

First Pan American Teleconference on AIDS

The First Pan American Teleconference on AIDS took place in Quito, Ecuador, on 14–15 September 1987. An innovative approach to the traditional scientific meeting, it allowed an estimated 45,000 health-care workers at over 650 sites in Latin America and the Caribbean and at over 350 hospitals in the United States to hear presentations by some of the world's leading authorities on AIDS and to participate by posing questions to the experts.

The teleconference was organized by the Pan American Health Organization with technical assistance and support from the Miami Children's Hospital (Global Development Network) and Project Share (Satellites for Health and Rural Education) of International Telecommunications Satellites (INTELSAT), which carried 16 hours of the broadcast free to 30 countries. It was cosponsored by the World Health Organization, the Inter-American Development Bank, the U.S. Centers for Disease Control, the National Institute of Allergy and Infectious Diseases of the U.S. National Institutes of Health, the Latin American Union Against Sexually Transmitted Diseases, the Abbott Wellcome Group, and Electronucleonics Laboratories. The U.S. Agency for International Development also provided some financial assistance.

The objective of the two-day teleconference was to make available the latest scientific and technical information on AIDS to health professionals, researchers, and educators, as well as to decision-makers and the media. In recognition of the impact the media can have in supporting disease-prevention programs in general and the fight against AIDS in particular, press conferences were held at the end of each day. In addition, key speakers gave separate interviews with

world media representatives. Because of the broad coverage afforded the teleconference by newspapers, radio, and television, it reached not only the thousands of people who viewed it directly but also millions of others who learned about it through the press.

With assistance from the Ecuadorian Institute of Telecommunications, the teleconference was transmitted live in four languages—English, Spanish, French, and Portuguese. Participants used portable earphones or radio receivers to hear the simultaneous translations. The teleconference consisted of four sessions, each of which included formal presentations, a round-table discussion, and a question-and-answer period during which viewers in the countries receiving the transmission could pose questions via satellite to the panel of experts in Quito. Multilingual volunteers manned the specially installed telephones to receive the questions, and a board of editors sorted them, translated them into the language of the speaker to whom they were directed, and gave them to the session's moderator for presentation to the speakers and the audience in Quito.

The teleconference was inaugurated by Dr. José Tohmé, Minister of Health of Ecuador, who welcomed the participants on behalf of President Febres Cordero. PAHO's Director, Dr. Carlyle Guerra de Macedo, emphasized in his opening remarks the commitment of PAHO and WHO to fighting AIDS everywhere by all available means. He announced that PAHO/WHO had received US\$5 million to support AIDS research in Latin America and the Caribbean through a contract with the U.S. National Institutes of Health.

Dr. Ronald St. John, Coordinator of PAHO's Health Situation and Trends As-

assessment Program and Scientific Director of the Teleconference, was the moderator for the first session, which reviewed the epidemiology of AIDS in the Americas and around the world. During this session, Dr. Jonathan Mann, the Director of WHO's Global Program on AIDS, spoke of the precarious balance required between sounding an alarm against the spread of this lethal disease and voicing optimism that the profound changes needed to stop it can be made. He said that since AIDS is a disease spread by specific, identifiable actions, it is controllable and preventable by changes in human behavior. Presentations on AIDS in Africa and in the Americas followed.

The second session, which focused on virology and immunology, was moderated by Dr. Gloria Echeverría de Pérez of the WHO Collaborating Center on Clinical Immunology in Caracas. This session included overviews of HIV and related viruses, the immunology and pathogenesis of HIV infection, and the clinical spectrum of the infection. One speaker, Dr. Thomas Quinn of Johns Hopkins University, reviewed the natural history of HIV infection and transmission and cautioned that changing people's sexual behavior is not easy. Participants in the round table discussed the clinical and laboratory diagnosis of AIDS, testing methodology, surveillance, and case definition.

