Understanding HIV and AIDS

Goal: To provide funeral industry professionals with information about the Human Immuno-deficiency Virus (HIV) and Acquired Immuno-deficiency Syndrome (AIDS), including safety procedures and regulatory concerns affecting how it can be managed in the workplace.

Objectives: After completing the course, the student should be better able to:

- Understand the virus' life cycle, current research, and recommended treatments
- Identify modes of transmission, early symptoms, and related medical conditions
- Minimize risks of transmission by following appropriate safety procedures
- Understand and follow legal guidelines relating to HIV/AIDS-related issues.

Introduction

When what we have come to identify as HIV first became known to the world back in 1981, the response was one of horror, anger, and terror. As human beings anything which threatens us, and which we do not understand, is naturally frightening. With over 25 years of research, however, we are better able to manage this scourge. What was once experienced as a death sentence is now often considered to be more of a long-term illness, manageable through regimes of medication. With education and outreach we continue creating inroads to better inform and, most importantly, effect positive behavioral changes.

Microorganisms, such as viruses or bacteria that are carried in the blood and cause diseases in people, are called bloodborne pathogens. These include not only HIV, but any of the hepatitis viruses and syphilis (to name just a few). In some ways, private choices relating to personal 'recreational' (e.g., sex, drug use) activities are the most critical, because they hold the greatest risk of transmission for any individual.

While virtually anyone may be at risk of contracting such a disease, professionals in the funeral industry, much like those in the health care professions, must be especially diligent in their practice of safety procedures to minimize the risk of transmission. Workplace concerns, such as handling and embalming the deceased are complex. If you are the owner of a funeral home, you may need to manage the realities of HIV/AIDS on yet another level: if or when you learn that one of your employees has HIV, even if that happened outside of the workplace.

This course will review the facts of HIV as scientists currently understand them, as well as how to avoid or minimize risks and manage exposure, treatments, legal regulations, and future challenges.

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Statistics

The Centers for Disease Control (CDC) Estimates for the United States:

- Approximately 40,000 persons in the United States become infected with HIV each year.
- 24 to 27% of people with HIV are undiagnosed and unaware of their infection
- The cumulative estimated number of deaths of persons with AIDS in the United States and dependent areas, through 2005, was 550,394.

The Joint United Nations Program on HIV/AIDS (U.N.A.I.D.S.) Worldwide Estimates for 2006:

- The number of people living with HIV ranges between 34.1 and 47.1 million
- People newly infected with HIV ranges between 3.6 and 6.6 million
- Number of AIDS deaths ranges between 2.5–3.5 million

Myths about HIV and AIDS

Research has revealed a great deal of valuable medical, scientific, and public health information about HIV and AIDS. Ways in which HIV can be transmitted have been clearly identified. Unfortunately, false information or statements that are not supported by scientific findings continue to be shared widely through word of mouth, the Internet or popular press. So let's begin by considering a few frequently asked questions about HIV and AIDS, hoping at the same time to dispel some of the myths.

Can I get HIV from casual contact (shaking hands, hugging, using a toilet, drinking from the same glass as someone who is HIV-infected, or being close to an infected person who is sneezing or coughing)?

HIV is not transmitted by casual day-to-day contact in social settings, schools, or the workplace. You cannot be infected by shaking someone's hand, by hugging someone, by using the same toilet, or by being exposed to coughing or sneezing by an infected person. HIV is NOT an airborne pathogen.

Does HIV only affect homosexuals and drug users?

Anyone who has unprotected sex, shares injecting equipment, has a transfusion with contaminated blood, or does not take necessary protective measures when working with a potential source of infection, can become infected with HIV. Infants can be infected with HIV from their mothers during pregnancy, during labor, or after delivery through breastfeeding.

Can you tell someone has HIV just by looking at them?

You cannot tell if someone has HIV or AIDS by just looking at them. A person infected with HIV may look healthy and feel good, but they can still pass the virus to you. A blood test is the only way a person can find out if he or she is infected with HIV.

Can I have more than one sexually transmitted disease at a time?

Absolutely, you can have more than one sexually transmitted infection (STD) at the same time. Each infection requires its own treatment. Many men and women do not see or feel any early symptoms when they first become infected with an STD, however, they can still infect their sexual partner.

Are mosquito bites a risk of infection with HIV?

HIV is not spread by mosquitoes or other biting insects. Even if the virus enters a mosquito or another sucking or biting insect, it cannot reproduce in insects. Since the insect cannot be infected with HIV, it cannot transmit HIV to the next human it feeds on or bites.

When you are on antiretroviral therapy, can you transmit the virus to others?

Antiretroviral therapy does not prevent an infected person from passing on the virus to others. Therapy can keep viral load down to undetectable levels, but HIV is still present in the body and can be transmitted to others through sexual contact, by sharing injecting equipment, or by mothers breastfeeding their infants.

Does male circumcision reduce the risk of acquiring/transmitting HIV?

U.N.A.I.D.S. reports that the results of three randomized controlled trials indicate male circumcision, performed by well-trained medical professionals, is safe and reduces the risk of acquiring HIV infection by approximately 60%. However, experts caution that male circumcision is no cure-all. Where it is promoted for HIV prevention, it should be emphasized as an additional HIV prevention choice to complement other known effective preventive methods (e.g., abstinence from penetrative sex; correct and consistent use of condoms).

The Virus

Physiology

HIV belongs to a class of viruses called retroviruses, which have genes composed of ribonucleic acid (RNA) molecules. Like all viruses, HIV can replicate only inside cells, commandeering the cell's machinery to reproduce. However, only HIV and other retroviruses, once inside a cell, use an enzyme called reverse transcriptase to convert their RNA into DNA, which can be incorporated into the host cell's genes.

HIV belongs to a subgroup of retroviruses known as lentiviruses, or slow viruses. The course of infection with these viruses is characterized by a long interval between initial infection and the onset of serious symptoms.

