Title :

Combinatorial Therapeutic Strategies and Multi-Modal Synergies for Functional HIV Remission: Modeling and Optimization of Integrated Therapeutic Sequences

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Abstract

The persistence of HIV-1 despite effective antiretroviral therapy (ART) reveals a fundamental truth: single-modality interventions are architecturally insufficient for achieving durable remission or cure. HIV latency, immune dysfunction, and viral rebound are governed by interconnected biological systems that cannot be dismantled in isolation. In this article, I examine combinatorial therapeutic strategies that integrate pharmacological, immunological, genetic, and computational modalities to achieve functional HIV remission. I place emphasis on the rational design, temporal sequencing, and systems-level optimization of multi-modal interventions. I argue that the future of HIV cure research lies not in awaiting a singular breakthrough, but in the precision orchestration of therapeutic ecosystems.

Keywords: HIV cure,Functional remission,Combinatorial therapy,Therapeutic synergy,Multi-modal intervention,Temporal sequencing,Systems optimization,Computational modeling,Shock and Kill,Treatment interruption,Latency reversing agents (LRAs),CAR-T cells,Broadly neutralizing antibodies (bNAbs),Therapeutic vaccine,Precision medicine

1. Introduction: The Systemic Failure of Monotherapies in HIV Cure Research

HIV is not a single-target disease. It is a distributed biological network—a complex system spanning viral reservoirs, host immune landscapes, tissue sanctuaries, and chronic inflammatory feedback loops. While ART effectively suppresses viral replication, it does not address the core pillars of persistence: latent proviral DNA, immune exhaustion, and chronic inflammation. Consequently, viral rebound following treatment interruption is nearly universal. I contend that these limitations demand a radical shift in strategy, from targeting individual components to designing combinatorial interventions capable of dismantling the entire system of persistence simultaneously.

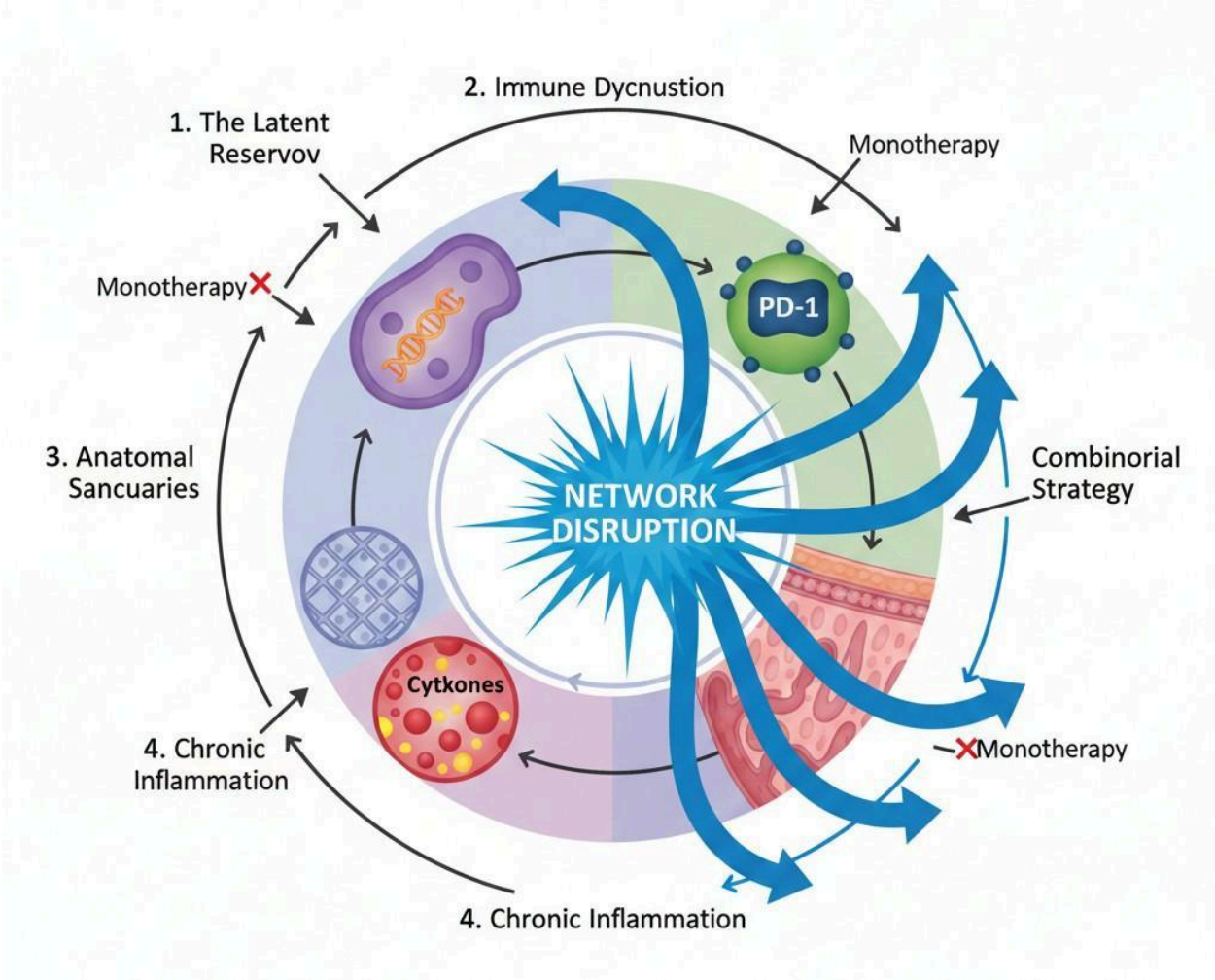

Figure 1. HIV persistence as a multi-layered biological network requiring combinatorial intervention.

