

## PREPARATION AND VERIFICATION OF NIST SYNTHETIC FECAL STANDARD FOR ANALYSIS OF Am-241, Pu-238, U-238, AND Sr-90

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For the evaluation of laboratory performance and the degree of their measurement traceability to the national standards in low-level radiobioassay analysis, a batch of synthetic fecal sample spiked with radionuclides of Am-241, Pu-238, U-238, and Sr-90 was prepared by National Institute of Standards and Technology (NIST). A total of 20 chemicals was used in the preparation of 16 kg of bulk fecal matrix consisting of 5% inorganics, 30% organics, and 65% water that simulates the composition of human feces. The bulk material was divided into 160 100-g samples, of which 100 were individually spiked with known amounts of the radionuclides. To verify the gravimetrically added radioactivity, radiochemical analyses were performed on five randomly selected samples and three blanks. After adding known amounts of actinide tracers and stable Sr carrier, the spiked samples and blanks were slowly ashed in a muffle furnace up to 450 °C following an optimized protocol. Each ashed sample was refluxed with 100 mL of concentrated HNO<sub>3</sub> and 15 mL of 30% H<sub>2</sub>O<sub>2</sub> on a hot plate until the color of the sample solution changed to light yellow. The sample solution was centrifuged and residue was discarded. After converting the supernate into 100 mL of 3 M HNO<sub>3</sub>, the actinides in the sample solution was separated from the matrix as a group on a 1.0 x 20 cm column packed with 4 g of TRU resin. Individual separation of the actinides was then achieved with ion exchange column procedures. The purified Am-241, Pu-238, and U-238 were electro-deposited on stainless steel discs and measured in an alpha spectrometer. The separation of Sr from the sample matrix and interfering radionuclides was performed on a 1.0 x 20 cm column packed with 4 g of Sr resin. The purified Sr was precipitated as SrCO<sub>3</sub> and was mounted on a planchet for beta counting. The radiochemical procedures developed in this verification measurement have been proven effective with a satisfactory yield. The degree of agreement between the radiochemical analyses and gravimetric measurement will be presented.