Solving Major Crime from Minor Contributors: A Case Report Using TrueAllele® Casework

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Abstract

On Thursday August 9th, 2018 Detective Hayes was dispatched to the scene of a home invasion. Upon arrival, a male victim was observed covered in blood laying in a ditch. They immediately notified an ambulance service. When the detective entered the residence, a female victim was discovered with lacerations to head and lip. The female victim stated that a suspect entered the residence through the front door holding an assault rifle asking where the safe was. The female victim attempted to run away but was hit in the back of the head with an unknown object. The female victim informed the detective she was sexually assaulted by this suspect. A condom was recovered where the sexual acts were reported to have taken place. Afterward it was learned that another suspect stabbed the male victim approximately twenty-four times. The male victim endured five surgeries, lost vision in both eyes…but survived! A bow release was recovered from the scene. Two suspects were established during the investigation – James Tabb & Terrance Miles. Richland Parish Sheriff's Office (RPSO) submitted DNA evidence to the Louisiana State Police Crime Laboratory (LSP) in August of 2018.

In 2015, Louisiana State Police began informing their agencies about Cybergenetics' TrueAllele probabilistic genotyping tool. In 2021, LSP began training every analyst to utilize TrueAllele routinely in the casework cycle to include and exclude references submitted for comparison. In 2022, this task was completed and TrueAllele is now a part of the LSP analyst training process. When RPSO contacted LSP in December 2021 to submit additional evidence in this case, LSP decided to review the 2018 case file to determine if utilizing TrueAllele would provide more information instead of submitting additional evidence. After reviewing the case file, LSP suggested processing the swab taken from the bow release.

The sample was processed using the TrueAllele Casework software. The software was able to objectively separate out three contributors from the complex mixture, producing a 75% major contributor and two overlapping 12% minor contributors. The major contributor matched to the victim reference with a match statistic in the hundreds of nonillions. One of the minor contributors statistically matched James Tabb with a value of 4.07 million. These match statistics provided strong support in tying both the victim and suspect references to the bow release.

When the case proceeded to trial, defense counsel requested a Daubert hearing. Defense counsel intended to question the scientific validity of TrueAllele and question the LSP analyst's qualifications. LSP's Technical Leader definitively answered the concerns raised during the Daubert hearing and the court ruled that the TrueAllele evidence was admissible. A jury unanimously convicted James Tabb for a minimum of 114 years.

DNA Evidence

Samples were initially tested using manual analysis with the standard LSP analytical threshold of 100 rfu. Statistics were produced for several samples including: suspected blood inside door handle, condom, boots, and a head lamp.

Key pieces of evidence in this case were the bow release and headlamp, pictured below.

Exhibit 12 – One camouflage Tru-Fire brand bow release

Exhibit 13 – One black and red Defiant brand head lamp containing three Defiant brand batteries

Manual Analysis

LSP uses an analytical threshold of 100 rfu for manual interpretation.

The results of the manual analyses on the bow release (Ex. 12) and headlamp (ex. 13) are summarized as follows:

- Exhibit 12 – The DNA profile from the bow release was consistent with being a mixture of DNA from a minimum of three contributors, with one major contributor. Victim 1 cannot be excluded as the major contributor to this profile. Due to the limited nature, no conclusions can be made regarding the minor contribution.
- Exhibit 13 – Victim 1 cannot be excluded as the donor of the DNA profile from the head lamp. Additional minor alleles were present which were inconsistent with Victim 1.

LSP performed further analysis using TrueAllele Casework to further resolve the minor contributors of both evidence items.

TrueAllele Casework

Cybergenetics' (Pittsburgh, PA) TrueAllele Casework (TA) probabilistic genotyping system uses Bayesian probability modeling and Markov chain Monte Carlo (MCMC) statistical sampling to interpret DNA data. The TrueAllele process is objective and uses all of the DNA data to separate out genetic types for each contributor in a DNA sample. The software learns from evidence data and does not need to be calibrated on previously developed laboratory data.

