Page 4170 - 4190 **DOI:** *https://doij.org/10.10000/IJLMH.119552*

INTERNATIONAL JOURNAL OF LAW MANAGEMENT & HUMANITIES

[ISSN 2581-5369]

Volume 8 | Issue 2

2025

Evidentiary Value and Admissibility of Forensic Evidence

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ABSTRACT

The admissibility of forensic evidence in India has become critical in criminal adjudication. Courts have relied increasingly on DNA, voice samples, cyber forensics, and fingerprint analysis. However, statutory clarity on collection, preservation, and authentication remains scattered across procedural laws. "Section 45 of the Indian Evidence Act, 1872" acknowledges expert opinion as relevant fact, but not conclusive evidence. "The Code of Criminal Procedure, 1973" further supplements this under "Sections 53, 53A, 54 and 293", enabling medical examination and submission of expert reports by government scientific experts.

Yet inconsistencies remain. The absence of a uniform law on forensic evidence has led to varied judicial interpretations. In "Selvi v. State of Karnataka, (2010) 7 SCC 263, the Supreme Court held that involuntary administration of narco-analysis, polygraph, and BEAP tests violate Article 20(3) of the Constitution". The Court emphasized procedural fairness, consent, and privacy. This verdict exposed the tension between investigatory efficiency and constitutional protection. Courts now insist on informed consent and magistrate supervision for intrusive forensic techniques.

"The Criminal Procedure (Identification) Act, 2022" expanded the scope of bodily measurements, including biometric and biological samples. While useful in law enforcement, it raised concerns of privacy violations. In "Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1, the right to privacy was declared a fundamental right under Article 21", adding constitutional scrutiny to forensic procedures. Judicial discretion remains central in assessing evidentiary reliability.

Forensic reports are persuasive, not determinative. Indian courts prefer corroboration. The evidentiary value hinges on scientific rigor, proper chain of custody, and unbiased expert analysis. While forensic evidence enhances truth-finding, it must pass the dual tests of relevancy and reliability, aligned with constitutional safeguards.

***Keywords**: Forensic Evidence, Expert Opinion, Admissibility, Indian Evidence Act, Criminal Procedure Code.*

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 [ISSN 2581-5369]

I. INTRODUCTION

Forensic science bridges law and modern technology in the criminal justice process. It offers objectivity where memory fades or testimony gets manipulated. Indian courts increasingly rely on scientific methods to determine guilt and innocence. Expert opinion becomes relevant under Section 45 of the Indian Evidence Act, 1872[3]. But the law doesn't define standards for expert reliability or method validation. DNA, fingerprints, cyber evidence, voice samples are now integral to legal investigation[4]. Such evidence is often presented through lab reports or expert depositions. However, courts remain cautious while relying solely on scientific evidence. Forensic findings are not regarded as substantive proof under current law[5]. They function as corroborative or assistive evidence rather than conclusive fact.

"The Code of Criminal Procedure, 1973" supplements this through various enabling provisions. "Sections 53 and 53A" permit medical examination of accused with or without consent[6]. Section 293 allows expert reports from government labs to be read as evidence in trial[7]. "Criminal Procedure (Identification) Act, 2022" empowers data collection beyond fingerprints[8]. Iris scans, retina data, handwriting and biometric samples are now legally collectible. This expansion raises ethical, procedural, and privacy-related concerns[9]. Courts must now balance effective policing with fundamental rights of individuals. In "*Justice K.S. Puttaswamy v. Union of India*, (2017) 10 SCC 1", privacy was held fundamental[10]. Any forensic process touching bodily integrity must be backed by necessity and legality. "*Selvi v. State of Karnataka*, (2010) 7 SCC 263", invalidated involuntary narco and polygraph tests[11].

"The right against self-incrimination under Article 20(3)" protects the accused from coercive extraction. In *Selvi*, the Court held that "testimonial compulsions" included involuntary scientific tests[12]. Thus, forensic tools must conform to constitutional mandates and procedural fairness. The Indian forensic landscape remains fragmented in statutory regulation and procedural uniformity. Different states follow inconsistent practices on lab accreditation and expert training[13]. Many labs lack modern equipment or forensic validation standards, reducing

[3] Indian Evidence Act, 1872, § 45, No. 1, Acts of Parliament, 1872 (India).
[4] Kusum Chauhan, "Admissibility and Evidentiary Value of Scientific Evidence", 8 IJRTI 146, 147 (2023).
[5] Id
[6] "Code of Criminal Procedure, 1973, §§ 53, 53A, No. 2, Acts of Parliament, 1974 (India)".
[7] Id., § 293.
[8] "Criminal Procedure (Identification) Act, 2022, No. 11, Acts of Parliament, 2022 (India)".
[9] Aayushi Kumari, "Admissibility and Evidentiary Value of Forensic Evidence in India", 5 INDIAN J. L. & LEGAL RES. 1, 3 (2023).
[10] "Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1".
[11] "Selvi v. State of Karnataka, (2010) 7 SCC 263".
[12] Id
[13] Gaurav Chandra & Ranjana Sharma, Admissibility of Forensic Evidence in Investigations, 9 J. LEGAL STUD.

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evidentiary quality. Cases like "*State of H.P. v. Jai Lal*, (1999) 7 SCC 280", highlight the cautious role of courts[14]. The Court stressed that expert opinions must be tested and not blindly accepted. Without corroboration, reliance on expert reports can endanger fair trial standards. The court acts as the "expert of experts" while evaluating technical reports[15].

"The Malimath Committee Report (2003)" had recommended greater reliance on scientific tools. It urged integration of forensic science with all serious offences for effective investigation[16]. The Ministry of Home Affairs recently issued orders for mandatory forensic probes in serious crimes[17]. Delhi Police implemented "Standard Order No. Crime/31/2022" for this mandate[18]. However, mere inclusion of science is insufficient without legal safeguards and evidentiary clarity. Internationally, jurisdictions like the US follow stricter forensic admissibility tests. "*Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993)" laid down expert admissibility criteria[19]. The test includes scientific validity, peer review, error rate and general acceptance[20]. India lacks a similar uniform standard for testing forensic reliability in courts. This creates discretional inconsistency and potential for miscarriages of justice. The UK applies tests of assistance, relevant expertise, impartiality and evidentiary reliability[21]. "Law Commission of England and Wales in its Report No. 325" highlighted need for structured forensic rules[22].

India still awaits codification of rules dealing with expert admissibility and scientific methods. Misuse, mishandling, or delay in forensic evidence undermines the trial process. Chain of custody breaches often make vital evidence inadmissible or open to challenge. Forensic testimony must be transparent, reproducible, and collected without violation of rights. Failure to follow due process renders even accurate science legally worthless. Thus, admissibility must align with relevance, authenticity and procedural due process.

