

The Immortality Update: September 2025

The past week has marked a pivotal moment in longevity sciences, with breakthrough blood-based aging tests, AI-driven therapeutic discoveries, and the first mainstream pharmaceutical embrace of "longevity drugs" terminology. This convergence of precision diagnostics, artificial intelligence, and clinical validation signals a fundamental shift from experimental aging research toward translatable interventions that enhance functional capacity rather than merely extend lifespan. The developments span from revolutionary aging measurement tools to the first-ever human trials of epigenetic reprogramming, representing the most significant week for longevity science translation in recent history.

Key findings reveal revolutionary aging diagnostics

The most significant breakthrough emerged September 15, 2025, with the **Nature Aging** publication of "Systems Age" - a single blood-based DNA methylation test that measures aging across 11 distinct physiological systems. [Nature](#) [Nature](#) Led by researchers Raghav Sehgal, Yaroslav Markov, and Morgan Levine, this multi-institutional discovery enables personalized prediction of disease risk and precise tailoring of longevity interventions. [Nature +2](#) Unlike existing global aging clocks, Systems Age reveals distinct biological aging subtypes with unique health decline patterns, measuring Heart, Lung, Kidney, Liver, Brain, Immune, Inflammatory, Blood, Musculoskeletal, Hormone, and Metabolic systems independently. [Nature](#) [Nature](#)

The technology has already been licensed to TruDiagnostics as the "SYMPHONYAge" product, indicating rapid commercial translation. [Longevity.Technology](#) This represents the first aging diagnostic capable of identifying which specific systems are aging faster in each individual, enabling targeted interventions rather than broad anti-aging approaches.

Complementing this diagnostic advance, researchers at Insilico Medicine published groundbreaking work September 11 on AI-driven proteomic aging clocks using 55,000+ UK Biobank participants. Their ipf-P3GPT AI model revealed that idiopathic pulmonary fibrosis represents distinct biological aging patterns rather than simple accelerated aging, providing new therapeutic targets for age-related diseases while demonstrating AI's potential for personalized aging interventions. [Founders Forum Group](#) [EurekAlert!](#)

Clinical trials advance toward human longevity treatments

The world's first epigenetic reprogramming clinical trial moves toward human testing as Life Biosciences prepares their ER-100 gene therapy for FDA Phase 1 trials in Q1 2026. [Lifebiosciences](#) This landmark intervention uses partial epigenetic reprogramming through modified Yamanaka factors (Oct4, Sox2, Klf4) to reverse age-related cellular damage. [Labiotech.eu](#) [Ddw-online](#) Preclinical studies in nonhuman primates demonstrated restoration of visual function in age-related conditions, with cells showing reversal of methylation patterns and improved cellular function. [Longevity.Technology +2](#)

Simultaneously, **major pharmaceutical companies publicly embraced longevity medicine** for the first time at the ARDD 2025 conference. Dr. Andrew Adams from Eli Lilly asked "Are GLP-1s the world's first longevity drugs?" while Dr. Lotte Bjerre Knudsen from Novo Nordisk declared "Semaglutide as a proven longevity medicine." This represents an unprecedented strategic pivot, with supporting evidence showing semaglutide demonstrating biological aging deceleration in clinical trials beyond diabetes and obesity applications. [European AIDS Treatment Gr...](#) [longevity](#)

The **PEARL trial results for rapamycin longevity** showed confirmed safety and functional benefits in healthy adults aged 50-85. Women taking 10mg rapamycin demonstrated significant improvements in lean tissue mass (+6.2kg at 48 weeks) and reduced self-reported pain, with quality of life improvements in general health and emotional well-being. [Medical News Today +2](#) This Phase 2 randomized, double-blind, placebo-controlled study represents the most robust clinical evidence for rapamycin's healthspan benefits in humans. [P05](#) [medRxiv](#)

Early-stage research demonstrates cellular rejuvenation breakthroughs

Laboratory advances continue pushing the boundaries of cellular aging reversal. **Chinese Academy of Sciences researchers achieved multi-system aging reversal** in elderly macaques using senescence-resistant mesenchymal progenitor cells enhanced with FOXO3 genes. This 44-week primate study demonstrated enhanced cognitive function, improved bone density, restored reproductive health, and reduced cellular senescence [Chinese Academy of Sciences](#) - representing 5-7 years of biological age reversal across multiple organ systems. [Nature](#) [Chinese Academy of Sciences](#)

