

## XRF DETECTION OF HEAVY METAL PESTICIDES IN ARCHAEOLOGICAL AND ANTHROPOLOGICAL ARTIFACTS

Aaron N Shugar  
Art Conservation Department  
Buffalo State College  
1300 Elmwood Ave Rm 230  
Buffalo, NY 14222

A wide range of pest control techniques have been used on museum collections. Some of these pest control techniques involve the use of heavy metals which are considered the most persistent forms of pesticide. The specific heavy metals which are of greatest concern are Arsenic (As), Mercury (Hg) and Lead (Pb) (see Goldberg (1996) and Odegaard *et al* (2005) for details concerning types of pesticides used). These elements were applied to artifacts (wood, textiles, leathers, skins, feathers etc...) in various ways including spraying in aerosol form, sprinkling with dust, painting with a solution or submerging items in liquid compounds. Contact with the contaminants may put individuals such as museum staff, visitors using the collections, and Native Communities, to which many objects are being repatriated, at risk. Investigations into contaminated collections have been carried out and reported by a number of institutions worldwide (See Sirois *et al*, in print, for more details).

Because it is difficult to gain permission from many museums to take physical samples from contaminated objects for traditional investigation, portable XRF offered a less invasive method of analysis. The use of a portable handheld X-Ray Fluorescence (XRF) to investigate heavy metal contamination in museum collections began around 1998. A main concern with the handheld XRF is the lack of understanding of the reported results of analysis. Few standards exist for pesticides of this nature and for the wide range of materials found in museum collections. Without proper calibration we are unable to say what difference a reported result of 20 ug/cm<sup>2</sup> is to 500ug/cm<sup>2</sup> of Hg in an object. In addition, there is no understanding of how these pesticide treatments infiltrated the objects (i.e. the depth of penetration, homogeneity of application and surface contamination, and rate of decay and evolution during storage). All of these issues must be clarified, before a good understanding of the health risks of using a contaminated object can be calculated.

Recent research has focused the production of reference materials which match the diverse nature of materials found in museum artifacts to ensure consistent calibration. This is a large collaborative program including the Smithsonian, NIST, the Canadian Conservation Institute, the EPA, Various museums around the world as well as the main manufactures of handheld XRFs.

Goldberg, L. "A History of Pest Control Measures in the Anthropology Collections, National Museum of Natural History, Smithsonian Institution." *JAIC* 35 (1996) pp. 23-43.

Odegaard, N. and A Sadongi. *Old Poisons, New Problems: A Museum Resource for Managing Contaminated Cultural Materials*. Walnut Creek: Alta Mira Press, 2005,

Sirois, J., Johnson, J., Shugar, A., Poulin, J. and Madden, O. (in print) "Pesticide Contamination: Working Together to Find a Common Solution" Forthcoming article from Symposium 2007: Preserving Aboriginal Heritage: Technical and Traditional Approaches. Ottawa Canada September 2007