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# **DNA EVIDENCE: ONE STEP FORWARD TOWARDS JUSTICE**

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## **Abstract**

Evolution of Science and Technology is a part of humankind. DNA evidence has emerged as one of the most reliable and transformative tools in modern forensic science, fundamentally altering the manner in which crimes are investigated and adjudicated. Deoxyribonucleic acid, present in almost every cell of the human body, contains a unique genetic blueprint that allows for the accurate identification of individuals with an exceptionally high degree of certainty. The introduction of DNA Profiling in the late twentieth century revolutionized criminal justice by providing scientific methods to link suspects to crime scenes, identify victims and exonerate the wrongly convicted. Unlike traditional forms of evidence such as eyewitness testimony or confessions, DNA analysis is based on objective biological data, thereby reducing the risk of human error and bias. Further DNA evidence also has the role in the identification of victims in crimes where the specimen is damaged or tampered. The application of DNA evidence extends across various stages of the criminal process, including investigation, prosecution and post-conviction review. Biological materials such as blood, saliva, hair, skin and semen can be collected from crime scenes and compared with samples obtained from suspects or existing databases. Ultimately, DNA evidence represents a powerful instrument for achieving justice, but its effectiveness depends upon responsible collection, rigorous analysis and balanced legal regulation that protects both societal and individual rights. Moreover there also arises a concern of Right to Privacy while examining the DNA samples of the individuals. Forensic Science puts a great focus on micro analysis of the evidences obtained during investigation process and also to prove the innocence of an individual who has been wrongfully suspected of committing an offence. This paper attempts to understand what is DNA evidence, Analysis of DNA evidence, its role in criminal justice administration, its applicability in the Bharatiya Sakshya Adhinyam and human rights issues.

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**Keywords:** DNA evidence, specimen, Forensic science, Right to Privacy, Bharatiya Sakshya Adhiniyam.

## Introduction

As crime evolves in a society, there also arises a need of newer technologies which helps in identifying the suspects of proving guilty of the offence committed. In this world of technologies emerging day-by-day, Forensic Science forms an integrated part of criminal justice system. Since time immemorial, crime is considered a social phenomenon. It affects the public at large. With the advancement of Science and Technology, the nature and performance of the crimes committed by the offenders has undergone a phenomenal transformation. Nowadays, the criminals are trying to adopt newer methods and techniques for committing offences.

In a situation like these, it becomes challenging for the investigating agencies to find out the culprit and held him guilty of committing the offence. So, they need to adopt new methods of identifying the evidence at the crime spot which could help them to find the support. Analysis of DNA evidence through DNA Profiling in forensics is one such method. There are different methods of DNA analysis which includes Restriction Fragment Length Polymorphism (RFLP), Polymerase Chain Reaction (PCR), Short Tandem Repeats (STR), Variable Number of Tandem Repeats (VNTR), Y- Chromosome Analysis, Mitochondrial DNA Analysis etc.

Although DNA evidence has gained increasing prominence in the criminal justice system of India, it lacks proper regulatory implementations. The collection and analysis of DNA samples of any person raises questions that whether it violates the fundamental rights of an individual of Article.21 and Article.20(3), that is Right to life and personal liberty and Protection against self-incrimination respectively guaranteed by the Constitution of India. As India is a developing nation, the crime rates of various States have been increasing drastically, which would enable the Legislature to enact stricter laws against the offenders and new technologies of identifying the evidence of the suspects in forensic science. This would create a fair and equitable criminal justice administration.