A systems diagram depicting HIV persistence not as a single target, but as interconnected layers: 1. The Latent Reservoir (proviral DNA integrated in memory CD4+ T cells), 2. Immune Dysfunction (exhausted cytotoxic T cells with high PD-1 expression), 3. Anatomical Sanctuaries (lymphoid tissue, gut), and 4. Chronic Inflammation (cytokine feedback loop). Monotherapies (single arrows) are shown failing to disrupt the network, while a combinatorial strategy (multiple converging arrows) targets all layers simultaneously to achieve disruption. Created with BioRender.com.

2. Conceptual Framework: Defining the Attainable Goal — Functional Remission

Given the profound biological integration of HIV, a sterilizing cure—the complete elimination of every replication-competent virus—may remain elusive for scalable application. Therefore, I focus on functional remission as a realistic and transformative endpoint. This state, mirroring the elite control observed in a minority, is defined by: durable immune-mediated viral suppression in the absence of ART, minimal reservoir reactivation, and the absence of clinical progression. Achieving this state, I propose, will not be the result of a single 'magic bullet,' but of intelligently stacked, synergistic intervention packages.

3. The Therapeutic Arsenal: Classes of Modalities for Integration

3.1 The Antiretroviral Backbone — The Essential Platform

ART remains the non-negotiable foundation, providing critical stability by suppressing viral replication and preventing new reservoir seeding. It creates the necessary platform of viral suppression upon which all adjunctive, curative interventions must be built.

3.2 Latency-Modulating Agents — Manipulating the Reservoir

This class includes latency-reversing agents (LRAs) to 'shock,' latency-silencing compounds to 'block and lock,' and epigenetic modulators. Their role is to manipulate the proviral state, making the reservoir either visible for elimination or permanently inert. I see them as essential but fundamentally incomplete alone.

3.3 Immune-Based Interventions — Rebuilding the Executor

Here lies the effector arm: therapeutic vaccines to prime responses, broadly neutralizing antibodies (bNAbs) for passive protection and clearance, engineered CAR-T cells for targeted killing, and immune checkpoint modulators to reverse exhaustion. These modalities aim to restore or enhance the immune system's capacity to control or eliminate the virus.

3.4 Genetic and Cellular Engineering — Redesigning the Host

The most durable strategies involve host redesign: CCR5 gene editing, autologous stem cell modification to generate resistant immune systems, and programmable immune circuits. These approaches offer the promise of a one-time intervention for lifelong control.

4. Synergy as a Core Design Principle, Not an Afterthought

In this context, therapeutic synergy is not merely additive; it is emergent and necessary. Properly designed combinations can create effects greater than the sum of their parts: amplifying immune clearance, reducing individual dosing (and thus toxicity), and overcoming mechanisms of escape. I analyze key synergistic pairs: LRAs to expose the reservoir followed by CAR-T cells for precise elimination; bNAbs to suppress viremia while a therapeutic vaccine educates the immune response; gene-edited immune cells supported by checkpoint blockade to ensure their long-term activity.

