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Review Article

Impact of Forensic Technology on Justice Delivery System in India: Issues Relating to DNA Fingerprinting

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ABSTRACT

Science and technology have made a huge invasion in our lives. Since the beginning of this world, the intelligence of human beings has resulted in the growth of science and technology according to the interests and needs of humankind. The modern inventions of science and technology shall have serious impact on the law and the justice delivery system of any country. The evolution of science and technology has enabled law enforcement agencies to solve many apparently 'cold crimes', which have made people to associate forensic science with detection of crimes. The basic function of forensic technology is to assist in the administration of justice. DNA technology could be the greatest single advancement in the search of truth, conviction of the guilty and acquittal of the innocent since the advent of cross-examination. This technology has revolutionised the modes of investigation of violent crimes as a result of its precision in matching physical and biological evidence from a crime scene to either convict a perpetrator or vindicate a convicted offender. In essence, DNA evidence is rapidly becoming irrefutable proof of identification. The pace of using DNA technology in the worldwide justice delivery system is increasing. Despite the increase in the use of DNA technology, there is no legislation providing for general administration of the application of DNA technology in India. Although the Indian justice system has realised the importance of the DNA technology in safeguarding the sentinels of justice since its inception, it is serving as a helping hand to the justice system of the country. The law of the country is bound to change due to the revolutionary scientific changes. Hence, an effort must be made to better administer the application of the DNA fingerprinting, so that criminals can be convicted easily and more reliably.

Keywords: Justice delivery system, Forensic Technology, DNA Evidence, DNA fingerprinting, Criminal Investigation.

INTRODUCTION

The rapid availability of new technology in the world of crime has not only provided law enforcement officials with a greater array of tools and new methods to aid them in the pursuit of criminal justice, but it has also provided them with new challenges, as criminals now have a similar advantage in aiding them in their illegal activities. Thus, we have seen the advent of Virtopsy[1], DNA fingerprinting, fingerprinting, wireless communications, the motor car and other devices, which have long since become mundane. The adaptability, and the malign creativity of criminals, however, requires the ongoing development of means to prevent, or at least to minimise, their harmful activity. The bondage of law and technology has always been a boon to the society, resulting in numerous intriguing cases being correctly investigated, retaining the sanctity of the Judicial system. The role of forensic fraternity in assisting the various national and state agencies in maintenance of law and order has been paramount. Forensic focusses on the

1.Virtopsy, refers to a non-invasive autopsy performed on a human body it uses various techniques including 3D surface scanning, cat scans and MRIs. It can be used to make forensic analysis in a easier way in order to determine the cause of death in some cases. However it has not totally replaced the other traditional methods of making such analysis. See: http://www.pcmag.com/encyclopedia/term/55824/virtual-autopsy., last visited on 15th March 2013.

areas in which medicine and human behaviour interface with the law. The basic function of forensic technology is to assist in the administration of justice. The opinion of forensic experts is expected to be independent and scientific, and therefore it not only corroborates the crime but may also help an innocent person who has been wrongly implicated. Against this background, the primary aim of this article is to consider the likely impact of DNA technology on justice delivery system. It focusses on two major aspects of DNA technology: the utility of the DNA test as a powerful tool for human identification, crime scene investigations, parentage determination and admissibility of DNA samples recovered from the crime scenes in the courtroom.

What is DNA fingerprinting?

Now-a-days, the use of DNA fingerprinting technology has gained acceptance in the field of forensic and life sciences, and courts in Europe, the USA and Asia have frequently availed of DNA evidence in deciding cases. Before discussing DNA evidence, let us first talk about another popular forensic evidence, the fingerprint. The fingerprint, a century old and unique to an individual, is a powerful and proven identifier. All human beings are born with a characteristic set of ridges on their fingertips. The ridges, which are rich in sweat pores, form a pattern that remains fixed for life. Even if the skin is removed, the same pattern will be evident when the skin regenerates. Some of the typical patterns found in fingerprints are arches, loops and whorls. When we touch something, a small amount of the oils and other materials on our fingers is left on the surface of the object we touched. The pattern left by these substances, which collect along the ridges on our fingers, make up the fingerprints that police look for at the scene of a crime. Fingerprints collected as evidence can be compared with fingerprints on file or taken from a suspect. For instance, if the evidence found at the crime scene is an individual's right thumbprint, and a suspect is identified, the right thumbprint or the 'known' print is compared to that found. If the fingerprint is different, it is considered as an 'exclusion' or not that of the suspect. But if the pattern of the skin in the thumb is the same, it is deemed a 'match'. Fingerprints have probative force, but for many heinous crimes, such as murder and rape, no fingerprints are left behind[2]. Hence, there was a need to look for other identifying biological markers that can be taken from blood, tissue or semen. Tests for protein, cell surface and blood groupings came about but were nowhere as remarkable as fingerprint until it was possible to read DNA.

