

# Aids essay



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## AIDS

Acquired immune deficiency syndrome, or AIDS, is a recently recognized disease

entity. It is caused by infection with the human immunodeficiency virus (HIV),

which attacks selected cells in the immune system (see IMMUNITY) and produces

defects in function. These defects may not be apparent for years. They lead in

a relentless fashion, however, to a severe suppression of the immune system's

ability to resist harmful organisms. This leaves the body open to an invasion by various infections, which are therefore called opportunistic diseases, and to

the development of unusual cancers. The virus also tends to reach certain brain

cells. This leads to so-called neuropsychiatric abnormalities, or psychological disturbances caused by physical damage to nerve cells. Since the first AIDS cases were reported in 1981, through mid-1992, more than 190, 000 AIDS cases and

more than 152, 000 deaths had been reported in the United States alone.

This is

only the tip of the iceberg of HIV infection, however. It is estimated that

between 1 million and 1. 5 million Americans had been infected with the virus by

the early 1990s but had not yet developed clinical symptoms. In addition,

although the vast majority of documented cases have occurred in the United

States, AIDS cases have been reported in about 162 countries worldwide.

Sub-

Saharan Africa in particular appears to suffer a heavy burden of this illness.

No cure or vaccine now exists for AIDS. Many of those infected with HIV may not

even be aware that they carry and can spread the virus. It is evident that HIV

infection represents an epidemic of serious proportions. Combating it is a

major challenge to biomedical scientists and health-care providers. HIV

infection and AIDS represent one of the most pressing public policy and public

health problems worldwide.

Definition of AIDS

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The U. S. CENTERS FOR DISEASE CONTROL has established criteria for defining

cases of AIDS that are based on laboratory evidence, the presence of certain opportunistic diseases, and a range of other conditions. The opportunistic diseases are generally the most prominent and life-threatening clinical manifestations of AIDS. It is now recognized, however, that neuropsychiatric manifestations of HIV infection of the brain are also common. Other complications of HIV infection include fever, diarrhea, severe weight loss, and

swollen lymph nodes (see LYMPHATIC SYSTEM). When HIV-infected persons experience

some of the above symptoms but do not meet full criteria for AIDS, they are given the diagnosis of AIDS-related complex, or ARC. The growing feeling is that asymptomatic HIV infection and ARC should not be viewed as distinct entities but, rather, as stages of an irreversible progression toward AIDS.

#### Historical Background

In the late 1970s, certain rare types of cancer and a variety of serious infections were recognized to be occurring in increasing numbers of previously

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healthy persons. Strikingly, these were disorders that would hardly ever threaten persons with normally functioning immune systems. First formally described in 1981, the syndrome was observed predominantly to be affecting

homosexual and bisexual men. Soon thereafter, intravenous drug users, hemophiliacs, and recipients of blood transfusions were recognized as being at

increased risk for disease as well. It was also noted that sexual partners of persons displaying the syndrome could contract the disease. Further study of AIDS patients revealed marked depletion of certain white blood cells, called T4

lymphocytes. These cells play a crucial role in orchestrating the body's immune

defenses against invading organisms. It was presumed that this defect in AIDS

patients was acquired in a common manner. Then, in 1983, a T-cell lymphotropic

virus was separately discovered by Robert Gallo at the U. S. National Institutes

of Health and Luc Montagnier at France's Pasteur Institute. The virus was at <https://assignbuster.com/aids-essay/>

first given various names: human lymphotropic virus (HTLV) III, lymphadenopathy-associated virus (LAV), and AIDS-associated retrovirus (ARV).

It is now officially called human immunodeficiency virus (HIV), and considerable

evidence demonstrates that it is indeed the causative agent for AIDS. A second

strain that has been identified, HIV-2, is thus far relatively rare outside of Africa. Little is known about the biological and geographical origins of HIV.

Apparently, however, this is the first time in modern history that the virus has

spread widely among human beings. Related viruses have been observed in animal

populations, such as certain African monkeys, but these do not produce disease

in humans.

