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RECONSTRUCTION DNA PATERNITY TESTING IN LINEAGE DETERMINATION: Intersection between Genetic Science and Islamic Law

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Abstract: DNA (*Deoxyribonucleic Acid*) paternity testing in Indonesia has not been optimized in determining lineage or biological relationships because it is not explicitly regulated in positive law and is perceived by Muslim communities as having a lower evidentiary status than sharīʿah-based methods of proof. The limited use of DNA testing has contributed to various violations of children's rights, such as neglect and manipulation of lineage or biological relationships. This study is normative legal research with a conceptual approach, analyzed using a descriptive-analytical method, to examine the use of DNA paternity testing as the primary evidentiary instrument for determining a child's origin by integrating genetic science and Islamic law. This study finds that DNA paternity testing is necessary to prevent violations of children's rights because recent studies support its accuracy. DNA paternity testing can be regarded as equivalent to the *firāsh* method (*sexual relations within a marriage*) in establishing lineage under Islamic law, as both complement each other materially and procedurally. To anticipate possible errors in DNA test results, verification can be conducted through expert testimony in a number equivalent to the requirements for witnesses under Islamic law, namely two just male witnesses in determining the lineage of a legitimate child, including a child born from an unregistered marriage, and four just male witnesses in cases of *liʿān*. This study contributes to the international development of Islamic legal studies by conceptualizing DNA paternity testing as a primary evidentiary instrument, equivalent to the *firāsh* method, and by recommending the strengthening of its legal status in Indonesian positive law.

Keywords: Biological Relationship; DNA (*Deoxyribonucleic Acid*) Paternity Testing; Genetic; Islamic Law; Lineage.

Abstrak: Tes paternitas DNA (asam deoksiribonukleat) di Indonesia belum dioptimalkan untuk menentukan garis keturunan atau hubungan biologis karena belum diatur secara eksplisit dalam hukum positif dan dianggap oleh masyarakat Muslim memiliki status pembuktian yang lebih rendah dibandingkan dengan metode pembuktian berbasis syariah. Keterbatasan penggunaan tes DNA telah berkontribusi pada berbagai pelanggaran hak anak, seperti pengabaian dan manipulasi garis keturunan atau

hubungan biologis. Studi ini merupakan penelitian hukum normatif dengan pendekatan konseptual yang dianalisis menggunakan metode deskriptif-analitis untuk meneliti penggunaan tes paternitas DNA sebagai instrumen pembuktian utama dalam menentukan asal-usul anak melalui integrasi ilmu genetika dan hukum Islam. Studi ini menemukan bahwa tes paternitas DNA diperlukan untuk mencegah pelanggaran hak anak karena akurasinya didukung oleh penelitian terbaru. Tes paternitas DNA dapat dianggap setara dengan metode firāsh (hubungan seksual dalam perkawinan) dalam menetapkan garis keturunan menurut hukum Islam, karena keduanya saling melengkapi, baik secara material maupun prosedural. Untuk mengantisipasi kemungkinan kesalahan dalam hasil tes DNA, verifikasi dapat dilakukan melalui kesaksian ahli dalam jumlah yang setara dengan persyaratan saksi dalam hukum Islam, yaitu dua saksi laki-laki yang adil dalam menentukan garis keturunan anak sah, termasuk anak yang lahir dari perkawinan tidak terdaftar, serta empat saksi laki-laki yang adil dalam kasus liʿān. Studi ini berkontribusi pada perkembangan internasional studi hukum Islam melalui rekonstruksi konseptual status tes paternitas DNA sebagai instrumen pembuktian utama yang setara dengan metode firāsh, serta merekomendasikan penguatan status hukumnya dalam hukum positif Indonesia.

Kata Kunci: Hubungan Biologis; Tes Paternitas DNA (*Asam Deoksiribonukleat*); Genetika; Hukum Islam; Garis Keturunan.

Introduction

Recently, DNA (*Deoxyribonucleic Acid*) testing as evidence for determining a child's lineage has attracted public attention in Indonesia through a dispute over the acknowledgment of a child born outside marriage between Lisa Mariana and Ridwan Kamil (former Governor of West Java) in Bandung District Court Case Number 184/Pdt.G/2025/PN.Bdg.[1] During the evidentiary stage of the case, the Indonesian National Police Center for Medical and Health Services concluded that Lisa Mariana's child was not the biological child of Ridwan Kamil. However, Lisa Mariana's legal team questioned the validity of the forensic findings and requested a second opinion through a re-examination at Mount Elizabeth Hospital, Singapore.[2] Ridwan Kamil's legal team rejected the request because the DNA test results issued by the Indonesian National Police Center for Medical and Health Services were legally valid and binding.[3] This case has generated public debate regarding the evidentiary authority of DNA testing in determining a child's biological relationship within the Indonesian legal system and the perspective of Islamic law in Indonesia.[4] Several legal practitioners argue that the implementation of DNA testing to determine a child's lineage

1 Rizky L. Pratama, "Kuasa Hukum Sebut Ridwan Kamil Siap Tes DNA, Tapi Harus Atas Perintah Pengadilan Atau Penyidik," *Kompas*, April 4, 2025; Nurul Amanah, "Ridwan Kamil Siap Tes DNA Buktikan Anak Lisa Mariana Bukan Dagingnya," *INews*, April 5, 2025,

2 Handar Subhandi Bakhtiar et al., "The Utilisation of Scientific Crime Investigation Methods and Forensic Evidence in the Criminal Investigation Process in Indonesia," *Egyptian Journal of Forensic Sciences* 15, no. 1 (2025): 1–18, https://doi.org/10.1186/s41935-025-00456-y. Muhammad Djaelani Prasetya et al., "Subordinate Justice to Forensic Scientists: Indonesia's Authority and Regulation Gap," *Media Iuris* 9, no. 1 (2026): 129–52, https://doi.org/10.20473/mi.v9i1.77587.

3 Isnaya Helmi, "Lisa Mariana Ajukan Permintaan DNA Ulang Di Singapura, Begini Respons Pihak Ridwan Kamil," *Kompas*, September 9, 2025, https://www.kompas.tv/nasional/616540/lisa-mariana-ajukan-permintaan-dna-ulang-di-singapura-begini-respons-pihak-ridwan-kamil. Hammam Izzuddin, "Lisa Mariana Bersikukuh Minta Tes DNA Ulang Di Singapura," *Tempo*, September 11, 2025.

4 Kompas, "Dokter Forensik Blak-Nlakan Soal Kemungkinan Manipulasi Hasil Tes DNA Ridwan Kamil-Lisa Mariana," 2025, https://www.youtube.com/watch?v=Gmf1XTzxQTc.

in Indonesia continues to face various challenges, both in its practical application and in the certainty of its evidentiary value. This is despite its limited recognition through Constitutional Court Decision Number 46/PUU-VIII/2010, which states that a child born outside marriage may have a civil relationship with his or her biological father if such a relationship can be proven through science and technology and/or other legally recognized forms of evidence. [5] This legal uncertainty arises because the decision was not followed by the enactment of a specific statute and implementing regulations that more clearly govern the legal status and evidentiary mechanism of DNA testing.[6] Consequently, in judicial practice, the Constitutional Court's decision is often regarded merely as jurisprudence. It has not been consistently implemented, particularly because of Indonesia's strong civil law tradition, which treats written statutory law as the primary basis for judicial reasoning. [7]

The decision is also subject to multiple interpretations, making it difficult for judges to apply, particularly with respect to the phrases "children born outside of marriage" and "science and technology and/or other evidence". The phrase "a child born out of wedlock" creates ambiguity between a child born from an unregistered marriage and a child born as a result of adultery.[8] In addition, the absence of a clear affirmation of DNA testing in the decision has left its evidentiary status inconsistent. Several court decisions in *contentiosa* cases show that DNA testing is generally used as supplementary evidence or as a last resort to confirm a biological relationship. At the same time, judges continue to prioritize conventional forms of evidence, such as witness testimony and civil registration documents.[9]

Meanwhile, in *voluntary* cases, several court stipulations show that the determination of a child's origin and status is based on administrative evidence and witness testimony without involving DNA testing, including cases concerning children born from legal and unregistered marriages.[10] This pattern demonstrates that

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5 Rinanda Dwi Yuliawati, "Hotman Paris Sarankan Ridwan Kamil Tak Jalani Tes DNA, Soroti Soal Pengakuan Hingga Warisan," *Tribun News*, April 10, 2025; Putri Wartina Lestari, Sonny Dewi Judiasih, and Bambang Daru Nugroho, "Inheritance Rights of Extramarital-Children After the Constitutional Court Decision of 2010," *ICLR: Indonesian Comparative Law Review* 6, no. 1 (2023): 46–61, https://doi.org/10.18196/iclr.v6i1.19655. Fradhana Putra Disantara et al., "The Problematics of the Legal Standing of Deoxyribonucleic Acid (DNA) Test Result Concerning Civil Relationships of Illegitimate Children: A Legal Pluralism Perspective," *Jurnal Ilmiah Mizani* 11, no. 2 (2024): 435–48, https://doi.org/10.29300/mzn.v11i2.5156.

6 This can be seen in Constitutional Court Decision Number 46/PUU-VIII/2010, which added the method of determining paternity based on science and technology and/or other evidence that, according to the law, has a blood relationship. The petitioner's petition was only for the non-applicability of Article 43 Paragraph (1) of Law Number 1 Year 1974 and the recognition of the civil rights of children from a siri marriage with their biological father.

7 Sekar Anggun Gading Pinilih, Retno Saraswati, and Ahmad Muzaki, "Disobedience of the Constitutional Court's Decision by the Supreme Court," *Pandecta* 17, no. 2 (2022):178–88, https://doi.org/10.15294/pandecta.v17i2.36196.

8 Jamrud Qomaruz Zaman et al., "Judicial Interpretation Challenges in Implementation Child Protection Rights Outside of Marriage: A Study of The Religious Court of Malang Regency," *Istinbáth: Jurnal Hukum Dan Ekonomi Islam* 24, no. 1 (2025): 66–82, https://doi.org/10.20414/ijhi.v24i1.777.

9 Tangerang District Court Decision Number 746/Pdt.G/2021/PN.TNG; Arso Religious Court Decision Number 004/Pdt.G/2019/PA.Ars; Padang District Court Decision Number 167/Pdt.P/2018/PN.Pdg; Tuban Religious Court Decision Number 1323/Pdt.G/2018/PA.Tbn; Semarang High Religious Court Decision Number 147/Pdt.G/2018/PTA.Smg; Surabaya High Religious Court Decision Number 0114/Pdt.G/2015/PTA.Sby; and Surabaya Religious Court Decision Number 0792/Pdt.G/2014/PA.Sby.

