COMPARISON OF DIRECT KINETIC PHOSPHORESCENCE ANALYSIS AND RECOVERY CORRECTED KINETIC PHOSPHORESCENCE ANALYSIS FOR DETERMINATION OF NATURAL URANIUM IN HUMAN TISSUES

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Abstract

In the analysis of biological samples with sub ng/g uranium concentrations, pre-concentration has been shown to improve the detection limit for the determination of uranium. Recovery corrected kinetic phosphorescence analysis (KPA) combines pre-concentration and separation of uranium by anion exchange from human tissues dissolved in 6 M HCI, with the radiochemical yield determined by alpha spectrometry, using ^{232}U as a tracer. Total uranium is determined by KPA after correction for chemical recovery. Twenty-one randomly selected dissolved tissue samples from the United States Transuranium and Uranium Registries (USTUR) Case 0242 were chosen for comparative analyses. The set of samples included dissolved bone and soft tissues. Uranium concentrations for seven samples had not been previously reported. Direct KPA could not be used to determine uranium concentrations at or below the KPA L_Q value of 0.028 ng/mL and two tissues had known matrix interferences. All seven of the unreported tissues were successfully analyzed by recovery corrected KPA; concentrations ranged from 9 ng to 1380 ng per tissue, including those that could not be analyzed by direct KPA due to matrix problems. Recovery corrected KPA gives results similar to direct KPA where matrix interferences and low detection limits are not encountered. A comparison of the direct method of KPA versus recovery corrected KPA shows marked improvement for the determination of uranium in samples that heretofore either uranium was not detected or the sample had to be drastically diluted to minimize matrix effects in order to measure uranium.

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