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Reassessing the Evidentiary Value of DNA in the Era of Human Genome Editing

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ABSTRACT

Indian courts have raised the status of DNA profiling to a level that nearly carries proof beyond reasonable doubt, and have described properly handled DNA as almost infallible. That confidence in genetic identification rests on three biological assumptions: that an individual's genetic profile is uniform across tissues, stable over time, and naturally acquired. The authors argue that all three premises are qualified, though not, as is often alleged, principally by genome editing. The immediate forensic complication is allogeneic haematopoietic stem cell transplantation, which results in individuals routinely bearing two allelic short tandem repeat profiles distributed unevenly across tissues, a phenomenon reported in criminal casework for over two decades. Approved somatic genome-editing therapies, by contrast, are autologous and edit single non-identifying loci; exagamglogene autotemcel (Casgevy), for instance, modifies the erythroid-specific enhancer of BCL11A in a patient's own cells without touching any forensic identification marker. Heritable genome editing would introduce non-natural variation and is globally prohibited, and in 2025 a multi-stakeholder coalition called for extending the existing moratorium to 2035. This article maps that biological reality against India's forensic DNA architecture under the new legal regime. It identifies a structural gap: Indian forensic protocol provides no mechanism to recognise chimeric or edited profiles, and no doctrine to distinguish an exclusion from a discordance. It further contends that, where compelled sampling can disclose therapeutic genomic modification, the settled position that biological samples are non-testimonial for the purposes of Article 20(3) ought to be revisited. The article proposes two coordinated statutory instruments rather than a single omnibus law: a reconstituted DNA Regulatory Board, and supplementary evidentiary directions for discordant-profile cases.

Keywords: *DNA, chimerism, genome editing, Bharatiya Sakshya Adhiniyam, Article 20(3), genetic privacy, Criminal Procedure (Identification) Act*

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I. INTRODUCTION

Over three decades, deoxyribonucleic acid (DNA) profiling has been transformed from a novel technique into an evidentiary keystone. The judicial path of DNA evidence in India displays a steadily growing confidence: from the first reported use of DNA evidence in a paternity dispute in *Kunhiraman v. Manoj*,[1] through the substantive constitutional accommodation in *Sharda v. Dharmpal*,[2] to the Supreme Court's treatment of DNA in *Mukesh v. State (NCT of Delhi)*[3] as furnishing evidence of an essentially unimpeachable character. That confidence has always rested on an unstated biological proposition: that the identifying portion of an individual's genome is a single, fixed, naturally occurring signature.

The proposition has never been entirely accurate, and it is becoming less so. Three separate developments bear on the question, and they are frequently confused with one another in both popular and legal literature.

The first is allogeneic transplantation. Where an individual receives haematopoietic stem cells from a genetically distinct donor, the patient's blood-derived DNA carries the donor's profile while other tissues retain the patient's own profile.[4] In the strict forensic sense this generates a chimera: one person with two identifications, distributed unevenly across tissues. None of this is novel, uncommon, or connected to genome editing.

Somatic genome editing is the second. Clinical use of CRISPR-Cas9 and its successors began in earnest in 2023, when a genome-edited cell therapy, exagamglogene autotemcel, was approved in the United Kingdom, the United States and the European Union.[5] Marketed as the first CRISPR therapy, it was followed by a broader regulatory shift: the United States Food and Drug Administration's (FDA) draft guidance of 23 February 2026 establishes a 'plausible mechanism' framework for individualised genetic therapies.[6]

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[1] Kunhiraman v. Manoj, II (1991) DMC 499 (Ker. H.C.).
[2] Sharda v. Dharmpal, (2003) 4 SCC 493 : AIR 2003 SC 3450.
[3] Mukesh v. State (NCT of Delhi), (2017) 6 SCC 1 : AIR 2017 SC 2161.
[4] K. Fleischhauer et al., *Donor Selection for Allogeneic Hematopoietic Cell Transplantation*, DEUTSCHES ARZTEBLATT INTERNATIONAL (2023), https://doi.org/10.3238/arztebl.m2023.0031.
[5] Exagamglogene autotemcel (Casgevy) was authorised by the United Kingdom Medicines and Healthcare products Regulatory Agency on 16 November 2023, by the United States Food and Drug Administration on 8 December 2023, and by the European Commission in February 2024. See EUROPEAN MEDICINES AGENCY, *Casgevy: European Public Assessment Report*, https://www.ema.europa.eu/en/medicines/human/EPAR/casgevy.
[6] E.R. Feierman et al., *Implications of the FDA's New Plausible Mechanism Framework for the Development of a Personalized In Vivo Prime Editing Platform*, 113 AM. J. HUM. GENET. 891 (2026); see also FOOD AND DRUG ADMINISTRATION, *Considerations for the Use of the Plausible Mechanism Framework to Develop Individualized Therapies That Target Specific Genetic Conditions with Known Biological Cause: Draft Guidance for Industry* (23 Feb. 2026).

