



### **K57 Evaluating the Presence and Dangers Associated With Heavy Metals in Commonly Encountered Consumer Products**

*Lindsay A. Carbone, BS\*, Thomas H. Pritchett, MS, and Brian J. Gestring, MS, Cedar Crest College, 100 College Avenue, Allentown, PA 18104*

After attending this presentation, attendees will learn how to develop a new method for evaluating the presence of heavy metals and their transfer into human saliva.

Heavy metal contamination is a significant problem for consumer products imported from outside of the United States. This presentation will impact the forensic community by evaluating its regional prevalence and shedding light on a new method to evaluate the associated hazard.

Since the late 1970's lead levels in commercially available paints have been regulated in the United States by the Consumer Product Safety Commission (CPSC). Levels of lead above 600 ppm were banned on surface coatings, toys, and other items intended for children, and furniture. While this has been successful in regulating products made in this country, an unintended consequence of the global economy is that more of these regulated items are being produced outside of the U.S. For the most part, the CPSC relies on the foreign manufacturer to comply with these U.S. guidelines. Recently this self-regulation has resulted in the CPSC issuing numerous product recalls. Over 42 million toys have had to be removed from the market due to excessive lead paint contamination of the toy's surface. With clear published standards on lead levels, investigations into how these items were allowed on the market might well result in criminal charges.

While lead's toxicity is well established and its presence well regulated, other unregulated heavy metals found in paints as pigments or driers might also pose health risks. This preliminary study evaluated the presence of heavy metals in commonly encountered consumer products that either by design or by chance; ends up in an individual's mouth. The most obvious candidate for this category is children's toys. While it is usually not safe, it is common for young children to put non-food items in their mouths. A number of children's toys including some that had been subjected to a CPSC lead paint recall were evaluated as part of this study. Samples were not strictly limited to children's toys but also included some items that adults might inadvertently put in their mouths. To this end, pencils, pens, and certain cosmetic items were also evaluated.

Samples evaluated in this study were first screened for the presence of heavy metals. Initially this was accomplished through the use of Scanning Electron Microscopy with Energy Dispersive Analysis (SEM EDS). This approach proved problematic so screening was then changed to a portable x-ray fluorescence (XRF) unit which allowed for rapid non-destructive real-time elemental analysis.

Currently there is an abundance of literature regarding lethal doses of heavy metals and their associated toxicities. What's lacking are any studies that demonstrate how much of these metals are transferred into human saliva, the matrix that these samples would be exposed to. To address this issue an experiment was designed where a fixed amount of solid lead was placed into a set volume of human saliva that was maintained in a conical tube at body temperature. The saliva was then sampled at intervals from 30 seconds up to 240 minutes and compared against a saliva blank maintained under the same conditions via atomic absorption spectroscopy (AAS). Statistically significant concentrations of lead were found after x minutes that remained reasonably consistent for the duration of the exposure. This was performed for each heavy metal that was being evaluated by AAS.

Samples that had positive screening results with the XRF were then evaluated through the saliva transfer test. A 1 cm square was excised from the sample and allowed to sit in human saliva maintained at body temperature for XX. Results were then compared with saliva blanks also maintained at temperature. The Excised samples were then removed from the saliva, mechanically broken down, and then replaced into the saliva again. After being allowed to sit for X minutes again, the saliva was reevaluated for the presence of the heavy metal.

#### **Metals, Transfer, Saliva**