10 Sleman Religious Court Stipulation Number 14/Pdt.P/2024/PA.Smn; Bogor District Court Stipulation Number 112/Pdt.P/2024/PN.Bgr; Pontianak District Court Stipulation Number 497/Pdt.P/2024/PN.Ptk; Pati District Court

DNA testing has not yet been consistently positioned as a primary form of stand-alone evidence in determining lineage or biological relationships. Other regulations, such as Article 42 of Law Number 1 Year 1974 on Marriage and Article 99 of the Compilation of Islamic Law, also do not allow DNA testing as the primary evidence for determining the origin or legitimacy of children. Both articles explain that a legitimate child is a child born in or as a result of a legal marriage. From this provision, it appears that even if a child is born a day after marriage, it is considered a legitimate child without the need for other evidence that is more credible. The two articles provide ample room for abuse of a child's lineage (*nasab*) status when a woman becomes pregnant due to adultery, and the man who adulterated her does not take responsibility, so to cover the family's shame, she is married off to another man.[11]

Abuse of the child's lineage status also occurs due to falsification of the child's identity from being an adopted child to a legitimate child. This often occurs in Indonesia through a legal loophole in the form of Article 5 Paragraph (2) letter d of Regulation of the Minister of Home Affairs of the Republic of Indonesia Number 109/2019, which explains that a birth attendant can recommend a birth certificate. The concept of birth attendants generally refers to traditional birth attendants, who still play a role in rural areas due to the lack of medical personnel.[12] Even so, in some areas with health facilities, traditional birth attendants still play a role in cultural preservation.[13] These traditional healers are not bound by a code of ethics like doctors or midwives, so they can freely provide birth certificates for anyone they help. Sometimes these baby shamans do assist in the delivery or birth of a child who then provides a false certificate of the child's status to the adopter.

On the other hand, some baby shamans do not assist in the delivery or birth of a child at all, but provide a false birth certificate at the request of the adopter. Various factors cause this to happen, such as the baby shaman's lack of knowledge, compassion for the adopter due to difficulties in obtaining offspring, and certain gratuities given by the adopter to the baby shaman.[14] If these regulations and legal loopholes for the abuse of children's lineage continue to occur, then there is no longer respect for *hifz al-nasl*. Such actions are considered a violation of Allah's *sharī'a* as explained in Surah Al-Ahzab 33:5, which prohibits attributing the lineage of a child other than to his biological/logical father (except in the case of children resulting from adultery).[15] The implicit meaning of this

Stipulation Number 47/Pdt.P/2024/PN.Pti; Jepara District Court Stipulation Number 48/Pdt.P/2024/PN.Jpa; Denpasar District Court Stipulation Number 131/Pdt.P/2024/PN.Dps; Gianyar District Court Stipulation Number 137/Pdt.P/2024/PN.Gin; and Pekanbaru District Court Stipulation Number 9/Pdt.P/2024/PN.Pbr.

11 Hiba Fajarwati, Iffatin Nur, and Fatkul Hidayat, "Legal Consequences of Establishing the Civil Rights of Illegitimate Children from the Progressive Fiqh Perspective," *Karsa: Journal of Social and Islamic Culture* 32, no. 1 (2024): 90–118, https://doi.org/10.19105/karsa.v32i1.13646.

12 Putu Sri Devi Tari and Helen Andriani, "The Relationship between Maternal Participation in Household Decision Making and Birth Attendant Selection: Evidence from Indonesia Demographic and Health Survey," *Scientific Foundation SPIROSKI* 18, no. 10 (2022): 1343–49, https://doi.org/10.3889/oamjms.2022.9514.

13 Laksmi Trisasmita, "The Existence of Traditional Birth Attendants (Dukun Paraji) in the Practice of Birth Assistance Service in Bogor Regency," *JGMI: The Journal of Indonesian Community Nutrition* 13, no.1(2024):1–11, https://doi.org/10.30597/jgmi.v13i1.34261.

14 Anna Veronica Pont et al., "Factors Associated with Birth Registrations in Indonesia," *Electronic Journal of General Medicine* 20, no. 2 (2023): 1–7, https://doi.org/10.29333/ejgm/12900.

15 Haouassi Yamna and Hadjoudj Keltoum, "The Validity of Genetic Fingerprinting in Attributing a Child Born from Rape," *Lex Localis: Journal of Local Self-Government* 23, no. 11 (2025): 1495–1508, https://doi.org/10.52152/m3pmkd32.

verse is the importance of maintaining the clarity of the child's lineage status and respecting the rights of his biological father.[16] Therefore, the issue of the child's lineage is not seen as a playful act. A solution is needed to ensure the credibility of the child's lineage in this manipulative era. In this study, DNA testing is considered one of the strongest pieces of evidence that can compete with traditional methods of proof based on *nāsh* in determining lineage/biological status.

This study aims to deconstruct the methods of paternity proof in classical Islamic law, which have long been based on logical assumptions and past empirical observations and reinforced by some contemporary studies, but are now considered less relevant in light of modern scientific developments, even though some of their principles are still adopted in Indonesian positive law. In classical *fiqh* literature, the determination of lineage was formulated based on the biological knowledge and social realities of the time. For instance, Mālik ibn ʾAnas (Imam Mālikī) and Muḥammad bin Idrīs asy-Syāfiʿī (Imam Shāfiʿī) established that a child's lineage may be attributed to the husband if the child is born at least six months after the marriage contract, a position later reaffirmed by Wahbah az-Zuhailī.[17] However, this requirement creates potential loopholes for lineage manipulation, for example when a woman who becomes pregnant as a result of adultery is subsequently married to a man who is not the child's biological father.[18] It is also increasingly questioned by medical findings reporting cases of premature births at approximately four months and fifteen days of gestation that can survive with the assistance of incubators.[19]

In contrast, Abū Ḥanīfah An-Nu'mān (Imam Hanafī) emphasized the principle of *firāsh*, namely the presumption of legitimacy whereby a child born within a valid marriage is attributed to the husband regardless of the interval between the marriage contract and the child's birth.[20] This approach has influenced family law systems in several Muslim-majority countries, including Indonesia, as reflected in Article 42 of Law Number 1 of 1974 on Marriage and Article 99 of the Compilation of Islamic Law. Although contemporary Islamic scholarship has begun to accept DNA paternity testing in determining biological lineage, its evidentiary status is still placed below the traditional method of proof based on the principle of *firāsh.* It is only considered equivalent to circumstantial indication evidence (*qarīnah*) or identification of a person using physical signs (*qīyafah*).[21]

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[16] Doni Azhari, Asmuni, and Khoiruddin Nasution, "Reassesing Tajdid Al-Nikah: Maqasid Al-Shariah and Legal Status of Illegitimate Children in Central Lombok," *Justicia Islamica: Jurnal Kajian Hukum Dan Sosial* 22, no. 1 (2025): 1–24, https://doi.org/10.21154/justicia.v22i1.7343.

[17] Muhāmmad bin Idrīs Al-Syāfi'ī, *Al-Umm Juz 5* (Beirut: Dār al-Khatab Al-Ilmiah, 1993), 32. Muhāmmad bin Idrīs Al-Syāfi'ī, *Al-Bayān Juz 10* (Beirut: Dār al-Fikr, 1998), 148. Al-Imam Muhāmmad al-Dīn al-Mubārak Ibnu Muhāmmad al-Jazarī Ibnu Al-Thīr, *Al-Nihāyah Fī Gharīb Al-Hadīts Wa Al-Āthar Juz 3* (Beirut: Dār al-Fikr, 1979), 41. Wahbah Az-Zuhailī, *Fiqih Islam Wa Adillatuhu Jilid 10* (Jakarta: Gema Insani, 2011), 32-33.

[18] Mursyid Djawas et al., "The Legal Position of Children of Insect (A Study of Madhhab Scholars and Compilation of Islamic Law)," *Samarah: Jurnal Hukum Keluarga Dan Hukum Islam* 6, no. 1 (2022): 139–55, https://doi.org/10.22373/sjhk.v6i1.11904.

[19] Delfina Serrano Ruano, "The Duration of Pregnancy in Contemporary Islamic Jurisprudence (Fiqh) and Legislation: Tradition, Adaption to Modern Medicine and (In) Consequences," *The Muslim World* 112, no. 3 (2022): 367–84, https://doi.org/10.1111/muwo.12442.

[20] Abū Zakariā Yahyā bin Syaraf Al-Nawāwī, *Shahīh Muslīm Bi Syarah Nawāwī Juz 7* (Mesir: Al-Misriyyah wa Maktabatuha, 1943), 37-38.

[21] Mohammad Fadel, "DNA Evidence and the Islamic Law of Paternity in Light of Maqāsid Al-Sharī'a," *The Muslim World* 112, no. 3 (2022): 311–23, https://doi.org/10.2139/ssrn.3757975. Khairil Hafizi Yaacob, Mazlena Mohamad Hussain, and Nurul BAdriyah Ali, "Presumption of Legitimacy Based on Medical Scientific Evidence (DNA Test): A Comparative Study between Shariah and Civil Law in Malaysia," *Global Journal Al-Thaqafah* November, no. Empowering Civilization in the Era of Industrial Revolution 5.0 (2025): 29–43,

Therefore, reconstructing the concept of lineage determination by integrating modern scientific findings is essential so that it no longer relies solely on classical presumptive assumptions but is also supported by more accurate biological evidence.[22] This research focuses on DNA testing as one of the most powerful forms of evidence for determining a child's lineage today. Therefore, this research cannot be separated from the approach of genetics as an auxiliary science.[23] After knowing the results of the genetic science approach, the correlation with Islamic law is analyzed. It is hoped that optimizing the development of science as a tool will no longer make people hesitate to use it as evidence and ensure the purity of lineage from various manipulations. Positive law in Indonesia, which still connotes only formal proof and contains legal loopholes for the misuse of lineage, should be deconstructed through the right legal construction.

Method

This research is normative legal research[24] that focuses on a critical review of the use of DNA testing from the perspectives of genetic science and Islamic law, to optimize the determination of a child's origin (both lineage determination and biological relationship).[25] The research employs a conceptual approach through an in-depth analysis of DNA paternity testing as the primary evidentiary instrument for determining a child's origin, while also opening space for integrating genetic science and Islamic legal perspectives to achieve more accurate and transformative outcomes.[26] The legal materials used in this research consist of primary and secondary legal sources. Primary legal materials include statutory regulations, court decisions, fatwas, and classical *fiqh* literature on the use of DNA paternity testing to determine lineage or biological relationships. Meanwhile, secondary legal materials comprise various books and journal articles relevant to the research topic.[27]

Legal materials were collected through a literature study by systematically tracing, identifying, and examining relevant scholarly sources to obtain a comprehensive understanding of the determination of a child's origin based on DNA paternity testing.[28] Legal materials were validated through source triangulation by cross-checking and comparing information obtained from various primary and secondary legal sources, including statutory regulations, court decisions, fatwas, classical fiqh literature, books, and relevant journal articles.[29] Subsequently, the legal materials are analyzed using a descriptive-analytical approach to critically examine the relationship between developments in genetic science and the construction of Islamic law in determining a child's origin.[30]

https://doi.org/10.7187/GJATSI112025-3.
Masriadi, "DNA Testing and Lineage in Muslim Societies: Yusuf Al-Qaradawi's Perspective within Contemporary Islamic and Social Studies," *Muharrik: Jurnal Dakwah Dan Sosial* 7, no. 1 (2024): 201–10, https://ejournal.insuriponorogo.ac.id/index.php/muharrik/article/view/8364.

