Cybergenetics

TrueAllele DNA Interpretation

TrueAllele® Database

TrueAllele® Database (TADB) is a powerful DNA tool that can identify victim remains and solve violent and serial crimes. The TADB is a built-in component of TrueAllele® Casework[1], the most sophisticated DNA probabilistic genotyping computer interpretation software. Forensic scientists have used the TrueAllele Database to link crime scenes together, as well as link suspects to multiple crimes.

Identifying Victims of Mass Disaster

On September 11, 2001, around 2,700 people lost their lives in the terrorist attack on the World Trade Center in New York City. Following the collapse of the twin towers, authorities had the almost impossible task of identifying the missing victims. Search teams recovered over 18,000 human remains. The DNA from these victim remains were in small amounts and damaged. Due to the limitations of human DNA interpretation at the time, the Office of the Chief Medical Examiner of New York City could not interpret the DNA data and contacted Cybergenetics (Pittsburgh, PA) for help.

Cybergenetics used TrueAllele Casework to re-analyze the DNA data from the victim remains. The software automatically uploaded the genetic types (genotypes) from these data to the TrueAllele Database. Analysts then uploaded the known DNA data from personal effects and victim family members to the database to be searched against the victim remain genotypes. The TrueAllele Database matched victim remain DNA to the known DNA with no restrictions, ultimately identifying the missing people and brining closure to their family and friends.

Solving Serial Crime

In the suburbs of Cleveland, Ohio in 2015, gang members committed a rash of car thefts. The police collected over 100 evidence items from 37 separate incidents. The police provided 38 suspect references for comparison. The DNA data from this evidence was challenging to interpret as there was often little DNA present or too many contributors in the DNA mixture samples.

Using limited manual interpretation methods, the local crime laboratory was able to get some DNA information from the evidence in about two months. However, the DNA

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conclusions for several samples were either inconclusive, due to too little data, or uninterpretable, due to a high number of contributors.

The crime laboratory, who was bringing TrueAllele Casework onboard at the time, asked Cybergenetics to use TrueAllele to interpret the same car theft DNA data. Following TrueAllele interpretation, the TrueAllele Database automatically compared the separated evidence genotypes to the suspect genotypes to find DNA connections. This process took under a month to complete.

The TrueAllele Database produced highly informative DNA match results. It did not discard any DNA evidence samples. All evidence items were automatically compared with all reference items, producing informative DNA match statistics. TrueAllele Database found new leads by linking multiple suspects to the same crime scene, and linking several suspects to multiple cases.

For 30 DNA mixtures initially reported as inconclusive, TrueAllele Database found a DNA association with a reference. With 12 initial exclusions, TrueAllele Database returned informative DNA matches. The computer also extracted the full measure of DNA information from the evidence, overcoming the limitations of simpler methods. Complex profiles that were deemed inconclusive through manual interpretation were linked to suspects using automated TrueAllele interpretation.

What Makes TrueAllele Database Unique?

The current national DNA database (CODIS) has rules that limit what DNA data and information is uploaded. Crime lab analysts can only upload some of their evidence mixture samples to that database. The DNA information that does get uploaded is based on partial allele information (a list of DNA data values) not informative genotypes (pairs of alleles with probability).

TrueAllele Database is a DNA genotype database. The genotypes uploaded to the TADB are derived from DNA evidence sample data or from known individuals. There is no rule-based limits for uploading evidence. All DNA mixture genotypes can be uploaded, preserving identification information. There is also no restriction on the types of DNA evidence sample data that can be uploaded. A DNA analyst or other party can upload all mixtures, including complex samples and partial profiles.

Automated processes exist to readily upload evidence sample data for TrueAllele interpretation. Genotypes are automatically uploaded to the TADB afterwards. Once new genotypes are present on the TrueAllele Database, they are automatically searched and matched against other evidence and reference genotypes. Genotypes

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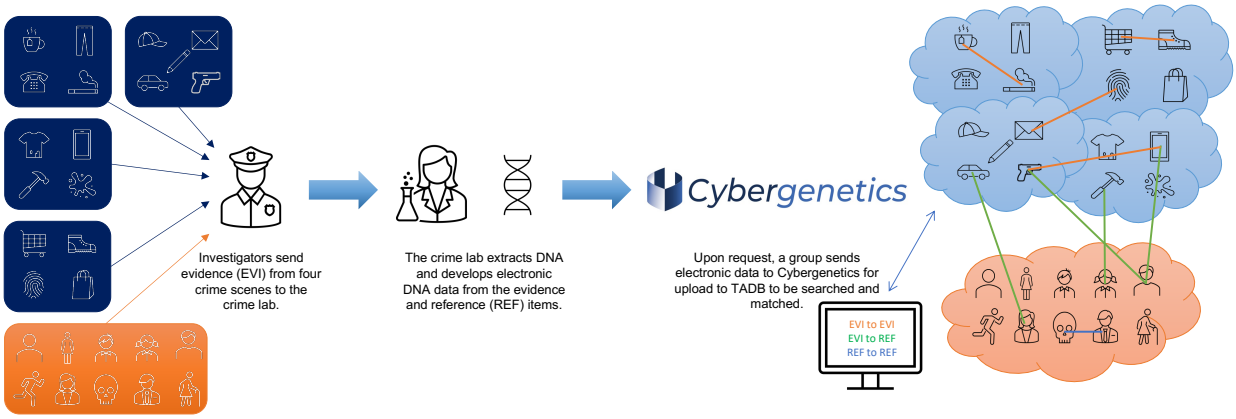
previously uploaded to the TrueAllele Database are continually compared against new genotypes when uploaded. TADB matches are stored indefinitely, readily identified again when needed.