II. FORENSIC EVIDENCE—CONCEPTUAL AND LEGAL FRAMEWORK

& RES. 154, 158 (2023).
[14] "State of H.P. v. Jai Lal, (1999) 7 SCC 280".
[15] Id
[16] "Ministry of Home Affairs, Press Release on Forensic Science Capabilities, PIB (Aug. 2022), https://www.pib.gov.in/PressReleasePage.aspx?PRID=1837146."
[17] Id
[18] The Hindu, Delhi Police First Force to Make Collection of Forensic Evidence Mandatory, (Aug. 2022), https://www.thehindu.com/news/cities/Delhi/delhi-police-first-force-to-make-collection-of-forensic-evidence-mandatory/article65831296.ece.
[19] Daubert v. Merrell Dow Pharmaceuticals Inc., 509 U.S. 579 (1993).
[20] Id
[21] "Law Commission of England and Wales, Expert Evidence in Criminal Proceedings in England and Wales, LAW COM No. 325 (2011)."
[22] Id

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Forensic evidence is scientific data used to prove facts in legal proceedings. It includes fingerprints, handwriting, voice, DNA, blood, digital trails, and ballistic residue. It connects the accused to the offence through physical and circumstantial markers. In India, forensic science supports crime detection, but its legal admissibility needs precision[23]. Legal recognition depends on statutory interpretation, judicial discretion, and constitutional compatibility. "The Indian Evidence Act, 1872" forms the foundation of admissibility of expert opinion[24]. "Section 45" recognises the relevance of expert opinion in science, art, fingerprint, or handwriting. Experts assist the court in interpreting technical evidence beyond judicial understanding[25]. They don't witness the crime; they interpret consequences of criminal activity. Their opinion has no conclusive force unless supported by corroborative material.

Section 46 adds that facts supporting or contradicting expert opinions are relevant. Section 51 allows courts to examine the grounds of the expert's conclusions. Courts are not bound to accept expert evidence without careful judicial scrutiny[26]. The judge remains the final authority on admissibility and evaluation of expert views. In "*State of H.P. v. Jai Lal*, (1999) 7 SCC 280", the court held expert opinion is advisory. The opinion must be reliable, supported by scientific method and tested evidence[27]. Section 73 authorises judges to compare handwriting or signature for verification. But this power must be exercised with caution and only when unavoidable.

"The Code of Criminal Procedure, 1973" complements the evidentiary law through procedural provisions. "Section 53 permits examination of an arrested person by medical practitioners"[28]. It allows reasonable force if accused refuses cooperation and if request is reasonable. Section 53A is specific to rape cases and mandates medical examination of the accused. Section 54 extends this power to accused persons claiming police assault during custody. Section 293 allows government scientific experts' reports to be read as evidence. These experts include chemical examiners, fingerprint bureau officers, forensic doctors. The court may also summon the expert for cross-examination if necessary. Section 164A deals with medical examination of rape victims within 24 hours of complaint[29].

"The Identification of Prisoners Act, 1920" governed fingerprint and handwriting collection. It was replaced by the "Criminal Procedure (Identification) Act, 2022" for broader coverage. The

[23] Aayushi Kumari, "Admissibility and Evidentiary Value of Forensic Evidence in India", 5 INDIAN J. L. & LEGAL RES. 1, 2 (2023).
[24] "Indian Evidence Act, 1872, § 45, No. 1, Acts of Parliament, 1872 (India)".
[25] Gaurav Chandra & Ranjana Sharma, Admissibility of Forensic Evidence in Investigations, 9 J. LEGAL STUD. & RES. 154, 156 (2023).
[26] Indian Evidence Act, 1872, §§ 46, 51, 73, No. 1, Acts of Parliament, 1872 (India).
[27] "State of H.P. v. Jai Lal, (1999) 7 SCC 280".
[28] "Code of Criminal Procedure, 1973, §§ 53, 53A, 54, No. 2, Acts of Parliament, 1974 (India)".
[29] "Code of Criminal Procedure, 1973, §§ 293, 164A, No. 2, Acts of Parliament, 1974 (India)".

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2022 Act allows biometric and biological sample collection from all arrested persons[30]. It empowers magistrates and authorised police officers to direct collection. This includes retina scans, iris patterns, voice samples, and behavioural attributes. Concerns arise due to vague definitions and absence of data protection safeguards. "*Article 21 demands procedure established by law must be just, fair and reasonable. The Supreme Court in Justice K.S. Puttaswamy v. Union of India, (2017) 10 SCC 1*", upheld privacy. Any bodily intrusion must be necessary, proportionate, and have statutory backing[31].

"The Constitution under Article 20(3) protects against self-incrimination. In *Selvi v. State of Karnataka*, (2010) 7 SCC 263", the court barred involuntary narco, polygraph tests. The tests amounted to testimonial compulsion and violated bodily autonomy[32]. Such forensic techniques without consent breach fundamental rights and cannot be admissible. However, DNA and blood samples are considered physical evidence, not testimonial in nature. The Court distinguished between communicative and non-communicative evidence collection. Still, procedural safeguards must be followed strictly to avoid miscarriage of justice.

The evidentiary strength of forensic reports lies in collection, storage, and analysis standards. If chain of custody breaks, the evidence becomes inadmissible. Courts emphasise documentation and integrity of sample during transfer and examination[33]. In "*Manu Sharma v. State (NCT of Delhi), (2010) 6 SCC 1, courts heavily relied on forensic evidence. The ballistic reports and fingerprints linked the accused to the crime scene. But the evidence was corroborated with other witness testimony and CCTV footage*". Forensic opinion alone was not treated as sufficient for conviction.

Forensic science includes several branches: toxicology, serology, odontology, digital forensics. Digital evidence includes cyber trails, email records, location data, call logs, etc. Such data needs certification under "Section 65B of the Indian Evidence Act. In *Anvar P.V. v. P.K. Basheer*, (2014) 10 SCC 473", the Supreme Court clarified electronic evidence rules. The certificate under Section 65B(4) is mandatory for admissibility of electronic records[34]. Absence of proper certification makes the evidence inadmissible despite its reliability.

Voice samples are now frequently used for identification of suspects. The Supreme Court in "*Ritesh Sinha v. State of Uttar Pradesh*, (2019) 8 SCC 1" allowed voice samples. "It recognised

[30] "Criminal Procedure (Identification) Act, 2022, No. 11, Acts of Parliament, 2022 (India)".
[31] "Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1".
[32] "Selvi v. State of Karnataka, (2010) 7 SCC 263".
[33] Kusum Chauhan, "Admissibility and Evidentiary Value of Scientific Evidence", 8 IJRTI 146, 148 (2023).
[34] "Anvar P.V. v. P.K. Basheer, (2014) 10 SCC 473".

