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Investigative Genetic Genealogy

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ASCLD supports the responsible use of Investigative Genetic Genealogy to produce investigative leads to improve public safety by solving major crimes against the person, while maintaining appropriate checks on security and privacy.

The mission of forensic laboratories is to maximize the forensic value of evidence. Accredited forensic laboratories take great care in locating and identifying biological materials from potential perpetrators and unidentified human remains at crime scenes, using validated techniques to generate STR (Short Tandem Repeat) DNA profiles. Adding the additional tool of Investigative Genetic Genealogy helps solve crime by generating additional genetic information to identify potential relatives of the crime scene person of interest. Private DNA laboratories are currently conducting the genetic testing utilized in Investigative Genetic Genealogy. Forensic laboratories provide DNA and case expertise to identify forensic genealogy case candidates as well as ensure the quality of samples is maintained.

ASCLD proposes member laboratories take an active role in advising law enforcement agencies regarding case and sample criteria for consideration for Investigative Genetic Genealogy, as well as conducting direct STR DNA comparisons of investigative leads to crime scene profiles to generate inclusions and exclusions. A number of forensic crime laboratories are currently investigating the laboratory component of providing this additional investigative genetic genealogical analysis.

What is Investigative Genetic Genealogy? Investigative Genetic Genealogy is a new technique that generates new leads on previously unsolved cases where DNA from the suspect is present at the crime scene [1]. When there are no CODIS (Combined DNA Index System) hits on a suspect crime scene STR DNA profile and a case remains unsolved, further DNA analysis can now be conducted to develop a new profile using different DNA markers known as single nucleotide polymorphisms (SNPs). Approximately 800,000 SNPs are in the profile conducted by direct-to-consumer ancestry companies. This SNP profile can be compared against a publicly available database (e.g.

GEDMatch, Family Tree DNA) where individuals have voluntarily placed their genetic information, permitting it to be searched to find potential relatives of the perpetrator. These relatives may include those suspected of committing the unsolved crimes. Individuals placing their genetic information in GEDMatch have been provided notification of law enforcement's use of the database and have made an affirmative choice to "opt in" to making their profile available for investigative genetic genealogical searching.

The discrimination of this large database of genetic information coupled with the expanded SNP profile permits identification of distant relatives, including 3rd, 4th and even 5th cousins. This differs from familial searching, in that familial searching typically only identifies immediate family members and uses the state CODIS database. Therefore, Investigative Genetic Genealogy casts a much broader net over a wider group of potential relatives. While this group of individuals did not commit the crime, they enable genealogy investigators to construct family trees that may include the potential perpetrator. Applying meta data from the crime, such as sex, age, location and other factors known to be unique to the crime suspect, the suspect pool is narrowed to specific individuals. These target individuals can be followed to obtain discarded DNA to not arouse suspicion, which is then compared directly to DNA from the crime scene for inclusion or exclusion. Even with an exclusion, kinship information can be developed to further the search among other potential family members.

In just under one year since the use of Investigative Genetic Genealogy to apprehend the Golden State Killer, more than 50 previously unsolved sexual assaults and homicides have been solved, as well as identification of previously unidentified human remains. It is predicted that as available databanks grow, the solution rate for Investigative Genetic Genealogy will reach over 90% when full SNP suspect crime scene profiles can be generated.

Why is it important? Investigative Genetic Genealogy potentially solves more than cold cases. It can solve any current case where there has not been a CODIS hit and a SNP profile can be generated when crime scene evidence containing suspect DNA is still available. Therefore, it is important to carefully evaluate which cases should be considered for potential analysis using Investigative Genetic Genealogy. When conducted properly, using Investigative Genetic Genealogy to develop investigative leads is ethical and legal, therefore it is appropriate to consider its addition to law enforcement's crime solving tools.

What kinds of cases are impacted? While the investigation of any type of case could potentially benefit from the use of Investigative Genetic Genealogy, given the high level of resource requirements, costs, and ethical considerations, it is proposed that only major crimes against the person be processed. In a survey of over 1,500 individuals conducted by bioethicists, 80% were in favor of the use of forensic genealogy, 79% supported its use on homicide and sexual assault cases, while only 39% supported its use on property crimes [2].

The major crimes of sexual assault and homicide are the most serious threat to public safety, and can become recidivist if the perpetrators remain at large. In many cases, suspect DNA has been found at the crime scene, yet there has been no CODIS match. When a suspect profile is

found at a crime scene, a CODIS hit results approximately 40% of the time. While CODIS hits solve many cases without a suspect, many cases remain unsolved using current methods. Investigative Genetic Genealogy is capable of solving these cases by providing new suspects for direct comparison to crime scene DNA. Therefore, it is imperative to proceed with evaluating and solving these unsolved cases.

What are the features of a case that make it a candidate for Investigative Genetic Genealogy?

The following features are proposed as minimum criteria for consideration for Investigative Genetic Genealogy:

1. Sexual Assault or Homicide Case with sufficient DNA evidence available for SNP DNA
2. Crime scene sample is believed to be from the potential perpetrator
3. Searched in CODIS with no hit
4. Reasonable traditional investigative efforts have not developed successful leads
5. Remaining crime scene DNA sample is of sufficient quality and quantity for SNP analysis
6. Signed MOU or formal policies with police agency and prosecuting office to investigate and pursue prosecution where warranted
7. Training for all crime lab and investigators prior to release of investigative leads
8. Training for all local prosecutors and judges

ASCLD members are stewards of the field of forensic science. When performed responsibly, Investigative Genetic Genealogy has the potential to be one of the greatest crime solving and preventing technologies to emerge since DNA analysis was applied to crimes. Therefore, ASCLD strongly advocates for crime lab guided use of Investigative Genetic Genealogy.

[1] Wickenheiser, R.A., Forensic genealogy, bioethics and the Golden State Killer case, Forensic Science International: Synergy 1 (2019) 114-125. <https://doi.org/10.1016/j.fsisyn.2019.07.003>

[2] Guerrini, C.J, Robinson, J.O., Peterson, D. and A.L. McGuire. 2018. Should police have access to genetic databases? Capturing the Golden State Killer and other criminals using a controversial new forensic technique. *PLoS Biol.* October 2. 16 (10). <https://journals.plos.org/plosbiology/article/file?id=10.1371/journal.pbio.2006906&type=printable>