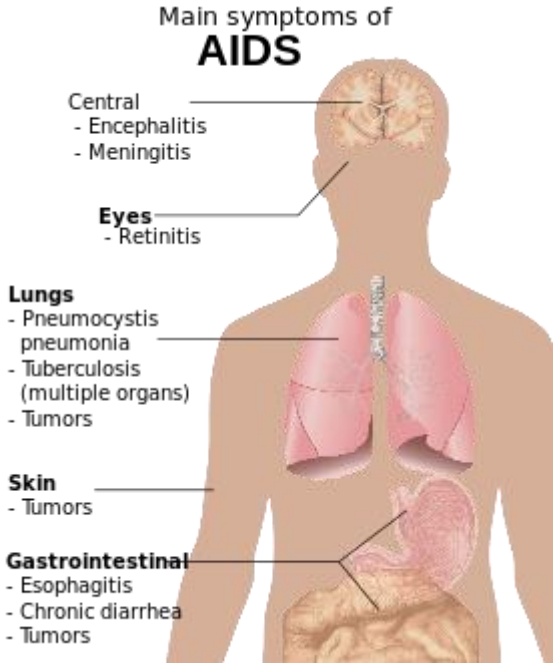
AIDS

Acquired immunodeficiency syndrome



Main symptoms of AIDS.

Acquired immunodeficiency syndrome (AIDS) was first clinically observed in ١٩٨١ in the United States. The initial cases were a cluster of injecting drug users and homosexual men with no known cause of impaired immunity who showed symptoms of *Pneumocystis carinii* pneumonia (PCP), a rare opportunistic infection that was known to occur in people with very compromised immune systems. Soon thereafter, an unexpected number of homosexual men developed a previously rare skin cancer called Kaposi's sarcoma (KS). Many more cases of PCP and KS emerged, alerting U.S. Centers for Disease Control and Prevention (CDC) and a CDC task force was formed to monitor the outbreak. At one point, the CDC coined the phrase "the ٤H disease", since the syndrome seemed to affect Haitians, homosexuals, hemophiliacs, and heroin users. In the general press, the term "GRID", which stood for gay-related immune deficiency, had been coined. However, after determining that AIDS was not isolated to the gay community, it was realized that the term GRID was misleading and the term AIDS was introduced at a meeting in July ١٩٨٢. By September ١٩٨٢ the CDC started referring to the disease as AIDS.

AIDS is defined in terms of either a CD^{4+} T cell count below ٢٠٠ cells per µL or the occurrence of specific diseases in association with an HIV infection. In the absence of specific treatment, around half of people infected with HIV develop AIDS within ten years. The most common initial conditions that alert to the presence of AIDS are pneumocystis

pneumonia (٤٠٪), cachexia in the form of HIV wasting syndrome (٢٠٪) and esophageal candidiasis. Other common signs include recurring respiratory tract infections.

Opportunistic infections may be caused by bacteria, viruses, fungi and parasites that are normally controlled by the immune system. Which infections occur partly depends on what organisms are common in the person's environment. These infections may affect nearly every organ system.

People with AIDS have an increased risk of developing various viral induced cancers including Kaposi's sarcoma, Burkitt's lymphoma, primary central nervous system lymphoma and cervical cancer. Kaposi's sarcoma is the most common cancer occurring in ١٠ to ٢٠٪ of people with HIV. The second most common cancer is lymphoma which is the cause of death of nearly ١٦٪ of people with AIDS and is the initial sign of AIDS in ٣ to ٤٪.Both these cancers are associated with human herpesvirus ٨. Cervical cancer occurs more frequently in those with AIDS due to its association with human papillomavirus (HPV). Conjunctival cancer (of the layer which lines the inner part of eyelids and the white part of the eye) is more common in those with HIV.

Additionally, people with AIDS frequently have systemic symptoms such as prolonged fevers, sweats (particularly at night), swollen lymph nodes, chills, weakness, and weight loss. Diarrhea is another common symptom present in about ٩٠٪ of people with AIDS. They can also be affected by diverse psychiatric and neurological symptoms independent of opportunistic infections and cancers.

What causes AIDS?