The TrueAllele Database is stored on a secure computer, either in-house or on the cloud. The computer software is scalable, expanding to the needs of a particular group. The TADB is customizable, allowing a group to control what data is uploaded and what is searched and matched. For example, a group can set their own TADB match rules, only comparing evidence to suspects or evidence to other evidence. An analyst or group can also easily find TADB matches using a visual user interface.



Current TrueAllele Database Applications

Crime laboratories that use TrueAllele also use the TrueAllele Database as a local DNA database to link evidence to suspects or other crime scenes, both within and across cases. These labs upload all DNA mixture evidence and can compare this evidence to other mixture evidence items, suspects, or other groups of references present on their TADB computer. Some labs are also using TrueAllele Database to do familial searching, which involves finding database evidence to kinship match statistics. This application allows investigators to find suspect leads by linking evidence to a family member's DNA. The TADB also allows a crime lab to detect contamination by comparing all evidence to staff member DNA.

Why Should You Use TrueAllele Database?

The TrueAllele Database system can easily interpret and match any complex DNA evidence. As noted in the case examples, the TADB has been used to aid in matching

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degraded mass disaster samples and to solve serial crime (robbery, gang crime, rape, etc.). TrueAllele Database can also be used with handgun evidence, drug crime samples, or retail theft touch data. Some groups can use the TADB to facilitate familial searching, linking evidence to a potential suspect's family member DNA.

The TrueAllele automated matching database, together with automated genotype separation, lets users to find more DNA information with less effort. Sometimes DNA data is complex, with low peak heights and many contributors. But the automated TrueAllele system empowers the investigator to easily get all the DNA information. TrueAllele Database leads help to further an investigation. Once database hits are found, confirmatory TrueAllele Casework processing and reports are needed for scientist testimony.

Police

Police are responsible for investigating crimes. DNA is often left at crime scenes. TrueAllele Database gives police the ability to link crime scene evidence to suspects or other crime scenes. TADB gives police reliable leads for suspects. They then have probable cause to get arrest warrants. TADB also allows police have the ability to link serial non-suspect crimes through evidence to evidence matches. If the same genotype is on multiple pieces of evidence from multiple crime scenes, the detective can further investigative leads should a suspect be developed in any of those cases.

Elected Officials

Crime can be detrimental to a community. Violence involving drug crimes, robberies, and theft can make people feel uneasy in their own homes. Elected officials, such as attorney generals and mayors, can benefit from TrueAllele Database to solve crimes within their communities. Using TADB, these officials can help improve police investigations and solve and prevent crime. These officials can also use TADB to help solve older cases, and potentially exonerate inmates wrongfully convicted in those cases.

Crime laboratories

Crime laboratories already use TrueAllele Database as an already built-in extension of their TrueAllele Casework system. Unlike CODIS, analysts can upload all DNA mixture data and genotypes with no rules or restrictions. They can use TADB to search and match customized categories and detect potential contamination. The TrueAllele Database can also help to screen CODIS hits as all of the DNA information is stored on the TADB, leading to more specific matches.

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Get Started Today!

Getting started using TrueAllele Database is simple. First, the agency requests all of their electronic DNA data files from their crime lab. Then, the agency sends these DNA data files to Cybergenetics, who will get the mixture and reference data into the correct format and upload it to a secure TADB computer. Cybergenetics will then initiate the automated batch TrueAllele interpretation. Once data interpretation is complete, TrueAllele Database will automatically search and match the evidence and reference genotypes based on the match scenarios determined by the agency (e.g., evidence to evidence, evidence to suspect). TADB matches happen automatically. The agency or Cybergenetics can then retrieve the TADB matches, finding DNA linkages. Once probative matches are found, the agency can then request confirmatory TrueAllele process and report that can be used for court testimony.

Available Funding

The U.S. Department of Justice Bureau of Justice Assistance provides grants for DNA backlog reduction and database funding. Some of this funding has gone to public forensic DNA laboratories to assist in processing more DNA samples and for laboratory database applications. These types of grants are continuously offered as funding becomes available.

The Future of TrueAllele Database

In the future, uploading DNA data to TrueAllele for interpretation will be automated. A person will be able to upload the raw DNA data files directly to the computer and in a few hours, be able to retrieve database matches. Having this capability allows an agency to purchase an in-house TrueAllele Database computer and manage it on their own with technical support provided as needed.

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

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