

To: Irma Rios, MBA  
Director- Forensic Analysis Division  
Houston Forensic Science Center  
1200 Travis Street, 24th Floor  
Houston, TX 77002

**Re: Audit of Houston Forensic Science Center DNA Mixture Interpretation Practices****Final Report**

July 28, 2015

*Introduction*

On 05/12/2015 Soraya McClung, Scientific Training Director, Houston Forensic Science Center (HFSC), contacted Dr. Bruce Budowle, Executive Director, Institute of Applied Genetics, via email to review and make recommendations on the mixture interpretation and calculation methods performed at HFSC's DNA Section. HFSC's request was promulgated by recent events that occurred at the Department of Forensic Sciences (DFS), District of Columbia, in which serious problems were discovered regarding interpretation of DNA mixture evidence and management practices. Since mixture interpretation is a complex and challenging enterprise, HFSC decided to take a proactive approach to evaluate its DNA mixture interpretation practices and requested an outside audit by Dr. Budowle. The areas of focus of this targeted review were:

1. Review of HFSC mixture interpretation guidelines
2. Review of a variety of cases and scenarios
3. Interview some analysts and supervisors

Prior to the onsite evaluation, Dr. Budowle was provided with relevant standard operating protocols (SOPs) for interpretation of DNA mixture evidence. These SOPs were: DNA 13 - Analysis and Interpretation of DNA Results; DNA 14 - Statistics; DNA 15 - Reports; and DNA 16 - CODIS (Combined DNA Index System).

A 2-day on-site visit of HFSC was conducted on June 22 and 23, 2015. Interviews were carried out with 19 members of the DNA Section and some members of the managerial staff, including the four biology/DNA supervisors (Courtney Head, Lloyd Halsell, Amy Castillo and Jennifer Clay), Irma Rios (Forensic Analysis Division Director), Peter Stout (Chief Operating Officer), and Dan Garner (HFSC CEO). Two members of the quality division were present during an audit update. In addition, approximately 15 cases with various complexities of mixture evidence were presented by the staff and discussed to allow for an assessment of practices and to determine if practices were in compliance with the HFSC SOPs and with accepted scientific principles. Lastly, Dr. Budowle provided presentations on probabilistic modeling of DNA mixture evidence and on the issues in interpretation of mixture evidence that arose at DFS. The discussions during the audit and presentations allowed for an assessment of the practices at HFSC, the general knowledge of the analysts

regarding interpretation of DNA evidence, the culture of the DNA Section, and the culture promoted by the management.

### *Findings*

HFSC should be commended for its proactive approach to address one of the most difficult aspects of forensic DNA typing, i.e., mixture interpretation. Instead of waiting for a problem to arise to address current practices, HFSC sought review and input to improve its system. Indeed, both management and staff were eager and open to demonstrate and discuss the manner(s) that HFSC carries out mixture interpretations and to seek advice on enhancing quality performance.

1. The openness and continuous questions raised by staff demonstrates a healthy work ethic and environment at HSFC. The discussions over the 2-day visit showed that the staff is well-educated and trained in forensic DNA typing and is more than competent to carry out such work. Indeed, the staff is more than qualified to perform mixture analysis. Moreover, the staff held discussions with Dr. Budowle, and, more importantly, among themselves in a passionate, but respectful manner; again the management and staff should be commended for the healthy work environment. The staff is committed to best practices and continuous improvement. The staff was positive about the team, the management, and the facility. Communications amongst staff and between staff and management occur regularly and appear to be helpful and supportive.

The only infrastructure limitation potentially affecting performance was that the DNA Section occupies two floors of the building. This separation is a challenge for keeping the groups on different floors up to date with each other's findings and experiences. While there is little that can be done about the building space, management and staff are well aware of the limitation, are making efforts to address potential communication gaps among its staff, and should consider additional approaches to ensure that all staff are informed.

*Recommendation:* HFSC should continue whatever it is doing to promote a healthy work environment.

*Recommendation:* Until new laboratory facilities are built, management should develop strategies to ensure communication among staff residing on different floors of HFSC. This recommendation does not imply that a serious communication problem exists. There is little evidence of problematic communication issues. It is given in the spirit of the HFSC culture to proactively address potential issues before they can become problematic.

2. HSFC's DNA Section has 2-person teams that work cases: one person performs the analysis and the second person carries out the technical review. Review of practices demonstrates that HFSC follows its protocols with sound scientific principles. The technical leaders are actively involved, work well with the staff, and are diligent to ensure that the practices are within guidelines and standards. There is sufficient documentation of casework, technical review, and administrative review such that an expert can review and evaluate DNA case analyses.