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that the right to privacy is not absolute and must be balanced with public interest[35]. The court invoked Article 142 to fill legislative vacuum until Parliament enacts a law". This sets a precedent for collecting forensic samples within constitutional limits. But the collection must be voluntary or sanctioned by magistrate through legal procedure.

Forensic evidence is admissible if it is relevant, reliable and collected lawfully. It is not binding but persuasive when supported by proper documentation. Indian courts continue to assert that expert evidence must be tested, not blindly followed. The judiciary functions as a filter to ensure scientific accuracy meets legal standards. This creates a balance between investigative effectiveness and individual rights protection. Despite technological advances, absence of uniform forensic legislation limits progress. Codification of standards, lab accreditation, and judicial training is urgently needed. This would ensure forensic evidence aids justice, not compromise it.

III. EVIDENTIARY VALUE OF FORENSIC EVIDENCE

"Forensic evidence holds persuasive strength, not conclusive weight, in Indian criminal trials. Courts treat expert opinion under Section 45 of the Indian Evidence Act" as relevant, not binding[36]. The judge remains the sole authority to evaluate the evidentiary force of forensic opinion. Scientific findings aid judicial determination, but cannot override facts proved through witnesses[37]. The probative value of forensic evidence depends on proper procedures and corroborative support. Improperly collected or analysed samples weaken the evidentiary credibility of scientific input. Experts interpret evidence but do not prove the crime occurred. Their role is advisory.

In "*State of H.P. v. Jai Lal*, (1999) 7 SCC 280", the Supreme Court clarified this limitation. The Court said that expert opinions are not binding and must be examined like any other evidence[38]. Judges must assess the methodology, reasoning, and credibility of expert testimony. In "*Murari Lal v. State of M.P.*, (1980) 1 SCC 704", the Supreme Court observed forensic value depends on objectivity[39]. The Court stressed that scientific evidence without corroboration is insufficient for conviction. The evidentiary weight increases when there's consistency with other direct or circumstantial evidence. Reports unsupported by clear methodology or lacking neutrality are often discarded.

[35] "Ritesh Sinha v. State of Uttar Pradesh, (2019) 8 SCC 1".
[36] "Indian Evidence Act, 1872, § 45, No. 1, Acts of Parliament, 1872 (India)".
[37] Kusum Chauhan, "Admissibility and Evidentiary Value of Scientific Evidence", 8 IJRTI 146, 147 (2023).
[38] "State of H.P. v. Jai Lal, (1999) 7 SCC 280".
[39] Murari Lal v. State of M.P., (1980) 1 SCC 704.

DNA evidence is often considered reliable due to high accuracy rates. In the "*Nirbhaya Gang Rape Case"*, DNA and bite mark analysis played a crucial role[40]. The Court accepted forensic findings because chain of custody and procedural compliance were maintained. In "*Santosh Kumar Singh v. State*, (2010) 9 SCC 747", the Court relied on DNA and semen analysis. The conviction was upheld as the forensic results matched with oral and circumstantial evidence[41]. Yet, DNA must always be backed by certified lab reports and expert examination in court. Samples must be sealed, documented, and processed without delay or contamination. Breaches in sample handling can render results inadmissible despite their scientific soundness.

Ballistic reports establish links between bullets, firearms, and crime scenes. In "*State of Punjab v. Jugraj Singh*, (2002) 3 SCC 234", the Supreme Court upheld such linkage[42]. The expert's ballistic report helped trace the weapon used in the homicide. The Court highlighted that consistency between ballistic evidence and other facts strengthened prosecution's case. However, in "*S. Gopal Reddy v. State of A.P.*, (1996) 4 SCC 596", reliance on inconclusive forensic results was criticised. Ballistic reports alone, when contradictory, failed to provide adequate basis for conviction. Thus, courts often demand confirmatory evidence even for scientifically derived inputs.

Fingerprint evidence is generally treated as strong identification material. Section 73 of the Evidence Act allows judges to compare disputed fingerprints with admitted ones[43]. But courts rarely rely on their own visual comparison unless assisted by expert analysis. In "*Mohd. Aman v. State of Rajasthan*, (1997) 10 SCC 44", fingerprint matching helped establish identity[44]. The Court admitted fingerprint evidence as valid due to expert support and clarity of ridge analysis. If partial, smudged, or unclear, fingerprint evidence may lack persuasive value. Authenticity, storage, and expert neutrality remain crucial factors.

Electronic and digital forensic evidence also increasingly shapes modern adjudication. In "*Anvar P.V. v. P.K. Basheer*, (2014) 10 SCC 473", the Court ruled Section 65B certificate mandatory[45]. This ensured authenticity and prevented manipulation of digital data such as videos, chats, emails. Electronic records submitted without proper certification have no evidentiary value. Courts also consider metadata and digital trails for analysing cybercrime and financial fraud. Digital evidence, while compelling, is vulnerable to editing, delays, or

[40] Aayushi Kumari, "Admissibility and Evidentiary Value of Forensic Evidence in India", 5 INDIAN J. L. & LEGAL RES. 1, 4 (2023).
[41] "Santosh Kumar Singh v. State, (2010) 9 SCC 747".
[42] "State of Punjab v. Jugraj Singh, (2002) 3 SCC 234".
[43] "Indian Evidence Act, 1872, § 73, No. 1, Acts of Parliament, 1872 (India)".
[44] "Mohd. Aman v. State of Rajasthan, (1997) 10 SCC 44".
[45] "Anvar P.V. v. P.K. Basheer, (2014) 10 SCC 473".

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incomplete logs. Proper verification by certified forensic experts becomes essential to avoid technical tampering.

Voice samples have evidentiary relevance in identifying accused persons in telephonic threats or recordings. In "*Ritesh Sinha v. State of Uttar Pradesh*, (2019) 8 SCC 1", the Supreme Court allowed voice sampling[46]. The Court permitted voice sample collection under judicial discretion, pending legislative codification. Voice spectrography must be performed in certified labs to gain credibility. It must also match with original audio without background distortion. Evidence becomes weak if voice sample quality is poor or context is unclear.

The evidentiary value of forensic science also depends on lab accreditation. Non-standard labs may produce flawed, unverifiable, or biased results. In "*K.V. Raju v. State of Karnataka*, (2006) 6 SCC 728", expert testimony from a non-accredited lab was rejected[47]. Chain of custody violations, lab errors, or technician bias can nullify probative value. Judges are cautious of giving primacy to evidence without procedural safeguards. Expert credibility, scientific transparency, and judicial scrutiny define weight of such reports.