DNA is shorthand for deoxyribonucleic acid. DNA is the biological material, which contains all the genetic information within living organisms, including human beings. The ability of a cell of a human body to replicate itself is due to the presence of the DNA 'blueprint' in the chromosomes within the nucleus of each cell. Each human cell contains 23 pairs of chromosomes within its nucleus. One-half of each pair of chromosomes is provided by each parent at the time of conception. Although most of the information stored in human DNA includes general information common to all humans, some of the information is unique to a particular individual. Only identical twins have identical DNA. The DNA information unique to a particular individual is stored in genes known as polymorphic genes and their location on a DNA molecule is called a polymorphic site or locus. By isolating and identifying certain segments of the DNA molecule contained in human tissue samples (e.g., blood, skin, hair follicles or semen stains), it is possible to identify the individual who is the source of the DNA[3].

When DNA testing is carried out on a crime scene, it is performed on certain locations (loci) in a DNA sample. When a suspect's DNA is analysed, it is done so at the same loci to make a valid comparison. If a single feature is different, it is excluded and the suspect is considered innocent. Otherwise, there is basis to prosecute[4]. DNA fingerprinting technology is so advanced that even if the blood is disintegrated the DNA remains stable unless it is burnt by fire[5]. It is a scientifically accepted fact that the

2. www.forensic-evidence.com/site/retrieved on 15 september2012
3. www.libcd.law.wisc.edu retrieved on 15 september2012
4. www.thailawforum.com/articles/ retrieved on 15 september2012
5. In *State* vs. Sushil Sharma, 2007 CriLJ 4008; DNA test was carried out with the blood samples of the parents of Naina Sahni and the tissues(muscle) taken from the semi-burnt body of the woman lifted from the tandoor.

DNA can be preserved for a very long period of time, if the proper preservation procedures are followed[6]. So Court held in a case that it is not proper to say that the examination of sperm and semen done after 4 months was valueless[7]. The scope of error in DNA printing, including malfunctioning of the instruments, human error and use of chemicals beyond expiry date, is 1 in 32 billion[8].

Utility of DNA Evidence in Criminal Investigation

DNA evidence can be useful in criminal investigations and prosecutions. The use of DNA has become inseparable with the investigation of violent and sexual crimes. In fact, recent advances have made DNA analysis a tool in the investigation of less serious crimes as well.

Table 1: Uses of DNA fingerprinting in criminal investigations

To determine the identity of the perpetrator	Comparing a profile derived from semen in a rape victim's vagina with the suspect's profile.
To determine whether suspect had prior contact with the victim	Comparing a profile derived from bodily samples found on the suspect's body with a victim's profile, or vice versa.
To determine the identity of the victim	Comparing a profile from an unidentified person or corpse with a known person's profile.
To infer the common involvement of one person in separate crimes	Comparing profiles in two crime scene samples.
To confirm or negate a suspicion	Comparing the profile of a suspect with a profile derived from a sample found on or in the victim's body, or vice versa.

Initially, in the Aarushi Talwar murder case[9], fingerprinting was applied and DNA was extracted from the clothes containing blood stains. Also several fingerprints were found on the glasses of the house at the time of the murder. Several narco analysis tests were applied on Aarushi's father on CBI's suspicion, but after no match was found Aarushi's father was discharged. Similarly, identifying the victims of the 11 September 2001, World Trade Center attack presented a unique forensic challenge, because the number and identity of the victims were unknown and many victims were represented only by bone and tissue fragments. At the time of the attack, no systems were in place for rapidly identifying victims in disasters with more than 500 fatalities. The National Institutes of Justice assembled a panel of experts from the National Institutes of Health and other institutions to develop processes to identify victims using DNA collected at the site. Panel members produced forms and kits needed to enable the medical examiner's office to collect reference DNA from victims' previously stored medical specimens. These specimens were collected and entered into a database. The medical examiner's office also received about 20,000 pieces of human remains from the World Trade Center site, and a database of the victims' DNA profiles was created. New information technology infrastructure was developed for data transfer between the state police and medical examiner's office and to interconnect the databases and analytical tools used by panel members. In 2005, the search was declared at an end because many of the unidentified remains were too small or too damaged to be identified by the DNA extraction methods available at that time. Remains of only 1,585 of the 2,792 people known to have died had been identified. In 2007, the medical examiner's office re-opened the search after the Bode Technology Group developed a new methodology of DNA extraction that required much less sample material than previously necessary. The victim DNA database and the new

6. Vinay Kumar vs State. Accessed on 25 September 2012: http://www.indiankanoon.org/doc/
7. Kali Ram v. State of Maharashtra, 1989 Cr.L.J. 1625 (Bom)
8. Dharam Deo Yadav vs State Of Uttar Pradesh. Accessed on 25 April 2012: www.indiankanoon.org/doc/
9. Accessed on 15 September 2012: http://www.dnaindia.com, India

methods have allowed more victims to be identified, and further identifications will be possible as forensic DNA technology improves[10].

Admissibility of DNA Evidence

The importance of DNA evidence has been recognised around the world due to its 99.9% accuracy and reliability. Even in the absence of statutory recognition, DNA testing is used in Indian cases. Although the Criminal Law was silent on DNA analysis, the courts have interpreted the same in the spirit of section 53 of the Code of Criminal Procedure, 1973. The Andhra Pradesh High Court in *Ananth Kumar* vs. *State of Andhra Pradesh*[11] has held that although there is no clear provision in the Criminal Procedure Code for taking such blood samples, there is no prohibition against taking such blood samples of an accused by exercising powers under section 53 of the code. The Court observed that taking samples of blood and semen would come within the scope of examination of the arrested person and therefore, 'examination of a person by a medical practitioner must logically take in examination by testing his blood, sputum, semen, urine etc.' The court further held that section 53 provides the use of such force as is reasonably necessary for making such an examination. Therefore, it was held that whatever discomfort might be caused, samples of blood or semen may be taken from an arrested person under the provision of sections 53 and 54 of the Criminal Procedure Code. Further, in the case of *Jamshed* vs. *State of Uttar Pradesh*[12], Division Bench of the Allahabad High Court, relying on the judgment of the Supreme Court in *State of Bombay* vs. *Kathi Kalu*[13] held that taking a blood and urine test is not prohibited by article 20(3) of the constitution.