Dr. King Holmes of Harborview Medical Center in Seattle, Washington, was the moderator for the third session, on day two of the teleconference. This session addressed aspects of the management of AIDS and HIV infection such as the clinical management of AIDS patients and counseling and long-term care of individuals with AIDS and HIV infection. Also considered were prospects for AIDS prevention, treatment, and vaccine development. In the third round-table discussion, moderated by Dr. St. John, topics ranged from screening for HIV

infection to the impact of AIDS on the strategy of health for all by the year 2000.

Dr. Kenneth Castro of the Centers for Disease Control moderated the teleconference's last session on prevention and control, during which presentations were heard on the AIDS education program in Brazil, the protection of blood supplies, training for health personnel who work with AIDS patients, and the psychosocial, ethical, and legal issues surrounding AIDS. The round-table discussion focused on global, national, and regional strategies for the prevention and control of AIDS.

Dr. Lydia Bond, Director of PAHO's AIDS Education, Information, and Counseling Program, introduced two PAHO-produced documentary films during the teleconference. The first dealt with innovative methods for teaching persons who engage in high-risk behaviors how to prevent the disease. The second film described mass AIDS-education campaigns in various countries and illustrated the diverse and sometimes unconventional approaches employed to improve communication about the spread of AIDS.

At the press conference following the last session, Dr. St. John closed the teleconference on a note of guarded optimism based on the enormous progress that has been made in understanding the disease in the few years since it became known.

To assist in evaluating the teleconference, participants were asked to fill out questionnaires. Of the 3,639 completed questionnaires received by PAHO, a sample of 1,211 was selected for analysis. Well over half of the respondents (63%) were physicians, and 18% were nurses. Two-thirds of the respondents had professional contact with AIDS patients in either a health education, clinical, laboratory, research, or counseling setting. The topics in which participants indicated the greatest interest were epi-

demiology (27%), AIDS diagnosis (20%), virology and immunology (16%), prevention and control (10%), and public health aspects of AIDS (7%). Suggested improvements included providing better translations, improving the acoustics and transmission of the signal, giving daily summaries of the material presented, and examining some topics in greater depth. These recommendations will be taken into account in the organization of future teleconferences.

Since it was possible to answer only a fraction of the questions received during the question-and-answer periods, PAHO made a commitment to the audience to address others in a question-and-answer booklet on AIDS. In addition, PAHO will make available a series of videotapes based on the teleconference that will cover such topics as the virology and immunology of AIDS, prevention and control, and AIDS in children. Also included in the series will be tapes offering a general introduction to educational teleconferencing on AIDS and an overview of the First Pan American Teleconference.

QUESTIONS AND ANSWERS ABOUT AIDS

The following is a sample of the more than 600 questions that were received during the teleconference. Those questions were grouped and summarized in a document containing some 40 questions and answers. Taken together, they constitute a primer on such topics as the epidemiology of AIDS and human immunodeficiency virus (HIV) infection; current issues in the pathogenesis of HIV infection; the clinical picture of AIDS and its related disorders; present and future therapies; and social, ethical, and legal concerns regarding the spread of the AIDS virus. The responses were compiled from PAHO experts and from currently available information in the medi-

cal and scientific literature. The positions of the World Health Organization and Pan American Health Organization are presented when those organizations have made statements on the issue being reviewed.

Where did the AIDS virus originate?

The origin of the human immunodeficiency virus must remain a matter of speculation at the present time. The path of the virus through different geographic areas and populations can be retrospectively studied by serologic testing of banked blood. The accuracy of such work depends on the wide availability of well-preserved human sera that are free of potentially complicating cross-reactive agents. Based on these studies, with their inherent limitations, the earliest evidence of an infected human comes from serum collected in Central Africa in 1959. The prevalence of the virus in surrounding areas was very low until it began increasing in the mid- to late 1970s. Serologic evidence of the virus also began to appear in North America and Europe in the 1970s, with subsequent rapid increases in the prevalence of HIV infection in at-risk populations.

Regardless of the exact geographic location of the first identified case of HIV infection, it is likely that the virus had been present in some isolated human population for many generations. There is ample precedent for rare viruses that infect isolated groups of people but that are not found outside of those groups. Increased travel to and from a previously isolated area can serve as the bridge that allows rare pathogens to escape their confined location. This scenario seems probable in the case of HIV.