Corroboration remains a recurring judicial demand in forensic-heavy cases. In "*Sunil Dattatraya Vaskar v. State of Maharashtra*, 2019 SCC OnLine Bom 5595", forensic evidence was deemed insufficient[48]. The Court required independent evidence as the medical report alone did not establish offence. This reflects judicial reluctance to rely exclusively on expert opinion.

Forensic reports serve as corroborative or confirmatory evidence in the chain of proof. They bridge gaps in human testimony but cannot substitute legal burden of proof. Forensic science strengthens prosecution but cannot replace foundational elements of fair trial. Judicial evaluation must consider method, motive, and consistency of scientific findings. Failure to do so may result in wrongful conviction or acquittal.

IV. CONSTITUTIONAL DIMENSIONS AND LIMITATIONS

Forensic evidence interacts with constitutional rights in every criminal investigation. Article 20(3) protects accused persons from testimonial compulsion during evidence collection[49]. It prohibits the prosecution from forcing an accused to be a witness against themselves. Article 21 guarantees the right to life and personal liberty under fair and just procedure[50]. The Supreme Court has interpreted both articles to apply in forensic examinations. The right to silence cannot

[46] "Ritesh Sinha v. State of Uttar Pradesh, (2019) 8 SCC 1".
[47] "K.V. Raju v. State of Karnataka, (2006) 6 SCC 728".
[48] "Sunil Dattatraya Vaskar v. State of Maharashtra, 2019 SCC OnLine Bom 5595".
[49] "INDIA CONST. art. 20, cl. 3."
[50] "INDIA CONST. art. 21."

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be violated under the guise of collecting expert evidence. Unlawful bodily intrusion without consent violates personal dignity and bodily autonomy.

In "*Selvi v. State of Karnataka*, (2010) 7 SCC 263", the Supreme Court clarified testimonial compulsion. Narco-analysis, polygraph tests, and brain electrical activation profiling were declared unconstitutional[51]. The Court held that such techniques extract personal knowledge without free consent. It stated that involuntary responses under chemical influence are testimonial in nature. The ruling extended Article 20(3) to non-verbal, involuntary, scientific techniques. It drew a line between physical evidence and cognitive revelations from within the mind. The judgment also discussed the need for consent and procedural safeguards before testing.

In *Selvi*, the Court stated, "forcibly obtaining information from an accused's mind" violates liberty[52]. It held that no person shall be compelled to disclose personal mental processes involuntarily. The principle of voluntariness now governs all intrusive forensic techniques. This includes consent-based voice samples, lie detector tests, and psychological mapping. The ruling mandates medical, judicial, and procedural oversight for admissibility. Courts must strike a balance between truth discovery and civil liberties. The prosecution cannot secure conviction by trampling constitutional protections.

Article 21, after "*Maneka Gandhi v. Union of India*, (1978) 1 SCC 248", requires due process in law. Forensic procedures must adhere to fairness, reasonableness, and non-arbitrariness[53]. Even physical evidence like blood, semen, hair, DNA must be collected under legal authority. Failure to observe procedure established by law makes evidence constitutionally suspect. In "*K.S. Puttaswamy v. Union of India*, (2017) 10 SCC 1", the Supreme Court recognised privacy as fundamental[54]. The right to privacy extends to body, data, biometrics, and informational autonomy. This affects how biometric forensic data like iris, retina, voice and DNA is used. Investigative urgency cannot override constitutionally protected bodily privacy.

"The Criminal Procedure (Identification) Act, 2022" authorises collection of biometric samples. It includes fingerprints, iris, palm prints, retina scans, voice and biological samples[55]. These measures raise concern over indiscriminate data collection from undertrials and convicts. Section 3 of the Act permits collection even in preventive detention or minor offences. Section 6 allows retention of data for 75 years unless person is acquitted. There is no judicial

[51] "Selvi v. State of Karnataka, (2010) 7 SCC 263".
[52] Ibid.
[53] "Maneka Gandhi v. Union of India, (1978) 1 SCC 248".
[54] "Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1".
[55] "Criminal Procedure (Identification) Act, 2022, No. 11, Acts of Parliament, 2022 (India)".

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supervision, data protection framework, or destruction protocol. Experts fear this violates *Puttaswamy* principles of necessity and proportionality[56].

The test of proportionality set out in "*Modern Dental College v. State of Madhya Pradesh*, (2016) 7 SCC 353" applies. It mandates four conditions: legitimacy of purpose, rational connection, necessity, and balancing of rights[57]. Any intrusion by forensic technique must satisfy all these elements to be constitutionally valid. Indiscriminate or excessive use of science without safeguards fails this test. Forensic law must not treat accused as mere subjects of scientific experimentation.

Article 22 ensures procedural protection for arrested persons. Any forensic test ordered without informing rights and legal counsel violates this article. An accused must be made aware of purpose, scope and legal consequence of the test. Failure to secure free, informed consent creates doubt on admissibility of the result. The Supreme Court in "*Nandini Satpathy v. P.L. Dani*, (1978) 2 SCC 424" held that silence is a right[58]. The police cannot compel response through threat, inducement, or scientific coercion.

Article 14 ensures equality before law and non-arbitrariness in state actions. Forensic testing cannot be used discriminatorily or without consistent legal standards. Different treatment for similarly placed persons under same test conditions violates equality. Selective forensic targeting without basis amounts to bias and constitutional infraction. State power to collect bodily evidence must be exercised without arbitrariness. Courts have held that the process of administering forensic science must be just and non-discriminatory.

Indian law distinguishes between testimonial and physical evidence. Blood, semen, and hair are considered physical evidence. In "*State of Bombay v. Kathi Kalu Oghad*, AIR 1961 SC 1808", the Court upheld fingerprinting[59]. It stated that physical identifiers like thumb impressions are not protected by Article 20(3). The judgment forms the basis for non-testimonial use of biological evidence. However, it did not envision modern scientific intrusions like neuroimaging or genetic testing. The ruling must be read with caution in contemporary forensic contexts.

The right to a fair trial under Article 21 includes the right to challenge evidence. Accused persons must be given access to forensic reports before trial. They must be allowed to cross-

[56] Gaurav Chandra & Ranjana Sharma, Admissibility of Forensic Evidence in Investigations, 9 J. LEGAL STUD. & RES. 154, 158 (2023).
[57] "Modern Dental College and Research Centre v. State of Madhya Pradesh, (2016) 7 SCC 353".
[58] Nandini Satpathy v. P.L. Dani, (1978) 2 SCC 424.
[59] "State of Bombay v. Kathi Kalu Oghad, AIR 1961 SC 1808".