Structure of HIV

HIV is composed of two distinct components, the viral envelope and the viral core. The viral envelope is the outer coat of the virus. It is composed of two layers of fatty molecules called lipids, taken from the membrane of a host human cell when a newly formed virus particle buds from the cell.

Within the envelope of a mature HIV particle is a bullet shaped core or capsid, made of 2000 copies of another viral protein, p24. The capsid surrounds two single strands of HIV RNA, each of which has a copy of the virus's nine genes.

Life Cycle of HIV

Entry of HIV Into the Cells.
Infection typically begins when an HIV particle, which contains two copies of the HIV RNA, encounters a cell with a surface molecule called a cluster designation 4 (CD4). Cells with this molecule are known as CD4 positive cells. The membranes of the virus and the cell fuse. Following the fusion, the virus's RNA, proteins, and enzymes are released into the cell. Drugs that block either the binding or the fusion process are being developed and tested in clinical trials. The Food and Drug Administration (FDA) has approved one of the so-called fusion inhibitors for use in HIV-infected people.

Reverse Transcription
In the cytoplasm of the cell, HIV reverse transcriptase converts viral RNA into DNA, the nucleic acid form I which the cell carries its genes. Most drugs (approximately 15) approved in the United States for treating people with HIV infection work by interfering with this stage of the viral live cycle.

Integration
The newly made HIV DNA moves to the cell's nucleus, where it is spliced into the host's DNA with the help of HIV integrase. HIV DNA that enters the DNA of the cell is called a provirus. Several drugs that target the integrase enzyme are in the early stages of development and are being investigated for their potential as antiretroviral agents.

Transcription
For a provirus to produce new viruses, RNA copies must be made that can be read by the host cell's protein-making machinery. These copies are called messenger RNA (mRNA), and production of mRNA is called transcription, a process that involves the host cell's own enzymes.

Translation
After HIV mRNA is processed in the cell's nucleus, it is transported to the cytoplasm. HIV proteins are critical to this process. In the cytoplasm, the virus co-opts the cell's protein-making machinery, including the ribosomes, to make long chains of viral

proteins and enzymes, using HIV mRNA as a template. This process is called translation.

Assembly and Budding

Newly made HIV core proteins, enzymes, and RNA gather just inside the cell's membrane, while the viral envelope proteins aggregate within the membrane. An immature viral particle forms and pinches off from the cell, acquiring an envelope that includes both cellular and HIV proteins from the cell membrane. During this part of the viral life cycle, the core of the virus is immature and the virus is not yet infectious. The long chain of proteins and enzymes that make up the immature viral core are now separated into smaller pieces by a viral enzyme called protease. This step results in infectious viral particles.

Drugs called protease inhibitors interfere with this step of the viral life cycle. The FDA has approved approximately eight such drugs for marketing in the United States.

Recently, researchers have discovered that virus budding from the host cell is much more complex than previously thought. Discovery of this budding pathway has revealed several potential points for intervening in the viral replication cycle. An HIV inhibitor that targets a unique step in the viral life cycle, very late in the process of viral maturation, has been identified and is currently undergoing further development.

Strains of HIV

Researchers discovered the primary causative viral agent of AIDS in 1984: the human immunodeficiency virus type 1 (HIV-1). In 1986 a second type of HIV, called HIV-2, was isolated.

The strains of HIV-1 can be classified into three groups: the "major" group M, the "outlier" group O and the "new" group N. These three groups may represent three separate introductions of simian immunodeficiency virus into humans.

More than 90% of HIV-1 infections belong to HIV-1 group M. Within group M there are known to be at least nine genetically distinct subtypes (or clades) of HIV-1. These are subtypes A, B, C, D, F, G, H, J and K. (Group O appears to be restricted to west-central Africa and group N - discovered in 1998 in Cameroon - is extremely rare.)

Occasionally, two viruses of different subtypes can meet in the cell of an infected person and mix together their genetic material to create a new hybrid virus (a process similar to sexual reproduction, and sometimes called "viral sex"). Many of these new strains do not survive for long, but those that infect more than one person are known as "circulating recombinant forms" or CRFs. For example, the CRF A/B is a mixture of subtypes A and B.

 It is almost certain that new HIV genetic subtypes and CRFs will be discovered in the future, and indeed that new ones will develop as virus recombination and mutation continue to occur. The current subtypes and CRFs will also continue to spread to new areas as the global epidemic continues.

The HIV-1 subtypes and CRFs are very unevenly distributed throughout the world, with the most widespread being subtypes A and C. As examples: Subtype A and CRF A/G predominate in West and Central Africa, with subtype A possibly also causing much of the Russian epidemic. Historically, subtype B has been the most common subtype/CRF in Europe, the Americas, Japan and Australia. Although this remains the case, other subtypes are becoming more frequent and now account for at least 25% of new infections in Europe.

Multiple Infections

Until about 1994, it was generally thought that individuals do not become infected with multiple, distinct HIV-1 strains. Since then, many cases of people co-infected with two or more strains have been documented.

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

Means of Transmission

Among adults, HIV is spread most commonly during sexual intercourse with an infected partner. During intercourse, the virus can enter the body through the mucosal linings of the vagina, vulva, penis, or rectum or, rarely, via the mouth and possibly the upper gastrointestinal tract after oral sex. The likelihood of transmission is increased by factors that may damage these linings, especially other sexually transmitted infections that cause ulcers or inflammation.

The proper and consistent use of condoms when engaging in sexual intercourse--vaginal, anal, or oral--can greatly reduce a person’s risk of acquiring or transmitting sexually transmitted diseases, including HIV infection. Condoms are classified as medical devices and are regulated by the Food and Drug Administration (FDA). Condom manufacturers in the United States test each latex condom for defects, including holes, before it is packaged.