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The third is heritable human genome editing, which would introduce intentional, heritable variation. In all major jurisdictions it remains prohibited or practically unavailable, and in 2025 a broad coalition of scientific, clinical, patient and bioethics bodies called for extending the existing moratorium to at least 2035.[7]

Clarifying these three is not mere pedantry, for it determines what reform is actually needed. Legislation designed to detect 'edited genomes' would target a non-problem while ignoring an actual one.[8] The edited genome, in that framing, operates as a magic technique rather than an actual one. This study uses doctrinal and comparative methods. It examines the statutory and case law of India, the governance instruments of the World Health Organisation, the European Union and the Council of Europe, and the national frameworks of China, the United Kingdom and the United States, chosen because they represent different regulatory approaches, namely criminal sanction, licensed research and indirect prohibition respectively. The scientific claims rest on regulatory documentation and peer-reviewed forensic genetics literature.

II. Three Biological Complications and Their Unequal Forensic Weight

Before a legal system can address the forensic issues surrounding genome editing, it must understand the biological processes that render genetic identity mutable. The law of evidence has traditionally treated DNA as a stable biometric identifier, a fingerprint written in biology. The molecular reality is far more dynamic. Genome editing technologies do not merely read the genome; they rewrite it, raising the possibility that a person's genetic profile may not be fixed but may instead vary across tissues and over time, or be designed rather than inherited.[9]

A. Allogeneic Transplantation and Forensic Chimerism

Following allogeneic haematopoietic stem cell transplantation, donor cells populate the recipient's haematopoietic system, and analysis of blood ultimately reveals the donor's short tandem repeat (STR) profile. Other tissues may yield the STR type of the recipient, of the donor, or a mixture of the two. Chimerism varies by tissue type, so the choice of reference sample can significantly affect how a profile is interpreted.[10]

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[7] D. Barrett et al., *International Call for a 10-Year Moratorium on Heritable Human Genome Editing*, 27 CYTOTHERAPY 885 (2025).
[8] D. Thaldar et al., *Heritable Human Genome Editing and the Politics of Law: The South African Case Study*, 12 J.L. & BIOSCIENCES lsaf029 (2025).
[9] C. Gyngell, *Gene Editing and the Health of Future Generations*, 110 J. ROYAL SOC'Y MED. 276 (2017).
[10] D. Kristt et al., *Hematopoietic Chimerism Monitoring Based on STRs: Quantitative Platform Performance on Sequential Samples*, 16 J. BIOMOLECULAR TECHNIQUES 380 (2005).

The forensic consequences are documented in criminal casework. In one Alaska sexual assault investigation, crime-scene semen matched an offender in the database who was demonstrably incarcerated at the time.[11] The match was traced to a bone marrow transplant received from his brother, whose profile the analysis had in fact picked up. In a road-traffic fatality in Seoul in 2008, blood analysis indicated that the decedent was female although the body was male; the discrepancy was resolved when investigators learned that the decedent had received a transplant from his daughter. Analysts may misread multi-allelic profiles of this kind as a two-person mixture and treat them as contamination, even though they come from a single person.

The issue is growing, not diminishing. The annual increase in transplant volumes, together with the shift in forensic practice towards single-nucleotide polymorphism (SNP) panels in investigative genetic genealogy, raises questions that the STR literature does not answer. The impact of chimerism on SNP profiles in the forensic context has so far received little attention.[12]

B. Somatic Genome Editing

Exagamglogene autotemcel is the therapeutic centrepiece of the current genome editing era, and the architecture of the treatment is decisive. It involves taking a patient's own CD34+ haematopoietic stem and progenitor cells, editing them outside the body, and reinfusing them. No material from a genetically different individual is introduced, so no forensic chimerism arises. The modification is confined to a single location: a guide RNA directs Cas9 to the erythroid-specific enhancer region of BCL11A, reducing BCL11A expression and restoring fetal haemoglobin production. That effect is limited to the erythroid lineage.[13]

Forensic identification, by contrast, depends on a deliberately selected panel of short tandem repeat loci in non-coding regions, chosen precisely because they carry no phenotypic or clinical significance.[14] BCL11A is not among them, and there is no therapeutic rationale for any editing platform to target an identification locus. A patient who receives exagamglogene autotemcel will continue to match their pre-treatment reference profile at every marker used for identification.

