

Enzymes to block HIV replication

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In news: The researchers at IISc, Bengaluru have developed artificial enzymes to block replication and reactivation of HIV

Key updates and

- According to the researchers these “nanozymes”, made from vanadium pentoxide nanosheets, work by mimicking a natural enzyme called glutathione peroxidase that helps reduce oxidative stress levels in the host’s cells, which is required to keep the virus in check.
- **Advantages of Nanozymes:**
 - The nanozymes are stable inside biological systems and do not mediate any unwanted reactions inside the cells
 - They are also quite easy to prepare in the lab
- They pointed out that elimination of HIV from a patient’s body completely is impossible as of now, anti-HIV drugs that have been developed so far are only successful in suppressing the virus. However, they fail at eradicating HIV from infected cells
- **Reactivating & Replication of HIV:** The IISc has mentioned that The virus hides inside the host’s immune cells in a “latent” state and stably maintains its reservoir. When the levels of toxic molecules such as hydrogen peroxide increase in the host’s cells, leading to a state of increased oxidative stress, the virus gets ‘reactivated’ – it emerges from hiding and begins replicating again
- **Study by:** It was published in EMBO Molecular Medicine, was led by Amit Singh, Associate Professor and Wellcome Trust-DBT India Alliance Senior Fellow at the Department

of Microbiology & Cell Biology and Centre for Infectious Diseases Research (CIDR).

- The same team had developed a biosensor to measure oxidative stress levels in HIV-infected immune cells in real-time some years back.
- During the same time another group of researchers had published a study showing that nanowires made of vanadium pentoxide can efficiently mimic the activity of glutathione peroxidase. Singh's lab, therefore, decided to collaborate with them.
- The researchers have found that these nanosheets (that were prepared using vanadium pentoxide) were having some sort of direct effect where the expression of the host genes essential for virus reactivation is reduced

Replication

It is the process to make new copies. The HIV virus only replicates in human cells. The HIV replication process carries seven steps, the steps are entry, reverse transcription, integration, transcription, translation, assembly, release and maturation.

Nanozymes

An artificial enzyme is a synthetic, organic molecule or ion that recreates some function of an enzyme.

Nanozymes are nanomaterials that display enzyme-like characteristics. They are an important way of connecting nanomaterials to biological systems.

Human Immunodeficiency Virus (HIV)

- HIV is a virus that attacks the body's immune system. If HIV is not treated, it can lead to AIDS (acquired immunodeficiency syndrome).
- There is currently no effective cure. Once people get HIV, they have it for life. But with proper medical

care, HIV can be controlled

- The virus can be transmitted through contact with infected blood, semen or vaginal fluids.
- According to the World Health Organisation (WHO), HIV has claimed almost 33 million lives from across the world to date. An estimated 38 million people were living with HIV at the end of 2019, statistics indicated.