DNA MIXTURES AND RE-INTERPRETATION

OC CRIME LABORATORY, DNA SECTION
ELIZABETH THOMPSON
APRIL 3, 2014
• “SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories”
• **SWGDAM Goals:**
  • Written procedures for the interpretation of analytical results and more specificity in SOPs.
  • Greater consistency and accuracy among analysts within a laboratory.
  • Mixtures should be interpreted prior to comparison with any known samples other than those of assumed contributors.
SWGDAM GUIDELINES

• SWGDAM stated that the guidelines were not intended to be applied retroactively.
• OCDA’S DNA Unit questioned if SWGDAM should be the ones to determine if the guidelines should be applied retroactively.
• Is It up to a committee of scientists to determine what should be applied to criminal cases and case law?
• SWGDAM guidelines were not written to address legal arguments and Brady issues.
OC CRIME LABORATORY

- OCCL had mixture interpretation guidelines in place and majority of casework mixtures were interpreted in accordance with the 2010 SWGDAM guidelines.
- OCCL was using CPI: combined probability of inclusion formula even with samples with possible allelic dropout.
- Participation in the NIJ Burglary project (using DNA to help solve property crimes) brought in lots of evidence with touch/trace DNA and mixtures. CPI used frequently.
OCCL DNA MIXTURE COMMITTEE

• May 2010 – OCCL DNA formed a committee with six experienced DNA analysts including the DNA Technical Leader
  • Evaluated Identifiler and Identifiler Plus data from validations.
  • Tested hypotheses with mixtures prepared in the laboratory with known standards in various ratios.
The committee defined the three types of mixtures typically found in casework:

- Mixtures with assumed known contributor
- Two person mixtures
- Mixtures with three or more individuals

Each group was further divided based on single major contributor or two main contributors present.
OCCL DNA MIXTURE COMMITTEE

- New guidelines given to the DNA analysts so they could use them with current casework mixtures.
- Mixture guidelines updated in our QSM July 15, 2011.
- OCCL eliminated CPI and making comparisons with unresolved three person mixtures.
- QSM provided detailed instructions and examples to address low level and complex mixtures often seen in touch/trace DNA samples analyzed in our lab.
WHAT IS BRADY?

• 1962 case – Brady and Boblit - suspects in a murder during an armed robbery. Boblit confessed, Brady was co-conspirator. Boblit’s confession was never included in Brady’s trial. Brady was convicted and sentenced to death.

• US Supreme Court reversed Brady’s death sentence because exculpatory evidence was withheld from the jury.

• Prosecution is obliged to provide the defense with exculpatory evidence that is material to either guilt or punishment.
BRADY – CONTINUED

• Burden is on the prosecution to disclose – the suspect does not have to request the information.
• Includes information in possession of the prosecution team or others acting on the government’s behalf.
• Does not require that disclosure of the evidence would have resulted ultimately in the defendant’s acquittal.
• Discussions with the OCDA’s DNA Unit since May, 2010 regarding the new guidelines and how they could affect historical cases
• Letter from the OCDA on July 29, 2011:
  • .....expeditious notification of DNA mixture results where interpretive protocol changes may now alter a conclusion regarding:
  • Individual’s inclusion or exclusion in a DNA mixture,
  • Change the number of loci or alleles attributed to an individual,
  • Change the frequency estimate of the evidentiary DNA profile.....
DNA MIXTURE RE-INTERPRETATION PROJECT

• Started with 60 cases, then 120 cases to evaluate and estimate what percent of OCCL mixture cases could be affected.

• Randomly selected Identifiler and Identifiler Plus profiles that had been auto imported into LIMS from GeneMapper ID-X with at least one locus with more than two alleles.

• In 2009 – OCCL DNA Section implemented a report writing module and auto importation of DNA allele calls directly into LIMS.
DNA MIXTURE RE-INTERPRETATION PROJECT

- August, 2011: estimated that there were 4,000 cases and 8,500 samples to review and one hour of analyst time to review each case.
- Currently working on 3,000 cases and 7,190 DNA numbers that were auto imported into LIMS.
- Majority of the cases are from 2008-2010 with some 2005-2008 cases.
DNA MIXTURE RE-INTERPRETATION PROJECT

• Files pulled by clerical.
• Grant funded analyst reviews case and makes determination about mixture.
• If conclusion would change, then interpretation and report writing go to the original analyst.
• DNA Supervisor reviews reports and enters into database.
• Most of the DNA analysts have multiple reports pending on their desks to review and write.
GRANT FUNDED DNA ANALYST