There are many different types and brands of condoms available--however, only latex or polyurethane condoms provide a highly effective mechanical barrier to HIV. In laboratories, viruses occasionally have been shown to pass through natural membrane ("skin" or lambskin) condoms. Women may wish to consider using the female condom when a male condom cannot be used.

Although some laboratory evidence shows that spermicides can kill HIV, researchers have not found that these products can prevent a person from getting HIV. Work

continues on the development of topical microbicides that could be used in the vagina or rectum to prevent transmission.

HIV also can be transmitted by contact with infected blood, most often by the sharing of needles or syringes contaminated with minute quantities of blood containing the virus. The risk of acquiring HIV from blood transfusions is extremely small in the United States, as all blood products in this country are screened routinely for evidence of the virus.

Almost all HIV-infected children in the United States get the virus from their mothers before or during birth. The virus also may be transmitted from an HIV-infected mother to her infant via breastfeeding. In the United States, approximately 25 percent of pregnant HIV-infected women not receiving antiretroviral therapy have passed on the virus to their babies. The use of combinations of antiretroviral drugs and simpler drug regimens has reduced the rate of mother-to-child HIV transmission in the United States.

Casual contact through closed-mouth or "social" kissing is not a risk for transmission of HIV. Because of the potential for contact with blood during "French" or open-mouth kissing, the CDC recommends against engaging in this activity with a person known to be infected. However, the risk of acquiring HIV during open-mouth kissing is believed to be very low.

In 1997, the CDC published findings from a state health department investigation of an incident that suggested blood-to-blood transmission of HIV by a human bite. There have been other reports in the medical literature in which HIV appeared to have been transmitted by a bite. Severe trauma with extensive tissue tearing and damage and presence of blood were reported in each of these instances. Biting is not a common way of transmitting HIV. In fact, there are numerous reports of bites that did not result in HIV infection.

 HIV has been found in saliva and tears in very low quantities from some AIDS patients. It is important to understand that finding a small amount of HIV in a body fluid does not necessarily mean that HIV can be transmitted by that body fluid. HIV has not been recovered from the sweat of HIV-infected persons. Contact with saliva, tears, or sweat has never been shown to result in transmission of HIV.

From the onset of the HIV epidemic, there has been concern about transmission of the virus by biting and bloodsucking insects. However, studies have shown no evidence of HIV transmission through insects--even in areas where there are many cases of AIDS and large populations of insects such as mosquitoes. Lack of such outbreaks, despite intense efforts to detect them, supports the conclusion that HIV is not transmitted by insects. For example, if mosquitoes could transmit HIV infection, many more young children and preadolescents would have been diagnosed with AIDS.

Differences in Transmission of Subtypes

It has been observed that certain subtypes/CRFs are predominantly associated with specific modes of transmission. In particular, subtype B is spread mostly by homosexual

contact and intravenous drug use (essentially via blood), while subtype C and CRF A/E tend to fuel heterosexual epidemics (via a mucosal route).

More recent studies have looked for variation between subtypes in rates of mother-to-child transmission. One of these found that such transmission is more common with subtype D than subtype A. Another reached the opposite conclusion (A worse than D), and also found that subtype C was more often transmitted that subtype D. A third study concluded that subtype C is more transmissible than either D or A. Other researchers have found no association between subtype and rates of mother-to-child transmission.

Prevention

Scientists and medical authorities agree that HIV does not survive well in the environment, making the possibility of environmental transmission remote. HIV is found in varying concentrations or amounts in blood, semen, vaginal fluid, breast milk, saliva, and tears. No one has been identified as infected with HIV due to contact with an environmental surface. Additionally, HIV is unable to reproduce outside its living host (unlike many bacteria or fungi, which may do so under suitable conditions), except under laboratory conditions, therefore, it does not spread or maintain infectiousness outside its host.

Education is one of the most powerful tools in preventing the transmission of HIV or any other bloodborne pathogen, but only when it successfully leads to healthy behavior. With respect to one's personal life, 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 having unprotected sex. **In certain professions, however, there are additional risks.**

Funeral Service Professionals

Funeral service workers, like those in the health care industries, are among those who may confront exposure in ways that the general population usually does not. This is especially important when we consider that a 'source individual' of infection means anyone, living or dead, whose blood or other potentially infectious materials may present a risk of occupational exposure to the worker. HIV has been known to survive for days in the bodies of unembalmed deceased persons. The risks of exposure include initial removal, preparing unembalmed remains, embalming, and preparation for cremation. Therefore it is essential to be familiar with, and adhere to, the OSHA Bloodborne Pathogen Standard. Following are some highlights from that Standard:

- All potentially infectious body fluids or other materials must be treated as if they are known to be infected with pathogens.
- Thoroughly wash hands with an FDA listed antimicrobial liquid hand soap.
- Follow procedures for minimizing needlesticks, splashing/spraying of blood. These include, but are not limited to, avoiding the recapping of needles; placing needles and other "sharps" in properly labeled or color coded, closable, puncture-resistant containers with leak-proof sides and bottom.

- Contain and dispose of regulated wastes, using proper labeling and packaging for washing, decontamination, storage, or shipping purposes.
- Prohibit eating, drinking, smoking, applying cosmetics of lip balm, and handling contact lens in work areas where there is a reasonable likelihood of occupational exposure.
- The employer must require workers to use appropriate Personal Protective Equipment (PPE), which must be provided and maintained/replaced at no cost to workers. These include gloves, goggles, face shields, and aprons.
- Maintain a written schedule for cleaning and method of decontamination to be used following contact with potentially infectious materials. Generally, all surfaces, tools, equipment and any other objects that come in contact with potentially infectious materials must be decontaminated and sanitized as soon as possible.
- Guidelines apply to removal vehicles and related materials. Removal personnel should be trained in proper removal techniques and use of PPE; removal vehicles should have a supply of PPE.
- Soiled linen should be bagged or placed in containers, and transported in a way that will prevent leakage.
- Biohazard symbols should be pictured on warning labels affixed to containers of regulated waste, refrigerators and freezers, and other containers which are used to store or transport blood or other potentially infectious materials.

