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Research Article

Navigating The Use Of Touch Dna Evidence In India: Legal Considerations

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ABSTRACT

Forensic science contributes significantly to criminal investigations by using scientific methods to collect and analyse evidence. Bloodstain patterns, DNA, fingerprints, and other materials may be used as evidence. Law enforcement and forensic scientists collaborate closely to investigate crimes and guarantee that justice is done.

Sexual offences are among the most severe crimes that may be committed. Although comparable crimes against males have also been reported, the majority of victims in these situations are women and girls.

A crucial component of every criminal inquiry is forensic science. It is especially important in situations of sexual offences as there are frequently no witnesses to these types of crimes. Biological evidence gathered at the crime scene, therefore, serves as mute witnesses in its place. The steps of gathering, preserving, and analysing forensic evidence must be done meticulously.[1] Numerous biological samples may be utilised as proof in rape or sexual assault cases.

Touch DNA, also referred to as trace DNA, is a forensic technique used to examine minute quantities of DNA left on surfaces or objects when a person touches them. This approach can be used to extract and analyse the genetic material from even the smallest remains left by a person's touch, revolutionising forensic examinations.[2] This study investigates many techniques for forensic analysis and extraction.

Keywords: Forensic, Touch DNA, Biological Fluid, Evidence, Medico-legal, Sexual offences.

1. INTRODUCTION

The likelihood of sexual assault or rape is four times higher for women in the 16–19 age group and three times higher for female college students in the 18–24 age group compared to males. All across the world, women fear being victims of sexual offences. Globally, over 35% of women have acknowledged experiencing sexual harassment at some point in their lives. Additionally, estimates have been made in nations where rape statistics are available.[3]

Forensic evidence is an incredibly important tool for investigating sexual offences. This paper's focus is limited to investigating the value of forensic evidence in establishing sexual offences against women, as women are disproportionately impacted by these types of crimes. While many evidences might be employed in an investigation, the focus of this study is on the forensic examination of three specific evidence types: bodily fluids, hair, and DNA. The information stated above has been selected for further discussion because it is more significant in sexual offences than other evidence that is currently accessible. Because of the sensitive nature of such crimes and their widespread harmful consequences, many of them go unreported due to the presumption of not getting justice after a long and difficult process of contacting the judicial system. The conviction rate can be greatly raised because of the forensics' sensitive and generally correct individualised analysis. This research also investigates recently developed forensic methods for these evidences that have not yet been used in real-world situations. It also illustrates the relevance of such evidence in court using recent court cases and gives solutions to close existing holes in the system. Such research is important since it examines the field's current established methods and suggests more effective testing procedures. Additionally, the research clarifies the

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legal position of DNA and medico-legal evidence admission in courts as well as the actions that must be made to advance.

The genetic substance that comprises the genetic code in all organisms is called deoxyribonucleic acid, or DNA. All humans contain essentially the same composition of DNA which is composed of Adenine (A), guanine (G), cytosine (C), and thymine (T) are the four chemical bases that make up the information encoded in DNA. The order of these chemical bases in the DNA determines the information that creates and preserves the creature. There is some DNA found in the mitochondria, known as mitochondrial DNA, however the majority of DNA is found in the nucleus and is referred to as nuclear DNA. The fact that DNA is self-replicating is crucial because, during cell division, the strands that make up the double helix of the DNA act as the a pattern for creating a duplicate copy as each new cell requires to have an exact copy of the DNA present in the old cell.[4]

In order to prove a crime, DNA samples from hair, bodily fluids, skin material, etc. are compared with samples of DNA from certain people. Therefore, before a sexual assault forensic examination can be conducted, it is crucial that the victim of a sexual offence not bathe, clean their fingernails, or pee. While such material can also be discovered in the victim's clothing, it gains greater significance and value when it is discovered on the victim's body. However, since DNA might disclose genetic information, which is private information, authorisation must be obtained before obtaining a sample.[5]

Touch DNA, also known as trace DNA, is a forensic technique that analyses DNA left at a crime scene. The fact that it only needs extremely little samples—like skin cells left on an object after it has been touched or carelessly handled, or even footprints—gives it its name. The method is extremely sensitive and may be applied to as little as seven or eight human skin cells in the outermost layer.[6] However, touch DNA analysis does have certain limitations. False positive findings can arise from contamination; for example, fingerprint brushes used by crime scene investigators may transmit minute quantities of skin cells from one surface to another, producing results that are not reliable. Touch DNA is more frequently employed by the defence than by the prosecution to assist disqualify a suspect because of this risk.

