

DNA Profiling in Criminal Justice System of India: Relevance and Importance

Dr Tabasum Ara

Ex Ph.D Scholar

Department of Law, Central University of Kashmir, Ganderbal, J&K, India

Abstract

One of the most significant developments in the field of forensic science now applied in the criminal justice system is the development of Deoxyribonucleic Acid (DNA) technology. Every human has unique DNA, which is present everywhere. It is the foundation of anyone's genetic composition. Through a scientific procedure called DNA profiling or DNA typing, an individual's distinctive DNA profile can be discovered isolating its genetic material and transforming it into perceptible images. This enables the quick identification of culprits through the forensic examination of evidence from crime scenes. In India, a paradigm shift in criminal justice system has been brought about by DNA profiling in crime scene analysis. It has made it possible for criminal justice to successfully exonerate the innocent and punish the guilty. This paper highlights the importance and relevance of DNA Profiling in India through analysis of literature, both online and offline.

Keywords: DNA Profiling, Criminal, Investigation, Accuracy, Identification

Introduction

Since the dawn of human civilization, crime has existed in one form or the other. The definitions of crime as well as the strategies used by criminals to commit it have drastically changed as a result of advancement in science and technology. While the sophisticated criminal has been swift to use science for his crimes, but the police investigator can no longer rely on his age-old methods of questioning, gathering information, and surveillance to find criminal activity. Additionally, inhumane and cruel methods of crime detection have no place in a civilised society. In such situation, what can the police investigator turn to, except the developing science? It is in this framework; Forensic science has found its existence and has developed as a potent tool in the hands of the judiciary and law enforcement agencies. The forensics have developed not only its own techniques but also its own branches, which are more or less exclusive domains of forensic science. The science of fingerprints, anthropometry, track marks, documents and forensic ballistics essentially belongs to forensic science alone. More advances that are significant have been made in serology, voice analysis, and odour analysis and in studies to pattern recognition through computers [1]. DNA technology is, however the latest tool of forensic science. It is the outcome of tremendous development of genetic science. DNA or Deoxyribo Nucleic Acid is the fundamental building block for an individual's entire genetic make-up. It is a component of virtually every cell in the human body; a person's DNA is same in every cell. DNA profiling is a new technique to identify a person on the bases of his genes. The structure of DNA is different in every individual and except identical twins; no two individuals can have identical DNA. Variation in human DNA is known as 'polymorphism'. It is these polymorphic segments in the DNA molecule, which serve as a tool to identify individuals. DNA in one sense is an individual's Genetic Code, "the blue print which makes you what you are". The discovery of DNA profiling has played a pivotal role not only in scientific identification of offender in criminal cases, but also in paternity or maternity disputes, baby exchange cases, in several civil litigations etc.

DNA Profiling as scientific evidence, in comparison to other human evidence, is considerably faster, more precise, accurate, and definitive, and it can withstand a court's scrutiny to establish an accused person's guilt or innocence. In criminal cases like rape, murder etc., timely medical examination and proper sampling of body fluids followed by quality forensic analysis can offer irrefutable evidence, circumventing the need of prolonged argument in the courts of law. Evidence of eye witnesses can be corroborated with scientifically explainable and reconstructed sequence of events. The relevant details gathered from the physical clues can be used to check the veracity of eye witness accounts, especially in those cases in which the witnesses become hostile. The truth behind the statements can be ascertained if the crime scene is reconstructed by using this latest method of forensic science[2].

What is DNA?

The human body is composed of innumerable cells, each one of which carries a complete set of chromosomes. In every cell there are number of components like Ribosome, Golgi Bodies and every cell, except Red Blood cell and a few other minor types, contain within it a structure or component called "Nucleus". Within the nucleus of each cell resides an identical copy of the individual's genetic material known as DNA or the Deoxyribonucleic Acid¹. It is the structural material for chromosomes. It carries the genetic code. Hence it determines human character, behaviour and body characteristics. It is a molecule in the form of a long twisted chain called a double helix and is made up of only four nucleotides i.e. Adenine, Cytosine, Guanine and Thiamine. The arrangement of these nucleotides produces a code just as the arrangement of letters produce written words. Many of the letter sequences in chromosomal DNA form genes.

