Evaluation of Limit of Detection for Actinides in Urine Screen by Extraction Chromatography Combined with Quadrupole Inductively Coupled Plasma Mass Spectrometry (EC-ICP-MS)

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**Abstract**

Actinides are among several priority radionuclides that could be present in a nuclear or radiological incident. A rapid actinide screening method was developed as a component of the CDC Urine Radio-Bioassay Screen and to provide assessments of radiological contamination in patient urine following an incident. Assessments of contamination is part of a CDC directive for nuclear and radiological emergency preparedness and response. Five actinides (241Am, 239Pu, 237Np, 232Th and 238U) were analyzed by Extraction Chromatography-ICP-MS in this study. The method’s limit of detection (LOD) is vital. The LOD must be sufficiently low for the method to be useful as a pass/fail screen to determine which patient urine samples are contaminated. The LODs of five actinides in this method were determined by using an approach that considers Types I and II errors as recommended by the Clinical Laboratory Standards Institute EP-17. We evaluated the obtained LODs against Clinical Decision Guide levels and made comparisons against reported LODs from other laboratories and from methods using more expensive and sophisticated Sector Field (SF) ICP-MS.

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