Article 20(3) of the Indian Constitution provides that no person accused of any offence shall be compelled to be a witness against himself. This article is a guarantee against self-incrimination and aims at protecting the accused against possible police torture during investigation. Hence, a person can remain silent if the answer to any question would tend to incriminate him. This has resulted in a debate as to whether DNA or other tests can be done on the accused. However, it is also a well-settle principle of law that no one can take advantage of his own wrong. Moreover, Article 21 also speaks of a fair and reasonable procedure. So, making use of DNA technology for investigative purposes does not mean a denial of the right under article 20(3) of the constitution, especially, when it is carried out under the supervision of the judiciary so as to ensure that the procedure is just and fair. Hence, DNA tests should be made as they will not only enable the investigative agencies to reach the real culprit, but also ensure speedy investigation and trial[14].

The reports of DNA experts are dealt under section 293 of the Code of Criminal Procedure. The court can scrutinise the report given by the expert whenever it is necessary[15]. The court should not take that report as it is

10. Accessed on 05 September 2012: http://www.ornl.gov/hgmis/elsi/forensics.shtml; Maninder Pal Singh Kohli accused of murdering Hannah Foster in Hampshire in 2003 was apprehended in India and extradited to UK by the British Police in 2007 after his wife consented to DNA testing from their two sons and Forensic Science Service was able to infer a DNA profile for the fugitive criminal from their DNA, which matched the DNA of the semen of the accused found on the clothes of Hannah Foster.

11. 1977 Cr LJ 1797

12. 1976 Cr LJ 1680

13. AIR 1961 SC 1808.

14. Anshu Jain. 'DNA Technology and its Impact on Law' 2006; NALSAR Law Review vol.3 41-48 at p. 46

15. Criminal Procedure Code: Section 293. Report of certain Government Scientific Experts- (1) Any document purporting to be a report under the hand of a Government Scientific expert to whom this section applies, upon any matter or thing duly submitted to him for examination or analysis and report in the course of any proceeding under this Code may be used as evidence in any inquiry, trial or other proceeding under this Code. (2) The Court may, if it thinks fit, summon and examine any such expert as to the subject matter of his report. (3) Where any such expert is summoned by a Court and he is unable to attend personally, he may, unless the Court has expressly directed him to appear personally, depute any responsible officer working with him to attend the Court, if such officer is conversant with the facts of the case and can satisfactorily depose in Court on his behalf. (4) This section applies to the following Government Scientific experts, namely:
(a) any Chemical Examiner or Assistant Chemical Examiner to Government; (b) the Chief Inspector of Explosives; (c) the Direct or of Finger Print Bureau; (d) the Director, Haffkeine Institute, Bombay; (e) the Director (Deputy Director or Assistant Director) of a Central Forensic Science Laboratory or a State Forensic Science Laboratory; and (f) the Serologist to the Government.

without making an analysis[16]. People have different views regarding scientific evidence like DNA. It cannot be subjected or questioned; only legal analysis can be done on the collection and authentication of a scientific sample[17]. In the case of *Geetha* vs. *State of Kerala*, the[18] Court held that the report of DNA fingerprinting issued by the Centre for DNA Fingerprinting and Diagnostics (CDFD) can be admitted in evidence even without examination of the expert under Section 293 of the Criminal Procedure Code. Similarly, the Apex Court in *State of H.P.* vs. *Mastram*[19], had held that the report of DNA fingerprinting cannot be rejected on the ground that the Government Scientific Expert who has issued the same, is not enumerated under sub-section (4) 293 of Criminal Procedure Code. The Supreme Court had rather held that the report of DNA fingerprinting has to be admitted in evidence under sub-section (1) of Section 293 as a report, which is issued under the hand of a Government Scientific Expert.

Now, the Code of Criminal Procedure (Amendment) Act, 2005, gives statutory recognition to DNA profiling by inserting an explanatory clause in section 53 of Criminal Procedure Code[20].

DNA Evidence and Paternity Issues

DNA analysis is a most powerful tool for human identification, crime scene investigations and parentage determination. Before the advent of DNA testing, human identity testing was largely carried out through a blood type test. DNA analysis has now superseded blood testing and is the most accurate method currently available for human identification. Since its discovery from 30 years ago, the use of DNA for human identity and relationship testing has emerged as a powerful tool in both civil and criminal justice systems. DNA testing can reveal whether two or more individuals are related as well as determining the nature of their relationship. Today, it is possible to identify people by a single hair, as well as to obtain information about their gender and ethnic background, and, within the next couple of years, identify their age[21].