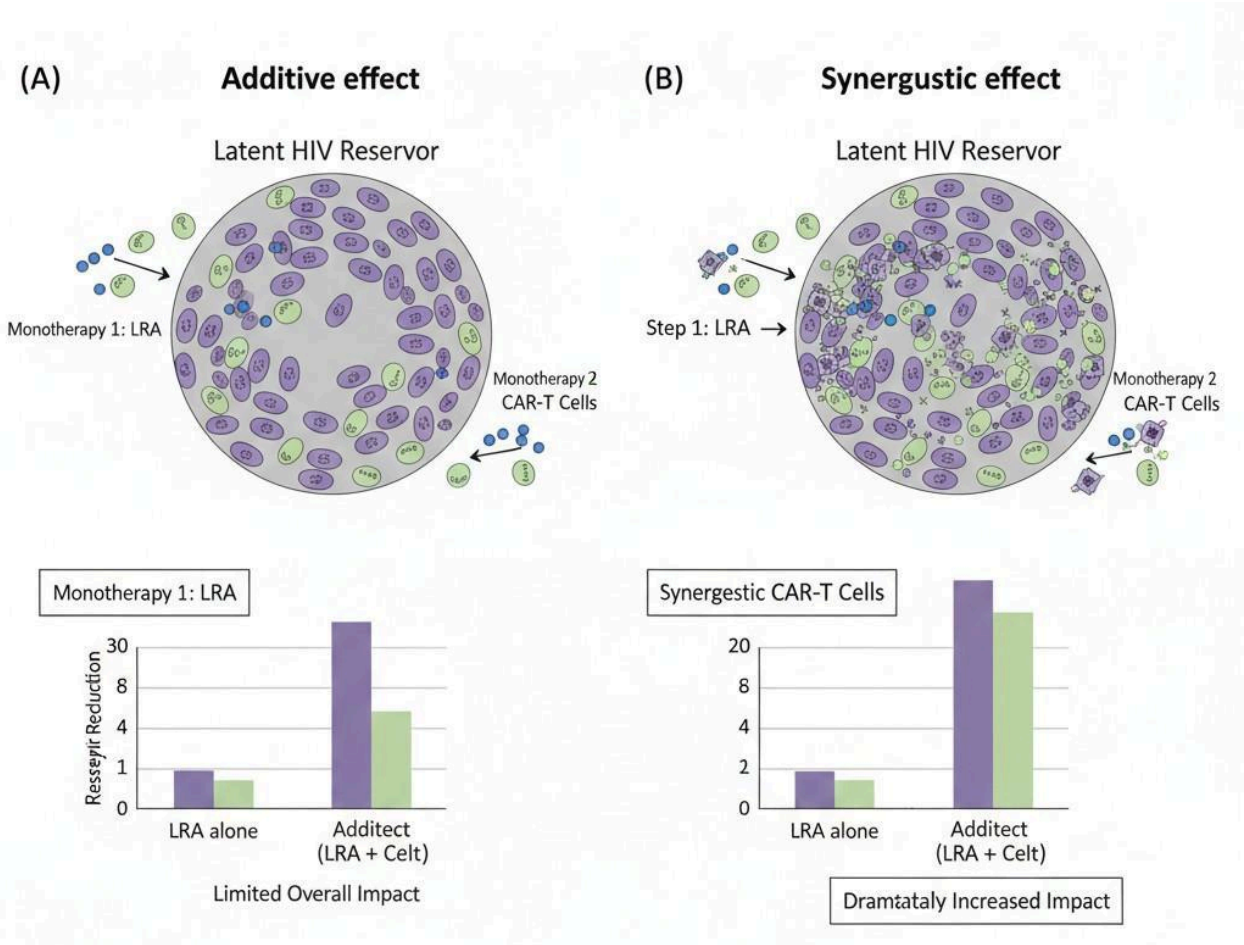

Figure 2. Emergent therapeutic synergy in a multi-modal HIV cure strategy.

(A) Additive effect: Schematic representation of two monotherapies (e.g., a Latency-Reversing Agent, LRA, and CAR-T cells) acting independently with limited overall impact on the reservoir size. (B) Synergistic effect: The same interventions, when combined and rationally sequenced, demonstrate an emergent effect. The LRA exposes latent cells, dramatically increasing the

target pool for the pre-infused CAR-T cells, leading to a reduction in reservoir size that is greater than the sum of the individual effects. Created with BioRender.com.

5. Temporal Sequencing: The Critical Dimension of Therapeutic Logic

Timing is not a logistical detail; it is a biological determinant of success. A powerful therapy delivered at the wrong moment may be useless or harmful.