LSP began using TrueAllele for casework on July 1, 2021. Prior to deployment, LSP Technical Lead, Paul Berry, received TrueAllele training from Cybergenetics. He then developed an in-house training program for LSP analysts. A software validation was also completed by Cybergenetics and LSP, prior to use of the software.

Electropherogram (EPG) Data
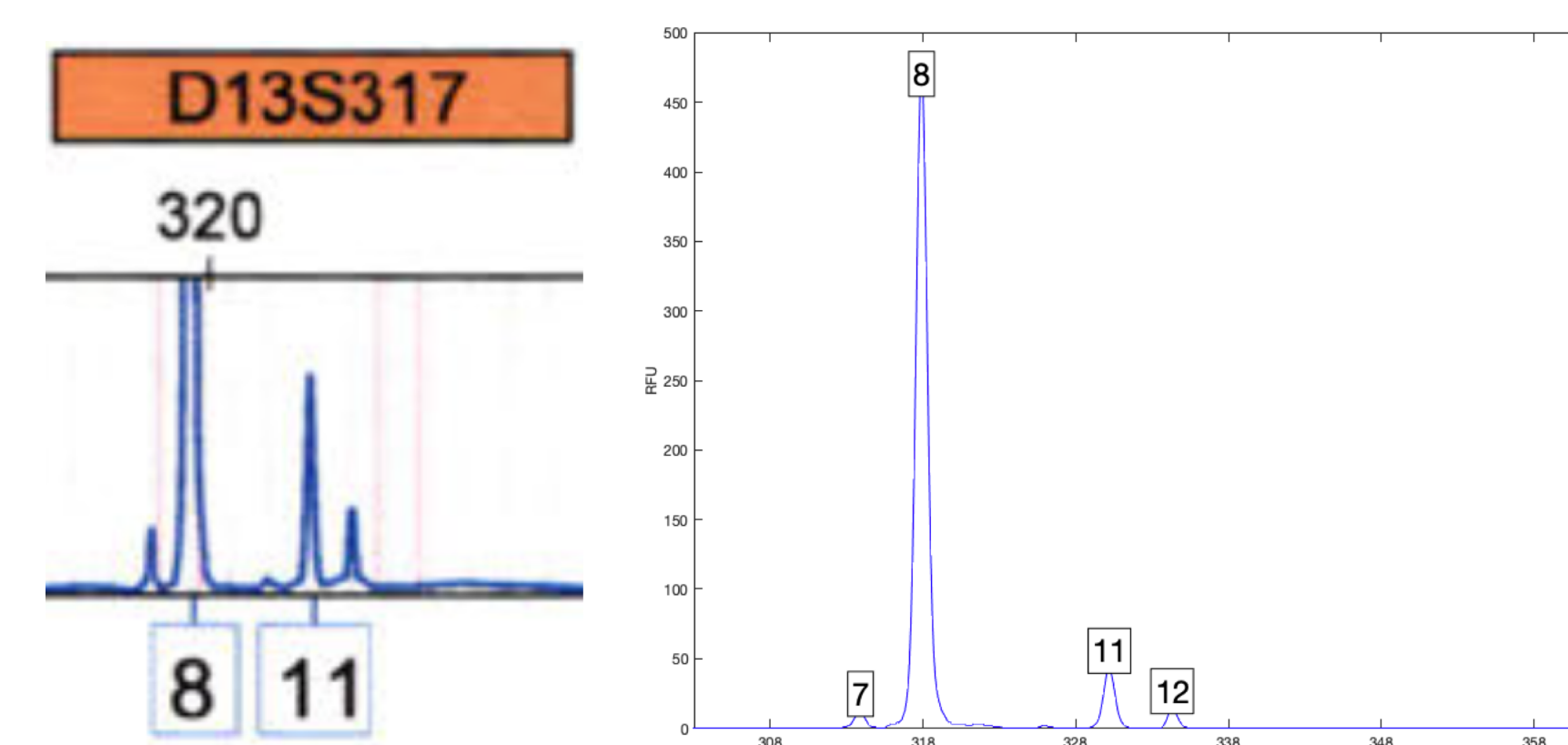
The LSP EPG (left) shows a threshold of 100 rfu. The TrueAllele EPG (right) labels all data peaks. Other methods discard relevant data peaks, such as the 12 peak, when a threshold is applied.