22 Aslati et al., "Utilizing Science Maqāṣid Al-Sharī'ah in Resolving Contemporrary Issues of Islamic Family Law," *Al-Manāhij: Jurnal Kajian Hukum Islam* 18, no. 1 (2024): 17–36, https://doi.org/10.24090/mnh.v18i1.10571.

23 Dragan Milovanović, *A Primer in the Sociology of Law* (New York: Harrow and Heston Publisher, 1994), 164-165.

24 Johny Ibrahim, *Metode Penelitian Hukum Normatif* (Malang: Banyumedia, 2008), 249.

25 Peter Mahmud Marzuki, *Penelitian Hukum: Edisi Revisi* (Jakarta: Kencana Prenada Media Group, 2005), 47.

26 Johnny Ibrahim, *Teori Dan Metodologi Penelitian Hukum Normatif* (Malang: Bayumedia, 2006), 300.

27 Marzuki, *Penelitian Hukum: Edisi Revisi*, 141.

28 Suratman and H. Philips Dillah, *Metode Penelitian Hukum* (Bandung: Penerbit Alfabeta, 2013), 82-85.

29 Norman K. Denzin and Yvonna S. Lincoln, *Handbook of Qualitative Research* (Sage Publications, 2000), 779-780.

30 Muhaimin, *Metode Penelitian Hukum* (Mataram: Mataram University Press, 2020), 76.

DNA Test Credibility in Paternity Determination

In the history of forensic genetics, the foundation for the use of DNA testing in determining biological relationships was first established by Alec Jeffreys of the University of Leicester in 1984 through the discovery of DNA fingerprinting techniques based on variations in repetitive DNA sequences, which later became the precursor to Short Tandem Repeat (STR) analysis.[31] Although Jeffreys's early method was still based on minisatellites (RFLP), the development of PCR technology in the late 1980s and early 1990s encouraged the scientific community and international forensic institutions, including the Federal Bureau of Investigation (FBI), through the development of the CODIS system to adopt STR as the most accurate, efficient, and reliable method for analyzing identity and biological relatedness.[32] The adoption of STR as a standard was driven by its high level of polymorphism, minimal DNA sample requirements, and superior stability of results compared to previous methods.[33] In the context of early applications in family law, the use of DNA evidence was first documented in the mid-1980s in family reunification and immigration cases in the United Kingdom, where DNA techniques were employed to scientifically establish parent–child relationships.[34] Since then, STR-based paternity testing has evolved and is widely accepted as the most precise method of biological proof in modern forensic genetics.[35]

An STR is a short DNA sequence consisting of 1 to 6 nucleotide base pairs that are repeated sequentially, usually 5 to 10 times, at various locations in the genome.[36] In paternity testing, allele matches at several STR loci are compared between the child sample and the parent sample to determine the biological relationship. This DNA STR test is performed by taking DNA samples from the child and the presumed father, with the mother's DNA sample as a comparator. Such cases are commonly referred to as trio testing, which makes paternity identification easier. However, paternity testing can also be done between the father and the child only (duo).[37] Even in its development, DNA testing with STR repeats is currently based on non-invasive prenatal testing in the fetus using Next Generation Sequencing (NGS) tools that no longer require direct fetal blood samples, but only maternal blood samples called cell-free fetal DNA (cffDNA).[38] Each person has two alleles of each STR locus, with one inherited from the biological

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31 Johannes Hendrik Smith and M. Singh, "DNA Forensic and Forensic Investigative Leads," *Journal of Forensic Medicine* 9, no. 2 (2024): 1–7, https://doi.org/10.37421/2472-1026.2024.9.347.

32 Sharlize Pedroza Matute and Sasitaran Iyavoo, "Implementation of NGC and SNP Microarrays in Routine Forensic Practice: Opportunities and Barriers," *BMC Genomics* 26, no. 1 (2025): 3–15, https://doi.org/10.1186/s12864-025-11723-6.

33 Binglin Li et al., "STRaM: A Genetic Framework for Improved Cell Product Provenance for Research and Clinical Translations," *Communications Biology* 8, no. 1 (2025): 1–20, https://doi.org/10.1038/s42003-025-08547-1.

34 Roberta Bivins, "Pilot Programs and Postcolonial Pivots: Pioneering 'DNA Fingerprinting' on Britain's Borders," *Comparative Studies in Society and History* 65, no. 2 (2023): 346–71, https://doi.org/10.1017/S0010417522000494.

35 Donya A. Khalid and Nasser Nafea, "A Deep Neural Network Model for Paternity Testing Based on 15-Loci STR for Iraqi Families," *Journal of Intelligent System* 32, no. 1 (2023): 1–15, https://doi.org/10.1515/jisys-2023-0041.

36 Max Verbiest et al., "Mutation and Selection Processes Regulating Short Tandem Repeat Give Rise to Genetic and Phenotypic Diversity Across Species," *Journal of Evolutionary Biology* 36, no. 2 (2022): 321–36, https://doi.org/10.1111/jeb.14106.

37 Roslyn Stella Thellingwani, Catherine Ashley Jonhera, and Collen Masimirembwa, "Analysis of Data and Common Mutations Encountered During Routine Parentage Testing in Zimbabwe," *Scientific Reports* 14, no. 1 (2024): 1–9, https://doi.org/10.1038/s41598-024-51987-8.

38 Wenqian Song et al., "Non Invasive Prenatal Paternity Testing Using Mini-STR Based Next Generation Sequencing: A Pilot Study," *Genes* 12, no. 3 (2021): 337–44, https://doi.org/10.22541/au.164864542.28963224/v1.

mother and one from the biological father. For example, if a child has alleles 13 and 16 at locus D13S317, then both the biological mother and father must have at least one of those alleles (13 or 16). If neither of them has a match for that allele, then they will be excluded from paternity or maternity.[39] For more details, here is a simple example in the form of a table consisting of 4 Short Tandem Repeat (STR) loci.

Table 1.
Simple example of paternity test on 4 Short Tandem Repeat (STR) alleles

No Loci	Child	Mother	Father I	Father 2
D8S1179	11, 14	11, 13	12, 14	13, 14
D21S11	11, 13	9, 11	13, 15	12, 14
D7S820	14, 16	14, 15	15, 16	15, 16
CSF1PO	14, 17	14, 16	16, 17	15, 16

Source: Author's illustration based on Butler, 2012.[40]

From the above data, it can be concluded that father 1 is the biological father of the child because there is full similarity between one of the alleles of the child and one of the alleles of the father. Whereas father 2 was declared not to be the biological father due to the difference in alleles at the STR loci D21S11 and CSF1PO. The data is only a simple example and does not have high accuracy. The probability of paternity will be more accurate if more than 12 Short Tandem Repeat (STR) loci are tested[41]. Still, some other studies require as many as 15 STR loci to achieve 99% accuracy.[42]

Although the accuracy of paternity tests using STR can reach more than 99%, the possibility of errors remains, although the risk is very small. According to John M. Butler, the probability of a random person matching in testing DNA STR alleles in a paternity test is 1:1,000,000,000,000,000,000 (one quadrillion).[43] Whereas William C. Thompson, quoting Bruce Weir, said that the probability of random unrelated people having the same STR DNA allele is 1: 2,000,000,000,000,000,000 (2 quadrillion).[44] The most common sources of error in DNA STR tests are contamination and human error. Contamination is the most crucial factor, as it can lead to irreparable damage. Forms of contamination can include cross-contamination between DNA samples, contamination by microorganisms, and environmental contamination such as uncontrolled temperature and humidity. Meanwhile, human error can take the form of sample labeling errors, data input errors, errors in analysis, or interpretation errors. Most human-error errors can still be corrected.[45]

In its development, the risk of human error in paternity DNA testing can be minimized with the use of Artificial Intelligence (AI). The application of AI in

[39] Krysztof Żak and Magdalena Konarzewska, "Analysis of Short Tandem Repeat Mutations in Paternity Caes from Masovian Voivodeship Provinces Form Years 2018-2022 Based on Materials of the Departement of Forensic Medicine, Medical University of Warsaw," *Arch Med Sadowej* 73, no. 2 (2023): 139–48, https://doi.org/10.4467/16891716amsik.23.012.18687.

[40] John Butler, *Advanced Topics in Forensic DNA Typing: Methodology* (San Diego, CA: Elsevier Academic Press, 2012), https://doi.org/10.1016/C2011-0-04189-3.

[41] Majeed A. Sabbah et al., "Short Tandem Repeat (STR) Variation from 6 Cities in Iraq Based on 15 Loci," *Jordan of Genetic Engineering and Biotechnology* 21, no. 1 (2023): 1–9, https://doi.org/10.1186/s43141-023-00570-1.

[42] Amela Pilav et al., "Allele Frequencies of 15 STR Loci in Bosnian and Herzegovian Population," *Forensic Science* 58, no. 3 (2017): 250–56, https://doi.org/10.3325/cmj.2017.58.250.

[43] John M. Butler, *Advanced Topics in Forensic DNA Typing: Methodology* (Elsevier, 2012), https://doi.org/10.1016/B978-0-12-374513-2.00028-2.

[44] William C. Thompson, "Forensic DNA Evidence: The Myth of Infallibility," in *Genetic Explanations: Sense and Nonsense* (Cambridge, Massachusetts: Harvard University Press, 2008), 227–347.

[45] Katherine E. Donohue et al., "Pitfalls and Chalanges in Genetic Test Interpretation: An Exploration of Genetic Professionals Experience with Interpretation of Result," *Clin Genet* 99, no. 5 (2021): 638–49, https://doi.org/10.1111/cge.13917.

forensic genetics focuses on two important aspects: first, accelerating and improving the classification of DNA samples. Secondly, analyzing repeat patterns in STR profiles to minimize the risk of misinterpretation by forensic geneticists.[46] There are many types of AI used in DNA analysis, such as random forests, support vector machines (SVMs), deep learning models, hidden markov models (HMMs), and clustering algorithms. The average accuracy rate of these models is reported to exceed 94%.[47] Although AI can help analyze DNA tests more quickly and accurately, it does not eliminate the possibility of errors, such as algorithmic bias, which, under certain conditions, can harm patients or other parties involved and contradict the principles of medical ethics. Therefore, the use of AI should not replace expert human judgment as a validator. AI should serve only as a tool, although in practice there are still challenges in interpreting data generated by AI-based systems.[48]

Based on the discussion regarding the credibility of DNA testing in determining paternity, it can be concluded that Short Tandem Repeat (STR) analysis is the most accurate and widely used method in DNA-based paternity testing. This method operates by analyzing alleles at each STR locus inherited from the biological mother and father, thereby enabling highly precise identification of biological relationships. Technological developments have also facilitated the application of STR testing in non-invasive prenatal contexts by enabling analysis of cell-free fetal DNA (cffDNA) using Next Generation Sequencing (NGS) technology. The accuracy of paternity testing increases significantly when conducted using trio testing and analysis of at least 12-15 STR loci, achieving a certainty level of approximately 99%. Nevertheless, potential inaccuracies may still arise due to sample contamination and human error during the analytical process. In recent developments, AI has also been used to enhance the speed and precision of STR analysis. However, the process still requires expert validation to ensure the reliability of the results.