This should be stated plainly, because the opposite implication is widespread. On present evidence, the forensic risk from approved somatic editing therapies is negligible. What the era

[11] H.T. Greely et al., *Family Ties: The Use of DNA Offender Databases to Catch Offenders' Kin*, 34 J.L. MED. & ETHICS 248 (2006).
[12] A.B. Alsaleh et al., *The Impact of Chimerism on DNA-Based Human Identification from Skin Surface Cells of Post-Allogenic Hematopoietic Stem Cell Transplantation Patients*, 318 FORENSIC SCI. INT'L 110636 (2021).
[13] F. Movahedi Motlagh et al., *CRISPR/Cas9 Ablated BCL11A Unveils the Genes with Possible Role of Globin Switching*, 13 ADVANCED PHARMACEUTICAL BULL. 799 (2023).
[14] N. Wyner, M. Barash & D. McNevin, *Forensic Autosomal Short Tandem Repeats and Their Potential Association with Phenotype*, 11 FRONTIERS IN GENETICS 884 (2020).

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of editing raises is a question of detection rather than of identification. The FDA's companion draft guidance on next-generation sequencing for off-target assessment, produced alongside the plausible mechanism framework and directed at base and prime editing, supplies an analytical toolbox for identifying edits in a biological sample.[15]

C. Heritable Editing

Germline modification affects a gamete or embryo and is therefore heritable. He Jiankui's 2018 announcement of CRISPR-edited twins established that the act was technically possible and globally condemned;[16] in December 2019 a Shenzhen court convicted him of illegal medical practice and sentenced him to three years' imprisonment.[17] The international position has hardened since. The Third International Summit on Human Genome Editing concluded in 2023 that heritable editing remains unacceptable for the present.[18] A multi-stakeholder coalition reiterated that position in March 2025, calling for a moratorium extending to at least 2035 on the basis that the scientific, ethical and regulatory preconditions for safe clinical use are unlikely to be met before then.[19] The position was formalised in CYTOTHERAPY in May 2025 and endorsed by the leading cell-and-gene-therapy organisations, and in late 2025 a reaffirmation to the same effect was issued in response to commercial activity seeking to normalise the practice.[20]

If heritable editing were adopted clinically, forensic databases would contain profiles reflecting intentional rather than inherited variation, and no field in those databases would capture the distinction. The gap is real, but prospective, and should be described as such.

III. THE EVIDENTIARY VALUE OF DNA IN INDIAN CRIMINAL JURISPRUDENCE

To gauge the extent of any disruption caused by genome editing, one must first understand the structure of judicial precedent and legislative policy on which DNA evidence currently rests in India. For over three decades the Supreme Court has developed a substantial body of law treating DNA profiling as the gold standard of forensic evidence, while confronting the constitutional tension between effective investigation and individual privacy. That history is not

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[15] Feierman et al., *supra* note 6.

[16] H.T. Greely, *CRISPR'd Babies: Human Germline Genome Editing in the 'He Jiankui Affair'*, 6 J.L. & BIOSCIENCES 111 (2019).

[17] *He Jiankui Jailed for Illegal Human Embryo Gene-Editing*, XINHUA (30 Dec. 2019), http://www.xinhuanet.com/english/2019-12/30/c_138666754.htm.

[18] NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE, *Third International Summit on Human Genome Editing: Expanding Capabilities, Participation, and Access: Proceedings of a Workshop in Brief* (2023).

[19] Barrett et al., *supra* note 7, at 886.

[20] INTERNATIONAL SOCIETY FOR CELL & GENE THERAPY, *Global Scientific Consortium Reaffirms Position on Human Heritable Genome Editing* (18 Nov. 2025), https://www.isctglobal.org/blogs/ken-ip1/2025/11/18/global-scientific-consortium-re-affirms-position-o.

merely retrospective: it establishes the baseline assumptions of genetic constancy, scientific infallibility and procedural integrity on which genome editing now casts doubt. The trajectory of the paternity disputes, the methodical framework set out in *Kattavellai @ Devakar v. State of Tamil Nadu*,[21] and the constitutionalisation of privacy in *K.S. Puttaswamy v. Union of India*[22] together illuminate the conviction with which the Indian legal system has come to treat DNA as stable and objective truth.