Genotype

locus	allele 1	allele 2	probability
D13S317	11	12	0.34
	11	11	0.22
	8	11	0.17
	8	12	0.07
	12	12	0.07
	12	13	0.03
	8	8	0.02
	11	13	0.02
	9	12	0.01
	9	11	0.01
	10	11	0.01

Genotype table showing the genotype probabilities of an inferred minor contributor from Ex. 12. The genotype probabilities are displayed at a 95% credible level.

Explaining the LR
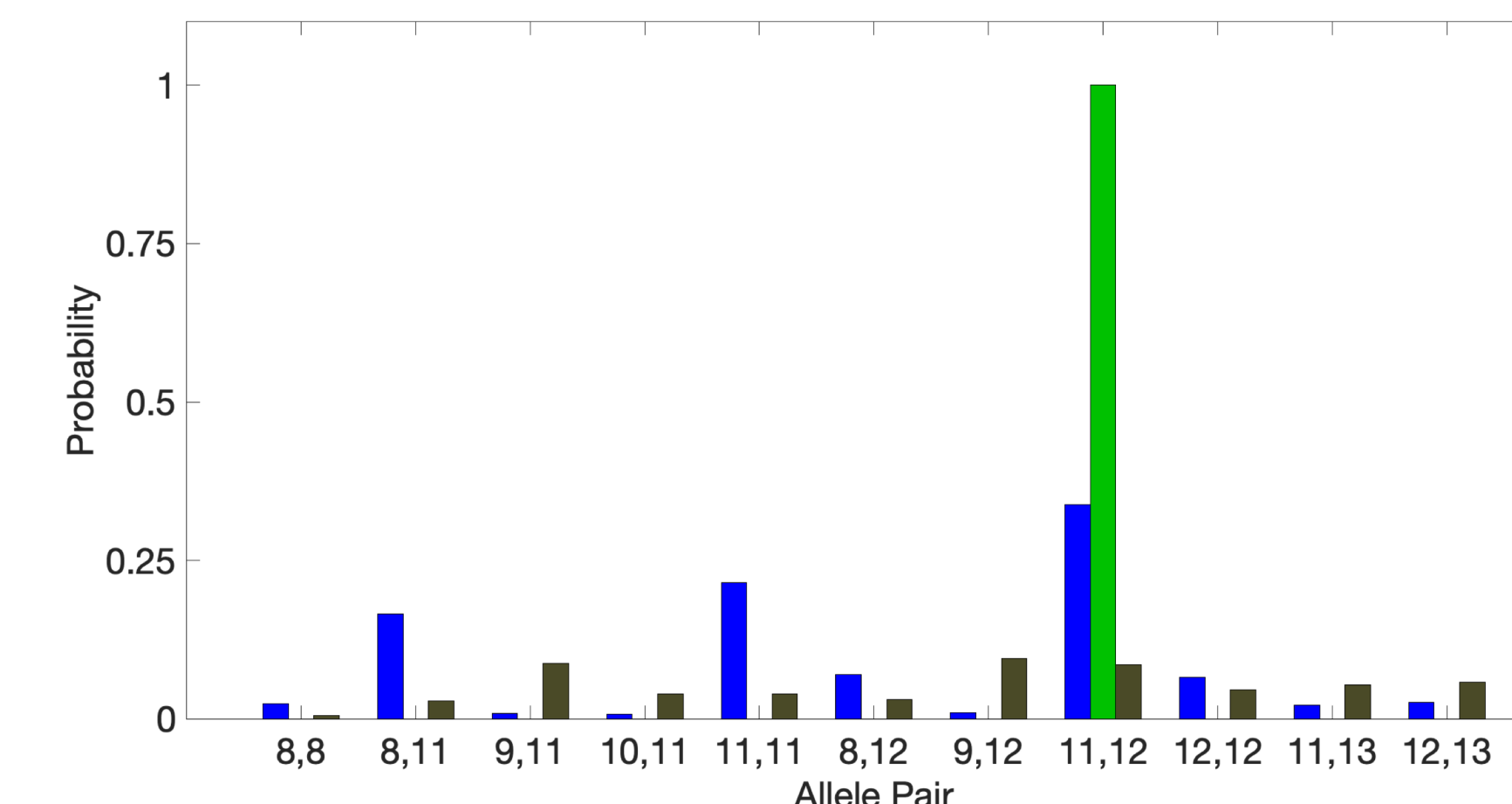
Genotype probability distributions at locus D13S317: 13% minor evidence contributor (blue), suspect (green), population (brown). At each allele pair, the LR is the ratio of evidence (blue) to population (brown) probability.

