Update on HIV Transmission

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Accurate knowledge about HIV transmission is important in helping both HIV-infected and uninfected individuals prevent new infections from occurring. It is equally important for everyone to be aware of how HIV is not transmitted to avoid unnecessary fears and reactions. Approximately nine years into the epidemic, this article will review our knowledge of HIV transmission and highlight a few areas of current interest.

Sexual Transmission

The majority of people with AIDS have acquired HIV infection through sexual contact. In the United States, most of these are men who report a history of sexual contact with other men. A smaller number are men or women who are thought to have been infected through heterosexual contact. Of these, some were born in countries (in central Africa and parts of the Caribbean) where heterosexual transmission is believed to account for the majority of AIDS cases. Other men and women had partners of the opposite sex—such as bisexual men or intravenous (I.V.) drug users—who were either HIV-infected or at increased risk for HIV infection.

Among men who have sex with men, the sexual practice most highly associated with HIV infection is unprotected (without a condom) anal intercourse. Although receptive anal intercourse is associated with the greatest risk, researchers have also described cases of HIV infection among those men who reported only insertive anal intercourse.

While receptive anal intercourse also appears to increase the risk of HIV infection in women, most heterosexual transmission apparently occurs during vaginal intercourse. Virus has been isolated in semen and cervical/vaginal secretions, and transmission has occurred from men to women and from women to men.

The presence of other sexually transmitted diseases may play an important role in increasing the likelihood of HIV infection during sexual intercourse. In particular, genital ulcer disease (caused by such infections as herpes and syphilis) may facilitate HIV infection, possibly by breaking the skin or mucous membrane. In addition, if infected partners are immunosuppressed—for example, have AIDS or a very low T-helper cell count—they may more efficiently transmit HIV infection, possibly because they have higher levels of virus-infected cells. These conditions, however, are not prerequisites for transmission; someone may look and feel perfectly healthy and still infect sexual partners.

Although not foolproof, condom use plays a major role in reducing transmission of HIV as well as many other sexually transmitted diseases. Recommendations for condoms include use of latex, rather than natural membrane, condoms and use of only water-based lubricants. Oil-based lubricants may weaken latex condoms. The ingredients in some commercially available spermicides have been shown in the laboratory to inactivate HIV and some other sexually transmitted agents. While guidelines discuss the possible beneficial effect of spermicides among people who also use condoms during vaginal intercourse (for example, in the event of condom leakage), spermicides alone are not recommended to prevent HIV transmission.

As stated above, studies of gay and bisexual men have found unprotected anal intercourse to be the sex practice associated with the greatest risk of HIV infection. In these studies, oral-genital contact has not been statistically associated with HIV transmission. However, if a specific sex practice, such as oral-genital contact, is associated with a lower risk of HIV infection, this risk may not be detected statistically. This does not imply, however, that the lower risk practice is entirely safe. Identifying the risk associated with a specific sex practice may be especially difficult in studies where individuals report several different practices.

Researchers have reported several cases of HIV infection after exposure to semen through receptive oral intercourse (fellatio). Risk factors facilitating transmission through such exposures have not been conclusively identified. Therefore, receptive oral intercourse with ejaculation, even if associated with lower risk of HIV infection than practices such as unprotected anal intercourse, should not be considered risk-free.

There has also been one report hypothesizing female-to-male transmission through oral-genital contact. In this report, an HIV-infected man retrospectively reported as his only risk fellatio and cunnilingus with a female prostitute who used I.V. drugs. Several commentators noted that this report would have been more convincing if the prostitute had been contacted to verify this report, or if her HIV-infection status had been known. Researchers have also described a small number of cases of HIV infection among women who reported sexual contact with other women. In at least one report suggesting possible female-to-female transmission, two women who practiced digital, oral-genital, and oral-anal contact were exposed to vaginal blood as a result of their sex practices and menstruation.

Although HIV has been recovered from the saliva of people with HIV infection, laboratory studies indicate that the virus is much less frequently recovered from saliva than from blood. Laboratory experiments also suggest that saliva may contain components that inhibit HIV infectivity. One brief report hypothesized that two gay men seroconverted for HIV after exposure to saliva during insertive fellatio. Both men denied engaging in anal intercourse for at least three months before their seroconversion. Several commentators noted that this report would have been more convincing if additional information had been provided. For example, since seroconversion may occasionally occur more than three months after HIV infection, it would have been important to know the last time these men were exposed to

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semen during any sexual contact (including receptive fellatio). Contact with saliva in other settings—such as among health care workers exposed to the saliva of their HIV-infected patients—has not been associated with seroconversion. Although HIV infection after exposure to saliva is theoretically possible, many researchers do not believe that such transmission has been conclusively documented. If such transmission occurs at all, current evidence suggests that it is at best a rare phenomenon.