A. From Acceptance to Qualified Reliance

Indian DNA jurisprudence is judicial rather than legislative in formation. *Sharda* held that a court-ordered DNA test in a civil proceeding violates neither Article 21 nor Article 20(3).[23] *State of Karnataka v. Krishnappa* is cited in the literature for the proposition that DNA evidence is highly reliable in the prosecution of sexual offences, subject to custodial integrity.[24] In *Pantangi Balarama Venkata Ganesh v. State of Andhra Pradesh*, the Supreme Court recorded the expert view that contamination-free DNA profiling is among the most accurate methods of identification available.[25] In *Mukesh*, profile convergence across multiple exhibits was treated as virtually conclusive of presence.[26]

That upward trajectory has been checked from within. In *Devakar*, a three-judge Bench set aside the appellant's conviction and death sentence.[27] The Court noted that the post-mortem had been conducted in the open, that there was a delay of 41 days in transmitting the samples to the laboratory, that custody documents were missing and that there was no clear record of storage. It directed the nationwide implementation of mandatory documentation of collection bearing the FIR particulars of the case and the signatures of the examining doctor, the investigating officer and an independent witness; delivery of sealed samples to the Forensic Science Laboratory (FSL) within forty-eight hours, with a written explanation for any delay; a prohibition on opening or resealing without the trial court's authorisation; and the maintenance of a chain-of-custody register recording each transfer through to disposal.

One feature of *Devakar* must be noted. The Court categorised DNA as opinion evidence under Section 39 of the Bharatiya Sakshya Adhiniyam 2023, the successor to Section 45 of the Indian Evidence Act 1872, holding that its probative value varies with the facts of each case and that

[21] Kattavellai @ Devakar v. State of Tamil Nadu, 2025 INSC 845.
[22] Justice K.S. Puttaswamy (Retd.) v. Union of India, (2017) 10 SCC 1.
[23] *Sharda*, *supra* note 2.
[24] State of Karnataka v. Krishnappa, (2000) 4 SCC 75.
[25] Pantangi Balarama Venkata Ganesh v. State of Andhra Pradesh, (2009) 14 SCC 607 : AIR 2009 SC 3129.
[26] *Mukesh*, *supra* note 3.
[27] *Kattavellai @ Devakar*, *supra* note 21.

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it requires corroboration. Reformist arguments therefore do not confront a settled orthodoxy; they push at an open door.

B. Expert Opinion under the Bharatiya Sakshya Adhiniyam 2023

Section 39(1) of the BSA renders admissible the opinion of persons specially skilled in science or art, a category that includes DNA analysis,[28] and Section 40 makes relevant those facts which, though otherwise irrelevant, support or are inconsistent with the opinion of such an expert.[29] The common-law principle that expert opinion is not conclusive survives: courts are required to scrutinise method and reasoning, not merely conclusions.[30] A gap between doctrine and practice nevertheless persists. Trial courts and investigating agencies continue to treat a reported match as near-dispositive. The classification adopted in *Devakar* is doctrinally correct, but it has not yet transformed institutional behaviour, and the Court gave no specific guidance on what a court scrutinising methodology should look for.

C. Constitutional Constraint after Puttaswamy

In *Puttaswamy*, the Supreme Court held that state intrusions into privacy must satisfy specific requirements in order to be constitutional.[31] The framework applies to DNA at two points. First, at collection: the taking of intimate biological material is an encroachment on bodily privacy. Second, at retention: a genomic sample contains health, ancestry and familial information far in excess of what is required to identify a person.

IV. International Legal and Policy Responses to Human Genome Editing

No country can resolve the forensic implications of genome editing in isolation. India's regulatory response must be shaped by comparative practice, given the transnational character of scientific research, the mobility of researchers across borders and the harmonisation of standards in international criminal law. The international community has responded to the He Jiankui affair, and to the broader genome editing revolution, with a mixture of hard law, soft governance and institutional frameworks that differ substantially in stringency and scope.