Population	LR	log(LR)	PME	One in
FBI BLK	11.4 million	7.0557	5.7647e-09	173 million
FBI CAU	8.5 million	6.9296	7.7369e-09	129 million
FBI SWH	4.1 million	6.6131	1.5044e-08	66.5 million

Match table showing the Likelihood Ratio (LR), log(LR), Probability of Misleading Evidence (PME) and Error Rate (One in) for the match between a minor contributor evidence genotype from Ex. 12 and the suspect.

Match Statement
A match between an inferred genotype and James Tabb is 4.10 million times more probable than a coincidental match to an unrelated individual.
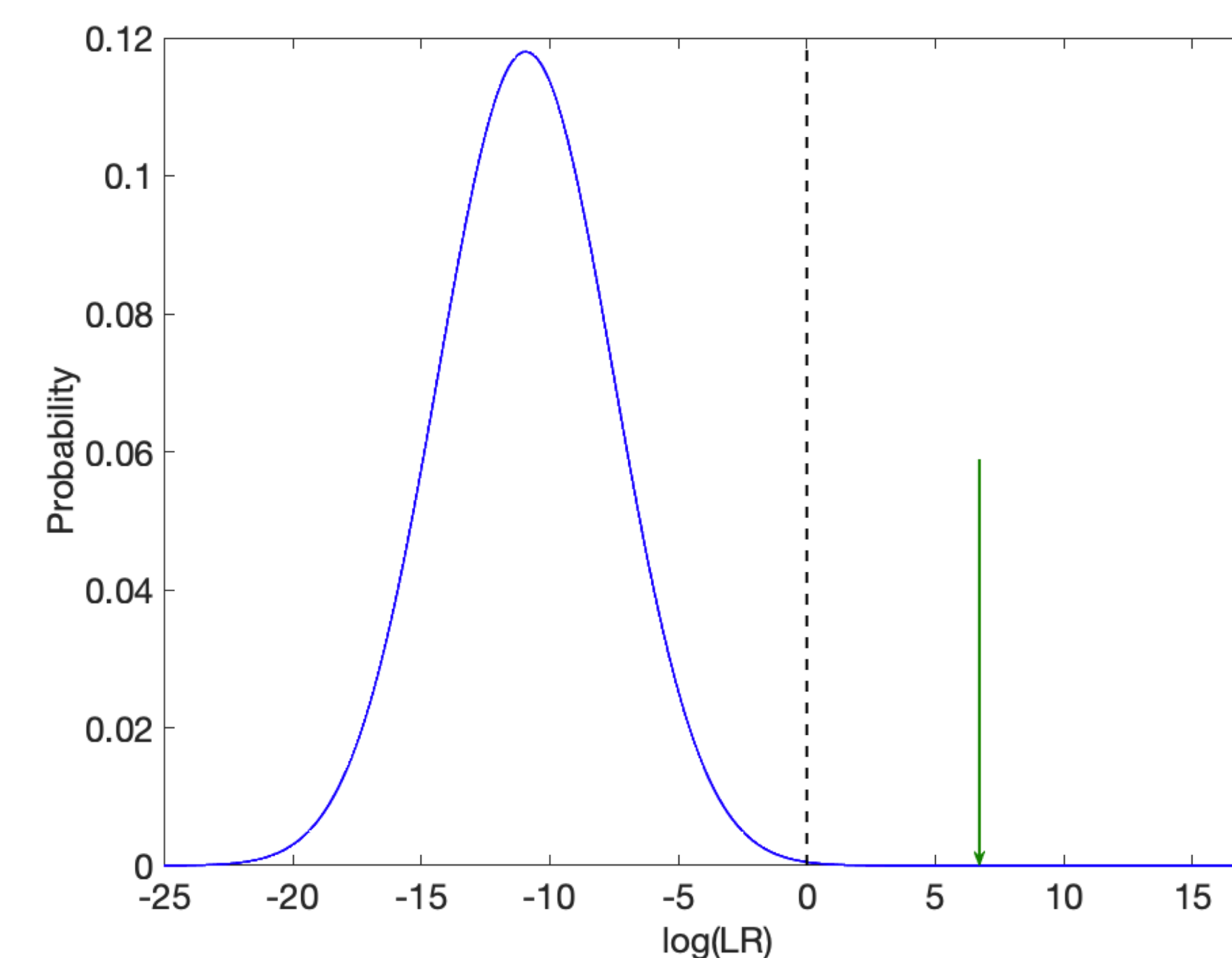
The Noncontributor distribution for the ~13% minor contributor from Exhibit 12. The blue curve shows the log(LR) distribution for noncontributors. The suspect's matching log(LR) of 6.61 is indicated by the green arrow. The false positive error rate is the area under the blue curve to the right of the green arrow.

