

DNA DATABASE

DNA DATABASE MANAGEMENT: WITH SPECIAL REFERENCE TO THE CRIMINAL JUSTICE SYSTEM OF PAKISTAN

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A report on the status of DNA matching uploaded by ENFSI DNA Working Group in 2017 caused me to attempt this article by relating it to the criminal justice system of Pakistan. The common perception about a police investigator in Pakistan is a semi-literate ill-equipped police officer carrying a cardboard clipboard tucked with a few pieces of paper, carbon papers, and an HD pencil. For the last few years, direct induction through the provincial Public Service Commission in the rank of Sub-Inspector has added better qualified young officers who have been entrusted to the investigation wings, but they share the same old technology. A considerable percentage of police investigators have been trained in modern investigative techniques, including collecting DNA samples, during their induction courses, and the training mandatory for career progression. The School of Investigation of Khyber Pakhtunkhwa and Punjab have recently been added, which will go a long way to improving training standards. International organizations like GIZ, UNODC, and the Australian Federal Police have also been arranging courses to impart training in crime scene investigation. These organizations also donated investigation kits and boxes to the police departments, but these were not sufficient to cater to the police departments of the four provinces and the federal law enforcement units. Having trained in the use of modern investigative technology when the officers revert to their areas of responsibility they do not get the equipment they were trained in. A few years ago, the investigation units stationed at police stations were distributed one investigation box each, but the police did not find the funds to replenish the used articles. Presently (1920), the investigation kits are not available. In case of a serious crime like rape or murder, crime-scene-vans are requisitioned from the Forensic Science Labs to help the investigators manage the crime scene and collect evidence, especially the DNA. This facility is available in the provincial Capital Cities only. In other areas, the district police administration has developed teams of crime scene experts who help the investigators. The investigators of Punjab province have

to send a police officer to Lahore from hundreds of kilometers away to hand over the samples to the forensic science laboratory. This is the only Lab that is catering to the whole of the country. Laboratories are available in Sindh, Islamabad, and Khyber Pakhtunkhwa but they stand nowhere compared with the Punjab Forensic Science Lab concerning human, physical, and financial resources, and reliability of results. Therefore, when a sensational and serious crime is committed in a province that is likely to have country-wide reverberations; the samples are sent to the Punjab Lab which is already overburdened. No doubt, in crimes of political consequences, the Lab produces results overnight, yet the routine evidence samples sometimes take a year or more.

In Pakistan, DNA samples are not taken in every case for want of capacity and funds. In some countries, the cases that entail taking DNA stain samples are enlisted in procedural law. The human rights standards pertaining right to privacy are very stringent in the European and some other developed states, yet some of these states have found a way to legislate in favor of taking samples of some categories of persons and developed a DNA database that may help detect the heinous crimes.

The DNA samples of the following categories of persons can be taken and included in a DNA database:

- a. Persons convicted for a minor or major crime
- b. Suspects of cognizable crimes, especially crimes against person and property
- c. At the time of arrest, all arrestees may be asked to donate a sample
- d. Persons who voluntarily give samples to help in the investigation of a case
- e. Victims of crime whether alive or dead
- f. DNA sample of a missing person to trace him/her
- g. To rule out involvement in crime DNA of persons at the crime scene

If a suspect or arrestee does not voluntarily give the sample, he can be forced to do so under a magisterial order or by force. In Pakistan, in the case of rape, the medico-legal officer can use minimum necessary physical force to take the sample (Section 53-A of the Criminal Procedure Code).

To increase the chances of a match the databases have to be large. The specimen in serious cases should be very carefully collected ensuring that it belongs to the perpetrator.

