

The Role of DNA Evidence with Special Reference to Criminal Cases in India

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ABSTRACT:

The application of DNA evidence has brought about a significant transformation in criminal investigations and legal proceedings on a global scale, including within the jurisdiction of India. This abstract examines the crucial use of DNA evidence in criminal cases in India, highlighting its importance, difficulties, and legal consequences. DNA profiling provides unmatched precision in identifying persons, connecting suspects to crime scenes, and absolving the innocent. In India, this technology is used in a wide range of criminal cases, including murder and sexual assaults, to enhance standard forensic techniques. Nevertheless, the incorporation of DNA evidence encounters obstacles such as procedural deficiencies, constraints in forensic infrastructure, and concerns regarding its acceptance in court proceedings. This abstract analyzes the most recent legislative advancements and judicial rulings that have influenced the utilization of DNA evidence in Indian courts. The statement emphasizes the necessity of implementing strong protocols, providing training, and considering ethical aspects in order to successfully utilize the potential of DNA within India's legal system, thus ensuring a fair and equitable criminal justice process.

KEYWORDS: DNA Evidence, Forensic Science, Crime Scene Evidence, DNA Legislation

INTRODUCTION:

The use of DNA (Deoxyribonucleic Acid) evidence in forensic science has significantly transformed criminal investigations on a global scale in recent years. India's criminal justice system has various obstacles, but DNA evidence has become a crucial instrument in determining guilt or innocence with exceptional precision. This study examines the significant influence of DNA evidence in criminal trials in India, focusing on its role in improving investigation methods, guaranteeing justice in the judicial process, and dealing with the challenges of proving guilt beyond a reasonable doubt. This study seeks to clarify how DNA evidence not only aids in identifying and prosecuting criminals, but also adds to wider discussions on justice and human rights within the Indian judicial system by examining its legal, procedural, and ethical aspects.

HISTORICAL DEVELOPMENT OF DNA EVIDENCE IN INDIA

The origin of DNA evidence in India may be traced back to the mid-1980s with the introduction of the Restriction Fragment Length Polymorphism (RFLP) technique. This approach enabled scientists to discover distinct patterns in an individual's DNA, akin to a fingerprint, for the purpose of identification.

During the 1990s, the polymerase chain reaction (PCR) technology emerged as the prevailing method for DNA testing in India. This technique facilitated the rapid amplification of DNA samples, resulting in a substantial rise in the utilization of DNA evidence in criminal investigations. In 1988, researchers at the Centre for Cellular and Molecular Biology (CCMB) in India created their own DNA fingerprinting probes, establishing India as the third nation globally to develop this technology. The probes were employed as evidence in a paternity dispute case in the Kerala High Court in 1991, marking the inaugural acceptance of DNA evidence in an Indian court of law. Since its inception, DNA fingerprinting has been widely employed in India for diverse purposes, encompassing the identification of individuals involved in criminal cases such as homicide, sexual assault, and targeted killings, as well as the determination of paternity and resolution of familial conflicts, and the identification of missing persons and unidentified corpses. The Centre for DNA Fingerprinting and Diagnostics (CDFD) was founded as an independent institute by the Department of Biotechnology, Government of India, in order to facilitate the increasing utilization of DNA evidence. Although DNA evidence is now widely acknowledged in Indian courts, several challenges persist. These include the absence of explicit regulations regarding sample collection, data storage, and privacy. Additionally, DNA evidence is often treated as supporting rather than definitive proof, and its use in establishing the innocence of suspects and convicts is limited. In order to tackle these difficulties, India is currently in the process of enacting a DNA Technology (Use and Application) Regulation Bill. This bill seeks to establish a DNA Regulatory Board that will be responsible for creating guidelines and standards for DNA testing laboratories and data banks. The implementation of this bill is expected to enhance the utilization of DNA evidence in the Indian legal system, thereby maximizing its effectiveness in criminal investigations and exonerations.