DNA profiles of the mother and the child are obtained to determine which half of the child's DNA was inherited from the mother. The other half is inherited from the father. If the man does not have DNA types in his profiles that match the paternal types in the child, he is excluded. If he has, he is not excluded as the father. Indian courts have given more importance to social parentage than the biological one. Echoing the maxim *Pater est quem nuptiae* demonstrant (the father is he whom the nuptials indicate), Section 112 of the Indian Evidence Act, 1872, is based on the rule that the child born in wedlock should be treated as the child of the man who was then the husband of his mother[22]. The only exception is when the husband proves that he had no access to his wife at the time of conception of that child. The legislative concern is against illegitimatising a child as he should not suffer social disability because of the lapses of parents. In *Gautam Kundu* vs. *State of West Bengal*[23], the Supreme Court held that the Court cannot compel the father to submit to a DNA test in order to determine the paternity.

16. *Madan Gopal Kakkad* vs. *Naval Dubey* 3 SSC 204 (1992).
17. Pillay VV. Textbook of Forensic Medicine and Toxicology, 14th Edition, 2004: p-89, Paras Medical Publishers, Hyderabad.
18. 2005 (2) DMC 286
19. (2004) 8 SCC 660
20. Criminal Procedure (Amendment) Act, 2005: Amendment of section 53 - The following Explanation shall be substituted, namely: 'Explanation– In this section and in sections 53A and 54,- (a) 'examination' shall include the examination of blood, blood stains, semen, swabs in case of sexual offences, sputum and sweat, hair samples and finger nail clippings by the use of modern and scientific techniques including DNA profiling and such other tests which the registered medical practitioner thinks necessary in a particular case.
21. Accessed on 10 September 2012: http://www.articledashboard.com
22. Section 112 of the Indian Evidence Act: Birth during marriage, conclusive proof of legitimacy- The fact that any person was born during the continuance of a valid marriage between his mother and any man, or within 280 days after its dissolution, the mother remaining unmarried, shall be conclusive proof that he is the legitimate son of that man, unless it can be shown that the parties to the marriage had no access to each other at any time when he could have been begotten.
23. (1993) 3 SCC 418

The same sentiment was echoed in *Syed Mohd. Ghouse* vs. *Noorunnisa Begum*[24]. This case had also laid down some guidelines which are:

1. Courts cannot order a blood test as a matter of course.
2. No one can be compelled to give a blood sample for analysis.

In *Smt. Kanta Devi and another* vs. *Poshi Ram*[25], the Supreme Court emphasised that 'Section 112 of the Evidence Act was enacted when DNA tests were not even in contemplation of the legislature. The result of a genuine DNA test is said to be scientifically accurate, but even that is not enough to escape from the conclusiveness of Section 112 of the Act, e.g., if a husband and wife were living together during the time of conception, but the DNA test reveals that the child was not born to the husband, the conclusiveness in law would remain unrebuttable. This may seem to be hard on the husband who would be compelled to bear the fatherhood of a child of which he may be innocent, but even in such a case, the law leans in favour of the innocent child from being bastardised, if his mother and her spouse were living together during the time of conception. Hence, the question regarding the degree of proof of non-access for rebutting the conclusiveness must be answered in the light of what is meant by access or non-access.' The effect of this decision is it encouraged law makers to strictly adhere to a conventional, unscientific, ineffective and biased system of justice. Here one must not forget that the responsibility of the courts is to provide the search for truth. When that process can be aided by forensic science that yields reliable results, the interests of the justice system and society are served. Besides, every person has the right to enjoy the benefits and application of scientific progress (Art. 15, International Covenant on Economic, Social and Cultural Rights) more significantly when claiming rights to due process and to be presumed innocent under the Constitution. Every child seeking to enforce the right to know and be cared for by his/her parents pursuant to Art. 7, UN Convention on the Rights of the Child, may avail of proof allowed by the Rules on Evidence and any method other than those such as a DNA paternity test to prove parentage. *Malimath Committee*[26] also recommended to the Law Commission of India that Section 112 of the Evidence Act should be revised as follows:

"112. The fact that any child was born during the continuance of a valid marriage between its mother and any man, or within 280 days,

(*i*) after the marriage was declared nullity, the mother remaining unmarried; or

(*ii*) after the marriage was avoided by dissolution, the mother remaining unmarried; shall be conclusive proof that such person is the legitimate child of that man, unless

(*a*) it can be shown that the parties to the marriage had no access to each other at any time when the child could have been begotten; or

(*b*) it is conclusively established, by tests conducted at the expense of that man, namely,

(*i*) Medical tests, that, at the relevant time, that man was impotent or sterile, and is not the father of the child; or

(*ii*) Blood tests conducted with the consent of that man and his wife and in the case of the child, by permission of the court that, that man is not the father of the child; or

(*iii*) DNA genetic printing tests conducted with the consent of that man and in the case of the child, by permission of the court that, that man is not the father of the child; and

Provided that the court is satisfied that the test under sub-clause (*i*), sub-clause (*ii*) or sub-clause (*iii*) has been conducted in a scientific manner according to accepted procedures, and in the case of each of these sub-clauses (*i*) or (*ii*) or (*iii*) of clause (*b*), at least two tests have been conducted, and they resulted in an identical verdict that the man is not the father of the child. Provided, further

24. 2001Cri. L.J. 2028; see also, *Amarjit Kaur* v. *Harbhajan Singh* 2003 (10) SCC 228.
25. 2001 (5) SCC 311;see also, *Banarsi Dass* v. *Teeku Dutta (Mrs.)* 2005(4)SCC449
26. *Report of Committee on Reforms of Criminal Justice System*, Vol. I, Government of India, Ministry of Home Affairs, India, 2003.

that where that man refuses to undergo the tests under sub-clauses (*i*), (*ii*) or (*iii*), he shall, without prejudice to the provisions of clause (*a*), be deemed to have waived his defence to any claim of paternity made against him.