### The Nature of the Virus

HIV is an RNA RETROVIRUS. Viewed in an electron microscope, it has a dense cylindrical core that encases two molecules of viral RNA genetic material. A

spherical outer envelope surrounds the core. Like all retroviruses, HIV

possesses a special enzyme, called reverse transcriptase, that is able to make a

DNA copy of the viral DNA. This enables the virus to reverse the normal flow of

genetic information (see GENETIC CODE) and to incorporate its viral genes into

the genetic material of its host. The virus may then remain in a latent form for a variable and often lengthy period of time until it is reactivated.

Further knowledge of the mechanisms and triggers of the activation process is

important to the efforts being made to control HIV infection. A critical step in

HIV infection is the binding of the virus to a host-cell receptor, enabling it

to gain entrance into the cell. Studies have demonstrated that a molecule

called CD4, expressed predominantly on the surface of the T4 cell, serves as

this receptor. Although the T4 cell is a major HIV target, virtually any other

cell also expressing the CD4 surface molecule is able to become infected with

HIV. Thus cells of the monocyte and macrophage type are very important

additional targets.

### Modes of Transmission

Researchers have isolated HIV from a number of body fluids, including blood, semen, saliva, tears, urine, cerebrospinal fluid, breast milk, and certain

cervical and vaginal secretions. Strong evidence indicates, however, that HIV is transmitted only through three primary routes: sexual intercourse, whether

vaginal or anal, with an infected individual; nondigestive exposure to infected

blood or blood products; and from an infected mother to her child before or during birth. At least 97 percent of U. S. AIDS cases have been transmitted through one of these routes, with transmission between homosexual men accounting

for about 60 percent of the cases. Heterosexual transmission in the United States accounts for only about 5 percent of cases but is a significant mode of transmission in Africa and Asia. About 21 percent of AIDS cases occur in intravenous drug abusers exposed to HIV-infected blood through shared needles.



Current practices of screening blood donors and testing all donated blood and

plasma for HIV antibodies have reduced the number of cumulative cases due to

transfusion to about 1 percent. The number of new cases of AIDS in women of

reproductive age is increasing at an alarming rate. AIDS has become the leading

cause of death for women between the ages of 20 and 40 in the major cities of

North and South America, Western Europe, and sub-Saharan Africa. In the United

States, AIDS has hit hardest among black and Hispanic women. These women

represent 17 percent of the female population but make up 73 percent of women

with AIDS. AIDS is also having a devastating impact on infant mortality, since

over 80 percent of HIV-infected children under the age of 13 acquired HIV from

their infected mothers. Between 24 and 33 percent of children born to infected

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women will develop the disease. No scientific evidence supports transmission of

AIDS through ordinary nonsexual conduct. Careful studies demonstrate that despite prolonged household contact with infected individuals, family members

have not become infected—except through the routes described above.

Health-

care workers have been infected with HIV from exposure to contaminated blood or

by accidentally sticking themselves with contaminated needles.

Clinical Signs

Following infection with HIV, an individual may show no symptoms at all, or may

develop an acute but transient mononucleosis-like illness. The period between

initial infection and the development of AIDS can vary greatly, apparently from

about 6 months to 11 years. Various estimates indicate that somewhere between

26 to 46 percent of infected individuals will go on to develop full-blown AIDS

within a little more than 7 years following infection. Once AIDS sets in, the clinical course generally follows a rapid decline; and most people with AIDS die within 3 years. Opportunistic Infections and Cancers Because the T4 cell is

involved in almost all immune responses, its depletion renders the body highly

susceptible to opportunistic infections and tumorous growths. The most

predominant and threatening is Pneumocystic carinii PNEUMONIA, which is frequently the first infection to occur and is the most common cause of death.

Other infections include the parasites *Toxoplasma gondii* (see TOXOPLASMOSIS) and

*Cryptosporidiosis*; fungi such as *Candida* (see CANDIDIASIS) and *Cryptococcus*

(see FUNGUS DISEASES); mycobacteria such as *Mycobacterium avium*, *intracellulare*,

and tuberculosis (see TUBERCULOSIS); and viruses such as cytomegalovirus and

herpes simplex and zoster (see HERPES). Increased susceptibility to bacterial infection is noted particularly among children with AIDS. Many AIDS patients

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develop CANCERS, including Kaposi's sarcoma (KS), non-Hodgkin's lymphoma, and

HODGKIN'S DISEASE. KS occurs in patients who manifest hardly any evidence of

immunological impairment, indicating that other factors may also be at work in

the development of such cancers. Among the non-Hodgkin's lymphomas are immunoblastic and Burkitt's-type lymphomas as well as primary brain lymphomas.

