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In This Issue:

Abstract

The emergence of HIV/AIDS has had a dramatic impact on the practice of dentistry. Although significant improvements in the management of HIV/AIDS has contributed to a dramatic decline in morbidity and mortality, the number of individuals newly infected with HIV disease continues to increase. As more and more people become infected, there will be an increased need to provide oral healthcare to this population. Therefore, dental practitioners need to have a thorough knowledge about HIV disease.

Learning Objectives

- *Learn about how HIV/AIDS emerged from the first report in 1981 to the present time.*
- *Understand who is infected with HIV disease.*
- *Know the routes of transmission of HIV disease.*
- *Learn the risk of HIV transmission after an occupational exposure incident.*

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HIV/AIDS

By Louis G. DePaola, DDS, MS

Over the last 30 years, many new infectious diseases have been discovered. At the same time others are constantly emerging and/or reemerging. The National Institute of Allergy and Infectious Diseases (NIAID) has documented the presence of at least sixteen new pathogenic organisms in the last 20 years. Among these are hepatitis C, hepatitis E, *Helicobacter pylori*, Lyme borreliosis and human herpes virus 6 and 8.[1] Many other diseases are reemerging in the form drug resistant infections that are both much more difficult and expensive to treat. Multi-drug resistant TB as well resistant strains of *Streptococcus* and *Staphylococcus aureus*, especially methicillin resistant *Staphylococcus aureus* (MRSA), are becoming more and more common and problematic.[1] In a review of new and reemerging microbial threats during the 10 year period between 1994 and 2004, the NIAID identified seven diseases of particular concern.
These were:

- HIV/AIDS
- Tuberculosis
- Malaria
- West Nile virus
- Severe acute respiratory syndrome (SARS)
- Influenza
- Potential bioterrorist agents.[2]

Each of these diseases poses a threat, some more significant than others. For example, SARS which emerged from November 2002 to July 2003 had few adverse, long-term effects.[3] Feared to be the next doomsday pandemic, SARS was not as pathogenic or easily transmitted as feared and caused a total of approximately 8098 infections and only 774 deaths.[3] The most sobering aspect of this outbreak, however, was the rapid, worldwide spread of SARS. Within a very short period of time it was reported in 26 countries, confirming that in modern society disease(s) that are easily transmitted from person-to-person by means of respiratory droplets pose a significant risk.[3] How bad could it had been if, instead of SARS, a highly pathogenic influenza virus or a bioterrorist agent had been the cause of the epidemic?

While any infectious disease may influence dentistry indirectly, the first disease on the NIAID list, HIV/AIDS has had a direct impact on the profession. From the first reports in the early 1980s, HIV infection rates and AIDS deaths steadily increased.[4-7] As this disease initially had a 100% mortality rate, fear of acquiring this new and mysterious infection generated an AIDS hysteria that gained momentum with each report of new cases. Everyone became alarmed that they might be exposed to and acquire this infection. Healthcare providers in all disciplines were compelled to modify medical/dental practices to allay fears of both patients and health professionals and reduce the risk of HIV/AIDS transmission in every type of

healthcare setting throughout the world. Infection control, which had been of little concern, especially in dentistry, became paramount. As a direct consequence of the emergence of HIV/AIDS, clinical practice in the area of infection control changed rapidly, almost overnight. The delivery of medical and dental care was modified to include acceptance of universal/standard precautions. Dentists, hygienists and staff routinely encounter patients infected with HIV disease and as the numbers of people infected with HIV/AIDS increases, more patients with HIV infection will require oral health care. Therefore, oral health providers should have a fundamental knowledge about HIV/AIDS. This issue of the FORUM will discuss epidemiology, emergence, routes of transmission and other relevant issues of HIV disease.

