

Wrongful convictions, The role of DNA Evidence

DNA evidence has emerged as one of the most powerful tools in the modern criminal justice system, playing a critical role in both securing convictions and preventing or overturning wrongful ones. Since the late 20th century, the use of DNA analysis has revolutionised forensic science by offering a highly accurate method for identifying individuals based on their unique genetic profiles. In the context of wrongful convictions, DNA evidence serves two essential roles: exposing miscarriages of justice and safeguarding against future errors.

One of the most significant contributions of DNA evidence is its role in exonerating individuals who were wrongfully convicted. Numerous cases across the world, particularly in jurisdictions like the United States, the United Kingdom, and Canada, have seen convicted individuals exonerated years—even decades—after their trials, solely on the basis of DNA testing. The Innocence Project in the U.S., for instance, has helped overturn hundreds of convictions using post-conviction DNA testing, revealing that a substantial proportion of these cases involved errors such as mistaken eyewitness identification, false confessions, prosecutorial misconduct, and flawed forensic practices. DNA evidence provides a scientifically objective basis to challenge such errors, especially in cases where biological evidence such as semen, blood, hair, or skin cells was collected and preserved from the crime scene.

DNA evidence also acts as a preventative tool by serving as a check on other forms of evidence that are inherently more fallible. Traditional evidence such as eyewitness testimony, confessions, and circumstantial inference are vulnerable to human error and bias. DNA analysis, by contrast, offers a high degree of precision, particularly when proper protocols are followed in collecting, storing, and analyzing samples. In recent years, advances in technology such as touch DNA and low-copy-number DNA testing have further enhanced the sensitivity of forensic analysis, making it possible to obtain reliable DNA profiles from minimal samples. This helps ensure that individuals are not wrongfully accused or convicted based on weaker forms of evidence.

However, the reliability of DNA evidence is not absolute and depends on the integrity of the forensic process. Contamination of evidence, misinterpretation of mixed DNA profiles, or faulty lab procedures can lead to misleading results, which in turn may contribute to wrongful convictions if not properly scrutinized. There have also been cases where the presence of a person's DNA at a crime scene was misused as the sole or primary basis for conviction, without considering alternative explanations for its presence. This underscores the importance of ensuring that DNA evidence is interpreted within the proper legal and factual context.

In conclusion, DNA evidence plays a vital dual role in addressing wrongful convictions. It not only provides a scientific means to revisit and correct past errors in the justice system but also serves as a safeguard to improve the accuracy of criminal investigations and prosecutions.

While it is not infallible, when applied with proper safeguards and in conjunction with other credible evidence, DNA technology significantly enhances the fairness and reliability of the criminal justice process. Its continued integration into legal systems, along with reforms in evidence preservation and forensic standards, remains essential to minimising wrongful convictions in the future.

Contrast Between the Global and Indian Scenario in the Context of DNA Evidence and Wrongful Convictions

The role of DNA evidence in addressing and preventing wrongful convictions presents a stark contrast between global practices and the Indian scenario. While several countries have integrated DNA technology robustly into their criminal justice systems—both as a tool for conviction and exoneration—India remains at a relatively early stage in terms of infrastructure, legal standards, and systemic reliance on forensic science for ensuring justice. The contrast can be explored across multiple dimensions: institutional frameworks, legal safeguards, use in post-conviction reviews, awareness, and procedural implementation.

1. Institutional Frameworks and Exoneration Mechanisms

Globally, particularly in the United States, United Kingdom, and Canada, the use of DNA evidence has been institutionalised within the criminal justice system. Organisations like the **Innocence Project** in the U.S. have pioneered efforts to revisit old convictions using DNA testing. Courts in these countries have accepted post-conviction DNA evidence as valid grounds for re-opening cases, resulting in hundreds of exonerations. Legal frameworks in these jurisdictions facilitate such reviews through well-defined procedures, access to preserved evidence, and cooperation between forensic labs and legal aid bodies.