 **Federal Trade Commission regulations prohibit charging a family more money for preparing a body that is infected by HIV (which would also be a violation of the American with Disabilities Act). Furthermore, a decedent infected by HIV cannot be denied the same services as the general public.**

Risks / Prevention in Other Settings

In the health care setting, workers have been infected with HIV after being stuck with needles containing HIV-infected blood or, less frequently, after infected blood gets into a worker's open cut or a mucous membrane (for example, the eyes or inside of the nose). There has been only one instance of patients being infected by a health care worker in the United States; this involved HIV transmission from one infected dentist to six patients. Investigations have been completed involving more than 22,000 patients of 63 HIV-infected physicians, surgeons, and dentists, and no other cases of this type of transmission have been identified in the United States.

There is no known risk of HIV transmission to co-workers, clients, or consumers from contact in industries such as food-service establishments. Food-service workers known to be infected with HIV need not be restricted from work unless they have other infections or illnesses (such as diarrhea or hepatitis A) for which any food-service worker, regardless of HIV infection status, should be restricted. All food-service workers should follow recommended standards and practices of good personal hygiene and food sanitation.

In 1985, CDC issued routine precautions that all personal-service workers, such as barbers and massage therapists, and tattoo artists should follow: instruments that are intended to penetrate the skin (e.g., needles) should be used once and disposed of, or thoroughly cleaned and sterilized; instruments not intended to penetrate the skin but which may become contaminated with blood (e.g., scissors) should be used for only one client and disposed of or thoroughly cleaned and disinfected after each use.

Occupational Exposure and Post-Exposure Prophylaxis (PEP)

PEP, as the name suggests, is prophylaxis (preventative) medications given after an HIV, or suspected HIV, exposure, in hopes of decreasing the likelihood of HIV infection. Although the most important strategy for reducing the risk of HIV transmission is to prevent exposures, plans for post-exposure management of healthcare and other workers should be in place.

An exposure that might place someone at risk for HIV infection is defined as a percutaneous injury (e.g., a needlestick or cut with a sharp object), contact of mucous membranes, or nonintact skin (e.g., exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, tissue, or other body fluids that are potentially infectious. Though the risk of infection is not known, the following fluids also are considered potentially infectious: cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid. Feces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus are not considered potentially infectious unless they contain blood. The risk for transmission of HIV infection from these fluids and materials is extremely low.

For most HIV exposures that warrant PEP, a basic 4-week, two-drug (there are several options) regimen is recommended. For HIV exposures that pose an increased risk of transmission (based on the infection status of the source and the type of exposure), a three-drug regimen may be recommended. Special circumstances such as a delayed exposure report, unknown source person, pregnancy in the exposed person, resistance of the source virus to antiviral agents, and toxicity of PEP regimens must also be considered.

Occupational exposures should be treated as urgent medical concerns. Individuals with occupational exposure to HIV should receive follow-up counseling, post-exposure testing, and medical evaluation, regardless of whether they receive PEP. HIV-antibody testing should be performed for at least 6 months post-exposure (e.g., at 6 weeks, 12 weeks, and 6 months).

Testing and Diagnosis

Because early HIV infection often causes no symptoms, the diagnosis is made by testing a person’s blood for the presence of antibodies to HIV. The standard HIV test looks for antibodies in a person's blood. When HIV (which is a virus) enters a person's body, special proteins are produced. These are called antibodies. Antibodies are the body's response to an infection. So if a person has antibodies to HIV in their blood, it means they have been infected with HIV. The only exception might be an HIV negative

baby born to a positive mother. Babies retain their mother's antibodies for up to 18 months, so may test positive on an HIV antibody test, even if they are actually HIV negative. This is why babies born to positive mothers may receive a PCR test after birth.

 Getting tested earlier than 3 months may result in an unclear test result, as an infected person may not yet have developed antibodies to HIV. **The time between infection and the development of antibodies is called the "window period."** During the window period people infected with HIV have no antibodies in their blood that can be detected by an HIV test. However, the person may already have high levels of HIV in their blood, sexual fluids or breast milk. Someone can transmit HIV to another person during the window period even though they do not test positive on an antibody test. So it is best to wait for at least 3 months after the last time you were at risk before taking the test, and in the meantime to abstain from sex. Some test centers may recommend testing again at 6 months, just to be extra sure.

Types of HIV Tests

There are three main types of HIV tests:

The first type of test is the HIV antibody test. This test shows whether a person has been infected with HIV, the virus that causes AIDS. Antibody tests are also known as ELISA (Enzyme-Linked Immunosorbent Assay) tests.

The second type of test is an antigen test. Antigens are the substances found on a foreign body or germ that trigger the production of antibodies in the body. The antigen on HIV that most commonly provokes an antibody response is the protein P24. Early in the infection, P24 is produced in excess and can be detected in the blood serum by a commercial test (although as HIV becomes fully established in the body it will fade to undetectable levels). P24 antigen tests are sometimes used to screen donated blood, but they can also be used to test for HIV in individuals, as they can detect HIV earlier than standard antibody tests. Some of the most modern HIV tests combine P24 and other antigen tests with standard antibody identification methods to enable earlier and more accurate HIV detection.

The third type of test is a DNA or RNA test. These types of tests detect the genetic material of HIV itself, and can identify HIV in the blood within a week of infection. DNA/RNA tests come in a number of forms. Babies born to HIV positive mothers may be tested using a type of DNA test called a PCR (Polymerase Chain Reaction). Blood supplies in developed countries are screened for HIV using an RNA test known as NAT (Nucleic Acid-amplification Testing). When a person already knows that she or he is infected with HIV, they may also have a viral load test to detect HIV genetic material and estimate the level of virus in the blood. DNA/RNA tests are rarely used to test for HIV in adults, as they are very expensive and more complicated to administer than a standard antibody or P24 test.