Epidemiology of HIV/AIDS: 2008

First reported in 1981, the AIDS pandemic, caused by infection with human immunodeficiency virus (HIV), has sustained momentum over decades and has killed over 25 million people.[4,5] In its history of more than 25 years, although significant improvements in the medical management have greatly reduced morbidity and mortality, a cure for HIV remains elusive. Much slower in its spread than SARS or influenza, by the end of 2007 HIV disease has been reported in every country of the world. The World Health Organization (WHO) estimated that in the year 2007 33.2 million people were living with HIV and 2.5 million were newly infected.[3] The disease has ravaged many countries with more than 96% of the cases in communities of low and middle income. Each and every day almost 7,000 people are newly infected with HIV disease and more then 5700 die from AIDS.[3] Those without access to medical care suffer immeasurably and the majority of deaths are attributable to inadequate access to HIV prevention and treatment services.[3] Some regions of the world are particularly devastated by HIV. In 2007, Sub-Saharan Africa accounted for 68 % of all people living with HIV and 76% of all AIDS deaths.[3] The incidence in Asia in 2007 was also very high with an estimated 4.9 million people living with HIV and approximately 440, 000 Asians newly infected. Over 300,000 Asians died from AIDS-related illnesses in 2007.[3] From the first report of AIDS in 1981 to 2007 more than 25 million people have died and Africa alone has produced 12 million AIDS orphans. Throughout the world 7.1 million people are in immediate need of life-saving AIDS drugs; but they will not get them and they will die. Only 28% of people who need antiretroviral drugs on a global basis are receiving them.[3]

In the United States, the situation, while serious, is less grave. The CDC has developed comprehensive surveillance systems for AIDS case data and to document and update the impact of HIV/AIDS. Between June 1981 and the end of 2005 a cumulative total of 956,018 AIDS cases, of which 769,635 were men and 186,383 women, have been reported in the US.[6-8] Approximately one million people in the US are currently living with HIV/AIDS, 400,000 of whom have AIDS.[6-8] CDC estimates that 40,000 individuals in the US will be newly infected in 2008. [6,8] Most worrisome is the fact that about 25% of the Americans infected with HIV do not know they are infected, despite widespread availability of prevention programs, antiretroviral treatment, and counseling & testing.[6-8] Persons who are unaware of an infection usually do not undertake any measures to prevent the spread of the disease.[9] As a result, the 25% of those infected and are unaware of their infection cause about 54% of new infections.[9] Conversely, those who know they are infected are more prevention oriented. The 75% who are aware of their HIV infection cause only 46% of new the infections.[9] In an effort to remedy this situation, CDC has revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings.[9] The sooner the diagnosis of HIV is made, the sooner people can enter prevention and treatment programs which will help to limit both the spread of HIV and improve the overall prognosis. Although medical management of HIV in the US may be among the best in the world, many people cannot or will not enter treatment. An estimated 42%-59% of those infected with HIV/AIDS in 2003 had not been receiving medical care and 55% of the HIV infected were not receiving antiretroviral therapy (ART) when it was indicated.[6,8,10] Highly active antiretroviral therapy (HAART) has been successful in slowing the progression of HIV disease and reducing the number of AIDS cases. The CDC reported AIDS cases have declined from a zenith of 69,242 in the 1980's to 42,832 in 1995-1998 and 41,993 in 2005. [6,8] While the number of AIDS deaths in the US has significantly decreased, primarily due to HAART, the number of new infections is increasing at an alarming rate, especially in minority populations. In 2005, African-Americans and Latinos each represented 12.2% of the US population but accounted for 48.4 and 20.3 % of the number of new AIDS cases. Whites, however, accounted for 66.9% of the population but only 29.1% of AIDS cases. [6,8] When compared to 1985, whites accounted for 60% of the AIDS diagnosis followed by African-Americans at 25% and Latinos with 15%.[6,8] These data clearly illustrate the current racial and ethnic inequity of HIV infection in the US. While originally a disease of gay, white men, the epidemic in the US has exploded in minority populations and disproportionately affects these communities, especially African-American's who represent only 12.2% of the population but account for almost 50% of the cases. [6,8]

The Emergence of HIV/AIDS

HIV/AIDS probably emerged in very small numbers and in isolated areas between the 1940's to the 1960's. It wasn't until the virus was present in a large number of people who transmitted the disease to more and more people that it became evident that a new type of infection was probable.

