



## Yesterday

- On June 5, 1981, the first cases of a new and fatal disease now known as acquired immunodeficiency syndrome (AIDS) were reported in the CDC publication *Morbidity and Mortality Weekly Report*.
- AIDS was first recognized in homosexual men, but it was soon determined that the virus that causes AIDS can spread through sexual contact, blood and blood products, and from mother to infant during pregnancy, delivery and breast feeding.
- AIDS is caused by the human immunodeficiency virus (HIV). By killing or damaging cells of the body's immune system, notably CD4+ T cells, HIV progressively destroys the body's ability to fight infections and certain cancers. People diagnosed with AIDS may get life-threatening diseases called opportunistic infections, which are caused by microbes such as viruses or bacteria that usually do not make healthy people sick.
- At the beginning of the AIDS pandemic, treatment was confined to palliative care and management of opportunistic infections.

## Today

- NIH-sponsored basic research provided an understanding of HIV pathogenesis and the structure of HIV that was essential to the development of current treatments and drug regimens for people with HIV infection. This research also led to tools for rapid HIV diagnosis and approaches for monitoring the effectiveness of treatment.
- In 1994, a landmark NIH-funded study demonstrated that the antiretroviral drug AZT reduced by two thirds the risk of HIV transmission from an HIV-infected mother to her infant. Current antiretroviral drug therapy (ART) regimens have nearly eliminated the risk of HIV transmission from mother to child in the United States. For resource-limited settings, NIH-funded research has shown that administering a single dose of the drug Nevirapine—a cheaper regimen – to the mother and the child, can substantially reduce mother to child transmission.

- In 1996, NIH-sponsored research demonstrated that combinations of at least three antiretroviral drugs, called highly-active antiretroviral therapy or HAART, greatly reduced HIV viral load and in many cases delayed progression of HIV infection and AIDS. ART reduced HIV-related deaths in the United States by more than half in the three years after it was introduced.
- This research is the basis for state-of-the art treatment and prevention guidelines.
  - See <http://www.aidsinfo.nih.gov>
- NIH-sponsored clinical trials in Kenya and Uganda showed that medically performed circumcision reduced by 50 percent a man's risk of acquiring HIV through heterosexual contact—and perhaps could lead to fewer infections in women.
- Despite this progress, HIV/AIDS has become a global epidemic. According to the Joint United Nations Program on HIV/AIDS, approximately 33.4 million people worldwide are living with HIV/AIDS, and more than 2.7 million people were newly infected in 2008—about 7,400 each day. In 2008, there were an estimated 2 million deaths worldwide due to HIV/AIDS, including 280,000 children under the age of 15.
- In the United States, more than 1 million people are living with HIV/AIDS, with one fifth of the people unaware of their status, and approximately 56,000 new infections occur each year. HIV/AIDS disproportionately affects racial and ethnic minorities, women of color, and men who have sex with men.
- NIH supports a comprehensive biomedical research program of basic, clinical, and behavioral research on HIV infection, its associated co-infections, opportunistic infections, malignancies, and other complications. Research to develop new and better drugs and drug regimens with lower toxicity and fewer side effects is a critical NIH research area, and includes drugs to treat HIV-related cardiovascular, neurological, and metabolic complications as well as cancer and other conditions.
- NIH is supporting the development of topical microbicides (including vaginal gels, creams, or other substances) to prevent the transmission of HIV and other sexually transmitted infections.

- Through collaborations with government and nongovernmental partners, NIH is also evaluating an HIV prevention strategy called pre-exposure prophylaxis (PrEP), which involves providing antiretroviral (ARV) drugs to HIV-negative individuals who are at high risk of HIV infection. Scientists theorize that taking an antiretroviral drug before exposure to HIV could potentially inhibit HIV replication immediately after exposure to the virus, thereby thwarting the establishment of permanent infection.
- NIH-sponsored research demonstrated that syringe exchange programs can reduce HIV transmission without increasing injection drug use.
- NIH is addressing critical research questions to determine the feasibility of expanding HIV testing, better linking those who test HIV positive to medical care and treatment, and improving adherence to HIV treatment. Called TLC+ (for Enhanced Test, Link to Care Plus Treat Strategy), this approach is based on a mathematical model that immediate initiation of ARV therapy for individuals who test positive would lower their viral load in the blood and, thereby, may reduce the spread of HIV in a community. The components of TLC+ will be evaluated against the current standard of HIV testing and treatment.
- The issue of HIV and aging is a new NIH research priority due to the increasing incidence of new HIV infections in individuals over 50, the increasing number of HIV-infected persons living longer on long-term ART, and reports of premature aging of HIV-infected individuals. Older HIV-infected adults experience complex interactions among HIV, ART, age-related changes to the body, and, often, treatment for illnesses associated with aging.
- NIH is expanding its efforts to find a cure for HIV/AIDS. Through research to improve basic understanding of HIV latency, NIH seeks to achieve long-term HIV remission following discontinuation of ARV therapy—a “functional” cure—or, ultimately, complete eradication of the virus “reservoirs”, pockets of undetectable latent and persistent HIV, which exist even in people on ART who have an undetectable viral load.
- Finally, NIH is supporting research to develop a safe and effective vaccine that could prevent HIV infection or disease progression. In 2009, a major clinical study in Thailand, co-sponsored by the U.S. Army and the National Institute of Allergy and Infectious Diseases (NIAID), demonstrated for the first time that an experimental

vaccine could prevent HIV infection among some people. In other studies, scientists at NIAID and elsewhere discovered several new antibodies capable of neutralizing diverse HIV strains. NIH is building on these achievements through a sustained commitment to pursuing both basic and vaccine discovery research while continuing to advance the most promising HIV vaccine candidates into testing.

## Tomorrow

- The results of the ongoing Vaginal and Oral Interventions to Control the Epidemic (VOICE) trial will provide additional information about safety, effectiveness, and acceptability of using ART to prevent HIV infection in women, either in the form of a vaginal gel or oral tablets.
- Scientists are working to characterize HIV reservoirs, in order to develop new and more effective drugs to eliminate or control HIV so that lifelong ART is not necessary.
- Scientists are pursuing clinical studies to identify effective regimens to treat HIV and its co-infections, including tuberculosis, malaria, and hepatitis. Studies are also focusing on more effective treatment for related malignancies, cardiovascular complications, and other HIV-related complications.
- The development through research of new prevention tools, such as such as vaccines, microbicides, strategies to prevent mother-to-child transmission, ART as pre-exposure prophylaxis, treatments for drug and alcohol addiction, and behavioral interventions, promise to effectively reduce HIV transmission. NIH researchers have developed a “toolbox” of scientifically proven prevention strategies that can be used in combination and tailored to specific populations.

***Additional information on HIV/AIDS and NIH-supported HIV/AIDS research can be found at***

***<http://www.niaid.nih.gov/topics/hiv aids/Pages/Default.aspx> or***

***<http://www.oar.nih.gov/hiv aids/institutes.asp>***