In human cells, DNA is tightly wrapped into 23 pairs of chromosomes one of each chromosomal pair comes from the mother and other from the father and it is unique in every person except in case of identical twins. This uniqueness makes DNA evidence very valuable in investigations as it is almost impossible that someone else may have DNA identical to that of an individual [3]. It is identical throughout a person's body whether found in his blood, saliva, skin cells, semen, bones and hair roots. It does not change over a period of time hence even the old samples can be compared with the latest ones. It is often referred to as 'Blue Print of Life' because it contains the information needed to give us physical characteristics and functional abilities. It is due to these properties DNA has become a useful identifier of a person.

Sources of DNA

DNA, in each individual, is the same in each and every human cell, but it differs in every individual. For DNA profiling, the basic material is the DNA itself. To determine the individuality, the DNA has to be first extracted from the specimen. It can be extracted from tissue or body fluids. It is found present in every living cell of our body. Finding of polymeric chain is, however, easy when the fresh specimen is drawn [4]. DNA is found in every living cell of our bodies and can, therefore, be extracted from a whole variety of different materials, a list of the same is given below:

1. Blood and bloodstains
2. Semen and semen stains
3. Hair and hair roots
4. Finger nail pairings
5. Saliva
6. Body tissues and body organs
7. Bone and bone marrow
8. Urine
9. Fecal matter
10. Tooth canal root pulp
11. Foetal material
12. Post-mortem materials
13. Blood samples in blood relationship cases
14. Other body fluids

What is DNA Profiling?

The complete analysis of DNA is known as 'DNA Profiling' or 'DNA typing'. It is a technique involving chemically dividing the DNA into fragments which form a unique pattern and then matching the identity profile' with the pattern obtained from similarly testing suspect's blood specimen. If the two patterns match, the possibility of error i.e., the chance that they do not belong to the same individual may be less than one in 30 billion. DNA Profiling is essentially a biological tool that allows the scientist to compare samples of DNA material. DNA profiling is a technique employed by forensic scientists to assist in the identification of individuals by their respective DNA profiles. As mentioned above, with the exception of identical twins, the DNA of every individual is different and unique and this is what makes DNA profiling such an invaluable tool in investigative procedures. DNA analysis reveals the genetic profile of a person and when this is compared with the samples obtained from scene of crime or in case of proving paternity, with the sample of the other person, it provides a conclusive proof of connection or relation. This is a technique of "justice through advance science". This new forensic technique has been advocated on a number of grounds [5]:

1. It is better than traditional techniques such as ABO grouping, as it has a higher discriminating power and is more stable than many other systems.
2. It is a powerful identification tool in cases where there is no reliable eyewitness identification.
3. It can be used to distinguish serial crimes from "copy-cat" crimes or to link unsolved crimes.
4. It can save court's time and money and avoid unnecessary anguish for both victims and suspects by: (a) excluding innocent suspects; (b) eliminating trials where a confession is obtained based on DNA evidence and (c) focusing defence issues in those cases that do go to trial, e.g., consent or alibi defences.

Use & Application of DNA Profiling

A DNA profile is a computerized alpha-numeric value obtained from the visualized output of DNA analytical process. A suspect in a criminal investigation can be identified, confirmed, or eliminated using DNA analysis as an intelligence tool. Additionally, it can be used to identify crime or catastrophe victims, as well as to link crimes by comparing DNA profiles from various crime scenes. If the DNA from a crime scene and a suspect's DNA profile match, the match may be used as proof of the suspect's guilt [6].

