transuranics include anion exchange separation with BioRad resin AG I-X4, preceded by solvent extraction of ²⁴¹Am into dibutyl-N, N-diethylcarbamoyl phosphonate (DDCP) if required, followed by electrodeposition and alpha spectrometry. A new procedure utilizing TRU-Spec chromatographic resins is being implemented, offering the advantage of sequential elution of plutonium, americium, uranium and thorium from the same sample solution. Current minimum detectable activities are on the order of 0.5 mBq per sample. Although fission-track autoradiography offers improved sensitivity (on the order of 0.5 uBq), it is not currently practical for the USTUR sample load of 2000-3000 per year. Other advanced methods based on mass spectrometry also offer improved sensitivity, but at greatly increased cost. The ultimate goal for the USTUR program is an analytical method capable of detecting fallout levels of plutonium in the general population (1 uBq g⁻¹) at a cost of \$500 per sample.

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