The Position of DNA Test as Paternity Evidence According to Islamic Law

The methods of paternity testing based on the opinions of classical scholars are divided into two, namely the primary method and the secondary method.[49] The primary method refers to sexual intercourse within the bond of marriage or ownership of a slave. This relationship is often referred to as *firāsh*, which means "bed." The literal meaning of the phrase *firāsh* is that the child is attributed to the legal partner in the marriage bond, with the husband having sex with his wife or the male master having sex with his slave girl in bed.[50] According to Ibn Hajar al-'Asqālanī, the reason *firāsh* is used as the primary method for determining lineage is that the Prophet (SAW) faced a dispute over lineage and preferred the birth of a child from a legal marriage over dubious physical resemblance.[51] The secondary

[46] Mengyu Tan et al., "Explainable Artificial Intelligence in Forensic DNA Analysis: Alleles Identification in Challenging Electropherograms Using Supervised Machine Learning Methods," *Forensic Science International: Genetics* 78, no. 1 (2025): 103289, https://doi.org/10.1016/j.fsigen.2025.103289.

[47] Maryam Yeganegi et al., "Research Advancements in the Use of Artificial Intelligenceb for Prenatal Diagnosis of Neural Tube Defects," *Frointiers in Pediatrics* 13, no. 1 (2025): 1–10, https://doi.org/10.3389/fped.2025.1514447.

[48] Mark Barash et al., "Machine Learning Applications in Forensic DNA Profiling: A Critical Review," *Forensic Science International: Genetics* 69, no. 1 (2024): 1–15, https://doi.org/10.1016/j.fsigen.2023.102994.

[49] Ayman Shabana, "Paternity between Law and Biology: The Reconstruction of the Islamic Law of Paternity in the Wake of DNA Testing," *Zygon* 47, no. 1 (2012): 214–39, https://doi.org/10.1111/j.1467-9744.2011.01246.x.

[50] Al-Imam Abūl Husain Muslīm, *Shahīh Muslīm* (Beirut: Dār al-Kutūb al-Ilmiyah, 1998), 1457.

[51] Ahmad Ibn Alī Ibn Hajar Al-'Asqālanī, *Fath Al-Bārī Bi Sharh Shahīh Al-Bukhārī* (Cairo: Maktabat al-'Ilm, 2000) 12:39.

method is used if the primary method is difficult to ascertain or does not exist, and it can also serve as strong supporting evidence (*qarīnah*). These secondary methods include recognition (*iqrar*)[52], proof (*bayyinah*)[53], identification of a person using physical signs (*qīyafah*)[54], and lottery (*qur'ah*).[55] The four methods are arranged vertically, and they replace each other if the method above is absent or difficult to prove.

In modern developments, DNA testing has emerged as an empirical method based on deoxyribonucleic acid (DNA). This molecule carries genetic information inherited by all living organisms and possesses unique characteristics. The emergence of DNA paternity testing has generated debate among contemporary Muslim scholars because this method had never been explicitly discussed in the *nāṣh* nor in the *ijtihād* of classical scholars.[56] The debate primarily concerns the placement of DNA testing within the established hierarchy of methods for proving lineage, traditionally formulated by classical scholars.[57] Nevertheless, most contemporary scholars generally acknowledge the permissibility of using DNA paternity testing to establish lineage.[58] Some scholars and medical experts participating in a symposium organized by the Islamic Organization for Medical Sciences in Kuwait in October 1988 further stated that DNA

[52] Muhammad Alī Yūsuf Muhammadī, *Ahkām Al-Nasab Fī Al-Sharī'ah Al-Islāmiyyah, Turuq Ithbātihi Wa Nafiyh* (Doha: Dār Qatrī Ibn al-Fujā'ah, 1994), 267.

[53] Muhammadī, *Ahkām Al-Nasab Fī Al-Sharī'ah Al-Islāmiyyah, Turuq Ithbātihi Wa Nafiyh*, 286. In its development, the concept of evidence (*bayyinah*) has been extended to CCTV evidence, DNA, and others; Yahaya Ibrahim Abikan, "Examining the Admissibility or Otherwise of Evidence Generated from Closed Circuit Television (CCTV) and Deoxyribonucleic Acid (DNA) Test as Means of Proof of Zin under Islamic Law," *Al-Manâhij: Jurnal Kajian Hukum Islam* 17, no. 1 (2023): 83–96, https://doi.org/10.24090/mnh.v17i1.8172.

[54] There is disagreement between the Imams regarding the validity of *qīyafah* as a method of paternity. The Hanafī and Mālikī Imams reject the *qīyafah* method because it is based solely on prejudice or conjecture and the narration of Abū Hurairah, which states that the Prophet (SAW) rejected the *qīyafah* method on the grounds of inheriting traits from distant ancestors (Sunan Ibn Mājah, 1992 and 1993). Imam Shāfi'ī and Imam Hanbalī accept the *qīyafah* method in paternity testing because it is based on the *hadīth* narrated by Aisha (Sahīh Bukhārī No. 6771 and Sahīh Muslīm No. 1459) that the Prophet used the *qīyafah* method in determining the lineage between Usāmah ibn Zayd and Zayd ibn Hāritsah. See Muhammadī, *Ahkām Al-Nasab Fī Al-Sharī'ah Al-Islāmiyyah, Turuq Ithbātihi Wa Nafiyh*, 332.

[55] This method of lottery (*qur'ah*) is the last resort in determining nasab if there is no guidance at all by drawing lots between the disputing parties. Some classical scholars, including Imam Shāfi'ī accepted this method based on the *hadīth* narrated by Zayd ibn Arqam (*hadīth* narrated by Abū Dawūd No. 2269, An-Nasā'ī No. 3490, and Ahmad No. 19342) that the Prophet was silent (not forbidding) and even smiled until his molars were visible at the action of Alī ibn Abī Thālib, who judged three men who had sexual intercourse with one woman during chastity by drawing lots to determine the parentage of the child born. See Muhammadī, *Ahkām Al-Nasab Fī Al-Sharī'ah Al-Islāmiyyah, Turuq Ithbātihi Wa Nafiyh*, 332.

[56] Almazrouei, Siti Aisyah Samudin, and Mahamatayuding Samah, "Examining the Validity of Genetic Fingerprints in Lineage Determination Under Islamic Shariah and Malaysian Law," *Journal of Shariah Law Research* 10, no. 1 (2025): 37–62, https://doi.org/10.22452/jslr.vol10no1.3. Alfitri, Muhammad Idzhar, and Muhammad Kholil Muqorrobien, "Constitutionalizing Islamic Law in Indonesia: Sharia Courts and the Legitimate Child Clause," *Ahkam: Jurnal Ilmu Syariah* 25, no. 2 (2025): 395–414, https://doi.org/10.15408/ajis.v25i2.41896.

[57] Abū Khuzaymah and Asmā' Mandūh, *Wasā'il Itbāt Al-Nasab Bayna Al-Qadīm Wa Al-Mu'āsir, Dirāsah Fiqhiyyah Muqāranah* (Alexandria: Dār al-Fikr al-Jāmi'ī, 2010), 325. Muhammad al-Mukhtār Sallāmī, *Al-Tibb Fī Daw' Al-Īmān* (Beirut: Dār al-Gharb al-Islāmī, 2001), 184.

[58] Fatwa of the Islamic Jurisprudence Council of the Islamic World League in Makkah Al-Mukarramah, 16th session, 21-26/10/1422 H or 5-10/01/2002. Fatwa of the Islamic Organizations for Medical Sciences (IOMS) Conference in Kuwait in October 1998. National Council for the 101st Islamic Religious Affairs Fatwa Committee Malaysia on 27 September 2012. 31st NU Mukhtamar in Grand Pasundan Hotel, Bandung on 11 October 2004.

testing could serve as a substitute for, or verification of, the *liʿān* declaration, arguing that *sharī'ah* does not reject scientific evidence. This view is also supported by Abdul Karīm Zaydān, who asserted that establishing lineage through empirically based medical science, such as DNA testing, is a necessity and is consistent with the principles of *sharī'ah* that encourage scientific exploration of nature as a means of discovering the signs of the greatness of Allah SWT.[59]

The majority of contemporary scholars place paternity DNA testing as a supporting form of evidence (*qarīnah*) in determining lineag. This view is represented by several scholars such as Sa'd al-Dīn Mus'ad Hilālī, Khalīfah 'Alī Ka'bī, and Muhammad Ra'fat 'Uthmān.[60] According to them, the high level of accuracy of DNA testing does not automatically make it an absolute form of evidence capable of replacing the evidentiary methods established in the *sharī'ah*. The main argument of this group is that the system of proof in determining lineage within Islamic law is hierarchical; therefore, evidence recognized by the *sharī'ah*, such as *firāsh* (marriage), must remain the primary proof. In this regard, DNA testing only functions as corroborative evidence or an additional indication that assists judges in understanding biological facts, but it cannot replace the fundamental principles that have been formulated by classical Islamic scholars.

Some contemporary scholars also view paternity DNA testing as a possible substitute for the method of *qiyāfah*, a traditional technique used to determine kinship through the analysis of physical resemblance. In this perspective, DNA testing is considered to have stronger evidentiary value than *qiyāfah* because it is based on scientific evidence that can be empirically verified.[61] Nevertheless, from a methodological standpoint, both are still regarded as having a similar function, namely as indicative forms of evidence that assist the process of proof.[62] Several contemporary scholars even argue that the relevance of *qiyāfah* has become increasingly questionable in the modern context, since physical resemblance may derive from more distant ancestral lines and does not necessarily indicate a direct biological relationship.[63] Therefore, DNA testing is considered a modern development of biological identification methods that were previously recognized within the tradition of Islamic law.

Various fatwas produced through consensus or international conferences of scholars continue to maintain a procedural and hierarchical system of proof in determining lineage. Within this system, marriage (*firāsh*) is still regarded as the strongest evidence in establishing lineage, as it refers to the legal framework formulated by classical scholars.[64] Several classical

[59] Abdul Karīm Zaydān, *Al-Mufassal Fī Ahkām Al-Mar'ah Wa Bayt Al-Muslīm Fī Al-Sharīat Al-Islāmiyyah Vol. 9* (Libanon: Muassasah al-Risālah, 1993), 414.

