INDIANA STATE POLICE LABORATORY DIVISION

PHYSICAL EVIDENCE BULLETIN

FORENSIC INVESTIGATIVE GENETIC GENEALOGY

INTRODUCTION:

Forensic Investigative Genetic Genealogy (FIGG) is an investigative technique that may generate leads in unsolved crimes when DNA from the putative perpetrator is present but remains unidentified. In order to perform FIGG, the unknown crime scene sample or standard from unidentified remains must be re-analyzed to obtain FIGG-suitable Single Nucleotide Polymorphism (SNP) DNA data. FIGG may provide information leading to the perpetrator when that individual's profile is not in the Combined DNA Index System (CODIS).

The SNP DNA data can be searched in law enforcement (LE) accessible public DNA databases in the hopes of identifying biological relatives of the individual that left the DNA at the crime scene. Traditional genealogy techniques are then utilized to build the family trees of those relatives, which can then lead to the possible suspect in the case. FIGG can also be utilized for the identification of unidentified human remains.

I. SNP ANALYSIS

A. Re-analysis of the sample(s) utilizing SNP technology is required. SNP testing may be performed by the ISP Laboratory utilizing the ForenSeq® Kintelligence kit or by a vendor lab for Whole Genome Sequencing or other SNP technologies. DNA profiles demonstrating the presence of a mixture will require vendor laboratory testing.

B. ISP Laboratory Biology Forensic Scientists can assist in determining if a case is suitable for SNP analysis and if there is sufficient sample of good quality remaining for testing.

C. If a case requires vendor laboratory SNP profile development, the ISP Laboratory Biology Forensic Scientists can assist the agency with re-analysis and/or preparation of the sample for shipment.

II. SEARCHING

A. SNP DNA data from the person of interest can be uploaded to third party databases and compared to individuals from around the world who have voluntarily uploaded their own SNP DNA data for law enforcement searching.

B. The closer related two people are, the more DNA they will share. Database searches identify shared DNA segments and produce lists of potential relatives. Search results show how much DNA they have in common with the person of

interest, which indicates a range of how close that relationship may be (e.g., 3rd cousin).

C. Potential relatives that share DNA segments with others from the list can be used as a starting point in looking for a Most Recent Common Ancestor (MRCA) between those individuals and the person of interest.

D. Public or direct-to-consumer databases, such as GEDmatch or Family Tree DNA, may be available for searching by LE. Not all direct-to-consumer databases allow searching of crime scene profiles by LE.

E. Database user agreements recommend that LE searches should only be done for violent crimes (e.g., homicides and sexual assaults) or unidentified human remains cases. Database user agreements should be reviewed to verify the types of crime allowed to be searched prior to upload.

III. GENEALOGY

A. Traditional genealogy techniques utilizing public records (e.g., birth, death, and census records) are used to build family trees for the potential relatives identified in the database search.

B. The privacy of all potential relatives identified in the FIGG process must be respected.

1) Potential relatives should only be contacted if it is deemed necessary to further the investigation and their names should not be released publicly.

2) SNP DNA profiles from other potential relatives may need to be developed to aid in building additional lineages in the family tree. If DNA samples from these individuals are needed, the ISP Laboratory requires that samples are voluntarily obtained with a signed informed consent.

C. Individuals in the family tree that have the genetically predicted relationships to the potential relatives identified in the database search might be the source of the crime scene sample. These are further narrowed down using criteria such as age, whereabouts, and other investigatory information to produce a small number of potential persons of interest.

IV. REFERENCE TESTING

A. Any names identified by the use of FIGG must be treated like any other investigative lead. After traditional police investigation, if the agency chooses to pursue any of the potential suspects developed by FIGG, a new DNA sample must be obtained from the person of interest for direct comparison to the evidence profile via the normal DNA analysis process by the ISP Laboratory.

B. The forensic DNA comparison can be completed with a direct reference standard. See ISP Laboratory's *Physical Evidence Bulletin (PEB) - 17 DNA** for details.

C. If the sample is from unidentified human remains or if the person of interest is no longer living, a forensic relationship comparison to a close relative (i.e. parent, child, or sibling) may be completed by the ISP Laboratory to confirm identity. See ISP Laboratory's *PEB-21 Missing Persons-Unidentified Human Remains** for details.

* PEBs are available at the ISP Regional Laboratories or on the ISP Laboratory's website.

V. POINTS FOR CONSIDERATION

A. Not all forensic DNA samples are appropriate for SNP analysis. Trace amounts of DNA and complex mixtures are unlikely to produce useable results. Consult with the ISP Laboratory about specific case sample(s).

B. FIGG can be an expensive and time consuming process.

1) All other reasonable leads and types of forensic testing should be exhausted prior to initiating FIGG.

2) A commitment from the prosecuting agency is recommended to ensure the case will move forward if a suspect is identified using FIGG.

VI. CONTACT INFORMATION

For more information, please contact the Biology Section of the ISP Regional Laboratory in your area with any questions at the following numbers.

Evansville	(800) 852-3970
Fort Wayne	(800) 552-0976
Indianapolis	(866) 855-2840
Lowell	(877) 874-0009

ISP Regional Laboratory hours are 8:00 a.m. to 4:30 p.m.; Monday through Friday.