These tumors tend to be unusually aggressive and poorly responsive to chemotherapy, particularly in AIDS patients who have already experienced opportunistic infections. Other HIV-Related Disorders and Co-factors

Neuropsychiatric manifestations occur in about 60 percent of HIV-infected persons. It is now well established that HIV can exist and proliferate within the brain, spinal cord, and peripheral nerves. This results in a broad range of symptoms, including meningoencephalitis (see ENCEPHALITIS) and DEMENTIA.

Evidence thus far indicates that circulating HIV-infected monocytes may be responsible for the initiation of infection in the brain, with little evidence

to support direct infection of neuron tissue by HIV. Blood-cell abnormalities of

HIV patients include ANEMIA, reduced white blood-cell counts, and platelet deficiencies. Researchers have also been able to show direct infection of bone-

marrow cells–the precursors of circulating blood cells– and the proliferation of the virus within these cells. Thus bone marrow may represent an important

reservoir of HIV in an infected person and provide a potential mechanism for dissemination of the virus through the body. Other HIV-related syndromes include nephritis (see KIDNEY DISEASE), ARTHRITIS, and lung inflammation

(pneumonitis). Certain co-factors appear to play an important role in HIV infection and AIDS by increasing susceptibility to infection and by enhancing

viral-disease activity. Other sexually transmitted diseases appear to be of particular significance. Damage to genital skin and mucous membranes may

facilitate transmission of the virus. In addition, laboratory studies show that certain microbes frequently found in AIDS patients, such as mycoplasmas, also

probably act as co-factors.

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## Treatment of HIV

Two major avenues are being pursued by biomedical scientists in the fight against HIV infection and AIDS. One strategy is to develop a vaccine that can induce neutralizing antibodies against HIV and protect uninfected individuals if

exposed to the virus itself. The second approach involves the discovery and development of therapeutic agents against HIV infection and AIDS. At present no

vaccine exists to protect against infection, although recent advances have led

some experts to predict that a vaccine should be available within the next 10 years. Obstacles still remain, however, primarily due to the variability of the virus itself. Many different strains of HIV exist, and even within a given individual's body the virus can undergo mutations rapidly and easily. A number

of candidate vaccines were in the early phases of testing in human volunteers by

the early 1990s around the world. Dramatic strides are also being made in the

treatment of HIV infection and its complications. Efforts are being focused on two major areas: antiviral drugs with a direct effect against the causative agent, and immunomodulators that act to reconstitute or enhance immune-system

function. Efforts to develop and improve treatments of specific opportunistic infections and neoplasms are also being made. Because of the complex life cycle

of HIV, however, the successful development of antiviral and immune-enhancement

therapies represents an enormous scientific challenge. Unlike most known pathogens, HIV infects the very cells that are intended to orchestrate and lead

the immune system's attack against invaders. This makes it technically very hard to kill the virus without destroying the already threatened immune system.

Furthermore, there may be several important reservoirs in the body for HIV that

will be difficult to deal with while not causing fundamental damage to the host

cells involved. For example, macrophage cells can support HIV replication while

harboring the virus from the body's immune surveillance. Circulating macrophages

appear to play an important role in the propagation of HIV throughout the body,

including the brain. In seeking effective therapies, other important

considerations are involved. Thus, since the brain is an important target of

HIV infection, an effective anti-HIV agent should be able to cross the blood-

brain barrier (see BRAIN). It would also be desirable if therapies could be

taken orally, since it is likely that AIDS drugs would have to be taken for a

long period and perhaps a lifetime. Dozens of agents have been tested in humans,

but only two have been licensed by the U. S. Food and Drug Administration (FDA):