The following benefits can be gained by maintaining a DNA database:

- the possibility of solving crimes
- improve detection and conviction rate of crime
- better results in less time
- blind cases will be resolved
- false identities will be easily resolved
- Comparing parts of the body of a person found in different places

ENSURING THE RELIABILITY OF DATA

The DNA of every person, except the Siamese twins or monozygotic twins, is unique. There are at least three million sites at which the human genome is different. With the existing processes of DNA matching, we can safely say whether the sample found at the crime scene belongs to the suspect or not. The question arises, is there a chance that an innocent person is implicated due to a mistake in the DNA typing analysis? Yes, it is possible if due diligence is not adopted in collecting, processing, interpreting, and updating the database. In the USA, the court judges the credibility of the evidence by examining the technology used in developing the results. The terms coined for judging the reliability and credibility of scientific evidence are called the Daubert and Frye tests. In the Daubert test, before admitting the evidence, the presiding judge examines whether the methods used are scientifically correct and whether the experts involved in producing the evidence are proficient. The States that use the Frye method, do not admit the methods that are not time tested. In other words, they do not admit new scientific methods.

The latest DNA kits and criteria of international standards should be used to avoid evidence of doubtful value (adventitious match). In serious crime cases such as DNA, information may be used as a help in the investigation.

The lab should use the latest kits, matching criteria, and processes. It should also be able to show that ample steps have been taken to monitor the quality of data and identification of errors with the availability of preventive and

corrective measures in this respect. The laboratory should also maintain an Elimination Database containing profiles of those who are involved in handling the samples in the chain of custody and those who handle the samples in the Lab. The scientists and the supporting staff working in the laboratory should give consent for taking their samples as a job requirement. Elimination data helps eliminate the chances of contamination of the DNA material. In cases where the suspect is not absconding, the samples of his near relatives like parents and siblings can be taken. In such cases, the stringency (strict standards) of the match will be low but it can help the investigators. This method is called 'familial search' and is allowed in some countries. Research is continuing to solve the inability to match in the case of monozygotic twins. The DNA analysts and those who manage the database should be kept updated about advances in genetic science and criminal law. The laboratories and forensic scientists should be put to regular proficiency tests and get accreditation from the relevant international organizations. Automation should be preferred over manual entries while producing DNA profiles. Automation also helps reduce human error and typographical mistakes while making entries into the database. Software is available to detect and correct these errors. Forensic laboratories should earn the accreditation of ISO 17025 or any other standard in vogue. The Punjab Forensic Science Laboratory has been accredited by the United Kingdom Accreditation Services (UKAS) and complies with the standards of ISO 17025.

In the recent past, the Police have solved some serious crimes by using DNA matching. The child molestation case of Mardan, the Zainab case of Kasur, serial killing by a pedophile in Chunian Kasur, and the recent motorway rape case were a few examples. A large number of people are in favor of the DNA profiling of the whole population, to increase the probability of crime detection. Such a plan was loudly discussed in the United Arab Emirates a few years ago and a law to this effect had recently been passed in Kuwait¹. In Europe, the mandatory DNA profiling of all the citizens is not possible owing to the European Convention on Human Rights which terms it impinging upon the citizens' right to privacy. The convention envisages, "Everyone has the right to

¹ <http://news.kuwaittimes.net/website/kuwait-to-enforce-dna-testing-law-on-citizens-expats-visitors-tests-wont-be-used-to-determine-genealogy-affect-freedoms/>

respect for his private and family life.²” However, subsection 2 of this Article gives an exception “in the interests of national security, public safety or the economic wellbeing of the country, for the prevention of disorder or crime”. Following a verdict of the European Court of Human Rights, the UK had to delete a database of 1.7 million profiles that were considered by the Court to be in clash with Article 8(1) of the Convention. If we, in Pakistan, opt for the mandatory profiling of all citizens at the time of making the National Identity Card we shall be exposing ourselves to condemnation by the enlightened world. The project may meet the same fate that the Automated Fingerprint Identification System (AFIS) and the Police Stations Record Management and Information System (PROMIS) had met for the want of funds, and political and bureaucratic will.

In some countries, DNA profiles of the suspects are deleted after having been declared innocent or after their convictions have been set aside by the appeal courts. However, legislation can be done to retain such records because in a sizeable percentage of cases the actual culprits are innocent due to careless investigation, failure of the prosecution, the craftiness of the defense lawyers, and compromise between the parties.