It is likely that HIV has infected humans for much longer than since the beginning of the present epidemic. In a series of studies, the RNA sequences of

HIV-1 were compared with those of another related human retrovirus, HIV-2, and those of the monkey equivalent of HIV, simian immunodeficiency virus (SIV) to determine relatedness. These studies suggest that as the primates diverged evolutionarily, retroviruses adapted to each respective branch may have also evolved from a common precursor. There is little reason to believe that HIV only recently entered the human population.

What is the relationship of HIV-2 to the AIDS virus?

A human retrovirus related to HIV-1 was first isolated from patients with an AIDS-like syndrome in West Africa. This second virus, now called HIV-2, has been conclusively linked to a clinical syndrome indistinguishable from AIDS caused by HIV-1. The routes of transmission of HIV-2 and its spectrum of disease are similar to those of HIV-1. Little is known, however, about the natural history of infection with HIV-2 and the rates of progression from an infected asymptomatic state to AIDS. Genetic studies suggest that HIV-2 occupies a position genetically intermediate between the simian immunodeficiency viruses and HIV-1. HIV-2 antigens cross-react inconsistently with HIV-1 antigens in commonly employed screening tests, which further indicates that HIV-1 and HIV-2 are related viruses.

AIDS caused by HIV-2 is a problem principally in West Africa. Occasional cases of infection with HIV-2 have been reported in Europe, and HIV-2 infection has been suspected in the Americas. A surveillance program for HIV-2 infection in the United States found no cases of infection in a study of over 22,000 individual sera, a preponderance of which were samples from individuals at risk for HIV-1 infection. Effective programs for

control of HIV-1 transmission are also anticipated to control the spread of HIV-2.

Does the mutability of HIV present problems in developing a vaccine against the virus?

The genetic variability of HIV has been well documented. Virus isolates obtained from different infected individuals display a great degree of diversity, particularly in the composition of the envelope protein. Because the envelope is a principal antigen leading to the production of neutralizing antibodies in infected individuals, envelope diversity may explain the poor neutralizing activity of antisera raised against individual isolates when tested against other isolates. This diversity of HIV may present difficulties in establishing a common immunogen that could form the basis for a vaccine.

Which cells does HIV infect?

HIV has a selective tropism for cells bearing the CD4 phenotypic marker, which includes the principal target cell of HIV, the T4 lymphocyte. It has been shown that the CD4 marker serves as a receptor for the virus, and its presence on the cell surface is an absolute requirement for infection of human cells. Cells of macrophage/monocyte lineage that also bear the CD4 marker have been found to be infected with HIV in clinical specimens obtained from blood, brain, and various other organs. Despite the characteristic profound depletion of T4 lymphocytes in patients with AIDS, only about one in 100,000 peripheral blood lymphocytes show actual evidence of infection with HIV. The disparity between the devastating immune deficiency seen in AIDS and the very low levels of virus detected in patients remains an unexplained aspect of the pathogenesis of AIDS.

How can the virus be detected in an individual?

Culturing the virus from an individual is the definitive demonstration of infection with HIV. Research laboratories routinely isolate virus for the purpose of scientific study, but in clinical practice virus isolation is rarely required to demonstrate infection with HIV. A variety of serologic tests have been developed to indirectly detect the presence of the virus. The most commonly used tests are the enzyme immunoassay (EIA or ELISA) and the Western blot. Both of these tests employ disrupted virus particles as a substrate to demonstrate the presence of host antibodies directed against the various viral antigens.

The diagnostic tests passing the United States Food and Drug Administration's (FDA) stringent evaluation for licensing are very accurate (>99.0% sensitivity and specificity). The grave implications of a positive test result, however, have prompted the wide use of a tiered approach in testing for HIV to reduce the risk of false positive results. Initially positive EIA tests are repeated to reduce the risk of laboratory error. Two positive EIA tests are confirmed by the Western blot, a test that detects the presence of specific antibodies directed against individual HIV proteins. The criteria for a positive EIA result have been developed by the manufacturers of each test in extensive clinical evaluations before licensing. These criteria have been further evaluated by ongoing efforts to improve the sensitivity and specificity of the tests. It should be noted that not all EIA and Western blot tests on the market have the same diagnostic accuracy. The clinical validation of any unlicensed HIV diagnostic test kit should be evaluated prior to its use.