EVOLUTION OF FORENSIC SCIENCE

Over the past three decades, the significance of DNA evidence in criminal cases in India has undergone substantial evolution. The introduction of DNA technology in India dates back to 1989, when it was initially utilized in a paternity dispute case. Since then, it has emerged as an indispensable forensic tool in the pursuit of justice. The utilization of DNA evidence has been crucial in the examination of diverse criminal and civil instances, furnishing irrefutable scientific evidence that surpasses all reasonable uncertainty. Nevertheless, the recognition of the necessity for precise regulation and rules to endorse the utilization of DNA profiling for forensic objectives in India has resulted in the establishment of the DNA Technology (Use and Application) Bill in 2019. Although DNA evidence has played a crucial role in resolving intricate crimes, identifying perpetrators, and proving the innocence of individuals, the Indian judiciary has expressed reservations regarding the dependability and acceptability of DNA reports. This highlights the need to establish a strong framework for the admission of such scientific evidence. To maintain the credibility and successful integration of DNA evidence into the criminal justice system in India, it is crucial to implement uniform norms, quality assurance procedures, and promote interdisciplinary collaboration.

INTRODUCTION OF DNA PROFILING IN INDIA

The implementation of DNA profiling in the criminal justice system in India has brought about a significant transformation, offering a potent means to identify culprits and absolve the innocent. Following its initial successful application in a paternity case in Thalassery, Kerala during the 1990s, DNA evidence has gained growing acceptance as admissible evidence in Indian courts. The Indian judiciary has

recognized the effectiveness of DNA profiling, but the absence of clear restrictions has resulted in conflicting decisions about its admissibility. The DNA Technology (Use and Application) Regulation Bill, introduced in 2019, seeks to create a legislative framework for the gathering, retention, and utilization of DNA profiles, while ensuring a balance between the pursuit of justice and the safeguarding of individual privacy rights.

CONCEPT OF DNA PROFILING:

Deoxyribonucleic Acid (DNA) is the hereditary substance found in the cells of all organisms. Every individual possesses a unique DNA that is only identical to that of monozygotic twins. Alec Jeffreys, a geneticist at Leicester University in England, is credited with inventing the DNA profiling technique. DNA profiling technology is a contemporary genetic method utilized by forensic experts to ascertain the identity of an individual. DNA profiling involves the analysis of human DNA obtained from various sources such as saliva, skin, hair, blood, and sperm. This DNA can be compared to DNA samples collected from a specific individual in the past. It aids in determining the personality characteristics, conduct, and occasionally even inheritable diseases of an individual. In crimes such as homicide and sexual assault, advancements in technology have made it possible to identify individuals based on even a little fragment of tissue. It is also employed in legal proceedings, particularly in circumstances when familial relationships are established.

DNA EVIDENCE IN INDIAN COURTS:

India currently lacks specific legislation regarding the criteria for eligibility in DNA profiling or forensic analysis. While the Code of Criminal Procedure and Indian Evidence Act, 1872 do address medical and technological issues, their regulations are rather tacit. Therefore, the decision to authorize or refuse DNA testing is solely in the hands of the judges. This often leads to disorder and uncertainty while enforcing justice. Thus, the acceptability of the technique of DNA collection and testing in court relies on its legitimacy and the conviction of the courts of the authenticity of the DNA test. Although the effectiveness of the DNA profiling technology is not in question, justices of the Supreme Court and High Courts have differing viewpoints on whether DNA evidence should be allowed in court due to constitutional or statutory restrictions.³ In the recent case of *Nandlal Wasudeo Badwaik v. Lata Nandlal Badwaik & Anr.*, the Supreme Court prioritized DNA testing as per Section 45 of the Indian Evidence Act, rather than relying on the legal presumption outlined in Section 112 of the Indian Evidence Act.

THE DNA TECHNOLOGY (USE AND APPLICATION) REGULATION BILL:

The Union Cabinet approved the DNA Technology (Use & Application) Regulation Bill in 2018. However, despite efforts, the law was not passed by the end of 2018 and became invalid when the 16th Lok Sabha was dissolved. Following the establishment of the 17th Lok Sabha in 2019, the bill was reintroduced and is currently under examination by the Standing Committee of the Rajya Sabha. The objective of the Bill is to establish a DNA repository that encompasses profiles of individuals who have been accused, victims, and their relatives. However, there are apprehensions regarding this measure, specifically with the establishment of a DNA Data Bank, which might potentially result in the mishandling of personal information belonging to any individual, regardless of their identity. Additionally, the storage of DNA profiles of innocent individuals is deemed unconstitutional since it infringes upon the right to privacy.