[28] The Bharatiya Sakshya Adhiniyam, 2023, No. 47 of 2023, s. 39(1) (India).
[29] *Id.* s. 40.
[30] D.R. Hassan, *Evidentiary Value of Expert Opinion Under the Bharatiya Sakshya Adhiniyam, 2023: A Study with Special Reference to Relevancy of DNA Reports*, 9 Int'l J.L. Mgmt. & Human. 688 (2026).
[31] *Puttaswamy*, *supra* note 22.

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A. The WHO Framework and Its Limits

The World Health Organisation's governance framework, developed by its Expert Advisory Committee following the He Jiankui affair, is the most comprehensive multilateral instrument in the field.[32] It sets out governance mechanisms and values for human genome editing, proposes a global registry and oversight structure, and recommends measures to ensure compatibility with human rights and the 2030 Agenda for Sustainable Development.[33] Its limitation is that it addresses genome editing as a biomedical practice and remains silent on forensic consequences: it says nothing about identification, evidence or criminal procedure.[34] India may adopt its registration structure and accrediting logic, but will find no forensic guidance within it.

B. Regional Instruments

Article 13 of the Council of Europe's *Oviedo Convention* 1997 permits an intervention seeking to modify the human genome only for preventive, diagnostic or therapeutic purposes, and only where its aim is not to introduce a modification in the genome of any descendants.[35] This is the most explicit regional prohibition on heritable modification currently in force.[36] In the European Union, processes for modifying the germ line genetic identity of human beings are excluded from patentability under Article 6(2)(b) of Directive 98/44/EC, reproductive germline modification is effectively ruled out by the Clinical Trials Regulation, and Article 3(2) of the Charter of Fundamental Rights prohibits eugenic practices.[37]

C. National Postures

In response to the He Jiankui affair, China condemned and penalised the conduct and amended its legislation, making the implantation of gene-edited or cloned human embryos a criminal offence carrying up to seven years' imprisonment in especially serious cases, and requiring ethics committee approval for genetic research. The governing theme is prohibition backed by penal sanction.[38]

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[32] WORLD HEALTH ORGANIZATION, *Human Genome Editing: A Framework for Governance* (2021).

[33] M. Alonso & J. Savulescu, *He Jiankui's Gene-Editing Experiment and the Non-Identity Problem*, 35 BIOETHICS 563 (2021).

[34] Q. Chen et al., *Making Sense of It All: Ethical Reflections on the Conditions Surrounding the First Genome-Edited Babies*, 5 WELLCOME OPEN RESEARCH 216 (2021).

[35] Convention for the Protection of Human Rights and Dignity of the Human Being with Regard to the Application of Biology and Medicine (*Oviedo Convention*), art. 13, 4 Apr. 1997, ETS No. 164.

[36] T. Vidalis, *Genome Editing in Human Gametes and Embryos: The Legal Dimension in Europe*, 12 BIOTECH 1 (2022).

[37] Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998 on the Legal Protection of Biotechnological Inventions, art. 6(2)(b), 1998 O.J. (L 213) 13; Regulation (EU) No 536/2014 on Clinical Trials on Medicinal Products for Human Use, art. 90, 2014 O.J. (L 158) 1; Charter of Fundamental Rights of the European Union, art. 3(2), 2012 O.J. (C 326) 391.

[38] L. Song & Y. Joly, *After He Jiankui: China's Biotechnology Regulation Reforms*, 21 MED. L. INT'L 174 (2021); Criminal Law of the People's Republic of China, art. 336a, inserted by Amendment (XI), in force 1 Mar. 2021.

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In the United Kingdom, the Human Fertilisation and Embryology Authority permits embryo research up to 14 days but prohibits reproductive germline editing. The Nuffield Council on Bioethics has suggested that any future clinical heritable editing should be licensed case by case, with long-term monitoring. The model is one of regulated permissibility with a hard reproductive boundary.[39]

In the United States, heritable modification is prohibited indirectly, through appropriations riders that bar the FDA from considering applications involving heritable embryo modification, with breaches of the Federal Food, Drug, and Cosmetic Act carrying significant criminal exposure.[40] Because the restriction depends on annual renewal, the model prohibits through fiscal instruments rather than through substantive statute, and is structurally fragile.

D. What Transfers to India

The comparative exercise yields three transferables and one caveat. The United Kingdom's institutional model, in which a single named statutory authority performs licensing and monitoring, is the most administratively coherent, and it aligns with the DNA Regulatory Board proposed in the withdrawn 2019 Bill.[41] The WHO registry concept is directly adaptable to a domestic register of clinical genome-editing procedures, which is also the least privacy-invasive route to solving the forensic disclosure problem.[42] The Indian Council of Medical Research (ICMR) already operates an ethics committee regime.