## An Overview of DNA

DNA is called deoxyribonucleic acid or considered as “The Blueprint of life”. It is the genetic material of every human being which contains genes in it. DNA is present in almost every cell

of living beings. This molecule is responsible for the genetic makeup of an individual. The discovery of deoxyribonucleic acid dates back to 18<sup>th</sup> century, when a Swiss biologist Johann Fredrich Miescher recognized a distinct molecule during his work on white blood cells and named it as DNA. Later, it was in 1953, when two scientists, James Watson and Francis Crick proposed a Double-helix structure of DNA,<sup>3</sup> which today has achieved a milestone in unraveling the evidences of the crime. The structure of DNA consists of polynucleotide chain composed of four types of nucleotide subunits. This chain is known as a DNA strand and helps in the replication of DNA. The structure of DNA mostly resembles as a twisted ladder. Each strand consists of a nucleotide which is composed of a 2-deoxyribose sugar (5- carbon sugar), a phosphate group and one of the four bases, that is Adenine (A), Guanine (G), Cytosine (C) and Thymine (T). The deoxyribose sugar and phosphate group are linked by a phosphodiester bond in DNA, which is called 3'-5' phosphodiester lineage. All DNA strands are read from the 5' to the 3' end. The 5' end terminates in a phosphate group and the 3' end terminates in a sugar molecule. Every cell of the human body has a sample of DNA. An average human body contains about 250 grams of DNA and each human nucleus contains about five pictograms of DNA. If the DNA inside one cell were stretched out end to end, it would be approximately 1.8 meters long.<sup>4</sup>

### **What is DNA evidence?**

As DNA of every individual is unique except of identical twins, it becomes easy to identify and match the samples collected with that of the suspects. The evidences collected are extremely precise like hair, tissues, bodily fluids etc. So, proper protocol is needed to collect and preserve the samples. Collection process includes paper documentation mentioning the location, date, time and the individuals involved to maintain a good harmony. The collected DNA evidence must be preserved carefully to prevent degradation and must be handled with due care. The sample should be packed and labeled which can help to trace it easily. After that, different methods like RFLP, PCR, STR, VNTR etc. are employed for DNA analysis.

### **The value of DNA evidence**

The evidentiary value of DNA plays a key role in the investigation process, so as to find out the culprit as early as possible. For example, in the cases which include heinous crimes like

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<sup>3</sup> Himanshu Pandey & Anitha Tiwari, Evidential Value of DNA: A Judicial Approach, BHARTI LAW REVIEW (June 2017).

<sup>4</sup> A Jamie Cuticchia, Genetics: A Handbook for Lawyers. 168 (ABA Publishing, Chicago, 2<sup>nd</sup> ed., 2019)

sexual assault or rape, the evidence such as skin, hair, semen or blood which is left on the victim's body can be examined and linked it with the suspects. Properly collected DNA evidence can be compared with known samples to place a suspect at the scene of the crime. Therefore, it can be clearly said that DNA evidence is one another kind of circumstantial evidence employed in the investigation process.

### **Significance of DNA evidence**

- Every individual's DNA differs from each other in a body, which helps us to identify the dissimilarities of everyone.
- The stability of DNA over a long-period of time distinguishes from other forms of evidence that can degrade or change over time. DNA evidence from cold cases can be once-again re-examined with the help of modern techniques where the conventional techniques fail to identify the suspect.
- As DNA is inherited from parents, it allows for easy familial comparisons to identify. If a suspect is not available for DNA testing, samples from their parents can provide strong indicative results.
- The long durability of DNA can be useful in historical investigations and cases involving long-term missing persons.
- Identification of DNA evidence plays a key role in minimizing wrongful detention of a person held guilty of committing the offence. It helps to reach at the actual perpetrator.

### **Limitations of DNA evidence**

Using DNA evidence in some cases has its limitations. DNA can confirm the absence of specific materials at a crime scene or on a victim. Still, it cannot provide insights into the crimes's specific circumstances, such as consent or intent. Therefore, while DNA evidence serves as a powerful tool for the investigating agencies, it may not always offer a comprehensive understanding of the events. The potential unavailability or incompleteness of DNA evidence is also a challenge to the investigating agencies. Certain factors like the passage of time or evidence contamination can also impact the quality and quantity of recovered DNA. There can be errors while interpreting complex DNA profiles. Whenever there are mixtures of DNA from multiple contributors, it further complicates the interpretation process.

