Scientific & Technical Review Panel Final Report for 2022-S-0002 Standard Practice for the Identification of Compounds Related to Organic Gunshot Residue (OGSR) by Gas Chromatography– Mass Spectrometry (GC-MS)

Organization of Scientific Area Committees (OSAC) for Forensic Science

STRP Final Report
2022-S-0002
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Organization of Scientific Area Committees (OSAC) for Forensics Science
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Scientific & Technical Review Panel Members

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Report Summary:

The Scientific and Technical Review Panel (STRP) for "Standard Practice for the Identification of Compounds Related to Organic Gunshot Residue (OGSR) by Gas Chromatography– Mass Spectrometry (GC-MS)" is an independent panel appointed by the National Institute of Standards and Technology (NIST). A STRP is established with a range of experts to consider how well a standard meets the needs of the forensic science, law enforcement, and legal communities, and to recommend improvements to the standards under review. The STRP appreciates the efforts of Candice Bridge, Ignitable Liquids, Explosives, & Gunshot Residue Subcommittee affiliate, while serving as the subcommittee liaison to this STRP during the review process.

The STRP began its review process with a kickoff meeting on November 8, 2021, and concluded with this STRP final report. The panel reviewed the draft standard and prepared comments for the Ignitable Liquids, Explosives, & Gunshot Residue Subcommittee.

Report Components:

The STRP reviewed this draft standard against OSAC's *STRP Instructions for Review* which include the following content areas: scientific and technical merit, human factors, quality assurance, scope and purpose, terminology, method description and reporting results. The details below contain a brief description of each reviewed content area and the STRP's assessment of how that content was addressed in the Draft OSAC Proposed Standard.

1. **Scientific and Technical Merit:** OSAC-approved standards must have strong scientific foundations so that the methods practitioners employ are scientifically valid, and the resulting claims are trustworthy. In addition, standards for methods or interpretation of results must include the expression and communication of the uncertainties in measurements or other results.

    1.1 Consensus View – The STRP finds this draft standard to be scientifically and technically sound to establish minimum requirements for the qualitative identification of organic compounds typically associated with the discharge of a firearm (organic Gunshot Residue or OGSR) using gas chromatography-mass spectrometry (GC-MS). The draft standard describes the analytical criteria for a GC-MS assay including

typical target compounds and quality assurance and quality control procedures. Example instrumental operating procedures are included which will be useful to forensic science service providers (FSSPs). A detailed table in the standard describes typical target analytes and includes target ions and references. The draft standard is limited to the analytical methodology and compound identification. It does not describe or address interpretation of the analytical results for an analyst to render a conclusion or opinion with respect to the presence or absence of OGSR.

1.2 Minority View – None

2. **Human Factors:** All forensic science methods rely on human performance in acquiring, examining, reporting, and testifying to the results. In the examination phase, some standards rely heavily on human judgment, whereas others rely more on properly maintained and calibrated instruments and statistical analysis of data.

2.1. Consensus View –The standard, as revised, provides significant and valuable procedures for reducing potential biases. Much of this work is done by articulating clear criteria for examiners to consider when evaluating, documenting, and interpreting results. By specifying appropriate criteria for these critical steps, the standard appropriately mitigates subjective judgments to reduce the potential for cognitive biases that may influence conclusions.

While most sections of the standard provide criteria for evaluation and interpretation that are sufficiently specific to reduce cognitive biases and other human factors concerns, there are some exceptions. One remaining concern is Section 8.3.2.5 (background subtraction). A previous comment flagged this section but did not offer specific guidance on a proposed revision. The STRP suggests revisions to this section that: (1) specify the conditions or specific criteria for examiners to address when deciding whether background spectral subtraction is appropriate; and (2) either specify a validated procedure or provide normative references on validated methods for selecting appropriate background control samples and performing spectral subtraction.

The directive in sections 8.3.2.3 and 8.3.2.4 are vague (e.g., “generally agree”, “majority”, “similar”). If it is not feasible to assign specific values (such as the 5% criteria for low abundance ions), explanations are vital. Analysts must clearly explain in their notes why they are or are not considering differences (e.g., missing or extra peaks or % relative abundance differences) between the certified reference material (CRM) and known spectra as part of compound identification.

Criteria for Selected Ion Monitoring (SIM) analysis (such as # ions) should be spelled out if the scope of the analysis is to include SIM methodology

2.2. Minority View – None

3. **Quality Assurance:** Quality assurance covers a broad range of topics. For example, a method must include quality assurance procedures to ensure that sufficiently similar results will be obtained when the methodology is properly followed by different users in different facilities.

3.1. Consensus View – The STRP believes that quality assurance and quality control procedures are properly addressed in Section 9 of this standard.

3.2. Minority View – None

4. **Scope and Purpose:** Standards should have a short statement of their scope and purpose. They should list the topics that they address and the related topics that they do not address. Requirements, recommendations, or statements of what is permitted or prohibited do not belong in this section.

4.1. Consensus View – The STRP believes that the scope and purpose of the standard is clearly stated.

4.2. Minority View – None

5. **Terminology:** Standards should define terms that have specialized meanings. Only rarely should they give a highly restricted or specialized meaning to a term in common use among the general public.

5.1. Consensus View – The STRP believes that all relevant terminology is clearly defined in the draft standard.

5.2. Minority View – None

6. **Method Description:** There is no rule as to the necessary level of detail in the description of the method. Some parts of the method may be performed in alternative ways without affecting the quality and consistency of the results. Standards should focus on standardizing steps that must be performed consistently across organizations to ensure equivalent results. Alternatively, standards can define specific performance criteria that are required to be demonstrated and met rather than specifying the exact way a task must be done. For example, it may be enough to specify the lower limit for detecting a substance without specifying the equipment or method for achieving this limit of detection.

6.1. Consensus View – The STRP believes that the draft standard provides sufficient information in the method description. Concerns regarding compound identification procedures are described in Human Factors.

6.2. Minority View – None

7. **Reporting Results:** Methods must not only be well described, scientifically sound, and comprehensive but also lead to reported results that are within the scope of the standard, appropriately caveated, and not overreaching.

7.1. Consensus View – This topic was not applicable to this draft standard. It does have a "Records" section that describes what data and information is to be recorded and stored. The STRP believes this section is adequate given the scope of the draft standard.

7.2. Minority View – None