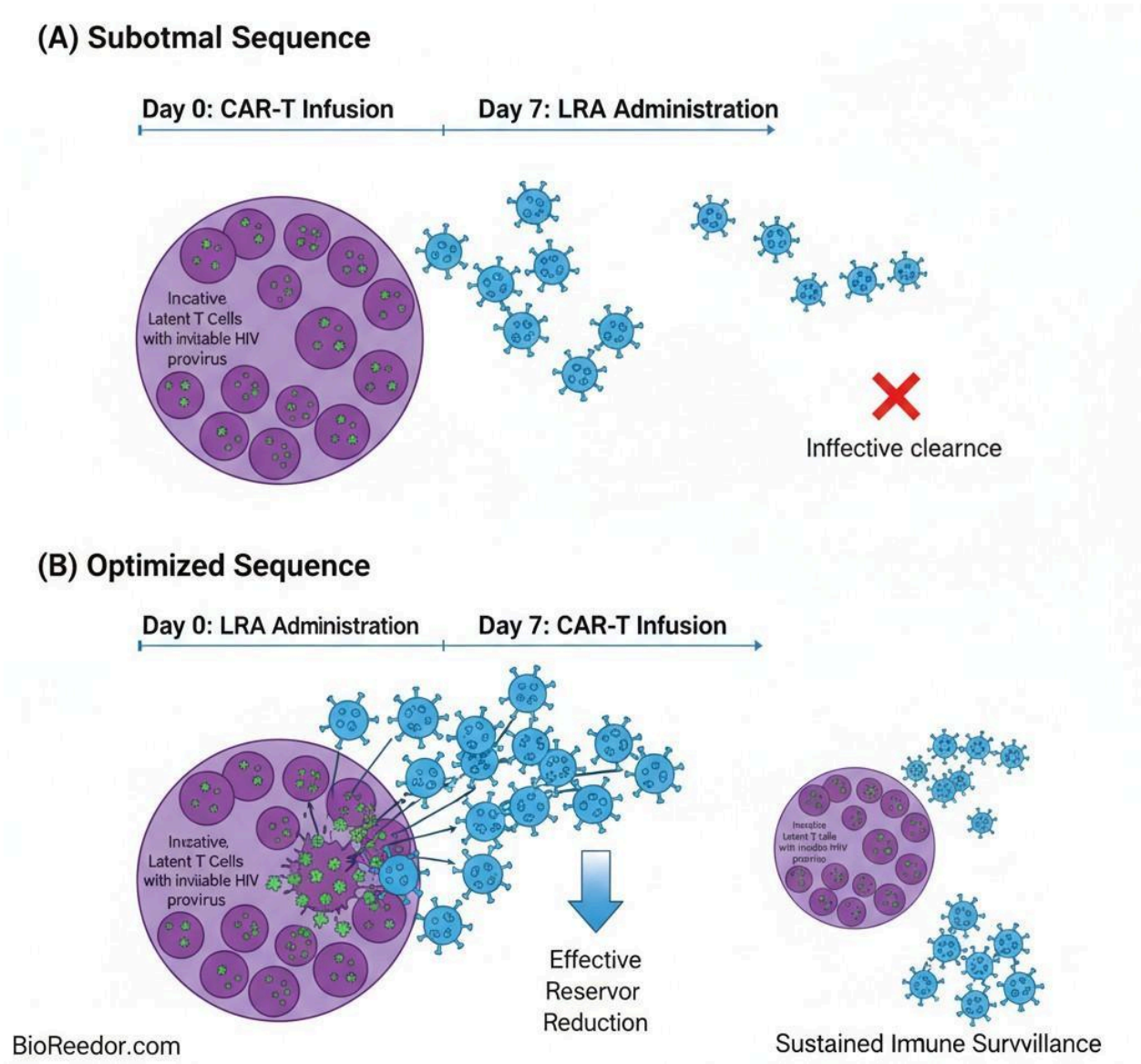

Figure 3. The critical impact of temporal sequencing on therapeutic outcome.

A comparative timeline of two combination strategies targeting the HIV reservoir. Upper Panel (Suboptimal Sequence): CAR-T cell infusion precedes LRA administration. The engineered

immune cells lack visible targets, leading to contraction and ineffective clearance. Lower Panel (Optimized Sequence): LRA administration precedes CAR-T infusion. The reactivated reservoir cells express viral antigens, becoming visible targets for the subsequently infused CAR-T cells, leading to effective reservoir reduction and sustained immune surveillance. Created with BioRender.com.

5.1 Sequential vs. Simultaneous Logic

I distinguish between sequential delivery (e.g., prime the immune system before reactivating the reservoir) and simultaneous delivery (e.g., combining a LRA with an immediate cytotoxin). Misapplication risks immune interference or missed opportunities.

5.2 Defining Treatment Windows

The therapeutic journey must align with biological phases: a reservoir activation window, an immune reconstitution and priming window, and a long-term maintenance surveillance window. Optimized sequencing transforms a list of therapies into a coherent biological narrative.

6. Computational Modeling and Systems Optimization: From Guesswork to Engineering

To navigate this complexity, I argue for the indispensable role of computational tools.