Acquired Immune Deficiency Syndrome, shortened AIDS, is caused by HIV. Some people may refer to AIDS as advanced HIV infection. AIDS is a medical condition. A person is diagnosed with AIDS when their immune system is too weak to fight off infections.

Since AIDS was first identified in the early ١٩٨٠s, an unprecedented number of people have been affected by the global AIDS epidemic. Today, there are an estimated ٣٥,٣ million people living with HIV and AIDS worldwide.

HIV is a virus that gradually attacks immune system cells. As HIV progressively damages these cells, the body becomes more vulnerable to infections, which it will have difficulty in fighting off. It is at the point of very advanced HIV infection that a person is said to have AIDS. If left untreated, it can take around ten years before HIV has damaged the immune system enough for AIDS to develop.

What type of virus is HIV?

HIV is a lentivirus, and like all viruses of this type, it attacks the immune system. Lentiviruses are in turn part of a larger group of viruses known as retroviruses. The name 'lentivirus' literally means 'slow virus' because they take such a long time to produce any adverse effects in the body. They have been found in a number of different animals, including cats, sheep, horses and cattle. However, the most interesting lentivirus in terms of the investigation into the origins of HIV is the Simian Immunodeficiency Virus (SIV) that affects monkeys, which is believed to be at least ٣٢،٠٠٠ years old.

The structure of HIV

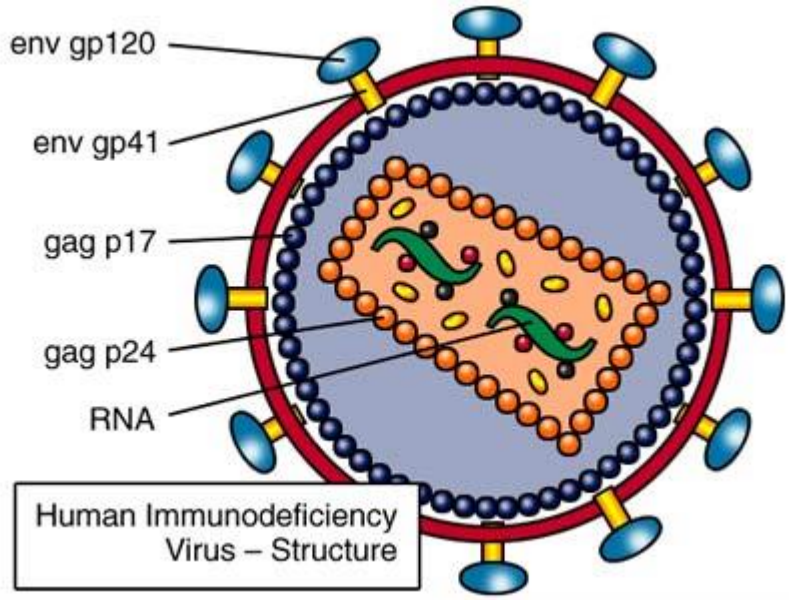
An HIV particle is around ١٠٠-١٥٠ billionths of a meter in diameter. That's about the same as:

- ٠,١ microns
- ٤ millionths of an inch
- one twentieth of the length of an E. coli bacterium
- One seventieth of the diameter of a human CD٤+ white blood cell.

Unlike most bacteria, HIV particles are much too small to be seen through an ordinary microscope. However they can be seen clearly with an electron microscope.

The viral core (or capsid) is usually bullet-shaped and is made from the protein p٢٤. Inside the core are three enzymes required for HIV replication called reverse transcriptase, integrase and protease.

Also held within the core is HIV's genetic material, which consists of two identical strands of RNA.



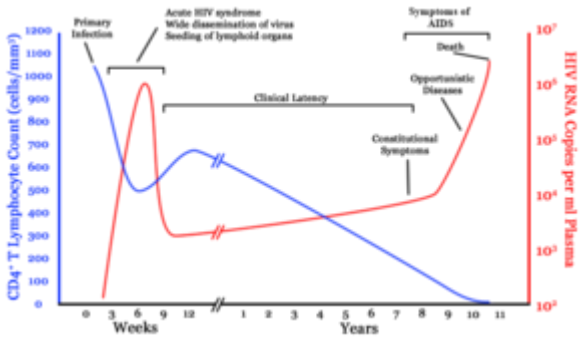
The Structure of HIV is made up of a viral envelope and viral core.