MATCH NOMENCLATURE

Loci is the plural of locus. In the field of genetics, loci are the specific location at which a specific gene is located on a chromosome. Each chromosome carries many genes, and each gene occupies a fixed specific location or locus. In humans, the total number of genes in a set of 23 chromosomes is around 19,000 to 20,000³. The ENFSI DNA Working Group, a DNA legislation group has developed a method of presenting the results, for example, 14.1.H which denotes fourteen loci matches, one mismatch, and H for high stringency. H, M, and L stand for high, moderate, and low stringency levels, respectively⁴.

MATCH VALIDATION

² Article 8 (1) of the European Convention of Human Rights

³ Ezkurdia, Iakes; Juan, David; Rodriguez, Jose Manuel; Frankish, Adam; Diekhans, Mark; Harrow, Jennifer; Vazquez, Jesus; Valencia, Alfonso; Tress, Michael L. (2014-11-15).

⁴ DNA DATABASE MANAGEMENT: REVIEW AND RECOMMENDATIONS, ENFSI DNA Working Group April 2017, p-25, downloaded from <https://enfsi.eu/wp-content/uploads/2017/09/DNA-databasemanagement-review-and-recommendatations-april-2017.pdf> on 2 October 2020

In some countries, the positive results or near matches are validated by taking a sample from the suspect afresh or by analyzing the duplicated sample that has been stored but yet not been used. If the suspect insists that he is not involved, his fresh sample is taken and analyzed to ensure the interest of fair play and justice. In Pakistan, unfortunately, the FSL immediately jumps to a conclusion and wastes no time in resorting to the electron media to earn clapping and cheers. In sensational cases, the government is under so much pressure that sometimes it makes the FSL announce the results within hours and looks like acting as a part of the prosecution. In the case of gang rape, independent profiles are compared with the mixed DNA profile which is not necessarily a true match⁵. In such haste, erroneous results cannot be ruled out. A normal full match between two profiles can be announced by the database managing personnel but in case of a match with a partial or mixed profile, the final disposition should be examined and announced by a DNA expert. The report should therefore contain a warning concerning the possibility of adventitious matches and that this possibility should be taken into account, especially when the database match was obtained from a search with a partial DNA profile and in situations where other incriminating evidence is missing or weak. Reporting should be done in such a way that does not create misconceptions in the mind of the person receiving the match report⁶.

MIXED PROFILES

Mixed profiles can occur when two or more individuals have left cell material on the same object (e.g., smoking from the same cigarette or drinking from the same bottle), or when, for example, cells of a perpetrator are mixed with cells of a victim (which often occurs in rape cases). In such cases, the profile of the known person (for example a victim) and that of the unknown (the perpetrator) should be separated by subtracting alleles of the victim by comparing it with the victim's DNA sample. After subtracting, the remaining allele will naturally be that of the perpetrator. IFSG has issued guidelines regarding the analysis of the mixed profiles⁷. It can also be resolved through several applications (see the website of the ISFG <http://www.isfg.org/software>

⁵ Ibid

⁶ Ibid

⁷ Gill, P. et al (2006), 'DNA commission of the International Society of Forensic Genetics: Recommendations on the interpretation of mixtures', *Forensic Sci Int.* 160, 90-101

for open-source software). LRmix Studio is an open-source example of such a software program⁸. SmartRank is a program that links LRmix Studio to a DNA database for the comparison of complex mixed profiles to all reference profiles in the DNA database⁹. Only validated software should be used.

Interestingly, although rarely a mixed profile can be obtained from a single individual if the blood stem cells, or bone marrow of another person has been transplanted. Although, in such cases, only the blood of the receiver may contain the DNA profile of the donor; in the case of a buccal swab some micro blood vessels may be ruptured contaminating the swab with the donor's DNA¹⁰.