Western blot tests licensed by the FDA are also interpreted following the manu-

facturer's guidelines established through clinical testing. Current guidelines advise that a positive Western blot displays virus-specific bands in a pattern described by the test's manufacturer. Blots revealing the presence of bands that are insufficient to diagnose HIV infection are considered indeterminate; a test is usually scored negative only if no bands appear on the blot. Indeterminate tests are typically repeated at a later date if the clinical circumstances and history suggest an increased risk for HIV infection. The use of highly accurate EIA and Western blot tests in a tiered protocol can yield a false positive rate of only about one in 100,000 persons tested. In some countries, sensitive immunofluorescence techniques have been used in place of Western blotting to confirm a positive EIA result.

What are the clinical manifestations shortly following infection with the virus?

A mononucleosis-like syndrome has been described in many but not all patients after a presumed exposure to HIV with subsequent seroconversion. An estimated incubation period of three to six weeks precedes the development of an acute febrile illness lasting another two to three weeks. Fever is typically accompanied by chills, diarrhea, arthralgias, and myalgias. Patients commonly report headaches, which at times are associated with meningism. A characteristic maculopapular rash often occurs on the trunk for the duration of the acute illness.

Hematological abnormalities frequently include a mild leukopenia, lymphopenia, and a relative monocytosis. HIV has been isolated from both the cerebrospinal fluid (CSF) and blood at the time of the acute illness, which often presents as a lymphocytic meningitis. Serologic evidence of HIV infection is absent at the

time of symptoms, but seroconversion reportedly occurs within two to three months after the illness. The few reports of initial seroconversion confirm the presence of antibodies against the core and envelope constituents of the virus; however, newer laboratory techniques have indicated the presence of viral antigen at the time of presentation and preceding the antibody response.

What is the minimum infective dose of HIV?

The minimum number of viral particles leading to a productive HIV infection that culminates in human disease is not known. Blood transfusion-related cases of AIDS provide indirect information about the circumstances surrounding single exposures that result in HIV infection. These cases prove that single exposures are sufficient to infect a host and ultimately produce AIDS. One study showed that once an infected donor gave blood that led to infection in a recipient, all subsequently donated blood was also infectious. Blood that was most likely to be infectious was donated by individuals who developed AIDS in the next 23 months. In contrast, health-care workers exposed to needlesticks from HIV-infected patients rarely develop HIV infection. The risk of infection from the small amounts of blood contained in a typical needle (approximately one microliter) is estimated to be less than 1%. It is likely, therefore, that a single inoculum of blood will result in infection only if it is sufficiently large and delivered parenterally.

The risk of infection through sexual transmission can only be estimated. Studies of long-term monogamous heterosexual partners of persons with AIDS have found that only two-thirds or less of the partners show signs of infection despite months to years of unprotected sexual activity. Studies in homosexual men have demonstrated that the likelihood of

seropositivity rises with increasing numbers of different sex partners, but there has been no consistent correlation between seropositivity and the length of a relationship with a single partner or the number of sexual encounters with that partner. Perhaps genetic and environmental factors interact with differences in HIV strains to determine susceptibility in any given individual.

Are some individuals more likely to be infected with HIV than others?

The most important risk factors for infection are behaviors that allow an uninfected person to be exposed to an infected individual. Numerous investigations have attempted to identify genetic predispositions for infection when exposure to HIV takes place. Early reports identified plasma proteins called group components that seemed to confer relative resistance to HIV-1 infection; however, these reports remain unconfirmed in follow-up studies.