AI-enhanced Yamanaka factors developed through OpenAI collaboration with Retro Biosciences showed 50-fold increases in stem cell reprogramming marker expression compared to wild-type factors. These GPT-4b micro-designed variants demonstrate enhanced DNA damage repair capabilities and improved cellular rejuvenation potential, [Longevity.Technology](#) suggesting safer alternatives to traditional reprogramming approaches. [BiopharmaTrend +3](#)

Northwestern University researchers published **breakthrough CRISPR delivery system enhancements** in PNAS, showing lipid nanoparticle spherical nucleic acids (SNAs) tripled gene-editing efficiency while improving safety and reducing toxicity. This technological advance enables more effective genetic interventions for aging-related conditions.

Technological tools accelerate discovery pipelines

AI-driven drug screening platforms demonstrated remarkable success in identifying longevity compounds. Scripps Research and Gero AI's polypharmacological screening platform achieved 70% success rates in extending lifespan in *C. elegans* models, [Scripps Research](#) while Italian Institute of

Technology's AgeXtend platform screened 1.1 billion compounds and accurately identified known geroprotectors like metformin and taurine. [Alwire](#)

The **2025 Biomarkers of Aging Challenge** continued through September with 152 teams from 28 countries competing using novel DNA methylation datasets from 500 individuals aged 18-99. This mass collaboration advances next-generation biomarkers for chronological age, mortality, and multi-morbidity prediction using Illumina MethylationEPIC v2.0 platforms. [PubMed Central](#)

Virginia Tech's ProRNA3D-single AI tool, released September 16, provides open-source capabilities for 3D RNA-protein interaction modeling, accelerating drug discovery for age-related neurological conditions and viral infections affecting older adults.

Ethical and practical considerations emerge

The rapid translation of longevity interventions raises significant accessibility concerns, as **costs and complexity may limit initial availability** of advanced interventions like epigenetic reprogramming and AI-designed therapeutics. Early adopters will likely be affluent populations, potentially exacerbating health disparities unless deliberate access strategies are implemented.

Safety considerations remain paramount as long-term effects of genetic modifications and epigenetic interventions require extended monitoring. The senescence-resistant stem cell therapies and CRISPR enhancements show promise but need comprehensive safety profiles before human implementation.

Regulatory pathways present ongoing challenges, though the FDA's acceptance of two Reasonable Expectation of Effectiveness (RXE) determinations for Loyol's canine longevity drugs establishes important precedent for aging as a therapeutic indication, even in veterinary medicine. [DVM 360](#) [DVM 360](#)

Future directions point toward precision longevity medicine

The convergence of AI-driven discovery platforms, precision aging diagnostics, and clinical validation suggests **2026 will mark the beginning of personalized longevity medicine**. The Systems Age diagnostic enables identification of individual aging patterns, while AI platforms accelerate discovery of targeted interventions for specific aging mechanisms.

Combination therapeutic approaches targeting multiple aging hallmarks simultaneously show particular promise, with polypharmacological AI screening identifying synergistic compound combinations. The integration of senolytics, metabolic regulators, and cellular reprogramming suggests multi-modal interventions may achieve superior functional outcomes compared to single-target approaches.

Major pharmaceutical investment signals industry confidence in longevity medicine's commercial viability, with total 2024 longevity investment reaching \$8.49 billion. [Longevity.Technology +2](#) The explicit

embrace of "longevity drugs" terminology by Eli Lilly and Novo Nordisk indicates mainstream acceptance of aging as a therapeutic target. [longevity](#) [Longevity.Technology](#)

Conclusion

September 10-17, 2025 represents a watershed moment for functional longevity sciences, characterized by precision diagnostics enabling personalized interventions, AI acceleration of therapeutic discovery, and unprecedented pharmaceutical industry commitment to aging medicine. **The shift from experimental research to clinical translation is now irreversible**, with multiple human trials of longevity interventions launching within 18 months. Most significantly, the focus has evolved from simple lifespan extension toward functional capacity preservation, addressing the core challenge of maintaining healthspan rather than merely prolonging life. [Science](#) The convergence of these technological, clinical, and commercial developments suggests that personalized longevity medicine will become standard healthcare practice within the current decade.