In contrast, **India lacks a formal exoneration mechanism** based on post-conviction DNA testing. There is no equivalent to the Innocence Project, and post-conviction DNA review is rare and procedurally complex. While Indian courts have occasionally acknowledged DNA evidence in appeals, such interventions are infrequent and usually initiated only in high-profile cases. Additionally, evidence preservation in India is inconsistent, limiting the availability of biological material for testing long after conviction.

2. Legal Standards and Forensic Infrastructure

Globally, forensic science laboratories are highly regulated, accredited, and subject to quality control protocols. DNA testing is routinely used in both investigation and trial phases, and in many cases, is mandated by law. Legal standards are well-developed for the admissibility and interpretation of DNA evidence.

India, on the other hand, suffers from **underdeveloped forensic infrastructure**, a shortage of trained personnel, and a lack of uniform protocols across states. Although DNA evidence is admissible under the Indian Evidence Act, its collection, handling, and analysis are often flawed due to procedural lapses or insufficient expertise. The **DNA Technology (Use and Application) Regulation Bill**, which aims to establish regulatory bodies and quality assurance measures, has yet to become law, leaving a regulatory vacuum.

3. Use in Preventing and Correcting Wrongful Convictions

In the global context, DNA evidence plays a critical role in **correcting miscarriages of justice**. Courts are generally receptive to forensic re-evaluation, especially when traditional forms of evidence such as eyewitness testimony have proven unreliable. In the U.S., for example, over 70% of DNA-based exonerations involved mistaken identity.

In India, wrongful convictions rarely come to light through DNA testing. Instead, many are identified through lengthy appeals or media attention. The lack of routine DNA testing in criminal trials, combined with weak evidence preservation protocols, hinders its use as a corrective mechanism. Moreover, public defenders and legal aid systems often lack the resources to advocate for DNA testing on behalf of convicts.

4. Awareness and Legal Literacy

Globally, there is a high degree of awareness among legal practitioners, law enforcement, and civil society about the probative value of DNA evidence. Training programs, continuing legal education, and academic research support its judicious use.

In India, while awareness is growing, **legal literacy among police, lawyers, and even judges** regarding DNA technology and its limitations is uneven. This can lead to misuse, misinterpretation, or overreliance on DNA evidence without contextual analysis, potentially undermining fair trials.

In summary, while DNA evidence has transformed the criminal justice landscape in many countries by actively preventing and remedying wrongful convictions, **India is yet to harness its full potential**. The global scenario demonstrates how institutional support, legal safeguards, forensic infrastructure, and awareness can make DNA testing a pillar of justice. For India to bridge this gap, reforms are needed in legislation, forensic capacity-building, evidence preservation protocols, and access to post-conviction review mechanisms. Only through such structural changes can DNA evidence effectively contribute to the reduction of wrongful convictions in the Indian context.

Ways of Containing Wrongful Convictions Through DNA Evidence

DNA evidence is a scientifically reliable tool for identifying individuals and plays a crucial role in reducing and correcting wrongful convictions. The effectiveness of DNA in containing such miscarriages of justice depends on a combination of **legislative support, forensic infrastructure, judicial willingness, and procedural safeguards**. Globally, the following methods are commonly used:

I. Global Best Practices to Contain Wrongful Convictions Through DNA Evidence

1. Post-Conviction DNA Testing

- Allows convicts to request DNA reanalysis of evidence to prove innocence.
- Legal frameworks ensure access to biological evidence even after conviction.
- Supported by bodies like the **Innocence Project (USA)** and government-funded forensic units.

2. Mandatory DNA Collection in Serious Crimes

- Automatic collection and preservation of biological samples in crimes like rape and murder.
- Enables future testing if initial convictions are challenged.

3. Centralised DNA Databases

- Databases help match crime scene DNA with known offenders or wrongly convicted persons.
- Reduces reliance on eyewitness testimony or confessions.

4. Strict Forensic Protocols

- Accredited labs follow standard operating procedures to prevent contamination.
- Chain of custody is strictly maintained, ensuring integrity of evidence.

