

# HIV INFECTION AND AIDS

AIDS, first reported in the United States in 1981, has become a major worldwide epidemic. AIDS stands for acquired immunodeficiency syndrome, and it is caused by a virus called HIV (human immunodeficiency virus). This virus progressively destroys the body's ability to fight off infections and certain cancers by killing or impairing cells of the immune system. Individuals diagnosed with AIDS are susceptible to life-threatening infections caused by microbes that usually don't cause harm to healthy people.

More than 200,000 cases of AIDS have been reported in the United States since 1981, and more than one million Americans are thought to be infected with HIV. This fact sheet summarizes what is currently known about infection with HIV.

## Transmission

HIV is spread most commonly by sexual contact with an infected partner. The virus can enter the body through the lining of the vagina, vulva, penis, rectum or mouth during sex.

HIV is also spread through contact with infected blood. Prior to the screening of blood for evidence of HIV infection and before the use of heat-treating techniques for blood products, which were routinely adopted in 1985, HIV was transmitted through transfusions of contaminated blood or blood components. Today, the risk of

acquiring HIV from such transfusions is extremely small.

HIV is frequently spread, however, by the sharing of drug needles or syringes contaminated with minute quantities of blood of someone infected with the virus. Transmission from patient to health-care worker or vice-versa via accidental sticks with contaminated needles or other medical instruments has rarely been reported.

Children can contract HIV from their infected mothers either during pregnancy or birth. Approximately one-third of all pregnant women infected with HIV will pass the infection to their newborns. HIV can also be spread to babies through the breast milk of mothers infected with the virus.

Although researchers have detected HIV in the saliva of infected individuals, there is no evidence that the virus is spread by contact with saliva. Laboratory studies reveal that saliva has natural compounds that inhibit the infectiousness of HIV, and studies of individuals infected with HIV have failed to find evidence that the virus is spread to others through saliva such as by kissing. However, the risk of infection from so-called "deep" kissing, involving the exchange of large amounts of saliva, is unknown. There is also no evidence that HIV can be spread through sweat, tears, urine or feces.



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Studies of families of HIV-infected people have clearly shown that HIV is not spread through casual contact such as the sharing of food utensils, towels and bedding, swimming pools, telephones, or toilet seats. There is also no evidence that HIV can be spread by biting insects such as mosquitoes or bed bugs. Although at first HIV mainly infected male homosexuals in this country, anyone potentially can become infected with HIV. The numbers of heterosexual men and women infected by the virus continue to grow.

HIV can infect anyone who practices certain behaviors. Behaviors that put people at risk of HIV infection include:

- ▶ Sharing drug needles or syringes.
- ▶ Having unprotected sexual contact with an infected person or with someone whose infectious status is unknown.

Having another sexually transmitted disease, such as syphilis, herpes, chlamydia, or gonorrhea also appears to make someone more susceptible to acquiring HIV infection during sex with an infected partner.

### **Early Symptoms**

Many people do not develop any symptoms when they first become infected with HIV. Some people, however, have a flu-like illness within a month or two after exposure to the virus. They may have fever, headache, malaise and enlarged lymph nodes (organs of the immune system easily felt in the neck and groin). These symptoms usually disappear within a week to a month and are often mistaken for those of another viral infection.

More persistent or severe symptoms may not surface for 10 years or more after HIV first enters the body in adults, and within 2 years in children infected during birth or pregnancy. This period of "asymptomatic" infection is variable, however. Some people may begin to have symptoms in as soon as a few months, whereas others may be symptom-free for more than 10 years.

During the asymptomatic period, however, HIV is infecting and killing cells of the immune system. Its effect is seen most obviously in a decline in the blood levels of T4 cells (also called CD4 cells)—the immune system's key infection fighters. The virus initially disables or destroys these cells without causing symptoms.

As the immune system deteriorates, a variety of complications begins to surface. One of the first such symptoms many people infected with HIV experience is lymph nodes that remain enlarged for more than 3 months. Other symptoms often experienced months to years before the onset of AIDS include a lack of energy, weight loss, frequent fevers and sweats, persistent or frequent yeast infections (oral or vaginal), persistent skin rashes or flaky skin, pelvic inflammatory disease that doesn't respond to treatment, or short-term memory loss. Some people also develop pearly white spots on the tongue, frequent and severe herpes infections that cause mouth, genital or anal sores, or a painful nerve disease known as shingles. Children may have delayed development or failure to thrive.