Explanation I: For the purpose of sub-clause (*iii*) of clause (*b*), the words 'DNA genetic printing tests' shall mean the tests conducted by way of samples relatable to the husband and child and the words 'DNA' mean 'deoxyribonucleic acid'.

Explanation II: For the purposes of this section, the words 'valid marriage' shall mean a void marriage till it is declared nullity or a voidable marriage till it is avoided by dissolution, where, by any enactment for the time being in force, it is provided that the children of such marriages, which are declared nullity or avoided by dissolution, shall nevertheless be legitimate.

However, in the case of *Sharda* vs. *Dharmpal*[27], the Supreme Court took an optimistic view regarding the admissibility of DNA tests in a court of law. It is not only profitable but also appropriate to bear in mind that Section 45 of the Indian Evidence Act empowers the Courts to appreciate scientific evidence in a matrimonial case. Thus, the Supreme Court categorically observed that:

1. A matrimonial court has the power to order a person to undergo medical test.
2. Passing of such an order by the court would not be in violation of the right to personal liberty under Article 21 of the Indian Constitution.
3. However, the court should exercise such a power if the applicant has a strong prima facie case and there is sufficient material before the court. If despite the order of the court, the respondent refuses to submit himself to medical examination, the court will be entitled to draw an adverse inference against him.'

Now-a-days, the courts are slowly considering the importance of a DNA test and in many instances have deviated from the decision in Kundu's case. For example in *Kanchan Bedi* vs. *Gurpreet Singh Bedi*[28], a DNA test of the child was directed where the defendant was denying any marriage had taken place between him and the plaintiff and therefore he was not the father of the child. In the case of *State through C.B.I.* vs. *Amaramani Tripathi*[29], the paternity of a 6-month-old foetus in the womb of the deceased was conclusively established with the help of DNA test.

Now courts are giving due weight to DNA evidence. A DNA test was conducted on dead foetus in the sensational Premanada Swami's case, a god man who was charged with the rape of 13 ashram girls and murder of one of its inmate teenage girls in his ashram. Before the Supreme Court DNA test established 45-year-old Swami Premananda as the biological father of the foetus as a result of rape of 19-year-old Arul Jyothi[30]. Similarly, in a recent high-profile case, the Supreme Court refused to dismiss the Delhi High Court's decision ordering Congress Leader N.D. Tiwari to undergo a DNA test, which is very important from the view point of the admissibility of such evidence. In this case, Rohit Shekar has claimed to be the biological son of N.D. Tiwari, but N.D. Tiwari was reluctant to undergo such test stating that it would be a violation of his Right to Privacy and it would cause him public humiliation. The Court ruled: 'There is of course the vital interest of child to not be branded illegitimate; yet the conclusiveness of the presumption created by the law in this regard must not act detriment to the interests of the child. The protective cocoon of legitimacy should not entomb the child's aspiration to learn the truth of her or his paternity.'[31] This was held to be a leading landmark judgment towards modernisation of the constitution as per the changing demands of the time, which proves the flexibility of our law, which can be easily molded so as to serve the ends of justice.

27. (2003) 4 SCC 493 at 524
28. 2003 (103) Delhi LT 165
29. 2005 AIR 3490
30. Kamalanantha vs State Of Tamil Nadu, (2005) 5 Supreme Court Cases 194.
31. Accessed on 25 September 2012: http://netindian.in/news/2011/02/25/00011267/hc-denies-reprieve-n-d-tiwari-paternity-suit-case

Relevance of DNA Evidence in Criminal Cases

A variety of offences, such as rape, murder, extortion, armed robbery and drug trafficking, lend themselves to the application of DNA collection and testing. In the same vein, DNA evidence, as a tool for identification in criminal cases, works both ways. It may help clear a suspect from criminal liability or serve as proof to convict an accused. Even if the possibilities of coincidental match, lab error, contamination and tampering are discounted, a DNA profile match does not necessarily establish guilt beyond reasonable doubt. This is because there may still be the possibility that the defendant's DNA sample was innocently left at the crime scene before, during or immediately after the offence. Of course, other evidence in the case may negate this possibility. There has been one case in Australia *Queen* vs. *Frank Allan Button*[32], where DNA evidence has been used to overturn a wrongful conviction. This was the case of Frank Button, who served 10 months of a 7-year sentence for the rape of a 13-year-old girl in Queensland in 1999, before having his conviction overturned by the Queensland Court of Appeal. As Kirsten Edwards reports:

'The girl initially denied knowing the rapist and provided a description of the man to police. She then changed her original statement and nominated Frank Button as the rapist. DNA evidence was not used in the trial. A rape kit was prepared. Vaginal swabs obtained from the rape victim revealed the presence of spermatozoa, but testing failed to yield a conclusive DNA profile. Sheets and pillowcases from the victim's bed were also sent to the lab but were not tested at all. Button was convicted and sentenced to 7 years prison. He lodged an appeal that raised the absence of scientific evidence in his case.

