

THE EL-RAKHAWI DOCTRINE OF CONSTITUTIONAL GENOMIC SOVEREIGNTY ESTABLISHING GENETIC

INTEGRITY AS AN INALIENABLE CONSTITUTIONAL RIGHT AGAINST GERMLINE
EDITING, GENOMIC DISCRIMINATION, AND INTERGENERATIONAL BIOLOGICAL HARM

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FIRST GLOBAL ACADEMIC EDITION

September 28, 2026

DIGITAL OBJECT IDENTIFIER

10.5281/zenodo.23002584

PERMANENT URL

<https://doi.org/10.5281/zenodo.23002584>

GLOBAL MULTILINGUAL KEYWORDS

English: El-Rakhawi Doctrine, Constitutional Genomic Sovereignty, Genetic Integrity, CRISPR-Cas9, Germline Editing, Genomic Discrimination, Intergenerational Rights, Biobanking, Genetic Privacy, Human Dignity, Gene Editing Moratorium, Bio-Constitutionalism.

Arabic: عقيدة الرخاوي، السيادة الجينومية الدستورية، السلامة الجينية، كريسبر-كاس9، التعديل الجيني الوراثي، التمييز الجينومي، الحقوق بين الأجيال، البنوك الحيوية، الخصوصية الجينية، الكرامة الإنسانية، حظر التعديل الجيني، الدستورية الحيوية.

French: Doctrine El-Rakhawi, Souveraineté Génomique Constitutionnelle, Intégrité Génétique, CRISPR-Cas9, Édition Germinale, Discrimination Génomique, Droits Intergénérationnels, Biobanque, Vie Privée Génétique, Dignité Humaine, Moratoire sur l'Édition Génétique, Bio-Constitutionnalisme.

Spanish: Doctrina El-Rakhawi, Soberanía Genómica Constitucional, Integridad Genética, CRISPR-Cas9, Edición Germinal, Discriminación Genómica, Derechos Intergeneracionales, Biobanco, Privacidad Genética, Dignidad Humana, Moratoria de Edición Genética, Bio-Constitucionalismo.

German: El-Rakhawi-Doktrin, Konstitutionelle Genomische Souveränität, Genetische Integrität, CRISPR-Cas9, Keimbahneditierung, Genomische Diskriminierung, Generationenübergreifende Rechte, Biobank, Genetische Privatsphäre, Menschliche Würde, Moratorium für Genbearbeitung, Bio-Konstitutionalismus.

Chinese: 埃尔哈瓦维学说, 宪法基因组主权, 基因完整性, CRISPR-Cas9, 种系编辑, 基因组歧视, 代际权利, 生物样本库, 基因隐私, 人类尊严, 基因编辑禁令, 生物宪法主义。

Russian: Доктрина Эль-Рахауи, Конституционный геномный суверенитет, Генетическая целостность, CRISPR-Cas9, Редактирование зародышевой линии, Геномная дискриминация, Межпоколенческие права, Биобанк, Генетическая конфиденциальность, Человеческое достоинство, Мораторий на редактирование генов, Биоконституционализм.

EXECUTIVE SUMMARY

This research introduces the El-Rakhawi Doctrine of Constitutional Genomic Sovereignty, a groundbreaking jurisprudential framework that elevates the human genome from a biological substrate to a constitutionally protected domain of inalienable human dignity. The revolutionary advent of CRISPR-Cas9 gene editing, the emergence of commercial direct-to-consumer genomics, and the persistent threat of genomic discrimination have created an unprecedented constitutional crisis: the human genome, the very blueprint of biological identity, remains inadequately protected under existing constitutional frameworks designed for a pre-genomic era.

Synthesizing biophysics, molecular genetics, and constitutional theory, this doctrine establishes four foundational pillars. First, the Principle of Genetic Integrity as Constitutional Dignity, which recognizes the unmodified human genome as an inviolable component of human dignity, deserving the highest tier of constitutional protection. Second, the Doctrine of Intergenerational Genomic Rights, which establishes that future generations possess an enforceable constitutional right to inherit an unmodified human germline, creating a novel category of trans-temporal constitutional standing. Third, the Doctrine of Genomic Non-Discrimination, which elevates genetic information to a constitutionally protected class, prohibiting any discrimination based on genomic data in employment, insurance, education, or state action. Fourth, the Principle of Genomic Self-Determination, which guarantees absolute individual sovereignty over one's genomic data, including the right to informed consent, data portability, and cryptographic erasure.

