AIDS: a compilation on America and the Pacific

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Introduction

The first official announcement of what would mark the start of the AIDS pandemic came on 5th June 1981. The United States Centres for Disease Control and Prevention (CDC) reported five cases of unexplained immune suppression leading to Pneumocystis carinii pneumonia (PCP) in gay men in Los Angeles, California[1]. One month later, CDC described an epidemic of an aggressive form of Kaposi's sarcoma (KS) affecting gay men in California and New York[2]. Later this same syndrome was seen in haemophiliacs and injection drug users (IDUs), leading investigators to conclude that it was due to an infectious blood borne agent.

HIV was isolated in 1983[3] and in 1985 a test to screen blood for the presence of the HIV antibody was licensed and became widely available. Like other members of the retrovirus family, infected host cells permit a specific viral enzyme to change viral RNA into DNA, which then becomes incorporated into the infected cell's genome as a so-called "provirus". Once infected, an individual remains infected for life. HIV is lymphotropic; it has a preference for a specific white blood cell called the T-helper or T4. The T4 cell is sometimes referred to as "CD4 cell" because it has high concentrations of CD4 receptors on its surface.

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Natural history and HIV antibody testing

HIV infection may be manifested in a number of different ways. Although most infected individuals are asymptomatic at the time of infection, approximately 40% manifest a mononucleosis-like illness within the first one to three weeks after primary infection. Non-specific symptoms of this illness, including headache, muscle ache, sore throat and fever, last from one to three weeks. During this period of acute primary infection, before the body produces antibodies to HIV, high levels of HIV can be found in the blood. HIV levels decrease markedly, concurrent with seroconversion to an HIV antibody positive status[4]. Most infected individuals mount a detectable antibody response within six to 12 weeks after infection[5]. Virtually all infected individuals demonstrate antibodies to HIV within six months after exposure[6,7]. The period between infection with HIV and development of an antibody response is referred to as the "window" period. During this period, a person maybe highly infectious, although this infection will be undetectable by current HIV antibody assays[4].

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The current serum antibody testing protocol includes an initial ELISA test; if positive this is confirmed by a second ELISA test. If both tests are positive, a supplemental test is used to confirm the ELISA results. In most cases, this will be a Western blot, but in some instances, an indirect fluorescent antibody (IFA) test is used. The sensitivity and specificity of these tests, when performed by a laboratory with strict quality assurance protocols, are both greater than 99%[5].

Cost and logistic considerations, and technical improvements in the HIV antibody screening test have led to alternative approaches to HIV-antibody testing. The World Health Organisation (WHO) has recently defined three HIV antibody-testing strategies that rely only upon the use of ELISA or rapid/simple assays such as dot immunoassays and agglutination tests, and provide results equivalent in accuracy to those obtained using the Western blot[8,9]. This offers

a substantial savings in both time and money, without unduly compromising validity of test results.

Strategy I involves the use of a single ELISA or rapid/simple assay (ERS) test. This is proposed by WHO for serosurveillance purposes where the study population has an HIV prevalence rate higher than 10%. Strategy I is the minimum recommended HIV testing strategy for ensuring the safety of donated blood and tissues. Strategy II involves repeat ERS testing of all sample reactive by initial ERS test. This strategy is recommended for serosurveillance purposes where the study population has an HIV prevalence rate less than or equal to 10%. Strategy II may also be used to identify asymptomatic HIV-infected persons in study populations where the HIV prevalence rate is higher than 10%. Strategy III involves retesting, with a third ERS test, all sera reactive by two previous ERS tests. Strategy III is proposed for identification of asymptomatic HIV-infected persons in study populations where the HIV prevalence rate is less than or equal to 10%.

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Recently, saliva has been proposed as an alternative to sera for HIV antibody testing[10]. This non invasive alternative would provide a simple and safer means of sample collection. Trained phlebotomists would not be required, occupational risk of needle stick injuries would be eliminated, and the potential risk of infection from exposure to blood would be greatly diminished as the amount of infectious virus is much lower in saliva than in blood. However, WHO is awaiting the resolution of quality control and assurance issues before recommending saliva testing for routine HIV antibody testing purposes[11].