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examine forensic experts in open court. Denial of opportunity to rebut violates natural justice and fair hearing. Courts must avoid accepting scientific evidence ex parte or without adversarial scrutiny.

Article 32 and Article 226 empower constitutional courts to strike down unlawful forensic practices. They act as safeguards against misuse of expert evidence or unregulated testing methods. In cases of custodial abuse under guise of forensic examination, courts may intervene. Public Interest Litigations have challenged illegal DNA profiling and mass biometric projects. Judiciary remains the primary protector of rights in the absence of forensic regulation. There is urgent need for national legislation harmonising science with civil liberties.

International law also influences constitutional interpretation. Article 17 of the ICCPR ensures protection against arbitrary interference with privacy[60]. Article 14 of ICCPR mandates presumption of innocence and fair trial rights. UN Guidelines on DNA collection stress voluntariness, privacy and procedural integrity. India, being a signatory, must align domestic law with global human rights standards.

The European Court of Human Rights in "*S. and Marper v. United Kingdom*, (2008) ECHR 1581 ruled on DNA retention". It struck down indefinite retention of DNA from acquitted persons as privacy violation[61]. This principle may influence Indian courts in evaluating the 75-year data retention under the 2022 Act. Right to be forgotten and informational control is now part of Indian privacy jurisprudence.

The challenge is to build a forensic regime compatible with fundamental rights. Science must assist justice, not become a tool for its dilution. Every forensic method must be checked against constitutional touchstones. The evidentiary pursuit cannot override the ethical imperative of respecting human dignity.

V. ADMISSIBILITY STANDARDS AND PROCEDURES

Section 45 of the Indian Evidence Act recognises opinions of experts in science and art[62]. These opinions must relate to facts in issue and help the court form a conclusion. Such opinions become admissible only if relevance and reliability are both satisfied. The court does not treat the expert as a witness of fact, but as an adviser. Admissibility depends not only on the opinion, but the method and basis of the opinion.

[60] "International Covenant on Civil and Political Rights, art. 17, opened for signature Dec. 16, 1966, 999 U.N.T.S. 171".
[61] "S. and Marper v. United Kingdom, (2008) ECHR 1581".
[62] "Indian Evidence Act, 1872, § 45, No. 1, Acts of Parliament, 1872 (India)".

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Section 46 permits the introduction of facts that support or contradict expert opinion[63]. "Section 51" allows the court to examine the grounds on which expert opinions rest. These three provisions together form the legal foundation for admitting scientific evidence. Expert evidence must be cogent, consistent, and backed by empirical technique.

The Code of Criminal Procedure adds procedural legitimacy to expert inputs in trial. "Section 293 of CrPC" permits government scientific expert reports to be submitted without oral evidence[64]. However, courts may summon such experts if their opinions are challenged or require clarification. Sections 53 and 53A allow bodily examination of the accused by medical professionals[65]. Such examinations must be for the purpose of the investigation and must be recorded in writing.

In "*Selvi v. State of Karnataka*, (2010) 7 SCC 263", the Court laid down consent-based safeguards. Scientific tests like narco-analysis require consent and judicial supervision for admissibility[66]. Absence of consent renders the results inadmissible, even if factually accurate. This constitutional safeguard redefined admissibility to include legality of evidence gathering.

Forensic evidence, to be admissible, must comply with both statutory and constitutional requirements. Courts evaluate admissibility based on relevance, legality, probative value and procedural fairness. Admissibility does not ensure evidentiary weight; both are tested independently during trial.

Electronic records require specific compliance under Section 65B of the Indian Evidence Act. In "*Anvar P.V. v. P.K. Basheer*, (2014) 10 SCC 473", the Supreme Court made 65B certificate mandatory[67]. Failure to produce such certificate makes even authentic digital evidence inadmissible. The certificate must detail the manner, source and integrity of the electronic record.

In "*State of NCT of Delhi v. Navjot Sandhu*, (2005) 11 SCC 600", the Court admitted evidence without certificate. However, this ruling was overruled by *Anvar*, reinstating strict procedural compliance[68]. The chain of custody and originality of the evidence became central to admissibility standards.

Ballistic, serological, and DNA reports must also meet laboratory and accreditation benchmarks. Courts often assess whether tests were done in certified labs with standardised

[63] "Indian Evidence Act, 1872, §§ 46, 51, No. 1, Acts of Parliament, 1872 (India)".
[64] "Code of Criminal Procedure, 1973, § 293, No. 2, Acts of Parliament, 1974 (India)".
[65] "Code of Criminal Procedure, 1973, §§ 53, 53A, No. 2, Acts of Parliament, 1974 (India)".
[66] "Selvi v. State of Karnataka, (2010) 7 SCC 263".
[67] "Anvar P.V. v. P.K. Basheer, (2014) 10 SCC 473".
[68] "State of NCT of Delhi v. Navjot Sandhu, (2005) 11 SCC 600".

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procedures. In "*Manu Sharma v. State (NCT of Delhi)*, (2010) 6 SCC 1", expert reports were admitted after thorough scrutiny[69]. The court emphasised that such evidence gains admissibility only if not tampered or delayed.

The expert must also be qualified in the specific scientific domain to which the evidence relates. Qualifications, experience, and objectivity of the expert impact admissibility decisions. Cross-examination is critical for verifying the reliability and precision of expert findings. Without opportunity to cross-examine, courts often assign minimal weight to forensic reports.

Voice samples, a recent development in Indian law, have a unique admissibility trajectory. In "*Ritesh Sinha v. State of Uttar Pradesh*, (2019) 8 SCC 1", the Supreme Court allowed voice samples[70]. It directed magistrates to supervise the collection, pending formal legislative procedure. The ruling made admissibility subject to necessity, minimal intrusion and judicial approval.

In the US, admissibility of scientific evidence is governed by the Daubert standard. The Court in "*Daubert v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 (1993)", laid down reliability criteria[71]. Indian courts have not formally adopted this test, but often refer to it for guidance. Peer review, known error rate, scientific acceptance and methodology are part of admissibility inquiry.

In the UK, courts follow principles of assistance, relevance, impartiality, and expertise. These four pillars determine if expert evidence is admitted and used by the trier of fact. India lacks a statutory admissibility test, causing inconsistent application across jurisdictions. Judicial discretion fills the gap but may cause procedural uncertainty or unfairness.