Blood-Borne Transmission
Transmission of HIV has occurred after transfusion with infected blood products or, for people with hemophilia, receipt of clotting factor concentrates derived from infected blood plasma. The great majority of people infected through blood transfusions received blood before blood banks instituted antibody testing and donor deferral programs to protect against HIV transmission. A small number of individuals have become infected since these mechanisms were instituted, typically because they received blood from people who became HIV-infected shortly before donation; in such situations, donors may not have had time to develop positive antibody tests when their blood was screened. According to one study, the risk of contracting HIV through a unit of blood which tests negative for HIV antibody is approximately 26 per million; other studies have suggested risks that are even lower. For hemophilia care, clotting products are now protected through mechanisms, such as heat treatment, that inactivate HIV.

HIV may also be transmitted among I.V. drug users who are exposed to infected blood when they share needles. Several strategies are being used and evaluated to reduce transmission among I.V. drug users, including bleach distribution, needle exchange, and drug treatment programs, such as methadone maintenance.

HIV transmission has also been reported among health care workers who have stuck themselves with needles contaminated with blood from HIV-infected patients. Several studies have indicated that the risk after such exposures is very low; one study estimated the risk to be approximately 1 in 200. There have also been a few reports of health care workers infected after contact with blood to their open wounds, skin with breaks in it (for example, due to dermatitis or chapping) or mucous membranes (such as the mouth). Current studies suggest that the risk of HIV infection after exposure of non-intact skin or mucous membranes is much less than that from needlestick exposures. The U.S. Public Health Service has issued guidelines recommending that health care workers follow universal blood and body fluid precautions, properly dispose of needles and other sharp objects, and follow other infection control measures. These guidelines also help protect against other infectious agents, such as hepatitis B.

Perinatal Transmission
The great majority of children with HIV infection have been born to mothers who are themselves infected. Researchers believe that these children have been exposed to the virus during pregnancy or possibly labor and delivery. Studies suggest that approximately 25 to 50 percent of infants born to HIV-infected women are themselves infected. In addition, several reports have suggested that HIV may be spread through breast feeding, although the risk associated with breast feeding has not been conclusively defined.

Casual Contact
At least 11 studies have evaluated the risk of HIV transmission through non-sexual, person-to-person exposure in over 700 household or boarding school contacts of both adults and children infected with HIV. Household members have had a variety of interactions with infected people, in some cases helping the infected person to bathe, dress, or eat; some household members have also shared a variety of household items (such as eating and drinking utensils) and facilities (such as the kitchen, bath, and toilet). Some of these exposures probably resulted in contact with the saliva or other body secretions of the infected person. None of these studies has found evidence of HIV transmission occurring via these exposures.

Conclusion
New cases of HIV infection continue to occur. Among adults, most of these new infections are due to either sexual contact with an infected person or exposure to contaminated blood during I.V. drug use. It will be important to further define factors either facilitating or decreasing HIV transmission in these settings. At the same time, education and risk reduction will remain primary public health weapons for prevention of these new infections.

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References

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Refining Safer Sex

Neil R. Schram, MD

In 1983 the American Association of Physicians for Human Rights (AAPHR) developed HIV risk reduction guidelines designed to explain safe sex and to encourage people to practice it. The original guidelines, now famous for defining sexual practices as “safe,” “possibly safe,” and “unsafe,” have undergone little formal change over the years. But new data, particularly regarding oral sex, and the public’s increased sophistication requires redefinition of the guidelines' concepts of risk and sexual practice.

Several influences affected the development of the original guidelines. Researchers at the time were uncertain whether a virus caused AIDS, and even less certain which “body fluids” were most likely to transmit the virus if it existed. Because of the immediate crisis, it was necessary to consider as safe only those behaviors that did not transmit any potentially infectious fluids. Thus, the guidelines were conservative, appropriately reflecting knowledge at the time, and, in fact, have been an effective educational and public health tool. Studies of HIV transmission have increased this knowledge and allowed for a refinement of the guidelines.

Within the categories of “no risk,” “some risk,” and “high risk,” updated guidelines can help people decide which risks they are prepared to take and how to minimize those risks. For example, oral sex with men, without “pre-cum” or ejaculation, now seems to offer no realistic risk of HIV transmission. This article reflects further changes in the state of the knowledge of HIV transmission and offers consumers an approach that allows them to minimize risk while deciding to participate in activities not considered safe. It may help define acceptable levels of risk and suggest ways to maximize safety.

