B99 Trace Laboratory Gunshot Residue Contamination Study

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After attending this presentation, attendees will become familiar with gunshot residue analysis by scanning electron microscopy (SEM), the per- sistence of gunshot residue (GSR) particles, potential for the presence of GSR contamination, and the need for effective and practical QC procedures in order to eliminate contamination concerns.

This presentation will impact the forensic community and/or humanity by serving as an example of a method to ensure that established QC procedures are effective as a primary means to guard against potential contamination.

The preferred analytical method of GSR analysis is by SEM. This analytical method is a highly sensitive and highly specific method to identify particles characteristic of GSR. Characteristic particles can be detected and confirmed to the sub-micron size. However, the sensitive and specific nature of SEM as an analytical method also introduces a strong potential for GSR contamination.

Characteristic GSR particles consist of a single particle containing three elements included in the majority of ammunition primers. These ele- ments include lead (Pb), Antimony (Sb), and Barium (Ba). These three ele- ments are recognized as heavy metals and are known to be very persistent with very little degradation under normal conditions. For this reason, it is commonly accepted that characteristic GSR particles readily transfer from surface to surface, either by secondary or tertiary conditions. Contamination and false positives have been associated with suspect holding areas, police vehicles, brake pads, and fireworks. Also, as with many analytical methods in any laboratory, contamination may occur with poor evidence handling.

This study identified several areas as potential contaminants. For the purpose of the study, these areas included items such as law enforcement officer's hands, analyst's hands, and evidence technician's hands as well as areas such as laboratory evidence rooms and the trace evidence laboratory. The study also includes various common area surfaces throughout the lab- oratory including, doorknobs and elevator buttons. Finally, the study was expanded to identify the possibility of airborne contamination in a GSR laboratory. Each item was sampled using a GSR collection kit utilizing a carbon adhesive tab. Collection was conducted in a random manner over a period of approximately 15 months. The samples were examined using an automated GSR analysis system on a scanning electron microscope with electron detector system (EDS). Also, the collection occurred with no prior notification to individuals being tested.

The results of this study identified several sources of potential conta- mination throughout the laboratory building. These areas included exterior doorknobs, elevator buttons, and evidence packages. A minimal amount of GSR (one to two particles) was found on each of these items at various time intervals. The nearby Harris County Sheriff's Office (HCSO) Firearms Laboratory was identified as a source of contamination as well. However, no GSR contamination was identified inside the trace section of the labo- ratory. Additionally, no airborne particles of contamination were identified in the stubs set out in the trace laboratory. The results obtained in the cont- amination study were consistent with laboratory expectations based on existing literature. Further, the study established several QC procedures being practiced by the trace laboratory as being appropriate and practical.

This study will impact the forensic community by serving as an example of a method to ensure that established QC procedures are effective as a primary means to guard against potential contamination.

In conclusion, this study confirms the Harris County Medical Examiner's Office Trace Evidence Section produces accurate, reliable, and repeatable gunshot residue analysis despite the persistence of GSR particles and the potential for contamination.

Gunshot Residue, Contamination, Scanning Electron Microscopy

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