



B53 Determination of Gunshot Residue (GSR) in Vehicle Head Liners Using Scanning Electron Microscope (SEM)

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After attending this presentation, attendees will understand some principles of Gunshot Residue (GSR) collection, the use of a Scanning Electron Microscope equipped with Energy Dispersive X-ray (SEM/EDX) for gunshot residue analysis, the potential for using a High-Efficiency Particulate Absorption (HEPA) filter/hand-held vacuum approach to collect GSR from vehicle head liners, and the feasibility of using this alternate collection method.

This presentation will impact the forensic science community by offering the possibility of augmenting current GSR collection from vehicles with the addition of a HEPA filter/hand-held vacuum methodology to collect GSR from any part of a vehicle. Identification of a practical approach for collecting GSR from vehicles could allow for faster and more accurate collection.

This study began as a continuation of a previous project that used the same collection methodology to recover GSR from hair. It was determined from this earlier project that this collection methodology could be a useful approach for collecting GSR evidence elsewhere. This experiment reinforces the methodology presented in this research as a means of reducing the amount of time spent processing surfaces for the presence of GSR.

The experiment consisted of the collection of GSR from ten different vehicles — five with the firearm discharged inside the vehicle and five with the firearm discharged one foot distance outside the vehicle from the passenger-side window. The firearm in all instances was discharged perpendicular to the long axis of the open car window. Each vehicle was divided into eight sections for collection. The eight sections were the Driver-Side Front Head Liner (DFH), Driver-Side Front (DF) that consisted of everything except the head liner, Passenger-Side Front Head Liner (PFH), Passenger-Side Front (PF) that consisted of everything except the head liner, Driver-Side Rear Head Liner (DRH), Driver-Side Rear (DR) that consisted of everything except the head liner, Passenger-Side Rear Head Liner (PRH), and Passenger-Side Rear (PR) that consisted of everything except the head liner. For this project, the sections of the vehicles labeled PFH were analyzed. The collection method included a hand-held vacuum with a HEPA filter and GSR stubs. The GSR stubs were manually analyzed at 500x using a horizontal method that covered the width of the stub. This was done in a single pass using SEM/EDX.

Analysis of the passenger head liner from firing inside the vehicle showed a success rate of greater than 20% of the particles scanned and from firing outside the vehicle, a success rate of 10%-15%. The success rate was based on a particular particle containing lead, barium, and antimony (Pb-Ba-Sb). Pb-Ba-Sb is such a unique particle that, when found, can directly be connected to GSR. The collected results suggest that using this alternate collection method could aid greatly in the time spent on collecting evidence from vehicles. Firing from completely inside the vehicle resulted in more GSR being recovered than from firearms discharged outside the vehicle.

The results further indicate that it is feasible to detect gunshot residue from vehicle head liners using a HEPA filter and a vacuum. The HEPA filter must screen for particles as small as 1-10 μ m. The filters used in this experiment screened for particles as small as 0.3 μ m. Because portability is a necessary requirement for crime scene equipment, the vacuum used was a rechargeable hand-held model that had been proven previously to have enough power to gather GSR particles from hair. The significance of these results show that this alternate collection methodology can be a useful tool for crime scene investigators.

Gunshot Primer Residue, Vehicles, SEM/EDX