The model to be avoided is the American one. India should not imitate prohibition by appropriation. A rider is not a regulation: it binds one agency, lapses every year and creates no enforceable norm. Equating the Dickey-Wicker position with the Oviedo prohibition greatly exaggerates the American position.[43]

V. The Indian Regulatory Landscape

The regulatory framework for forensic DNA and genome editing in India displays a notable asymmetry. The judiciary has developed nuanced standards of evidentiary scrutiny. The executive has significantly intensified its investment in biometric surveillance capability. The

[39] J.B. Appleby & A.L. Bredenoord, *Should the 14-Day Rule for Embryo Research Become the 28-Day Rule?*, 10 EMBO Molecular Med. e9437 (2018).
[40] J. Johnston, *Budgets Versus Bans: How U.S. Law Restricts Germline Gene Editing*, 50 Hastings Center Report 4 (2020).
[41] A.O. Amankwaa & C. McCartney, *The UK National DNA Database: Implementation of the Protection of Freedoms Act 2012*, 284 Forensic Sci. Int'l 117 (2018).
[42] D. Juric, M. Zlatin & A. Marusic, *Inadequate Reporting Quality of Registered Genome Editing Trials: An Observational Study*, 22 BMC Med. Research Methodology 131 (2022).
[43] E. Cave, *Advocating Distinct Regulatory Paths for Embryos and Embryo-Like Structures*, 12 J.L. & Biosciences lsaf008 (2025).

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legislature has failed to supply a statute connecting the two. The withdrawal of the DNA Technology Bill in 2023 left a gap that the Criminal Procedure (Identification) Act 2022 fills only partially and problematically. Genome editing policy, meanwhile, has focused on agricultural biotechnology; human applications are governed only by general research ethics guidelines, which lack enforcement.

A. The Vacuum Left by the DNA Technology Bill

The DNA Technology (Use and Application) Regulation Bill 2019 was withdrawn from the Lok Sabha on 24 July 2023,[44] ending an exercise of some twenty years traceable to a Department of Biotechnology draft of 2003 and to the 271st Report of the Law Commission of India.[45] The Bill's architecture rested on three pillars: a DNA Regulatory Board, an accreditation system for laboratories, and a national databank. In February 2021 the Parliamentary Standing Committee on Science and Technology reported a series of recommendations that were never acted upon.[46] The reason given for the withdrawal, that the field is already covered by the Criminal Procedure (Identification) Act 2022, does not survive scrutiny. The CPIA confers powers to collect. It creates no accreditation, no quality assurance and no database governance. The effect is the removal of the scheme's regulatory element and the retention of its coercive one.

B. The Criminal Procedure (Identification) Act 2022

The CPIA has replaced the Identification of Prisoners Act 1920 and expands collection powers considerably. 'Measurements' now include biological samples and their analysis, which encompasses DNA profiling. Collection is permitted from convicted persons, arrested persons and preventive detainees and, on a magistrate's order, from any person for the purposes of an investigation. The obligation to provide biological samples applies only to persons arrested for offences against women or children, or for offences punishable with imprisonment of not less than seven years. Records are retained by the National Crime Records Bureau (NCRB) for 75 years.[47]

The scheme is flawed in four ways. First, 'analysis' is nowhere defined, so it remains unclear whether the permitted processing extends beyond identification loci into clinically informative sequence. Second, the NCRB has neither forensic infrastructure nor authority to accredit a

[44] B. Jain, *DNA Technology Bill Withdrawn from Lok Sabha*, TIMES OF INDIA (25 July 2023), https://timesofindia.indiatimes.com/india/dna-technology-bill-withdrawn-from-lok-sabha/articleshow/102091755.cms.

[45] LAW COMMISSION OF INDIA, *271st Report on Human DNA Profiling: A Draft Bill for the Use and Regulation of DNA-Based Technology* (2017).

[46] PRS LEGISLATIVE RESEARCH, *The DNA Technology (Use and Application) Regulation Bill, 2019*, https://prsindia.org/billtrack/the-dna-technology-use-and-application-regulation-bill-2019.

[47] THE CRIMINAL PROCEDURE (IDENTIFICATION) ACT, 2022, No. 11 of 2022, ss. 2(1)(b), 3, 4 and 5 (India).

