



Developments in HIV Vaccine Research

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Why in News?

Despite 4 decades of effort, traditional vaccine approaches have been unable to prevent HIV acquisition **because the virus mutates rapidly and hides from the immune system.**

- Experts believe that more sophisticated vaccine strategies will be necessary and that the research and development process will take some more time.

What is the Traditional Vaccine Approach against HIV?

▪ About:

- It refers to the development of vaccines that aim to prevent infection from the **human immunodeficiency virus (HIV) using conventional methods** such as **inactivated or weakened forms of the virus, viral subunits, or other components that elicit an immune response.**
- These approaches typically involve **stimulating the body's immune system to recognize and attack HIV**, thus preventing infection or reducing the severity of the disease.
 - It teaches the body to fight off new invaders.

▪ Failure of Traditional Vaccine Approach Against HIV: This approach has failed for HIV due to the following reasons.

- **Lack of Natural Self-Defence in Body:** Unlike other viruses, most of the human bodies don't build good defences against **HIV** on their own.
- **Rapid mutation:** HIV has parts that mutate often, like a **shape-shifter**. Vaccines target these parts, but by the time the vaccine is ready, the **virus has already changed its shape.**
- **Extreme viral diversity:** HIV has a vast pool of circulating variants, making it difficult to target all strains.
- **Complex immune response:** A successful vaccine needs to stimulate both antibody and cellular immune responses against a rapidly changing virus.

What is the Progress in the Development of Effective HIV Vaccines?

- **Broadly Neutralising Antibodies (bNAbs):** It is a kind of antibody, which could neutralise a large number of circulating viral strains.
- Germline Targeting Approach: It uses a series of vaccines to encourage the development and multiplication of specialised precursor B cells that have the make bnAbs.
 - It **identifies and** matures **B-cells** into bNAb-producing cells against HIV to neutralise a wide range of HIV strains.
- **Other Vaccines:**
 - **N332-GT5 Immunogen:** To **train B cells** to produce a different powerful antibody called

BG18.

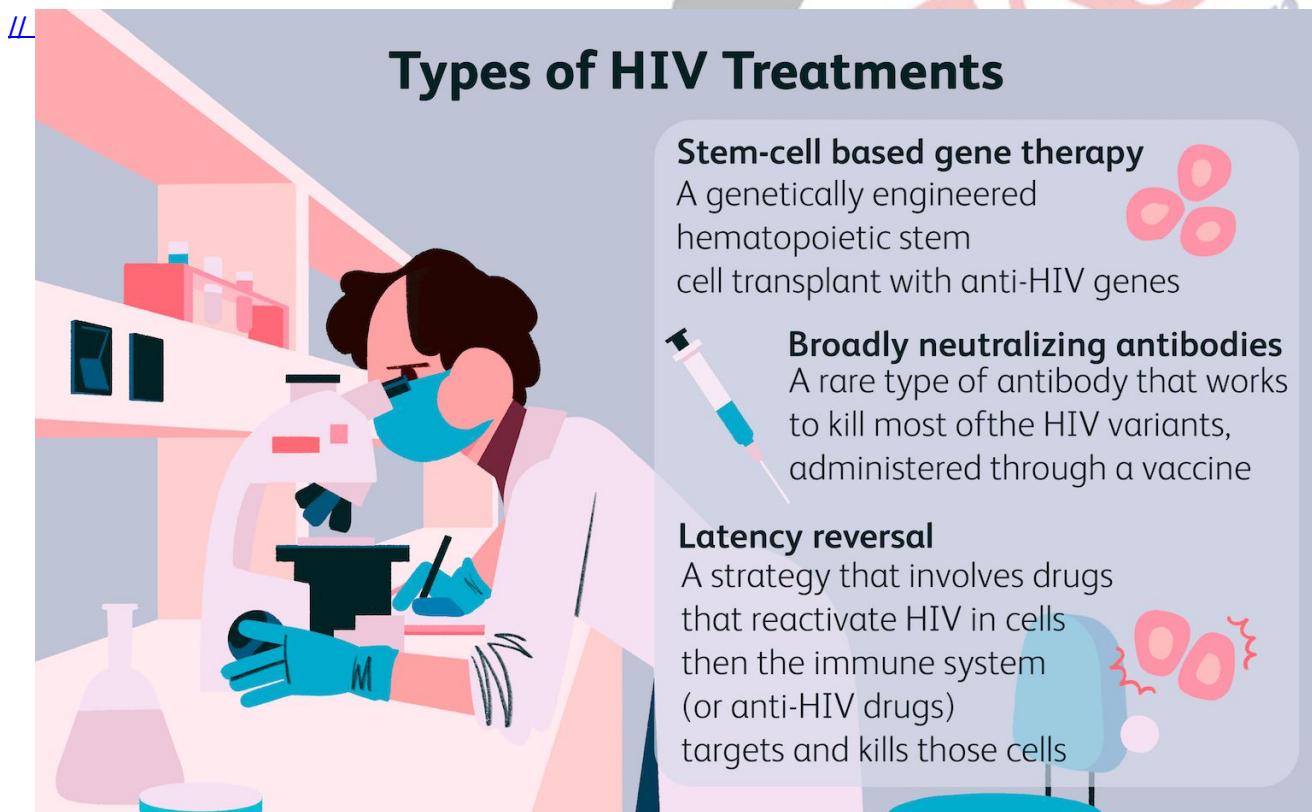
- **MPER-Targeting Vaccine:** It targets a more stable region of the HIV envelope that doesn't mutate as frequently.

HIV (Human Immunodeficiency Virus)

- **HIV/AIDS is a chronic and potentially life-threatening condition** caused by the **human immunodeficiency virus (HIV)** which targets the immune system, making individuals more susceptible to infections and diseases
- **HIV attacks CD4, a type of White Blood Cell (T cells)** in the body's immune system.
 - T cells are those cells that move around the body detecting anomalies and infections in cells.
- After entering the body, **HIV multiplies itself and destroys CD4 cells**, thus severely damaging the human immune system. Once this virus enters the body, it can never be removed.
- **Related Initiatives:** The [HIV & AIDS Prevention and Control Act, 2017](#), [Project Sunrise, 90-90-90](#), The Red Ribbon, [Global Fund to Fight AIDS, Tuberculosis and Malaria \(GFATM\)](#).

Prevalence of HIV-AIDS

- It is estimated that globally **39 million persons** are living with HIV (Human Immunodeficiency Virus). In **India** the figure is **2.4 million**.
- There were **1.3 million new HIV infections in 2022 globally** and 63,000 in India.
 - In 2022, 650,000 persons died due to these conditions globally. **In India, AIDS caused 42,000 deaths.** Many of these opportunistic infections are preventable and treatable.



Types of HIV Treatments

- Stem-cell based gene therapy**
A genetically engineered hematopoietic stem cell transplant with anti-HIV genes
- Broadly neutralizing antibodies**
A rare type of antibody that works to kill most of the HIV variants, administered through a vaccine
- Latency reversal**
A strategy that involves drugs that reactivate HIV in cells then the immune system (or anti-HIV drugs) targets and kills those cells

Read more: [ART's Intervention in HIV/AIDS Treatment](#), [Human Immunodeficiency Virus](#), [UNAIDS Report: Progress & Challenges in HIV/AIDS Fight](#)

UPSC Civil Services Examination Previous Year Question (PYQ)

Q. Which of the following diseases can be transmitted from one person to another through tattooing? (2013)

1. Chikungunya
2. Hepatitis B
3. HIV-AIDS

Select the correct answer using the codes given below:

- (a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (b)

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