



Is the HIV pandemic over?

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A global pandemic starts

In 1981, a new disease was first recorded in major American cities, particularly affecting young gay men in San Francisco and New York. Sufferers presented with a range of symptoms uncommon in the young and healthy, including fungal pneumonias, rare skin cancers and other opportunistic infections. The disease destroyed a crucial part of their immune system, the CD4⁺ T cells, which are an important facet of our defense against pathogens, leaving them vulnerable to a range of infections.

While first called GRID ("gay-related immunodeficiency disease") it was soon found in other groups, with early cases in those injecting drugs or receiving medical blood products.

In the early 1980s, AIDS was a death sentence, with an average life expectancy from diagnosis of around a year. Death was often painful, with fungal pneumonia leaving sufferers fighting for breath and other infections causing wasting or painful sores. Having AIDS carried stigma as a sexually-transmitted disease known by some as 'the gay plague', despite affecting all parts of the population.

There was no cure.

Understanding your enemy

The cause of AIDS was first identified in 1983 by Luc Montagnier and Francois Barre-Sinoussi at the Pasteur Institute in the lymph node of a young gay Parisian. It is a novel virus, now called the human immunodeficiency virus, HIV.

This discovery started the race to understand the virus and to design treatments and cures.

HIV is a retrovirus. This means that it contains a blueprint made from RNA, wrapped in a shell made of proteins and then wrapped in a membrane coat. The virus binds to a molecule found on the surfaces of our CD4⁺ T cells, binding direct to the CD4 receptor. This provides a route for the virus to infect the cell.

The virus then moves to the nucleus of the cell, where it unwraps to release its RNA. The nuclei of our cells also contain a blueprint to guide production of our own cells. This is made from DNA. The retrovirus does something remarkable. It 'reverse transcribes' its own RNA blueprint into a DNA molecule, using a viral enzyme called the reverse transcriptase. This DNA copy of the viral RNA is inserted into the DNA of the CD4⁺ T cell by a viral enzyme called the integrase.

This is one of the secret weapons of the virus as it allows it to remain hidden, or "latent", in the CD4⁺ T cell. But it is also a weakness. Our bodies do not have reverse transcriptase or an integrase. This allows us to design medicines which specifically target the virus and which prevent it from replicating.

To emerge from the cell, the virus also needs a unique enzyme, known as the protease, which is required for viral maturation.

Researchers started urgently working on the design of vaccines to stop the virus from entering our cells and on medicines which target the protease, integrase and reverse transcriptase to stop viral replication.

The development of anti-retroviral therapies

The first medicine to stop AIDS was a drug developed to treat cancer, AZT. It blocked the reverse transcriptase. Approved in 1987, it was the only drug available until the mid-1990s and it was imperfect.

Next came medicines which blocked the function of the protease, designed by understanding how the enzyme works. These could be mixed with AZT and were transformative when they were released in the 1990s, changing life expectancy from around 18 months to closer to 30 years.

We now have cocktails of molecules which block the protease, the reverse transcriptase and the integrase. These are provided as antiretroviral therapies (ARTs) and can be taken as a daily pill or as a long-lasting injection. HIV+ people can now have 'normal' life-expectancies if they have access to medicines.

We can also use these drugs prophylactically as PrEP. By taking the pills or an injection, HIV negative people can protect themselves from being infected. PrEP prevents 99% of infections.

These amazing medicines have changed HIV from a life sentence to something we can control. So, is the pandemic over?

The AIDS/HIV pandemic today

The World Health Organization estimated that in 2025 there were 41 million people living with HIV and that 1.2 million new infections occurred. They also estimated that 570,000 people died from AIDS in 2025.

The numbers show that HIV is most prevalent in Africa, with 26 million HIV+ people and 350,000 deaths. There is limited access to ART and transmission occurs before people know that they are infected.

The pandemic is not over.

The future of the pandemic

What next?

Today, only 7 people have been cured of being HIV+, through life-threatening blood transfusions. In the vast majority of HIV+ people, the virus remains latent in their CD4+ T cells, where it can emerge if they do not or cannot continue with treatment. The virus can be controlled but not removed.

Researchers are therefore working on a cure and on better prevention. How can we cause the virus to be expelled from the cells in which it remains hidden, latent? Can we design a long-lasting vaccine to replace PrEP as a cheaper and more practical solution to prevent infection?

HIV/AIDS has been transformed by amazing medical advances. How can we make the next step?

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References and Further Reading

The history of the pandemic:

"The age of innocence: Britain in the time of AIDS" by Simon Carfield

"And the band played on" by Randy Shilts

General information about HIV:

<https://hivinfo.nih.gov>

<https://www.who.int/news-room/fact-sheets/detail/hiv-aids>

Prevention, treatment and cure of HIV infections (2023) Nature Reviews Microbiology

The HIV-1 envelope glycoprotein: structure, function and interactions with neutralizing antibodies (2025) Nature Reviews Microbiology

Mechanisms of HIV-1 assembly, release and maturation (2026) Nature Reviews Microbiology

Health advice:

<https://www.nhs.uk/conditions/hiv-and-aids/>