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national database.[48] Third, a seventy-five-year retention period, combined with discretionary destruction for acquitted persons, sits poorly with proportionality. Fourth, the Act assumes a one-person, one-profile architecture. The absence of any field for a chimeric individual, and of any mechanism to record that a reference sample post-dates a transplant, means that it cannot distinguish an exclusion from a discordance.

C. Genetic Data under the DPDP Act 2023

The Digital Personal Data Protection Act 2023 is loosely structured and contains no definition of genetic data. Its exemptions for state processing in the prevention, detection, investigation and prosecution of offences substantially disapply its protections in precisely the forensic context at issue.[49] Its principles of purpose limitation, data minimisation and storage limitation conflict directly with the CPIA's requirement of retention for 75 years. The two statutes were enacted within sixteen months of one another and rest on opposite propositions about how long the state may retain intimate biological information.[50]

D. The Human and Agricultural Asymmetry

India's genome editing policy has developed in agriculture. In 2022, plants edited through site-directed nucleases in the SDN-1 and SDN-2 categories, and free of exogenous introduced DNA, were exempted from the biosafety rules applicable to genetically modified organisms, and the Department of Biotechnology issued safety assessment guidelines routing approvals through Institutional Biosafety Committees.[51] There is no equivalent structure for human applications: the ICMR's ethical guidelines have no force of law.

E. Article 20(3) and the Medical Information Problem

The existing literature addresses the most important constitutional question only briefly. Since *State of Bombay v. Kathi Kalu Oghad*,[52] and as refined in *Selvi v. State of Karnataka*,[53] it has been settled that the compelled furnishing of biological samples does not violate Article 20(3), because such samples are non-testimonial. *Selvi* drew the line at techniques that retrieve the contents of a person's mind.

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[48] S. Rahamathulla & S.A.M. Ahmed, *From Fingerprints to Facial Recognition: Constitutional Implications of Technological Expansion Under the Criminal Procedure (Identification) Act, 2022*, 9 INT'L J.L. MGMT. & HUMAN. 890 (2026).

[49] THE DIGITAL PERSONAL DATA PROTECTION ACT, 2023, No. 22 of 2023, s. 17(1)(c) (India).

[50] F. Siddiqui, *Is India's Data Protection Board Independent Enough to Protect You?*, LIVELAW (25 July 2026), https://www.livelaw.in/articles/india-data-protection-board-542731.

[51] MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE, Office Memorandum on the Exemption of SDN-1 and SDN-2 Genome Edited Plants from Rules 7 to 11 of the Rules, 1989 (30 Mar. 2022); DEPARTMENT OF BIOTECHNOLOGY, *Guidelines for the Safety Assessment of Genome Edited Plants, 2022* (17 May 2022).

[52] State of Bombay v. Kathi Kalu Oghad, AIR 1961 SC 1808 : (1962) 3 SCR 10.

[53] Selvi v. State of Karnataka, (2010) 7 SCC 263 : AIR 2010 SC 1974.

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That reasoning holds so long as the sample reveals nothing but identity. It is beginning to acquire the potential for further disclosure. The analytical infrastructure being built to assess off-target effects in edited therapies is equally an infrastructure for identifying therapeutic modification in a biological sample. The genome of a person with sickle cell disease or transfusion-dependent beta-thalassaemia who has received a discrete, dateable and expensive treatment involving a BCL11A enhancer edit will carry a marker establishing that fact.[54]

Three consequences follow. First, compelled sampling that yields this information is no longer merely identificatory; it is a compelled disclosure of medical history, information within the possession of the person which the state would otherwise have to ask for. Whether that crosses the testimonial line drawn in *Selvi* is genuinely arguable, and no Indian court has considered it.[55] Second, even if Article 20(3) is not triggered, the informational privacy limb of *Puttaswamy* plainly is: the proportionality analysis for retaining a profile that encodes a diagnosis differs materially from that for retaining twenty non-coding STR loci.[56] Third, the CPIA's failure to define 'analysis' becomes constitutionally load-bearing, because the Act does not confine processing to identification loci. The difference between confining it and not confining it is the difference between a permissible intrusion and an impermissible one.

A statutory limitation of forensic processing to an established identification panel would therefore be good practice, and is probably constitutionally required. It should be put in place before the question reaches a court, rather than after.

