Scientific & Technical Review Panel Final Report for OSAC 2021-S-0021 Forensic Autosomal STR DNA Statistical Analyses - General Protocol, Protocol Verification, and Case Record Requirements

Organization of Scientific Area Committees (OSAC) for Forensic Science

STRP Final Report
OSAC 2021-S-0021
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Report Summary:

The Scientific and Technical Review Panel (STRP) for "Forensic Autosomal STR DNA Statistical Analyses - General Protocol, Protocol Verification, and Case Record Requirements" 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 Michael Coble, Human Forensic Biology 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 July 8, 2021, and concluded with this STRP final report. The panel reviewed the draft standard and prepared comments for the Human Forensic Biology 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 recognizes that the proposed standard, for the use of the calculations commonly employed for statistical analysis protocols of DNA evidence, is based on valid principles in published literature. It contains relevant references and general guidance about the approach for using each of the protocols; the performance measures needed to verify the use of these protocols;

and for materials to be included in the case record. Documented verification of the statistical analysis protocol used is a requirement for the laboratory. Uncertainties are defined within the statistical approach taken and is dependent on the protocol used. The document contains an informative Annex with basic information on the three (3) major statistical approaches currently used in practice. The STRP believes that including standards for CPI/CPE is important as outlined in the footnote to "Annex A". However, the document should strongly advocate that laboratories adopt the use of likelihood ratios for the interpretation of evidence, whether they use binary, semi-continuous or fully continuous methods, taking

advantage of the many options (open source and commercial) and opportunities for training available. The OSAC criterion for technical merit is that a standard has a strong scientific foundation. CPE/CPI is too controversial to have earned that distinction. Although common in paternity testing, no research has ever undertaken a published validation study, it arguably does not answer a legally relevant question, and can potentially mislead a decision maker. Only one paper (Bieber et al BMC Genetics, 2016, 17:125) describes a forensic casework method and a basis for its use. The 2016 report by the President's Council and Advisors on Science and Technology (PCAST) found "the interpretation of complex DNA mixtures with the CPI statistic has been an inadequately specified—and thus inappropriately subjective—method. As such, the method is clearly not foundationally valid." PCAST did agree that the rules specified in Bieber et al were necessary, but due to the late release of the paper, they did not conduct a review, nor did they take a position of whether reliability was addressed.

1.2 Minority View – NA

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 STRP believes that this proposed standard adequately addresses some of the issues related to human factors and performance. Specifically, there is a verification requirement for evaluating consistency among analysts in the laboratory, and the standards include a requirement to define the acceptable range of variability. However, there are human factor issues that are not yet addressed in this proposed standard and should be considered when the document is next reviewed. For example, a high priority for attention would be the Appendix A reference to propositions in LR calculations that states "may be referred to as prosecution/defense." It unfortunately does not point out that the continued use of such terminology perpetuates arguments of cognitive bias. During the next review, the subcommittee is also urged to

address the following matters:

2.1.1 Increasing transparency: More transparency in decision-making has many benefits. This document begins to introduce documentation requirements for certain aspects of the process, but there are other aspects that labs or analysts are still left to determine, either in a general sense (e.g., creating a policy) or on a case-by-case basis. Laboratory or analyst decisions and the underlying reasons for those decisions (e.g., if there is research to support that decision, if it is lab policy to make this decision, if there is a technical reason that the decision is being made) should be documented fully in the

examiner's notes with a summary in the report to inform the reader that judgement was required in their decision.

2.1.2 Standardizing procedures: In several places throughout the document, there are protocols and procedures that are described in a vague, permissive manner so that laboratories can decide how to deal with those matters. While this might make sense in some instances, each individual lab will do things slightly differently, and sometimes laboratories will implement procedures that are lower quality than desired. At a minimum, providing options that are acceptable or being more specific about what the laboratory policy must include, and what is less consequential, should be explained in these clauses when this proposed standard is reviewed in the future.

2.1.3 Increasing comprehension: Including examples and simple ways of presenting information are immensely helpful to analysts and legal professionals. Maybe these things are not appropriate to have in the proposed standard itself, but tools and materials could be provided on an open-source website (e.g., Open Science Framework) and the link included in the proposed standard to help analysts and those who need to understand the reports make sense of the analyses.

2.2. Minority View – NA

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 topics are appropriately covered in this proposed standard. Requirements for robust protocols are included that define when specific methods, options, and/or assumptions are deployed to develop consistency within a laboratory. Limitations of the statistical methods are also included. Evaluating consistency

among analysts in the laboratory and defining the acceptable range of variability is a component of quality assurance. Evaluating consistency within the laboratory's statistical calculations utilizing probabilistic genotyping software having an element of randomness to the results is also covered. Laboratories would benefit from specific examples being incorporated into the proposed standard to explain complex concepts as discussed in the comments on Human Factors.

3.2. Minority View – NA

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 considers the statements of scope and purpose to be adequate. The wording in the proposed standard is compliant with its scope and purpose.

4.2. Minority View – NA

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 finds that the proposed standard defines appropriate terms that are specific to a statistical analysis work process. The document avoids defining commonly used terminology.

5.2. Minority View – NA

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 considers the proposed standard to meet the Method Description requirement. This is based on inclusion of all three (3) major statistical calculations encompassing the legacy CPI/CPE approach and the more developed approaches of RMP and LR. The core requirements for each

approach are documented to perform the statistical analysis correctly. The laboratory maintains the ability to choose the statistical approach to meet their capabilities or if there is no other statistical calculation available. The information shared with the STRP that ANSI/ASB Standard 018, First Edition 2020, Standard for Validation of Probabilistic Genotyping Systems addresses the validation of probabilistic genotyping software and the acceptable degree of variability for randomness of results was considered in this deliberation.

6.2. Minority View – NA

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 – The STRP recognizes that the proposed standard applies to performing calculations resulting from the comparison of DNA profiles, but reporting results is not within the scope of this document. Propositions and conditioning used to calculate a LR does carryover into reporting and is within the scope of this document. The STRP is of the opinion that the guidance provided for the use of propositions and conditioning with the calculations are adequately described to avoid misinterpretation and is not overreaching.

7.2. Minority View – NA