It is also important that you are not exposed to further risk of getting infected with HIV during the window period. The test is only accurate if there are no other exposures between the time of possible exposure to HIV and testing.

Most people develop detectable HIV antibodies within 6 to 12 weeks of infection. In very rare cases, it can take up to 6 months. It is exceedingly rare for someone to take longer than 6 months to develop antibodies, so if an individual's test is negative at six months, and they have not been exposed in the meantime, they are considered to be uninfected.

 The only way to know for sure whether you are infected with HIV is to have an HIV antibody test. It is not possible to tell from symptoms alone.

Reasons to Have an HIV Test

Many people who have an HIV test have been worrying unnecessarily. Getting a negative result (which means you are not infected with HIV) can put your mind at rest. If your test result is positive, many things can be done to help you to cope with the HIV positive result and look after your health. If your test is positive, then:

- A doctor can keep an eye on your health. Many people who test positive stay healthy for several years. But if you fall ill, there are many drugs called antiretrovirals that can help to slow down the virus and maintain your immune system. You can also have medicines to prevent and treat some of the illnesses that people with HIV get. You may also have access to trials of new drugs and treatments.
- If you do fall ill, the doctor is going to take your symptoms more seriously if they know that you are HIV positive.
- If you know that you are HIV positive, you can take steps to protect other people. For example, by practising safe sex and informing you past sexual partners.
- Knowing that you have HIV may affect some of your future decisions and plans, for example starting a family.

Where to Get Tested

In most countries, there are many places that you can get tested for HIV. It is recommended that you get the HIV test done at a health clinic or at the doctor's office. When you go to get tested, you will see a doctor, trained counselor, a nurse or some other health professional in private. He or she will explain what the test involves and what the result means. Normally a small sample of blood will be taken from your arm, sent to a laboratory and tested. Rapid HIV tests are also available now. The advantage of a rapid test is that you do not have return to get your test result. The test results from a rapid test are usually available in approximately 30 minutes. Rapid tests are single-use, and do not require laboratory facilities or highly trained staff. Depending on the test used, it can take anywhere from 30 minutes to a week or longer to get the result back.

While it is generally recommended that the HIV test is done in a health care setting, in some countries 'home sampling' kits are available. With a home sampling kit, a person can take a small blood sample and then send it to a laboratory for testing. A few days

later, the person phones up a special number, gives their individual identification code, and is given the result over the phone. If the result is positive then a professional counselor will provide emotional support and referrals.

With home sampling, the major advantages are convenience, speed, privacy and anonymity. In countries where HIV tests are not free, home sampling may be a cost-effective way to get tested. But for some people, the lack of face-to face counseling before and after the test may be a disadvantage.

There is a difference between home 'sampling' and home 'testing.' Using an HIV test kit at home means that the results are learned on the spot without any counseling. Reactive test results must be confirmed by further testing at a clinic. In many countries, including the United States, it is illegal to sell HIV test kits to the public.

How accurate are HIV tests?

EIA (ELISA) tests which can detect either one or both types of HIV have been available for a number of years. According to the CDC, current HIV-1 EIAs "can accurately identify infections with nearly all non-B subtypes and many infections with group O HIV subtypes." However, because HIV-2 and group O infections are extremely rare in most countries, routine screening programs might not be designed to test for them. Anyone who believes they may have contracted HIV-2, HIV-1 group O or one of the rarer subtypes of group M should seek expert advice.

Rapid tests - which can produce a result in less than an hour - are becoming increasingly popular. Most modern rapid HIV-1 tests are capable of detecting all the major subtypes of group M. Rapid tests which can detect HIV-2 are also now available.

Standard HIV antibody (ELISA) tests are at least 99.5% accurate when it comes to detecting the presence of HIV antibodies. This high level of sensitivity however means that their specificity (ability to distinguish HIV antibodies from other antibodies) is slightly lowered. Any HIV positive result given by an ELISA test must therefore be confirmed using a second test. Secondary tests include:

- Western Blot Assays – One of the oldest but most accurate confirmatory antibody tests. It is complex to administer and may produce indeterminate results if a person has a transitory infection.
- Indirect Immunofluorescence Assay – Like the Western blot, but uses a microscope to detect HIV antibodies.
- Line Immunoassay - Commonly used in Europe. Reduces chance of sample contamination and is as accurate as the Western Blot.
- A second ELISA – In resource-poor settings with relatively high prevalence, a second ELISA test may be used to confirm a diagnosis. The second test will usually be a different commercial brand and will use a different method of detection to the first.

When two tests are combined, the chance of getting an inaccurate result is much less than 0.1%.

Babies born to mothers infected with HIV may not be infected with the virus, but all carry their mother's antibodies to HIV for several months. If these babies lack symptoms, a definitive diagnosis of HIV infection using standard antibody tests cannot be made until after 15 to 18 months of age. By then babies are unlikely to still carry their mother's antibodies and will have produced their own, if they are infected.

The Stages of HIV Infection

HIV infects cells in the immune system and the central nervous system. The main type of cell that HIV infects is the T helper lymphocyte. These cells play a crucial role in the immune system, by coordinating the actions of other immune system cells. A large reduction in the number of T helper cells seriously weakens the immune system.

HIV infects the T helper cell because it has the protein CD4 on its surface, which HIV uses to attach itself to the cell before gaining entry. This is why the T helper cell is sometimes referred to as a CD4+ lymphocyte. Once it has found its way into a cell, HIV produces new copies of itself, which can then go on to infect other cells.

Over time, HIV infection leads to a severe reduction in the number of T helper cells available to help fight disease. The process usually takes several years.