5. Legal and Judicial Reform

- Laws explicitly allow DNA evidence to override previously accepted but flawed evidence.
- Judicial officers are trained in forensic science, ensuring proper interpretation of DNA reports.

6. Public Defenders and Legal Aid Support

- Public defenders are trained to request DNA tests and challenge flawed convictions.

- Funding is provided for DNA testing where defendants cannot afford it.

II. Current Methods Used by the Indian Government

India has taken **preliminary steps** toward integrating DNA evidence to prevent wrongful convictions, but systemic use remains limited and inconsistent. Below are the existing methods in practice:

1. Admissibility of DNA Evidence in Courts

- DNA evidence is **admissible** under the **Indian Evidence Act**, and courts increasingly rely on it in cases of sexual assault and homicide.
- However, it is not yet **mandatory**, and its use varies across jurisdictions.

2. Forensic Infrastructure and Laboratories

- Several **state forensic science laboratories (FSLs)** and the **Central Forensic Science Laboratory (CFSL)** under the Ministry of Home Affairs conduct DNA testing.
- India has around 30+ FSLs with DNA testing capability, but **equipment, personnel, and backlog remain major constraints**.

3. DNA Technology (Use and Application) Regulation Bill

- Aims to establish a **National DNA Data Bank** and regional data banks.
- Provides for **DNA Profiling Boards** to set quality standards.
- Introduces provisions for use of DNA for identification in criminal and civil matters.
- **Status:** Passed by the Lok Sabha in 2019 but **pending approval in the Rajya Sabha** as of now.

4. Preservation of Biological Evidence

- There is **no uniform national policy** on the long-term preservation of DNA or biological evidence post-conviction.
- This significantly limits the ability to conduct post-conviction DNA reviews.

5. Use in Sexual Assault Investigations

- The **Criminal Law (Amendment) Act, 2013** mandates collection of DNA evidence in rape cases.
- The Ministry of Women and Child Development has promoted the use of **Sexual Assault Evidence Collection (SAEC) kits**, especially under schemes like '**One Stop Centres**' for survivors.

6. Judicial Precedents

- Indian courts have recognised the value of DNA evidence in overturning convictions or acquitting accused individuals, though such instances are rare.
- However, DNA evidence is **not yet central to post-conviction review mechanisms**.

7. Capacity-Building and Training

- Some efforts are being made to train police officers, prosecutors, and forensic experts.
- Institutions like the **National Institute of Criminology and Forensic Science (NICFS)** offer limited modules on DNA technology.

While globally, DNA evidence is a well-established tool in **preventing, detecting, and correcting** wrongful convictions, India's framework remains underdeveloped. The Indian government has made **initial strides** by enabling admissibility, enhancing forensic lab capabilities, and introducing regulatory legislation. However, the absence of **mandatory preservation laws**, the **pending status** of the DNA Regulation Bill, and the **limited use of post-conviction DNA review** continue to hamper its effectiveness.

For India to contain wrongful convictions through DNA evidence meaningfully, it must:

- **Enact the pending DNA Bill** with safeguards on privacy and misuse.
- **Standardise procedures** for evidence collection and preservation.
- **Invest in forensic infrastructure**, training, and capacity-building.
- **Institutionalise post-conviction review mechanisms**, especially for undertrial and indigent prisoners.

Only with a combination of legal reform, technical competence, and judicial openness can DNA evidence fulfill its potential in protecting the innocent and strengthening the credibility of India's criminal justice system.

The following is a list of **leading cases—both global and Indian—where wrongful convictions were addressed using DNA evidence**, along with key judicial observations or outcomes. While such cases are widespread in countries like the United States and the UK, India has only a few examples due to structural limitations around post-conviction DNA testing.

