D32 A Study to Determine the Use of Gunshot Residue Upon Clothing as an Item of Evidence

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After attending this presentation, attendees will gain an insight into the need to gain a primary level of experimental data for different types of trace evidence pertinent to an investigation in order to establish a contextual understanding of the behavior and persistence of such evidence. This approach then enables the incorporation of the results derived to build upon a secondary level experimentation on a case-by-case basis so as to provide an empirical base for the collection, analysis, and interpretation of trace evidence for intelligence and evidentiary purposes.

This presentation will impact the forensic science community by providing insights into the behavior of one particular form of trace evidence, Gunshot Residue (GSR), using Scanning Electron Microscope (SEM) analysis to identify the transfer, distribution, and persistence of GSR upon clothing.

In recent years, there has been a decrease in the use of trace evidence in criminal investigations. This is partly due to the discovery of DNA evidence and partly due to the lack of understanding into the behavior of the various types of trace evidence such as GSR. In order to gain such information, the aim of this United Kingdom-based study was to determine the behavior of GSR by analyzing its detectability after washing, by analyzing its spatial distribution upon clothing, and by determining a timeframe within which detectability is still possible. These are interesting factors to analyze as there is currently a limited amount of information that is inferred from GSR evidence; therefore, further understanding is needed to increase its evidentiary value and to be used as an evidentiary tool in criminal investigations.

This experimental study was designed to asses both spatial and temporal aspects of GSR behavior on clothing. First, clothing of three witnesses in close proximity to a shooter at different angles was analyzed. The firearm, a .357 Magnum® revolver, was discharged five times for each of the four experiments. Sampling was carried out by utilizing SEM stubs to tape-lift the GSR particles from various areas of the clothing. After sampling, each stub was analyzed by the SEM to confirm the presence of GSR.

Second, it was determined that after washing the clothing, the concentration of GSR was significantly reduced, making detectability unlikely but not impossible. It was also determined that there was a pattern to its spatial redistribution depending on the location of the witness. However, this distribution is dependent on a variety of variables that need to be considered if a secondary level of experimentation were to occur. In this study, GSR was still detected on the clothing after 12 hours. The implications of this finding, given that current regulations in the United Kingdom are that garments are only tested for GSR up to six hours after an incident, will be discussed.

This research, therefore, offers a positive foundation for further studies in order to determine a framework for GSR behavior and its utility as a form of evidence in criminal investigations. It also shows that the variability in the GSR distribution pattern regarding garments should not be overlooked when recovering evidence.

Gunshot Residue, Trace, Forensic Evidence

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