

CHAPTER 6

INFECTION CONTROL

A supplement to Volume 52 (2003) MMWR Recommendations and Report, "Guidelines for Infection Control in Dental Health-Care Settings - 2003" consolidates and updates previous recommendations on preventing and controlling infectious diseases and managing personnel health and safety concerns related to infection control in dental settings. These new recommendations can be accessed at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5217a1.htm>

I. GENERAL INFECTION CONTROL PRACTICES

RECOMMENDATIONS:

Dental providers and dental office staff should be trained in the principles and practices of infection control.

The clinician should consult infection control guidelines for dentistry recommended by any of the following: the Centers for Disease Control and Prevention (CDC),¹ the American Dental Association (ADA),² or the Organization for Safety and Asepsis Procedures (OSAP).³ In addition, the clinician should comply with the bloodborne standards set by the Occupational Safety and Health Administration (OSHA)⁴ and the mandatory infection control training set by the New York State Board of Regents.⁵

Universal or standard infection control precautions should be carried out for all dental patients and all dental procedures.⁶ Special precautions are not necessary for patients with HIV because all patients are considered to be potentially infected with a bloodborne pathogen.

Workplace and engineering controls, including hand-washing, effective barrier precautions, proper use of personal protective equipment and safety devices, appropriate cleansing and sterilization of instruments and dental equipment/environmental surfaces, and both the safe handling and disposal of sharps, should be emphasized.

OSHA mandates that employers must offer employees free-of-charge immunization against hepatitis B. Employees who choose not to be immunized must sign a declination statement.⁴

Because adult chicken pox is associated with high morbidity, employees who are not immune should be encouraged to be immunized against the varicella zoster virus (VZV). For information about immunization against other pathogens, refer to CDC's Immunization of Health Care Workers recommendations.⁷

New York State requires that dentists and dental hygienists receive explicit training in infection control every 4 years, with particular emphasis on the modes and risks of HIV transmission in the dental

environment.⁵ In addition, OSHA mandates annual employee training about bloodborne pathogen transmission and an annual update of the clinic occupational exposure control plan.⁴ Oral health care providers must follow practice regulations as defined by the Americans with Disabilities Act.⁸ Those citing infection control concerns as grounds for not treating HIV-infected patients are subject to censure or prosecution (see Chapter 7: *Ethical and Legal Considerations*).

A number of pathogenic microorganisms may be transmitted in the dental setting. These include airborne pathogens, such as tuberculosis (TB); bloodborne pathogens, such as HIV, hepatitis B virus (HBV), and hepatitis C virus (HCV); waterborne pathogens; and mucosa/skinborne pathogens, such as VZV or herpes simplex virus (HSV).

II. AIRBORNE INFECTION CONTROL (TUBERCULOSIS)

RECOMMENDATIONS:

The risk for transmission of *Mycobacterium tuberculosis* in most dental settings is quite low. Oral health care providers should conduct a periodic risk assessment, and TB infection control policies for each dental setting should be based on this risk assessment.⁹

Oral health care providers should defer all non-emergency dental treatment in patients with suspected pulmonary or laryngeal TB disease until they are confirmed by a physician to be non-infectious. Emergency dental treatment for infectious patients should be performed in an isolation room with appropriate ventilation, and providers should wear appropriate personal respiratory protection. Appropriate respiratory equipment has been defined by CDC.⁹

Routine dental treatment should not be deferred for patients with the following conditions: extrapulmonary TB, latent TB infection in the absence of clinical disease, or MAC disease. Routine dental treatment also should not be deferred for patients with tuberculosis who are currently receiving treatment and are no longer infectious.

All untested oral health care providers should receive a baseline tuberculin skin test, unless they are already PPD+ or recent exposure dictates testing sooner. The frequency of retesting of oral health care providers is based on the risk assessment of the facility in which they practice.⁹

Throughout the 1980s and early 1990s, tuberculosis infection with *M tuberculosis* resurged as a significant public health problem. Tuberculosis is once again a significant public health problem in the United States. New York State had the second highest incidence rate of TB in the United States in 1998.¹⁰ The HIV epidemic explains part of the resurgence, and TB has been reported in 5% to 21% of persons with HIV infection. Strains of *M tuberculosis* that are resistant to anti-tuberculosis

medications have been reported with greater frequency in New York State than elsewhere, and transmission has been documented in health-related settings.⁹ Multidrug-resistant (MDR) isolates—those resistant to both isoniazid and rifampin—are of particular concern. Resistance to these drugs, which are the two most potent anti-tuberculosis medications, significantly confounds TB treatment and preventive therapy.