DNA profiling is used as a powerful and accurate forensic tool in many different ways by police all over the world in thousands of cases every year. It can be used in post-mortem examination where identification of the deceased is difficult, such as in cases of incineration, drowning, or complete or partial decomposition of a corpse. It is used in cases where the more common methods of radiography and odontology are unsuitable. It is most useful for investigating crimes where more than one person has been killed or injured. By identifying the likely source of a bloodstain at a crime-scene, the investigation team can determine the location of people during the offence and find out how individuals moved through the crime-scene. DNA profiling is of value to the police in investigating crimes such as prolonged abuse, by positively identifying the source of minute bloodstains distributed at the crime-scene as belonging to the victims. One of the most important and valuable qualities of DNA profiling is its ability to

solve historic cases. DNA technology allows for samples of historic crimes that were never solved, to be analyzed. This can lead to the arrest of suspect even years after the offence was committed [7].

With its capability to implicate or eliminate, DNA profiling offers investigators a powerful means to unravel criminal cases. DNA profiling is therefore a vital addition to the techniques traditionally available to investigators. Linked criminal strategies can be analyzed and new criminal phenomena recognized, resulting in more effective police management and corresponding savings in human, material and financial resources. DNA profiles can be obtained from most biological materials such as blood, tissue, bone, semen, skin, urine, bone-marrow, faeces and cells found in saliva, sweat and tears. The improved sensitivity of DNA technology has meant that profiles can now be obtained from contact traces even after minimal contact between a person and the object. Examples of contact traces are fingerprints, ear-prints, facial contact smudges, saliva on drink cans, material expelled from coughing and sneezing. The potential for recovering DNA trace evidence must be borne in mind when investigating all incidents of criminal activity. In cases of missing persons, mass disasters or unidentified bodies, DNA offers the opportunity of body identification [8].

When an offender has left any DNA samples at a crime-scene, a forensic analyst will compare these samples with a DNA sample taken from a suspect or a DNA database – to find a match. If there is a match between the samples, the analyst will consider the statistical likelihood that the sample found at the crime-scene could have come from someone other than the suspect or victim. This analysis will help focus further investigations, and may also be used as evidence at trial. DNA evidence is used not only in the investigation of recent crimes, but also in relation to past unsolved crimes. Samples taken from crime-scenes held in police files, in some cases for decades, may lead to identification of offenders or bodies using the new DNA identification technology. The establishment of DNA databases has increased the potential to identify offenders of past crimes.

Precisely, DNA profiling can be used in following situations[9]:

1. To resolve legal issues. For example, In the case of succession, inheritance of property, maintenance and adoption of minor.
2. Linkage of the criminal, the victim, the weapon of offence, vehicle used in the crime, scene of occurrence, routes etc., *inter se* through body materials exchanged or deposited as clue materials.
3. Identification of the potential suspects whose DNA match evidence left at crime scene;
4. Exoneration of persons wrongly accused of crimes;
5. Establishment of paternity and other family relationships;
6. Identification of endangered and protected species as an aid to wildlife officials (could be used for presenting poachers);
7. Detecting bacteria and other organisms that may pollute air, water, soil and food;
8. Matching of organ donors with recipients in transplant programmes;
9. Determination of pedigree for seed or livestock breeds;
10. Authentication of consumables such as wine and caviar;
11. Identification of fake encounters.
12. Immigration Cases
13. Identifying remains of the dead persons
14. To control terrorism through preservation of genetic data in DNA data banks
15. Certification and authentication of various food products.

Importance and Relevance of DNA Profiling

In most of the crimes, establishing the identity of an individual, be it a victim or the suspect of crime, is the backbone of police investigation. Fingerprinting science has been, so far, the only infallible means available to establish identity of criminals but to a limited extent. The chances of establishing identity on the bases of biological evidence, in particular, genetically determined markers like blood groups and red cell enzymes have not yielded satisfactory results. Such methods showed relatively low exclusion power. Even the best effort made by combining all the known genetic marker systems, individualization has always remained elusive. But recently, DNA which has a distinct genetic code has made a spectacular breakthrough in biotechnology. To the forensic scientists, it is the single most genetic marker and the most powerful tool, now available, for individualizing and discriminating the biological evidence in forensic investigation. The term “DNA Fingerprinting” was a trade mark name given by Cell Mark Diagnostic, a company in America which licensed the technique, developed by UK. Its initial name helped to carry the message conveyed by fingerprints to a lay man. The more appropriate term now gaining currency is *DNA Profiling* [10].