Error Rate Statement
For a match strength of 4.1 million, only 1 in 66.5 million people would match as strongly

Court

Before proceeding to trial, the admissibility of the evidence was challenged in a Daubert hearing. The opposition challenged the reliability of TA and the qualifications of the Tech Lead, Paul Berry, to teach TrueAllele. The judge ultimately ruled in favor of TrueAllele and the evidence was permitted at trial.

At the trial, the LSP analyst, Julia Naylor, who performed the TrueAllele analysis testified about the results. The analysts from LSP noted that it was interesting that after the opposition requested the Daubert hearing there were hardly any questions pertaining to that hearing in cross examination. The jury grasped the expert witness testimony well. Defense counsel did not bring up TA analysis.

The jury found the suspect guilty. The suspect, James Tabb, was sentenced to 50 years on attempted second degree murder, 49 years on attempted armed robbery and 15 years on attempted aggravated burglary. The sentence carries a minimum of 114 years.

Conclusions

The LSP lab had probative evidence items where they knew there was discarded peak data when using manual methods. With the deployment of TrueAllele, they are now able to refer those cases for further analysis.

TrueAllele was able to get further results from the bow release and headlamp. TrueAllele accomplishes this by using all of the peak data, without thresholds. The peak data is fully modelled using Bayesian methods and Markov chain Monte Carlo (MCMC).

TrueAllele was necessary to interpret the minor component on the bow release. With the TrueAllele results tying the suspect to the minor contributor, and previous manual results tying the victim to the major contributor, both individuals are in context on the same item. This information provides powerful evidence at trial.

Further, on the headlamp, TrueAllele was able to provide results that linked a suspect that had not been previously included in the crime.

TrueAllele withstood an admissibility challenge and provided valuable evidence at trial. This case example shows how TrueAllele analysis can act as a crime lab complementor, providing additional information even in previously analyzed cases.

Reference

State of Louisiana v. James Tabb
Fifth Judicial District
Daubert hearing
June 1, 2022
Trial court admitted TrueAllele into evidence
Case number F-2018-216
Download Ruling at:
https://www.cybgen.com/information/admissibility/Tabb2022.pdf

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