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DNA Testing in Modern Criminal Investigations - Challenges and Future Directions

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Collecting samples from the crime spot plays a very crucial role in apprehending the culprits. DNA testing is a method through which the collected samples can be examined and it can be accurately told that those samples belong to a particular person. Samples like blood spots, hair, semen, etc. collected from the crime spot can be examined through DNA testing by matching the results with the suspects, the real culprit can be arrested. Samples of victims can also be examined through DNA testing to solve a crime. In this way, there is a big role of DNA testing in the criminal investigation. The technologies used in DNA testing are continuously evolving and because of these various complex cases can be solved now very easily through these advanced DNA testing methods. The concept of modern criminal investigation is continuously evolving with the evolution of DNA testing technologies. In this research paper challenges and future directions for DNA Testing in 'Modern Criminal Investigations' are examined by using the doctrinal method of research. Helpful suggestions have been given in the end to deal with the challenges and to improve the efficiency of DNA testing in criminal investigations.

Keywords*: criminal justice system, DNA testing, forensic science, DNA technology.*

INTRODUCTION

A revolution has been brought by DNA testing technologies in accurately solving various legal cases and in disseminating justice without any dissatisfaction. DNA testing can help in disclosing the accurate features of samples and this testing can help in identifying the person with whom those samples belong. Investigation in criminal cases and collection of admissible evidence has become easier due to the usage of DNA testing technologies. Though the DNA testing technology may not be accurate in differentiating the samples when those samples belong to identical twins in other cases, the accuracy of the DNA testing technology has been largely accepted and now DNA testing has become one of the important methods to trace the criminals in criminal investigations. Not only in tracing the criminals but it is also very useful in saving innocent people as well. People who are wrongly accused in a case can prove themselves innocent and can easily avail justice. Properly collecting samples and immediate orders for DNA testing can help in disclosing the cases very quickly but the DNA testing method is also not free from various challenges. Because DNA testing is becoming an important tool in the process of criminal investigation, continuous research is required on the usage of various methods of DNA testing, it can help in improving the accuracy of the results. Continuous critical research work on the legal regulation of DNA testing methods can help in removing the shortcomings in the legal arena and in bringing the necessary amendments according to modern requirements.[1]

IMPORTANCE OF DNA TESTING IN CRIMINAL INVESTIGATION

With the help of forensic science, DNA testing has helped a lot in accurately collecting evidence and in quickly culminating the investigations. To prove that the collected samples belong to a particular person is a very difficult task and DNA testing has provided convincing results in determining the identity of a person with whom those samples belong. Though the use of DNA

[1] Ankit Srivastava et al., 'Impact of DNA evidence in criminal justice system: Indian legislative perspectives' (2022) 12 Egyptian Journal of Forensic Sciences <https://doi.org/10.1186/s41935-022-00309-y> accessed 05 March 2024

technology has been criticised in many countries[2] but this technology can easily help in the disclosure of cases and in nabbing the culprits very quickly, that is why the DNA testing process has become very important in countries where it is accepted to be used in criminal investigations.

Biological materials are collected as samples from the crime spot. These samples may include blood, hair follicles, semen, skin cells, etc. Using these samples for DNA testing can help in disclosing the identity of the person with whom those samples belong. Comparison of DNA profile to a database of offenders or comparing the DNA profile with the profile of an accused person or with the profile of a suspect makes the investigators declare that:

Perpetrators are Identified: Samples collected at the crime scene by being checked through DNA testing may disclose the real perpetrator when the DNA profile is matched. This disclosure helps in collecting the incriminating evidence.

Providing Relief to wrongly Accused People: Innocents can be exonerated when it is found that the samples at the crime spot do not belong to them. Wrongly accused people or even wrongly convicted people can seek protection through DNA testing. DNA testing can help in negating the statements of faulty eyewitnesses as well as the DNA testing gets preference over circumstantial evidence. In this way, there is a big importance of DNA testing in providing relief to the wrongly accused people.

