

HIV INFECTION AND AIDS

Human Immunodeficiency Virus (HIV) infection and the resulting immunodeficiency syndrome (AIDS) is one of the most serious public health threats facing the U.S. and the world.

Describe the HIV virus. How does it replicate?

HIV is an RNA retrovirus enveloped with proteins some of which are unique to HIV, thus allowing serologic tests and drugs to target it.

As a retrovirus, HIV uses reverse transcription to produce a DNA copy of itself which is transported into the nucleus of a healthy cell where it integrates into chromosomal DNA. Once integrated, it is called proviral DNA or provirus, which is difficult to eliminate without damaging human DNA. Integrated DNA manufactures virions that mature into a virus capable of infecting other cells. This process kills the host cell.

HIV usually replicates very rapidly, about every two days. It has a high mutation rate, leading to development of resistance to antiretroviral drugs. In some infected cells, replication occurs slowly and thus avoids antiretroviral drugs that target replication. These latently infected cells serve as a reservoir of HIV infection, further complicating a cure.

What role does the immune system play in HIV infection?

T-cells are a type of lymphocyte (white blood cell) which fight viral infections. T-helper cells (CD4+ cells) recognize an invading organism and alert B-cells to start making antibodies. They also activate other T-cells and immune system scavenger cells called macrophages. When an infection is brought under control, T-suppressor cells (CD8+ cells) draw the immune response to a close.

HIV only infects cells with the surface receptor CD4+ which the T- helper cells have. When enough T-helper cells are destroyed, the immune system deteriorates. Resulting impairment affects the ability to develop antibodies, the macrophage function, and more.

With an impaired immune system, an HIV-infected person becomes susceptible to a wide range of “opportunistic infections” that a healthy person can fight off.

What are the four ways HIV is transmitted? What are risk factors for transmission?

Sexual transmission from unprotected sex is the most frequent risk factor. Highest risk is from receptive anal intercourse, next highest is receptive vaginal intercourse. Sexually transmitted diseases that cause ulcers, such as syphilis or chancroid greatly facilitate HIV transmission.

Blood contamination also transmits HIV. Injection drug users (IDUs) spread HIV by sharing needles and other contaminated injection equipment. Blood transfusions and organ transplants are no longer common causes of transmission.

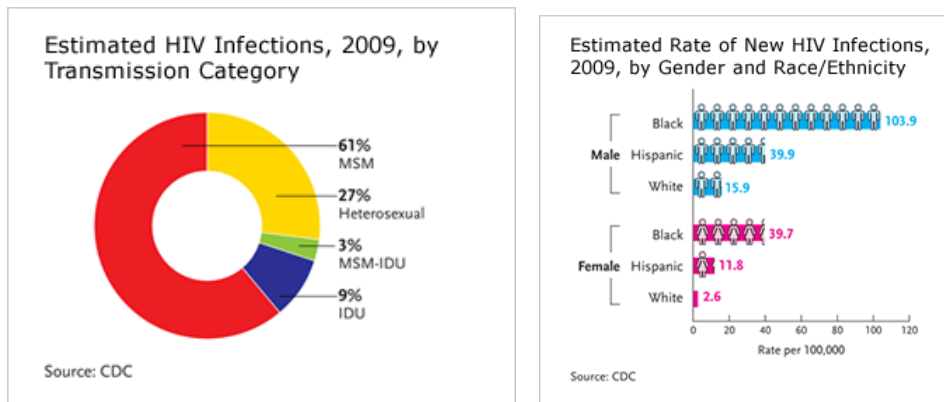
Accidental penetration injury (needle sticks) may transmit HIV in rare instances.

Perinatal transmission or mother-to-child transmission (MTCT) can occur during pregnancy or delivery. This risk is reduced to 2% if the HIV-infected pregnant woman is treated with antiviral prophylaxis. Breastfeeding by HIV-infected women is discouraged because it can transmit HIV to the infant.

HIV *cannot* be transmitted by casual contact, mosquitoes, food or water.

What is the prevalence of HIV in the U.S.? Which groups are most heavily affected? What percentage of HIV-infected people are unaware of their status?

Gay and bisexual men of all races, African Americans, and Hispanics/Latinos are most heavily affected as indicated in the following charts.



One in five (20%) of HIV-infected people are unaware of their status (as of 2006).