[60] Sa'd al-Dīn Mus'ad Hilālī, *Al-Basmah Al-Wirāthiyah Wa 'Alā'iquhā Al-Shar'iyyah, Dirāsah Fiqhiyyah Muqāranah* (Kuwait: Jāmi'at al-Kuwayt, 2001), 272. Khalīfah 'Alī Ka'bī, *Al-Basmah Al-Wirāthiyyah Wa Atharuhā 'alā Al-Ahkām Al-Fiqhiyyah* ('Ammān: Dār al-Nafā'is, 2006), 292. Muhammad Ra'fat 'Uthmān, *Al-Māddah Al-Wirāthiyyah, Al-Jīnum, Qadāyā Fiqhiyyah* (Cairo: Maktabat Wahbah, 2009), 339.

[61] Anas Maulana et al., "Inheritance Rights of Nasabiyah Children Born Out of Wedlock According to Islamic Family Law," *El-Usrah: Jurnal Hukum Keluarga* 7, no. 2 (2024): 444–61, https://doi.org/10.22373/ujhk.v7i2.25072. Nafiu Ahmed Arikewuyo, "Forensic Medicine and Its Legal Implication on Selected Matters in Islamic Law of Inheritance," *Australian Journal of Islamic Studies* 10, no. 2 (2025): 74–89, https://doi.org/10.55831/ajis.v10i2.681.

[62] Ka'bī, *Al-Basmah Al-Wirāthiyyah Wa Atharuhā 'alā Al-Ahkām Al-Fiqhiyyah*, 361.

[63] Shabana, *Paternity between Law and Biology: The Reconstruction of the Islamic Law of Paternity in the Wake of DNA Testing*.

[64] Islamic Jurisprudence Council of the Islamic World League in Makkah Al-Mukarramah, 16th session, 21-26/10/1422 H or 5-10/01/2002. 'Abd Al-Husnī and Mahmūd Samad, *Al-Basmah Al-Warathiyyah Wa Madā Hujjituha Fī Al-Ithbat* (Iskandariyyah: Dār al-Fikr al-Jam'i, 2009), 724.

scholars, such as Imam Mālik and Imam Shāfi'ī, established a minimum period of six months after the marriage contract as the time threshold for attributing lineage, a view that has also been supported by contemporary scholars such as Wahbah az-Zuhailī.[65] In addition, in cases of *liʿān*, the oath remains the primary form of evidence affirming the husband's doubt regarding his wife's fidelity, even when the results of DNA testing or other forensic evidence do not indicate the occurrence of adultery. In this context, paternity DNA testing is only positioned as supplementary evidence that does not directly determine the outcome of the legal decision.[66]

The approach that positions DNA testing merely as supporting evidence has the potential to overlook highly compelling material evidence in revealing biological truth. Such neglect may be considered contrary to the principle of *ḥifẓ al-nasl* (the protection of lineage) within *maqāṣid al-sharīʿah*, as it may lead to the loss of a child's right to be affiliated with his or her biological father when that relationship has been scientifically proven.[67] Normatively, the Qur'an emphasizes the importance of attributing children to their biological fathers, as reflected in Surah Al-Ahzab 33:5.[68] Moreover, the neglect of biological evidence may also threaten the fulfillment of children's rights, particularly for those born outside marriage, whether from unregistered marriages or from extramarital relationships. Although the Qur'an does not explicitly regulate the obligation of financial support for children born from adultery, the responsibility of the biological father toward such children may be understood as part of the principle of *maṣlaḥat al-ṭifl*, namely the protection of the child's best interests.[69] On the other hand, developments in modern medical science also indicate that the six-month minimum pregnancy period adopted by classical scholars such as Imam Mālik and Imam Shāfi'ī has empirical limitations. Recent research shows the possibility of premature births occurring at shorter gestational ages with the assistance of incubator technology. The six-month minimum pregnancy requirement also contains potential loopholes for manipulation, such as cases where a woman who is one or two months pregnant as a result of adultery subsequently marries another man to conceal the pregnancy.[70] Therefore, it is necessary to reconstruct fatwas concerning the determination of a child's origin, both lineage and biological relationship, by taking into account

Khālid Muhammad Sha'bān, *Mas'ūliyyat Al-Tibb Al-Shar'ī* (Iskandariyyah: Dār al-Fikr al-Jāmi'ī, 2008), 459-600.

65 Al-Syāfi'ī, *Al-Bayān Juz 10*, 148. Al-Thīr, *Al-Nihāyah Fī Gharīb Al-Hadīts Wa Al-Āthar Juz 3*, 41. Az-Zuhailī, *Fiqih Islam Wa Adillatuhu Jilid 10*, 32-33.

66 Islamic Jurisprudence Council of the Islamic World League in Makkah Al-Mukarramah, 16th session, 21-26/10/1422 H or 5-10/01/2002. symposium of the Islamic Organization for Medical Sciences (IOMS) Conference in Kuwait in 2000. comparison of the position between rights and laws that live in society.

67 Dörthe Engelcke and Nadjma Yassari, "Child Law in Muslim Jurisdiction: The Role of the State in Establishing Filiation (Nasab) and Protecting Parentless Children," *Journal of Law and Religion* 34, no. 3 (2019): 332–35, https://doi.org/10.1017/jlr.2019.40.

68 Zainal Anwar et al., "Child Filiation and Its Implications on Maintenance and Inheritance Rights: A Comparative Study of Regulations and Judicial Practice in Indonesia, Malaysia, and Turkey," *Journal of Islamic Law* 5, no. 1 (2024): 62–85, https://doi.org/10.24260/jil.v5i1.2326.

69 M. Nasihul Umam Al-Mabruri, Wahyu Rizki, and Abdul Rahim Hakimi, "Children Born out of Wedlock Inherit the Lineage of Their Biological Father: Jasser Auda's Maqāşid Asy-Syarī'a Perspective," *Asy-Syari'ah: Jurnal Ilmu Syari'ah Dan Hukum* 55, no. 2 (2021): 415–38, https://doi.org/10.14421/ajish.v55i2.415.

70 Hātim Al-Hajj, *Athar Al-Tatawwur Al-Tibb "Ala Taghyīr Al-Fatwā Wa Al-Qadā"* (Cairo: Dār Bilāl bin Rabāḥ-Dār Ibn Hazm, 2012), 310. Ruano, "The Duration of Pregnancy in Contemporary Islamic Jurisprudence (Fiqh) and Legislation: Tradition, Adaption to Modern Medicine and (In) Consequences."

developments in modern genetic science, particularly through the use of paternity DNA testing. Such an approach would allow the determination of lineage to more closely reflect actual biological truth while remaining consistent with the objectives of protecting lineage (*ḥifẓ al-nasl*) and safeguarding the best interests of the child (*maṣlaḥat al-ṭifl*) within Islamic law.

Enhancing the Legal Framework for Paternity DNA Testing in Indonesia: Intersection between Genetic Science and Islamic Law

With the numerous functions of DNA testing in modern life, one of its most important applications is the determination of paternity.[71] Therefore, its regulation within a country's positive law becomes a necessity as part of protecting the fundamental rights of its citizens. However, Indonesia remains relatively unresponsive in regulating paternity DNA testing within its statutory framework. To date, its recognition appears only implicitly through Putusan Mahkamah Konstitusi Nomor 46/PUU-VIII/2010, without being followed by more specific legislation. As a result, its implementation in judicial practice often encounters difficulties. Consequently, some law enforcement officials tend to hesitate to use DNA testing as the primary form of evidence in paternity determination cases and instead place it in a marginal position, while in practice DNA testing is more frequently utilized in urgent criminal forensic investigations. This reluctance is also influenced by religious perspectives that have developed within society. The decision of the Muktamar Nahdlatul Ulama ke-31 positions paternity DNA testing as subordinate to traditional methods of determining lineage based on *sharīʿah*. Similar views can also be found in the opinions of classical and contemporary scholars such as Imam Mālik, Imam Shāfi'ī, and Wahbah az-Zuhailī as well as in several international fatwas, which indirectly contribute to the limited acceptance of paternity DNA testing within legal practice in Indonesia.[72]

The understanding that places paternity DNA testing merely as secondary evidence, without deeper examination, especially within societies where the tradition of *taqlīd* remains strong, has the potential to lead to serious violations of children's rights. These include child neglect, manipulation of lineage, and various other forms of violations related to the protection of lineage (*ḥifẓ al-nasl*). This situation arises because traditional methods of establishing lineage tend to emphasize procedural aspects, thereby creating loopholes that allow legal manipulation. This conservative attitude is also reflected in national regulations, such as Article 42 of Law Number 1 of 1974 on Marriage and Article 99 of the Compilation of Islamic Law, which essentially facilitate the determination of lineage solely based on the existence of a marriage contract, without taking into account the limits of pregnancy duration or other forms of material evidence. The lack of public criticism, the absence of re-evaluation by religious organizations, and the limited response of lawmakers to the practical difficulties in implementing the Constitutional Court's decisions have caused positive law to remain insufficiently adaptive to developments in science. Therefore, legal reconstruction is required to integrate developments in modern genetic

[71] Ankit Srivastava et al., "Impact of DNA Evidence in Criminal Justice System: Indian Legislative Perspective," *Egyptian Journal of Forensic Sciences* 12,no.1(2022):1–12, https://doi.org/10.1186/s41935-022-00309-y. Zvinkomborero M. Robson, Charles Simbarashe Gozho, and Taruvinga Muzingili, "'Seeking for Clarity in Genetic Science': Exploring the Factor Behind Men's Decisions to Seek DNA Testing in Zimbabwe," *Cogent Social Science* 10, no. 1 (2024): 1–18, https://doi.org/10.1080/23311886.2024.2415527.

[72] Al-Syāfi'ī, *Al-Umm Juz 5*, 32. Al-Syāfi'ī, *Al-Bayān Juz 10*, 148. Al-Thīr, *Al-Nihāyah Fī Gharīb Al-Hadīts Wa Al-Āthar Juz 3*, 41. Az-Ẓuhailī, *Fiqih Islam Wa Adillatuhu Jilid 10*, 32-33.

science, particularly paternity DNA testing, while still upholding the principles of Islamic law and moral values. In this way, the law can function as a tool of social engineering that promotes progress and the public welfare (*maṣlaḥah*) of society.

