B16 "Free Range" Gunshot Primer Residue: A Study on Multiple Transfers of Gunshot Primer Residue

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Learning Overview: After attending this presentation, attendees will have a better understanding of the number of times Gunshot primer Residue (GSR) can transfer from one surface to the next.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing practitioners insight into the dynamics of GSR particle transfers from one surface to a second surface to a third surface. This presentation describes the methods used to test this theory of transfer of GSR.

GSR is produced by a firearm when it is discharged. The primer for centerfire cartridges is mainly composed of lead styphnate, barium nitrate, and antimony sulfide. The residue from the primer explosion escapes from openings in the gun and can be deposited on a person's hands and clothing. These particles can be collected and analyzed using automated scanning electron microscopy/energy dispersive X-ray spectroscopy. Characteristic GSR particles have a molten appearance and contain barium, antimony, and lead. There have been several studies that examine the transfer of GSR to the interior of police cars from a person who has gunshot residue on their person. There have not been studies conducted that try to determine the number of times GSR particles could transfer from one surface to another.

This presentation will detail the results of two studies on the potential transfer of GSR. The first study involves the transfer of GSR from a GSR-contaminated area to a clean subject who enters the area, then subsequently transfers the gunshot residue particles to other surfaces outside the contaminated area. One of the analysts of the Trace Evidence section of the laboratory attended firearm familiarization training given by the Firearms and Toolmarks section of the laboratory. This analyst does not handle firearms at all. At the end of the training, the analyst was asked to stub her clothing, her cubicle chair, the driver seat of her car, and any chairs that she might have sat in at her home in the same clothing she had worn to the training.

The second study deals with the potential transfer of GSR from a victim's clothing to a person's hands that touch the victim. The Firearms and Toolmarks section re-created a shooting victim's clothing. An analyst who had no GSR on their hands handled the shooting victim's clothing. Their hands were then stubbed to analyze for GSR.

All of the above stubs were analyzed using scanning electron microscopy energy dispersing X-ray spectroscopy instrumentation using standard laboratory procedures for the analysis of GSR.

This research takes a novel approach by investigating the likelihood of multiple transfers of GSR particles between surfaces.

Gunshot Primer Residue, Scanning Electron Microscopy, Locard's Theory

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