The first documented report was published on June 5, 1981.[11] The CDC became aware of and reported an unusual cluster of *Pneumocystis carinii* pneumonia (PCP) infections and other opportunistic infections, in five, previously healthy, homosexual men.[11] This very unique cluster of cases and subsequent similar reports suggested some kind of attack on the immune system resulting in profound immune suppression which allowed for the development of opportunistic infections and an especially aggressive form of Kaposi's sarcoma (KS).[12] Shortly thereafter it was suggested that the disease was not limited to gay men and cases were reported in injection drug users (IDU), Haitian immigrants, recipients of blood and/or blood products, hemophiliacs, infants, prisoners, and women who had sex with infected men.[13-19] By 1982 it was recognized that anyone who came in contact with infected blood or body fluids could acquire the infection and the term AIDS, Acquired Immune Deficiency Syndrome, was introduced.[20-22] Theories abounded about the cause of this new disease but it was not until 1983 that a novel retrovirus was isolated and identified as the agent responsible for the development of AIDS.[20-22] Although shrouded in controversy, co-founders Luc Montagnier and Robert Gallo eventually named this new virus, human immunodeficiency virus (HIV).[21-22] This virus selectively infects and reproduces in critical immune cells known as CD4 cells.[23] In the process of reproduction, the CD4 cell is killed releasing more HIV; which infects more cells, that makes more virus, that kills more cells.[23] This directly translates to a gradual decline in immune function. The diagnosis of AIDS is made when the CD4 count falls below 200 and/or one or more AIDS Defining Illness is documented.[23,25,26] With declining immune function opportunistic infections develop and eventually, the patient succumbs to the one or more of these infections. If HAART is not instituted the average amount of time from infection to death in 10 years.

Transmission of HIV

The routes of transmission of HIV are well described. All involve contact with blood and/or body fluids (semen, vaginal secretions, and breast milk) that are infected with HIV and include:

- Sexual contact
  - Universal risk for unprotected sexual contact regardless of sexual preference
- Injection drug use (IDU)
- Mother to child
  - Perinatal
  - Breast feeding
- Exposure to blood/blood products
  - Blood/blood product transfusion or infusion
  - Organ transplantation
  - Occupational exposure.[3-8,21-30]

Sexual contact accounts for the majority of cases. During a sexual encounter, the mucosal linings can be damaged allowing HIV to enter the body and bind/attach to immune cells in the submucosal areas.[23] With HIV attached these cells then migrate to the regional lymph nodes, initiating systemic HIV infection.[23] Any contact with infected blood/blood products can transmit the virus and any behavior, medical/dental treatment and/or occupational activity where there is contact with blood, blood products, body fluids puts an unprotected individual at risk for acquiring HIV.[3-8,21-30] Transfusion of blood or blood products efficiently transmits HIV. While problematic in the 1980s, development of sophisticated tests makes transfusion related transmission of HIV in the US and other developed countries very rare.[25,27] However, transfusion still accounts for cases of HIV transmission in any instance that appropriate screening of the blood is not performed.[25,27] In the US, especially large urban centers, IDU accounts for almost one-third of the cases of HIV. Needles, syringes and other paraphernalia can become contaminated with minute quantities of blood infected with HIV. If shared and/or not adequately disinfected, HIV can be transmitted.[27,28] Women who contracted HIV through sharing needles or having sex with an IDU may pass the virus on to their unborn children.[27,29,30] Mother-to-child transmission is perhaps the most tragic consequence of HIV infection. Without HAART, 16%-25% of infants born to infected mothers in North America and Europe will develop HIV infection during pregnancy, labor & delivery or through breast feeding.[27,29,30] Fortunately, the availability and widespread use of drugs such as zidovudine (AZT) significantly reduces the risk of perinatal transmission.[29-31] Today, with incorporation of HAART in prenatal care, elective caesarian section as appropriate and formula feeding the risk of perinatal transmission can be reduced to < 2%.[29-31] However, in the regions of the world hardest hit by HIV/AIDS, especially Sub-Saharan Africa, access to AZT and other drugs is non-existent and HIV perinatal transmission may be as high as 30%.[4,29,30] The routes of HIV transmission all involve intimate contact with infected blood and/or body fluids. The virus is not transmitted by casual contact and it is not transmitted by shaking hands, talking; sharing food, eating utensils, plates, drinking glasses, household items or by hugging and kissing on the cheek or lips. There is no evidence that mosquitoes or other animals transmit the infection.[27]

