TrueAllele in Virginia

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DNA Mixtures in Virginia prior to 2010

- Ran gels (FMBIO) for many years
- Capillary electrophoresis in 2008

Mixture statistics

- Likelihood ratio
- Combined probability of inclusion (CPI)

SWGDAM 2010 interpretation guidelines

- CPI on data above stochastic thresholds
- Does mention probabilistic modeling as a possible approach

TrueAllele (TA)

- Began to research probabilistic modeling
- Sent Cybergenetics known mixtures and evaluated their software
- Started a 2 part validation study fall 2011

TrueAllele Validation Part 1

- Validation at Cybergenetics
  - mixtures from forensic cases
  - A TrueAllele report would be issued which would be used in Virginia courts
  - Publication TrueAllele Casework on Virginia DNA Mixture Evidence: Computer and Manual Interpretation in 72 Reported Criminal Cases. PLoS ONE 9(3): e92837, 2014

True Allele Validation
Part 2

- Conducted at DFS
- DFS Staff, DFS server and known mixture samples
- Publication Establishing the Limits of TrueAllele® Casework: A Validation Study

  JFS

VDFS Validation Study

- Used mock casework samples which included the following:
  - 17 single source profiles (degraded and stochastic)
  - 18 two person mixtures
  - 14 three person mixtures
  - 7 four person mixtures

Tested using TrueAllele® Casework (TA):

- Single source samples
  - With allelic and locus drop-out
- Reproducibility of the process
- Accuracy of the TA process
  - Exclusion of non-contributors
  - Inclusion of true contributors
  - Mixture weight assessment for two-person mixtures
- Sensitivity of the TA process
  - Minor contributor contribution level below which results in negative log likelihood ratio {log(LR)}
- Specificity of the TA process
  - Elimination of non-contributors
  - Elimination of relatives of the contributors

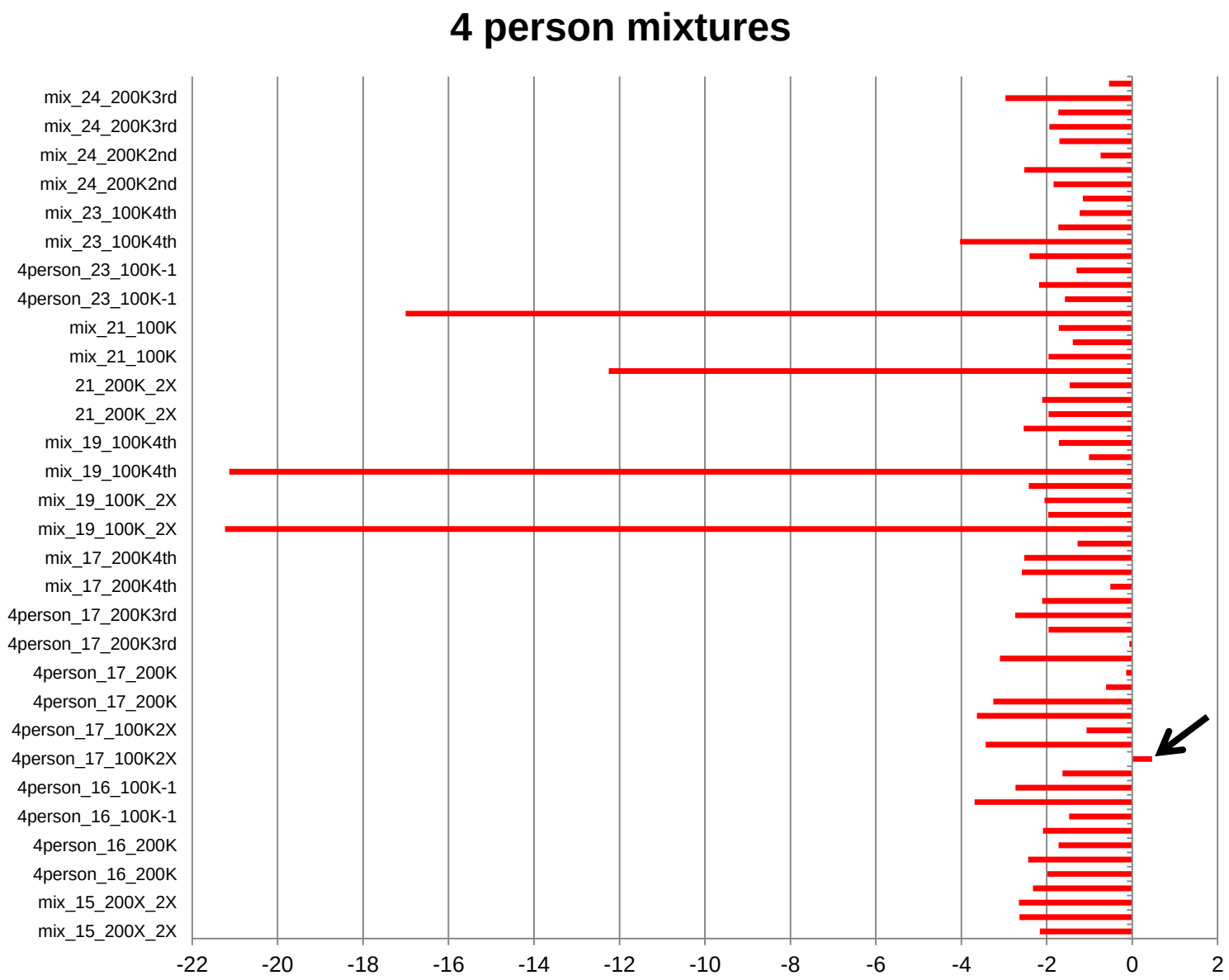
Specificity - Largest log (LR) values obtained

Compared mixtures against 100 reference profiles

A total of 21,400 comparisons made

One non-reproducible positive match statistic

2.9X more likely



Training of Staff at DFS

- 4 examiners in house
- Participated in validation work
- Completed Operator training courses taught by Cybergenetics.
- Observed TrueAllele testimony in Virginia

DNA testing in Virginia

- 4 laboratories
- 55 DNA examiners
- 4 DNA examiners qualified in TrueAllele
  - Online Jan 2014
  - Richmond Laboratory
  - TA Server located in Richmond

DNA testing in Virginia

- Use TA in violent cases in crimes against a person
- Use on 2 and 3 person mixtures
- Will try and generate a “traditional” statistic on the mixture first
- If the traditional statistic cannot be calculated case transferred to the TA team

DNA testing in Virginia

- 3 person mixture in a homicide
- Examiner and technical reviewer agree a subject person could be a possible contributor
- Report “conclusions and statistical estimates regarding item _____ will be the subject of a separate report”
- Forward to the TA team for a separate report

TA cases in Virginia

- Approximately 130 cases
- State, federal and military courts
- Approximately 20 court testimonies
- 1 admissibility hearing
  - State court
  - Homicide case
  - Week long

TA processing

- How long does it take
  - Simple single source reference samples minutes
  - 3 complex person mixtures several days of processor time

TA lessons learned

- Belt and suspenders approach
- A lot of data to review
- Depending on the mixture may not be a fast process
- Does not always provide a rare match statistic
- Will lead to more eliminations

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