Based on the various arguments and facts presented, this study finds that DNA paternity testing is consistent with the meaning of the *nāṣh* concerning the application of material evidence in determining lineage, as it has been proven to be highly accurate, despite the existence of a very small probability of error.[73] Based on the discoveries of genetic science, it is found that errors in DNA tests are due to contamination and human error, not from the DNA itself.[74] Therefore, it is very important to present several genetic expert witnesses to verify the results of paternity DNA testing. Even some scholars who are pro paternity DNA testing as the main evidence in the consensus of the Islamic Jurisprudence Council of the Islamic World League in Makkah Al-Mukarramah in 2002 argued that, to avoid errors and misuse, DNA testing should be carried out by experts and verified by other neutral expert witnesses under strict supervision from the government.[75]

The position of genetic expert witnesses in determining lineage/biology in the modern era can be recognized as valid and main evidence in revealing the material truth. According to al-Qurtubī, the validity of this expert witness is based on the implicit value of Sūrah *Yusūf* 12:26, which tells the story of the Prophet Yusuf when he was acquitted of the charges of rape based on the testimony of wise men related to the tear of his robe.[76] This is also supported by the opinion of Ibn Qayyīm Al-Jauziyyah, who interpreted the word "*al-bayyinah*" in the Qur'ān as something that indicates the disclosure of truth that is not limited to general witnesses alone, but something broader, including expert witnesses or other evidence that further strengthens the material truth. Therefore, DNA paternity test-based corroboration and the testimony of sworn expert witnesses are as strong as the connotations of traditional methods of corroboration.[77] Thus, the number of genetic expert witnesses in paternity DNA test cases can be determined based on the provisions of *nāsh*, namely a minimum of two fair men for cases of determining the lineage of legitimate children (including children resulting from siri marriage) and four fair men for *li'ān* cases. The existence of expert witnesses to verify contamination and human error can help optimize the accuracy of the material truth in determining the lineage/biological relationship to prevent violations of the rights that children should enjoy.

Although the DNA paternity test shows accuracy that is close to the material truth, which is very useful in determining the biology of adulterated children, in determining legitimate children, this method also has the disadvantage of relying solely on biological empirical facts. There is another main requirement in determining the lineage of a legitimate child, namely *firāsh*. DNA paternity testing and *firāsh* must be integrated and not subordinate to each other because both have an important role in

[73] Butler, *Advanced Topics in Forensic DNA Typing: Methodology*. Alketbi, *DNA Contamination in Crime Scene Investigations: Commons Errors, Best Practices, and Insights from a Survey Study*.

[74] Alketbi, *DNA Contamination in Crime Scene Investigations: Commons Errors, Best Practices, and Insights from a Survey Study*.

[75] Consensus of the Islamic Jurisprudence Council of the Islamic World League in Makkah Al-Mukarramah, 16th session, 21-26/10/1422 H or 5-10/01/2002.

[76] Muhammad Ibn Ahmad Al-Qurtubī, *Al-Jāmi' Li Ahkām Al-Qur'ān Vol 9* (Beirut: Ihyā' al-Turāth al-'Arabi, 2003), 172.

[77] Ibnu Qayyīm Al-Jauziyyah, *Ath-Thurūq Al-Hukmiyyah Fī as-Siyasah Asy-Syar'iyyah* (Cairo: Dār al-Madanī, 2005), 13-15.

determining the lineage of a legitimate child.[78]

This study proposes strengthening the legal framework governing the use of paternity DNA testing in proceedings before the Religious Courts as an effort to enhance legal certainty in determining a child's lineage and biological relationship. Within this framework, paternity DNA testing is positioned as a strong form of scientific evidence that may be considered comparable to the evidentiary method of *firāsh* under certain circumstances. To ensure the credibility and integrity of the test results, regulations are required concerning laboratory standards, sample collection procedures, and the qualifications of expert witnesses authorized to verify potential technical errors, such as sample contamination and human error. Furthermore, the proposed guideline may regulate the minimum number of expert witnesses providing testimony in court by analogically referring to the principles of testimony established in the *nāsh*, namely two just male witnesses in cases concerning the determination of the lineage of a legitimate child (including children born from unregistered marriages) and four just male witnesses in cases of *liʿān*. Through the establishment of such guidelines, the use of DNA evidence in court proceedings would not only gain scientific legitimacy. Still, it would also remain consistent with the principles of Islamic law that guide the practice of the Religious Courts.

Conclusion

This study finds that paternity DNA testing constitutes a strong form of evidence in determining a child's biological lineage and can be positioned as equivalent to the evidentiary method of *firāsh* (within marriage). Both function as complementary instruments of proof in revealing lineage more comprehensively as a means of protecting children's rights (*maṣlaḥat al-ṭifl*). Paternity DNA testing is capable of uncovering material truth that was previously beyond the reach of traditional evidentiary methods. Conversely, the *firāsh* method provides a normative framework that does not rely solely on empirical findings but also considers the legal legitimacy of a child as established in the provisions of *naṣh*. In this sense, *firāsh* addresses the limitations of DNA testing, which is primarily oriented toward empirical results without accounting for the distinction between legitimate and illegitimate children within the normative structure of Islamic law. To ensure the credibility of testing results, verification through expert testimony is required. This mechanism may adopt evidentiary principles derived from *naṣh,* namely the presence of two just male witnesses in cases concerning the determination of legitimate lineage (including children born from unregistered marriages) and four just male witnesses in cases of *liʿān*. As a contribution to the international development of Islamic legal studies, this study proposes a conceptual reconstruction of the evidentiary status of DNA testing by positioning it as a principal form of evidence possessing probative force equivalent to the firāsh method. To strengthen the legal framework and provide greater certainty regarding this evidentiary practice, this study recommends that DNA testing be explicitly regulated within the Indonesian positive legal system. Such regulation is expected to accommodate developments in scientific knowledge while

[78] Ayman Shabana, "Islamic Law of Paternity Between Classical Legal Texts and Modern Contexts: From Physiognomy to DNA Analysis," *Journal of Islamic Studies* 25, no. 1 (2014): 1–32, https://doi.org/10.1093/jis/ett057. See also the Fatwa of the Dā'iratul Iftā' al-Ām No. 2794 entitled "Ruling on Proving or Disproving Paternity through DNA Testing," dated April 11, 2013, https://www.aliftaa.jo/research-fatwa-english/2794/Ruling-on-Proving-or-Disproving-Paternity-through-DNA-Testing#:~:text=In%20conclusion%2C%20proving%20or%20disproving,Allah%20the%20Almighty%20knows%20best.

maintaining consistency with the principles of Islamic law in determining lineage. Nevertheless, this study is limited in addressing the practical implementation of DNA testing in Religious Courts, particularly considering the relatively high cost of testing, which may restrict accessibility and risk reducing its role to merely a normative provision or law in the books.

Bibliography

Journals

Abikan, Yahaya Ibrahim. "Examining the Admissibility or Otherwise of Evidence Generated from Closed Circuit Television (CCTV) and Deoxyribonucleic Acid (DNA) Test as Means of Proof of Zin under Islamic Law." *Al-Manâhij: Jurnal Kajian Hukum Islam* 17, no. 1 (2023): 83–96. https://doi.org/10.24090/mnh.v17i1.8172.

Al-Mabruri, M. Nasihul Umam, Wahyu Rizki, and Abdul Rahim Hakimi. "Children Born out of Wedlock Inherit the Lineage of Their Biological Father: Jasser Auda's Maqāṣid Asy-Syarī'a Perspective." *Asy-Syari'ah: Jurnal Ilmu Syari'ah Dan Hukum* 55, no. 2 (2021): 415–38. https://doi.org/10.14421/ajish.v55i2.415.

Alfitri, Muhammad Idzhar, and Muhammad Kholil Muqorrobien. "Constitutionalizing Islamic Law in Indonesia: Sharia Courts and the Legitimate Child Clause." *Ahkam: Jurnal Ilmu Syariah* 25, no. 2 (2025): 395–414. https://doi.org/10.15408/ajis.v25i2.41896.

Alketbi, Salem Khalifa. "DNA Contamination in Crime Scene Investigations: Commons Errors, Best Practices, and Insights from a Survey Study." *Biomedical Journal of Scientific and Technological Research* 58, no. 5 (2024): 50970–83. https://doi.org/10.2139/ssrn.4979243.

Almazrouei, Saeed, Siti Aisyah Samudin, and Mahamatayuding Samah. "Examining the Validity of Genetic Fingerprints in Lineage Determination Under Islamic Shariah and Malaysian Law." *Journal of Shariah Law Research* 10, no. 1 (2025): 37–62. https://doi.org/10.22452/jslr.vol10no1.3.

Amanah, Nurul. "Ridwan Kamil Siap Tes DNA Buktikan Anak Lisa Mariana Bukan Dagingnya." *INews*, April 5, 2025. https://www.inews.id/lifestyle/seleb/ridwan-kamil-siap-tes-dna-buktikan-anak-lisa-mariana-bukan-darah-dagingnya.

Anwar, Zainal, Mhd. Ilham Armi, Zulfan, Ahmad Bakhtiar bin Jelani, and Ahmad Luthfy Nasri. "Child Filiation and Its Implications on Maintenance and Inheritance Rights: A Comparative Study of Regulations and Judicial Practice in Indonesia, Malaysia, and Turkey." *Journal of Islamic Law* 5, no. 1 (2024): 62–85. https://doi.org/10.24260/jil.v5i1.2326.

Arikewuyo, Nafiu Ahmed. "Forensic Medicine and Its Legal Implication on Selected Matters in Islamic Law of Inheritance." *Australian Journal of Islamic Studies* 10, no. 2 (2025): 74–89. https://doi.org/10.55831/ajis.v10i2.681.

Aslati, Armi Agustar, Silawati, Arisman, and Siti Arafah. "Utilizing Science Maqāṣid Al-Sharī'ah in Resolving Contemporrary Issues of Islamic Family Law." *Al-Manāhij: Jurnal Kajian Hukum Islam* 18, no. 1 (2024): 17–36. https://doi.org/10.24090/mnh.v18i1.10571.

Azhari, Doni, Asmuni, and Khoiruddin Nasution. "Reassesing Tajdid Al-Nikah: Maqasid Al-Shariah and Legal Status of

Illegitimate Children in Central Lombok." *Justicia Islamica: Jurnal Kajian Hukum Dan Sosial* 22, no. 1 (2025): 1–24. https://doi.org/10.21154/justicia.v22i1.7343.

Bakhtiar, Handar Subhandi, Amir Ilyas, Abdul Kholiq, and Handina Sulastrina Bakhtiar. "The Utilisation of Scientific Crime Investigation Methods and Forensic Evidence in the Criminal Investigation Process in Indonesia." *Egyptian Journal of Forensic Sciences* 15, no. 1 (2025): 1–18. https://doi.org/10.1186/s41935-025-00456-y.

Barash, Mark, Dennish McNevin, Vladimir Fedorenko, and Pavel Giverts. "Machine Learning Applications in Forensic DNA Profiling: A Critical Review." *Forensic Science International: Genetics* 69, no. 1 (2024): 1–15. https://doi.org/10.1016/j.fsigen.2023.102994.

Bivins, Roberta. "Pilot Programs and Postcolonial Pivots: Pioneering 'DNA Fingerprinting' on Britain's Borders." *Comparative Studies in Society and History* 65, no. 2 (2023): 346–71. https://doi.org/10.1017/S0010417522000494.

Butler, John M. *Advanced Topics in Forensic DNA Typing: Methodology*. Elsevier, 2012. https://doi.org/10.1016/B978-0-12-374513-2.00028-2.

