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ROLE OF DNA IN CRIMINAL INVESTIGATION

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Abstract

DNA evidence rarely the sole basis of a prosecution case . It is the most useful when placed alongside other evidence such as fingerprints , footprints , crime scene examination and eyewitness accounts . Other biological evidence may also be collected , for example blood splash patterns and microbial information which may give clues as to the time of the death . Every person has a unique DNA profile , making it very useful for identifying people involved in a crime . Forensic scientists can use DNA profiles to identify criminals or determine parentage . This paper is an attempt to reflect the necessity of DNA profiling during the scientific or forensic investigation. A DNA profile is like a genetic fingerprint . Deoxyribose Nucleic Acid (DNA) is an organic compound which have a molecular structure and found in all prokaryotic cell (lack of nuclear membrane around nucleus) and eukaryotic cell (true cell with nuclear membrane) . DNA is a long polymer of deoxyribose nucleotide . According to the number of nucleotides and base pair (bp) , we can determine the length of DNA . for example : In Bacteriophage has 5386 nucleotide (Single strand of DNA) , haploid human cell has $3.3*10^9$ bp (double stranded), Escherichia coli has $4.6 * 10^6$ bp (double stranded), and diploid human cell has $6.6 * 10^9$ bp (double stranded). The genetic material in DNA allows the identification of the perpetrator by the processing and the analysis of biological evidence transferred in the crime scene . Through the processing of DNA from biological fluid samples alongside DNA statistical interpretation , the identification of an individual can be done. This is done when swabbing known profiles from the scene and through DNA databases, such as CODIS , which contains reference profiles from past offenders , can be used to search for the questioned profiles when a known profiles is not available. Forensic DNA testing has done more than just punishing the guilty for the crimes they have committed . Additionally , This paper aims that the successes of utilizing DNA as evidence in court to prosecute the guilty and exonerate the innocent for decades, DNA is repeatedly sought by judges , attorneys and detectives as primary from a crime scene .

KEY WORDS : DNA profiling , DNA evidence , biological evidence , crime scene examination , identification of individual , DNA utilization .

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Introduction

DNA is a long polymer of deoxyribonucleotides . RNA was the first genetic material . It is used to act as a genetic material as well as a catalyst but , RNA being a catalysts was reactive and hence unstable. Therefore , DNA has evolved from RNA with chemical modifications that make it more stable. DNA being double stranded and having complementary strand further resists changes by evolving a process of repair.[1] The presence of thymine at the place of Uracil also confers additional stability to DNA . DNA however is dependent on RNA but DNA being more stable is preferred for storage of genetic information . [2] This genetic information play a very vital role in investigation to identify the criminals , bodies , parentage of individual . A cell (functional and structural unit of life) have nucleus which have chromosome and that chromosome have DNA . DNA is present in nucleus as well as in some cell organelle like plastid and mitochondria . DNA is in mitochondria , so we called it as (mt DNA) mitochondrial DNA. There are around 16,000 bp of mt DNA in human.

Importance Of Study

DNA can be used to identify criminals with incredible accuracy when biological evidence exists . In cases where a suspect is identified , a sample of that person's DNA can be compared to evidence from the crime scene . The result of this comparison may help to establish whether the suspects has committed the crime. But, In cases where a suspect has not identified , biological evidence from the crime scene can be analyzed and compared to offender profiles in DNA databases to help identify the perpetrator . In all, DNA technology is increasingly vital to ensuring accuracy and fairness in the criminal justice system.[3]

Objectives Of The Study

1. To understand the structure and functions of DNA.
2. To diagnose genetic disorders and formulate new drugs .
3. To describe and explain the ways that DNA technologies can be used in criminal investigation and turned into DNA evidence in criminal proceedings .
4. To study the social implications and transformations of cultures and professional practices arising from the presence of DNA technology in the criminal justice system.
5. To recognize and identify the potential risks arising from the use of DNA technology.

Research Methodology

The study is based upon the doctrinal research method . The doctrinal study will include study of secondary data which includes text books , legal journals , statutes , reports , judgments , newspaper , website , digests and published statistics .