THE LEGAL FRAMEWORK GOVERNING DNA EVIDENCE IN INDIA

Indian Evidence Act, 1872:

The Indian Evidence Act of 1872 is the fundamental basis of the legal structure governing evidence in India, encompassing forensic evidence as well. Although the Act does not explicitly refer to DNA evidence, it establishes a broad basis for the acceptability, pertinence, and assessment of evidence in criminal trials.

- Section 45 grants the court the authority to take into account the expert opinions pertaining to subjects that necessitate specialist knowledge, such as DNA analysis. Forensic specialists might offer expert views derived from DNA analysis to aid the court in comprehending the evidence.

Criminal Procedure Code (CrPC), 1973:

The Criminal Procedure Code delineates the protocols for the inquiry, compilation, and utilization of evidence in criminal proceedings.

- Section 53 allows the police to request a medical practitioner to examine the accused, including the collecting of DNA samples.
- Section 164A of the law requires the compulsory medical examination of individuals who have been subjected to rape. This examination involves the gathering of forensic evidence, such as DNA samples, in order to confirm the occurrence of the crime and determine the identity of the perpetrator.

DNA Technology (Use and Application) Regulation Bill, 2019:

The objective of this legislation is to establish a complete legal structure for the utilization and oversight of DNA technology in India. While it has not been officially implemented, the proposal includes numerous important provisions:

- The law suggests the establishment of national and regional DNA data banks to retain DNA profiles only for forensic purposes.
- The certification of DNA laboratories is required to guarantee the quality and dependability of DNA testing.
- The bill contains measures to protect the privacy of persons and mandates that informed consent be obtained for the collecting of DNA samples, save in instances related to criminal acts.

ADMISSIBILITY OF DNA EVIDENCE IN INDIAN COURTS:

The utilization of DNA evidence has been of utmost importance in the Indian criminal justice system, as it offers irrefutable scientific validation in a wide range of criminal inquiries, including instances of sexual assault, child abuse, and murder. The Indian judiciary has progressively acknowledged the acceptability of DNA evidence, but with certain caveats. Section 45 of the Indian Evidence Act, 1872 permits the admission of expert opinions, including those pertaining to DNA analysis. Nevertheless, courts have exhibited prudence in fully adopting DNA evidence due to apprehensions regarding the insufficient infrastructure, knowledge, and the possibility of samples being misused or contaminated. Although DNA evidence is typically seen as supporting rather than the primary foundation for conviction, the courts have recognized its significance in bolstering the prosecution's case, particularly when eyewitness testimonies are deemed reliable and trustworthy. In paternity issues, the Indian judiciary has had challenges in determining the acceptability of DNA evidence. This is because the presumption of legitimacy stated in Section 112 of the Evidence Act sometimes contradicts the scientific reliability of DNA testing. In general, the Indian legal system acknowledges the importance of DNA evidence, but is still working to

find a balance between scientific progress and traditional types of evidence in order to maintain a fair and equitable criminal justice system.

IMPACT OF DNA EVIDENCE ON THE CRIMINAL JUSTICE SYSTEM IN INDIA

Enhancing Accuracy and Reliability of Investigations

The fundamental effect of DNA evidence has been its capacity to significantly enhance the precision and dependability of criminal investigations. DNA profiling is widely regarded as the most reliable and accurate method in forensic science. It enables investigators to establish a definitive connection between suspects and crime sites with an unparalleled level of accuracy. This has played a crucial role in resolving unsolved criminal cases, proving the innocence of those who were wrongly found guilty, and reducing the number of possible suspects. The strength of DNA evidence resides in its inherent uniqueness - the DNA of each individual is distinct, save in the case of identical twins. This feature renders it an exceptionally potent instrument for identification, since it can establish a direct connection between a suspect and a crime scene, or between a victim and a perpetrator. The utilization of DNA evidence has revolutionized the methodology of investigations, redirecting the emphasis towards a more impartial and fact-driven approach.

