APPLICATION OF EDXRF TO RAPID SCREENING FOR TOXIC ELEMENTS IN FOODS AND ASIAN PATENT MEDICINES

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The effectiveness of portable EDXRF (PEDXRF) was evaluated for field examination of foods. This presentation will describe results from a number of different case studies to illustrate the importance of PEDXRF in various FDA activities focusing on protecting consumers from contaminated foods and drugs, with specific focus on determination of toxic elements in foods, dietary supplements, Asian patent medicines, ceramicware, and related samples.

An experiment was conducted to emulate the effectiveness of a Niton Xli-728e PEDXRF device in detecting presence of six toxic elements added to two model foods at acute but sub-lethal levels. The toxic elements at 1x and 0.5x the acute dose were mixed in typical serving sizes (240 mL and 140 g, respectively) of cranberry juice and instant/powdered potatoes. The foods were placed in HDPE plastic bags (potatoes) or HDPP plastic centrifuges tubes (juice) for detection. The PEDXRF was used in “thin mode” to identify these elements. Five of the six elements (As, Cd, Cr, Pb, and Hg) were successfully identified by the on-board algorithms at both dose levels. The identification of Tl required comparison of experimental spectra to on-board library spectra, as this particular analyzer did not have an identification algorithm for Tl. Since minimal or no sample preparation is required for most food samples and the analyzer can be used in the field for rapid identification of toxic elements, we have concluded that PEDXRF can be effectively used by investigators to “screen” foods that may contain acutely toxic levels of some elements. Such an investigation would also require concomitant collection of suspect samples for confirmatory laboratory analysis and detention of the suspect lot.

Several different case studies involving various types of samples (i.e., dietary supplements, contaminated foods, Asian patent medicines) have demonstrated that PEDXRF can provide useful information on sample composition in the field or more accurate quantitation in the lab after homogenization, placement in sample cups, and analysis in “bulk mode”. Several examples of both analysis modes will be described including the following: human poisoning from As in cassareep (a condiment accidentally contaminated with sodium arsenite from ant traps found to contain 244 mg/kg via PEDXRF and 233 mg/kg via ICP-MS), human poisoning from Ayurvedic medicines, (% levels of Fe, Pb, and Hg), and As in Asian patent medicines.