Supported by the El-Rakhawi Genomic Sovereignty Index (EGSI), a mathematical model for quantifying violations of genomic rights, and a blockchain-based Genomic Data Sovereignty Smart Contract, this research provides the first comprehensive constitutional architecture to protect the human genome against the converging threats of commercial exploitation, state surveillance, and irreversible germline modification. It ensures that the constitutional order evolves to safeguard the biological foundation of human identity in the genomic age.

INTRODUCTION

The human genome, comprising approximately three billion base pairs organized into roughly twenty thousand protein-coding genes, represents the most intimate biological archive of human identity. For millennia, this archive remained immutable, passed unchanged through

generations except by the slow hand of natural selection. The discovery of the DNA double helix in 1953, the completion of the Human Genome Project in 2003, and most critically, the development of CRISPR-Cas9 gene editing technology by Emmanuelle Charpentier and Jennifer Doudna (awarded the Nobel Prize in Chemistry in 2020) have fundamentally altered this biological permanence.

Today, the human genome is simultaneously readable, writable, editable, and commodifiable. Direct-to-consumer genetic testing companies have genotyped over thirty million individuals worldwide. State biobanks collect genomic data from entire populations. Germline editing, once theoretical, became reality in 2018 when He Jiankui announced the birth of twin girls whose genomes had been modified using CRISPR-Cas9, triggering global condemnation and exposing the absence of enforceable constitutional constraints on genomic intervention.

Constitutional law, however, remains largely silent on these existential questions. Traditional constitutional frameworks protect bodily integrity, privacy, and equality, but none explicitly recognize the genome as a distinct constitutional domain. The United States Genetic Information Nondiscrimination Act (GINA) of 2008 provides statutory protection against employment and health insurance discrimination, but falls short of constitutional status and contains significant loopholes. The European Union's Oviedo Convention of 1997 prohibits germline modification, but lacks enforcement mechanisms and universal ratification.

This constitutional vacuum creates a perilous situation. Without explicit constitutional recognition of genomic sovereignty, the human genome remains vulnerable to three converging threats: commercial commodification by biotechnology corporations, state surveillance through mandatory biobanking, and irreversible germline modifications that alter the biological inheritance of all future generations.

The El-Rakhawi Doctrine of Constitutional Genomic Sovereignty addresses this vacuum by proposing a comprehensive constitutional framework that recognizes the human genome as a constitutionally protected domain, establishes intergenerational rights over the germline, prohibits genomic discrimination as a fundamental constitutional violation, and guarantees individual sovereignty over genomic data. It represents the first systematic effort to constitutionalize the biological foundation of human identity.

CHAPTER I: THE SCIENTIFIC FOUNDATIONS OF GENOMIC SOVEREIGNTY

Section 1.1: The Architecture of the Human Genome

The human genome is not merely a collection of genes but a complex, dynamically regulated system. Protein-coding genes constitute only approximately 1.5 percent of the genome; the remainder includes regulatory elements, non-coding RNA genes, repetitive sequences, and structural regions whose functions are still being elucidated. This complexity means that any genomic intervention, particularly germline editing, carries unpredictable risks of off-target effects, epigenetic disruption, and unintended consequences that may manifest only across multiple generations.

The biophysical reality is that the genome is a holographic system: modification at one locus can have cascading effects throughout the entire genomic architecture through mechanisms of pleiotropy, epistasis, and epigenetic regulation. This scientific fact has profound constitutional implications: irreversible germline modification constitutes an intervention not merely in an individual's biology but in the biological inheritance of the entire human species.

Section 1.2: CRISPR-Cas9 and the Revolution in Genomic Editing

The CRISPR-Cas9 system, adapted from bacterial immune mechanisms, enables precise, programmable editing of DNA sequences with unprecedented efficiency and accessibility. Unlike previous gene editing technologies, CRISPR-Cas9 is relatively inexpensive, technically accessible, and scalable. This democratization of genomic editing capability creates both tremendous therapeutic potential and existential risks.

Somatic cell editing, which affects only the treated individual, holds promise for treating genetic diseases such as sickle cell anemia, cystic fibrosis, and certain cancers. Germline editing, which modifies eggs, sperm, or embryos, produces heritable changes that are transmitted to all subsequent generations. The distinction between somatic and germline editing is constitutionally decisive: the former affects individual autonomy, while the latter implicates the biological inheritance of humanity itself.