Risk for Occupational Transmission of HIV

Exposure to blood and body fluids that contain blood can and does occur in the workplace. While the risk of HIV transmission after an occupational exposure of health care workers (HCWs) to HIV-infected blood is quite low, it has been documented to occur.[32-34] CDC has documented 57 HIV seroconversions resulting from occupational HIV exposure. These include 19 laboratory workers (16 of whom were clinical laboratory workers), 24 nurses, 6 physicians, 2 surgical technicians, 1 dialysis technician, 1

respiratory therapist, 1 health aide, 1 embalmer/morgue technician, and 2 housekeeper/maintenance worker.[32-34] Percutaneous injury (puncture/cut) occurred in 48 of the 57 (84.2%) of the transmissions. Of the remaining 9 cases, 5 had mucocutaneous (mucous membrane and/or skin) exposure, 2 had both percutaneous and mucocutaneous exposure, and were 2 unknown. Exposure to HIV-infected blood caused most transmissions (85.9%) but concentrated virus in a laboratory (5.2%), visibly bloody fluid (1.7%) and unspecified fluid (7.0%) also were responsible for occupational transmission, although in much lower numbers.[32-34] There are a number of factors that contribute the overall risk of bloodborne disease transmission after an exposure incident.[24, 32-38] Among these are the prevalence of HIV, HBV and HCV in the patient population with the higher the number bloodborne infections the greater the probability of exposure to the dental provider. HIV transmission after an exposure incident is dependent of the type of exposure. Was the exposure percutaneous, which more efficiently transmits virus or permucosal (eye, nose, mouth, mucous membrane)? How large was the volume of the exposure? What was the amount of virus (viral load) of the donor patient? The worst case scenario is high volume of blood/body fluid from with a patient with a high viral load of virus. Conversely, low volume, low (or non-detectable) viral load would constitute the lowest overall risk. By their nature dental needles are very small bore, with the 21 gauge the largest in common use. Therefore, the volume of infected material after a dental needle exposure is very small. However, the risk, while very small, is not zero. A small volume of blood from a person with a high viral load could transmit enough virus to cause infection. The highest risk exposure is percutaneous/parenteral (needlestick or cut exposure to HIV-infected blood) with the rate of infection 0.3% which translates to about 1 seroconversion in every 300 exposures (Table 1).[24, 32-38] Statistically for every 1000 percutaneous/parenteral exposures to HIV infected blood only 3 would transmit HIV, 997 would not be infected. Mucosal exposures (splashes to the eye, nose, or mouth) to HIV-infected blood are even a lower risk and CDC estimates 0.1% (1 in 1,000) would result in infection (Table 1).[24, 32-38] There have been no reports of documented transmission of HIV following contact with intact skin.[24, 32-38] Although very low, the risk of transmission of HIV, as well as other bloodborne pathogens, is a concern for the entire dental team and their families. Every effort should be made to prevent exposure incidents in the dental office. Practice smart; practice safe. Fundamental to safety in the dental office is establishing and maintaining an infection control program that complies with the current CDC recommendations.[24, 39,40] Standard precautions, as outlined in Table 2, should be utilized for every patient contact.. Patients infected with HIV and other bloodborne may look completely healthy and not even know that they are infected. In order to minimize the risk of transmission of HIV, and any other infectious disease, incorporate and comply with CDC recommended infection control guidelines and routinely employ standard precautions so that the infection control practices are the same way, every day for every patient.