Disantara, Fradhana Putra, Dicky Eko Prasetio, Geraldha Islami Putra Disantara, and Briggs Samuel Mawunyo Nutakor. "The Problematics of the Legal Standing of Deoxyribonucleic Acid (DNA) Test Result Concerning Civil Relationships of Illegitimate Children: A Legal Pluralism Perspective." *Jurnal Ilmiah Mizani* 11, no. 2 (2024): 435–48. https://doi.org/10.29300/mzn.v11i2.5156.

Djawas, Mursyid, Gamal Achyar, Nursyiwan Bustanul Arifin, Masri Reza, and Baharuddin Umar Yakub. "The Legal Position of Children of Insect (A Study of Madhhab Scholars and Compilation of Islamic Law)." *Samarah: Jurnal Hukum Keluarga Dan Hukum Islam* 6, no. 1 (2022): 139–55. https://doi.org/10.22373/sjhk.v6i1.11904.

Djegadut, Rikard. "Kuasa Hukum: Ridwan Kamil Siap Tes DNA, Tapi Harus Atas Perintah Pengadilan Atau Penyidik." *Indo News*. 5, April 2025. https://indonews.id/artikel/343219/Kuasa-Hukum-Ridwan-Kamil-Siap-Tes-DNA-tapi-Harus-atas-Perintah-Pengadilan-atau-Penyidik/.

Donohue, Katherine E., Catherine Gooch, Alexander Katz, Jessica Wakelee, Anne Slavotinek, and Bruce R. Korf. "Pitfalls and Chalanges in Genetic Test Interpretation: An Exploration of Genetic Professionals Experience with Interpretation of Result." *Clin Genet* 99, no. 5 (2021): 638–49. https://doi.org/10.1111/cge.13917.

Engelcke, Dörthe, and Nadjma Yassari. "Child Law in Muslim Jurisdiction: The Role of the State in Establishing Filiation (Nasab) and Protecting Parentless Children." *Journal of Law and Religion* 34, no. 3 (2019): 332–35. https://doi.org/10.1017/jlr.2019.40.

Fadel, Mohammad. "DNA Evidence and the Islamic Law of Paternity in Light of Maqāsid Al-Sharī'a." *The Muslim World* 112, no. 3 (2022): 311–23. https://doi.org/10.2139/ssrn.3757975.

Fajarwati, Hiba, Iffatin Nur, and Fatkul Hidayat. "Legal Consequences of Establishing the Civil Rights of Illegitimate Children from the Progressive Fiqh Perspective." *Karsa: Journal of Social and Islamic Culture* 32, no. 1 (2024): 90–118. https://doi.org/10.19105/karsa.v32i1.13646.

Helmi, Isnaya. "Lisa Mariana Ajukan

Permintaan DNA Ulang Di Singapura, Begini Respons Pihak Ridwan Kamil." *Kompas*, September 9, 2025. https://www.kompas.tv/nasional/616540/lisa-mariana-ajukan-permintaan-dna-ulang-di-singapura-begini-respons-pihak-ridwan-kamil.

Intens. "Respon Hotman Saat Tahu Lisa Marinana Ingin Tes DNA Ulang Pada RK," 2025. https://www.youtube.com/watch?v=5kVebWk4B7I.

Izzuddin, Hammam. "Lisa Mariana Bersikukuh Minta Tes DNA Ulang Di Singapura." *Tempo*, September 11, 2025. https://www.tempo.co/hukum/lisa-mariana-bersikukuh-minta-tes-dna-ulang-di-singapura-2068859.

Khalid, Donya A., and Nasser Nafea. "A Deep Neural Network Model for Paternity Testing Based on 15-Loci STR for Iraqi Families." *Journal of Intelligent System* 32, no. 1 (2023): 1–15. https://doi.org/10.1515/jisys-2023-0041.

Khuzaymah, Abū, and Asmā' Mandūh. *Wasā'il Itbāt Al-Nasab Bayna Al-Qadīm Wa Al-Mu'āsir, Dirāsah Fiqhiyyah Muqāranah*. Alexandria: Dār al-Fikr al-Jāmi'ī, 2010.

Kompas. "Dokter Forensik Blak-Nlakan Soal Kemungkinan Manipulasi Hasil Tes DNA Ridwan Kamil-Lisa Mariana," 2025. https://www.youtube.com/watch?v=Gmf1XTzxQTc.

Lestari, Putri Wartina, Sonny Dewi Judiasih, and Bambang Daru Nugroho. "Inheritance Rights of Extramarital-Children After the Constitutional Court Decision of 2010." *ICLR: Indonesian Comparative Law Review* 6, no. 1 (2023): 46–61. https://doi.org/10.18196/iclr.v6i1.19655.

Li, Binglin, Chi Le, Wen Lei, Yingqi Zhou, Ying Zhang, Yanwen Wang, Yanyan Wan, et al. "STRaM: A Genetic Framework for Improved Cell Product Provenance for Research and Clinical Translations." *Communications Biology* 8, no. 1 (2025): 1–20. https://doi.org/10.1038/s42003-025-08547-1.

Masriadi. "DNA Testing and Lineage in Muslim Societies: Yusuf Al-Qaradawi's Perspective within Contemporary Islamic and Social Studies." *Muharrik: Jurnal Dakwah Dan Sosial* 7, no. 1 (2024): 201–10. https://ejournal.insuriponorogo.ac.id/index.php/muharrik/article/view/8364.

Matute, Sharlize Pedroza, and Sasitaran Iyavoo. "Implementation of NGC and SNP Microarrays in Routine Forensic Practice: Opportunities and Barriers." *BMC Genomics* 26, no. 1 (2025): 3–15. https://doi.org/10.1186/s12864-025-11723-6.

Maulana, Anas, Zainuri Akbar, Ramadhani Alfin, and Habibie. "Inheritance Rights of Nasabiyah Children Born Out of Wedlock According to Islamic Family Law." *El-Usrah: Jurnal Hukum Keluarga* 7, no. 2 (2024): 444–61. https://doi.org/10.22373/ujhk.v7i2.25072.

Pilav, Amela, Naris Pojskić, Anesa Ahatović, Mirela Džehverović, Jasmina Ćakar, and Damir Marjanović. "Allele Frequencies of 15 STR Loci in Bosnian and Herzegovian Population." *Forensic Science* 58, no. 3 (2017): 250–56. https://doi.org/10.3325/cmj.2017.58.250.

Pinilih, Sekar Anggun Gading, Retno Saraswati, and Ahmad Muzaki. "Disobedience of the Constitutional Court's Decision by the Supreme Court." *Pandecta* 17, no. 2 (2022): 178–88. https://doi.org/10.15294/pandecta.v17i2.36196.

Pont, Anna Veronica, Fahmi Hafid, Kadar Ramadhan, Wedad M. Al-Mutairi, Semuel Piter Irab, and Ferry Efendi. "Factors Associated with Birth Registrations in Indonesia." *Electronic Journal of General Medicine* 20, no. 2 (2023): 1–7. https://doi.org/10.29333/ejgm/12900.

Prasetya, Muhammad Djaelani, Amir Ilyas, Erwin Mansyur Ugu Saraka, and Ratnawati. "Subordinate Justice to Forensic Scientists: Indonesia's Authority and Regulation Gap." *Media Iuris* 9, no. 1 (2026): 129–52. https://doi.org/10.20473/mi.v9i1.77587

Pratama, Rizky L. "Kuasa Hukum Sebut Ridwan Kamil Siap Tes DNA, Tapi Harus Atas Perintah Pengadilan Atau Penyidik." *Kompas*, April 4, 2025. https://www.kompas.tv/entertainment/584830/kuasa-hukum-sebut-ridwan-kamil-siap-tes-dna-tapi-harus-atas-perintah-pengadilan-atau-penyidik.

Robson, Zvinkomborero M., Charles Simbarashe Gozho, and Taruvinga Muzingili. "'Seeking for Clarity in Genetic Science': Exploring the Factor Behind Men's Decisions to Seek DNA Testing in Zimbabwe." *Cogent Social Science* 10, no. 1 (2024): 1–18. https://doi.org/10.1080/23311886.2024.2415527.

Ruano, Delfina Serrano. "The Duration of Pregnancy in Contemporary Islamic Jurisprudence (Fiqh) and Legislation: Tradition, Adaption to Modern Medicine and (In) Consequences." *The Muslim World* 112, no. 3 (2022): 367–84. https://doi.org/10.1111/muwo.12442.

Sabbah, Majeed A., Mohammed M. Al-Zubaidi, Thooalnoon Y. Al-Janabi, Dhuha S. Namaa, Heider K. Al-Rubai, and Hala K. Ibrahem. "Short Tandem Repeat (STR) Variation from 6 Cities in Iraq Based on 15 Loci." *Jordan of Genetic Engineering and Biotechnology* 21, no. 1 (2023): 1–9. https://doi.org/10.1186/s43141-023-00570-1.

Shabana, Ayman. "Islamic Law of Paternity Between Classical Legal Texts and Modern Contexts: From Physiognomy to DNA Analysis." *Journal of Islamic Studies* 25, no. 1 (2014): 1–32. https://doi.org/10.1093/jis/ett057.

———. "Paternity between Law and Biology: The Reconstruction of the Islamic Law of Paternity in the Wake of DNA Testing." *Zygon* 47, no. 1 (2012): 214–39. https://doi.org/10.1111/j.1467-9744.2011.01246.x.

Smith, Johannes Hendrik, and M. Singh. "DNA Forensic and Forensic Investigative Leads." *Journal of Forensic Medicine* 9, no. 2 (2024): 1–7. https://doi.org/10.37421/2472-1026.2024.9.347.

Song, Wenqian, Nan Xiao, Shihang Zhou, Weijian Yu, Ni Wang, Linnan Shao, and Xiaohua Liang. "Non Invasive Prenatal Paternity Testing Using Mini-STR Based Next Generation Sequencing: A Pilot Study." *Genes* 12, no. 3 (2021): 337–44. https://doi.org/10.22541/au.164864542.28963224/v1.

Srivastava, Ankit, Abhimanyu Harshey, Tanurup Das, Akash Kumar, Murali Manohar Yadav, and Pankav Shrivastava. "Impact of DNA Evidence in Criminal Justice System: Indian Legislative Perspective." *Egyptian Journal of Forensic Sciences* 12, no. 1 (2022): 1–12. https://doi.org/10.1186/s41935-022-00309-y.

Suratman, and H. Philips Dillah. *Metode Penelitian Hukum*. Bandung: Penerbit Alfabeta, 2013.

Tan, Mengyu, Yuxuan Tan, Haoyan Jiang, Jiaming Xue, Qiushuo Wu, Yazi Zheng, Guihong Liu, et al. "Explainable Artificial Intelligence in Forensic DNA Analysis: Alleles Identification in

Challenging Electropherograms Using Supervised Machine Learning Methods." *Forensic Science International: Genetics* 78, no. 1 (2025): 103289. https://doi.org/10.1016/j.fsigen.2025.103289.