Section 1.3: Commercial Genomics and the Commodification of Biological Identity

The emergence of direct-to-consumer genetic testing companies has created a vast commercial infrastructure built upon the commodification of genomic data. These companies collect, analyze, and monetize the genomic information of millions of individuals, often through terms of service that grant broad rights to share, sell, or use this data for research, pharmaceutical development, or law enforcement purposes.

This commercial genomic economy raises fundamental constitutional questions about ownership, consent, and the commodification of biological identity. When an individual's genome becomes a tradable asset in a commercial marketplace, the constitutional principles of human dignity and bodily integrity are fundamentally challenged.

CHAPTER II: THE CONSTITUTIONAL CRISIS OF THE GENOMIC AGE

Section 2.1: The Absence of Genomic Protection in Traditional Constitutional Frameworks

Most existing constitutions were drafted before the genomic revolution and contain no explicit provisions protecting genetic integrity, prohibiting genomic discrimination, or recognizing intergenerational genomic rights. Traditional constitutional protections of bodily integrity, privacy, and equality, while potentially applicable by analogy, lack the specificity required to address the unique challenges of the genomic age.

This constitutional silence creates a dangerous gap. In the absence of explicit constitutional protection, the human genome remains vulnerable to legislative erosion, judicial interpretation

that fails to recognize its unique status, and commercial exploitation that treats biological identity as a mere commodity.

Section 2.2: The Threat of Genomic Discrimination

Genomic information reveals predispositions to diseases, physical traits, and even behavioral tendencies. This information, if accessible to employers, insurers, educational institutions, or state authorities, creates the potential for a new form of biological discrimination more insidious than racial or gender-based discrimination, because it targets the very biological foundation of individual identity.

Genomic discrimination threatens to create a biological caste system, where individuals are sorted and stratified based on their genetic profiles. This violates the most fundamental constitutional principle of equality before the law and the equal dignity of all human beings.

Section 2.3: The Intergenerational Threat of Germline Editing

Germline editing presents a constitutional challenge of unprecedented scope: it modifies the biological inheritance of all future generations without their consent. Unlike other constitutional violations that affect only living individuals, germline editing creates irreversible biological changes that propagate through the human gene pool indefinitely.

This raises profound questions about the constitutional standing of future generations. Traditional constitutional law recognizes rights only for living individuals. The genomic age demands recognition of a new category of constitutional rights: intergenerational genomic rights that protect the biological inheritance of humans not yet born.

Section 2.4: State Genomic Surveillance and Mandatory Biobanking

Several states have established or proposed mandatory national biobanks, collecting genomic data from entire populations under the guise of public health, forensic identification, or national security. These programs, often implemented without adequate constitutional safeguards, create the potential for unprecedented state surveillance of biological identity.

When the state possesses the genomic data of its entire population, it holds the power to identify biological relationships, predict disease predispositions, and potentially target individuals based on their genetic profiles. This represents a fundamental threat to constitutional privacy and the presumption of innocence.

CHAPTER III: THE EL-RAKHWI DOCTRINE OF CONSTITUTIONAL GENOMIC SOVEREIGNTY

Section 3.1: The Principle of Genetic Integrity as Constitutional Dignity

The first pillar of the El-Rakhawi Doctrine establishes that the unmodified human genome constitutes an inviolable component of human dignity, deserving the highest tier of constitutional protection. This principle recognizes that the genome is not merely biological material but the fundamental blueprint of human identity, and that any non-therapeutic modification of the human

genome constitutes a violation of human dignity equivalent to violations of bodily integrity or mental autonomy.

Under this principle, germline editing for enhancement purposes (non-therapeutic modification aimed at improving physical, cognitive, or other traits beyond normal health) is constitutionally prohibited as a violation of human dignity. Therapeutic germline editing, aimed at preventing serious genetic diseases, is permitted only under strict constitutional safeguards, including informed consent, independent ethical review, and demonstration that no less invasive alternative exists.

Section 3.2: The Doctrine of Intergenerational Genomic Rights

The second pillar establishes that future generations possess an enforceable constitutional right to inherit an unmodified human germline. This doctrine creates a novel category of trans-temporal constitutional standing, recognizing that constitutional rights can extend to individuals not yet born when those rights concern the biological foundation of human identity.

This doctrine is philosophically anchored in Joel Feinberg's foundational concept of "The Right to an Open Future," which posits that children possess a right to reach maturity with their life options, opportunities, and biological autonomy intact. Germline editing irreversibly forecloses the future child's right to determine their own biological destiny, thereby violating this fundamental constitutional principle. Under this doctrine, any germline modification that alters the human gene pool in ways that cannot be reversed or that carry unknown risks for future generations is constitutionally presumptively invalid. The burden of proof rests on proponents of germline modification to demonstrate, through rigorous scientific evidence, that the modification carries no significant risk of harm to future generations and serves a compelling therapeutic purpose.

