OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: Development of New/Novel GSR Method(s) for Specific Identification of Shooters

Keyword(s): Gunshot Residue, GSR, Shooter Identification, Data Analysis, Analytical Methods

Submitting subcommittee(s): Ignitable Liquids, Explosives, & Gunshot Residue

Date Approved: 3/02/2021

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

Background Information:

1. Does this research need address a gap(s) in a current or planned standard? (ex.: Field identification system for on scene opioid detection and confirmation)

Yes, this research will address a fundamental gap in both current and planned standards with regard to the probative question for which GSR analysis is typically used. The probative question surrounding GSR analysis is "Did person X discharge the firearm?" (i.e. "Did person X shoot the gun?") Current GSR methods cannot unequivocally identify a specific individual as having discharged a firearm, to the exclusion of either of the current alternative possibilities, which are that the individual (1) only handled a firearm, or (2) only was in the vicinity of firearm discharge. Research to identify and develop new/novel methods that can provide data that can be used to conclusively distinguish a firearm shooter from a firearm handler, and a firearm discharge bystander, is needed in order to provide a definitive answer to the probative question. Whatever approach is developed as a result of this type of research will need to be practical with respect to sample collection, preservation, and analysis, and will ideally make use of instrumentation readily available to forensic laboratories. The sensitivity of the technique must also be demonstrated with regard to the amount of time between a shooting event and sampling of the individual and obtaining a positive result. Limitations to the techniques including false positives and false negatives must also be investigated.

2. Are you aware of any ongoing research that may address this research need that has not yet been published (e.g., research presented in conference proceedings, studies that you or a colleague have participated in but have yet to be published)?

No.

3. Key bibliographic references relating to this research need: (ex.: Toll, L., Standifer, K. M., Massotte, D., eds. (2019). Current Topics in Opioid Research. Lausanne: Frontiers Media SA. doi: 10.3389/978-2-88963-180-3)

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[4] 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

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[10] K. Bar-Or, J. Almog. Children and guns: The detection of recent contact with firearms on children's hands by the PDT reagent. For. Sci Int. 2015, 253 43-47.

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[12] B. Yeager, K. Bustin, J. Stewart, R. Dross and S. Bell. Evaluation and Validation of Ion Mobility Spectrometry for Presumptive Testing Targeting the Organic Constituents of Firearms Discharge Residue. Analytical Methods. 2015, 7, 9683.

4. Review the annual operational/research needs published by the National Institute of Justice (NIJ) at https://nij.ojp.gov/topics/articles/forensic-science-research-and-development-technology-working-group-operational#latest? Is your research need identified by NIJ?

Yes. This research need is related to the Operational Requirement "Novel and/or improved evidence recognition, collection, and visualization tools and analytical instrumentation for field and lab use," as related to the Activity "Scientific Research; Technology Development; Assessment & Evaluation," within the Forensic Discipline "Trace Evidence." This research calls for creative thinking and "out of the box" problem solving in order to develop new/novel method(s) for the specific identification of shooters.

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

If a completely new method is developed for specific identification of a shooter, then laboratories who perform GSR analysis will be compelled to acquire the instrumentation and equipment needed to perform the new method.

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

Research into new/novel methods of GSR analysis will not only potentially uncover a means for the unambiguous discrimination of a shooter from the other current alternatives, but also is likely to result in the generation of valuable additional information regarding a variety of related factors, perhaps such as frequency of occurrence of various particle types, persistence and transfer probabilities, or theoretical modeling of particle deposition. Each of these potential results would make strides toward an improved understanding of the scientific basis for GSR analysis with respect to the probative question.

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

As previously stated, current methods of GSR analysis cannot unequivocally answer the probative question of who specifically discharged a firearm, to the exclusion of someone who only handled a firearm or was only in close proximity to a firearm discharge. If successful, the results of this research will provide the court with an unambiguous answer to the probative question: who fired the weapon?

8. 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.