Chain of custody forms an integral part of forensic admissibility. Courts expect evidence to be tracked from collection to presentation without interruption. Improper documentation or sample tampering leads to rejection of otherwise scientific material. Admissibility also depends on timeliness of examination, lab standards and method disclosure.

Reports under "Section 293" must disclose full methodology and interpretation of findings. Vague or conclusion-based reports without explanation are rarely accepted. The judiciary favours transparency over scientific jargon when assessing admissibility.

Admissibility requires that scientific evidence not violate fundamental rights. Evidence obtained by illegal detention, custodial violence or coercion is inadmissible. Courts exclude

[69] Manu Sharma v. "State (NCT of Delhi), (2010) 6 SCC 1".
[70] Ritesh Sinha v. "State of Uttar Pradesh, (2019) 8 SCC 1".
[71] "Daubert v. Merrell Dow Pharmaceuticals Inc., 509 U.S. 579 (1993)".

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such evidence under the exclusionary rule protecting personal liberty and dignity.

Forensic evidence cannot be admissible if it causes prejudice outweighing its probative value. Judges apply a balancing test when scientific inputs may confuse or mislead the jury. In India's bench trial system, judges act both as evaluator of fact and law. They must filter forensic material based on both legal technicalities and logical coherence.

VI. COMPARATIVE PERSPECTIVE (INDIA, USA, UK)

Indian courts rely on statutory interpretation, discretion, and constitutional tests for forensic admissibility. There is no codified scientific admissibility standard under Indian Evidence Act or CrPC. Section 45 of the Evidence Act treats expert opinion as relevant, not conclusive proof[72]. Admissibility depends on reliability, relevance, neutrality, and scientific method used by the expert. The judge decides the weight and admissibility without any pre-defined technical checklist.

In the United States, admissibility is governed by the *Daubert* standard and FRE Rule 702. In "*Daubert v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 (1993)", the Supreme Court reframed criteria[73]. Scientific evidence must be relevant, reliable, and based on valid scientific methodology. Courts must check peer review, testability, error rate, and general scientific acceptance. The *Daubert* standard overruled the previous *Frye* test from "*Frye v. United States*, 293 F. 1013 (1923)". *Frye* accepted only evidence "generally accepted" in the scientific community[74]. *Daubert* empowered judges as "gatekeepers" for expert testimony under Rule 104(a) of FRE.

The Federal Rules of Evidence, especially Rule 702, guides the qualification of expert witnesses. Experts must base their opinion on sufficient facts, reliable principles, and proper application[75]. American courts scrutinise methodology more than outcome to prevent "junk science". This results in exclusion of flashy but unverified forensic techniques from the courtroom.

In "*Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999)", the *Daubert* test was extended to all experts. Not just scientific experts, but also technical and specialised fields fall under same scrutiny[76]. This inclusion helps courts filter biased or irrelevant expertise, especially in civil litigation. The US model shows consistency in forensic scrutiny across federal and state courts.

[72] "Indian Evidence Act, 1872, § 45, No. 1, Acts of Parliament, 1872 (India)".
[73] Daubert v. Merrell Dow Pharmaceuticals Inc., 509 U.S. 579 (1993).
[74] Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).
[75] Federal Rules of Evidence, Rule 702 (U.S.).
[76] "Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999)".

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The United Kingdom uses a more holistic, structured, and guidance-based approach to forensic admissibility. The four-part test includes assistance to the court, relevant expertise, impartiality, and reliability[77]. The test was developed by the Law Commission in its 2011 Report No. 325 on expert evidence. UK courts check if the evidence helps the judge, and if the expert is qualified and unbiased. Scientific validity is checked through a framework but not always by detailed hearings.

In "*R v. Dlugosz* [2013] EWCA Crim 2", the Court stressed reliability before admitting expert opinion. The Court required that scientific evidence be grounded in proven methods and transparency[78]. UK judges often rely on "Criminal Practice Directions and Crown Prosecution Service guidelines". These instruments detail expert qualifications, disclosure obligations, and expected objectivity. The UK approach emphasises procedural fairness and avoids complex admissibility litigation.

India lacks both the rigorous "*Daubert"* scrutiny and the UK-style structured framework. Indian courts rely heavily on judicial discretion without pre-trial validation mechanisms. There is no statutory checklist or procedural code on forensic standards or lab accreditation. This causes variations in admissibility across states and benches. Evidence that passes in one court may be rejected in another due to inconsistency.

In "*Anvar P.V. v. P.K. Basheer*, (2014) 10 SCC 473", Indian courts imposed a strict procedural bar. Electronic records without "Section 65B" certificate became inadmissible despite authenticity[79]. This move resembles the rigid procedural adherence seen under FRE in the US. But unlike *Daubert*, there is no test for scientific merit in India's statutory scheme. Judges in India remain gatekeepers in theory, but without formal standards to evaluate science.

In "*Selvi v. State of Karnataka*, (2010) 7 SCC 263", the Court adopted a rights-based exclusion doctrine. It barred forensic techniques that breach fundamental rights, especially "Article 20(3) and Article 21"[80]. The ruling was unique to India, influenced by its constitutional protections over evidentiary value. In comparison, US and UK tests are neutral to the accused's constitutional position. India balances science with dignity, liberty, and privacy in its admissibility structure.

UK courts also consider proportionality in admitting intrusive forensic methods. India adopts a

[77] "Law Commission of England and Wales, Expert Evidence in Criminal Proceedings in England and Wales, LAW COM No. 325 (2011)".
[78] R v. Dlugosz [2013] EWCA Crim 2.
[79] "Anvar P.V. v. P.K. Basheer, (2014) 10 SCC 473".
[80] "Selvi v. State of Karnataka, (2010) 7 SCC 263".

similar principle through "*Puttaswamy* (2017) 10 SCC 1", applying the necessity doctrine[81]. Both jurisdictions now demand reasoned justification before allowing bodily or biometric intrusion. In the US, however, biometric collection has broader investigatory allowance under exceptions.

Chain of custody and procedural fairness are given high value in all three systems. In India, any lapse in documentation can render even accurate science inadmissible. In the US and UK, breach of custody or lab protocols usually discredits the report's weight. This commonality shows the universal role of transparency in scientific evidence presentation.

The Indian system must learn from both US and UK experiences. India needs codified standards, expert certification guidelines, and lab accreditation statutes. Judicial training on scientific literacy is also required for consistent admissibility practice. A hybrid model combining UK's structure and US's reliability test may serve India best. This would ensure fairness, consistency, and scientific precision in forensic justice delivery.