HIV infection can generally be broken down into four distinct stages: primary infection, clinically asymptomatic stage, symptomatic HIV infection, and progression from HIV to AIDS.

STAGE 1: Primary HIV Infection

This stage of infection lasts for a few weeks and is often accompanied by a short flu-like illness. In up to about 20% of people the symptoms are serious enough to consult a doctor, but the diagnosis of HIV infection is frequently missed.

During this stage there is a large amount of HIV in the peripheral blood and the immune system begins to respond to the virus by producing HIV antibodies and cytotoxic lymphocytes. This process is known as seroconversion. If an HIV antibody test is done before seroconversion is complete then it may not be positive, even if the virus is present.

STAGE 2: Clinically Asymptomatic Stage

This stage lasts for an average of ten years and, as its name suggests, is free from major symptoms, although there may be swollen glands. The level of HIV in the peripheral blood drops to very low levels but people remain infectious and HIV antibodies are detectable in the blood, so antibody tests will show a positive result.

Research has shown that HIV is not dormant during this stage, but is very active in the lymph nodes.

STAGE 3: Symptomatic HIV Infection

Over time the immune system becomes severely damaged by HIV. This is thought to happen for three main reasons:

- The lymph nodes and tissues become damaged or 'burnt out' because of the years of activity;
- HIV mutates and becomes more pathogenic, in other words stronger and more varied, leading to more T helper cell destruction;
- The body fails to keep up with replacing the T helper cells that are lost.

As the immune system fails, so symptoms develop. Initially many of the symptoms are mild, but as the immune system deteriorates the symptoms worsen.

Symptomatic HIV infection is mainly caused by the emergence of opportunistic infections and cancers that the immune system would normally prevent. These can occur in almost all the body systems, but common examples are featured in the table below.

As the table below indicates, symptomatic HIV infection is often characterized by multi-system disease. Treatment for the specific infection or cancer is often carried out, but the underlying cause is the action of HIV as it erodes the immune system. Unless HIV itself can be slowed down the symptoms of immune suppression will continue to worsen.

Examples of Opportunistic Infections/Cancers

Respiratory system
- Pneumocystis Carinii Pneumonia (PCP)
- Tuberculosis (TB)
- Kaposi's Sarcoma (KS)

Gastro-intestinal system
- Cryptosporidiosis
- Candida
- Cytomegolavirus (CMV)
- Isosporiasis
- Kaposi's Sarcoma

Central/peripheral Nervous system
- HIV
- Cytomegolavirus
- Toxoplasmosis
- Cryptococcosis
- Non Hodgkin's lymphoma
- Varicella Zoster
- Herpes simplex

Skin

- Herpes simplex
- Kaposi's sarcoma
- Varicella Zoster

STAGE 4: Progression from HIV to AIDS

As the immune system becomes more and more damaged the illnesses that occur become more and more severe leading eventually to an AIDS diagnosis.

In the US, an AIDS diagnosis is confirmed if a person with HIV develops one or more of a specific number of severe opportunistic infections or cancers. Someone may also be diagnosed with AIDS if they have a very low count of T helper cells in their blood. It is possible for someone to be very ill with HIV but not have an AIDS diagnosis.

Subtypes and Disease Progression

Studies of the natural history of HIV-2 are limited, but to date comparisons with HIV-1 show some similarities while suggesting differences. Both HIV-1 and HIV-2 have the same modes of transmission and are associated with similar opportunistic infections and AIDS. In persons infected with HIV-2, immunodeficiency seems to develop more slowly and to be milder. Compared with persons infected with HIV-1, those with HIV-2 are less infectious early in the course of infection. As the disease advances, HIV-2 infectiousness seems to increase; however, compared with HIV-1, the duration of this increased infectiousness is shorter. HIV-1 and HIV-2 also differ in geographic patterns of infection; the United States has few reported cases.

Treatment

The Food and Drug Administration has approved a number of drugs for treating HIV infection. The first group of drugs used to treat HIV infection, reverse transcriptase inhibitors, interrupts an early stage of the virus making copies of itself. There are two subgroups included in this category; nucleoside and nonnucleoside. Both subgroups of these drugs slow the spread of HIV in the body and delay the onset of opportunistic infections.

Protease inhibitors are the second major group of drugs approved to treat HIV infection. These drugs act to limit the virus's ability to cleave itself into small infectious pieces. They accomplish this by restricting the production of a specific protein that is required to perform the process.

Because HIV can become resistant to both classes of drugs, combination treatment using both is necessary to effectively suppress the virus.

Currently available antiretroviral drugs do not cure people of HIV infection or AIDS, and they all have side effects that can be severe. Some of the Nucleoside RT inhibitors may cause a depletion of red or white blood cells, especially when taken in the later stages of the disease. Some may also cause an inflammation of the pancreas and painful nerve damage. Other complications, including lactic acidosis and severe hepatomegaly with steatosis that may result in liver failure and death, have also been reported with the use or antiretroviral nucleoside analogs alone or in combination.

HIGHLY ACTIVE ANTIRETROVIRAL THERAPY (HAART) is credited as being a major factor in reducing the number of deaths from AIDS in this country by 47% in 1997. HAART is a combination of several drugs including reverse transcriptase inhibitors and protease inhibitors. A number of drugs are also available to help treat opportunistic infections, such as Pneumocystis carnii pneumonia.

Vaccine Research

The intervention most anticipated by everyone working to stop the HIV/AIDS epidemic is a vaccine to prevent infection. To date more than 60 Phase I, II, and III trials are taking place around the world.

Until a vaccine is available, and even afterwards, we must continue to reinforce the already proven methods of HIV prevention. It is critical that no one (whether involved in the trial studies or not) abandon safer sexual and drug-related behaviors proven to prevent HIV infection. Overall, vaccine development must not endanger progress already made in HIV prevention.

