GUNSHOT RESIDUE ON GSR EVIDENCE PACKAGING

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INTRODUCTION

GSR analysis is a valuable tool commonly used in forensic science to associate a suspect with the discharge of a firearm. Associations may result from firing a weapon, being in close proximity to a discharge, handling a weapon or fired cartridge, or handling some other surface bearing GSR. The presence of GSR particles does not prove that a person fired a weapon, but in a criminal investigation, it can place an individual in the proximity of the firing of a weapon.

Gunshot residue is created by combining lead (Pb), barium (Ba) and antimony (Sb) into one particle by the rapid heating and cooling associated with the discharge of a firearm. As few as three characteristic GSR (Pb-Ba-Sb) particles are sufficient to provide an association.

GSR particles can contaminate a surface, such as the external surface of evidence packaging, by unintended transfer during collection, transport and storage. Effective efforts must be made in the GSR testing laboratory to reduce the possibility of contamination. Steps should be taken to maintain separate areas for evidence package handling and analytical testing. Proper hygiene and the use of personal protective equipment (PPE) can help prevent contamination. Precautionary practices, such as control sampling of a collector's hands before evidence collection, can demonstrate the absence of GSR particles that could be a source of contamination.

Example of a stub used for collection

MATERIALS & METHODS

In order to evaluate the potential for packaging to be a source of GSR contamination, the exterior of 100 GSR collection kit packages of varying types was sampled for GSR. Samples were blindly tested using scanning electron microscopy/energy dispersive X-Ray spectroscopy (SEM/EDX) with automated software to detect particles characteristic of GSR by standard operating procedures. All GSR particles identified by the instrument were confirmed manually. Commercially available GSR stubs were used.

Package handling included transport by law enforcement officers, property room technicians, evidence technicians and storage in property room. Any of which could have been contributors. No additional or special handling of the evidence was performed.

Summary of characteristic particles identified

STUB #	CHARACTERISTIC PARTICLES	Ba-Sb	Pb-Sb	Pb-Ba	Pb	Ba	Sb
1	1				2		
2	1				1		
3	1						
14	1				1		1
15	2		1				2
24	4						
48	4				3		1
86	1				1		1
94	1						
97	1				1		1
98	1						
100	1						

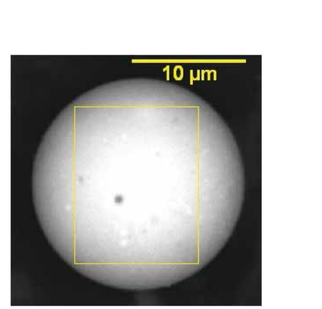
Discharge containing GSR

RESULTS & DISCUSSION

Results showed that 12 of the 100 sampled packages yielded characteristic GSR particles. Of the 12 positive exteriors, 3 had more than 1 particle. The source of the GSR could not be determined, but the packages were used by law enforcement personnel prior to submission.

These results show that GSR evidence packaging should be treated as if it were contaminated. The lab should maintain separate package handling and analytical testing areas. Good practices should include wiping GSR packaging at evidence intake, regular cleaning of dedicated laboratory packaging areas and analytical areas, and the use of PPE and good hygiene practices.

Example of a characteristic GSR particle (back-scattered electron image) and x-ray spectrum



CONCLUSION

This study identified a potential source of GSR laboratory contamination and demonstrated that actions be taken to mitigate occurrence. Laboratories engaged in GSR analysis must be able to demonstrate effective laboratory protocols in order to produce quality, contamination-free results.

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