



Human Trials for New HIV Vaccine

Why in News

Moderna, the Massachusetts-based American biotechnology company, will begin [human trials](#) for its novel [mRNA vaccine \(mRNA-1644\)](#) for [HIV \(Human Immunodeficiency Virus\)](#).

- This is the **first trial for an mRNA vaccine for HIV** after the success of **mRNA vaccines with Covid-19**.
- According to the [World Health Organization](#), there were around **37.7 million living with HIV as of 2020**.

Key Points

▪ mRNA Vaccine vs Traditional Vaccines:

- Vaccines work by training the body to recognise and respond to the proteins produced by disease-causing organisms, such as a virus or bacteria.
- **Traditional vaccines are made up of small or inactivated doses of the whole disease-causing organism, or the proteins that it produces**, which are introduced into the body to provoke the immune system into mounting a response.
- **mRNA vaccines tricks the body into producing some of the viral proteins itself.**
 - They **work by using mRNA, or messenger RNA**, which is the molecule that essentially puts DNA instructions into action. Inside a cell, mRNA is used as a template to build a protein.

▪ mRNA vaccine for HIV:

- The vaccine is expected to work similar to the **Covid-19 vaccine** — by getting the **body's cells to produce the HIV virus' spike protein** triggering an immune response.
- The **larger purpose of stimulating the B cells** is to generate what are called **broadly neutralising antibodies (bnAbs)**, which are specialised blood proteins that attach to the surface proteins of HIV and disable them by accessing key but hard-to-reach regions on the virus.
 - **B-cells** fight bacteria and viruses by making Y-shaped proteins called antibodies, which are specific to each pathogen and are able to lock onto the surface of an invading cell and mark it for destruction by other immune cells.
- Over the last decade, there have been **advances in identifying new bnAbs from HIV-infected individuals** that were seen to target very specific sites in the outer envelope of the HIV.
- **Lab-based analysis and tests on animals** have improved the understanding of how the knowledge of these sites can be used to make immunogens.
 - An **immunogen** refers to a molecule that is capable of eliciting an immune response by an organism's immune system, whereas an antigen refers to a molecule that is capable of binding to the product of that immune response.
 - So, **an immunogen is necessarily an antigen, but an antigen may not**

necessarily be an immunogen.

▪ **Expected Benefits:**

- **RNA-based immunogens** are believed to be a promising alternative because they **do not involve the use of a live virus, can be made relatively easily, can be quickly deployed and safely administered.**

▪ **Challenges:**

◦ **Issue of Reach:**

- The experience with the **Moderna and Pfizer vaccines shows**, getting **essential jabs to the regions** where they are most needed is the biggest stumbling block.

- Of the people living with HIV, **over two-thirds are in Africa.** Any success in containing the HIV pandemic would mean drastically cutting the rates of transmission there.

◦ **Sensitive to Temperature:**

- **m-RNA vaccines are sensitive to temperature in storage**, and is a challenge for developing countries.

◦ **Mutation of HIV:**

- **HIV has mutated into several variants** and is an insidious virus, and it will be many years before definitive proof of the success of the m-RNA approach can be established.

HIV (Human Immunodeficiency Virus)

▪ **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.
- The CD4 count of a person infected with HIV reduces significantly. In a healthy body, CD4 count is between 500- 1600, but in an infected body, it can go as low as 200.
- Weak immune system makes a person prone to opportunistic infections and cancer. It becomes difficult for a person infected with this virus to recover from even a minor injury or sickness.
- By receiving treatment, severe forms of HIV can be prevented.
- **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 \(GFATM\)](#).

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