I. Global Cases and Lead Judgments

1. *Kirk Bloodsworth* (United States)

- **Year of Conviction:** 1985
- **Charge:** Rape and murder of a 9-year-old girl
- **Wrongful Conviction Overturned:** 1993
- **Significance:** First American on death row exonerated by DNA evidence
- **Judicial Outcome:** The Maryland Court of Appeals ordered his release after post-conviction DNA testing proved the semen sample did not match Bloodsworth.
- **Impact:** Led to reform in death penalty review cases and the establishment of DNA databases in the U.S.

2. *The Central Park Five* (New York, United States)

- **Year of Conviction:** 1989
- **Charge:** Rape and assault of a jogger
- **Exoneration:** 2002
- **DNA Role:** The DNA did not match any of the accused; the real perpetrator later confessed and was confirmed by DNA
- **Judicial Outcome:** Convictions were vacated by the New York Supreme Court
- **Impact:** National spotlight on racial bias, coercive interrogation, and wrongful convictions; used as a landmark case in legal reforms for juveniles

3. *Sean Hodgson* (United Kingdom)

- **Year of Conviction:** 1982
- **Charge:** Rape and murder
- **Exoneration:** 2009

- **Judicial Outcome:** Conviction quashed by the Court of Appeal after DNA from the crime scene failed to match Hodgson
- **Impact:** Raised questions about evidence preservation and led to changes in police file review protocols

II. Indian Context: Emerging and Rare Examples

India does not have a long history of overturning wrongful convictions through DNA evidence, primarily due to poor evidence preservation, lack of a formal post-conviction review mechanism, and limited access to DNA testing. However, a few notable cases demonstrate its increasing legal relevance.

1. *Santosh Kumar Singh v. State through CBI, (2010) 9 SCC 747*

- **Context:** Convicted for the rape and murder of law student Priyadarshini Mattoo
- **Role of DNA:** The DNA matched Singh's semen with the sample taken from the victim
- **Initially Acquitted:** Trial court gave the benefit of doubt despite DNA match
- **Reversal:** Delhi High Court reversed the acquittal and Supreme Court upheld the conviction in 2010
- **Importance:** One of the first high-profile Indian cases where **DNA was central to conviction and upholding justice**

2. *State of Himachal Pradesh v. Rajiv Jassi, 2016 SCC OnLine HP 3501*

- **Charge:** Rape
- **Role of DNA:** Accused was convicted based on matching DNA evidence
- **Appeal Outcome:** Himachal Pradesh High Court reaffirmed that **DNA evidence can override inconsistencies in witness statements**, as it is scientifically objective
- **Judicial Note:** Emphasised the reliability of DNA in sexual offences where the victim may be a minor or hostile

3. *Mukesh & Anr v. State (NCT of Delhi) – Nirbhaya Case, (2020) 10 SCC 120*

- **Context:** Brutal gang rape and murder (2012)
- **Role of DNA:** DNA from bloodstains and semen samples matched the accused

- **Judicial Note:** Supreme Court upheld the use of DNA as highly reliable scientific evidence in rape and murder cases
- **Impact:** While not a case of wrongful conviction, it set **a precedent for DNA as conclusive forensic evidence**, strengthening its use in appeals and trials

4. *Rajesh v. State of Madhya Pradesh*, (2022) 3 SCC 350

- **Charge:** Rape and murder of a minor
- **Outcome:** Supreme Court overturned the conviction due to **lack of proper DNA evidence and procedural lapses**
- **Importance:** Affirmed that **absence or mishandling of DNA evidence can invalidate a conviction**, especially in capital cases

Globally, DNA evidence has been pivotal in **freeing hundreds of wrongfully convicted individuals**, many of whom were sentenced to life imprisonment or death. In countries like the U.S. and the UK, **post-conviction DNA testing is a well-established legal right** with active support from civil society and the judiciary.

In India, while DNA is admissible and increasingly recognised as critical forensic evidence, **its role in overturning wrongful convictions is still evolving**. High-profile cases have helped courts appreciate its value, but systemic reforms are needed to ensure access to DNA testing, preserve biological evidence, and integrate forensic science into post-conviction review processes.