Most agree that vaccines currently in development will probably be better at preventing transmission from one person to another, but will be unlikely to offer long term benefits for those already infected. The CDC's HIV vaccine research focuses on conducting and evaluating HIV vaccine trials in the United States and elsewhere. Thus far results indicate that the vaccines were not effective in reducing the risk for HIV infection, but the trials provided critical information that will guide future research on HIV vaccines.

Prevention efforts can be successful, but most agree that to win the battle against HIV and stop the spread of the epidemic, an effective vaccine must be developed. Yet, scientists agree that a truly effective HIV vaccine may yet be a decade away.

Here are some of the challenges facing researchers in their quest to find a cure:

Targeting Immune Responses

The body's immune response is a complex combination of reactions to foreign invaders in the body. Researchers need to target the immune responses that will provide the most effective and long-term protection from HIV. Should specific responses be targeted or a combination of many responses? In order to develop an effective vaccine, this question has to be answered.

Targeting Types of HIV

As mentioned before, there are several HIV types. Subtle genetic differences change the virus enough to warrant different treatment approaches. If a vaccine is going to be truly effective and offer long term protection, it has to target a broad spectrum of HIV types. If the vaccine is too specific to one HIV type, its universal effectiveness will be diminished.

Behavior and Vaccine Protection

In laboratory testing, vaccines are tested in situations free of factors such as human behavior. As we all know, behavior is the hardest thing to change. The concern of many researchers is that vaccines effective in the controlled environment of clinical trials will be less effective, and offer less long term protection, when human behavior is factored in.

Discrimination and Social Pressures

HIV vaccines will result in HIV positive serologies in those people vaccinated. Everyone is aware of the discrimination, stereotypes and prejudices faced by HIV infected people. HIV positive serologies will result in the same social issues. Volunteers for the first vaccinations will have to go through training to allow them to deal with those prejudices. In fact, realizing that discrimination is a possible affect of vaccination, volunteers may be hard to come by.

HIV Positive or Vaccinated?

Another barrier in the quest for a vaccine is how to tell who is HIV infected from who has been HIV vaccinated. Those infected need treatment so it will be necessary to identify them from those vaccinated. Tests that can distinguish between the infected and the vaccinated will have to be developed.

The need for an effective vaccine is both urgent and obvious, but the path to success is clearly a very complicated one.

HIV and Legal Regulations

HIV and the ADA

The Americans with Disabilities Act of 1990 (ADA) prohibits discrimination in employment on the basis of a person's disability, including HIV/AIDS. The ADA, which covers employers of 15 or more people, applies to employment decisions at all stages. To apply the ADA to everyday employment situations, employers must remember four key points:

1. The definition of disability
2. The importance of knowing the essential functions of jobs
3. The concept of reasonable accommodation
4. Preserving confidentiality of medical information and limiting medical inquiries within the boundaries of the law

An individual with a disability is a person who:

- Has a physical or mental impairment that substantially limits one or more major life activities
- Has a record of such an impairment
- Is regarded as having such an impairment

A *qualified* employee or applicant with a disability is an individual who, with or without reasonable accommodation, can perform the essential functions of the job in question.

Reasonable accommodation may include, but is not limited to:

- Making existing facilities used by employees readily accessible to and usable by persons with disabilities
- Job restructuring, modifying work schedules, reassignment to a vacant position
- Acquiring or modifying equipment or devices, adjusting or modifying examinations, training materials, or policies, and providing qualified readers or interpreters

As more effective drug therapies are extending the lives of HIV-positive people—and improving their quality of life—more workers are returning to the workforce and staying productive. Lawsuits filed by HIV-infected workers continue under the ADA. Most of these lawsuits are preventable through training and education.

HIV and the FMLA

The Family Medical Leave Act of 1993 (FMLA) applies to private sector employers with 50 or more employees within 75 miles of the work site. Eligible employees may take leave for serious health conditions or to provide care for an immediate family member with a serious health condition—including HIV/AIDS. Eligible employees are entitled to a total of 12 weeks of job-protected, unpaid leave during any 12-month period.

During this leave, an eligible employee is entitled to continued group health plan coverage as if the employee had continued to work.

Upon return from leave, the law generally requires that employees be restored to the same or an equivalent position with equivalent pay, benefits, and working conditions.

In order for individuals with HIV or AIDS to invoke FMLA protection, the disclosure of medical information to the employer may be required. Employers are not required to provide unpaid medical leave under FMLA if they are not informed that a disability or serious health condition exists.

If an employee makes an employer aware of his or her AIDS or HIV infection, laws such as the ADA require that information to be held in strict confidence.

Unpaid leaves of absence in addition to leave under the FMLA (or for employees covered by the ADA but not necessarily eligible under FMLA) may also be required as a "reasonable accommodation" under the ADA.

HIV and HIPAA

The Health Insurance Portability and Accountability Act of 1996 (HIPAA) attempts to address some of the barriers to healthcare coverage and related job mobility impediments facing people with HIV as well as other vulnerable populations.

HIPAA has three main goals:

1. Provides persons with group coverage new protections from discriminatory treatment
2. Enables small groups (such as businesses with a small number of employees) to obtain and keep health insurance coverage more easily
3. Gives persons losing/leaving group coverage new options for obtaining individual coverage

This law provides several protections important to people with HIV/AIDS:

- Limits (but does not wholly eliminate) the use of pre-existing condition exclusions
- Prohibits group health plans from discriminating by denying you coverage or charging additional fees for coverage based on an employee's family member's past or present poor health
- Guarantees certain small employers, and certain individuals who lose job-related coverage, the right to purchase individual health insurance
- Guarantees, in most cases, that employers or individuals who purchase health insurance can renew the coverage regardless of any health conditions of individuals covered under the insurance policy

Florida Law (FLORIDA LICENSEES ONLY)

Florida's Omnibus AIDS Act is comprehensive legislation created in 1988 to combat the spread of HIV and to protect the rights of those infected. Since then it has been amended a number of times, to keep it current with changes in the epidemic and to streamline testing procedures. Following is an overview of the Act:

Testing Requirements

The Omnibus Act places these provisions on testing:

1. Informed consent must be obtained
2. Positive test results must be confirmed through a corroborating test before informing the subject of the test results
3. Reasonable efforts must be made to notify the test subject about the test results

Informed consent means that, prior to testing, an individual must understand and explicitly agree to the HIV test. General consent to draw blood and to run unspecified tests is insufficient. Consent does not have to be in writing, but it must be documented in the patient's record. Informed consent is not required in certain circumstances, including for donations or transfer of human tissue, or when testing is part of an autopsy.