Touch DNA analysis involves extracting DNA from collected cells and evaluating 13 genetic regions that differ between persons in order to validate suspects or clear innocent parties.

The scope of this study is limited to forensic examination of touch DNA, hair, and bodily fluids in sexual offences perpetrated against women. This study examines new and current techniques for analysing touch DNA from hair, and bodily fluids, as well as the applicability and legal admissibility of such evidence. Recommendations are made after forensic evidence's importance in sexual offences against women is assessed. The research is based on the limited number of accessible experiments and secondary statistical data. Consequently, this might have an impact on suggesting the appropriate scientific methods to achieve the paper's goal. Furthermore, several of the forensic analytical techniques included in the research are still in the early phases of development, thus definitive conclusions may not yet have been reached. In addition, the topic is broad and encompasses the forensic examination of several more pieces of evidence, such as fibre evidence, fingernail scrapings, etc., which are outside the purview of this study.

2. ANALYZING THE TECHNO-LEGAL ASPECTS OF DNA TESTING

The Malimath Committee proposed the use of forensic technologies such as DNA profiling in rape cases. It was also suggested that legislation be passed to ensure that DNA samples are collected, tested, and admissible in a standardised manner. Additionally, rules and regulations should be established for police personnel to follow while gathering this kind of genetic evidence.[7] Additionally, they suggested adding DNA specialists to the list of scientific experts under Section 293(4) of the Criminal Procedure Code.[8] With the assistance of a medical professional, the police were able to get DNA samples from the bodies of the accused and the victim under Section 53 of the CrPC in 2005. DNA is unquestionably a crucial piece of evidence in sexual crimes as these interactions frequently end in the exchange of biological material that can be later used for DNA profiling.

2.1. Analysing the Gene Codes

Short Tandem Repeats, or STRs, are regions of the DNA strand where base pairs repeat themselves. These regions are evaluated in forensic DNA analysis, typing, and profiling. Nonetheless, mutations resulting in the acquisition or removal of a four-base block cause differences in the STR locus. The many locus variations are referred to as alleles, and each one has a certain amount of repetitions of four chemical bases. In forensic DNA analysis, the length of the DNA is evaluated at these locations and associated with the number of four chemical blocks that repeat. Thirteen STR loci have been found by the FBI, ten by Interpol for the UK and Europe, and nine standard loci among Indians.[9]

The initial step in DNA analysis is extracting DNA from a sample. Traditionally, the phenol-chloroform extraction technique was the most popular way to purify DNA. Firstly, the cells are lysed to release DNA suitable for Polymerase Chain Reaction (PCR). if the lysate is employed as a source of DNA or if the DNA is purified from the lysate prior to PCR depends on the kind of sample and the biology of the target loci that need to be genotyped. Therefore, there are two categories into which DNA extraction falls. Because there are so many different types of samples in forensic analysis, it is not possible to utilise a single extraction method, hence many techniques are frequently verified. The following variables impact extraction techniques: The type of

sample, processing time, chance of contamination, operator intervention, and complexity/ease of use are the variables that influence extraction processes. It is crucial to remember that the analyst must ensure that the DNA is extracted effectively and must also get rid of any potential inhibitors that can impede the process further.[10]

Samples received from a single donor have a greater concentration of DNA and fewer PCR inhibitors because they include more biological material and are less prone to deteriorate. As a result, only lysis and direct amplification may be extracted. Chelex, FTA, and thermally stable proteinases are examples of extraction techniques. Chelex has the benefit of being quick and not requiring hazardous organic solvents, but it is ineffective in getting rid of inhibitors that obstruct the amplification process. It works well with biological samples that have a significant quantity of DNA in them. In the incident of a rape or other sexual assault, this could not be the case. The quantity of DNA that may be retrieved from evidence varies greatly due to the extremely varied biological samples presented for forensic investigation. Male spermatozoa in semen and vaginal epithelial cells may be present in evidence samples taken from cases of sexual assault and rape. This is due to the fact that vaginal swabs are the most often employed form of evidence for collecting biological samples. A vaginal swab can be taken with or without a speculum, based on the desires of the patient and the physician. The sperm sample is most important in demonstrating a charge of sexual assault or rape; nevertheless, a vaginal swab normally includes more vaginal epithelial cells than sperm cells. To get distinct genotypes—one from the victim and one from the accused—the DNA from the sperm and vaginal cells must first be isolated and analysed. This is accomplished via differential lysis, initially reported by Gill and colleagues in 1968, which produces sperm and epithelial cells in separate tubes when dithiothreitol is present or absent.[11] Methods for purifying DNA come after this. This extraction method has been widely utilised in forensic labs; nevertheless, the separation may not always be perfect, leading to genotype mixtures and inaccurate results that are not admissible as evidence. Other approaches for separation include microfluidics, laser microdissection, and flow cytometry. Phase separation, differential centrifugation, and proteinase K-selective digestion of epithelial cells are the steps in the relatively new Differex System approach. This is a useful technique for removing male sperm DNA from mixture stains.[12]