## **AIDS**

The term AIDS applies to the most advanced stages of HIV infection. Official criteria for the definition of AIDS are developed by the U.S. Centers for Disease Control in Atlanta, Georgia, which is responsible for tracking the spread of HIV disease around the United States.

Most AIDS-defining conditions are what are known as opportunistic infections. These infections are caused by microbes that rarely cause harm in healthy individuals. In people with AIDS, however, these infections are often severe and sometimes fatal because the immune system is so ravaged by HIV that the body cannot fight off these bacteria, viruses and other microbes.

Opportunistic infections common in AIDS patients cause such symptoms as coughing, shortness of breath, seizures, dementia, severe and persistent diarrhea, fever, vision loss, severe headaches, wasting, extreme fatigue, nausea, vomiting, lack of coordination, coma, abdominal cramps, or pain and difficulty swallowing.

Although children with AIDS are susceptible to the same opportunistic infections as adults with the disease, they also experience severe forms of the bacterial infections to which children are especially prone, such as conjunctivitis (pink eye), ear infections, and tonsillitis.

People with AIDS are also particularly prone to develop various cancers such as Kaposi's sarcoma or cancers of the immune system known as lymphomas. These cancers are usually more aggressive and difficult to treat in people with AIDS. Hallmarks of Kaposi's sarcoma in light-skinned people are

round brown, reddish or purple spots that develop in the skin or in the mouth. In dark-skinned people, the spots are more pigmented.

During the course of HIV infection, most people experience a gradual decline in the number of T4-cells, although some individuals may have abrupt and dramatic drops in their T4-cell counts. A person with T4 cells above 200 may experience some of the early symptoms of HIV infection. Others may have no symptoms even though their T4-cell count is below 200. (Healthy individuals usually have T4-cell counts of 1,000 or more.)

Many people are so debilitated by the symptoms of AIDS that they are unable to hold steady employment or do household chores. Other people with AIDS may experience phases of intense life-threatening illness followed by phases of normal functioning.

A small number of people initially infected with HIV prior to 1981 have not developed AIDS. Experts believe that without effective therapy, however, virtually all people with HIV infection will eventually develop the severely deteriorated immune system and the infections that are the hallmark of AIDS.

### **Diagnosis**

Because early HIV infection often causes no symptoms, it is primarily detected by testing a person's blood for the presence of antibodies (disease-fighting proteins) to HIV. HIV antibodies generally do not reach detectable levels until 1 to 3 months following infection, and may take as long as 6 months to be generated in quantities large enough to show up in standard blood tests.



Two different types of antibody tests (ELISA and Western Blot) are used to diagnose HIV infection. If it is highly likely that a person is infected with HIV and yet both tests are negative, a doctor may also test for the presence of HIV itself in the blood. The person may also be told to repeat antibody testing at a later date, when antibodies to HIV are more likely to have developed.

Babies born to mothers infected with HIV carry their mothers' antibodies to the virus. These infants may or may not be infected. If these babies lack symptoms, a definitive diagnosis of HIV infection can't be made until after 15 months. At this age, they are unlikely to still carry their mothers' antibodies and will have produced their own, if they are infected. A relatively simple, inexpensive blood test has been developed that can diagnose HIV infection in infants less than 6 months of age. This new test detects antibodies produced by the infant and may soon offer physicians an early diagnostic test for babies with congenital HIV infection.

People who have been exposed to HIV should be tested for HIV infection as soon as they are likely to develop antibodies to the virus. Such early testing will enable them to receive appropriate treatment at a time when they are most able to combat HIV and prevent the emergence of certain opportunistic infections (see treatment section below). Early testing also allows HIV-infected people to help contain the virus' spread by notification of sexual partners.

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### Measures to Control HIV Spread:

- ▶ If you are "at risk" you should not donate blood.
- ▶ If you inject drugs, never share needles.
- ▶ If you are sexually active, you should practice safe sex.

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HIV testing is done in most doctors' offices or health clinics and should be accompanied by counseling. Individuals can also be tested anonymously at many test sites if they have particular concerns about confidentiality.

### Treatment

When AIDS first surfaced in this country, there were no drugs to combat the underlying immune deficiency and few treatments for the opportunistic diseases that resulted. Over the past 10 years, however, therapies have been developed to treat both HIV infection and its associated infections and cancers.