Section 3.3: The Doctrine of Genomic Non-Discrimination

The third pillar establishes that genetic information constitutes a constitutionally protected class, and that any discrimination based on genomic data is a fundamental constitutional violation subject to strict scrutiny. This doctrine elevates genomic non-discrimination from statutory protection to constitutional status, providing the highest level of judicial protection against genomic discrimination.

Under this doctrine, any law, policy, or private action that discriminates based on genomic information is presumptively unconstitutional unless it serves a compelling state interest and is narrowly tailored to achieve that interest. This includes discrimination in employment, insurance, education, housing, immigration, and any other domain of social life.

Section 3.4: The Principle of Genomic Self-Determination

The fourth pillar establishes that every individual possesses absolute sovereignty over their own genomic data, including the right to informed consent for any collection, analysis, storage, or use of their genomic information; the right to data portability, allowing individuals to transfer their

genomic data between service providers; and the right to cryptographic erasure, allowing individuals to permanently delete their genomic data from any database.

This principle recognizes that genomic data is not merely personal information but the biological foundation of individual identity, and that individuals must have absolute control over this data to preserve their constitutional dignity and autonomy.

CHAPTER IV: PROCEDURAL FRAMEWORK AND IMPLEMENTATION

Section 4.1: The El-Rakhawi Genomic Sovereignty Index (EGSI)

To provide courts and legislatures with a rigorous tool for evaluating violations of genomic sovereignty, this doctrine introduces the El-Rakhawi Genomic Sovereignty Index (EGSI), a mathematical model that quantifies the degree of violation across multiple dimensions. The EGSI is detailed in Appendix I.

Section 4.2: The Genomic Data Sovereignty Smart Contract

To enforce the Principle of Genomic Self-Determination in the digital realm, this doctrine proposes a blockchain-based smart contract that provides cryptographic guarantees of individual control over genomic data. The smart contract, detailed in Appendix II, ensures that genomic data cannot be accessed, shared, or used without explicit individual consent, and that individuals can exercise their right to cryptographic erasure at any time.

Section 4.3: Model Constitutional Amendment for Genomic Sovereignty

This research provides a template for constitutional amendment or legislation that codifies the principles of the El-Rakhawi Doctrine. The model amendment, detailed in Appendix III, can be adopted by national legislatures or incorporated into new constitutions being drafted in the genomic age.

Section 4.4: The International Treaty on Genomic Sovereignty

Recognizing that genomic threats are transnational, this doctrine advocates for an international treaty establishing universal standards for genomic sovereignty, prohibiting germline enhancement, protecting against genomic discrimination, and guaranteeing individual control over genomic data. The treaty would establish an International Genomic Sovereignty Authority to monitor compliance and coordinate enforcement.

CONCLUSION

The genomic revolution represents the most profound challenge to constitutional law since the invention of the printing press. For the first time in human history, the biological foundation of human identity is readable, writable, editable, and commodifiable. Without explicit constitutional protection, the human genome remains vulnerable to commercial exploitation, state surveillance, and irreversible modification that threatens the biological inheritance of all future generations.

The El-Rakhawi Doctrine of Constitutional Genomic Sovereignty provides the first comprehensive constitutional framework to address this challenge. By recognizing genetic integrity as a component of human dignity, establishing intergenerational genomic rights, prohibiting genomic discrimination, and guaranteeing individual sovereignty over genomic data, the doctrine provides a legal architecture to protect the biological foundation of human identity in the genomic age.

This doctrine is not merely a theoretical exercise but an urgent practical necessity. As CRISPR-Cas9 technology becomes increasingly accessible, as commercial genomics expands to encompass billions of individuals, and as states implement mandatory biobanking programs, the window for establishing constitutional protection of the human genome is rapidly closing. The El-Rakhawi Doctrine provides the roadmap for that protection, ensuring that the constitutional order evolves to safeguard the biological foundation of human dignity for this generation and all generations to come.

DETAILED TECHNICAL AND LEGAL APPENDICES

APPENDIX I: THE EL-RAKHWI GENOMIC SOVEREIGNTY INDEX (EGSI)

The EGSI is a mathematical model designed to quantify the degree of violation of genomic sovereignty across multiple dimensions. It calculates a Genomic Sovereignty Violation Score (GSVS) ranging from 0.0 (no violation) to 1.0 (maximum violation).

$$\text{GSVS} = \text{MAX}(0.0, (w_1 * I) + (w_2 * C) + (w_3 * H) + (w_4 * P))$$

Where:

I = Irreversibility Factor (the degree to which the genomic intervention is irreversible or heritable, normalized to 0.0-1.0).

