4. Birsa 101 - Science & Technology

India Launches First Indigenous CRISPR Gene Therapy for Sickle Cell Disease. India has launched BIRSA 101, its first indigenous, affordable CRISPR-based gene therapy for Sickle Cell Disease (SCD), developed by CSIR-IGIB and Serum Institute. This initiative supports the National Mission to eliminate SCD by 2047, specifically targeting the high disease burden in tribal populations.

1. Introduction - BIRSA 101 Launch

India has achieved a significant milestone in medical biotechnology by launching its first indigenous CRISPR-based gene therapy, named BIRSA 101.

Target Disease - It is specifically designed to treat Sickle Cell Disease (SCD).

Significance - This marks a major step towards self-reliance in advanced medical treatments, moving away from prohibitively expensive imported therapies.

2. Understanding Gene Therapy

Gene therapy is a medical technique that focuses on the root cause of genetic disorders rather than just treating symptoms.

Mechanism - It involves altering the genetic material within a person's cells to treat or prevent disease.

Goal - To correct the defective genes responsible for disease development.

Types of Gene Therapy

Type	Target Cells	Inheritance of Changes	Ethical/Regulatory Status
Somatic Gene Therapy	Non-reproductive cells (e.g., blood cells, muscle cells).	Not inherited by offspring.	Widely used for treatments (e.g., cancer, muscular dystrophy).
Germline Gene Therapy	Reproductive cells (sperm, eggs, embryos).	Passed down to future generations.	Highly restricted due to serious ethical and safety concerns.

3. About "BIRSA 101" Therapy

Nomenclature - The therapy is named BIRSA 101 in honor of Bhagwan Birsa Munda, a revered tribal freedom fighter, acknowledging the prevalence of SCD in tribal communities.

Technology Platform - It utilizes CRISPR-Cas9 technology. It is described as precision genetic surgery.

Future Potential - Beyond SCD, this platform has potential applications for other hereditary disorders.

Developers & Collaboration

Lead Developer - CSIR–Institute of Genomics and Integrative Biology (IGIB), New Delhi.

Strategic Partner - Serum Institute of India (SIIPL).

Objective of Partnership - To scale up the CRISPR platform and transform laboratory success into mass-deployable, affordable therapies.

Cost Efficiency

Current Global Standards - Imported gene therapies can cost between ₹20-25 crore.

BIRSA 101 Advantage - Developed as a low-cost alternative, customized for Indian conditions and economic realities.

Working Mechanism

Genetic Correction - The therapy edits the specific defective part of the genetic code causing the disease.

One-Time Treatment - It is a curative approach administered as a single infusion. Post-treatment, the body begins producing normal red blood cells naturally.

4. About CRISPR-Cas9 Technology

CRISPR-Cas9 is a revolutionary gene-editing technology enabling precise alterations (removing, adding, or altering) to DNA.

Key Components -

1. **Cas9 Enzyme -** Acts as "molecular scissors" that cut both strands of DNA at a precise, targeted site in the genome.

2. **Guide RNA (gRNA) -** A short, pre-designed RNA sequence. It acts as a GPS, directing Cas9 to the specific DNA location by binding to the target sequence.

Process -

1. The gRNA guides Cas9 to the target.
2. Cas9 cuts the DNA.
3. The cell's natural repair mechanisms kick in to delete, insert, or replace genetic material, effectively "editing" the genome.

5. About Sickle Cell Disease (SCD)

Definition - A genetic blood disorder where the body produces abnormal hemoglobin (Hemoglobin S).
Physiological Impact - Hemoglobin S causes Red Blood Cells (RBCs) to become rigid and crescent-shaped (sickle-shaped). These abnormal cells die early (causing anemia) and block blood flow in small vessels.
Inheritance - It follows an autosomal recessive pattern.
Condition - Both parents must carry the defective gene for a child to inherit the actual disease.
Symptoms -
Pain Crises - Episodes of severe, debilitating pain.
Physical Health - Anemia, chronic fatigue, swelling in hands and feet, and delayed growth.
Complications - Frequent infections, vision problems, and potential organ damage.

6. Government Initiatives against SCD

To combat the high prevalence of the disease, especially in tribal areas, the government has launched a dedicated mission.
Mission Name - National Sickle Cell Anaemia Elimination Mission (2023–2030).
Vision - To eliminate sickle cell disease as a public-health problem in India before 2047.
Immediate Goal (FY 2025-26) - To screen approximately 7 crore (70 million) people aged up to 40 years.
Geographical Focus
Target Areas - 17 high-focus states/UTs with significant tribal populations.
High Burden States - Tribal-dominated regions of Odisha, Chhattisgarh, Jharkhand, Maharashtra, Gujarat, and Madhya Pradesh.
Source - https -//www.newsonair.gov.in/india-launches-first-indigenous-crispr-gene-therapy-for-sickle-cell-disease/# -~ -text=Jitendra%20Singh%20today%20launched%20country's,the%2015th%20of%20this%20month.