Although home test kits for HIV are currently unavailable, the ease with which one may self-collect saliva specimens, and the ability to use saliva for HIV antibody testing, has focused concerns on the future implications of home HIV testing. It is important to differentiate between the self-collection of saliva for antibody testing by a laboratory and the collection and testing of saliva in the home setting ("home-testing"). Home-testing would be for screening purposes only as it would involve either an ELISA or ERS tests. Persons with positive screens would need to obtain confirmatory blood testing by a medical laboratory. The idea of allowing persons the opportunity to perform their own initial HIV antibody screen is similar to the strategy behind the marketing of home test kits for pregnancy testing. Women with positive results on a home pregnancy tests are instructed to seek medical evaluation and confirmation of their status, as the home kit is for "screening" as opposed to "diagnostic" purposes, and as such, tends to have lower specificity. Confirmatory testing is imperative also because the potential for inaccurate results is substantially higher in the home setting than when testing is performed by trained laboratory technicians. The same arguments hold for HIV antibody home-testing. Home-testing for HIV antibodies would also uncouple counselling and testing. The linkage of HIV antibody testing with pre- and post-test counselling is seen by many public health professionals as a key strategy for educating individuals about HIV prevention[12]. Concern has been expressed that by unlinking testing and counselling, this opportunity for prevention intervention may be lost[13-15].

An inherent weakness of any antibody detection assay is the length of time between infection and antibody response. During this window period, infection is present but undetectable. All currently available HIV-antibody tests would miss early infections within the window period. Antigen detection assays, such as the polymerase chain reaction (PCR) or p24 detection assay, are able to detect the presence of HIV infection much more rapidly than antibody detection methods, as they react to the presence of the virus itself, or its components. However, cost and logistic constraints have prevented widespread use of these methods for routine screening purposes.

Diagnosis of HIV infection in an infant can be difficult, as passively transferred maternal IgG antibodies may persist for 12 months or more. Antigen detection tests such as the PCR, p24 detection assay, or HIV culture may be necessary for accurate diagnosis of HIV infection during the initial 18 months of life[16]. The mother of an HIV-infected child needs to be evaluated, especially if the child is very young. In a significant number of cases, an infected child is the first sign of infection in the mother.

The median time from HIV infection until the development of severe symptomatic HIV disease or AIDS is 8–12 years[17]. Previously, the characterisation of HIV-related illness included the creation of artificially demarcated phases. Persons who were symptomatic, but who did not meet the surveillance case definition of AIDS, were said to have "AIDS related complex" (ARC). Current thought is that infection with HIV reflects a continuum of illness, progressing from asymptomatic HIV infection, to symptomatic infection, to severe life threatening manifestations. Persons with HIV infection lose, on average, 25–40 T4 cells per L per year. Once a person's T4 cell level falls below 300 cells per L, symptoms of immunosuppression are usually present. These may include, but are not limited to : recurrent oral or vaginal candidacies; recurrent bouts of herpes zoster (shingles, zona), and/or oral leukoplakia[4]. When T4 cell levels

drop below 200 per L, a person meets the revised case definition of AIDS. Other "AIDS-defining" diagnoses include Pneumocystis carinii pneumonia (PCP), Kaposi's sarcoma (KS), toxoplasmosis of the brain, tuberculosis, and cytomegalovirus retinitis[18].

Transmission

HIV has been isolated from the blood, semen, vaginal and cervical secretions, spinal fluid, and in very low concentrations in urine, tears, and saliva of infected persons. However, HIV transmission has only been documented by the following means: sexual contact with an infected individual (including vaginal, anal, and less commonly, oral sex, as well as artificial insemination with infected semen); inoculation of , or in rare cases, skin or mucous membrane exposures to blood; transplantation of an organ from an infected individual; ingestion of infected breast milk; and perinatal exposure in children born to infected mothers. WHO has estimated the efficiency of HIV transmission by type of exposure (Table 1), concluding that direct blood stream inoculation via transfusion, and blood exposure during the perinatal period are significantly more likely to result in transmission than other more "common" means of exposure.

Table 1. Efficacy of HIV transmission by type of exposure (Ref. 19)

Type of exposure	% Efficacy per single exposure
Blood transfusion	> 90
Perinatal	30
Sexual intercourse	0.1 – 1.0
IDU (sharing needles)	0.5 – 1.0
Health care worker: needle stick	< 0.5

Risk of transmission is also a function of stage of disease: an individual is most infectious during the time of this/her acute primary HIV infection. Years later, as the disease progresses and T4 cell level declines, with concurrent onset of symptoms relating from immunosuppression, HIV levels in the blood again increase as does the risk of infectivity[4].