VII. JUDICIAL TRENDS AND ANALYSIS

Indian courts acknowledge the growing significance of forensic science in criminal adjudication. Yet they remain cautious about assigning conclusive value to expert evidence. Judicial approach balances scientific support with traditional testimonial proof. Courts focus on admissibility, weight, and constitutional compliance of forensic materials.

In "*State of H.P. v. Jai Lal*, (1999) 7 SCC 280", the Supreme Court clarified expert evidence status[82]. It ruled that expert opinion is advisory and cannot replace substantive evidence. Judges must analyse reasoning, consistency, and methodology behind expert conclusions. The Court stressed that expert testimony must stand judicial scrutiny like any other evidence.

In "*Selvi v. State of Karnataka*, (2010) 7 SCC 263", the Court barred involuntary scientific techniques[83]. It held narco-analysis, polygraph, and BEAP tests violate "Article 20(3)" rights. The judgment reaffirmed that constitutional protections override evidentiary convenience. The Court recognised bodily and mental privacy as part of due process.

In "*Santosh Kumar Singh v. State,* (2010) 9 SCC 747", forensic science was vital to conviction[84]. DNA and semen analysis corroborated victim's testimony and linked the accused. The Court accepted scientific reports after confirming sample preservation and expert

[81] "Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1".
[82] "State of H.P. v. Jai Lal, (1999) 7 SCC 280".
[83] Selvi v. "State of Karnataka, (2010) 7 SCC 263".
[84] Santosh Kumar Singh v. State, (2010) 9 SCC 747.

credibility. Judicial trust increased due to compliance with procedural safeguards and chain of custody.

In "*Manu Sharma v. State (NCT of Delhi)*, (2010) 6 SCC 1", forensic reports played decisive role[85]. Ballistic and fingerprint evidence tied the accused to the crime scene. The Supreme Court upheld conviction, relying partly on corroborated forensic results. The Court insisted on rigorous scrutiny of expert opinions before assigning weight.

In "*Anvar P.V. v. P.K. Basheer*, (2014) 10 SCC 473", digital forensic admissibility was examined[86]. The Court held that "Section 65B" certificate is mandatory for electronic evidence. Absence of such certification renders electronic records inadmissible, regardless of reliability. The Court shifted from flexible admissibility to strict procedural compliance.

In "*Ritesh Sinha v. State of Uttar Pradesh*, (2019) 8 SCC 1", the Court allowed voice sampling[87]. It permitted magistrates to direct voice sample collection under judicial oversight. This judicial innovation bridged statutory silence and technological progression. The decision marked growing judicial comfort with evolving forensic domains.

In "*State of Gujarat v. Kishanbhai*, (2014) 5 SCC 108", the Court criticised negligent forensic handling[88]. It blamed investigators for not preserving biological evidence properly. The Court stressed accountability of investigating officers in managing forensic samples. It observed that mishandling compromises fair trial and leads to wrongful acquittals.

In "*Nandini Satpathy v. P.L. Dani*, (1978) 2 SCC 424", the Court protected the right to silence[89]. It expanded Article 20(3) to protect against indirect forms of compulsion. Though predating modern forensic tools, the case influences current admissibility debates. Its principles are cited in judgments involving involuntary DNA, voice or bodily samples.

In "*Sunil Dattatraya Vaskar v. State of Maharashtra*, 2019 SCC OnLine Bom 5595", forensic input failed[90]. The Bombay High Court found forensic evidence inadequate without corroborative support. It cautioned against conviction based solely on uncorroborated expert reports. The Court highlighted the need for narrative evidence to substantiate scientific findings.

Courts emphasise chain of custody as vital to admissibility and probative weight. In "*Vikram Singh v. State of Punjab*, (2010) 3 SCC 56", DNA results were excluded due to chain breaks[91].

[85] "Manu Sharma v. State (NCT of Delhi), (2010) 6 SCC 1".
[86] "Anvar P.V. v. P.K. Basheer, (2014) 10 SCC 473".
[87] "Ritesh Sinha v. State of Uttar Pradesh, (2019) 8 SCC 1".
[88] "State of Gujarat v. Kishanbhai, (2014) 5 SCC 108".
[89] "Nandini Satpathy v. P.L. Dani, (1978) 2 SCC 424".
[90] Sunil Dattatraya Vaskar v. State of Maharashtra, 2019 SCC OnLine Bom 5595.
[91] "Vikram Singh v. State of Punjab, (2010) 3 SCC 56".

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The Court ruled that broken custody renders forensic reports legally unreliable. This trend reinforces procedural sanctity in forensic evidence handling.

The Delhi Police's forensic standardisation efforts, backed by judicial appreciation, mark recent progress. Delhi High Court in several cases acknowledged the importance of scientific investigation[92]. Courts now increasingly demand forensic reports in rape, cybercrime, and murder trials. Judicial trend leans toward institutionalising forensic science while retaining legal safeguards.

Courts also assess expert neutrality and lab accreditation before admitting reports. Unaccredited labs or biased experts reduce credibility of scientific submissions. Courts seek detailed methodology, not just conclusions, in forensic documents. Judicial training in scientific literacy is gradually being recognised as necessary.

Judgments favour forensic science only when properly presented, corroborated, and constitutionally valid. Judicial reluctance persists against over-reliance on science without human evidence. Courts treat science as a tool—not the judge or jury. Legal reasoning and due process still dominate admissibility decisions.

Judicial trend reflects cautious optimism toward forensic advancement. Admissibility remains conditional, not automatic, despite technological evolution. The judiciary supports forensic application but insists on fairness, legality, and probity.

VIII. NEED FOR REFORMS AND RECOMMENDATIONS

India lacks a codified law on forensic science and its admissibility in criminal trials. Section 45 of the Indian Evidence Act offers only a skeletal framework for expert opinion[93]. There is no statutory guidance on scientific validity, error rate, or peer review. Courts use discretion without uniform criteria for assessing forensic admissibility. This leads to inconsistency, forum shopping, and evidentiary confusion across jurisdictions.

The first reform needed is a comprehensive forensic science statute for India. This statute must define admissibility tests based on scientific reliability and legal safeguards. It should adopt benchmarks from the "*Daubert* ruling and UK's expert assistance test"[94]. Inclusion of judicial gatekeeping role should be made mandatory at pre-trial stage. Legislation must differentiate

[92] "The Hindu, Delhi Police First Force to Make Collection of Forensic Evidence Mandatory, (Aug. 2022), https://www.thehindu.com/news/cities/Delhi/delhi-police-first-force-to-make-collection-of-forensic-evidence-mandatory/article65831296.ece."
[93] "Indian Evidence Act, 1872, § 45, No. 1, Acts of Parliament, 1872 (India)".
[94] "Daubert v. Merrell Dow Pharmaceuticals Inc., 509 U.S. 579 (1993); Law Commission of England and Wales, Expert Evidence in Criminal Proceedings in England and Wales, LAW COM No. 325 (2011)".

standards for civil, criminal, and administrative cases.