The lack of association between either the length of a sexual relationship or the number of exposures to a single individual and the risk for HIV seroconversion implies that other biological determinants may influence transmission during exposure to an infected individual. Some studies have shown a link between infection with other sexually transmitted diseases and risk of HIV infection, independent of the total number of sexual contacts. In addition, a history of genital ulcerative disease prior to HIV infection has been found in some groups studied. It is possible that lesions present in mucous membranes or skin at the time of an exposure to HIV increase the likelihood of infection.

Does the serologic response to the virus determine an individual's prognosis?

Researchers are attempting to identify a serologic pattern that characterizes the

course of infection with HIV. Initial indications are that early in infection there is a burst of viral protein production that is followed by the development of antibodies against the different viral proteins. Concurrent with antibody production, viral antigen becomes undetectable in most assays. During this interval, patients are often asymptomatic, but virus can be isolated from their peripheral blood.

Before the appearance of clinical AIDS, core antibody levels fall and viral antigen once again becomes detectable. Envelope antibodies often remain at high levels for the duration of infection. Thus, it appears that a fall in core antibody titers associated with a rise in viral antigen levels is a marker for progression of HIV infection to AIDS. At present it is unclear if the core antibody titer falls because of a debilitated immune system, or if it falls because it binds increasing levels of antigen. While these preliminary studies are provocative, the exact relationship of serology to the natural history of HIV infection remains to be firmly established.

Variations in many other serologic and immunologic determinants during HIV infection have been examined with inconsistent results. One reproducible observation is the fall in T4 cell numbers before the appearance of AIDS. The decrease in T4 cells is associated with many immunologic abnormalities that are readily demonstrable in a clinical laboratory.

Have any factors been identified that hasten the course of HIV-related disease?

The long period of apparent viral inactivity after infection and before the development of AIDS or AIDS-related complex (ARC) has raised questions about the possible influence of cofactors on the progression of HIV-related disease. In an effort to identify agents implicated in

promoting disease in infected individuals, several prospective studies have examined seropositive patients who went on to develop AIDS or ARC. One large study failed to identify factors that influenced the progression of disease in male homosexuals. Early hypotheses implicating cytomegalovirus and amyl nitrates as catalysts for the development of AIDS have not been confirmed, but pregnancy has been associated with an accelerated disease progression in women who are seropositive when pregnant.

Researchers have demonstrated that HIV has elaborate genetic controls that regulate reproduction of the virus and perhaps determine some of the clinical syndromes of AIDS. Immunologic activation of infected T-cells is known to induce HIV production in these cells, although the link of repeated antigenic stimuli to disease progression has not yet been conclusively demonstrated. Several different potential mechanisms by which agents might activate the virus are under study, but none has been clearly shown to serve as a cofactor.

Are babies born to HIV-infected mothers at risk for HIV infection?

The vast majority of children with AIDS have been born to a parent known to have AIDS or who is a member of a risk group for HIV infection. The isolation of HIV from umbilical cord blood, the presence of HIV in infants delivered by cesarean section, and the presence of a typical malformation in a series of HIV-infected infants show that infants can be infected with HIV in utero. The likelihood of infection in utero has been estimated in small studies to be from 40% to 50%. The small number of HIV-infected infants in the population relative to the number of child-bearing intravenous drug abusers supports these levels of transmission during pregnancy. Reports

of mothers giving birth to uninfected infants following the birth of an infected sibling further confirm that in utero infection is unpredictable. Infection during delivery has yet to be demonstrated, but a few case reports of HIV infection linked to breast-feeding have identified breast milk as a potential route of virus transmission. The inactivation of HIV in breast milk by pasteurization or other means has not been described.

Do prisoners represent a high-risk group for HIV infection?

AIDS cases have been identified with increasing frequency in prisons in many countries. The number of HIV-infected prisoners usually reflects the prevalence of HIV in the community from which the prisoners came. The reasons for HIV infection in prisoners vary, but in many countries prison inmates often have a history of intravenous drug abuse or prostitution. In addition, situational homosexuality can occur in prison due to the unique conditions imposed by prolonged incarceration. Thus, prisoners may already be infected with HIV at the time of incarceration or they may become infected during their internment.