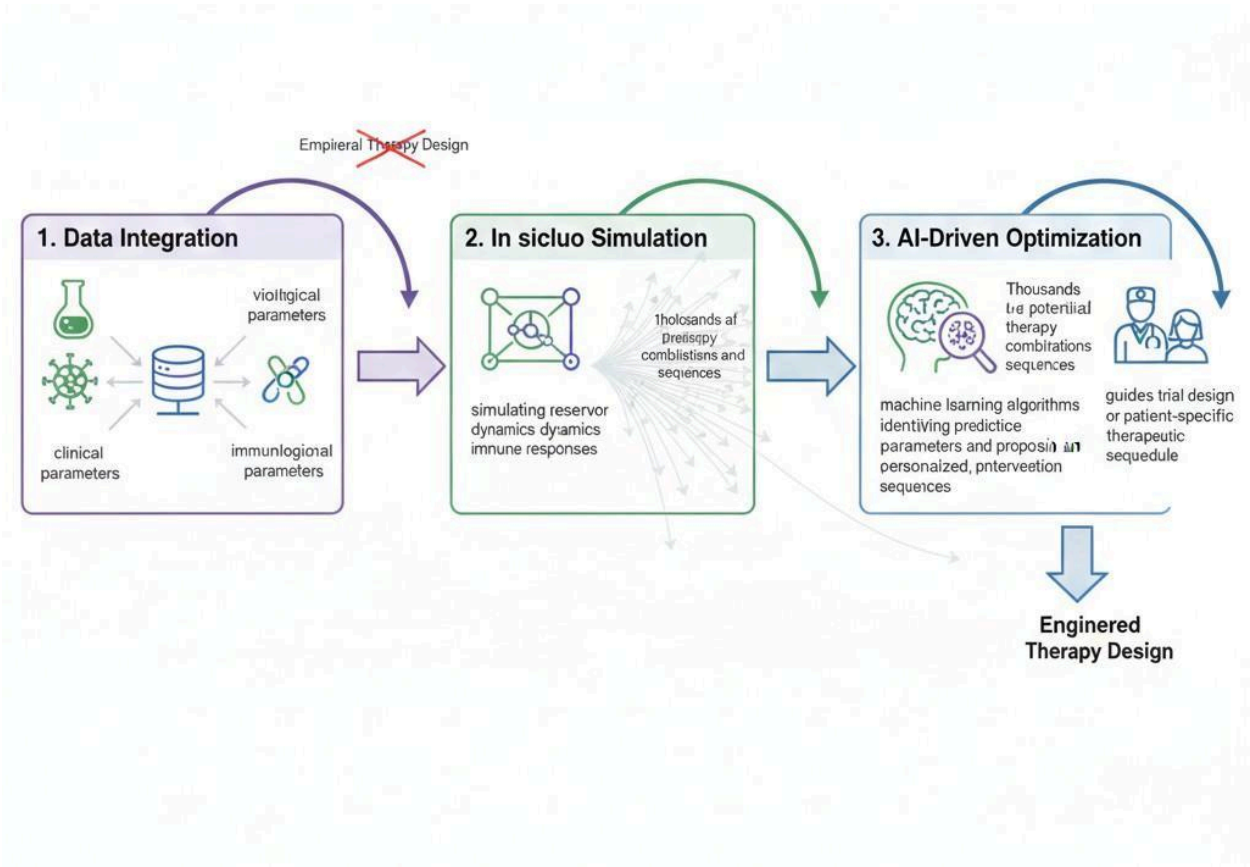

Figure 4. Computational modeling and AI-guided optimization of combinatorial HIV cure strategies.

A workflow diagram illustrating the shift from empirical to engineered therapy design. Step 1: Data Integration (clinical, virological, immunological parameters fed into a model). Step 2: In silico Simulation (an agent-based or mathematical model simulating reservoir dynamics and immune responses under thousands of potential therapy combinations and sequences). Step 3: AI-Driven Optimization (machine learning algorithms identifying the most predictive parameters and proposing an optimized, personalized intervention schedule). Step 4: Clinical Translation (the predicted optimal strategy guides trial design or patient-specific therapeutic sequencing). Created with BioRender.com.

6.1 Predictive Modeling

Mathematical and agent-based models can simulate reservoir dynamics, predict immune response patterns, and forecast viral rebound probabilities, moving the field beyond costly trial-and-error.

6.2 AI-Guided Strategy Design

Artificial intelligence and machine learning can analyze multidimensional patient data to suggest personalized intervention schedules, simulate adaptive clinical trials, and ultimately enable real-time therapeutic adjustment. This represents the shift from empirical medicine to precision immuno-engineering.

7. Clinical Evidence: Early Signals of a Multi-Modal Future

While no definitive cure exists, emerging clinical studies provide compelling proof-of-concept for synergy: delayed viral rebound in trials combining bNAbs with ART; enhanced immune clearance in studies pairing therapeutic vaccines with checkpoint blockade; the sustained remission observed in post-treatment controllers, which itself is a natural model of multi-factorial control. These are not failures, but the unmistakable signals that the combinatorial path is correct.

8. Navigating the Translational Landscape: Safety, Feasibility, and Equity

The elegance of a combinatorial strategy is matched by its translational challenges: cumulative toxicity, staggering manufacturing complexity, and prohibitive costs that threaten equitable access. I maintain that simplification, modularity, and scalability must be designed into these strategies from the outset, especially to serve the low- and middle-income countries bearing the greatest burden of the pandemic. A cure only for the wealthy is a scientific and moral failure.

9. Ethical and Regulatory Considerations in a Multi-Intervention Era

Pursuing functional remission in otherwise healthy individuals on effective ART raises unique ethical questions. We must carefully balance risk and benefit, ensure truly informed consent for complex multi-intervention protocols, and build regulatory frameworks that can evaluate synergistic packages rather than only isolated drugs. The goal must be an ethically sustainable remission, not just a biologically achievable one.

10. Conclusion: From Single Therapies to Engineered Therapeutic Ecosystems

The path to a functional HIV cure will not be unlocked by a single, isolated discovery. It will be built through the intelligent, systems-level orchestration of multiple modalities—pharmacological, immunological, genetic, and digital. By integrating deep biological insight with engineering principles and computational power, combinatorial strategies represent the most realistic, rigorous, and transformative roadmap toward the ultimate goal: long-term, drug-free control of HIV. The era of the monotherapy is over; the era of the therapeutically engineered ecosystem has begun.

References

Deeks, S. G., et al. Nature Medicine (2021).

Margolis, D. M., et al. The Lancet HIV (2020).

Barouch, D. H., et al. Science (2022).

Perelson, A. S. Nature Reviews

Immunology (2018).

Chun, T. W., et al. PNAS (2021).