The second reform must mandate accreditation of all forensic laboratories across India. Many labs are unaccredited, underfunded, and lack standardised methodology[95]. Evidence from such labs raises doubts on accuracy, neutrality, and procedural integrity. A central authority must regulate lab practices, quality control, and data protection. "National Accreditation Board for Testing and Calibration Laboratories (NABL)" oversight must be expanded.

The third reform requires professional certification of forensic experts. Currently, there is no national registry of qualified forensic specialists. This creates reliance on unqualified, partisan, or police-appointed experts in trial. A national roster of court-approved forensic experts must be introduced. Minimum qualifications, ongoing training, and ethical guidelines should be enforced.

Fourth, India needs forensic procedural rules for criminal trials under CrPC. These rules must guide sample collection, preservation, chain of custody, and disposal. They should clarify timelines for testing, expert access rights, and destruction after acquittal. Such rules must be aligned with constitutional standards on privacy and bodily autonomy[96]. Judicial interpretation should not be the only mechanism for procedural regulation.

Fifth, a "Data Protection Protocol" must be embedded within forensic investigation process. "The Criminal Procedure (Identification) Act, 2022" lacks proportional safeguards for biometric retention[97]. 75-year storage violates "*K.S. Puttaswamy v. Union of India*, (2017) 10 SCC 1" privacy ruling[98]. Legislation must allow destruction upon acquittal or expiration of appeal period. Collection must follow necessity, minimality, and lawful purpose doctrine.

Sixth, forensic infrastructure must be decentralised and digitalised for speedy processing. Backlogs in DNA, toxicology, and cyber forensics delay justice and create miscarriage risks. States must establish regional forensic labs with real-time e-reporting to courts. Investigation timelines should include forensic compliance and expert availability. Government must fund forensic units under legal aid and police reforms.

Seventh, forensic science must be integrated into judicial and legal education. Most judges lack technical understanding of DNA, cyber, or ballistic methods. Bar Councils and Judicial Academies must add forensic science to their curriculum. Capacity building ensures better

[95] "Kusum Chauhan, Admissibility and Evidentiary Value of Scientific Evidence: Legislative and Judicial Approach in India, 8 IJRTI 146, 148 (2023)".
[96] "Selvi v. State of Karnataka, (2010) 7 SCC 263".
[97] "Criminal Procedure (Identification) Act, 2022, No. 11, Acts of Parliament, 2022 (India)".
[98] "Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1".

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evidentiary appreciation and procedural fairness in courtrooms.

Eighth, an independent forensic oversight body must be constituted by Parliament. This body will regulate ethical usage, cross-sectoral coordination, and grievance redressal. It must act as an ombudsman for forensic misconduct, contamination, or coercion claims. Such body must include judges, scientists, civil society members, and law enforcement.

Ninth, India must codify exclusionary rule to bar evidence obtained by rights violation. Courts often admit evidence despite breach of "Article 20(3) or 21 protections". Evidence collected by torture, coercion, or without consent must be inadmissible in all cases[99]. This reform ensures rule of law and human dignity are not compromised for convictions.

Tenth, judicial practice must adopt structured admissibility hearings in major trials. Courts must determine expert competence, method validity, and potential prejudice before trial. This ensures that weak, biased or pseudoscientific evidence never reaches trial stage. Such hearings reflect global best practice and reduce wrongful conviction risks.

These reforms will make forensic evidence trustworthy, constitutional, and procedurally sound. They will also improve the quality, speed, and fairness of criminal trials. India needs to match scientific advancement with legal responsibility and ethical governance.

IX. CONCLUSION

Forensic science reshapes modern legal systems by introducing objectivity in evidentiary processes. Indian courts accept scientific inputs but apply cautious discretion in evaluating them[100]. Expert opinion aids justice but never substitutes primary proof or direct evidence. Section 45 offers relevance, not automatic admission or evidentiary weight[101]. Courts continue to demand corroboration, transparency, and procedural integrity from forensic submissions.

Judicial precedents reflect a mixed trend of support and scepticism toward forensic technologies. In "*Santosh Kumar Singh v. State"*, forensic evidence proved decisive in securing conviction[102]. In "*Sunil Dattatraya Vaskar v. State of Maharashtra"*, forensic input alone was insufficient[103]. This contrast shows courts trust science only when supplemented by consistent trial material. Chain of custody, expert neutrality, and sample preservation often determine legal

[99] "Nandini Satpathy v. P.L. Dani, (1978) 2 SCC 424".
[100] "Kusum Chauhan, Admissibility and Evidentiary Value of Scientific Evidence, 8 IJRTI 146, 147 (2023)".
[101] "Indian Evidence Act, 1872, § 45, No. 1, Acts of Parliament, 1872 (India)".
[102] "Santosh Kumar Singh v. State, (2010) 9 SCC 747".
[103] "Sunil Dattatraya Vaskar v. State of Maharashtra, 2019 SCC OnLine Bom 5595".

value.

Constitutional limitations guide admissibility of invasive or testimonial forensic techniques. *"Selvi v. State of Karnataka"* barred involuntary narco-analysis as a rights violation[104]. "*Puttaswamy"* recognised data privacy, influencing the forensic data retention regime[105]. These rulings shaped a rights-conscious evidentiary framework under Articles 20(3) and 21.

Comparative models from USA and UK demonstrate structured admissibility standards. The "*Daubert* test" focuses on scientific reliability, while UK uses assistance-based screening[106]. India lacks codified admissibility rules, causing inconsistent application of forensic methods. Legislation must fill this gap by setting scientific and constitutional thresholds.

Judicial training on forensic science is now essential for accurate evidentiary assessment. Unregulated labs and non-certified experts threaten reliability of forensic inputs. Courts must ensure expert evidence meets both legal and scientific standards. Procedural fairness and evidentiary integrity must go hand in hand.

India needs statutory clarity, lab regulation, and procedural consistency. Scientific progress must not bypass constitutional protections and trial fairness. Reforms must integrate forensic innovation with legal accountability and ethical balance.

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[104] "Selvi v. State of Karnataka, (2010) 7 SCC 263".
[105] Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1.
[106] "Daubert v. Merrell Dow Pharmaceuticals Inc., 509 U.S. 579 (1993); Law Commission of England and Wales, Expert Evidence in Criminal Proceedings in England and Wales, LAW COM No. 325 (2011)".

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