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History Of DNA

DNA as an acidic substance present in nucleus was first identified by Friedrich Meischer in 1869 . He named it as NUCLEIN . however , due to technical limitation in isolating such a long polymer intact , the elucidation of structure of DNA remained elusive for a very long period of time . It was only in 1953 that James Watson and Francis Crick , proposed a very simple but famous DOUBLE HELIX model for the structure of DNA . One of the hallmarks of their proposition was base pairing between the two strands of polynucleotide chains . however , this proposition was also based on the observation of Erwin Chargaff that for a double stranded DNA , the ratio between ADENINE , THYMINE , GUANINE and CYTOSINE are constant and equals one .[4]
Salient feature of the Double Helix structure of DNA are as follows :
1. It is made of polynucleotide chains , where the backbone is constituted by sugar phosphate , and the bases project inside .
2. The two chains have anti-parallel polarity . It means , if one chain has the polarity 5'>3' , the other has 3'>5'.
3. The bases in two strands are paired through hydrogen bond (H-Bond) forming base pair. Adenine forms two hydrogen bonds with Thymine from opposite strand and vice-versa . Similarly , Guanine is bonded with cytosine with three H-Bonds . As a result , always a purine comes opposite to a pyrimidine . This generates approximately uniform distance between the two strands of the helix .
4. The plane of one base pair stacks over the other in double helix . This , in addition to H-Bonds , confers stability of the helical structure .
So , the proposition of a double helix structure for DNA and its implication became revolutionary . very soon , Francis Crick proposed the central dogma in molecular biology , which states that the genetic information flows from DNA to RNA to PROTEIN .[5]

Genetic Material Is DNA

The unequivocal proof that DNA is the genetic material came from the experiments of Alfred Hershey and Chase in 1952. They worked with viruses that infect bacteria called bacteriophages . Bacteriophage attaches to the bacteria and its genetic material then enters the bacterial cell . The bacterial cell treats the viral genetic material as if it was its own and subsequently manufactures more protein or DNA from the virus that entered the bacteria . They grew some viruses on a medium that contained radioactive phosphorus and some other on medium that contain radioactive sulfur . Viruses grown in the presence of radioactive phosphorus contained radioactive DNA but not radioactive protein . Similarly , viruses grown on radioactive sulfur contained radioactive protein but not radioactive DNA because DNA contain phosphorus but does not contain sulfur . Radioactive phages were allowed to attach to E-coli bacteria. Then , as the infection proceeded the viral coats were removed from the bacteria by agitating them in a blender . The virus particles were separated from the bacteria by spinning them in a centrifuge . Bacteria which was infected with viruses that had radioactive DNA were radioactive , indicating that DNA was the material that passed from the virus to the bacteria and protein did nor enter the bacteria from the viruses . DNA is therefore the genetic material that is passed from virus to bacteria .[6]

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DNA Testing Procedures

The DNA testing process is comprised of four main steps :

Extraction :- DNA is located within the nucleus of cells throughout the body and the extraction step is responsible for breaking open the nucleus and releasing the DNA molecules into solution .
Quantitation :- To ensure that the DNA recovered from an extraction is human rather than from another source such as bacteria is done through quantitation where the quality of DNA present in a sample is measured and assessed .
Amplification :- DNA amplification is accomplished through the use of a technique known as polymerase chain reaction (PCR). PCR is a process in which millions of copies of a specific sequence of DNA can be made in a matter of only a few hours . This is important for forensic DNA samples since the DNA often found at crime scenes is limited in both quantity and quality .[7]
Analyzation :- After the PCR reaction is completed it results in a large mixture of amplified DNA molecules which need to be separated in order to distinguish the various molecules from one another .

DNA Fingerprinting

DNA fingerprinting is also called DNA profiling or forensic genetics , a technique employed by forensic scientists to assist in the identification of individuals or samples by their respective DNA profiles . It is a chemical test that shows the genetic makeup of a person or other living things . DNA fingerprinting involves identifying differences in some specific region in DNA sequence called as *repetitive DNA* , because in these sequences , a small stretch of DNA is repeated many times . These repetitive DNA are separated from bulk genomic DNA as different peaks during density gradient centrifugation . The bulk DNA forms a major peak and the other small peaks are referred to as *satellite DNA* . Depending on base composition , length of segment, and number of repetitive units , the satellite DNA is classified into many categories such as micro-satellites , mini-satellites etc. These sequences show high degree of polymorphism and form the basis of DNA fingerprinting . DNA fingerprinting is the basis of paternity testing , in case of disputes .[8] 99.9 % of base sequence among humans is same .
Sources of DNA fingerprinting :