Bibliographical references of Ndenga Lumbu Barack

Chuck, C., Robinson, J., & Ndenga, B. (2025). Bio-Adaptive Quantum Error Correction: Immune-Inspired Priors Enable 22–65% Overhead Reduction in Surface-Code Decoding (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17684948

Maman Moussa Maman, M., & Ndenga, B. (2025). Nutritional and Nutraceutical Valorization of Edible Grasshoppers from Niger: A Multi-Omics Characterization Integrated with Artificial Intelligence for Personalized Food Formulations (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17841603

Maman Moussa Maman, M., & Ndenga, B. (2025). Mathematical and Nutritional Modeling for Predicting the Effectiveness of Malaria Preventive Interventions: An Integrated Epidemiological Framework for Population-Level Risk and Response Optimization (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17886414

Maman Moussa Maman, M., & Ndenga, B. (2025). Beyond Body Mass Index: Development of the Adjusted Central Corpulence Index (ICCA) Integrating Age, Sex, and Abdominal Adiposity for Cardiometabolic Risk Assessment (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17955316

Maman Moussa Maman, M., Ndenga, B., SORE, I., Makiasi hambadiana, Y., & SCHOUNA MENI, C. (2025). Integrative Modulation of Telomeric Dynamics and Cellular Senescence through Nutrition, Phyto-Pharmacological Compounds, Translational Medicine, Artificial Intelligence, and Quantum Simulation. (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18075291

Maman Moussa Maman, M., Ndenga, B., SORE, I., Makiasi hambadiana, Y., SCHOUNA MENI, C., & Fatou, D. (2026). Complementary Mechanisms of Action and Potential Synergies Between Nutrition, Physical Activity, and Phytotherapy in Cardiometabolic Prevention : A Narrative Review and Theoretical Framework for the African Context (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18116505

Maman Moussa Maman, M., Ndenga, B., SORE, I., Makiasi hambadiana, Y., SCHOUNA MENI, C., & Fatou, D. (2026). Development and Validation of ICCA-O (Optimized Adjusted Central Adiposity Index): A Composite Cardio-Metabolic Risk Indicator Integrating BMI, WHR, WtHR, ABSI, and BAI (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18119723

Maman Moussa Maman, M., & Ndenga, B. (2025). Artificial Intelligence–Driven Personalized Optimization of Antimalarial Therapies Through the Integration of Nutrition,

Phytotherapy, and Pharmacology: A Multi-Factor Predictive Modeling Framework (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17861029

Maman Moussa Maman, M., & Ndenga, B. (2025). AI-Enhanced Biochemical Discovery and Optimization of Antimalarial Compounds from Indigenous Medicinal Plants: An Integrative Framework for Data-Driven Natural Product Drug Development (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17868086

Makiasi Hambadiana, Y., & Ndenga, B. (2025). Development of a Nutrient-Dense Infant Porridge Based on Local Ingredients in Kinshasa (DRC): The Hamba's Society Model (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17089147

Makiasi Hambadiana, Y., & Ndenga, B. (2025). Prostate-Protective Bioactivity of Cucurbita maxima Seeds: Molecular Pathways, Endocrine Regulation, and Clinical Relevance (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17880798

Makiasi hambadiana, Y., & Ndenga, B. (2025). Biocatalytic and Cytoprotective Role of the Zinc–L–Carnosine Complex in Gastric Mucosal Regeneration (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17410492

Makiasi Hambadiana, Y., & Ndenga, B. (2025). Functional and Preventive Potential of Cucurbita maxima as a Nutritional Therapeutic Agent. (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17763294

Ndenga, B. (2025). Information-Driven Order Formation in Natural and Artificial Systems (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17970157

Ndenga, B. (2026). Immuno-Engineering of Hematopoietic Stem Cells for Durable Immune Resistance to HIV: From the CCR5Δ32 Mutation to Autologous Gene Therapies Mediated by Lentiviral Vectors (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18203370

Ndenga, B. (2025). Reading and Transcription of a Tetra-Stranded Genetic Polymer : Decoding Channels, Controlled Ambiguities, and the Formal Definition of the Q-Code (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18068961

Ndenga, B. (2026). Next-Generation CAR-T Cells for HIV Cure Strategies: Dual-Specific Chimeric Antigen Receptors for Targeted Elimination of Latent Reservoirs Toward Artificial, Durable, and Adaptive Immune Surveillance (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18246641

Ndenga, B. (2025). Information-Theoretic Capacity of a Tetra-Stranded Hereditary Polymer : Effective Alphabets, Encoding Density, and Readout Constraints in Q-DNA (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18056935

Ndenga, B. (2025). Replication of a Tetra-Stranded Genome : Mechanistic Scenarios and Minimal Enzymatic Constraints for Q-DNA (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18064787

Ndenga, B. (2025). Catalogue of Tetra-Stranded Helical Architectures: Classes, Topological Invariants, and Structural Transitions (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18028731

Ndenga, B. (2025). Q↔D Kinetics: Nucleation, Propagation, and Kinetic Traps in a Tetra-Stranded Hereditary Polymer (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18054763

Ndenga, B. (2026). Programmable Nanomedicine and Multifunctional Vectors for the Selective Targeting of HIV-1 Reservoirs: Toward a Next-Generation Shock & Kill Strategy (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18177087