The drugs AZT (also known as zidovudine), ddC (zalcitabine) in combination with AZT, and ddI (dideoxyinosine) have been approved by the Food and Drug Administration for the treatment of HIV infection. These drugs slow the spread of HIV in the body and delay the onset of opportunistic infections; importantly, it appears they do not prevent transmission of HIV to other individuals. AZT is recommended for HIV-infected people when their T4-cell counts drop below 500, regardless of whether they have any symptoms.

AZT does not cure people of HIV infection or AIDS, however, and may cause a depletion of red or white blood

cells, especially when taken in the later stages of the disease. If the loss of blood cells is severe, treatment with AZT must be stopped. In other patients able to tolerate the drug, AZT may lose its effectiveness after a period of time.

HIV-infected people not able to benefit from AZT can be given ddI. This drug, unlike AZT, doesn't deplete the body's blood cells, and it appears to improve the T4-cell counts of patients whose infections no longer respond to AZT. DdI can cause an inflammation of the pancreas and painful nerve damage. Like AZT, it does not cure people of HIV infection.

In addition to AZT or ddI, adults with HIV whose T4-cell counts drop below 200 are also given drugs to prevent the occurrence of *Pneumocystis carinii* pneumonia (PCP), which is one of the most common and deadly opportunistic infections associated with HIV. Children are given PCP preventive therapy when their T4-cell counts drop to levels considered below normal for their age group. Regardless of their T4-cell counts, HIV-infected children and adults who have survived an episode of PCP are also given drugs for the rest of their lives to prevent a recurrence of the pneumonia.

There are a number of drugs available to help treat other opportunistic infections to which people with HIV are especially prone. These drugs include foscarnet and ganciclovir, which are used to treat cytomegalovirus eye infections, fluconazole to treat yeast and other fungal infections, and TMP/SMX or pen-tamidine to treat and prevent PCP.

HIV-infected individuals who develop Kaposi's sarcoma or other cancers are treated with radiation, chemotherapy,

or alpha interferon, a genetically engineered form of a naturally occurring protein.

### Prevention

There is currently no available vaccine for HIV, so the only way to prevent infection by the virus is to avoid behaviors that put a person at risk of infection, such as sharing needles and unprotected sex (see "Transmission" section).

Because many people infected with HIV have no symptoms, there is no way of knowing with certainty whether a sexual partner is infected unless he or she has been repeatedly tested for the virus or hasn't engaged in any risky behavior. It is recommended, consequently, that people either abstain from sex, or use latex condoms whenever having oral, anal or vaginal sex with someone they aren't certain is free of HIV or other sexually transmitted diseases. Water-based lubricants should be used with condoms to prevent them from tearing. Condoms cannot give 100-percent protection from the virus, however.

Although there is some laboratory evidence that spermicides can kill HIV organisms, scientists are still evaluating the usefulness of spermicides in preventing HIV. Some studies have found that frequent use of spermicides (more than three times per week) may cause vaginal inflammation, which might facilitate HIV transmission.

### Research

NIAID-supported investigators are conducting an abundance of research on HIV infection, including the development and testing of vaccines, therapies, and



more sensitive diagnostic tests for the disease and some of its associated conditions. Several AIDS vaccines are currently being studied in people, and many drugs for HIV infection or AIDS-associated opportunistic infections are either in development or testing. Researchers at NIAID are also pinpointing exactly how HIV damages the immune system. This research is suggesting new and more effective targets for drugs and vaccines. NIAID-supported investigators also continue to document the various ways HIV can be transmitted and the extent to which symptoms and treatment needs vary for minorities, women and children with the disease.

Although the medical research community has gathered an abundance of information on HIV, many questions about the virus and the immune disorder it causes remain unanswered. Scientific research aimed at providing such answers should lead to the expansion of the medical arsenal used to fight the AIDS epidemic.

*Many experimental therapies for HIV infection and its associated conditions are being tested in HIV-infected people. The NIAID supports a nationwide network of treatment testing sites at university-based medical centers and community clinics. To find out more information about clinical trials, call 1-800-TRIALS-A. HIV-infected individuals who can't participate in a clinical trial may be able to receive experimental drugs as part of expanded access programs carried out by drug companies.*

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