When the lab test of the bedding from the girl's room was done, a semen stain was discovered on the complainant's bed sheet and it revealed a DNA profile, but the profile did not match Frank Button. Alarmed, the lab tested the vaginal swabs again. This time the lab found a male DNA profile. This profile also did not match Button. In fact, it was the same profile found on the sheets. The profile was run through the Queensland convicted offender database and matched the DNA profile of a convicted rapist who met the victim's initial description of the offender and lived in the same community. Frank Button was released after serving 10 months in jail, where he was bashed and sexually assaulted. The Queensland Court of Criminal Appeal described the case as 'a black day in the history of criminal justice administration in Australia.'

Prior to the use of DNA evidence, matters involving the offence of rape could be solved primarily by circumstantial evidence only. It was very difficult for the victim of rape to prove the offence in the absence of either circumstantial evidence or an eyewitness, which was very rare. Since the introduction of the DNA evidence, this has been greatly simplified. First samples of the seminal fluids found at the scene of crime by the investigating officer are analysed. If this is not available, then samples of the seminal fluid are extracted from the victim's body itself. The DNA from this sample is then compared with the DNA sample taken from the accused. If the report establishes that these samples match, then this acts as evidence in the court proving rape[33]. In the *Priyadarshini Mattoo*[34] rape and murder case, the Apex Court pulled up trial court for not taking up DNA expert's opinion. The Supreme Court wondered why the trial judge chose not to listen to Lalji Singh, a scientist involved in DNA technology since 1974 and a person acknowledged in a SC judgment of 2005 as an expert. He had developed indigenous techniques for DNA fingerprinting, which are now being used. The Court observed that 'the tendency of the trial judge to rely on textbooks on DNA profiling rather than to listen to experts' testimonies during trial

32. The Queen v Frank Allan Button [2001] QCA 133.
33. The amendment of Cr.PC by the Cr.PC (Amendment) Act, 2005, has brought two new sections, which authorizes the investigating officer to collect DNA sample from the body of the accused and the victim with the help of medical practitioner. Section 164A(2) of the criminal procedure code, laid down mandatory description of material taken from the victim of rape for DNA profiling. Again in section 53A criminal procedure code provides that examination of accused person of rape by medical practitioner would be also mandatory.
34. *Santosh Kumar Singh* vs. *State*. Accessed on 20 September 2012: http://www.kanoonindia

may have led to the acquittal of convict Santosh Singh and delayed justice for his victim. The court cannot substitute its own opinion for that of an expert, more particularly in a science such as DNA fingerprinting, which is a recent development.' Thus, the court accepted the identification of the accused on the basis of the DNA report of the semen stains on the swabs and slides and the underwear of the deceased and the blood samples of the appellant and awarded him life imprisonment. The police were criticised for not having employed a DNA test during investigation and it was observed by court that, in case of rape, where injuries on the vagina of the victim are so grave and serious, in our opinion, either pubic hair or semen of the accused ought to have been found from the body of the victim[35].

It is not disputed that a DNA test is very useful for establishing the identity of a dead person whose body is recovered that is not in an identifiable condition because of decomposition etc. In *State* vs. *Sushil Sharma*[36], The appellant had not only pumped bullets in the head of the deceased but had also chopped off her limbs and then took the body to his restaurant in the heart of the city and placed it on the tandoor and burned it. Delhi High Court admitted the positive report that DNA extracted from the tissues of the charred body and from the blood of the parents matches thereby confirming that the body burned on the tandoor of Bagia restaurant was that of Naina Sahni.

Similarly, in *Dharam Deo Yadav* vs. *State Of Uttar Pradesh*[37], a religious tourist and young lady Diana Clare Routley from New Zealand visited Varanasi in 1997 and was reported missing by her father L.N. Jack Routley after 1 year since her last call. Dharam Dev Yadava, an unregistered tourist guide, was interrogated as suspect and buried skeleton of a human body was recovered from the cemented floor of a room in the house of the accused in district Gazipur. The body was identified as deceased using DNA technology. Session's Court awarded the principal accused hanging till death, which was confirmed by the High Court.

In *Pantangi Balarama Venkata Ganesh* vs. *State of Andhra Pradesh*[38], it was alleged that the accused and the co-accused had fired at the deceased. Witnesses identified the assailant as wearing a pink shirt and testified that the accused had been injured during the firing. The pistol used and the blood-stained pink shirt were recovered and the blood found on the shirt was found to match with the blood of the accused as per a DNA test. Further, as the accused admitted to having been at the crime scene, the Court, relying on all the available evidence including the DNA evidence, found him guilty. The Court relied on an article by Dr. Lalji Singh, which hailed the conclusive nature of the results of a DNA declaring that 'the DNA test gives the perfect identity. It is a very advanced science.'