Promoting Fairness and Preventing Miscarriages of Justice

The growing acceptance and dependence on DNA evidence in the Indian criminal justice system has profoundly influenced the equity and honesty of legal proceedings. DNA evidence has had a significant impact on legal strategy, case presentations, and judicial decision-making, resulting in a more objective and evidence-based approach in the courtroom. This has been especially crucial in situations when eyewitness testimony or circumstantial evidence may have served as the main foundation for prosecution. The utilization of DNA evidence has the capacity to either support or disprove such proof, therefore advancing equity and averting wrongful convictions. The absolution of persons who were erroneously condemned, relying on DNA evidence, has served as a compelling testimonial to the profound influence of modern science.

Challenges in Implementation

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Need for Specific Legislation

Although the advantages of DNA evidence are widely acknowledged, the integration of this technology into the Indian criminal justice system has encountered several difficulties. Concerns have arisen around sample contamination, the interpretation of intricate DNA mixes, and the possibility of DNA data being misused or misinterpreted.

These problems highlight the significance of ongoing research, the establishment of consistent forensic procedures, and the creation of strong rules and guidelines to guarantee the appropriate management and

analysis of DNA evidence. Continual training and development for law enforcement, forensic experts, and legal professionals are essential to tackle these problems and optimize the use of DNA evidence.

LANDMARK CASES:

Premjibhai Bachubhai Khasiya v. State of Gujarat (2009)

In the 2009 case of *Premjibhai Bachubhai Khasiya v. State of Gujarat*, the High Court emphasized the significance of corroborative evidence in criminal convictions that rely on DNA findings. The court stressed that although a favorable DNA report can greatly strengthen the prosecution's argument, it should not be the primary factor in determining the guilt of the accused. Instead, it is important to evaluate such a report in conjunction with other forms of evidence in order to establish guilt with a high level of certainty. In contrast, the court emphasized that a negative DNA analysis has significant exculpatory influence. If the DNA evidence does not establish a connection between the accused and the crime, it would definitively exonerate the defendant from the allegations. The differentiation guarantees that DNA evidence, although a potent instrument in the legal procedure, must be employed cautiously and in combination with other dependable evidence to guarantee equitable and righteous resolutions in criminal cases.

Anil v. State of Maharashtra (2014)

The Supreme Court of India emphasized the need of DNA profiling in connecting crime scene samples to suspects in the case of *Anil v. State of Maharashtra (2014)*. The Court recognized that when the DNA profile of a sample from the crime scene matches that of the suspect, it typically suggests a shared biological origin. This serves as compelling proof of the defendant's involvement in the murder. Nevertheless, the Court highlighted that the dependability of DNA evidence relies on the rigorous quality control and thorough processes carried out in the laboratory where the analysis takes place. Ensuring the meticulous gathering, safeguarding, and examination of the DNA samples is essential to avert any contamination or deterioration that may undermine the precision of the findings. To guarantee the strength and dependability of the DNA evidence given, it is crucial to uphold the integrity of the entire procedure, spanning from the crime scene to the courtroom. The Court's remark emphasizes the need of forensic laboratories following strict guidelines and optimal methods to generate reliable and trustworthy DNA reports. This, in turn, assists the court system in ensuring impartial and equitable judgments.

Mukesh and Another v. State (NCT of Delhi) and Others (2017)

The Supreme Court emphasized the increasing importance of DNA evidence in India's legal system in the case of *Mukesh and Another v. State (NCT of Delhi) and Others (2017)*. It highlighted the dependability of DNA evidence and stressed the necessity of its thorough use in court proceedings. The Court stated that DNA reports should be given significant importance and trustworthiness, adding that such evidence should be seen as definitive unless there are compelling reasons to question its reliability. More precisely, the Court declared that in order to dismiss a DNA result, it must be clearly proven that the report is defective because of a deficiency in the quality control or assurance during the testing procedure. This declaration signifies a crucial advancement in strengthening the probative significance of DNA in the legal system, promoting the adoption of scientifically rigorous techniques to uphold fairness in the administration of justice.

Rahul v. State of Delhi (2022)

In the notable *Rahul v. State of Delhi (2022)* case, the Supreme Court of India raised serious concerns regarding the credibility of DNA evidence. These concerns were mostly based on significant doubts around the procedures of sample collection and sealing. The case centered on the DNA evidence, which

was called into doubt due to possible mishandling and failure to follow correct procedures during the collection and preservation of the samples, despite indicating a match. The Court emphasized the crucial significance of maintaining a strict chain of custody and ensuring that samples are collected, sealed, and transferred in a way that completely prevents any chance of contamination or tampering. Because of the questionable integrity of the sample processing process, the Court determined that the DNA evidence could not be deemed completely credible. As a result, even though there was a DNA match, the Court found the accused not guilty. The Court emphasized that the reliability of forensic evidence is extremely important in guaranteeing a fair trial and maintaining the principles of justice.

