

# The Fight Against HIV: Progress, Prevention and Protecting the Immune System

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## Description

Human Immunodeficiency Virus (HIV) is a viral infection that attacks the body's immune system, specifically the CD4 cells (T cells), which play a critical role in defending the body against infections. If untreated, HIV can lead to Acquired Immunodeficiency Syndrome (AIDS), a stage where the immune system becomes severely compromised, making the body vulnerable to life-threatening infections and cancers [1]. Since its discovery in the early 1980s, HIV has become a global public health issue, with millions of people affected worldwide. This essay will explore the nature of HIV, its transmission, symptoms and progression and the significant advancements in treatment and prevention. HIV is a retrovirus, meaning it uses RNA as its genetic material and integrates itself into the host's DNA. Once inside the body, HIV specifically targets CD4 cells, using them to replicate and spread throughout the body, while gradually weakening the immune system. The virus is transmitted through the exchange of bodily fluids such as blood, semen, vaginal fluids, rectal fluids and breast milk [2]. The most common modes of transmission are unprotected sexual intercourse, sharing of needles or syringes and from mother to child during childbirth or breastfeeding.

## Symptoms and stages of HIV

It is important to note that HIV cannot be transmitted through casual contact, such as hugging, shaking hands, or sharing food and water. It also cannot be spread through the air, saliva, or sweat, which helps dispel many misconceptions about how the virus is passed from one person to another. HIV infection typically progresses through three stages, each characterized by different symptoms and levels of immune system compromise [3]. This stage occurs 2-4 weeks after the virus enters the body. During this period, some individuals experience flu-like symptoms such as fever, headache, sore throat, rash and swollen lymph nodes [4]. This is the body's natural response to the virus, as it multiplies rapidly and the viral load (the amount of HIV in the blood) is very high, increasing the risk of transmission. However, not everyone experiences noticeable symptoms during this stage, making it easy to overlook the infection.

Chronic HIV Infection (Clinical Latency) after the acute phase, the virus enters a period of dormancy where it continues to reproduce at low levels. This stage can last for several years,

during which many people may not show any symptoms [5]. However, the virus remains active and continues to damage the immune system, slowly reducing the number of CD4 cells. Without treatment, the infection will eventually progress to the next stage. AIDS (Acquired Immunodeficiency Syndrome) is the most severe stage of HIV infection, marked by a critically low level of CD4 cells (below 200 cells per cubic millimeter of blood). At this point, the immune system is so damaged that it can no longer effectively fight off infections or certain cancers. People with AIDS are vulnerable to opportunistic infections such as pneumonia, tuberculosis and certain cancers like Kaposi's sarcoma. Without treatment, AIDS is fatal, usually within three years. Through the use of antiretroviral therapy, PrEP and PEP, the spread of HIV can be controlled and people living with the virus can lead long, healthy lives. However, challenges remain, particularly in terms of access to care, stigma and education [6]. Continued global efforts are essential to overcoming these barriers and achieving a world where HIV is no longer a public health threat.

## HIV treatment: Antiretroviral therapy

One of the most significant advancements in the fight against HIV has been the development of Antiretroviral Therapy (ART). ART is a combination of drugs that work to suppress the replication of the virus, keeping the viral load low and preventing the progression to AIDS. While ART does not cure HIV, it can help individuals live long, healthy lives by maintaining a near-normal immune system function. ART is most effective when started early in the course of the infection, ideally right after diagnosis. It involves taking a combination of antiretroviral drugs daily, which prevent the virus from multiplying and damaging the immune system. Over time, this reduces the viral load to undetectable levels, significantly lowering the risk of transmitting HIV to others [7]. This is the concept behind U=U (Undetectable=Untransmittable), meaning that people with undetectable viral loads cannot transmit the virus through sexual contact. In addition to treatment, major strides have been made in preventing HIV transmission. Pre-exposure prophylaxis (PrEP) is a medication taken by HIV-negative individuals to reduce the risk of contracting the virus. When taken consistently, PrEP has been shown to reduce the risk of HIV infection by over 90% in high-risk populations, including those who engage in unprotected sex with HIV-positive partners or inject drugs [8]. Another preventive measure is Post-Exposure Prophylaxis (PEP), which involves taking

antiretroviral drugs within 72 h of potential exposure to the virus [9]. PEP is used in emergency situations, such as after accidental needle sticks or unprotected sex with an HIV-positive person and is highly effective if started promptly. Practicing safe sex by using condoms and getting regular HIV testing are also key strategies in reducing the spread of the virus. Testing is important, as early diagnosis allows for prompt treatment and prevents further transmission [10]. Despite advancements in treatment and prevention, HIV remains a major global health challenge. As of 2023, over 38 million people worldwide are living with HIV and many are in low- and middle-income countries with limited access to healthcare. Stigma and discrimination continue to hinder efforts to combat the epidemic, as many individuals fear getting tested or seeking treatment due to societal attitudes toward HIV. However, global initiatives like the UNAIDS 95-95-95 targets aim to have 95% of people living with HIV know their status, 95% of those diagnosed on ART and 95% of those on ART achieve viral suppression by 2030. This ambitious goal reflects the ongoing commitment to end the HIV epidemic through widespread testing, treatment and education. HIV has come a long way since its discovery, transforming from a fatal diagnosis to a manageable chronic condition thanks to advances in treatment and prevention.

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