VI. Recommendations

On the analysis so far, India's forensic DNA architecture is scientifically outdated, constitutionally vulnerable and legislatively deficient. The withdrawal of the DNA Technology Bill removed the best prospect of significant reform, while the CPIA's collection powers lack scientific rigour and privacy safeguards of comparable depth. The recommendations below seek to bridge these gaps through an integrated statutory, institutional and educational approach.

A. Two Instruments, Not One

The proposal for a single law governing both clinical genome editing and forensic DNA should be discarded. They are separate subjects, overseen by different bodies and addressed to different regulated communities; combining them would probably defeat both. India requires (a) a revived forensic DNA regulation statute, substantially the withdrawn 2019 Bill with the

[54] H. Frangoul et al., *CRISPR-Cas9 Gene Editing for Sickle Cell Disease and Beta-Thalassemia*, 384 New Eng. J. Med. 252 (2021).
[55] *Selvi*, *supra* note 53.
[56] *Puttaswamy*, *supra* note 22.

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Standing Committee's 2021 amendments incorporated, and (b) a separate human genome-editing oversight framework on the HFEA model. The boundary between their respective domains should be a single defined provision: a confidential clinical register of genome-editing and transplantation procedures, maintained under (b), accessible to forensic authorities under (a) only on judicial order in a specific case.

B. Reconstitute the DNA Regulatory Board

The Board proposed by the 2019 Bill should be revived. It should comprise a sitting or retired High Court judge, independent privacy and bioethics expertise, molecular biologists with editing and transplantation experience, and a standing ethics committee with grievance jurisdiction. Public transparency reporting and data security audits should be statutory obligations, not discretionary ones.

C. Restrict Processing to a Defined Identification Panel

The law should confine forensic processing to a specified set of identification loci. Data concerning other loci should not be stored, and should be inadmissible if obtained.

D. Harmonise Retention with the DPDP Act

The seventy-five-year period should be reduced and graded by gravity of offence. Expunction on acquittal or discharge should be automatic and time-bound. Where an individual's profile is recognised as chimeric, retention should carry a mandatory annotation.

E. Protocol and Accreditation Reform

Reference sample collection must record any prior transplantation or cellular therapy. Laboratories must be required to report single-source multi-allele findings as probable chimeras and to validate their methods against chimeric material. The admissibility of a laboratory report should be tied to its accreditation.

F. Supplementary Evidentiary Directions

The *Devakar* guidelines should be augmented to address cases involving a known transplantation or cellular-therapy history, and cases of discordant or multi-allelic profiles.[57] The essential point is that any discrepancy between reference and crime-scene profiles should be positively explained, rather than treated by default as an exclusion.

[57] *Kattavellai @ Devakar*, *supra* note 21.

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G. International Participation

India should support the WHO registry. Adoption of standards for the interpretation of chimeric profiles would be valuable, and India, with its large and fast-growing transplant population, is well placed to contribute primary data.

VII. Conclusion

The age of human genome editing has already arrived, though not in the manner of dystopian 'designer babies'. It has arrived more quietly, through the therapeutic use of CRISPR in clinical medicine. The FDA's 2026 draft guidance on platform gene therapies, together with the pathways adopted by the Medicines and Healthcare products Regulatory Agency, indicates that genome editing will become more common.[58] That normalisation has serious implications for forensic science, raising questions about the genetic constancy on which DNA evidence rests.

The legal framework for forensic DNA in India is disjointed and insufficient. The withdrawal of the DNA Technology Bill 2019 created a regulatory vacuum that has been only partially filled by the overbroad Criminal Procedure (Identification) Act 2022 and by the general evidentiary provisions of the Bharatiya Sakshya Adhiniyam 2023. The guidelines laid down by the Supreme Court in *Devakar*, while strengthening procedural integrity, do not account for the revolution in molecular biology.

India must reconsider the evidentiary significance of DNA through a policy approach that combines international standards of governance, constitutional privacy protection and scientific reality. The idea of genetic permanence was never entirely correct, and therapeutic genome editing has made its inaccuracy plain. Forensic DNA databases should evolve alongside standards for retention policy and expert testimony.

That will take legislative courage which has so far been missing. Indian legislation should regulate both the application of genome editing and the use of forensic DNA. It should establish an independent regulator, harmonise data protection with criminal procedure, and ensure that the 'virtually infallible evidence' of DNA is scientifically sound and constitutionally proportionate. Only then can the criminal justice system retain public trust at a time when the code of human identity is itself editable.

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[58] Feierman et al., *supra* note 6.

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