Once the DNA has been extracted from the biological sample, it is measured to determine how much of it has to be amplified to create a genetic profile that meets the laboratory's criteria. Polymerase Chain Reaction, which is used to duplicate a certain DNA sequence and make many copies of it, succeeds this procedure. Preferential amplification in PCR is believed to be affected by imbalanced DNA samples, which are typically derived from sexual offence evidence and contain the genetic profiles of two or more people. The samples are examined once the DNA has been amplified to include a significant amount for analysis.

2.2. Scientific Process in Dealing with Touch DNA

In order to harvest touch DNA, small quantities of epithelial cell tissue are found on surfaces by swabbing, taping, or scraping. This is how it operates:

Collection: Using items like doorknobs, counters, windows, clothes, and even food, forensic investigators gather samples. They delicately gather skin cells left behind by contact using specialised swabs.

Extraction: The DNA of the cells is taken out following collection.

The DNA is separated from the cellular components during the extraction procedure.[13]

Genomic Analysis: A genomic analysis is performed on the isolated DNA.

Researchers evaluate 13 distinct genomic regions (sometimes referred to as Short Tandem Repeats, or STRs) that differ between people. This analysis clears innocent people or validates suspicions.[14]

3. NAVIGATING THE LEGAL LANDSCAPE OF DNA ANALYSIS

DNA evidence has certainly revolutionised criminal investigations in India, serving as a vital tool for guaranteeing justice. Its superiority in the legal system is demonstrated by its capacity to precisely identify offenders, clear innocent parties, and resolve unsolved cases.

The Nirbhaya Case

This case resulted in considerable judicial reforms and public outcry following the vicious gang rape and killing of a young lady in Delhi in 2012.[15] Forensic evidence, such as DNA profiling and bite mark analysis, was crucial in this case in proving the accused's guilt.

The significance of forensic evidence in validating witness statements and determining guilt was underscored by the Supreme Court. DNA evidence proved the accused's guilt by providing a clear and unambiguous link between them and the crime.

Touch DNA has been pivotal in several high-profile cases

Caylee Anthony Case

In 2008, Caylee Anthony's two-year-old remains were discovered in a forested area close to her Florida home. Casey Anthony, her mother, was accused of first-degree murder. In this instance, touch DNA analysis was really important. Casey's car's trunk included a hair strand with a decaying root. Caylee was connected to the car because the DNA taken from her hair matched her profile. During Casey Anthony's trial, the discovery of Caylee's DNA in the car's trunk was a crucial piece of evidence.[16]

Ramsey JonBenet Case

In 1996, the body of six-year-old JonBenet Ramsey, a competitor in beauty pageants, was discovered in her family's Colorado home. The clothes JonBenet was wearing when her body was found was examined using touch DNA analysis. The analysis of her pants turned up DNA belonging to an unidentified guy. Touch DNA added to the continuing inquiry and raised concerns about possible intrusions, even if it did not directly identify the murderer.[17]

Brianna Denison Case

In 2008, a college student named Brianna Denison was kidnapped from her friend's home in Reno, Nevada. After weeks, her body was discovered. James Biela's connection to the crime was made possible in large part by touch DNA evidence. Biela's DNA was found in a swab extracted from the duct tape that was used to tie Brianna. Based on this and other evidence, Biela was found guilty and given the death penalty.[18]

The effectiveness of touch DNA analysis in criminal investigations is demonstrated by these examples. It emphasises how crucial it is to gather and preserve evidence with care since even minute traces can reveal important information.