Is it possible to be infected more than once?

Until about ١٩٩٤, it was generally thought that individuals do not become infected with multiple distinct HIV-١ strains. Since then, many cases of people coinfected with two or more strains have been documented.

All cases of coinfection were once assumed to be the result of people being exposed to the different strains more or less simultaneously, before their immune systems had had a chance to react. However, it is now thought that "super infection" is also occurring. In these cases, the second infection occurred several months after the first. It would appear that the body's immune response to the first virus is sometimes not enough to prevent infection with a second strain, especially with a virus belonging to a different subtype. It is not yet known how commonly super infection occurs, or whether it can take place only in special circumstances.

Diagnosis



A generalized graph of the relationship between HIV copies (viral load) and CD٤$^{+}$ T cell counts over the average course of untreated HIV infection. CD٤$^{+}$ T Lymphocyte count (cells/mm³) HIV RNA copies per mL of plasma

HIV/AIDS is diagnosed via laboratory testing and then staged based on the presence of certain signs or symptoms.[١٤] HIV screening is recommended by the United States Preventive Services Task Force for all people ١٥ years to ٦٥ years of age including all pregnant women. Additionally testing is recommended for all those at high risk, which includes anyone diagnosed with a sexually transmitted illness. In many areas of the world a third of HIV carriers only discover they are infected at an advanced stage of the disease when AIDS or severe immunodeficiency has become apparent.

HIV testing

Most people infected with HIV develop specific antibodies (i.e. seroconvert) within three to twelve weeks of the initial infection. Diagnosis of primary HIV before seroconversion is done by measuring HIV-RNA or p٢٤ antigen. Positive results obtained by antibody or PCR testing are confirmed either by a different antibody or by PCR.

Antibody tests in children younger than ١٨ months are typically inaccurate due to the continued presence of antibodies. Thus HIV infection can only be diagnosed by PCR testing for HIV RNA or DNA, or via testing for the p٢٤ antigen. Much of the world lacks access to reliable PCR testing and many places simply wait until either symptoms develop or the child is old enough for accurate antibody testing. In sub-Saharan Africa as of ٢٠٠٧–٢٠٠٩ between ٣٠ and ٧٠٪ of the population was aware of their HIV status. In ٢٠٠٩, between ٣٫٦ and ٤٢٪ of men and women in Sub-Saharan countries were tested which represented a significant increase compared to previous years.

Do HIV antibody tests detect all types, groups and subtypes?

Initial tests for HIV are usually conducted using the EIA (or ELISA) antibody test or a rapid antibody test.

Compared with first generation EIA antibody tests that were initially developed, third and fourth generation EIA antibody tests are significantly more accurate. Unlike previous tests, the fourth generation test detects HIV antibodies and antigens simultaneously. The WHO recommends that tests should have an accuracy rate of ٩٩ percent and whilst most do, this may vary slightly between the test brands.

The most-up-to date (fourth generation) EIA tests detect both HIV-١ and HIV-٢ infections. Although most HIV infections are HIV-١, EIA tests are also able to detect infections with rare groups and subtypes.

However, as HIV-٢ infections are extremely rare in most countries, routine screening programs might not be designed to test for them. Anyone who believes they may have contracted HIV-٢, HIV-١ or one of the rarer subtypes of group M should seek expert advice.

How is AIDS treated?

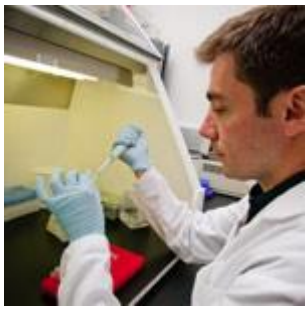
Antiretroviral treatment can significantly prolong the lives of people living with HIV. Modern combination therapy is highly effective and someone with HIV who is taking treatment could live for the rest of their life without developing AIDS.

An AIDS diagnosis does not necessarily equate to a death sentence. Many people can still benefit from starting antiretroviral therapy even once they have developed an AIDS defining illness. Better treatment and prevention for opportunistic infections have also helped to improve the quality and length of life for those diagnosed with AIDS.