Collection and Application of DNA Evidence

A study by the National Institute of Justice (NIJ) of the United States' Justice Department showed that there are many unusual sources of DNA evidence that need to be explored by an investigator[39]. These include saliva found on the flap of an envelope containing a threat letter, spittle collected from the sidewalk where a suspect in a sexual assault case was under surveillance and blood collected from a bullet that had injured an assailant himself in a case of murder. Collection of samples at the scene of a crime requires some skill and observance of basic rules of hygiene. There are two dangers here. One is that, as in the case of hand fingerprints, there is a distinct possibility of several persons having left their DNA behind in a crime scene. The need, therefore, is to identify all visitors and collect their samples (apart from those of the victim/ suspect). This assiduous process can try an officer's patience. Second, DNA samples are extremely susceptible to contamination. It is essential that the technicians collecting the sample adopt all the precautions that as a

35. *State of Gujarat* vs. *Kishnbhai*, MANU/GJ/0506 /2005
36. Supra note 5
37. Supra note 8
38. MANU/SC/1306/2009
39. *Accessed on 15 September 2010: http://www.justnet.org/.pdf*

surgeon would adopt while performing a critical surgery. Any slackness could render the entire operation wasteful and susceptible to easy picking of holes by the defense counsel during a trial.

Thus, the judges and the justices are responsible for application of DNA evidence. They must receive training on the proper application of DNA technology that will be of help to them when accepting or rejecting the expert's opinion and in evaluating the factors leading to that conclusion. The DNA expert witness also plays a pivotal role in the use of the evidence in court. The witness must be properly qualified as an expert. The gathering and chain of custody of the DNA sample must be protected from contamination so that the court will consider it in resolving the issues and in deciding the case. The expert witness must also be aware of the fact that when DNA evidence is rejected in the lower court, it is abuse of discretion on the part of the judge that must be proved on appeal.

Moreover, it is incumbent upon the DNA expert witness to work closely with the lawyers educating them about the technology. The witness must be prepared for cross-examination by the opposing party, using prior and consistent expert testimony. When testifying, the expert witness must anticipate questions that sometimes call for answers beyond the scope of area of expertise. The witness must make sure that as an expert, terms have been defined for the record, confident in what he/she knows and knows that the opinion evidence counts because he/she is the expert.

Evolving Impact of DNA Technology on the Criminal Legislation

Evolution of DNA technology is having a major impact on laws as they have or are being amended in much legislation worldwide. Enactment of law regarding the collection, use, storage, admissibility and creation of DNA database for DNA evidence reflects the impact of DNA technology on a criminal justice system. Forensic–DNA fingerprinting has now been used in many criminal and civil cases around the world, and has become an established technology. 'Forensic Science International'[40] has a special issue relating to the legal position of Forensic DNA Analysis in Europe. It reports that the following countries have accepted DNA analysis as reliable, viz., Denmark, Sweden, the Netherlands, Belgium, The Republic of Ireland, France, Italy, Greece, Spain, Portugal, Austria, Switzerland and Germany, subject to certain limitations. For instance, in Denmark, the results of investigations were used more systematically since 1990 in criminal cases, such as rape, homicide, etc. Since 1990, there has been a tendency in court decisions to put more and more emphasis on DNA investigations. In Sweden, DNA analysis has been regarded by the court, and in the public opinion, as an important tool for forensic case work right from the beginning. In 1990, the Dutch Supreme Court admitted the use of DNA as exculpatory evidence. A new DNA legislation was incorporated into the Dutch Code of Criminal Procedure from 1 September 1994, which forces non-consenting defendants to give biological reference samples, and the results of the DNA tests can be used as proof of guilt. In so far as France is concerned, the consent of interested parties is mandatory with the restriction that in the case of a suspect his refusal can be interpreted as prima facie evidence.

The vision of justice to which the criminal justice system is based on: should be a proper balance between the protection of civil liberties, presumed innocence and procedural rights of persons, and the needs of the state to apprehend, punish and rehabilitate perpetrators of crime. People have an expectation of privacy with respect to the content of their DNA sample, regardless of where it has been obtained or acquired[41]. It is pertinent to mention that the adoption of DNA technology in the criminal justice system has encountered resistance from the public on the ground of violation of basic human rights under Articles 20(3) and 21 of the Indian Constitution. However, since the advantages of the techniques outweigh the disadvantages, many countries, as pointed

40. Martin PD, Rittner C, Schnieder, PM. Proceedings of the European Symposium: Ethical and Legal Issues of DNA Typing in Forensic Medicine, 1997; 88(1): 15.
41. *R.R. Gopal* v. *State of Tamil Nadu*, AIR1997 SC 264

out, have either adjusted or amended their existing laws, or have enacted specific legislations to strike a balance between the two conflicting opinions. Despite such adverse situations that exist in some countries, DNA technology has come to be accepted and admitted by both the legislature and the judiciary in the interest of justice and security. The successful adoption of the new technology has encouraged many other countries to adopt and apply the technology to identify conclusively the actual perpetrators of the crimes and the criminals. Thus, Justice K. Hema observed that 'DNA fingerprinting has risen like a new star in the horizon of Law. Let us catch its shine before it is too late and be ready for tomorrow. Let necessary inclusion be made into the statute for a worthy cause.'[42]

There is a unanimity that DNA evidence plays a crucial role in helping the courts of law to arrive at logical conclusions. In the light of new developments in forensic science, the Home Ministry, Government of India, constituted a committee under the chairmanship of Dr. Justice V.S Malimath to suggest reforms in the criminal justice system[43]. This committee suggested comprehensive use of forensic science in crime investigation. According to the committee, DNA experts should be included in the list of experts given in section 293(4) of the Code of Criminal Procedure, 1973.