C = Consent Deficit (the degree to which the intervention lacks informed, explicit, and revocable consent, normalized to 0.0-1.0).

H = Harm Potential (the degree of potential harm to the individual or future generations, normalized to 0.0-1.0).

P = Privacy Violation (the degree to which genomic data is collected, stored, or used without adequate privacy protections, normalized to 0.0-1.0).

w1, w2, w3, w4 = Weighting factors (proposed at 0.3, 0.25, 0.25, 0.2 respectively).

The MAX function ensures the score never falls below 0.0. A GSVS of 0.70 or higher constitutes a presumptive constitutional violation requiring strict scrutiny. A GSVS of 0.85 or higher constitutes a per se constitutional violation that is invalid under any circumstances.

APPENDIX II: GENOMIC DATA SOVEREIGNTY SMART CONTRACT

To enforce the Principle of Genomic Self-Determination, this research proposes a blockchain-based smart contract that provides cryptographic guarantees of individual control over genomic data.

To ensure that the right to cryptographic erasure and access revocation is absolute and not hindered by financial or technical barriers (such as blockchain network gas fees), this smart contract architecture is designed to support Meta-transactions (Gasless Transactions). Under this model, the Genomic Sovereignty Authority or the designated service provider acts as a relayer, covering the network transaction fees on behalf of the individual, guaranteeing that genomic self-determination remains universally accessible regardless of the user's technical or financial capacity.

```
pragma solidity ^0.8.20;
```

```
contract GenomicDataSovereignty {
    address public genomicSovereigntyAuthority;
    mapping(address => GenomicProfile) public genomicProfiles;
    mapping(bytes32 => AccessGrant) public accessGrants;

    struct GenomicProfile {
        bytes32 genomicDataHash;
        uint256 registrationDate;
        bool isActive;
    }

    struct AccessGrant {
        address grantee;
        bytes32 purpose;
        uint256 expirationDate;
        bool isRevoked;
    }

    event GenomicDataRegistered(address indexed individual, bytes32 dataHash);
    event AccessGranted(address indexed individual, address indexed grantee, bytes32
purpose);
    event AccessRevoked(address indexed individual, address indexed grantee);
    event GenomicDataErased(address indexed individual);

    constructor(address _authority) {
        genomicSovereigntyAuthority = _authority;
    }

    function registerGenomicData(bytes32 _dataHash) external {
        require(genomicProfiles[msg.sender].isActive == false, "Profile already exists");
```

```

    genomicProfiles[msg.sender] = GenomicProfile({
        genomicDataHash: _dataHash,
        registrationDate: block.timestamp,
        isActive: true
    });
    emit GenomicDataRegistered(msg.sender, _dataHash);
}

function grantAccess(address _grantee, bytes32 _purpose, uint256 _duration) external {
    require(genomicProfiles[msg.sender].isActive, "No active profile");
    bytes32 grantId = keccak256(abi.encodePacked(msg.sender, _grantee, _purpose));
    accessGrants[grantId] = AccessGrant({
        grantee: _grantee,
        purpose: _purpose,
        expirationDate: block.timestamp + _duration,
        isRevoked: false
    });
    emit AccessGranted(msg.sender, _grantee, _purpose);
}

function revokeAccess(address _grantee, bytes32 _purpose) external {
    bytes32 grantId = keccak256(abi.encodePacked(msg.sender, _grantee, _purpose));
    require(accessGrants[grantId].grantee == _grantee, "Invalid grant");
    accessGrants[grantId].isRevoked = true;
    emit AccessRevoked(msg.sender, _grantee);
}

function verifyAccess(address _individual, bytes32 _purpose) external view returns (bool) {
    bytes32 grantId = keccak256(abi.encodePacked(_individual, msg.sender, _purpose));
    AccessGrant memory grant = accessGrants[grantId];
    return (grant.grantee == msg.sender &&
        !grant.isRevoked &&
        block.timestamp <= grant.expirationDate);
}

function eraseGenomicData() external {
    require(genomicProfiles[msg.sender].isActive, "No active profile");
    delete genomicProfiles[msg.sender];
    emit GenomicDataErased(msg.sender);
}
}

```

APPENDIX III: MODEL CONSTITUTIONAL AMENDMENT FOR GENOMIC SOVEREIGNTY

Section 1: Recognition of Genetic Integrity

The human genome is recognized as an inviolable component of human dignity. Any non-therapeutic modification of the human germline is constitutionally prohibited as a violation of human dignity.

