INTERLABORATORY EXERCISES ON DETECTION OF GAMMA, BETA, AND ALPHA RADIOACTIVITY IN FOOD

Kathryn Emanuele
Kathryn.Emanuele@hhs.fda.gov

Winchester Engineering and Analytical Center
Office of Regulatory Affairs, U.S. Food and Drug Administration
109 Holton Street, Winchester, MA 01890

Clarence, Rolle, Eileen Maher, Zhichao Lin, Stephanie Healey, Patrick Regan

A major nuclear or radiological incident can cause huge demand for food monitoring as demonstrated by the Fukushima nuclear disaster, in which nearly one million food samples were analyzed in Japan alone since the incident. To prepare for such high testing demand imposed by a large-scale nuclear or radiological emergency, FDA worked jointly with state and local radioanalytical laboratories to establish the testing capacity needed for risk assessment and consequence management. Given diverse radioanalytical methods used by different laboratories, assessment of method acceptability and laboratory proficiency is essential for ensuring data quality and confident decision-making.

Radionuclide characteristics, matrix disparity, and contamination mechanisms bring about different methodological challenges in the analysis of food for radioactive contaminants. To demonstrate acceptability of various methods used by member laboratories of Food Emergency Response Network (FERN), three separate multi-laboratory studies, aimed to assess sample homogenization technique, rapid screening food for triage, and analysis of food for alpha/beta radioactivity, respectively, were conducted. Fresh romaine lettuce containing heterogeneous radioactivity was used to evaluate sample preparation techniques for quantifying ^{134}Cs, ^{137}Cs, ^{133}Ba, and ^{60}Co by gamma spectrometry. Methods for screening contaminated food were assessed by directly counting 10 different grocery foods containing ^{134}Cs, ^{137}Cs, ^{133}B, ^{60}Co, and ^{152}Eu hotspots. Fresh spinach and composite food ash spiked with ^{90}Sr, ^{241}Am, and ^{239}Pu were used to examine methods for detection of alpha/beta radioactivity.

The studies showed that while many gamma spectrometry methods used by the participating laboratories were applicable per FERN data quality objective, others were deficient in coincidence-summing correction, counting efficiency calibration, and sample homogenization. In the aspect of detecting alpha/beta radioactivity in food, certain methods exhibited lack of matrix removal, low analyte recovery, or false positive detection. These deficiencies highlight the needs to harmonize various methods currently used for FERN emergency response and the necessity to continue monitoring laboratory capabilities.

This presentation will detail the approaches on assessing key methodological challenges in detection of gamma, beta and alpha radionuclides in food, discuss the study results for identifying method deficiencies, and convey method harmonization for improving method acceptability.