- Blood , blood stain
- Hair follicle
- Skin , Bone
- Sperm
- Saliva , Sweat

Explanation (a) of section 53 of CRPC, 1973 - 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 .[9]

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Techniques Of DNA Fingerprinting :

Techniques of fingerprinting was initially developed by ALEC JEFFEREYS . He used a satellite DNA as probe that shows very high degree of polymorphism . It was called Variable Number of Tandem (VNTR) . The technique , as used earlier , involved southern blot hybridization using radiolabelled VNTR as a probe . It includes :-

i. Isolation of DNA.
ii. Digestion of DNA by restriction endonucleases.
iii. Separation of DNA fragments by electrophoresis.
iv. Transferring of separated DNA fragments to synthetic membranes such as nitrocellulose or nylon.
v. Hybridization using labelled VNTR probe.
vi. Detection of hybridized DNA fragments by autoradiography . A schematic representation of DNA fingerprinting .

consequently , DNA from a single cell is enough to perform DNA fingerprinting analysis. In addition to application in forensic science it has wider application , such as in determining population and genetic diversities .

Role Of DNA Testing In Criminal Investigation

Since it was invented in 1984 , DNA fingerprinting most often has been used in court cases and legal matters . It can :

. Physically connect a piece of evidence to a person or rule out someone as a suspect.
. Show the parentage , sibling and other relatives may be .
. Identify a dead body that's too old or damaged to be recognizable .
. DNA fingerprinting is extremely accurate and reliable . The police keep copies of actual fingerprints.
. To look for cures for disease.
. To identify perpetrators and exonerate innocent parties.
. All body tissue contains DNA so, it is unaffected by outside contaminants such as acids , bases or other chemicals , a person cannot alter the results of their DNA testing.[10]

Legal Admissibility

The admissibility of the DNA evidence before the court always depends on its accurate and proper collection, preservation and documentation which can satisfy the court that the evidence which has been put in front, it is reliable . But the introduction of DNA testing posed many challenges as to constitutional validity and evidential value of such test .

The constitutional validity can be challenged on the basis of Article 20(3) and Article 21 of Indian Constitution which provides that "No person accused of an offence shall be compelled to be a witness against oneself." And "Right to privacy." In *State of Bombay v. kathikalu*[11] It was held by the Hon'ble court that giving information for forensic examination is just like providing relevant facts within the meaning of sections 9&11 of Evidence Act and it does not fall under the parameter of evidence against oneself . In *Asit Kapoor v. union of India*[12] It was held that no party to a legal proceeding can be compelled for any scientific test against his or her will as it has

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effect of infringing upon his Right to Privacy . some important guidelines are issued in *Gautam Khundu v. State of West Bengal*[13] which is summed up as follows :

- Matrimonial court has power to order a person to undergo some medical test.
- Such order wouldn't be considered as violation of Right to personal liberty enshrined under Article 21 of Indian constitution .
- Such a power is exercise by court when there is strong prima facie case and sufficient material before the court . If the respondent refuses to medical examination despite of the order of the court , then court will be entitled to draw adverse inference against him .

While testing the validity of DNA tests on the anvil of Article 20(3) of the Constitution of India, the Hon'ble Supreme Court made following observation in *Selvi v. State of Karnataka*[14] as :

The matching of DNA samples is emerging as a vital tool for linking suspects to specific criminal acts . It may also be recalled that as per the majority decision in *Kathikalu case* , the use of material samples such as fingerprints for the purpose of comparison and identification does not amount to a testimonial act for the purpose of Article 20(3) . hence , the taking and retention of DNA samples which are in nature of physical evidence does not face constitutional hurdles in the Indian context .

The Evidential value of the forensic information obtained from the Experts under section 45 of Evidence Act,1872, is not conclusive proof but it can be used as corroborative evidence . A general rule is that opinion of a person having special skill or knowledge in a particular field shall be admissible to the court of law. Thus , the experts assists and determine fact in issue and relevant fact to furnish information to judicial officers . [15] In *Madan Gopal Kakkad v. Naval Dubey*[16] it was held that opinion of expert is admissible . In *Machindra v. Sajjan Galpha Rankhamba*[17] has observed that an expert opinion should be demonstrative and supported by convensing reasons. In case *Rohit Shekhar v. N.D.Tiwari*[18] , in this case Rohit Shekhar has claimed to be the biological son of N.D.Tiwari and request for DNA test but N.D.Tiwari reluctant to undergo such test stating that it would be the violation of his Right to Privacy and would cause him public humiliation . But supreme court rejected this point stating that when the result of the test would not be revealed to anyone and it would under a sealed envelope, there is no point of getting humiliating . Supreme court ordering congress leader N.D.Tiwari to undergo the DNA test is very important from the viewpoint of the admissibility of such evidence .

