



## Criminalistics Section - 2015

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### **B25 Utilization of Commercial Portable Instruments for Screening Hand Swabs for the Presence of Firearms Discharge Residue (FDR): Collection Efficiency Using Commercial and In-House Media**

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After attending this presentation, attendees will understand what types of hand-swabbing materials are available for collection of FDR from the hands of potential shooters for subsequent analysis using a variety of analytical instruments.

The presentation will impact the forensic science community by providing data on methodology and efficacy of hand swabbing for the detection of FDR.

Gunshot Residue (GSR) consists of particulates containing lead, antimony, and barium (principally) that are formed from primer components that are vaporized during the firing of a weapon. The primary analytical technique used to characterize GSR is Scanning Electron Microscopy (SEM) coupled to X-ray spectroscopy. While conceptually and analytically sound, the drawbacks to this procedure are known and include loss due to secondary transfer and the challenge of interpretation of results.<sup>1-4</sup> Consequently, the forensic analysis of samples collected from the skin of potential shooters is no longer commonplace.

This is regrettable given that the firing of a weapon yields a wealth of useful physical and chemical evidence. GSR is only one type of physical evidence available; organic compounds are also produced when a weapon is discharged. This chemical residue is referred to as Organic Gunshot Residue (OGSR) which has been addressed in recent literature reports.<sup>2,5-7</sup> The organic and inorganic components combined are referred to as FDR. The focus of this study is to discuss research and validation studies undertaken using a variety of hand swabbing methods with the goal of using the collected samples in both presumptive and confirmatory analyses for organic and inorganic compounds.

The criteria for selection of media were: (1) wettability using isopropanol; (2) stability under thermal desorption conditions; (3) compatibility with several portable instruments for presumptive testing (X-ray fluorescence and ion mobility spectrometry); (4) extractability; and, (5) compatibility with Scanning Electron Microscopy with Energy-Dispersive X-ray Spectroscopy (SEM/EDS) methodology. Materials analyzed including clean room wipes, a raw fabric of Kevlar<sup>®</sup>/Nomex<sup>®</sup>, and commercially prepared Nomex<sup>®</sup> and muslin swabs. The combination of these materials and isopropanol as the wetting agent yields a simple, non-invasive sampling technique that has been approved by the West Virginia University Institutional Review Board (WVU IRB). The advantages and disadvantages of each media will be presented in terms of recovery efficiency from a skin surrogate, instrumental compatibility and performance, extractability, and stability of samples under typical storage conditions.



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### Hand Swabbing, GSR, IMS