DATA ENTRY SOFTWARE

Different software for maintaining and using the DNA Database is either locally developed or bought from international developer companies. In most countries, the Combined DNA Index System (CODIS) is used which has been developed by the FBI for the USA but is also available for non-USA law enforcement organizations. The UK and INTERPOL are using self-developed programs. Information from a national DNA database should be combined with other types of evidence to increase the likelihood of identifying leads in other crimes¹¹.

INTEGRITY OF THE DATABASE

To minimize the possibility of errors, the ENFSI DNA Working Group has given the following recommendations to ensure the integrity of the database¹²:

- DNA profiles should be entered into a database in a way that guarantees correct entry.
- Access to the DNA database should be limited to an authorized person.
- Regular back-ups should be made, stored in a safe place, and recovered at regular intervals to simulate recovery from a disaster.

⁸ <http://lrmixstudio.org>

⁹ <http://lrmixstudio.org/smartrank/>

¹⁰ DNA DATABASE MANAGEMENT: REVIEW AND RECOMMENDATIONS, ENFSI DNA Working Group April 2017, p-25,

¹¹ Ibid

¹² Ibid p-37

- When DNA profiles and their associated information are present in different systems, these systems should be regularly compared to verify whether they are properly synchronized.

STORAGE OF SAMPLES

Depending on the legislation some countries destroy biological material after having made a DNA profile out of it while others store it for future use. It is better to retain the biological material because over time kits with more sensitivity and reliability are being manufactured, e.g., Multiplex, Mini-STR, and SNP which can get profiles from degraded samples, as well. In case of some legal complication, the court may order taking fresh samples which may not always be possible. It should be kept in mind that if a person gives his DNA sample, his relatives can also be incriminated on its basis. It depends on the quality of democracy in a state whether to allow the inclusion of familial profiles in the process of investigation or it should be restricted to the individual whose sample has been taken. Like the EU Countries, legislation for DNA data protection and for its use only for the purpose it was taken can be considered. In most countries taking samples of minors is also allowed. The European Court of Human Rights does not regard it as a contravention of the Convention¹³.

CODE OF ETHICS

Personnel involved in DNA profiling and database maintenance should submit to the requirement of periodical background checks and production of 'good conduct' certificates. They should agree to the following code of professional ethics¹⁴:

- Ability to work very conscientiously
- Ability to keep confidential information confidential
- Ability to accept verification by colleagues
- Ability to report their own mistakes to enable further process improvement

¹³ European Court on Human Rights 20689/08.

¹⁴ DNA DATABASE MANAGEMENT REVIEW AND RECOMMENDATIONS ENFSI DNA Working Group April 2017

RECOMMENDATIONS

1. It is quite cumbersome, expensive, and time-consuming for the investigating officers of the other districts to visit the only forensic lab located in the capital cities. It was in the plans of the Punjab provincial government to establish smaller satellite labs in the bigger cities like Rawalpindi, Multan, Sargodha, DG Khan, and Faisalabad, and the collection centers at the district level. This plan could not materialize because of the lack of political will and funds. Unless the network of the labs and the collection centers are established the most pressing challenge of delay in submission of samples and production of results will persist.
2. Investigation boxes should be provided to every investigator and the article replenished in time.
3. It is next to impossible to spare the investigators to attend courses at the training institutes because each of them has a large number of cases to investigate at one time. Sometimes, this number extends to 50 cases. He has to visit the crime scenes, the Magistrates for getting physical remand, the prosecutor for the legal opinion, the chain of command for verification of investigating and for explaining complaints, writing case diaries, and whatnot. Whenever a training of investigation commences, the districts send those officers of the investigation wing who are not actively involved in the investigation process. Therefore, mobile training units should be formed and detailed to visit the investigation cells for imparting short training sessions like collecting DNA samples, preserving the samples, documentation, etc.
4. The training of the police will not achieve the goal of bringing the culprits to book unless the other partners of the criminal justice system are not trained in the same subject. These partners are the Prosecution Service and the Judiciary. I will not hesitate to include the lawyers on this list.
5. The use of DNA matching is restricted to offenses involving sexual assault, resources should be provided to the investigators and the laboratories to extend this facility to other offenses, as well.