HIV is not transmitted through "casual" contact. Intensive CDC follow-up studies of household contacts of infected persons have revealed only eight cases of HIV transmission within a household setting not demonstrated to be due to sexual intercourse of needle sharing. Each case was associated with a chronic history of repeated contacts with HIV-infected blood or body secretions, mostly within the context of providing home health care to HIV-infected family members[20]. This underscores the need for adherence to "universal" precautions when dealing with blood and body fluids[21]. Universal precautions include the routine use of appropriate barriers to prevent skin and mucous membrane exposure when contact with blood or other body fluids is anticipated. Examples of such barriers include gloves, protective eye wear, and gowns. The underlying theme is that one must assume all blood and body fluids are potentially infectious. Despite persistent rumours and popular fears, mosquitoes cannot transmit HIV. It is doubtful that any insect, transmits HIV; to date none has been identified[22]. In 1986, when media reports seemed to suggest mosquitoes as an explanation for the high incidence of AIDS in Western Palm Beach, Florida, CDC investigations instead linked most cases to injection drug use and heterosexual spread from injection drug users[23]. Pets (other than primates) are not a source of HIV and therefore cannot transmit infection. There is no known relationship between betel nut chewing and HIV risk, whether or not the chewier gives oral sex. However, HIV can sometimes be transmitted to a person giving oral sex.

Epidemiology of AIDS

As of 1st July 1994, a cumulative total of 401 749 AIDS cases had been reported in the United States. Approximately 60% of reported case-patients have died. A majority of these cases (98.6%) were in individuals ≥ 13 years old. Of the adult and adolescent cases, 87% were male and 94% were in specific risk exposure categories, including men who have sex with men (53%); injection drug users (24%); men who have sex with men and also inject drug (6%), haemophiliacs (1%); transfusion recipients of infected blood/blood components (2%); and heterosexual contacts of individuals in one of the groups listed above (7%)[24]. Approximately 6% of AIDS cases do not fall into any of the specific risk behaviour/exposure groups. Such "risk not reported or identified" cases include persons whose exposure history is incomplete because they have died, declined to be interviewed, or were lost to follow-up As there has been no significant increase in the proportion of individuals in this category since CDC began its AIDS surveillance activities, these persons are thought to have contracted infection via known risk exposure activities.

Of US paediatric AIDS cases reported to the CDC, 89% were infants born to infected mothers. The vast majority were related to injection drug use by the child's mother or her sexual partner[24] . An HIV-infected mother runs a 15–40% chance of transmitting the infection perinatally[25].

As of 1st October 1994, there has been a cumulative total of 1,464 AIDS cases in Hawaii (132 cases per 100,000 population). HIV epidemiology in Hawaii is similar to that reported nationally: identified cases include men who have sex with men (80%); injection drug users (6%); men who have sex with men and also inject drug (7%); haemophiliacs (1%) recipients of infected blood/blood components (1%); heterosexual contacts of individuals in one of the above listed groups (3%); and undetermined risk (1%). Hawaii has had 12 paediatric AIDS cases: nine had been infected perinatally[26]

With respect to reported AIDS cases and AIDS surveillance, it is important to note that only full-blown AIDS is reported in most U.S. jurisdictions, and globally, AIDS surveillance is much more complete and accurate than HIV surveillance, AIDS has been called the "tip of the HIV iceberg". For every AIDS case in the population there are many in apparent HIV-infected persons. The ratio of HIV-infected persons to persons with AIDS changes rapidly over time. During the initial few years of epidemic spread within a population, the ratio may be greater than 1 000:1; within the first decade, the ratio falls to less than 10:1[27]. This phenomenon is due to the fact that most HIV-infected individuals will develop AIDS within 10-20 years after becoming infected[17]. There is an estimated cumulative total of 1 million HIV-infected individuals in the U.S., with approximately 5 000-7000 infected individuals in Hawaii.

AIDS reporting in developing countries is often imperfect. As of 1st July 1994, WHO has received a cumulative total of 985 119 AIDS case reports globally, but estimates the actual number of cases to be more than four times that number (four million), with an estimated 17 million cumulative HIV infections having occurred since the onset of the pandemic in the late 1970s. Many Health Departments and Ministries in Asian and Pacific jurisdictions are understaffed and are unable to obtain accurate and reliable health data. The accuracy and completeness of AIDS case reporting varies greatly from region to region: in Asia it is estimated to be less than 10%; in Africa, 12-15%; in Latin America, 25-30%; and in the U.S., 85-90%[28].