Treating some opportunistic infections is easier than others. Infections such as herpes zoster and candidiasis of the mouth, throat or vagina, can be managed effectively in most environments. On the other hand, more complex infections such as toxoplasmosis, need advanced medical equipment and infrastructure, which are lacking in many resource-poor areas.

It is also important that treatment is provided for AIDS related pain, which is experienced by almost all people in the very advanced stages of HIV infection.

Cure for AIDS



A scientist conducting HIV gene therapy research at The Gates Foundation

There is currently no cure for AIDS or HIV infection. Although antiretroviral treatment can suppress HIV – the virus that causes AIDS – and can delay AIDS-related illness for many years, it cannot clear the virus completely.

However, there is hope and optimism around the possibility of a genuine cure for HIV being developed within the next few decades. The launch of a new strategy to develop a cure, involving scientists, policy makers, funders and people living with HIV, in July ٢٠١٢, marked an increased focus on the development of a cure as a potential approach to curbing the HIV and AIDS epidemic.

In the later stages of AIDS, a person will need palliative care and emotional support. In many parts of the world, friends, family and AIDS organizations provide home based care. This is particularly the case in countries with high HIV prevalence and overstretched healthcare systems.

End of life care becomes necessary when a person has reached the very final stages of AIDS. At this stage, preparing for death and open discussion about whether a person is going to die often helps in addressing concerns and ensuring final wishes are followed.

Is there an HIV vaccine?

An HIV vaccine does not yet exist, but efforts to develop a vaccine against HIV, the virus that causes AIDS, have been underway for many years.

Why do we need a vaccine for HIV and AIDS?

Even a partially effective HIV vaccine could save millions of lives. Experts have calculated that a vaccine that is ٥٠ percent effective, given to just ٣٠ percent of the population could reduce the number of HIV infections in the developing world by more than half over ١٥ years. An HIV vaccine that was more than ٥٠ percent effective could cut the infection rate by more than ٨٠ percent.

An HIV vaccine would have a number of key advantages over today's HIV prevention options. In particular, the protection offered by a vaccine during sex would not depend on the

consent of both partners (unlike condom use), and would not require behavior change (unlike abstinence). An HIV vaccine would also be invaluable for couples wishing to conceive a child while minimizing the risk of HIV transmission.

Children could be given an HIV vaccine before ever being exposed to HIV, and ideally this would protect them from all routes of HIV transmission. Vaccinating large numbers of people would probably require relatively little equipment and expertise, and would be much simpler and cheaper than providing antiretroviral treatment for those already infected.

What are the implications for an AIDS vaccine?

The development of an AIDS vaccine is affected by the range of virus subtypes as well as by the wide variety of human populations who need protection and who differ, for example, in their genetic make-up and their routes of exposure to HIV. In particular, the occurrence of super infection indicates that an immune response triggered by a vaccine to prevent infection by one strain of HIV may not protect against all other strains. The increasing variety of sub-types found within countries suggests that the effectiveness of a vaccine is likely to vary between populations, unless an innovative method is developed which guards against many virus strains.

Inevitably, different types of candidate vaccines will have to be tested against various viral strains in multiple vaccine trials, conducted in both high-income and developing countries.

Bone marrow transplants

In November ٢٠٠٨, a pair of German doctors made headlines by announcing they had cured a man of HIV infection by giving him a bone marrow transplant. The transplant - given as a treatment for leukemia - used cells from a donor with a rare genetic mutation known as Delta ٣٢ that confers resistance to HIV infection. Twenty months after the procedure, researchers reported they could find no trace of HIV in the recipient's bone marrow, blood and other organ tissues. Other experts at the time called for more tests to verify the cure claim. In a journal article published in December ٢٠١٠, the doctors concluded that the patient had indeed been cured of HIV infection. Their evidence showed a successful reconstitution of CD٤ T cells at both the systemic level and in the gut mucosal immune system.

However, bone marrow transplantation is too dangerous and costly for widespread use as a cure. Many patients die as a result of chemotherapy or reactions to the transplant, which is usually a last resort in treating life-threatening diseases.

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