BIOLOGY BREAKTHROUGHS

TOP NEWS HIGHLIGHTS

Genetic Engineering • Synthetic Biology • Biotechnology

JANUARY – JUNE 2024

From next-gen gene editing to living therapeutics and engineered life, the first half of 2024 witnessed remarkable leaps in biology.

JANUARY 2024

New CRISPR Tool Enables Ultra-Precise Gene Editing

Scientists develop "eSpCas9(1.1)", a more accurate CRISPR enzyme with fewer off-target edits, improving the safety of gene therapies.

Source: Nature Biotechnology, Jan 2024

JANUARY 2024

World's First "Base-Edited" Pig Organs Move Closer to Xenotransplantation

Base-editing reduces harmful pig genes that cause rejection in humans, bringing us closer to solving the organ shortage crisis.

Source: Nature, Jan 2024

FEBRUARY 2024

First CRISPR Therapy Approved in the UK for Sickle Cell Disease

The MHRA approves Casgevy (exa-cel), a CRISPR-based therapy, marking a major milestone for gene editing medicines.

Source: MHRA, Feb 2024

FEBRUARY 2024

First AI-Designed Synthetic Genome Published

Researchers publish the design of a minimal synthetic genome (Syn57), a step toward building fully synthetic cells.

Source: Science, Feb 2024

MARCH 2024

Engineered Plants Designed to Resist Multiple Diseases

Researchers create gene-edited rice and wheat with broad-spectrum resistance to fungal pathogens, reducing crop loss and pesticide use.

Source: Nature Plants, Mar 2024

MARCH 2024

Breakthrough in Gene Therapy for Inherited Blindness

AAV-based gene therapy shows long-term vision improvement in clinical trials for a rare inherited retinal disease.

Source: The Lancet, Mar 2024

APRIL 2024

Synthetic Microbes Turn CO_2 into Key Building Blocks

A synthetic biology platform converts carbon dioxide into compounds used in plastics, fuels and medicines, offering a sustainable manufacturing route.

Source: Science, Apr 2024

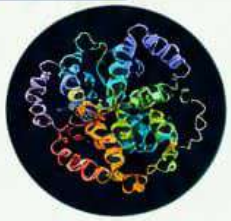
APRIL 2024

DNA Data Storage Hits New Milestone

Scientists store more than 1 petabyte of data in synthetic DNA, paving the way for ultra-dense, long-term data storage solutions.

Source: Nature Biotechnology, Apr 2024

MAY 2024



AI-Powered Protein Design Creates Highly Efficient Enzymes

New AI models generate novel enzymes that perform complex reactions with high efficiency, accelerating green chemistry and pharma applications.

Source: Nature, May 2024

JUNE 2024

Programmable Living Therapeutics Enter Clinical Trials

Engineered bacteria that sense disease signals and release therapeutics directly in the gut show promising results in early human trials.

Source: Nature Medicine, Jun 2024

TRENDS TO WATCH

- CRISPR and base editing therapies moving from lab to clinic
- Synthetic biology driving sustainable solutions for climate and health
- AI + biology accelerating discovery and design
- Living medicines and engineered microbes opening new frontiers

PRECISION GENE EDITING
Safer, more precise tools for treating genetic diseases

SUSTAINABLE BIOTECH
Engineered organisms tackling food security, pollution and climate

AI + BIOLOGY SYNERGY
Smarter design of proteins, genomes and biological systems

LIVING THERAPEUTICS
Programmable cells as next-generation medicines

The future is being coded in our cells.

BIOLOGY IS INNOVATING. LIFE IS EVOLVING. THE FUTURE IS NOW.

BIOLOGY BREAKTHROUGHS
& NEWS HIGHLIGHTS

KEY FINDINGS IN BIOTECHNOLOGY, GENETIC ENGINEERING & SYNTHETIC BIOLOGY

JULY – DECEMBER 2024

From next-gen gene editing to living therapeutics and engineered life, the second half of 2024 witnessed remarkable leaps in biology.

JULY 2024

IN-VIVO LUNG CRISPR EDITING

CRISPR-Cas9 editing was delivered directly to lung cells in mice, demonstrating durable gene correction.

Source: Science 384, 1196–1202 (2024), DOI: 10.1126/science.adk9428

AUGUST 2024

AIRSEQ – AIRBORNE DNA TECHNOLOGY

AirSeq captures and sequences airborne DNA to detect crop pathogens early.

Source: Natural History Museum, 2 Aug. 2024.

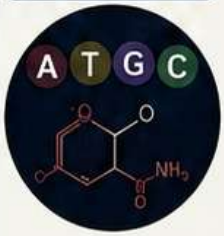
SEPTEMBER 2024

HUMAN iPSC-DERIVED BLOOD STEM CELLS

Human iPSC-derived hematopoietic cells showed long-term multilineage engraftment in mice.

Source: Nature Biotechnology, 2 Sept. 2024, DOI: 10.1038/s41587-024-02360-7.

SEPTEMBER 2024



EXPANDED GENETIC ALPHABET

Expanded genetic coding enables incorporation of noncanonical amino acids into proteins.

Source: Nature Biotechnology, 11 Sept. 2024, DOI: 10.1016/s41587-024-02385-y.

OCTOBER 2024

NOBEL PRIZE IN PHYSIOLOGY OR MEDICINE

Victor Ambros & Gary Ruvkun
Discovery of microRNA and its role in post-transcriptional

Source: Nobel Prize, 7 Oct. 2024.

OCTOBER 2024

NOBEL PRIZE IN CHEMISTRY

David Baker • Demis Hassabis •
Honored for computational protein design and AI-powered protein structure prediction.

Source: Nobel Prize, 9 Oct. 2024.

OCTOBER 2024

xPERT – CasRx RNA EDITING

Enables programmable A-to-II RNA editing without permanently altering genomic DNA.

Source: Nature Biotechnology, 9 Oct. 2024, DOI: 10.1038/s41587-024-02430-w.

NOVEMBER 2024

RNA "OBELISKS"

Researchers identified previously unknown viroid-like circular RNA elements in human-associated microbiomes.

Source: Cell, 2024, DOI: 10.1016/j.cell.2024.09.033.

NOVEMBER 2024

KEBILIDI – DIRECT-TO-BRAIN GENE THERAPY

FDA approved Kebilidi, an AAV gene therapy for aromatic L-amino acid decarboxylase deficiency.

Active ingredient: eladocagene exuparvovec-tneq.

Source: U.S. FDA, 13 Nov. 2024.

DECEMBER 2024

LENACAPAVIR – SCIENCE BREAKTHROUGH OF THE YEAR

Twice-yearly injectable lenacapavir showed exceptional efficacy for HIV prevention.

Source: Science, Breakthrough of the Year, Dec. 2024.

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