Safe Sex

Many people have decided that, because of the severity of HIV disease, there is no risk of exposure to the virus that is acceptable, and some of these individuals have chosen celibacy as a way to avoid any risk. However, risk-free sexual behavior—that is, behavior that may not be guaranteed safe but whose likelihood of causing transmission is on the order of being struck by lightning—is possible. Among these activities are hugging, massaging, and dry kissing. Mutual masturbation should pose no risk for people who have no significant skin rashes in places that may be exposed to their partner’s semen or cervical secretions. People with conditions in which the skin is open, especially on the hands, should seek counsel from a knowledgeable physician.

Wet, or “French,” kissing defines the boundary between sex that is safe and sex that is of possible risk. Since saliva is a poor transmitter of HIV, wet kissing is safe enough for most people to feel comfortable. But, because there is the potential for contact with the virus, wet kissing cannot be guaranteed 100 percent safe. If there is a risk, it is on the magnitude of 1:100,000 or 1:1,000,000.

Oral Sex

There continues to be concern surrounding oral sex, and a recent San Francisco AIDS Foundation survey showed a rise in the rate of oral sex since 1987 at the same time as there has been a decrease in the rate of unprotected anal sex. It has been documented that oral sex with ejaculation can result in HIV infection. While people often assume that transmission requires cuts in the mouth there is no proof that cuts are requisite. Although the mouth is a better barrier to infection than other membranes, HIV can be transmitted via the vagina, the male urethra, and the anus even in the absence of visible cuts to these membranes.

To reduce to the lowest possible level the risk of infection from oral sex, partners should avoid ejaculation and exposure to seminal fluid or pre-cum, although pre-cum would appear to represent a lower risk than ejaculate. New sexual partners should practice mutual masturbation to see if male partners secrete pre-cum prior to ejaculation. If pre-cum is not present or if ejaculation might occur, partners should use condoms. During oral sex with women, partners may come into contact with cervical secretions and possibly blood. Therefore, it appears that this presents a greater risk than oral sex with men who do not ejaculate or secrete pre-cum. To decrease the risk of HIV transmission, partners should use a dental dam (a thin layer of latex) as a barrier.

Anal and Vaginal Intercourse

There is no way to make anal or vaginal intercourse absolutely safe, but partners can minimize the risk of transmission by correctly and consistently using latex condoms and spermicides containing nonoxynol-9. The risk to receptive partners is further lowered if insertive partners do not ejaculate and do not secrete pre-cum. Insertive partners who do not use condoms are at risk of transmission because bleeding may occur in the anus or vagina during intercourse. HIV has been transmitted to the insertive male during vaginal and anal intercourse.

Condoms are effective only if they are worn properly. They must be used from the beginning of intercourse and removed while the penis is still erect immediately after ejaculation.

Conclusion

Approaches to risk reduction may vary depending on whether partners know if they are HIV-infected or not. Uninfected monogamous partners may feel it appropriate to engage in riskier sex, but this decision should be mitigated by factors such as a potential lag in antibody development, and the possibility of dishonesty about test results or outside relationships. In cases where both partners are infected, the decision to have risky sex should be mitigated by concerns about reinfection, and infection by other viruses, for example, cytomegalovirus (CMV) and hepatitis B. It seems inappropriate for any risky behavior to occur between an infected partner and an uninfected partner.

It is important that any two partners are honest with each other about their health status and that each is given an equal opportunity to participate in the decision about how much risk the couple will take. Using this standard, risk is increased when partners are intoxicated during negotiation or sexual behavior, and when one partner pressures another. There is no evidence that it is riskier to engage in truly safe sex with multiple partners than with one partner. It is clear that developing a regular relationship with one partner eliminates the need for repeated negotiations and may make continued negotiations easier.

The most important tenet is that each individual should decide his or her own limits before meeting a partner, and then discuss and stick to those limits. When this happens, people maintain control over the risks they take, and it is in this atmosphere that sexual contact may occur with no, or minimal, risk of infection.

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A study of three popular Miami "shooting galleries" found that 15 of 148 intravenous (I.V.) drug needles (10 percent) tested positive for HIV antibody. The study also found that 20 percent of 50 needles with blood residue were antibody positive, compared to 5.1 percent of 98 needles that had no obvious residue. The study defines shooting galleries as homes where drug users can rent syringes and needles, and inject drugs. Over a period of several days, a specialist in drug outreach work collected a limited number of needle and syringe combinations. The combinations were tested for HIV antibody and categorized as having no blood residue, as having blood residue, and as having dirt or non-blood stains.