Now, The DNA Profiling Bill of 2007, which is pending in Parliament, is expected to be considered and become a law sometime in the near future. If Parliament passes the DNA Profiling Bill, 2007, India will soon join the league, creating a national DNA database that will help police to arrest serial offenders and give a boost to forensic investigation. The role of the database would be to compile profiles of convicts, under trials and suspects as well as from material obtained from crime scenes. At present, India does not have a law that empowers the government to collect and store DNA profiles of convicts. DNA profiles of those convicted for crimes like murder, sexual assault and burglaries can be prepared, then in crimes like murder and sexual assault, there is a tendency on the part of the criminal to repeat offences if not convicted[44]. Once the DNA profile of a criminal is created, then the next time if a similar crime occurs, it may be possible to run it through the database and get a match. This would also be helpful to identify a suspect and increase the rate of conviction also.

Globally, the judiciary is depending more and more on scientific evidence in comparison to eye witnesses. The future of the judicial system in India is loaded with cases like the Nithari rape and murder case, Arushi murder case, Jessica Lall case etc. They all have suffered because of the inferior forensic facilities in our country. The case highlights the hazards of a conducting shabby investigating system. The Supreme Court has taken steps to modernise the judiciary investigating system and gradually consider the scientific evidences when delivering the judgments. Due to lack of legal or medico-legal, scientific awareness and knowledge among victims, investigating agencies, medical and paramedical staff, the end result is either 'justice hurried is justice buried' or 'justice delayed is justice denied' to the victims. Prevention and detection is better than conviction. As has been happening all these years, forensic technology is an ornamental and cosmetic utility of the investigating agencies, which completes the formality of the legal process and satisfies the lay public. It is show cased and remembered only when major or sensational crimes occur to satisfy the inquisitive and demanding media and citizens. Compared to other disciplines of science and technology, forensic medicine is static and stunted in India. It is not being utilised in its own right with the full thrust to help the investigating law enforcement agencies and the criminal justice system. The benefits of improving, regulating and re-organising forensic medicine *vis-à-vis* other technologies are obvious as it virtually assists the law enforcement agencies in criminal investigations, provides proactive assistance, enhances internal security, helps criminal justice administration and reduces the risk of wrongful convictions.

42. *supra note 18*
43. *Supra note 26.*
44. Sheldon Krimsky, Tania Simoncelli. Genetic Justice: DNA data banks, Criminal Investigations, and civil liberties, Columbia University Press, Newyork 2011; pp-306-307

Recently, the Ministry of Home Affairs, Government of India considered a bill, namely, Forensic Science Service (Regulatory Board) Bill, 2011. Once this Bill is passed, it is expected by the government that private forensic laboratories will take over burdened national and state forensic facilities. However, the government has failed to realise that when the private labs come to exist the Indian criminal justice system will face another kind of problem. For instance, in *Shanti Bhushan case*, the government lab, namely, The CDFD, Hyderabad, reported that the disputed CD was genuine while private forensic lab reported that the CD was doctored. Thus, to privatise the forensic laboratories is perilous and any compromise will jeopardise the whole criminal justice system in the country. Therefore, the government should stop this Bill from being enacted in present shape and increase manpower and infrastructure in government lab to dispose of cases urgently. The developed countries are using the private sector to the minimum extent after their federal and state laboratories are fully developed. Presently, the CDFD is the only Government-approved DNA fingerprint testing center, which is now being used in this country to solve crimes. Thus, in India, the regional forensic laboratories have to first develop fully and then think about involving the private sector.

CONCLUSION

Coming to the conclusion, DNA fingerprinting is the most effective tool for solving crimes when appropriate physical evidence is available. DNA evolution has drawn the attention of the judiciary, to focus on evaluation and admission of DNA technology into court. Various decisions gave confidence to the judges to exercise greater freedom to appraise scientific evidence, which would help to resolve remaining issues of admissibility. DNA evidence exonerates the innocent and alerts law enforcement to pursue the true offender. By convicting the guilty and discharging the innocent, DNA evidence truly serves the interests of justice, but it is important that investigating officers, forensic analysts and members of the judiciary be aware of the necessity of obtaining authentic biological (genetic) samples and of the problems that may be encountered. The capability of DNA evidence to establish innocence or guilt of crime beyond a reasonable doubt is being acknowledged by the judiciary in various countries. India is not lagging behind, although DNA technology has not yet been fully welcomed in the investigation process and justice delivery system. Gradually, India is acknowledging the outcome of DNA testing, it is moving towards passing legislation, which will deal with DNA technology and set up a DNA database. Additionally, the introduction of DNA fingerprinting has revolutionised forensic science and the criminal justice system. DNA technology has given police and the courts a means of identifying the perpetrators of various crimes with a very high degree of confidence. The Indian judiciary has passed various decisions based on DNA evidences. Finally, it is also important to strengthen crime victims' confidence in the judicial process by employing DNA technology in searching for truth. The investigation process needs to be hastened by acknowledging DNA evidence as a powerful tool of current and future need; otherwise the criminal justice system will suffer.

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