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Disease surveillance is an integral part of any HIV/AIDS prevention program. Globally, AIDS surveillance is largely based on systems relying upon passive reporting of cases[29]. In the U.S., in addition to passive reporting, active case finding is an essential component of AIDS surveillance. In large part, the reason for the high degree of accuracy and completeness of case reporting in the U.S., is related to active surveillance activities. Although information on prevalent AIDS cases is essential for current resource allocation purposes, it is of limited value for assessing future needs. Information gathered through surveillance of HIV infections (as opposed to AIDS cases) is much more pertinent for purposes of future health care and social service planning. With few exceptions, it is logistically impossible to carry out an ongoing surveillance program that includes an entire country's population. As HIV infections are not randomly distributed within the population, a strategy of well co-ordinated "sentinel" surveillance studies will provide valuable information on the status of the epidemic within the population without unreasonable costs. The object of sentinel surveillance is to a) identify the focus of infection, in order to target prevention, and b) follow trends in risk populations. Identifying which specific individuals within the population are HIV-infected, is not a goal of sentinel surveillance, although all HIV-positive persons identified by whatever means should be counselled and referred to health care providers. Where HIV prevalence rates are low, sentinel surveillance should focus predominately on population groups with "high risk" behaviours. One such group is sexually transmitted disease (STD) clinic patients. IDU may also be targeted at treatment facilities or rehabilitation centres. Sentinel surveillance should focus on easily defined accessible populations. Resampling may be undertaken on a periodic (e.g. semi-annual) basis. Reliance on specimens obtained from persons who request HIV antibody testing, or are approached and agree to be tested, introduces a high degree of selection bias and tends to underestimate the HIV infection rate in the study population. Hence it is recommended that specimens for surveillance purposes be obtained in an "unlinked" anonymous manner[29].

In the U.S., the population groups showing the most rapid increase in rates of HIV infection include heterosexual females and children, impacting African-American and Latino populations most severely[30, 31]. Between 1985 and 1988, the mortality rate for women due to AIDS quadrupled. HIV-related illness is now the leading cause of death among Black women aged 15-44 years old in New York and New Jersey. Their death rates are comparable to women living in the Ivory Coast of Africa[32]. In Thailand, a major HIV risk group is married women, reflecting HIV transmission between risk groups, in this case, from married heterosexual men who visit commercial sex workers, to the men's wives[33].

In 1992 in the U.S., HIV-related illness became the leading cause of death for males ages 25-44 years old, and the number four cause of death for females in this age group. HIV-related illness became the number eight leading cause of death for individuals of all ages[34].

Global perspective

The African continent accounts for over half of the estimated 17 million persons infected with HIV since the start of the pandemic[28]. The ratio of male to female AIDS cases is approximately one-to-one. This is in marked

contrast to the U.S., where male cases outnumber female cases 7:1. In Africa, heterosexual transmission appears to be the leading cause of infection. In the hardest hit regions, such as urban centres in the central African countries of Uganda and Zambia, approximately 20-30% of adults are HIV-infected, with over 10% of rural villagers being infected. In Nairobi, Kenya, 5-10% of all adults are infected. In Kigali, Rwanda, and in Blatyre, Malawi, approximately 30% of pregnant women have HIV infection[27].

Although the Americas, Europe, and Africa have been impacted the hardest by the AIDS pandemic, it is currently spreading in Asia faster than in any other region[28]. HIV seroprevalence studies of IDU in Thailand revealed how quickly HIV could spread through a population: the HIV infection rate increased from 1% in 1987 to 44% in August of 1988. A similar explosion in IDU has been seen in Vietnam. As in Africa, the HIV epidemic in Thailand is now predominately spread via heterosexual intercourse. In the northern Thai provinces, male military conscripts have demonstrated HIV seroprevalence rates of approximately 10%[33]. WHO estimates 2.5 million HIV-infected individuals in Asia[28]; Thailand alone accounts for an estimated 500 000-750 000[33].

As of 1st July 1994, AIDS cases have been reported from 12 Pacific Island jurisdictions, in addition to Australia and New Zealand (Table 2). Although the number of reported AIDS cases from the Pacific Islands jurisdictions are relatively low, between 1989 and 1993 this number has increased 500%[36].

Table 2. Cumulative AIDS cases from Oceania reported to WHO as of 1st July 1994 (Ref. 35)

Country/Area	Number of cases
Australia	4, 727
Fiji	6
French Polynesia	33
Guam	20
Kiribati	1
Northern Mariana Islands	4
Marshall Islands	2
Federated States of Micronesia	2
New Caledonia	32
New Zealand	431
Palau	1
Papua New Guinea	64
Western Samoa	1
Tonga	6

Lessons from the first decade

Public health professionals from Africa, Europe, and the Americas have learned many important lessons from the first decade of the HIV pandemic. These lessons should prove valuable to public health leaders and policy makers in Pacific jurisdictions. Sentinel surveillance systems for HIV are essential for early identification of HIV. These lessons should prove valuable to public health leaders and policy makers in Pacific jurisdictions. Sentinel surveillance systems for HIV are essential for early identification of HIV in the population as well as predicting future trends and planning for future needs. WHO is on record recommending the development of sentinel surveillance systems for routine public health surveillance of HIV infections[29].