What are the four stages in the typical course of untreated HIV infection?

Acute retroviral syndrome occurs in most people within a few weeks of infection. They experience fever and fatigue and may also have a red rash, swollen lymph nodes, sore throat or diarrhea. Most cases are mild and may go undetected even though very large numbers of virus are replicated.

Latent period infection involves no symptoms. HIV continues to infect cells destroying the cells as it replicates. Without antiretroviral therapy, the number of CD4 cells (T-helper cells) declines.

Opportunistic infections or stage 3 is considered AIDS. It occurs in a patient with a CD4 count below 200 cells/mm³ or with an opportunistic illness.

Death from intractable infection is the final stage. In the industrialized world, common infectious diseases associated with HIV include pneumonia, diarrhea, and meningitis (infection of the central nervous system). Common cancers include cervical cancer, lymphoma, and Kaposi's sarcoma.

What are the two most common initial screening tests for HIV? What are their strengths and limitations?

Enzyme Immunoassay (EIA) tests are most widely used. EIA is a serologic test for HIV antibodies in the blood. They are very sensitive. Limitations include:

- **False negatives** – EIA's do not identify very recent infections (usually 3 to 8 weeks after exposure) because antibodies are not at high enough levels to detect.

- **False positives** – EIA's cannot be considered conclusive evidence of HIV infection. A confirmatory test must verify HIV status.
- **Wait time** – Conventional EIAs require one to two weeks before test results are available.

HIV Rapid Testing can produce results in 20 minutes or less and can be conducted on oral fluid, finger-stick whole blood, venous blood, serum and plasma. Sensitivity and specificity of rapid tests are comparable to most conventional EIAs. Therefore, they must be confirmed by additional testing.

Which supplemental tests are used after initial screening tests?

The western blot (WB) test is the most widely used confirmatory test in the U.S.

The p24 antigen test is sensitive only during early infection and needs to be used in combination with tests that can accurately detect both early and longstanding HIV infection.

RNA tests can detect infection after 10 days of infection. Western blot testing may still be needed for specimens with reactive EIA results but negative RNA results.

Accurate and reliable measurement of CD4+ T-cells is essential to assessment of the immune system of HIV-infected persons. These measures are used to decide when to start therapy and to monitor the effectiveness of treatment.

What's the most important thing to understand about therapy for HIV infection?

Therapy is complex and constantly changing.

Most important is the fact that therapies are now quite effective in maintaining the health of healthy infected persons and improving the health of persons who are sick.

What is pre-exposure prophylaxis (PrEP)?

This daily pill can reduce sexual HIV acquisition in MSM. Its effectiveness depends on:

- Medication adherence
- Targeting to MSM at high risk for HIV
- Delivery as part of a comprehensive set of prevention services
- Regular monitoring for HIV status, side effects, adherence, and risk behaviors.

What is post-exposure prophylaxis (PEP) and when is it advised?

PEP drug combinations vary by medical care center. The drugs are most effective when given as soon as possible within 72 hours of exposure.

Needlestick injuries, blood splash to the eye, or on a cut in the skin are rare but serious exposures to HIV.

PEP may be indicated for uninfected individuals with recent sexual encounters with a newly identified HIV-positive partner.

Appendix

What are the recommendations of the National Advisory Committee on HIV and STD Prevention?

Early detection and treatment of curable STDS should be a major, explicit component of comprehensive HIV prevention programs at national, state, and local levels.

In areas where STDs and HIV transmission are prevalent, screening and treatment programs should be expanded in private and public sectors.

What interventions should be taken with a person with HIV and a new STD?

- Determine the type and frequency of sexual behaviors.
- Determine the number of sex partners and their HIV-infection status.
- Assist the person in taking steps to eliminate unprotected sex.
- Provide information on the role STDs play in facilitating HIV transmission.
- Provide information on STD treatment and prevention.

What are the most important new messages for persons at risk for HIV infection and other STDs?

- Other STDs facilitate HIV transmission and acquisition. Early STD detection and treatment will benefit their health and may help prevent HIV infection.
- Recognize and watch for the symptoms of STDs.
- Most STDs produce no symptoms, so annual STD check-ups are important.
- Effective interventions are available that can reduce the risk of acquiring HIV and other STDs.