azidothymidine (AZT) and dideoxyinosine (DDI). AZT interferes with virus

replication and has been found to prolong life significantly in some patients

and delay the onset of full-blown AIDS in persons with no symptoms, but its

potentially toxic side effects may preclude uses in many cases. DDI acts



similarly but is recommended for those who cannot tolerate AZT. Other promising

drugs are in clinical trials. Some drugs are available to fight major opportunistic illnesses. Eye infections can be treated with ganciclovir or foscarnet, which also helps patients live longer, while aerosolized pentamidine

fights *Pneumocystis carinii* pneumonia and protects the patient from AIDS dementia. The slow process of FDA approval of new AIDS drugs has developed into

a political issue. AIDS activists are demanding that the government speed up authorization by postponing certain tests comparing efficacy and ability to prolong life until after the drug is on the market. While a faster approval rate may expose patients to unforeseen side effects, activists argue that patients with life-threatening diseases who have no alternative therapy should still be entitled to choose these drugs.

#### Efforts at Prevention

In the absence of an effective vaccine or therapy, education and risk reduction

remain the most powerful tools in the fight against AIDS. Because of the limited number of transmission routes, the further spread of AIDS could virtually be stopped by avoiding behaviors that place persons at risk.

Education can help to achieve this, through development and dissemination of

materials by local community groups, statewide organizations, and national governments. In 1988, for example, the U. S. Public Health Service produced a

simple, straightforward brochure containing information about HIV infection and

AIDS. The brochure was mailed to every household in the nation. Although

behavior change is often very hard to achieve, studies of the groups most affected by AIDS in the United States have provided encouraging indications that

such change is beginning to occur. In March 1983 the major U. S. blood-banking

organizations also instituted procedures to reduce the likelihood of HIV

transmission by asking all individuals at increased risk of AIDS to refrain from donating blood. In addition, they expanded screening procedures to exclude

anyone with a history of risk behavior for AIDS or signs or symptoms suggestive

of AIDS. In early 1985 a test to screen blood directly for antibodies to HIV was developed and made available. The presence of antibodies, which generally

takes weeks or months to develop, means only that an individual has been exposed

to the virus. It does not indicate whether that individual has or will develop

AIDS, although this is almost certain. All blood intended for use in transfusion

or manufacture of blood products is now tested for the antibody. The

standardized procedure involves the use of the ELISA (enzyme-linked

immunosorbent assay) screening test, with confirmation of positive results with

a more specific test known as the Western Blot. Blood that tests positive on

any of these is absolutely eliminated from the blood-donation pool. Tissue and

organ banks use a similar process. Blood donations themselves pose no risk of

HIV infection at all, because sterile equipment is always used.

## Conclusion

The AIDS epidemic is having a profound impact on many aspects of medicine and

health care. The U. S. Public Health Service estimates that the annual cumulative lifetime cost of treating all persons with AIDS in the United States

in 1991 is \$5. 3 billion; this is expected to reach \$7. 8 billion by 1993. The

Public Health Service budget for AIDS research was \$849 million in 1991.

Persons exposed to HIV are having difficulties in obtaining adequate health insurance coverage. Yearly AZT expenses, for example, can average approximately

\$6, 000, although in 1989 the drug's maker did offer to distribute AZT freely to

HIV-infected children. The yearly expense for DDI is somewhat less at \$2, 000.

The effects of the epidemic on society at large are increasingly evident. AIDS tests are now required in the military services. Various proposals have been made for mandatory screening of other groups such as health-care workers, especially since a Florida dentist who died of AIDS in 1990 is believed to have

infected five patients. A number of nations, including the United States, have instituted stringent rules for testing long-term foreign visitors or potential immigrants for AIDS, as well as testing returning foreign nationals. In the United States one frequent phenomenon is the effort to keep school-age children with AIDS isolated from their classmates, if not out of school altogether. Governmental and civil rights organizations have countered restrictive moves with a great deal of success. There is little doubt that the ultimate physical toll of the AIDS epidemic will be high, as will be its economic costs, however the social issues are resolved. Concerted efforts are under way to address the problem at many levels, and they offer hope for successful strategies to combat HIV-induced disease.