

OSAC RESEARCH NEEDS ASSESSMENT FORM



Title of research need:

Describe the need:

When a weapon is discharged, it generates two types of gunshot residue (GSR): inorganic and organic. Current analysis to determine if an individual came into contact with GSR focuses on the analysis of inorganic GSR. Several factors have contributed to the increasing interest in the forensic examination of organic GSR (OGSR). These include the availability of ammunitions containing lead-free primer mixtures, the need to differentiate GSR particles from other environmental sources, and the need to increase the overall efficiency and accuracy of GSR analysis.

It is necessary to develop methods to supplement current inorganic GSR analysis. Advances in mass spectrometry have made possible the detection of OGSR in forensically relevant concentrations. Comprehensive feasibility studies that integrate metadata analysis of existing literature, method development and validation, and interpretation of analytical results are needed to transition this technology from the research laboratory to the forensic laboratory. The following research areas are identified as needing comprehensive studies and evaluation:

- Stability of OGSR on sampling media
- Sampling compatibility with established collection methods for pGSR by SEM/EDS
- Discriminating power of selected OGSR compounds
- Additional OGSR targets (example: nitroglycerin and nitrocellulose degradation products)
- Persistence and secondary transfer characteristics
- Compatibility with existing forensic laboratory instrumentation
- Population studies and environmental background

Keyword(s):

Submitting subcommittee(s):

Date Approved:

(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)

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)?

- Tatiana Trejos at West Virginia University has a NIH research grant on analyzing organic gunshot residue
- Céline Weyermann and other faculty at the University of Lausanne are conducting research on organic gunshot residue analysis and factors affecting its analysis
- Paul Kirkbride at Flinders University is conducting research on the collection of organic gunshot residue and its prevalence in the community
- Members of the OSAC ILEXGSR Subcommittee are conducting research on the analysis of organic gunshot residue by gas chromatography-mass spectrometry and liquid chromatography-mass spectrometry.

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. 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. Comprehensive evaluation of the detection and utility of organic gunshot residues

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

The research results would provide the basis for integrating OGSR analysis into existing laboratory capabilities. The work could also yield options for novel approaches for screening for GSR and improving efficiency of laboratory analysis.

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

The research results will provide fundamental information on the characteristics of organic gunshot residue and evaluate its potential as a forensic chemical evidence.

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

The research results would improve services to the criminal justice system by providing methods and data needed to integrate OGSR into forensic analysis of gunshot residue. OGSR analysis is anticipated to supplement primer GSR analysis and add to the weight and value of GSR evidence in cases involving the use of a firearm.

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

II

	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.