B102 A Study on the Transfer of Gunshot Primer Residue (GSR) From Fabric to Other Surfaces

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Learning Overview: After attending this presentation, attendees will have a better understanding of the potential for GSR particles to transfer from fabric surfaces onto other surfaces.

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 clothing to other surfaces. This presentation also 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 is deposited on nearby surfaces, including a person's hands and clothing. These particles can be collected and analyzed using automated Scanning Electron Microscopy/Energy Dispersive X-ray Spectrometry (SEM/EDS). Characteristic GSR primer particles have a molten appearance and are composed of barium, antimony, and lead.

There have been numerous studies addressing the potential for the transfer of gunshot primer residue from hands to other surfaces (hands to hands, hands to clothing, etc.) However, there is a lack of research addressing the potential of GSR transfer from fabric to another surface. In this study, three types of transfers are addressed: transfer from one piece of cloth to a second clean piece of cloth, transfer from a piece of cloth to clean hands, and tertiary (and more) transfers between fabric surfaces.

Oftentimes, investigators will submit multiple items of clothing in the same paper bag and ask for GSR analysis on all the items. Occasionally, questions arise of not only whether GSR was present, but specifically where on the garments the GSR particles were recovered from. In order to answer this question, the GSR analyst needs to be able to assess the potential for GSR transfer between two pieces of fabric. This portion of the study consisted of shooting a cloth target, then placing a clean target into contact with the shot target.

In some shooting cases, a person of interest will state that they did in fact touch the victim either to perform Cardiopulmonary Resuscitation (CPR) or check to see if the person was alive. Since more gunshot primer residue escapes from the barrel than from near the handle, the majority of both homicide and suicide victims have gunshot primer residue on their person. To answer the question of whether or not this is a reasonable explanation for the presence of GSR on the hands, a study was conducted in which a target was shot at and an individual with clean hands touched the target near the bullet hole to determine if GSR can transfer from a comparatively porous surface (the cloth target) onto a comparatively smooth surface (the hands).

There have been several studies that examine the transfer of gunshot primer residue 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 gunshot primer residue particles could transfer from one surface to another. An analyst who does not handle firearms either in the lab or at home spent a day of training in the firearms section. 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 may have sat in at her home in the same clothing she had worn to the training. These stubs were analyzed using SEM/EDS instrumentation using standard laboratory procedures for the analysis of gunshot primer residue.

This presentation will detail the results of a series of studies on the transfer of gunshot primer residue from clothing to clean areas that come in contact with the GSR-contaminated clothing. This research takes a novel approach by investigating the likelihood of transfers from clothing to other surfaces, including hands.

GSR, SEM/EDS, Locard's Theory

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