EVALUATION OF THE EFFECT OF PREPARATION TECHNIQUES IN ENVIRONMENTAL SOIL SAMPLES ON THE DETERMINATION OF ^{226}Ra FROM DAUGHTER NUCLIDES

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ABSTRACT:

This study was conducted to determine the amount of error which would be introduced into the determination of the measured activities of ^{226}Ra if daughter gamma peaks are used and are in a state of unknown equilibrium. Due to the relatively small branch of the 186 KeV ^{226}Ra gamma, routine laboratory practice is to use gamma peaks of the daughters in the ^{226}Ra-^{222}Rn-^{218}Po-^{214}Pb-^{214}Bi decay chain for the determination of ^{226}Ra. Based on data obtained at the Thermo **NU**tech/Richmond laboratory we can show that these results must be considered as approximate or "more than" because of the noniformity of the daughter distribution within the calibrated volume of the counting vessels, even if a sufficient time to establish euqilibrium between radium and daughters has elasped.

In order to obtain a qualitative understanding of the problem, several replicates of a finely ground, sized, and homogenized natural sample containing ^{226}Ra activity ($\sim$70 pCi/g) were counted continually from the moment of sample preparation until equilibrium was established by the radium decay chain. Some practical improvements in sample preparation have been developed to increase the correspondence between the virtual and the calibrated geometries for the counting of ^{226}Ra and daughters. The reproducible results show an agreement betweeen ^{226}Ra, ^{214}Pb,and ^{214}Bi gamma, and traditional radiochemistry techniques.