In an attempt to deal with HIV infection in prisons, the World Health Organization has developed general guidelines for prison officials and health authorities. Control and prevention of HIV infection are to be undertaken within the context of the need to improve the overall hygiene and health facilities of prisons. Prison officials should recognize their responsibility to minimize HIV transmission in prisons and thereby protect the general community from infection when prisoners are released. Prisoners should have the same right of access as other members of the community to educational programs designed to minimize the spread of the disease. Likewise, they

should have access to confidential serologic testing for HIV infection with appropriate pre- and post-test counseling, access to appropriately trained medical personnel for patient services that are equivalent to those given to AIDS patients in the community at large, and access to information on treatment programs with the right to refuse such treatment.

Prisoners should not be subjected to discriminatory practices related to HIV infection or AIDS, including involuntary testing, segregation, or isolation, unless such action is required for the prisoner's own well-being. It is essential that all prison staff receive current information and education on AIDS as part of an effective HIV transmission prevention program. WHO has also recommended that prisoners with AIDS be considered for compassionate early release so that they may die in dignity and freedom.

WHO projects that HIV infection and cases of both AIDS and ARC will increase markedly in the next few years. In facing this problem, it notes that prison officials have the responsibility to ensure the safety of prisoners and staff and to minimize the transmission of HIV in prison. Because transmission of HIV may occur in prison through homosexual acts and intravenous drug abuse, officials are urged to implement education and drug-user rehabilitation programs. Careful consideration should be given to providing condoms in the interest of disease prevention.

What types of behavior or contact do not transmit the virus?

Casual contact of household members with AIDS patients is not associated with HIV transmission. Family contact of several years' duration, which included sharing beds, bathing facilities, toilets, kitchens, eating utensils, plates, and

towels, has not been linked to a single case of HIV infection. Studies examining the contacts of AIDS patients note that transmission did not occur even though many of the patients were bathed, dressed, and fed by family members, the patients' clothes were put in the family wash, and family members routinely kissed the patients on the cheek and lips. Other studies have noted the lack of HIV transmission following bites inflicted by both infected adults and children. There are no data to suggest that HIV-infected patients pose a risk of transmitting the virus other than through sexual contact or through the exchange of blood. Accordingly, it is not recommended that authorities impose restrictive measures on HIV-infected patients or limit their non-sexual contact with others in efforts to control the spread of infection.

Have insects been implicated in the spread of HIV?

There is no evidence that biting insects can transmit HIV. The potential transmission of HIV by this route has been investigated in a variety of studies. Laboratory work shows that HIV cannot replicate or survive for prolonged periods of time in arthropods, and epidemiologic studies show that AIDS cases continue to cluster in young adults of reproductive age, with a relative absence of cases in the very young and the very old—age groups that are potential targets for biting insects. The most compelling evidence for a lack of HIV transmission by insects comes from southern Florida, where a detailed investigation in an area with a very high prevalence of AIDS revealed no association of AIDS cases with exposure to insects. Serologic studies to detect exposure to both arthropod-borne viruses and HIV documented no increased incidence of arthropod-borne viruses in HIV-infected compared to uninfected individ-

uals. Also, careful follow-up of all AIDS cases in that area proved that the vast majority of patients came from well-recognized risk groups and that the age distribution of the infected persons did not include the non-sexually active age groups of children and the elderly.

What treatment has been shown to be effective against HIV in infected patients?

The genome of HIV encodes numerous structural and regulatory proteins that provide potential targets for pharmacologic intervention in the treatment of AIDS and its related disorders. Research and clinical trials have concentrated on identifying inhibitors of the viral enzyme reverse transcriptase. This enzyme catalyzes an essential step in the early stages of the reproduction of the virus. Although many agents are being investigated for their ability to interfere with this enzyme, the compound most thoroughly studied has been azidothymidine (AZT). This compound is an analogue of the thymidine that is normally incorporated into the viral RNA. The chemical modification in AZT (loss of the 3' hydroxyl group) prohibits the normal synthesis of viral DNA from the RNA template, and thereby is thought to inhibit replication of the virus.

