D27 Conducting Laboratory Analysis of Gunshot Residue (GSR) on Clothing to Identify a Shooting Suspect

Alan A. Price, MA, University of Northern Colorado, PO Box 336433, Greeley, CO 80633*

After attending this presentation, attendees will understand the significance of why laboratory analysis is not routinely conducted on clothing.

This presentation will impact the forensic science community by showing how television dramas misrepresent the forensic laboratory analysis capabilities when analyzing gunshot residue (GSR) on clothing.

Fictitious annals of television crime dramas depict criminalists in crime laboratories being able to determine which individual discharged a firearm by examining their clothing. From this misrepresentation of laboratory capabilities, attorneys and law enforcement personnel frequently have incorrect perceptions of the analysis process for gunshot residue. Actually, most crime laboratories do not routinely examine clothing for GSR. Considerable research has been conducted to determine muzzle to target distance using GSR and stippling; however, studies are absent in assessing whether a specific item of clothing worn by a shooting suspect contains GSR. This research focused upon the utility of examining fabric for GSR in an attempt to identify a specific individual's clothing subsequent to a shooting incident, using a scanning electron microscope (SEM). Three common pieces of fabric were used as samples for collecting GSR and were then examined. Researchers used cotton, polyester, and denim sleeves for collection of residue samples. The revolver used in this project was a .357 magnum, with a 2.5 inch barrel. The three basic elements of gunshot residue are barium (Ba), antimony (Sb), and lead (Pb). Carbon-coated aluminum stubs were used to collect GSR particles from each individual fabric sample.

Each of the three fabric samples were washed with liquid detergent to remove any potential contaminates. The samples were collected on an outdoor firing range to avoid cross-contamination from any extraneous indoor particulates. Six bullets were fired for each collection sample. To prevent contamination researchers wore latex gloves while handling each sample. Immediately after the fabric was exposed to the weapon's discharge, they were placed and stored in individual clean paper "sleeves." All three-fabric samples had a 10 mm square marked onto the top of each sleeve. This is the area directly behind the "web" of the thumb and index finger and mostly exposed when holding and discharging a handgun. The primer control was discharged without gun powder or a bullet being present in the shell casing. Particulates from the primer were collected from stubs mounted on paper.

In the laboratory, the sample sleeves were pressed with the prepared stubs ten times. The samples were collected from within each 10 mm square previously marked on each sleeve. The two detectors used were backscatter and energy-dispersive spectrometry (EDS). After a GSR particle was located, it was then analyzed for five minutes at one location for EDS confirmation. Each fabric sample was manually scanned for one hour to search for GSR particles. In order to limit selection of possible particles on the samples, auto-brightness and contrast were performed on the primer sample. With this setting the sample stubs were examined, which prevented extraneous particles from showing up. The findings are as follows: GSR was readily detected from the primer standard; GSR was detected on the cotton fabric; GSR was detected on the polyester sample; and no GSR was detected on the denim fabric sample. Although not all elements of GSR were detected on the cotton and polyester samples, sufficient elements were present to conclude that GSR existed.

The analysis of clothing for GSR can be very inconclusive. Multiple extraneous variables will influence GSR analysis results. Movement or shaking of the fabric sample may dislodge particulates from the fabric. Rubbing or contact with another object may also result in dislodging GSR particulates. Air currents around the weapon and the fabric may have a significant influence of GSR adhering to a fabric. Without having the scanning software capabilities for an SEM/EDS, searching for and identifying GSR is very difficult and time consuming. This study illustrated that GSR on fabric cannot by itself be initially identified merely by shape, size and brightness under the SEM/EDS. Even though no GSR particles were found on the denim fabric, it cannot be concluded that a specific type of fabric has any more or less propensity of retaining GSR particles. As previously stated, mythical television entertainment is incorrect in representing forensic laboratory capabilities.

 ** Presenting Author*

GSR Particle Identification, Misperception of GSR Analysis Capabilities, Television Drama Misrepresentation

 ** Presenting Author*