Cybergenetics

TrueAllele DNA Interpretation

TrueAllele® Casework

Ohio v Slater Howell

In April 2014, Ohio gas station clerk Babul Kumer Saha was shot and killed during a robbery. The robber took money from the cash register. Video surveillance suggested that the assailant may have brought a plastic bag with him that he left at the crime scene. The police collected the bag and other items from the scene, and submitted the evidence to their local crime laboratory for forensic testing. Slater Howell III was eventually developed as a suspect in the case.

Inconclusive DNA Evidence

The crime lab obtained DNA from the plastic bag, cash register, and other evidence items. The plastic bag had DNA from at least seven people, all mixed together. With this many contributors, the crime lab's manual DNA interpretation methods couldn't work; they reported an ‘inconclusive’ result. The lab sent their electronic DNA data to Cybergenetics (Pittsburgh, PA) for a second look.

Same Evidence, More DNA Information

Every person has their own unique DNA. Scientists test dozens of DNA locations to find a person's genetic barcode (or "genotype"). A person's genotype may match a genotype from crime scene evidence. This DNA association can place the person at the scene. A match statistic says how strongly the DNA matches.

Cybergenetics analyzed the DNA data using TrueAllele Casework. The software was able to separate out seven genotypes, one from each of the seven people who left their DNA on the plastic bag. TrueAllele then compared these seven unmixed genotypes with the victim and suspect genotypes. The computer found positive match statistics, indicating that these people both left their DNA on the bag.

Court Testimony

In September 2017, an expert witness from Cybergenetics testified about the TrueAllele results. The expert explained to the jury that “a match between the plastic bag and Slater Howell is 98 thousand times more probable than a coincidence.” This match statistic gives scientific support for the defendant having left his DNA on the bag.

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The expert also testified that the false positive error rate for this match statistic was 1 in 1.19 million. That's the chance that someone who didn't leave their DNA would happen to match the bag as strongly as 98 thousand.

Case Outcome

The jury found Slater Howell guilty of all charges. In November 2017, he was sentenced to life in prison for this murder. The TrueAllele results provided a physical piece of the evidence puzzle that linked the defendant to the crime scene.

DNA Interpretation

DNA Mixture Evidence

Crime scene evidence is often a mixture of more than one person's DNA. Crime laboratories produce high quality DNA data from this evidence. However, this DNA mixture data can be complex, with many different genotype combinations possibly explaining the data. Humans are not able to interpret such complex evidence data, but computers can – as the case example shows.

Manual DNA Analysis

Until recently, manual DNA analysis done by a person was the most common way labs could interpret DNA evidence data. In this manual method, a person applies a threshold, like drawing a line in the sand. DNA signals above this line are used, while signals below are discarded. But all DNA data are important – even when below a threshold – and can be vital for accurate DNA results.

Probabilistic Genotyping

A better approach to interpreting complex DNA data is to use genotyping software. Probabilistic genotyping uses mathematics and computers to account for genotype uncertainty. By considering many data explanations, DNA information is preserved. There are a dozen probabilistic genotyping computer systems. Some use more DNA data than others, but all work better than manual DNA interpretation. With the best interpretation software, all DNA data is used without change.

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The TrueAllele Difference

TrueAllele Casework

TrueAllele Casework is automated probabilistic genotyping software developed by Cybergenetics. TrueAllele solves the DNA mixture problem, overcoming the limitations of manual DNA interpretation. It has no data threshold. The program inputs a crime lab's (previously uninterpretable) DNA data, transforming it into useful match information.

Cybergenetics invented modern probabilistic genotyping in 2000. TrueAllele was the first such software. The technology has been analyzing DNA evidence since 2005.

Unique Features

TrueAllele Casework interprets complex DNA data, deriving all the information using all the DNA data. Previously, complex DNA data samples were usually deemed to be inconclusive; they provided no genotype or match information for investigative or court purposes. But TrueAllele develops genotypes from DNA samples in very small amounts (only a few cells from a person), degraded (broken DNA strands), or a mixture of DNA from many people. TrueAllele overcomes the limitations of simpler interpretation methods, including other probabilistic genotyping software. TrueAllele can interpret any DNA data – from any lab for any type of case – to deliver match information.

How TrueAllele Helps

Police, attorneys, and forensic scientists are often frustrated by inconclusive DNA results. No DNA answer means no justice for victims of crime. Crime laboratories produce high quality DNA data from biological evidence. However, weaker interpretation methods cannot use all the DNA data.

But TrueAllele Casework preserves all the DNA identification information present in evidence data. Comparing to known references, the computer always calculates a match statistic. Inclusionary match statistics indicate that a person contributed their DNA to the evidence, while exclusionary stats show the person's DNA isn't there.

Police

Police officers want to solve crimes. TrueAllele is an investigative tool police can use to get the most DNA information from their evidence. The computer gives match statistics

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that can either implicate or eliminate a suspect. Even without a suspect, TrueAllele can show when DNA evidence is informative, providing probable cause for a DNA search warrant.

TrueAllele can link DNA evidence items together. These evidence-to-evidence linkages help find serial criminals. With TrueAllele, the police can compare an evidence item (like underwear from a sexual assault), to a castoff reference (like a cup used by a suspect taken from the trash). The computer can show when one person has left their DNA on mixture items from different crime scenes.

Attorneys

Attorneys want probative DNA evidence that is accurate, reliable, and admissible in court. The TrueAllele Casework method meets their criteria. Cybergenetics has conducted TrueAllele analysis in over a thousand cases in 46 U.S. states, plus federal and foreign jurisdictions. The software's reliability and accuracy have been tested in over 40 validation studies, 8 of them published in peer-reviewed journals.

There have been over 40 TrueAllele admissibility challenges in 15 U.S. states, U.S. federal court, and foreign jurisdictions. TrueAllele results were admitted every time the admissibility standard was applied. Cybergenetics analysts have testified in over 100 trials about TrueAllele results. They have assisted both the prosecution and defense. For post-conviction, TrueAllele DNA re-analysis has helped exonerate over 10 men.

TrueAllele results are accurate. They are easy to explain, and easily understood by a trier of fact. TrueAllele match statistics can answer probative questions like "did the defendant contribute their DNA to the evidence?". As in the *Ohio v Slater Howell* case above, where a TrueAllele expert explained what DNA information means, providing a match statistic of 98 thousand, and an error rate of 1 in 1.19 million.

Labs

Forensic laboratories produce high quality data that they then interpret. Forensic DNA analysts often must report that their informative DNA data is inconclusive, due to limited interpretation methods or software. Their protocols often stop them from using all their DNA data. They may need to apply thresholds, adjust parameters, rely on historical validation data, or give up on complex DNA data. By using all the data and all the variables, TrueAllele Casework overcomes these artificial limitations.

Crime laboratories can purchase a TrueAllele system for in-house use inside their own lab. The county lab in the Slater Howell case now uses TrueAllele Casework to interpret

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all their DNA evidence data, thus overcoming their previous interpretation limitations. Crime laboratories without TrueAllele often refer their agencies to Cybergenetics, so that accurate TrueAllele computing can go beyond "inconclusive". In these cases, on even complex or degraded DNA, TrueAllele complements the crime lab to provide thorough interpretation of the DNA evidence.

If you have questions, please email Cybergenetics at **info@cybgen.com**, or call us at **412.683.3004**.

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