Importance of Advanced DNA Technologies in Disclosing Old, Pending and Unsolved Cases: Reopening or re-analysis of old, pending and unsolved cases and using advanced DNA techniques can help in getting credible evidence. Breakthrough in those cases can be achieved with the help of using modern forensic science methods and DNA technologies. Cases may remain pending or unsolved because in those cases real culprits are not traced. The usage of old technologies in investigation can also be a reason for delays in investigations. In this way, there

[2] John M. Butler, 'U.S. initiatives to strengthen forensic science & international standards in forensic DNA' (2015) 18 Forensic Science International 4–20 <https://doi.org/10.1016/j.fsigen.2015.06.008> accessed 05 March 2024

is a big importance of advanced DNA technologies in disclosing old, pending and unsolved cases.

CHALLENGES FOR DNA TESTING IN CRIMINAL INVESTIGATION

As said above, though DNA testing is quite useful in criminal investigations, this method is also not free from many challenges.[3] The serious challenges are:

Collection of Samples and Storage: The biggest challenge is the collection of samples. If samples are not collected neatly then accurate results cannot be found. Storage of samples in a safe place is also very necessary to maintain their validity. If samples are not collected properly and if they are not stored in a safe environment, then the opposite party may claim to deny the admissibility[4] of the evidence. In this way, the trustworthiness of the outcome of the DNA testing can come in danger due to poor storage. Unnecessary delays will occur and solving that case will become so difficult if these kinds of challenges are not handled properly.

Tampering and Improper Handling of Samples: Samples cannot remain usable for DNA testing if they are handled improperly. Tampering is also required to be prohibited because it is very easy to tamper the samples which can change the outcome of the case. Tampering the samples can save the real culprits and it is possible that innocent people can be trapped in that case by changing the samples of the real culprits with the innocent people. These issues can raise questions over the authenticity of the DNA testing method; hence it is a big challenge to prevent the tampering and improper handling of samples.

Need for a Law or Protocol for Proper Collection, Storage and Handling of the Samples: Countries, where DNA testing is used for criminal investigation, must frame a law or protocol to govern the collection, storage and handling of the samples. Liabilities have to be fixed if there

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[3] Ramakant Gupta et al., 'An Insight on Its Legal Perspective Worldwide and Highlight on Admissibility in India' (2016) 2(2) Journal of Forensic Science and Medicine 102-106 <https://journals.lww.com/jfsm/Fulltext/2016/02020/Journey_of_DNA_Evidence_in_Legal_Arena__An_Insight.7.aspx> accessed 06 March 2024

[4] Kristen Bolden, 'DNA Fabrication, A Wake Up Call: The Need to Reevaluate the Admissibility and Reliability of DNA Evidence' (2011) 27(2) Georgia State University Law Review <https://readingroom.law.gsu.edu/cgi/viewcontent.cgi?article=1018&context=gsulr> accessed 06 March 2024

is improper collection, storage and handling of the samples. Proper implementation of this law/protocol is a challenge.

Creation and Continuous update of the database: When the suspect person is not identified by the police or the accused person is yet not found then in that case a database of criminals can be very useful. Matching the DNA profile of samples collected at the crime spot with criminals included in the database can give a breakthrough if the DNA profile of a criminal matches with samples found at the crime spot. However, it is a challenge to create an effective database because that database cannot be useful if the real culprit is the first-time offender. Due to Privacy concerns, there can be opposition from various activists to add the DNA profile of a person to the database. Hence, a database if it remains incomplete will not be quite useful. Continuous updates and regular addition of criminals to the database are one of the biggest challenges. DNA analysis cannot give fruitful results if the database is incomplete and immaculate.[5]

Privacy Concerns: The right to privacy has been recognised as a fundamental right in India[6] that is why many critiques have said that adding the personal details and DNA profile of a person in a database can cause a breach of privacy and can violate the fundamental right to life and liberty but it is argued in the support of databases that only the details of criminals and convicted people are stored in it but still it is a challenge to convince people that adding details in the database is not a breach of privacy but actually, it helps in quickly identifying the real culprits behind a crime.[7]

Fear of Self-incrimination: The right against self-incrimination is also a fundamental right in India.[8] However, storing the DNA profiles of someone in a database can make the person give evidence against himself. Hence, it is a challenging issue to create a database and store the DNA