Ndenga, B. (2025). Thermodynamics of a Tetra-Stranded Genome: Stability, Thresholds, and Entropic Constraints (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18036881

Ndenga, B. (2025). Q-DNA: A Formal Definition of a Canonical Tetra-Stranded Hereditary Polymer Beyond the Double Helix (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18015887

Ndenga, B. (2025). Quantum π in Biomolecular Dynamics: Proteins as Nano-Quantum Fluids (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17795878

Ndenga, B. (2025). Evolvability and Selection in a Tetra-Stranded Genome : Robustness, Modularity, and Adaptive Dynamics in Q-DNA (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18071359

Ndenga, B., & Sharma, H. (2025). Information Against Entropy: Toward a Governing Principle of Organization in Complex Systems (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17944808

Ndenga, B., & Himanshi, . sharma . (2025). Microcapsule-Enabled Self-Healing Silicon Anodes for Next-Generation Lithium-Ion Batteries: A Conceptual Design, Materials Framework, and Technical Feasibility Study (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17981741

Ndenga, B. (2025). Rigidity, Torsion, and Mechanical Response of a Tetra-Stranded Genome : A Unified Theoretical and Experimental Framework for Q-DNA Elasticity (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18052220

Ndenga, B. (2025). Mutation Landscape and Error Correction in Q-DNA : Correlated Errors, Structural Redundancy, and Topological Self-Correction in a Tetra-Stranded Hereditary Polymer (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18060921

Ndenga, B. (2025). Legume-Derived Anti-Angiogenic Networks Targeting Renal Cell Carcinoma: Mechanistic Insights into Polyphenol–Saponin–Fiber Bioactive Complexes from Phaseolus vulgaris (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18005392

Ndenga, B. (2025). Climate-Adaptive Batteries: Passive Thermal Regulation of Lithium-Ion Batteries Using Thermochromic Functional Surface Films (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17999867

Ndenga, B. (2025). Atomistic Stability of Q-DNA: Molecular Dynamics Simulations and Structural Persistence Criteria (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18047941

Ndenga, B. (2025). Four-Strand Pairing Beyond Watson–Crick: Interaction Hypergraphs, Controlled Degeneracy, and Sequence Constraints (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18040162

Ndenga, B. (2025). Information, Entropy, and System Dynamics: A Unified Framework Toward an Extended Thermodynamic Principle of Organization Across Physical, Biological, and Computational Systems (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17924903

Ndenga, B. (2025). The Informational Foundations of Organization in Physical and Biological Systems : Toward an Extended Thermodynamic Principle of Self-Organization (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17917388

Ndenga, B. (2025). On Organizational Efficiency and the Limits of Non-Equilibrium Thermodynamics Toward an Information-Centered Theory of Organization (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17931806

Ndenga, B. (2025). R-Law AI: A Thermodynamic Information–Entropy Framework for Self-Organizing Neural Networks Based on the IOE Principle (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17860353

Ndenga, B. (2025). The Extended Fifth Law of Thermodynamics: Establishing Information as a Fundamental Physical Quantity (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17904738

Ndenga, B. (2025). THE PRINCIPLE OF INFORMED ORGANIZATIONAL EFFICIENCY : A Comprehensive Foundational Framework for an Extended Fifth Law of Thermodynamics (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17848436

Ndenga, B. (2025). Nano-Turbulence in Biological Systems: A New Paradigm (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17803565

Ndenga, B. (2025). Schrödinger–Navier–Stokes–π Unified Computational Framework : A Unified Theoretical and Numerical Architecture for Quantum-Coherent Fluid Dynamics Across Physical and Biological Scales (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17832286

Ndenga, B. (2025). The Complete Solution to the Glass Transition: A Unified Energy–Topology Landscape (ETL) Framework (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17741451

Ndenga, B. (2025). Quantum-Fluid Interpretation of Enzymatic Tunnels and Energy Transport (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17822207

Ndenga, B. (2025). Schrödinger–Navier–Stokes–Quantum-π: A Unified Model and Hybrid Numerical Method for Quantum Fluids with π-Phase Structure (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17770899

Ndenga, B. (2025). Quantum π-Unification II: Definition, Mathematical Structure, and Foundational Properties of the Quantum π for Molecular Systems (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17716546

Ndenga, B. (2025). Electrostatics of a Tetra-Stranded Polymer: Ionic Condensation and Nonlinear Screening (Version V1). Zenodo. https://doi.org/10.5281/zenodo.18044219

Ndenga, B. (2025). H-ImmQπDecoder v2.0: A Bio-Inspired Quantum Error Decoder Integrating Immune Adaptation, Quantum-π Phase Control, and Quantum Metabolism (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17782652

Ndenga, B. (2025). The Octet Rule Revisited: A Quantum-Continuum Framework for Chemical Bonding (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17703765

Ndenga, B. (2025). Foundations of Quantum-π in Molecular Systems: A Fundamental Descriptor of Delocalization, Electronic Structure, and Molecular Stability. Zenodo. https://doi.org/10.5281/zenodo.17692965