In double-blind, placebo-controlled clinical studies performed on patients with advanced ARC or with AIDS manifested by recent *Pneumocystis carinii* infection, AZT decreased mortality and the frequency of opportunistic infections. In many patients receiving AZT there was also a transient improvement in T4 cell number and neurologic function. The drug produced numerous toxicities in the form of marked bone marrow suppression, headaches, myalgia, nausea, and insomnia. Despite the high cost of the drug and its significant toxicities, AZT is

currently the most efficacious drug available for use in individuals with AIDS or ARC. Its place in the treatment of other stages of HIV infection remains to be established, and such studies are already underway. Other compounds, including dideoxycytidine (ddC), alpha interferon, ribavirin, and tumor necrosis factor, are being evaluated in clinical trials now in progress.

No curative therapy for individuals infected with HIV has been identified. In addition to current antiretroviral therapy, short-term gains in prolonging the life of AIDS patients will center around the development of drugs that effectively treat the debilitating opportunistic infections and malignancies that afflict these patients. Other therapeutic advances will come with a more complete understanding of the life cycle and gene function of HIV, which are currently under investigation in laboratories around the world.

What are the costs of caring for an AIDS patient?

Most published figures for the costs of caring for AIDS patients come from estimates made in the United States. The economic cost of the first 10,000 AIDS cases in the United States, when expenditures for hospitalization and economic losses from disability and premature death are combined, has been estimated at over US\$4.8 billion. Of this total, about US\$1.4 billion went for payment of expenses directly related to patient care.

Studies have consistently documented the high cost of caring for AIDS patients in the United States, even if the expense of the recently available antiretroviral drug AZT is not included. The studies have shown the costs per patient to range from over US\$27,000 per year for inpatient care to over US\$46,000 per year of combined inpatient and outpatient care. Innovative community-based programs

that supplement hospital care and provide hospice services can decrease the costs of caring for AIDS patients. The actual price of medical care for AIDS patients will vary from country to country, but in no case will it be low. With increasing numbers of AIDS patients, the burden on health services will also increase and the availability of resources to address other health problems will be jeopardized.

Is there an effective prophylaxis against infection with HIV?

Mechanical and chemical barriers such as the condom and some spermicidal gels can provide protection against sexual transmission of the virus. Once the virus breaches these barriers and encounters infectable cells, no known factors—genetic or environmental—confer resistance to HIV infection in humans. Attempts to develop agents that can prevent infection after exposure to the virus have not been successful.

Drug trials currently center on altering the progression of HIV-related disease once infection has occurred. They have not systematically addressed the possible post-exposure protection against HIV provided by agents known to inhibit the virus. The role of immunoglobulins in development of passive protection after exposure has not been sufficiently studied. It has been noted, however, that neutralizing antibodies do occur in HIV-infected individuals, but they do not prevent the ultimate development of AIDS. Their ability to prevent primary infection has not been demonstrated.

What are the prospects for an effective vaccine against HIV?

An intensive search has been mounted to develop a vaccine against HIV. Initial efforts have centered on developing a

vaccine based on the virus envelope, which presents the outer protein coat of the virus to the immune system in the absence of an intact infectious virus particle. In the United States and some countries in Africa, early trials have begun in order to assess the ability of these vaccines to promote an immunologic response without adverse side effects.

Several difficulties must be overcome before a safe and effective vaccine is developed. The inherent variability of the virus, especially of its envelope, will present obstacles to the development of a single vaccine that will give protection against all isolates. Additionally, it is likely that the virus is transmitted at least in part by cell-to-cell spread, which could make an antibody-based vaccine inefficient in preventing infection. Another difficulty will be the design and execution of trials to adequately demonstrate that a candidate vaccine is safe and effective. The long incubation period of HIV-related disease will require protracted studies to prove that a vaccine will protect against disease following exposure to the virus.

Should the activities of HIV-infected individuals be restricted?

The legalized sequestering of HIV-infected individuals may significantly deter these people from presenting themselves to health-care providers. Fear of punishment for HIV infection could cause infected persons not to seek medical help when appropriate, not to reveal their potential HIV infection, and not to participate in epidemiologic studies and preventive programs.

