METHOD VALIDATION OF THE CDC GROSS GAMMA SCREEN

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ABSTRACT

The NaI Gross Gamma Screen (GGS-NaI) analytical method is a component of the CDC Urine Radio-Bioassay Screen and provides a rapid pass/fail screen for gamma emitters in patient samples collected in the aftermath of a nuclear or radiological (nuc/rad) emergency. Large-scale nuc/rad emergencies and incidents may require >100,000 individuals to be screened for internal contamination. A small sub-set of that population will have an intake of radionuclides. In order to effectively prioritize scarce medical countermeasures in these scenarios, we developed a rapid GGS-NaI method using full-spectrum counting for the detection of gamma emitters in urine from potentially contaminated patients. Samples with a GGS-NaI measurement above the normal urine population background will be sent for analysis by the High Purity Germanium (HPGe) method to provide radionuclide identification and quantification.

The CDC GGS-NaI method prioritizes accuracy and efficiency. CDC collaborated with ORTEC to develop the GammaScreen-8, an array of 8 NaI(Tl) Well radiation detectors in a single lead shield. Also, CDC collaborated with Hopewell Designs, Inc. to develop a sample tube changing robotics system (autosampler), with a sample tray capacity of 425 tubes. From timing experiments, we conclude that the sample throughput capacity, with four concurrently running GGS-NaI and sample changer systems, averages ~30 seconds per sample.

This analytical method was developed and validated using Cs-137, a count time of five minutes per sample, and a sample geometry of 10 mL urine in a 15 mL centrifuge tube. We have validated the method as fit-for-purpose by evaluating accuracy, precision, limit of detection, the population background reference, and identifying limitations such as “cross-talk.”

Disclaimer

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