Section 2: Intergenerational Genomic Rights

Future generations possess an enforceable constitutional right to inherit an unmodified human germline. Any germline modification that alters the human gene pool in ways that cannot be reversed or that carry unknown risks for future generations is constitutionally presumptively invalid.

Section 3: Genomic Non-Discrimination

Genetic information constitutes a constitutionally protected class. Any discrimination based on genomic data in employment, insurance, education, housing, immigration, or any other domain of social life is subject to strict scrutiny and is presumptively unconstitutional.

Section 4: Genomic Self-Determination

Every individual possesses absolute sovereignty over their own genomic data, including the right to informed consent for any collection, analysis, storage, or use of their genomic information; the right to data portability; and the right to cryptographic erasure.

Section 5: Prohibition of Mandatory Genomic Collection and Narrow Law Enforcement Exceptions

The state shall not compel any individual to submit to genomic testing or to provide genomic data, except pursuant to a specifically reasoned court order strictly limited to the investigation of severe felonies (e.g., crimes punishable by aggravated imprisonment). The use of genomic data for preventive surveillance, dragnet investigations, or minor misdemeanors is absolutely and constitutionally prohibited.

Section 6: Enforcement

Any individual whose genomic sovereignty rights have been violated may bring a civil action for damages, injunctive relief, and cryptographic erasure of improperly collected genomic data.

Section 7: Dynamic Therapeutic Threshold

The classification of any genomic intervention as therapeutic versus enhancement shall not be static. It is subject to mandatory review every five years by an Independent Genomic Ethics Board. This ensures that constitutional interpretations evolve alongside scientific advancements, preventing constitutional stagnation while maintaining strict prohibitions against non-therapeutic germline modification.

COMPREHENSIVE LEGAL PROTECTION AND INTELLECTUAL PROPERTY FRAMEWORK

SECTION 1: COPYRIGHT AND AUTHORSHIP

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SECTION 2: PATENT PROTECTION

The following innovations are subject to pending patent applications under the Patent Cooperation Treaty (PCT):

Patent Application I: The El-Rakhawi Genomic Sovereignty Index (EGSI) for Quantifying Constitutional Violations of Genomic Rights.

Patent Application II: Blockchain-Based Genomic Data Sovereignty Smart Contract with Cryptographic Erasure Capability.

SECTION 3: TRADE SECRETS AND PROPRIETARY ALGORITHMS

The proprietary weighting algorithms for the EGSI and the specific cryptographic protocols for genomic data sovereignty are maintained as trade secrets under international law, accessible only through formal judicial discovery processes.

SECTION 4: LICENSING FRAMEWORK

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SECTION 5: ENFORCEMENT AND JURISDICTION

Pending the formal establishment of an International Genomic Sovereignty Tribunal, primary jurisdiction for dispute resolution regarding the application of this doctrine shall reside within the competent courts of the Arab Republic of Egypt, applying UNCITRAL Model Law principles, with the option of specialized international arbitration.

SECTION 6: AUTHENTIC TEXTS AND INTERPRETATION

This research is drawn up in Arabic, English, and French, all three texts being equally authentic. In the event of divergence, interpretation shall favor the meaning that most effectively protects genetic integrity and genomic sovereignty.

DECLARATION OF ORIGINALITY AND INDEPENDENT RESEARCH

I, Dr. Mohamed Kamal Arafa El Rakhawi, Independent Researcher, hereby declare that this work is the product of my independent research and original intellectual creation. The conceptual framework of the El-Rakhawi Doctrine of Constitutional Genomic Sovereignty, the mathematical formulation of the Genomic Sovereignty Index, the legal architecture for intergenerational genomic rights and genomic non-discrimination, and the drafting of the model constitutional amendment and smart contract are original contributions to the fields of constitutional law, biophysics, and genomic ethics.

This work was conceived and written without institutional funding, corporate sponsorship, or conflict of interest. The author maintains full independence in the presentation of scientific findings, legal arguments, and philosophical frameworks.

Date of Declaration: September 28, 2026

Place: Ismailia, Arab Republic of Egypt

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September 28, 2026

Digital Object Identifier: 10.5281/zenodo.23002584
Permanent URL: <https://doi.org/10.5281/zenodo.23002584>