Manoj v. State of Madhya Pradesh (2022)

In the case of *Manoj v. State of Madhya Pradesh (2022)*, the Supreme Court of India emphasized significant concerns surrounding the trustworthiness of DNA evidence, specifically the potential for contamination. The Court determined that the lack of a random occurrence ratio in the DNA analysis could give rise to substantial uncertainties regarding the precision and dependability of the evidence. The significance of this ratio is in its ability to offer a statistical indication of the likelihood of encountering a specific DNA profile within the overall population. The credibility of the DNA evidence is impaired if we do not take into account the 'random match probability', which measures the possibility of a DNA profile randomly matching someone other than the suspect. The Court emphasized the need of including this statistical probability in order to build a strong and scientifically valid foundation for DNA matches. This ensures that the evidence can withstand scrutiny and serve as a dependable basis for judicial decisions.

CHALLENGES AND LIMITATIONS OF DNA EVIDENCE IN CRIMINAL CASES IN INDIA

Reliability and Admissibility Concerns: The recent rulings by the Supreme Court, such as *Rahul v. State of Delhi* and *Manoj v. State of Madhya Pradesh*, have brought attention to important issues about the trustworthiness and acceptability of DNA evidence in criminal proceedings. The Court has examined the methods employed for DNA collection, manipulation, and examination, highlighting concerns over possible contamination and insufficient procedural safeguards. An important issue of disagreement is the frequent exclusion of the random occurrence ratio or 'random match probability' (RMP) in DNA reports. This statistical metric is crucial for evaluating the importance of a DNA match. This exclusion affects the capacity to assess the probability of the DNA match happening by coincidence, thereby casting doubt on the overall dependability of the DNA evidence offered in these circumstances.

Lack of Robust Legal Framework: India does not have a distinct set of laws to regulate the use of DNA technology in the criminal justice system, resulting in serious deficiencies in the oversight of DNA evidence. The current legislation, such as the Indian Evidence Act, fails to sufficiently cover the intricacies and criteria for the acceptance of DNA evidence, leading to a lack of legal clarity. The lack of explicit norms and standards for the collecting, analysis, and reporting of DNA has resulted in variations in the application and interpretation of DNA evidence in court. This has compromised the dependability and efficacy of DNA as a tool in criminal investigations and prosecutions.

Capacity and Infrastructure Challenges: India's forensic DNA testing encounters substantial obstacles, especially in distant and rural regions where the presence of properly equipped facilities and skilled workers is frequently insufficient. This deficiency can undermine the caliber and dependability of DNA analysis. Furthermore, the accumulation of pending tasks in the processing of DNA samples and the prolonged wait for getting findings hinder the prompt conclusion of criminal cases. An important factor that worsens these problems is the insufficient understanding and training among law enforcement and

court professionals, which hinders the efficient exploitation of forensic DNA evidence. To tackle these issues and enhance the overall effectiveness of the criminal justice system in India, it is crucial to provide improved training programs and allocate more resources to forensic infrastructure.

Lack of Awareness and Training: Enhancing awareness and providing comprehensive training to legal professionals, law enforcement, and the judiciary on the accurate comprehension and interpretation of DNA evidence are essential for upholding the integrity of the criminal justice system. Lack of knowledge and experience can cause DNA evidence to be misunderstood or used incorrectly, which can lead to either false convictions or the rejection of genuine evidence. To maintain the effectiveness of DNA evidence and improve the accuracy and fairness of judicial outcomes, it is important to ensure that all parties involved have a comprehensive understanding of the intricacies of DNA analysis. This includes being knowledgeable about its limitations and the correct protocols for collecting, preserving, and presenting DNA samples.