[5] Aaron Opoku Amankwaa, 'Trends in Forensic DNA Database: Transnational Exchange of DNA Data' (2020) 5(1) Forensic Sciences Research <https://doi.org/10.1080/20961790.2019.1565651> accessed 05 March 2024

[6] *Justice K. S. Puttaswamy (Retd.) v Union of India* (2017) 10 SCC 1

[7] Sheethal Joy et al., 'India - National DNA offender database as tool for criminal surveillance: need for public debate!!!' 2018 5(3) Journal of Medicine, Radiology, Pathology & Surgery 11–14 <https://www.proquest.com/openview/d235294a64787c273a558786a2a68435/1?pq-origsite=gscholar&cbl=2068935> accessed 05 March 2024

[8] Constitution of India 1950, art 20(3)

profiles of all people in it. Generally, details of criminals are added to a database to call it a reasonable, genuine and justified step but still framing proper legal guidelines for storing the data can convince others to accept that this storage of data on a database does not violate the fundamental right against self-incrimination.[9]

Update of DNA Technologies and Complexities in Interpretation: Advanced technologies for DNA testing require well-qualified experts who can interpret the samples. Using old techniques can hamper the disclosure of cases. In this way, utilisation of the updated technologies and recruiting well-qualified experts are much-needed requirements. Challenges can be created in the accurate interpretation of samples if this condition is not fulfilled.

FUTURE AND PROSPECTS FOR DNA TESTING IN CRIMINAL INVESTIGATION

Various crucial breakthroughs in many criminal cases with the help of DNA testing have solidified the reputation of DNA testing in criminal investigations. The DNA testing method has performed quite commendable work in exonerating innocents and sending the real culprits behind bars.[10] In this way, the DNA testing method has shown its potential to aid the investigators in quickly finishing the investigations. The prospects and importance of DNA testing in future are going to be very crucial in solving criminal cases, the reasons are-

Emerging Technologies will make DNA Testing more advanced: Currently, the samples that are very difficult to test can be easily tested in future when they are examined through modern and advanced technologies. The issue of long pending cases can be minimised and cases can be quickly resolved through the adoption of highly advanced technologies for DNA testing. Small particles and old and degraded samples can also give crucial information when advanced techniques are used to examine them. In this way, the issue of limited evidence in cases can be

[9] The Hon Justice Michael Kirby AC CMG, 'DNA evidence: Proceed with care' (2001) 33(1) Australian Journal of Forensic Sciences 9-13 <https://doi.org/10.1080/00450610109410808> accessed 05 March 2024
[10] Stephen Sedley, Science & justice--DNA and the courts (2005) 45(2) Science and Justice 59-60 <https://doi.org/10.1016/s1355-0306(05)71627-0> accessed 06 March 2024

solved and enough evidence can be collected to finish the investigations quickly which in the end will help in the quick conclusion of trials as well.[11]

Faster Analysis will save time: Modern technologies will make testing happen very quickly which will save the precious time of the investigation. A quick conclusion of the investigation will help in a trial in courts to get finished quickly as well. Faster analysis will make more samples to reach for DNA testing, hence a good amount of evidence will be collected in the end to criminalise the offenders.

DNA testing of Ancestors will help in understanding complex cases: Unknown suspects can be traced with the help of advanced forensic genealogy. Using highly advanced technologies for examining the ancestral DNA patterns will be very crucial and helpful in complex cases where a detailed investigation of the samples of the suspects are required.

Recruitment of well-qualified investigations and forensics experts: For performing a good investigation, the investigators must be highly qualified in understanding the crime scene and in collecting the samples from the crime spot. Good training for conducting the investigation and knowledge of forensic science will improve the quality of criminal investigations. Hence, the bright future of the DNA testing method requires well-qualified investigators. Forensic experts should also be highly qualified. These experts must be aware of the recent updates and modern practices in DNA testing methods. A cordial relationship between criminal investigators and forensic experts is very necessary for a modern criminal investigation. It is expected that qualified investigators as well as modern and knowledgeable forensics experts will be recruited to solidify the concept of modern criminal investigation.