Notification Responsibilities

Though the law no longer requires pre-test counseling in most circumstances, nor is face-to-face post-test counseling required, both may be advisable depending on the circumstances. At a minimum, however, the law requires that when the test result is positive, post-test counseling must include information on the availability of appropriate medical and support services, the importance of notifying partners who may have been exposed, and prevention of the transmission of HIV. In instances where the test results are negative, post-test counseling should include information on the meaning of test results, the possible need for retesting, and options for reducing the risk of transmission.

Confidentiality

With few exceptions, no one who has knowledge of a person's HIV test result, positive or negative, may disclose the identity of the person tested or the results of the test. One exception is for healthcare workers and non-medical workers exposed while providing emergency medical assistance, who have the right to know the patient's HIV status. Other exceptions include: when there is a legally effective, signed release by the person tested; authorized medical and epidemiological researchers; among healthcare facilities and providers engaged in the transfer of human body parts; for donation or transfer of human tissue.

Testing Minors

A healthcare provider or health facility may examine and treat a minor for HIV and other STDs without parental consent. Florida law specifically forbids telling parents of the minor's HIV test results (e.g., sending a bill for testing or treatment without the minor's consent).

Permitted Disclosures

If the test subject is incapacitated or unable to understand the information, a person authorized by law to make decisions for that person, may be told. Test information may also be disclosed within correctional facilities on people convicted of certain offenses, such as prostitution, in which transmission might have occurred.

Consequences of Breaching Confidentiality

In the state of Florida it is a first-degree misdemeanor to unlawfully disclose HIV test results, and a third degree felony if it is done with malicious intent.

Notification of Third Parties

Healthcare practitioners cannot be held civilly or criminally liable for not notifying a third party of their exposure to someone who is HIV positive. However, providers may willingly intervene and breach confidentiality when certain conditions have been met, specifically:

1. Identification of the third party must come from the patient.
2. The practitioner must recommend that the patient notify the third party.
3. The practitioner must advise the patient of the practitioner's intent to notify the third party.
4. The preceding three steps must be documented in the patient's medical record without identifying the third party.
5. The practitioner may then tell the third party while protecting, to the fullest extent possible, the patient's name.

Future Challenges

In 1996, the world spent less than $300 million annually on HIV-related activities of any kind. That was also the year that researchers uncovered the benefits of combination antiretroviral therapy and in developed nations, at least, HIV no longer became a death sentence. In 2005, world spending reached $8.3 billion. Increased funding was driven by the desire to deliver antiretroviral therapy, and propelled by activist pressure and dramatic drug price declines. Yet, to implement a comprehensive response capable of reversing the epidemic, U.N.A.I.D.S. projects that annual spending of $22.1 billion will be needed by 2008, which is nearly three times more than is currently being expended.

Although the world's mobilization of financial resources for HIV is unprecedented in the history of global health, in 2006:

- Antiretrovirals reach only about 20 percent of those who need them
- Fewer than one in five individuals at high risk of HIV have access to evidence-based HIV prevention services
- Care and support services are available to fewer than 10 percent of families with children who have been orphaned or made vulnerable by AIDS

Research scientists continue to focus on the following: development of a preventive HIV/AIDS vaccine; testing chemical barriers, such as topical microbicides that people can use in the vagina or in the rectum during sex to prevent HIV transmissions; other methods to prevent sexual HIV transmission, including adult male circumcision; female diaphragms, which may help prevent women's acquisition of HIV by preventing viral exposure of the cervix; and prophylactic administration of antiretroviral drugs.

Ultimately, to defeat HIV and AIDS we need to reduce the number of people who become infected. Throughout the epidemic, prevention has remained the most effective defense against HIV/AIDS. A comprehensive approach must be used to prevent the further spread of HIV infection, including monitoring the epidemic to target prevention and care activities; determining the effectiveness of prevention methods; implementing and evaluating prevention efforts in high-risk communities; encouraging early diagnosis of HIV infection; continuing basic behavioral and prevention research to identify new effective prevention interventions; and fostering linkages between prevention and treatment programs.

Concluding Comments

Many years after the disease made its first appearance, the HIV/AIDS pandemic continues to explode. HIV/AIDS has established a worldwide foothold. Limitations in health infrastructure and limited access to effective therapies, have both contributed to the continued growth and spread of the disease.

Still we have made some progress. There is a global focus, greater funding, increased political will, and cooperative efforts to make resources more widely available. While we continue to struggle with denial, lack of a vaccine, and the fact that many countries have poor health infrastructures, we also know many of the answers: education, prevention, behavior modification, and anti-retroviral medications that work and can be delivered with increasing efficiency and effectiveness.

ADDITIONAL RESOURCES

Centers for Disease Control (CDC)
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348
In English, en Español
24 Hours/Day

CDC National Prevention Information Network
P.O. Box 6003
Rockville, Maryland 20849-6003
1-800-458-5231

Internet Resources
NCHSTP: http://www.cdc.gov/nchstp/od/nchstp.html
DHAP: http://www.cdc.gov/hiv
NPIN: http://www.cdcnpin.org