Ethical and Privacy Concerns: The utilization of DNA evidence in the criminal justice system raises significant ethical concerns, namely pertaining to privacy, data security, and the potential for genetic information to be misused. The DNA molecule, acting as a distinct marker, contains delicate personal information that, if mistreated, has the potential to violate individuals' rights to privacy. Strong safeguards and laws are essential to control the gathering, storage, and analysis of data, ensuring transparency and accountability in its utilization. These precautions should encompass stringent consent standards, robust storage techniques, and explicit guidelines for data retention and access. Furthermore, ethical frameworks need to consider issues related to discrimination, stigmatization, and the possibility of profiling individuals based on genetic predispositions. Ensuring the responsible application of DNA technology is crucial for maintaining justice and protecting the rights of individuals, as well as fostering faith in the criminal justice system.

FUTURE PROSPECTS AND RECOMMENDATIONS

Uniform guidelines and protocols:

Develop comprehensive and consistent protocols for the collecting, management, storage, and analysis of DNA samples in forensic laboratories throughout India. These standards should address key factors such as chain of custody, sample integrity, laboratory accreditation, and quality control procedures to guarantee the dependability and consistency of DNA analysis. In addition, establish explicit guidelines for the analysis and display of DNA evidence during legal proceedings, incorporating statistical indicators such as random match likelihood to effectively communicate the importance of the results.

Enhancing and developing skills and knowledge through training and capacity building:

Allocate resources to strengthen the knowledge and expertise of forensic experts and law enforcement professionals in DNA analysis and its use in criminal investigations. Offer specific training programs, workshops, and ongoing educational opportunities to guarantee the accurate collection, processing, and interpretation of DNA evidence. Promote cooperation among forensic scientists, legal experts, and law enforcement organizations to cultivate a multidisciplinary approach to the utilization of DNA evidence.

Enhancing the Forensic Infrastructure:

Enhance and enlarge the network of forensic laboratories in India to adequately address the increasing need for DNA analysis. Make sure that these laboratories have the latest technology, highly skilled staff, and sufficient resources to manage the growing number of cases. Advocate for the adoption of

sophisticated DNA profiling methods, such as Next-Generation Sequencing, to improve the accuracy and precision of DNA analysis.

Admissibility and Judicial Scrutiny:

Establish explicit protocols and legal structures to determine the acceptability of DNA evidence in legal proceedings related to criminal cases. Deliver extensive instruction to the judiciary regarding the scientific principles, constraints, and analysis of DNA evidence in order to facilitate well-informed decision-making. Urge the judiciary to thoroughly scrutinize the fundamental procedures and statistical importance of DNA analysis, as emphasized in recent Supreme Court rulings, in order to guarantee the dependable and suitable utilization of this evidence.

Legislative and policy changes:

Revise and enhance the current Indian Evidence Act and other applicable legislations to include explicit rules for the management and acceptability of DNA evidence. Create a comprehensive nationwide DNA repository, incorporating necessary measures to ensure privacy and security, to facilitate the identification of potential perpetrators, resolve unsolved criminal cases, and absolve individuals who have been wrongly implicated. Create thorough procedures and regulations to oversee the acquisition, retention, and utilization of DNA samples within the criminal justice system.

Enhancing public knowledge and involvement:

Promote widespread recognition and comprehension of the importance and use of DNA evidence within the framework of the criminal justice system. To enhance the proper and efficient utilization of DNA analysis, it is crucial to educate the wider population and important individuals such as law enforcement, legal experts, and politicians on its capacities and constraints. India may enhance the role of DNA evidence in criminal investigations and guarantee its dependable and acceptable usage in the criminal justice system by considering these future prospects and recommendations. This would ultimately lead to a justice system that is more transparent, fair, and efficient.

CONCLUSION:

The utilization of DNA evidence in India has brought about a profound transformation in the field of criminal justice, as it offers irrefutable scientific evidence that is essential for ensuring accurate judgments. The implementation of this signifies a significant change in the way investigations are conducted, improving their reliability and efficiency. Although it plays a crucial function, there are ongoing problems in terms of logistical restrictions and admissibility issues. These challenges require focused efforts in training and infrastructure development. In the future, improvements in DNA technology hold the potential for quicker analysis and larger databases. However, it is crucial to closely monitor and regulate these breakthroughs due to ethical concerns related to privacy and potential misuse. Essentially, the use of DNA evidence has greatly transformed criminal investigations in India. However, its successful application requires a fair and equitable methodology that ensures justice, safeguards individual rights, and properly utilizes technological breakthroughs.

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