



# Precision Medicine and Biobanks

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## Why in News?

**Precision medicine** is ushering in a new era of personalised healthcare. This field began to take concrete form as scientists completed **the [Human Genome Project \(HGP\)](#)**.

- It now encompasses genomics for diagnosing and treating cancers, chronic, immunological, cardiovascular, and liver diseases.

## Note:

- Acknowledging the **unique genetic diversity of the Indian population**, the HGP aims to identify and catalogue genetic variations among various Indian groups by sequencing the entire genomes of **10,000 healthy individuals from all major ethnic communities across the country**.

## What is Precision Medicine?

- **About:**
  - It is an **innovative strategy for treating and preventing diseases** that considers individual differences in genetics, environment, and lifestyle.
  - It emphasises **tailoring medical care to the unique characteristics of each patient** rather than using a one-size-fits-all approach.
  - This method **enables** healthcare professionals and researchers to **more accurately** forecast which **treatments and preventive measures** are effective for specific groups of individuals.
- **Role of Biobanks:**
  - Biobanks store **biological samples (e.g., DNA, cells, tissues)** for research. Their **diversity is crucial for precision medicine** to benefit broader populations.
  - Recent studies using **biobank data helped identify undiagnosed rare genetic disorders**.

## Role of Emerging Technologies

- **Gene Editing:** Techniques like **CRISPR** have opened avenues for correcting **genetic defects**, thereby providing potential cures for previously untreatable conditions.
- **mRNA Therapeutics:** The **Covid-19 pandemic** demonstrated the power of **mRNA technology**, allowing for the rapid development of vaccines. This innovative approach earned a **Nobel Prize**, highlighting its significance in modern medicine.

## What is the State of Precision Medicine and Biobanks in India?

- **Market Growth:**
  - The Indian precision medicine market is projected to **grow at a Compound Annual Growth Rate (CAGR) of 16%**, expected to **exceed USD 5 billion by 2030**.
    - Currently, it **accounts for 36% of the national bioeconomy**, encompassing areas such as cancer immunotherapy, **gene editing**, and biologics.
- **Policy Development:**
  - The advancement of precision therapeutics is included in the **new 'BioE3' policy**.
    - It is aimed at fostering high-performance **biomanufacturing**, which involves the production of **bio-based products across various sectors**.
- **Recent Approvals and Developments:**
  - In 2023, **the Central Drugs Standard Control Organisation** approved **NexCAR19**, India's domestically developed **CAR-T cell therapy**.
    - In 2024, the government also established a dedicated center for CAR-T cell therapy at IIT Bombay.
- **State of Biobanks in India:**
  - **Genome India Programme:** The **'Genome India' program** completed the sequencing of 10,000 genomes from 99 ethnic groups, aimed at identifying treatments for rare genetic diseases, among other goals.
  - **Phenome India Project:** The pan-India **'Phenome India' project** has gathered 10,000 samples to enhance prediction models for cardio-metabolic diseases.
  - **Paediatric Rare Genetic Disorders (PRaGeD) Mission:** This mission aims to identify new genes or variants to develop targeted therapies for genetic diseases affecting children.
  - **Regulatory Challenges:** Biobanking regulations in India pose **significant hurdles to realizing the full potential of precision medicine**.
    - In contrast to countries like the UK, US, Japan, and many European nations, which have **comprehensive regulations addressing biobanking issues** (e.g., informed consent, privacy, data protection), India's regulatory framework is inconsistent.

### UPSC Civil Services Examination, Previous Year Question (PYQ)

**Q. Which one of the following statements best describes the role of B cells and T cells in the human body? (2022)**

- (a) They protect the environmental allergens. body
- (b) They alleviate the body's pain and inflammation.
- (c) They act as immunosuppressants in the body.
- (d) They protect the body from diseases caused by pathogens.

**Ans: (d)**