Programs to educate the population about HIV risk behaviours are critically important. All our scientific findings lead us to conclude that AIDS is a preventable disease. Although it is an infectious viral disease, AIDS may also be considered a disease of risk behaviours. Even though education does not translate into behavioural change, it is a necessary first step. Early education targeting children within schools may be critical. Programs that incorporate open and relevant discussions with school children about sexual behaviours and condom usage do not lead to increases in sexual activity; on the contrary, such programs have been demonstrated to decrease sexual risk behaviours[37].

A key element in a successful HIV prevention program is a focus on the prevention and control of STD. The predominant means of HIV transmission globally is heterosexual intercourse. HIV infection should be seen as an STD, not only in its own right, but also because other sexually transmitted agents act synergistically to enhance the risk of acquiring HIV infection. This is true not only for genital ulcerative STD, but also for non ulcerative STD as well. Therefore, public health programs that successfully target STD will also reduce HIV transmission. This strategy is well articulated in the South Pacific Commission's Pacific AIDS Alert Bulletin: "Although the title of our publication is Pacific AIDS Alert, we refer to it as PASA (Pacific AIDS/STD Alert) because in the Pacific right now, sexually transmitted diseases (STD) are a bigger problem. While the number of AIDS cases is relatively low, in some island countries, the STD rate has reached epidemic proportions. In many others, STD is on the increase. In making the distinction between AIDS and STD, it is important to remember that the same type of behaviour - unprotected sexual intercourse with an infected partner - which can infect you with gonorrhoea, syphilis, genital herpes and other STD can infect you. HIV, the virus that causes AIDS"[38].

As of 1st July 1994, there have been 29 AIDS case reports from the nine former Trust Territories of the Pacific Islands (20 from Guam and 9 from the other island jurisdiction[3]). Limited seroprevalence studies undertaken in these populations indicate that HIV has not yet made significant inroads (unpublished data). However, reported STD rates in some American Pacific jurisdictions equal or surpass the rates seen in the U.S.: reported STD rates from Palau and Pohnpei are approximately equal to those seen in the U.S.[39], and epidemic syphilis has been reported in the Marshall

Islands[40]. Although HIV may initially be introduced into IDU or gay men, the size of these populations are much smaller than those of the heterosexual populations engaged in unprotected sex with multiple partners. It is apparent that in the long term, HIV will predominate as heterosexual STD in the Pacific, as it is now in Asia[41]

Behavioural surveys are needed to identify which HIV "risk" behaviours are practised in which population subgroups. Relevant questions include: to what extent are injection drug used; what is the prevalence of men having sex with men; what is the prevalence of premarital and extramarital sex; how often are condoms used during sexual encounters; and is the exchange of money or gifts for sex a common practice? Such information is needed in order to develop relevant HIV/AIDS prevention/education programs. Ongoing, population-based behavioral surveys could provide public health leaders and policy makers with this key information[41].

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Non-governmental organisations (NGOs) have played an invaluable role in assisting national governments in their responses to the HIV pandemic. NGOs may be able to address politically sensitive issues such as those relating to sexual and drug using behaviors in a more frank and direct way[42, 43]. In Hawaii, the Life Foundation, a community-based NGO, was funded by the state to develop and administer several HIV/AIDS prevention and care programs including a state-wide sterile needle exchange program for IDU.

The experiences and knowledge gained from the first decade of the HIV/AIDS pandemic can be used by public health leaders in the Pacific to develop relevant and effective prevention and education programmes. The HIV/AIDS epidemic has the potential to move rapidly through a population; it has been compared to a raging forest fire. A raging fire starts slowly, but once it takes hold, it is difficult to control. "Risk" behaviors are the kindling, and they are present throughout the Pacific. The way to control a forest fire is to prevent it from taking hold. We are in that narrow "window of opportunity" in the Pacific; the time for preventive action is now.

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" The experiences and knowledge gained from the first decade of the HIV/AIDS pandemic can be used by public health leaders in the Pacific to develop relevant and effective prevention and education programmes. "

"Education on safer sex and condom provision, together with treatment of other sexually transmitted diseases, are the cornerstones of our strategy to prevent sexual transmission of HIV."

Dr Michael Merson, Executive Director, WHO Global Programme on AIDS