Summary

This year 40,000 people will be infected with HIV disease in the United States. Many more will be infected worldwide. Although more then 25 years have passed since the first report of AIDS was published in 1981, the number of people infected with and/or impacted by this disease soars. Without a medical miracle, the HIV/AIDS pandemic will continue well into the future. Dental practitioners can expect to see more patients infected with HIV in need of oral healthcare. Patients infected with HIV can be routinely and safely seen in outpatient dental offices provided that the clinicians comply with current infection control recommendations.

Table 1

Risk of Viral Transmission with Sharps Injury from Infected Source:[31,32]	
Source	Risk
HBV	6-30%
HCV	1.8%
HIV percutaneous	0.3%
HIV mucous membrane	0.09%
HIV intact skin	< mucous membrane exposures
Modified fro MMWR June 29, 2001 / 50(RR11);1-42 http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5011a1.htm	

Table 2 [24,36,37]

Updated Standard Precautions*

Assume that every person is potentially infected or colonized with an organism that could be transmitted in the healthcare setting and apply the following infection control practices during the delivery of health care.

1. Hand hygiene:

a. When hands are visibly dirty, contaminated with proteinaceous material, or visibly soiled with blood or body fluids, wash hands with either
   i. a nonantimicrobial soap and water or
   ii. an antimicrobial soap and water.

b. If hands are not visibly soiled, or after removing visible material with nonantimicrobial soap and water, decontaminate with an alcohol-based hand rub.
   i. Alternatively, hands may be washed with an antimicrobial soap and water.

c. Do not wear artificial fingernails or extenders if duties include direct contact with patients at high risk for infection.
d. Perform hand hygiene
i. Before and after each patient contact
ii. When contaminated with blood or other body fluids
iii. Before touching the eyes, nose or other mucous membranes
iv. Before inserting contact lenses or applying makeup

2. Use of appropriate personal protective equipment (PPE) inclusive of:

a. Gloves
i. Changed after every patient
ii. Appropriate in size for each clinician
iii. Should use heavy duty gloves for cleanup
iv. Be aware of potential latex allergy
b. Masks
i. Surgical mask approved by FDA
ii. Filters 95% of particles 3-5 microns in diameter
iii. Worn whenever spray spatter or aerosol possible
iv. Changed between patients or sooner
c. Eye protection
i. Worn whenever spray spatter or aerosol possible
ii. Adequate sideshields mandatory for maximal protection
d. Gowns
i. Worn whenever spray spatter or aerosol possible
ii. Should cover the street clothing; Short sleeves inappropriate
iii. Wear a gown, that is appropriate to the task, to protect skin and prevent soiling or contamination of clothing during procedures and patient-care activities when contact with blood, body fluids, secretions, or excretions is anticipated.

3. Proper handling of instruments and other patient care equipment:

a. Instruments/devices
i. Should be properly cleaned to remove bioburden
ii. Any instrument that penetrates tissue or touches mucous membranes and/or non-intact skin (including dental handpieces) should be sterilized
b. Patient care equipment
i. Should be disinfected with an EPA approved surface disinfectant
ii. Tuberculocidal agents are preferred.
c. Sterilizers
i. Must use FDA approved device
ii. Use biological monitor at least monthly

4. Respiratory Hygiene/Cough Etiquette

a. Cover mouth and nose when coughing and sneezing
b. Provide tissues in all treatment and patient areas
1. Provide trash receptacles for disposal

5. Environmental control:

a. Maintain a clean, safe environment
b. Non-critical surfaces (touch by blood/other fluids) should be cleaned and disinfected with an EPA approved surface disinfectant.
i. Tuberculocidal agents are preferred.