Ndenga, B. (2025). Quantum π-Index in Advanced Materials: Predictive Framework for Nanostructures, Functional Polymers, and Superconducting States (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17662004

Ndenga, B. (2025). Q-Synapse: A Hybrid Quantum–AI Platform for Tumor State Classification Using Real Genomic Data (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17655039

Ndenga, B. (2025). Crystal-Guided AI Phototherapy for Personalized Oncology (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17398364

Ndenga, B. (2025). Quantum π-Driven Predictive Chemistry: Applications to Reactivity, Electronic Structure, and Simulation-Based Forecasting (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17654148

Ndenga, B. (2025). Numerical Solution of the Navier-Stokes Equations in 3D Using the Finite Volume Method: Application to the Millennium Problem. Zenodo. https://doi.org/10.5281/zenodo.15531853

Ndenga, B. (2025). Electronless Nuclear Matter: Magnetic Confinement and Bonding of Bare Nuclei in Extreme Fields (Version V1). Zenodo. https://doi.org/10.5281/zenodo.15764734

Ndenga, B., & Ndenga, B. (2025). AutoEvoChem V2.0 – A Smart Molecular Simulation & Synergy AI Toolkit for Computational Chemists and Biopharma Researchers. Zenodo. https://doi.org/10.5281/zenodo.15774

Ndenga, B. (2025). NanoChemicalDisc RDC-1000: A Novel Molecular Approach to Low-Cost Data Storage Using Colorimetric Encoding. Zenodo. https://doi.org/10.5281/zenodo.15871728

Ndenga, B. (2025). Autoevolving Nanodisk with Unlimited Memory: A Bioinspired and Quantum-Spiritual Approach (Version V1). Zenodo. https://doi.org/10.5281/zenodo.16569012

Ndenga, B. (2025). Self-Adaptive Photosynthetic Quantum Crystal: A Bioinspired Innovation for Intelligent Light Harvesting and Energy Conversion (Version V1). Zenodo. https://doi.org/10.5281/zenodo.16585048

Ndenga, B. (2025). Quantum-Nuclear DNA Computing: Using Nucleotide Spin States as Biological Quantum Bits for Molecular Calculations (Version V1). Zenodo. https://doi.org/10.5281/zenodo.16891194

Ndenga, B. (2025). BECChem: Self-Evolving Chemical AI for Advanced Molecular Analysis (Version V1). Zenodo. https://doi.org/10.5281/zenodo.16934328

Ndenga, B. (2025). Nuclear Matter Without Electrons: The Magneto-Nuclear Periodic Table (MNPT) and the Taxonomy of Nucleomorphs (Version V1). Zenodo. https://doi.org/10.5281/zenodo.16955871

Ndenga, B. (2025). Design of Multi-Target Hybrid Molecules for Synergistic Therapy of Malaria and Human African Trypanosomiasis (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17074442

Ndenga, B. (2025). Biological Neural Calculator Using Plant-Based Electromagnetic Responses (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17094316

Ndenga, B. (2025). Title: Molecular Wormhole Chemistry: Electronic Non-Locality Induced by Wormhole-Like Geometries in Conjugated Molecular Systems (Version V1). Zenodo. https://doi.org/10.5281/zenod.17114802

Ndenga, B. (2025). Towards a Unified AI-Driven Quantum Framework: Beyond Density Functional Theory for 3D Materials. https://doi.org/10.5281/zenodo.17148362

Ndenga, B. (2025). A Knot-Theoretic Approach to Turbulence: Toward Predictive Invariants in 3D Fluid Flows (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17172786

Ndenga, B. (2025). Towards a Unified Field Theory of Chemistry: Bridging Quantum, Organic, and Biochemical Reactions through a Single Formalism (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17217047

Ndenga, B. (2025). Vacuum Metabolism: A Theoretical Framework for Biological Exploitation of Quantum Zero-Point Energy (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17261682

Ndenga, B. (2025). The Darwin Limit: Mathematical Constraints on the Speed of Biological Evolution (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17280016

Ndenga, B. (2025). Integrating AI, Photonics, and Molecular Modeling: The Future of Precision Medicine (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17295049

Ndenga, B. (2025). Photonics + AI: Revolutionizing In Silico Drug Design (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17315749

Ndenga, B. (2025). Photonics and AI in Computational Oncology: Accelerating the Design of Next-Generation Cancer Therapies (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17341571

Ndenga, B. (2025). AI-Driven Light-Spectrum Optimization for Photonic Drug Discovery (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17360624

Ndenga, B. (2025). Photon-Enhanced AI Platforms for Multimodal Therapeutics (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17373765

Ndenga, B. (2025). AI-Optimized Photon-Assisted Molecular Docking for Rapid Drug Discovery (Version V1). Zenodo. https://doi.org/10.5281/zenodo.17416035

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MULONSO, H., & Ndenga, B. (2025). Contribution of Enzymatic and Non-Enzymatic Antioxidants from Cymbopogon citratus to Cellular Protection Against Oxidative Damage in Cancer (Version V1). Zenodo. https://doi.org/10.5281/zenodo.