Unlike other communicable diseases that are readily spread from person to person, HIV is transmitted inefficiently and only through intimate contact. HIV is not spread by any form of casual contact, and its transmission can be interrupted by changing the behaviors that

lead to its propagation. Uninfected individuals will not be at risk for infection unless they engage in sex with carriers of the virus or are exposed to the blood of these carriers. Adequate educational programs that inform the general public as well as at-risk and infected individuals of the mechanisms of HIV infection and that promote preventive behavior should greatly reduce the likelihood of transmission and spread of the virus.

Some countries provide for the detention of infected individuals who flagrantly ignore the risk that they pose to others and are thought to endanger the public significantly. Large-scale detention programs or quarantines have never been shown to reduce the spread of sexually transmitted diseases and are not likely to halt the spread of HIV. In a similar fashion, routine screening of travelers and the prohibition of HIV-seropositive persons from entry into a country is not thought to significantly reduce the introduction of the virus into new populations and is therefore not encouraged. Children who are infected with HIV need not be removed from the school system unless special circumstances such as poor personal hygiene or behavioral disorders are thought to pose a risk to others.

What evidence exists that an educational campaign can modify the risk of HIV transmission?

Programs that provide the public with basic information on AIDS and that describe behaviors known to transmit the virus are primary elements in controlling the AIDS epidemic. The homosexual communities of San Francisco and New York City, two areas with large and well-organized male homosexual populations severely affected by the epidemic, have carried out extensive educational campaigns to prevent the spread of the virus. These programs typically consisted of widespread community participation,

the distribution of educational literature, face-to-face counseling, telephone hotlines, support groups, and broadcast media campaigns. Studies to assess the impact of education in these cities have documented a clear reduction in behaviors known to transmit the virus.

A homosexual cohort studied in San Francisco demonstrated a marked decrease in the number of nonsteady sex partners over a period of years, along with a reduction in the number of individuals practicing receptive anal intercourse. Condom use has also increased in some of the populations receiving the coordinated educational barrage. Studies in other cities also demonstrate a reduction in risk behaviors, although the extent of reduction and duration of effect varies from study to study.

Similar attempts to reach the drug-abusing population are underway in some areas. While European and North American studies show that many intravenous drug abusers are aware of the risk of HIV infection, there is scant evidence to indicate that there has been a significant reduction in needle and syringe sharing despite the high levels of awareness. The utility of needle sterilization programs or providing "clean" needles directly to the user is presently under study.

Research performed in the United States has shown that while the public believes that AIDS is the most serious health threat to that nation and while many people display a basic understanding of the illness, misconceptions about the modes of transmission remain widespread. A study of the impact of an advertising campaign about AIDS on a group of young heterosexuals found no change following the campaign in either the frequency of sexual contacts or the use of a condom. It thus appears that information is not enough, and that the intensity of informational efforts and the

risk perceived by the population being addressed may influence the effectiveness of any educational program.

How can the fight against AIDS be funded in the Americas?

The AIDS problem in the Americas challenges national health care systems with already limited budgets to develop affordable approaches that will address a wide range of concerns. Any national or local AIDS program will require funding for public educational programs, patient care expenses, HIV screening, professional and technical training, and research and development initiatives. Other costs that are more difficult to cope with are the lost productivity of AIDS patients and the emotional trauma experienced by their friends and families.

Some of the financial burdens of caring for AIDS patients can be confronted by thoughtful community planning that addresses the long-range goal of reducing the number of infected individuals. Alternatives to expensive hospital-based care, including community support groups and hospices for AIDS patients, have been shown to reduce the cost of caring for terminally ill patients. In the absence of an efficacious vaccine or curative therapy, however, AIDS programs must center around prevention of new infections through targeted educational approaches and the screening of blood and blood products.

Financial and technical support for the establishment of national AIDS programs is being provided in part by funds raised by the World Health Organization. While this support is important to begin the fight against AIDS, additional funding and support from national and international sources in the respective countries will be required for operational and basic research to develop new preventive measures, treat infected patients, and develop educational services.