Tari, Putu Sri Devi, and Helen Andriani. "The Relationship between Maternal Participation in Household Decision Making and Birth Attendant Selection: Evidence from Indonesia Demographic and Health Survey." *Scientific Foundation SPIROSKI* 18, no. 10 (2022): 1343–49. https://doi.org/10.3889/oamjms.2022.9514.

Thellingwani, Roslyn Stella, Catherine Ashley Jonhera, and Collen Masimirembwa. "Analysis of Data and Common Mutations Encountered During Routine Parentage Testing in Zimbabwe." *Scientific Reports* 14, no. 1 (2024): 1–9. https://doi.org/10.1038/s41598-024-51987-8.

Trisasmita, Laksmi. "The Existence of Traditional Birth Attendants (Dukun Paraji) in the Practice of Birth Assistance Service in Bogor Regency." *JGMI: The Journal of Indonesian Community Nutrition* 13, no. 1 (2024): 1–11. https://doi.org/10.30597/jgmi.v13i1.34261.

Verbiest, Max, Mikhail Maksimov, Ye Jin, Maria Anisimova, Melissa Gymrek, and Tugce Bilgin Sonay. "Mutation and Selection Processes Regulating Short Tandem Repeat Give Rise to Genetic and Phenotypic Diversity Across Species." *Journal of Evolutionary Biology* 36, no. 2 (2022): 321–36. https://doi.org/10.1111/jeb.14106.

Yaacob, Khairil Hafizi, Mazlena Mohamad Hussain, and Nurul BAdriyah Ali. "Presumption of Legitimacy Based on Medical Scientific Evidence (DNA Test): A Comparative Study between Shariah and Civil Law in Malaysia." *Global Journal Al-Thaqafah* November, no. Empowering Civilization in the Era of Industrial REvolution 5.0 (2025): 29–43. https://doi.org/10.7187/GJATSI112025-3.

Yamna, Haouassi, and Hadjoudj Keltoum. "The Validity of Genetic Fingerprinting in Attributing a Child Born from Rape." *Lex Localis: Journal of Local Self-Government* 23, no. 11 (2025): 1495–1508. https://doi.org/10.52152/m3pmkd32.

Yeganegi, Maryam, Mahsa Danaei Azizi, Fatemeh Jayervand, Reza Bahrami, Seyed Alireza Dastgheib, Heewa Rasnavadi, Ali Masoudi, et al. "Research Advancements in the Use of Artificial Intelligenceb for Prenatal Diagnosis of Neural Tube Defects." *Frointiers in Pediatrics* 13, no. 1 (2025): 1–10. https://doi.org/10.3389/fped.2025.1514447.

Yuliawati, Rinanda Dwi. "Hotman Paris Sarankan Ridwan Kamil Tak Jalani Tes DNA, Soroti Soal Pengakuan Hingga Warisan." *Tribun News*, April 10, 2025. https://www.tribunnews.com/seleb/2025/04/10/hotman-paris-sarankan-ridwan-kamil-tak-jalani-tes-dna-soroti-soal-pengakuan-hingga-warisan.

Żak, Krysztof, and Magdalena Konarzewska. "Analysis of Short Tandem Repeat Mutations in Paternity Caes from Masovian Voivodeship Provinces Form Years 2018-2022 Based on Materials of the Departement of Forensic Medicine, Medical University of Warsaw." *Arch Med Sadowej* 73, no. 2 (2023): 139–48. https://doi.org/10.4467/16891716amsik.23.012.18687.

Zaman, Jamrud Qomaruz, Abd. Rouf, Siti Aisyah binti Samudin, and 'Ainan Husnaa binti Muhammad Saifullah. "Judicial Interpretation Challenges in Implementation Child Protection Rights Outside of Marriage: A Study of The

Religious Court of Malang Regency." *Istinbáth: Jurnal Hukum Dan Ekonomi Islam* 24, no. 1 (2025): 66–82. https://doi.org/10.20414/ijhi.v24i1.777.

Books

Al-'Asqālanī, Ahmad Ibn Alī Ibn Hajar. *Fath Al-Bārī Bi Sharh Shahīh Al-Bukhārī*. Cairo: Maktabat al-'Ilm, 2000.

Al-Hajāj, Al-Imam Abūl al-Husain Muslīm. *Shahīh Muslim Jūz 3*. Beirut: Dār Iḥyā' al-Turāth al-'Arabī, 1998.

Al-Hajj, Hātim. *Athar Al-Tatawwur Al-Tibb "Ala Taghyīr Al-Fatwā Wa Al-Qadā."* Cairo: Dār Bilāl bin Rabāḥ-Dār Ibn Hazm, 2012.

Al-Husnī, 'Abd, and Mahmūd Samad. *Al-Basmah Al-Warathiyyah Wa Madā Hujjituha Fī Al-Ithbat*. Iskandariyyah: Dār al-Fikr al-Jam'i, 2009.

Al-Jauziyyah, Ibnu Qayyīm. *Ath-Thurūq Al-Hukmiyyah Fī as-Siyasah Asy-Syar'iyyah*. Cairo: Dār al-Madanī, 2005.

Al-Nawāwī, Abū Zakariā Yahyā bin Syaraf. *Shahīh Muslīm Bi Syarah Nawāwī Juz 7*. Mesir: Al-Misriyyah wa Maktabatuha, 1943.

Al-Qurtubī, Muhammad Ibn Ahmad. *Al-Jāmi' Li Ahkām Al-Qur'ān Vol 9*. Beirut: Ihyā' al-Turāth al-'Arabi, 2003.

Al-Syāfi'ī, Muhāmmad bin Idrīs. *Al-Bayān Juz 10*. Beirut: Dār al-Fikr, 1998.

———. *Al-Umm Juz 5*. Beirut: Dār al-Khatab Al-Ilmiah, 1993.

Al-Thīr, Al-Imam Muhāmmad al-Dīn al-Mubārak Ibnu Muhāmmad al-Jazarī Ibnu. *Al-Nihāyah Fī Gharīb Al-Hadīts Wa Al-Āthar Juz 3*. Beirut: Dār al-Fikr, 1979.

Az-Zuhaili, Wahbah. *Fiqih Islam Wa Adillatuhu Jilid 10*. Jakarta: Gema Insani, 2011.

Denzin, Norman K., and Yvonna S. Lincoln. *Handbook of Qualitative Research*. Sage Publications, 2000.

Hilālī, Sa'd al-Dīn Mus'ad. *Al-Basmah Al-Wirāthiyah Wa 'Alā'iquhā Al-Shar'iyyah, Dirāsah Fiqhiyyah Muqāranah*. Kuwait: Jāmi'at al-Kuwayt, 2001.

Ibrahim, Johnny. *Teori Dan Metodologi Penelitian Hukum Normatif*. Malang: Bayumedia, 2006.

Ibrahim, Johny. *Metode Penelitian Hukum Normatif*. Malang: Banyumedia, 2008.

Ka'bī, Khalīfah 'Alī. *Al-Basmah Al-Wirāthiyyah Wa Atharuhā 'alā Al-Ahkām Al-Fiqhiyyah*. 'Ammān: Dār al-Nafā'is, 2006.

Marzuki, Peter Mahmud. *Penelitian Hukum: Edisi Revisi*. Jakarta: Kencana Prenada Media Group, 2005.

Milovanović, Dragan. *A Primer in the Sociology of Law*. New York: Harrow and Heston Publisher, 1994.

Muhaimin. *Metode Penelitian Hukum*. Mataram: Mataram University Press, 2020.

Muhammadī, Muhammad Alī Yūsuf. *Ahkām Al-Nasab Fī Al-Sharī'ah Al-Islāmiyyah, Turuq Ithbātihi Wa Nafiyh*. Doha: Dār Qatrī Ibn al-Fujā'ah, 1994.

Sallāmī, Muhammad al-Mukhtār. *Al-Tibb Fī Daw' Al-Īmān*. Beirut: Dār al-Gharb al-Islāmī, 2001.

Sha'bān, Khālid Muhammad. *Mas'ūliyyat Al-Tibb Al-Shar'ī*. Iskandariyyah: Dār al-Fikr al-Jāmi'ī, 2008.

Thompson, William C. "Forensic DNA Evidence: The Myth of Infallibility." In *Genetic Explanations: Sense and Nonsense*, 227–347. Cambridge, Massachusetts: Harvard University Press, 2008.

'Uthmān, Muhammad Ra'fat. *Al-Māddah Al-Wirāthiyyah, Al-Jīnum, Qadāyā Fiqhiyyah*. Cairo: Maktabat Wahbah, 2009.

Zaydān, Abdul Karīm. *Al-Mufassal Fī Ahkām*

Al-Mar'ah Wa Bayt Al-Muslīm Fī Al-Sharīat Al-Islāmiyyah Vol. 9. Libanon: Muassasah al-Risālah, 1993.

Fatwas and Regulations

1945 Constitution of the Republic of Indonesia.

31st NU Mukhtamar in Grand Pasundan Hotel, Bandung on 11 October 2004.

Arso Religious Court Decision Number 004/Pdt.G/2019/PA.Ars.

Bogor District Court Stipulation Number 112/Pdt.P/2024/PN.Bgr.

Compilation of Islamic Law.

Constitutional Court Decision Number 46/PUU-VIII/2010.

Denpasar District Court Stipulation Number 131/Pdt.P/2024/PN.Dps.

Fatwa of the Dā'iratul Iftā' al-Ām No. 2794 entitled "Ruling on Proving or Disproving Paternity through DNA Testing," dated April 11, 2013.

Fatwa of the Islamic Jurisprudence Council of the Islamic World League in Makkah Al-Mukarramah, 16th session, 21-26/10/1422 H or 5-10/01/2002.

Fatwa of the Islamic Organizations for Medical Sciences (IOMS) Conference in Kuwait in October 1998.

Gianyar District Court Stipulation Number 137/Pdt.P/2024/PN.Gin.

Jepara District Court Stipulation Number 48/Pdt.P/2024/PN.Jpa.

Law Number 1 of 1974 on Marriage.

National Council for the 101st Islamic Religious Affairs Fatwa Committee Malaysia on 27 September 2012.

Padang District Court Decision Number 167/Pdt.P/2018/PN.Pdg.

Pati District Court Stipulation Number 47/Pdt.P/2024/PN.Pti.

Pekanbaru District Court Stipulation Number 9/Pdt.P/2024/PN.Pbr.

Pontianak District Court Stipulation Number 497/Pdt.P/2024/PN.Ptk.

Semarang High Religious Court Decision Number 147/Pdt.G/2018/PTA.Smg.

Sleman Religious Court Stipulation Number 14/Pdt.P/2024/PA.Smn.

Surabaya Religious Court Decision Number 0792/Pdt.G/2014/PA.Sby.

Surabaya High Religious Court Decision Number 0114/Pdt.G/2015/PTA.Sby.

Tangerang District Court Decision Number 746/Pdt.G/2021/PN.TNG.

Tuban Religious Court Decision Number 1323/Pdt.G/2018/PA.Tbn.