Bleach and alcohol were available at each site for cleaning needles. These solutions were used only sometimes, and in some instances, cleaning involved rinsing the needle in water only. Each gallery averaged 125 customers a week, with many customers visiting more than once. Researchers did not discuss the frequency with which individual needles were used.

Heterosexual Transmission of HIV. University of Modena, Modena, Italy (Archives of Dermatological Research, 1989).

An Italian study supports the conclusion that HIV can be spread among heterosexuals. In a group of heterosexuals at increased risk of HIV infection, 15 of 397 men (4 percent), and 15 of 250 women (6 percent) tested positive for HIV antibody. Each subject fell into a group with one of the following risk factors: "heterosexual promiscuity"; heterosexual intercourse with people known to be at risk for HIV infection; and heterosexual intercourse with people with HIV infection. Subjects were recruited between 1985 and 1987 and tested for HIV antibody.

The highest incidence of infection was among subjects of the highest incidence of infection was among subjects of the group made up of those who had had intercourse with people with HIV infection. Of 139 subjects, four of 41 men (10 percent) and 12 of 98 women (12 percent) were seropositive. All of the seropositive subjects within this group reported at least three episodes of sexual intercourse with an infected person; none of the 38 subjects who reported one or two episodes of sexual intercourse with an infected person were seropositive.

In a group of 341 subjects who reported heterosexual intercourse with individuals at risk for infection, 10 of 224 men (5 percent), and three of 117 women (3 percent) were seropositive. The seropositive individuals within this group all reported episodes of sexual intercourse with a person known to be at risk for HIV infection.

HIV among Patients at an STD Clinic. New York City Department of Health and the Centers for Disease Control (American Journal of Epidemiology, February 1990.)

HIV infection among patients at a New York City STD clinic was associated to risk factors corresponding to current knowledge about transmission, including: intravenous (I.V.) drug use, sexual contact with bisexual and gay men, and sexual contact with I.V. drug users. The rate of infection in the study group of 1,201 subjects was 11.2 percent; 107 of 836 men (12.8 percent) and 27 of 365 women (7.4 percent) were seropositive. The rate in a blinded group of 348 patients was 7.5 percent; 19 of 235 men (8.1 percent) and six of 104 women (5.8 percent) were seropositive.

Between December 1986 and December 1987, researchers recruited STD clinic patients for a nonblinded study including an HIV antibody test and an interview regarding risk factors and demographic information. Nine percent of clinic patients agreed to participate in the study. To get an unbiased estimate of seropositivity, researchers also performed a blinded serosurvey of one-tenth of new clinic patients between February and mid-May 1987.

Among seropositive men in the nonblinded study, the most common risk factors were sex with men (50 percent), I.V. drug use (40 percent), and sex with a female I.V. drug user (32 percent). Among seropositive women in the nonblinded study, the most common risk factors were I.V. drug use (59 percent), and sex with a partner at risk (I.V. drug user: 67 percent; bisexual man: 26 percent). In addition, 56 percent of the seropositive women and 18 percent of the seronegative women had traded sex for money or drugs at least once since 1978.

Sixth International AIDS Conference. Organizers of the Sixth International AIDS Conference, to be held in San Francisco from June 20 to 24, announced innovations, such as greater selectivity of abstracts and fewer oral presentation sessions, designed to make conference presentations more accessible to participants. To simplify the conference, which is expected to draw more than 12,000 people, organizers have selected only one-half of the 4,800 abstracts submitted, representing only the most recent, unpublished research. They have also reduced the number of oral presentation sessions and increased the time allocated to viewing poster displays. Organizers have also planned a public forum every night of the conference "to allow a rational discussion between activists and researchers." Finally, more than 20 "satellite" conferences will occur simultaneously.

Next Month

Despite the fact that the risk of infection continues to be small, the concerns of health care workers who have been exposed to the virus on the job remain important. San Francisco General Hospital (SFGH) has developed a model program to monitor and respond to possible HIV exposures among hospital staff. The program includes counseling and testing, risk assessment, health management, and follow-up. In the July issue of FOCUS, Julie Gerberding, MD, Director of the HIV Counseling and Testing Service at SFGH, describes the program and examines issues such as confidentiality and AZT therapy. The SFGH program also provides psychological support for hospital staff to help them cope with the emotional crisis brought on by exposure to HIV. Also in the July issue, James W. Dilley, MD, Associate Director of the HIV Counseling and Testing Service and Director of the AIDS Health Project, discusses the service's approach to counseling.