OSAC Research Needs Assessment Form

Title of research need: Specific identification of shooters

Keywords: GSR, shooter identification, data analysis, analytical methods

Submitting subcommittee(s):   GSR   **Date Approved:**   11/28/16

(If SAC review identifies additional subcommittees, add them to the box above.)

Background information:

1. Description of research need:

Current methods of GSR analysis can only point to who was involved in, or in very close proximity to, a weapon discharge. A statistically defensible method (or methods) are needed to push the field to the point where it is possible to provide a probabilistic assessment of how and to what degree the results support or refute the hypothesis that a sample was obtained from a shooter vs. a bystander. The research will require controlled studies relating to particle deposition and recovery, loss rate, particulate density on skin surfaces, recovery efficiency, and background/environmental levels across a broad population.

2. Key bibliographic references relating to this research need:

[1] F. S. Romolo and P. Margot. Identification of Gunshot Residue: A Critical Review. *For. Sci Int.* **2001**, *119*, 195.

[2] B. Cardinetti, C. Ciampini, S. Abate, C. Marchetti, F. Ferrari, D. Di Tullio, C. D'Onofrio, G. Orlando, L. Gravina, L. Torresi and G. Saporita. A Proposal for Statistical Evaluation of the Detection of Gunshot Residues on a Suspect. *Scanning*. **2006**, *28*, 142.

[3] A. Biedermann and F. Taroni. A Probabilistic Approach to the Joint Evaluation of Firearm Evidence and Gunshot Residues. *For. Sci Int.* **2006**, *163*, 18.

[4] B. Cardinetti, C. Ciampini, S. Abate, C. Marchetti, F. Ferrari, D. Di Tullio, C. D'Onofrio, G. Orlando, L. Gravina, L. Torresi and G. Saporita. A Proposal for Statistical Evaluation of the Detection of Gunshot Residues on a Suspect. *Scanning*. **2006**, *28*, 142.

[5] A. Biedermann, S. Bozza and F. Taroni. Probabilistic Evidential Assessment of Gunshot Residue Particle Evidence (Part I): Likelihood Ratio Calculation and Case Pre-Assessment Using Bayesian Networks. *For. Sci Int.* **2009**, *191*, 24.

[6] S. Charles and B. Nys, in *Scanning Microscopy 2010*, eds. M. T. Postek, D. E. Newbury, S. F. Platek and D. C. Joy, 2010, vol. 7729.

[7] A. Biedermann, S. Bozza and F. Taroni. Probabilistic Evidential Assessment of Gunshot Residue Particle Evidence (Part II): Bayesian Parameter Estimation for Experimental Count Data. *For. Sci Int.* **2010**, *206*, 103.

[8] E. Lindsay, M. J. McVicar, R. B. Gerard, E. D. Randall and J. Pearson. Passive Exposure and Persisitence of Gunshot Residue (GSR) on Bystanders to a Shooting: Comparison of Shooter and Bystander Exposure to Gsr. *Can. Soc. Forensic Sci. J.* **2011**, *44*, 89.

[9] R. Gauriot, L. Gunaratnam, R. Moroni, T. Reinikainen and J. Corander. Statistical Challenges in the Quantification of Gunshot Residue Evidence. *J. Forensic Sci.* **2013**, *58*, 1149.

[10] N. Lucas, M. Cook, J. Wallace, K. P. Kirkbride and H. Kobus. Quantifying Gunshot Residues in Cases of Suicide: Implications for Evaluation of Suicides and Criminal Shootings. *For. Sci Int.* **2016**, *266*, 289.

[11] N. Lucas, H. Brown, M. Cook, K. Redman, T. Condon, H. Wrobel, K. P. Kirkbride and H. Kobus. A Study into the Distribution of Gunshot Residue Particles in the Random Population. *For. Sci Int.* **2016**, *262*, 150.

3a. In what ways would the research results improve current laboratory capabilities?

This data will be invaluable for data analysis and interpretation. Currently, reporting and testimony has to be limited to presence/absence of GSR. The results of this study (if successful) will increase the weight and value of GSR evidence and help to resolve issues related to shooter vs. by-stander.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

This study will supply critical data regarding GSR deposition, collection, and persistence as well as providing for a statistical tool for evidence evaluation

3c. In what ways would the research results improve services to the criminal justice system?

The ability to distinguish the shooter from by-standers will be invaluable in shooting investigations.

4. Status assessment (I, II, III, or IV): I

	Major gap in current knowledge	**Minor** gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.

Subcommittee	Approval date:	11/21/16

(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)

SAC

1. Does the SAC agree with the research need?   Yes   No ◯

2. Does the SAC agree with the status assessment?   Yes   No ◯

     If no, what is the status assessment of the SAC:

Approval date: 11/28/16

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)