Modern labs and increasing the numbers of these labs: Replacing old labs with new, modern and high-tech labs is very necessary for proper testing, safe handling and storage of samples. A modern criminal investigation cannot be done in old and unadvanced labs. It is expected that the number of labs will be increased in future and these labs will be highly advanced labs

[11] Sunil K Verma and Gajendra K Goswami, 'DNA evidence: current perspective and future challenges in India' (2014) 241 Forensic Science International <https://doi.org/10.1016/j.forsciint.2014.05.016> accessed 06 March 2024

equipped with modern technologies where the experts will be highly qualified DNA and forensics experts.

Use of AI: Using advanced AI tools and software will save time and testing will happen quickly. This technology can work 24/7 and will also reduce the cost of examination. Various complex data can be interpreted and stored very easily. In DNA testing, the tasks that were earlier conducted by taking long hours can be finished within a few minutes or even in a few seconds.

Framing of laws/protocols for managing DNA testing: Reliability, accuracy, trustworthiness of results and ethical use of DNA testing[12] requires a specific law to regulate and manage DNA testing. Countries where these laws and protocols are not framed can enhance the authenticity of DNA testing methods by bringing a legal framework/protocol in this regard. There is a fear that anybody can tamper with the samples, real samples can be replaced with fake samples, and corrupt officials and employees can protect the culprits by changing the samples. Similarly, there are many situations in which the authenticity of DNA testing can be questioned. A strict law/protocol can impose liabilities on the responsible people and testing can be done legally without any external disturbances. Experts, investigators or any other employee must be responsible and legal actions must be taken against them if samples are tampered with or changed. Legal regulation of DNA testing methods and continuous research on finding the shortcomings and loopholes will help in updating and improving those laws/protocols with the introduction of continuous amendments.

In this way, modern criminal investigations are going to be very accurate and high-tech. Investigations aided by updated and advanced technologies make the prospects for the usage of DNA testing very bright in future. By properly handling the above-mentioned challenges and by maximum utilisation of modern technologies, not only the results of DNA testing can be made more trustworthy but it also can create fear of law & order in the minds of criminals or wrongly indented people. Awareness that any sample (small or big) can make the culprits be identified easily which will prevent them from committing crimes. This phenomenon will make

[12] Amankwaa (n 5)

the environment in society crime-free, as well as with less time taken in completing the investigation and quick conclusion of trials, the huge burden of pending cases in the Indian courts will be reduced. Accurate convictions will also decrease the number of appeals.[13]

CONCLUSION AND SUGGESTIONS

Apart from various uses, the DNA testing is not only helpful in identifying the real criminals but it is also very helpful in protecting people who are wrongly accused in a case. In India, criminal investigations are being revolutionised with the growing importance of DNA testing. Samples collected at the crime spot have given crucial information about the suspects which has helped in quickly solving the cases and in apprehending the culprits. Access to justice, which has been recognised as a fundamental right in India,[14] can be provided to the victim if real culprits are nabbed with advanced investigations. Because punishment of the real culprits will provide justice to the victims, hence in this regard DNA testing plays an important role in identifying the real culprits. But the DNA testing method is also not free from challenges and if modern criminal investigation has to persist then the existing challenges have to be handled efficiently. In this regard, some helpful suggestions are:

- Framing of a strict law/protocol is very essential to manage and regulate DNA testing in criminal investigations.
- A database with necessary information on all the criminals must be made and continuously updated. Details of people who are accused but not convicted must also be added.
- More clarity is required regarding the status of privacy when details and DNA profiles of some criminals/accused are added to the database. Bringing a law justifying the addition of such details in the database can remove the existing confusion.
- The issue of self-incrimination has also to be resolved by spreading awareness that the addition of the details of criminals in the database will not lead to self-incrimination.

[13] Srivastava (n 1)
[14] *Anita Kushwaha v Pushap Sudan* (2016) 8 SCC 509

- Collaboration of lawmakers, investigators, forensic science experts & civil society organisations can help in bringing a strict legal framework to regulate and manage DNA testing and to remove confusion created by issues like privacy breaches, and self-incrimination.
- Strict legal actions should be taken if anyone interferes with or changes the samples to protect the culprits.
- Proper handling and storage of samples and improving the infrastructure for conducting advanced DNA testing are highly required to strengthen the modern criminal investigation system.