• Experienced DNA analyst hired using 2011 DNA Backlog Reduction grant funds. Funding continued on the 2013 DNA Backlog Reduction grant.
• Trained in OCCL DNA methods. Spends 20-50% of her time on the project and 50+% analyzing major crime cases.
• Reviews up to 50 cases per week depending on the complexity of the case. Currently reviewing cases from 2009.
OCDA’S INVOLVEMENT

- All supplemental reports from re-interpreted cases go to an attorney at the OCDA’s DNA Unit.
- Tammy Spurgeon – who will talk about her role and what she does with the reports.
FINDINGS AND YEARLY UPDATES TO THE OCDA

• First 60 cases reviewed:
  • Four DNA analysts - 14.5 hours to review.
  • Five cases where conclusions changed (8%).
  • The conclusions in the five cases did not implicate or associate a suspect to an evidence sample incorrectly.
  • All five cases had an individual eliminated and after review the DNA profile was considered to be unsuitable for comparison.
  • Supplemental, not amended, reports were issued.
CONCLUSIONS AND CATEGORIES

• **Group I**: significant change to reported inclusion – suspect was included but is now excluded or the result is inconclusive. Also, statistics have decreased by several orders of magnitude.

• **Group II**: DNA mixture profile may or may not have relevance to the case depending on the case circs.
  • Multiple DNA profiles in the case including single source
  • Suspect was included with low stats (< 1 in 5,000) but profile is now uninterpretable
  • Multiple suspects or multiple items of evidence
CONCLUSIONS AND CATEGORIES

• **Group III:** no previous DNA inclusions to the suspect. Suspect or victim were excluded and now the profile is uninterpretable and the result inconclusive. Also includes slight changes to stats.

• **Group IV:** cases where the reported statistics improved after reinterpretation.
FINDINGS AND YEARLY UPDATE TO THE OCDA

- March, 2012: 234 cases reviewed. 193 (82%) had no change. 41 cases (18%) had new conclusions or changes to the reported statistics.
  - Group I – 3 cases – primarily a reduction in population statistics
  - Group II – 5 cases – multiple suspects and multiple items of evidence
  - Group III – 29 cases – suspect or victim was excluded and now uninterpretable
  - Group IV – 4 cases with an increased population frequency
March, 2013: 649 cases reviewed. 545 (84%) had no change. 104 cases (16%) had new conclusions or changes to the reported statistics.

- Group I – 23 cases – primarily a reduction in population statistics
- Group II – 19 cases – multiple suspects and multiple items of evidence
- Group III – 58 cases – suspect or victim was excluded and now uninterpretable
- Group IV – 4 cases with an increased population frequency
FINDINGS AND YEARLY UPDATE TO THE OCDA

• March, 2014: 2,077 cases reviewed. 1,734 (83%) had no change. 339 cases (17%) had new conclusions or changes to the reported statistics.
  • Group I – 55 cases – primarily a reduction in population statistics
  • Group II – 110 cases – multiple suspects and multiple items of evidence
  • Group III – 164 cases – suspect or victim was excluded and now uninterpretable
  • Group IV – 14 cases with an increased population frequency

• THESE NUMBERS ARE CUMULATIVE FOR THE PROJECT
EXEMPLARY FOR EACH CATEGORY

Group I

- Suspect was a minor contributor to bike handle bars but now profile is not suitable for interpretation or comparison due to multiple minors.
- Extreme statistic change: 1 in one trillion to 1 in one thousand.
- Suspect was not eliminated and original stats ranged from 1 in 30 up to 1 in 200,000. After re-interpretation, the profiles are not suitable for comparison.
EXAMPLES FOR EACH CATEGORY

Group II

• Stats on gear shift profile shift from 1 in one trillion to 1 in 40 million, all other mixtures in cases do not change.

• Four mixtures in a case – one changed, three others do not.

• Stats on weapon change from 1 in 300 to not suitable for comparison.
EXAMPLES FOR EACH CATEGORY

Group III
• Suspect or victim were previously excluded as minor contributors and now minor is not suitable for interpretation or comparison.
• CODIS removal, mixture not suitable for comparison. Was never compared to a suspect

Group IV
• Original statistic of 1 in 20,000 increased to 1 in 2 million after reinterpretation
THE FUTURE

• After re-interpreting over 2,000 mixture cases with more pending, what will happen when
  • Laboratories implement likelihood ratios instead of or in addition to Random Man Not Excluded statistics
  • Laboratories implement software programs that interpret mixtures using probabilistic models
  • SWGDAM issues new guidelines for mixtures of 3+ people
ACKNOWLEDGMENTS

• OCCL Senior Forensic Scientist Mary Hong
• OCCL Forensic Scientist Chantel Callahan
• OCCL DNA Section Forensic Scientists
• OCDA’s DNA Unit Deputy District Attorneys Scott Scoville, Tammy Spurgeon, Camille Hill and Bruce Moore