The development of DNA profiling has provided new dimensions and accuracy to identification of individual even greater than the methods of fingerprinting. This is because the DNA profiling allows examination of human biological material at its most fundamental level i.e. the DNA molecule. As long as developed laboratory procedures are adhered to, the DNA profiling evidence is as reliable as any form of scientific evidence brought before the courts. DNA profiling is extensively used for criminal investigation as well as paternity testing. This profiling is very useful especially in the field of criminal law because it has the possibility to determine whether the blood or semen deposits at the scene of the crime come from the person suspected of crime or not. Thus, it is very useful in investigations of murder, sexual offences and paternity disputes whenever any blood, hair etc., are left by the culprit at the crime scene. DNA profiling can identify the person from his own biological deposits.

Since the technology of DNA has left a profound impact on the administration of justice, the pace of adoption of DNA evidence by various countries in the world has been different. In order to adopt this new science in the legal system, many countries have changed or amended their existing laws and some countries have even introduced new special DNA legislations. In USA, the grants has been proposed to State and Local Governments for establishing and improving forensic DNA testing capabilities and directed the establishment of standards for DNA testing laboratories. There has been the authorization for collection of DNA

samples from all persons arrested and facing charges under Federal Authorities. This is not the violation of right to privacy of individuals. In U.K., the provisions of DNA were laid in 1994 in detail and also modified whenever it was felt necessary to do so. In this context the activism on the part of the U.K. legislators is commendable. The central and most far reaching aspect was the creation of framework for the police administration of DNA sample collection necessary for profiling. Even in Canada, the Courts have been fond of DNA evidence and its evidentiary value since 1988. The Canadian Parliament has legislated to establish a body of law dealing with administration and taking of DNA samples for genetic testing. Besides this, judiciary in Canada is benefitted by legislative support as specific and detailed law based on DNA evidence and its admissibility is in force.

In India also, the use of DNA as evidence in criminal investigations has grown in recent years. It has helped law enforcement agencies to identify criminals and solve difficult cases. DNA evidence has also proved that many convicted people are actually innocent. It can be used in identification of criminals by analysing various objects recovered on the crime spot like any body fluid, hair root, saliva, fibres etc. which are associated with the crime and accurately linked to the perpetrator of the crime.

This technology is being utilised as a new form of circumstantial evidence, which is placed on a higher footing than the direct and ocular evidence because of its objectivity, scientific accuracy, infallibility and impartial character. Moreover, this new technology is also extensively applied in civil cases in order to determine paternity or maternity disputes, baby-exchanging cases, succession cases, maintenance proceedings and matrimonial disputes etc. For instance, in case of disputed paternity of a child, mere comparison of DNA obtained from the body fluid or body tissues of the child with the father and mother can offer infallible proof of biological parentage within a short time. No other evidence of corroboration is required because timely medical examination and proper sampling of body fluids followed by quality forensic examination can offer irrefutable evidence, circumventing the need of prolonged argument in courts of law[11].

Scientific technology now enables forensic investigations to identify individuals from their DNA sequence. This technique compares the genetic pattern contained in the body cells of one human with the genetic pattern of the body cell in another. This is very useful in the field of criminal investigation as well as parentage testing. Realising this immense potential, the countries in the west have already developed a jurisprudence of both academic and practical insight, and have begun to utilize this technique frequently for solving complicated cases[12].

DNA fingerprinting or profiling is an authoritative technique that is capable of distinguishing every human individual from other individual, with the exception of identical twins or clones. But it would be wrong to say that the DNA profiling is only useful in paternity disputes or in criminal investigation. This technique is specially used in the western countries extensively for solving cases of switched babies, for claiming of security benefits, for pedigree analysis of animals and for varietal identification in agriculture for vegetatively grown and self-pollinated crops or plants in the agricultural areas². In fact, it has been established that there is possibility of DNA typing of skeletal remains. Trace amounts of DNA can be recovered even from 5500 year old bones.