However, countries like India do not have any infrastructure or legislation for the operation of

DNA database. A DNA database is a tool used for identifying links between offenders and crime scenes. This tool proves to be a great source of information to the investigating agencies. Human DNA Profiling Bill <sup>5</sup>was proposed in 2019 in the legislature of India. The Bill was originally proposed in 2007 and in 2012, the drafting of the Bill began. The Bill shows the establishment of National DNA Data Banks and a DNA Profiling Board, which will collect the genetic data from offenders, suspects, missing persons, unidentified dead bodies etc. The data will be restricted and available only to the accused or the suspect. Hope the Government may implement it strictly and take due care for it. However, the Bill may also prove challenging for violating the right to privacy of individuals.

### **From the Indian Evidence Act, 1872 to The Bharatiya Sakshya Adhiniyam, 2023**

Scientific evidence was admitted as expert opinion under Section 45 of the Indian Evidence Act, 1872 and could be used by Courts in respect of matters of science, art, handwriting or foreign law. The Bharatiya Sakshya Adhiniyam, 2023 preserves this scheme in Section.39 (1), almost word for word, providing that where the Court is required to express an opinion on a matter of science or other technical subject, an opinion of an individual “specially skilled” in it is a relevant fact. Essentially, DNA examiners and other forensic scientists still provide “opinion evidence” under the new Act. Significantly, Section 39 (2) of the Bharatiya Sakshya Adhiniyam, 2023 extends a step further in clearly including electronic evidence. It makes the opinion of an Examiner of electronic evidence (as defined under the IT Act, 2000) relevant to opinions regarding any data stored or transmitted electronically. This enshrines contemporary cyber-forensics into the evidentiary paradigm, a concept missing under the Indian Evidence Act, 1872. In summary, the new Act demonstrates a general movement towards accepting scientific and electronic media as acceptable evidence with formal legal acceptance.

### **DNA Test and interference with personal liberty**

Before the blood test of a person is ordered, his consent is required; as that test is concerned with his personal liberty cannot be carried out without his consent. Even if there is legislation, which can compel for the blood test, then also unless and until there is consent of a concerned person, he cannot be compelled to appear before the hospital for giving the blood test.

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<sup>5</sup> The DNA Technology (Use and Application) Regulation Bill, 2019, PRS INDIA, (2020), <https://prsindia.org/billtrack/the-dna-technology-use-and-application-regulation-bill-2019> (last accessed on 20/02/2026)

In *Bipinchandra Shanti Lal Vs. Madhuriben B. Bhatti*, the Gujarat High Court observed,

- “There is no provision under the Hindu Marriage Act or the rules framed there under, or in the Code of Civil Procedure or the Indian Evidence Act or any other law which show any power to the Court to compel any party to undergo medical examination. A compulsion to undergo medical examination is certainly an interference with the personal liberty of a citizen and such a personal liberty could only be interfered under the provisions of any penal enactment or in exercise of any other coercive process vested in the Court under the law. Before ordering the blood test, either for DNA or the other test, the Court has to consider the facts and circumstances of the given case and the ramification of such an order. But the Court cannot compel a person to give the sample of blood.”

Originally, the Indian Constitution does not grant in express terms any right to privacy as such. But, such right has been culled out by the Supreme Court from Article.21 of the Indian Constitution of Right to life and personal liberty.

### CONCLUSIOIN

The *Bharatiya Sakshya Adhiniyam, 2023* unambiguously recognizes that scientific and forensic contributions are integral to contemporary trials. By making electronic records and opinion evidence real under the Act, Parliament has entered into an undertaking of technology facilitated justice. Abuse and misuse of DNA evidence can result in miscarriage of justice and erode public confidence. But with all the proper checks in place and more transparent laws, improved labs, capable personnel and alert judges, DNA Technology can become the “new gold standard” in India’s criminal trials. The *Bharatiya Sakshya Adhiniyam, 2023* provides the contemporary framework; it now remains for the Courts and the legislature to construct the rules and norms that will make forensic science perform its role in the cause of fair and accurate justice.

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