6. Injury prevention:

a. Safe handling of sharps
i. Do not recap needles by hand
ii. Use recapping devices
b. Place used sharps in puncture proof containers
i. Sharps containers should be readily available
ii. Do not overfill
c. Consider the use of engineered safe sharps.

* Modified from Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007, Updated, June 22, 2007, http://www.cdc.gov/ncidod/dhqp/pdf/guidelines/Isolation2007.pdf. and http://www.cdc.gov/ncidod/dhqp/gl_isolation_standard.html.

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CE Questions

HIV/AIDS

Test Instructions- Please fill in the bubble corresponding to the answer you believe to be correct for each question. Mail or fax completed tests to the Richmond Institute to receive CE Credit.

1. According to the CDC, how many people are estimated to be infected with HIV disease in the USA?
   a. 100,000
   b. 500,000
   c. 1 million
   d. 25 million
   e. None of the above

2. Which area of the world accounts for 68% of all people living with HIV and 76% of all AIDS deaths?
   a. Sub-Saharan Africa
   b. South America
   c. Asia
   d. North America
   e. None of the above

3. The first report of disease that would eventually be called HIV/AIDS was published in?
   a. 1963
   b. 1918
   c. 2003
   d. 1981
   e. 1975

4. Of the cumulative total AIDS cases in the USA at the end of 2005, more women had AIDS then men?
   a. True
   b. False

5. CDC estimated that what percentage of Americans who are infected with HIV, do not know that they are infected?
   a. Everyone is aware if they are infected
   b. 10%
   c. 25%
   d. 50%
   e. 75%

6. The diagnosis of AIDS is made when the CD4 count falls below?
   a. 10
   b. 50
   c. 100
   d. 200
   e. 500

7. Which of the following routes of transmission has been documented to cause HIV infection?
   a. Sexual contact
   b. Injection drug use (IDU)
   c. Blood/blood product transfusion or infusion
   d. Mother to child (perinatal)
   e. All of the above

8. With incorporation of drugs such as zidovudine (AZT) in prenatal care, elective caesarian section as appropriate and formula feeding the, risk of perinatal transmission of HIV in the USA can be reduced to
   a. No transmission
   b. <2%
   c. 16-25%
   d. Up to 30%
   e. Perinatal transmission cannot be reduced

9. The highest risk of occupational transmission of HIV is from percutaneous/parenteral exposure (needlestick or cut exposure to HIV-infected blood).
   a. True
   b. False

10. The rate of infection of HIV (seroconversion) from occupational transmission from percutaneous/parenteral exposure (needlestick or cut exposure to HIV-infected blood) is?
    a. 100%
    b. 10-15%
    c. 1-2%
    d. 0.3%
    e. None of the above

To Obtain CE Credit

Successful completion entitles respondent to one hour of CE credit through the Richmond Institute.
There is a $10.00 processing fee for each test submitted.

1) Please complete the answer section to the right. Incomplete tests will not be processed.
2) Submission:
   A) **Via Mail (with Check or Credit Card Information)**
   Mail completed test, address form, and $10.00 fee (no cash please) to
   The Richmond Institute for Continuing Education
   2260 Wendt St.
   Algonquin, IL 60102

   B) **Via Fax (with Credit Card Information ONLY)**
   Fax completed test and address form along with cover sheet marked "Attn: Richmond Institute" to *847•458•0063*

HIV/AIDS *By Louis G. DePaola, DDS, MS*

1.	○A	○B	○C	○D	○E	6.	○A	○B	○C	○D	○E
2.	○A	○B	○C	○D	○E	7.	○A	○B	○C	○D	○E
3.	○A	○B	○C	○D	○E	8.	○A	○B	○C	○D	○E
4.	○A	○B				9.	○A	○B			
5.	○A	○B	○C	○D	○E	10.	○A	○B	○C	○D	○E

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