The currently developing technique of DNA profiling promises a great degree of accuracy greater in fact even than the current methods involved in other scientific methods. This is because the DNA profiling allows examination of human biological material at its most fundamental level i.e. the DNA molecule. So long as well developed laboratory procedures are adhered to, DNA profiling evidence should be as reliable as any form of scientific evidence that is brought before the courts. It has been remarked that "it is true that science does occupy an important and unique role in criminal justice system that relates to the scientist's ability to supply accurate and objective information that reflect the events that have occurred at a crime" [13]. The technique of DNA testing and its application in various fields and its use in identification are well established now world over.

DNA profiling has emerged one of the most useful and powerful methods of criminal investigation. It has found great acceptance as a system of identification due to its great advantages over other methods. DNA analysis is more objective in comparison to other scientific methods.

Conclusion

Due to advancement of science and technology, the law also required to be changed so as to keep pace with it, especially in matters where these advancements have proved to be of great value for crime detection as well as to solve legal matters. The DNA technology, in this respect has made a great impact and has improved the methods of proving different types of criminal and civil cases. In future also, scientific evidence is going to play a major part in proving cases of criminal and civil matters. This fact has been acknowledged and accordingly adopted in other countries by way of making provisions in their existing laws for including DNA evidence and testing. Besides this some countries like Canada have even enacted separate Legislations concerning DNA. Unlike Canada, India does not have any specific DNA legislation yet. Apart from this, unlike other developing countries where the administration of justice has been enriched by forensic technology and new scientific techniques, in India the procedural laws have not been amended so as to include DNA evidence. Only a couple of sections in the Code of Criminal Procedure were amended in 2005 so as to include DNA profiling within its ambit. In other cases, the Judiciary has interpreted existing laws in their decisions, so as to include DNA sampling and profiling within its meaning. No hard and fast steps have been taken to enact a proper legislation and to make specific provisions for DNA evidence, in our legal system. It is difficult to understand the reason for this, but it is certainly clear that as far as things stand today, we are lagging far behind in adoption of DNA techniques for criminal and civil matters in our country. While as the Judiciary has shown creativism by approving DNA sampling and testing for investigations in criminal matters and in paternity disputes.

References

- [1] B.R.Sharma, "Forensic Science in Criminal Investigation & Trials", 15 ed, New Delhi: Universal Law Publishing, p 3, 2016.
- [2] Modi, "Medical Jurisprudence and Toxicology", 22 ed, LexisNexis Butterworths, p 37, 2001.

- [3] Usha R. Rani , “DNA Evidence and the Courts”, Karnataka Law Journal, vol 1, p 2, 2008.
- [4] *Supra* note 1 p 350
- [5] Anusha Jain, “DNA technology and its Impact on Law”, Nalsar Law Review, vol.3 2006-2007.
- [6] Justice R.K.Abhichandani , “New Biology & Criminal Investigation”, p 4, 2004.
- [7] *Ibid*
- [8] Modi, “Medical Jurisprudence and Toxicology”, 22 ed, LexisNexis Butterworths, p 65, 2001.
- [9] M. Monir, “Law of Evidence”, Universal Law Publishing Co. 14 ed, 14 vol.1, p.1004, 2005.
- [10] B.S. Nabar, “Forensic Science in Criminal Investigation”, 3rd ed, p.348, 2012.
- [11] Jyotirmoy Adhikary, “DNA Technology in Administration of Justice”, LexisNexis Butterworths, p 14, 2008.
- [12] Tandon Nidhi, “*The Journey from One Cell to Another: Role of DNA Evidence*” 2004, Available at www.ebc-india.com, accessed on 15-02- 2022.
- [13] Yashpal Singh and Mohammad Zaidi, “DNA Tests in Criminal Investigation, Trial and Paternity Disputes”, Allahabad: Alia Law Agency, p 37, 2006.