A variety of DNA mixture analyses were presented, described by the staff, and critiqued by the staff. The practices used by the staff adhere to current DNA SOPs, and generally the staff agrees and supports the current guidelines. For statistical calculations HFSC employs the random match probability (RMP) for single source samples and the combined probability of inclusion (CPI) for mixtures where a single source contributor cannot be resolved. These calculations are performed correctly. The review supports that HFSC follows its protocols and applies sound scientific principles regarding statistical calculations.

There is one major criticism of the current mixture interpretation practices. They are far too conservative. This intentional conservative nature should be commended as it avoids falsely including individuals as potential contributors of a mixture. However, these practices at times are so conservative that some good probative evidence is not being interpreted, some statistical calculations are not using the full value of the data, and some exculpatory evidence may not be reported. To date there are no data to support the latter has occurred, but the potential exists and thus should be addressed. Most of the conservative issues relate to situations where there are 2-person mixtures with some alleles below threshold, 3-person mixtures with two prominent contributors and one minor contributor, alleles below the threshold where there is no evidence of drop out, and to some cases, such as sexual assaults, where subtraction of known contributors is not carried out.

Lastly, one issue, not unique to HFSC, was raised by the staff. In cases where alleles fall below the stochastic threshold, the results are currently interpreted as inconclusive. However, at trial a prosecutor (or at times a defense attorney) may ask if these "inconclusive" alleles do match or are consistent with those of a suspect. This situation places the analyst in a difficult, uncomfortable position. Recognizing that the legal system shall precede in the manner it does and an analyst cannot control the situation, there is a need for more training and discussion to be carried out. Policy should be developed to provide staff guidance on how to present inconclusive evidence.

*Recommendation:* While HFSC should continue its conservative practices, there is a need for additional guidelines that use interpretable evidence to a fuller extent. HFSC should consider revising policies for the types of cases described above.

*Recommendation:* Alleles below a threshold that could not arise from a suspect (or a victim when relevant) at times may be exculpatory, instead of currently be rendered as inconclusive. Bearing in mind the potential for allele drop out and the greater uncertainty with DNA evidence that falls below an interpretation threshold, HFSC should consider guidelines for exclusions based on below threshold DNA evidence.

*Recommendation:* Training and policy should be developed on how analysts should address best practices when asked in court to render an interpretation beyond inconclusive results.

3. Dr. Budowle reviewed the SOPs and found them to be appropriate and thorough. A very few minor comments were provided to Ms. Courtney Head for consideration.

*Recommendation:* None. The comments were minor and HFSC can determine whether they warrant consideration.

4. HFSC does not interpret Y STR mixtures at this time. Y STR data are not being used to the full extent.

*Recommendation:* Training on methods for interpretation of Y STR mixture evidence should be considered.

5. Dr. Budowle provided a lecture on probabilistic modeling for mixture interpretation. It is clear that the community is beginning to move towards this method(s) of DNA evidence interpretation. Indeed, some of the limitations of the conservative nature of HFSC's current interpretation practices can be overcome with probabilistic modeling. However, it is important that analysts have a good understanding of the fundamentals of the interpretation of mixtures before implementing more complex interpretation systems. HFSC's analysts are well-trained and well-educated in the practices that are outlined in its SOPs. HFSC should enhance its current practices by addressing its conservative nature limitations first. This effort will prepare the staff better for alternate methods of interpretation. A long term effort should be training on probabilistic modeling. Analysts should understand how these novel approaches work and not treat them as "black boxes," which will take substantial resources and time.

*Recommendation:* HFSC should continue on its course and improve upon its quality practices. A long term effort should be training on probabilistic models for interpretation of DNA evidence.



Bruce Budowle, Ph.D.  
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Attachment: Signed Attendee List

**Mixture Interpretation Roundtable with Bruce Budowle  
June 22-23, 2015 Attendance**

\*Please sign if you attended both days

Leira Donley (Tiana Donley)

Jennifer Clay (Jennifer Clay)

Elizabeth Pichey (Elizabeth Pichey)

LA (Lloyd Halsell)

Courtney Head (Courtney Head)

Jessica Powers (Jessica Powers)

Jisel Bailon (Jisel Bailon)

Mary Symonds (Mary Symonds)

Rebecca Gonzalez (Rebecca Gonzalez)

Christine Konecny (Christine Konecny)

Katherine Morgan (Katherine Morgan)

Mary Hall (Mary Hall)

Shamika Kelley (Shamika Kelley)

**Mixture Interpretation Roundtable with Bruce Budowle  
Washington DC Presentation and Mixture Presentation only  
June 22-23, 2015 Attendance**

\*Please sign if you attended presentations only

*Ars* (Amy Castello)

*Brittany Beyer* (Brittany Beyer)

*Kisset Salazar* (Kisset SALAZAR)

*Belinda V. Salinas* (Belinda V. Salinas)

*Zoraya Reyes* (Zoraya Reyes)

*Kerry Todd*

*Janice Kelly* (Janice Kelly)