Touch DNA, despite its small size, is extremely important in criminal investigations. It fills in the blanks, bringing cold cases to life, clearing innocent people, and connecting suspects to crime scenes. Its influence echoes through courtrooms, guaranteeing the triumph of justice and can be used in the criminal investigation.[19]

4. KEY CONSIDERATIONS FOR DNA EVIDENCE ADMISSIBILITY IN INDIA

In India, the acceptance of DNA evidence is still relatively new. In the Indian judicial system, the use of DNA as definitive evidence has long been contentious. Due to the lack of scientific and legal regulations governing the acceptance of DNA, courts have the freedom to decide whether information is admissible.[20] The courts may permit the evidence's entry under the required conditions if they are convinced that it is pertinent and was accurately gathered and tested. It has been said to serve as a means of personal identification. DNA evidence needs to be compliant with the Indian Evidence Act,[21] the Code of Criminal Procedure, and the Indian Constitution.[22]

The right to life and personal liberty, the right against self-incrimination, and the right to privacy are all protected by articles of the Constitution. It is possible to argue that DNA technology violates these fundamental rights. But in judgements such as Govind Singh v. State of Madhya Pradesh,[23] it has been decided that limitations on basic rights in the public interest are acceptable since they are not unqualified. DNA testing was granted a vicarious legality in the State of Bombay v. Kathi Kalu Oghad case.[24] Nonetheless, consent is still implicitly needed in order to protect people's right to privacy.

The authorities are authorised to enlist the assistance of medical professionals under Section 53 of the Code of Criminal Procedure. However, the Section does not include the collecting of biological fluids such as saliva, blood, or other bodily fluids. Nonetheless, the Amendment Act of 2005's addition of Section 53A permits the taking of samples from the victim's body in rape cases. The Supreme Court has ruled in cases such as Krishna Kumar Malik v. State of Haryana[25] that the prosecution may use semen or DNA testing to support their case and render it fully proofed.

The Court held in decisions such as Smt. Selvi and others v. State of Karnataka[26] and Ranjitsing Brahmajeet Singh Sharma v. State of Maharashtra[27] that the legitimacy of a scientific test determines its trustworthiness. The scientific tests that are employed ought to be reliable and pertinent in the field of science. The admissibility of scientific evidence has been established in cases such as Mhd. Aman v. State of Rajasthan[28] and Pritam Singh v. State of Punjab.[29] Consequently, even if there isn't a definite threshold for establishing guilt based only on expert testimony provided under Section 45, the Court's independence and free will must nonetheless be maintained.

The DNA Technology (Use and Application) Regulation Bill, which was presented in 2019, seeks to govern the use of DNA evidence in criminal investigations. The bill intended to aid in criminal investigations in the following ways:

Evidence Identification: By connecting prospective criminals to particular crime scenes, DNA profiling assists in identifying possible perpetrators.

Efficiency Enhancement: DNA technology increases the criminal justice system's efficiency. Unlike eyewitness testimonies, which might be inaccurate under duress, it gives scientifically exact evidence. It guarantees precise identification and lessens dependency on witness statements based on memory.

PCR Analysis: Polymerase Chain Reaction is the most widely used DNA analysis technique (PCR). PCR generates several copies of minute quantities of DNA, enabling the examination of evidence samples of differing quality and quantity.

Schedule of Offences: The Bill has a Schedule outlining the offences for which DNA evidence may be used. These mostly deal with civil cases like paternity issues and offences punishable by the Indian Penal Code.

To summarise the DNA Bill was intended to aid justice in criminal cases, support investigations, and fortify forensic skills. However, the bill was withdrawn in July 2023.[30]

5. CONCLUSION

Forensic evidence is particularly important in the prosecution of sexual offences. The greatest care must be taken at every stage of DNA collection and preservation since the techniques used for DNA extraction and analysis determine the quality of the sample that is obtained. In order to prevent unanticipated damage, manipulation, or loss of biological evidence, it is also necessary to make sure that the medico-legal exams and evidence collecting are completed quickly. It is also acknowledged that the Malimath Committee Report's requirements for the admission of DNA and national databases must be implemented in full and in detail in order to bring about a revolutionary shift in the field of DNA forensic inquiry.

Touch DNA analysis has transformed forensic investigations by allowing professionals to recover and analyse genetic material from the smallest traces left by a person's touch. It can conclude criminal investigations in many ways like connecting suspects to crime scenes- benefit suspects and crime sites can be linked by traces of DNA left behind by touching objects. Touch DNA analysis is a non-invasive DNA collecting technology that offers an advantage over other techniques. Investigators utilise it to gather vital information that connects suspects to the crime scene. It eliminates the need for invasive procedures by offering a practical and less invasive method of obtaining DNA samples. Potential in cold cases helps trace quantities of DNA on things that can be analysed even years after a crime.

The jurisprudence of the laws will grow as a result of increased efforts to admit DNA and other medico-legal evidence in instances involving sexual offences. This will give these evidences more weight than merely corroboration or recommendation. It is also established that forensic investigations need to take into account and acknowledge the validity of various biological evidence.

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