DETECTION LIMITS OF GAMMA-RAY SPECTROSCOPY SYSTEMS USED FOR RADIOASSAY

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ABSTRACT

The ability of a radioassay system to quantify the activity in a given sample is determined by the counting time, background conditions, and detection efficiency. The detection limit of a radioassay system can be specified in a number of ways, each of which requires that the measurement process be strictly defined and controlled. Since spectroscopy systems used for radioassay of gamma-ray emitters present unique "Background" conditions with each spectrum, the requirement of strict background quality control is not met. A comparison of methods currently used to calculate detection limits for gamma-ray spectroscopy systems has been performed. The appropriateness of the use of each method has been evaluated with a series of controlled experiments. A method to properly specify and determine the detection limit for a gamma-ray spectroscopy system has been demonstrated. This method provides a more appropriate technique for determining the detection limit and, therefore, has a significant impact on regulations and instrumentation for both radiobioassay and assay of environmental samples for gamma-ray emitters.