B193 A Framework for the Assessment of Gunshot Residue (GSR) Evidence: Transfer, Contamination, and Preservation

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After attending this presentation, attendees will better understand the factors that could be considered in the assessment of GSR evidence in order to strengthen the value of this evidence when presented in court.

This presentation will impact the forensic science community by reporting the results of a number of surveys for GSR, including an assessment of prevalence within a random population and on the hands of firearms-carrying law enforcement officers, as well as an assessment of the extent of transfer from police to suspects during arrest. Applying the data gathered from these surveys to the assessment of GSR evidence will permit examiners to provide a more informed judgement of the significance of a GSR test result.

A quantitative model for the transfer of GSR and evaluation of the evidence has been elusive thus far, and extensive specific data that can be used to inform casework evidence evaluation in the context of background GSR prevalence and secondary transfer scenarios are lacking.[1,2] To ensure a GSR test result can be given an appropriate and rigorous weighting in court, the deposition, retention, and distribution of GSR in the aftermath of a firing event must be better understood as well as the likelihood of GSR being present on a suspect due to incidences unrelated to the event (e.g., cross-contamination or background prevalence). The goal of the research discussed in this presentation relates to the latter consideration.

In this research, several surveys were conducted in order to determine the prevalence of GSR particles in a wide random population; samples were collected from volunteers in public spaces in order to reach a determination.[3] Further, the prevalence of GSR particles on the hands of police officers is relevant. Even if police officers do not fire a firearm while arresting a suspect, GSR present on police officers' hands as a result their general activities might represent a source of particles capable of being transferred to the suspect. To determine the magnitude of this source, the hands of serving police officers in non-firing situations were sampled for GSR. Although the abundance of GSR particles on police officers' hands is important to determine, it is of greater relevance to determine the extent of transfer of these particles from officers to suspects during arrest. Accordingly, studies of direct transfer of GSR during mock arrests were conducted. Typical hand stub samples were analyzed using Scanning Electron Microscopy with Energy-Dispersive X-ray Spectroscopy (SEM/EDS) coupled with automated GSR analysis software (GSR Magnum™). Particles were confirmed as GSR by manual review. Data were then analyzed and interpreted with a view to contributing to a framework for the evaluation of GSR evidence.

This study explores the hypothesis that understanding a GSR test result in the context of a range of alternate scenarios by which GSR might end up on the suspect is essential in interpreting evidential value.

Reference(s):

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3. N. Lucas, H. Brown, M. Cook, K. Redman, T. Condon, H. Wrobel, K. P. Kirkbride, and H. Kobus. A study into the distribution of gunshot residue particles in the random population. *Forensic Science International.* 262 (2016): 150-155.

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