At present in India there is no concrete law to govern issues of admissibility of forensic techniques . Some Section i.e. sections 53 , 53(A) , 54 , 164 (A) of Code of Criminal Procedure govern science and technology issue to certain extend . Indian Judiciary had adopted forensic evidence but it is legislative machinery which is lagging behind in assimilating scientific development which plays important role not only to solve high profiles cases but rape case and post-conviction matter also . Therefore , it is completely left on judicial discretion either to permit DNA test or to deny such request .

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Drawbacks Of DNA Testing

1. The process itself is complex and tedious and can give results that may be hard to interpret .
2. There is no specific provisions to govern forensic science and techniques .
3. Improper testing methods may create false positive or false negative results .
4. In some cases , authorities may force certain individuals , innocent and otherwise to undergo DNA profiling as a part of their data gathering. It can be violation of one's privacy. [19]
5. Matching DNA from a crime scene to DNA taken from a suspect is not an absolute guarantee of the suspect's guilt .

Suggestions

- Legislators should take necessary step to legislate a uniform and national level law on conducting DNA tests and admissibility in courts .
- To regulate procedure in forensic laboratories to increase reliability on its report . Labs should adhere to high quality standard , use of splitting methods and uniform standard for DNA testing be adopted .
- DNA samples should be collected from suspect only after prior approval of a Judge or Magistrate .
- A national commission be created to regulate and monitor DNA profiling labs .
- Proper training and sensitization of legal fraternity is required so as to overcome contamination issues .
- Process and acceptability to post conviction DNA testing be incorporate in Indian laws . So, proper chain of custody should be maintained .

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Conclusion

DNA technology is very powerful investigative tools . DNA has been used in forensic science to link the evidence to the suspect and for identification of individual and species . Both human and non-human DNA analysis has been reported to aid criminal investigation . DNA evidence not only links the suspect with the crime but also help exclude the innocent . It can be used to identify missing persons and victims in mass disasters when there is a lack of positive identification methods . In addition , DNA provides information on kinship relation i.e. material lineage and paternal lineage of people who have different surnames . In non-human , DNA plays important role in species identification such as in wildlife crimes , narcotic plants , microbes , domestic animals and food authentication. It can also provide linkage of samples to an organism . However , there are some limits to DNA analysis of forensic samples but miniaturization of instrumentation was developed to support on site analysis as well as high throughput to perform analysis of large numbers of samples in the labs .[20] The emerging technology will enable fast , reliable and low cost DNA analysis in future which will enhance the role of DNA technology in criminal justice system .

End Notes

1. Stephen c. Meyer, *Signature in the cell: DNA and the Evidence for Intelligent Design,* Harper Collins Publishers.
2. M.P.Tyagi & K.N.Bhatia, *Elementary Biology Textbook,* New Ed. Vol.2, Trueman Publication, 2023
3. Role of DNA in Forensic Science, Available at https://www.azolifesciences.com
4. NCERT *Biology Textbook,* Molecular Basis of Inheritance- Chapter 6
5. James D. Watson, *DNA: The Story of The Genetic Revolution,* Penguin, 22 Aug 2017
6. Supra Note 4
7. Forensic Science- DNA testing Procedures Available at https://dps.mn.gov>bca
8. Supra Note 6
9. Section 53 of " The Code of Criminal Procedure,1973"
10. DNA Fingerprinting : purpose, Procedure and How it's used Available at https://www.webmd.com
11. AIR 1961 SC 1808
12. AIR 2004 Del 2003
13. AIR 1993 SC 2295
14. AIR (2010)7 SCC 263
15. Section 45 of " The Indian Evidence Act, 1872"
16. AIR 1992 SCW 1480
17. (2013) Cr no.1794, DOJ- April 19,2017
18. 2011(121) DRJ 563
19. Available at https://greengarageblog.org>pros and cons of DNA fingerprinting
20. Analyzing Human and non-Human DNA samples Available at https://frontiersin.org