Oral health care providers should be aware that the rate of TB disease among HIV-infected persons with a reactive tuberculin skin test (PPD+) is approximately 4 to 26 times higher than the rate among comparable HIV-infected persons with a non-reactive tuberculin skin test (PPD-). This rate is approximately 200 to 800 times higher than the rate of TB estimated for the United States population overall (0.01%).¹¹

TB is transmitted via airborne droplets, especially from the coughing and sneezing of patients with active pulmonary or laryngeal TB. TB “infection” is synonymous with a latent infection in which patients have been exposed to TB and have a reactive tuberculin skin test, yet they are asymptomatic and non-infectious. *Bacillus Calmette Guerin* (BCG) immunization may produce a reaction that cannot be distinguished reliably from a reaction caused by exposure to TB, although most positive reactions in persons with a history of BCG immunization indicate TB infection. TB “disease” is synonymous with symptoms of active infection, and these patients are considered potentially infectious. HIV-infected patients with TB infection have a higher rate of reactivation to TB disease. Extrapulmonary TB also may be present in a small percentage of patients.

Before dental care is performed, prompt medical consultation is advisable for patients with suspected TB disease or with an unclear TB history. Signs and symptoms of TB disease include a persistent productive cough, fatigue, fever, night sweats and chills, loss of appetite, weight loss, chest radiograph abnormalities, and positive sputum smear and/or culture. Tuberculosis infectivity diminishes rapidly when patients receive effective therapy. The resolution of cough and fever suggests a good response to therapy and a reduced potential for contagion. Sputum smears that are negative for acid-fast bacilli (AFB) are also strong evidence of diminished potential infectivity. Precise determination of when an individual with TB becomes “non-infectious” can be difficult and may best be made on a case-by-case basis in conjunction with the treating clinicians, evaluating both the clinical picture and AFB smear status. Pulmonary multidrug-resistant tuberculosis (MDR-TB) is neither more nor less infectious than drug-susceptible TB, but it is more difficult to treat. Patients with HIV infection who have pulmonary TB are no more infectious than non-HIV-infected persons with pulmonary TB. Hence, the same clinical and infection control principles apply to all patients with pulmonary TB. Knowledge of HIV status is not required for determination of an individual patient’s potential TB infectivity.

Routine dental treatment **should not** be deferred for patients with the following conditions:

- Patients with reactive tuberculin skin test (PPD+) who have neither signs nor symptoms of TB disease.
- Patients with TB limited to extrapulmonary sites.
- Patients with active TB who are currently receiving treatment and are no longer infectious (symptoms resolved and AFB smear or culture negative).
- Patients with *Mycobacterium avium* complex (MAC) disease who are sputum AFB positive, unless pulmonary TB remains a clinical possibility. Concomitant pulmonary TB can be present with MAC disease.

Extrapulmonary TB is not infectious via the respiratory route, although isolated cases of transmission from ulcerating lesions have occurred through percutaneous injury.^{12,15} Persons with reactive tuberculin skin tests who do not have active pulmonary TB are not infectious. MAC disease is a major opportunistic infection in patients with HIV infection who have advanced immunosuppression.⁹ MAC is common in the environment, is of limited pathogenic potential to immunocompetent persons, and does not require special infection control precautions.

To protect other patients and staff (especially those who are HIV infected), all patients with a cough should be asked to cover their mouth and nose. Oral health care workers treating patients in an isolation room must follow strict respiratory precautions. Routine surgical masks are not adequate personal protective devices. Oral health care providers must wear NIOSH-certified submicron particulate respirator masks, requiring fit-testing by trained personnel.¹⁴

Reviews of TB management in a dental practice are available for further reading.¹⁵ Further information on TB control is available from the CDC at <http://www.cdc.gov/nchstp/tb/>.^{9,16}

III. BLOODBORNE INFECTION CONTROL (OCCUPATIONAL EXPOSURE)

RECOMMENDATIONS:

Employers are mandated by OSHA to have an exposure control plan.⁴ The plan must be reviewed and revised annually and updated regularly, and it should include consideration and use of commercially available safer devices shown to reduce the risk of occupational exposure.^{17,18}

Following any occupational exposure (either percutaneous or mucocutaneous), risk assessment for transmission of bloodborne pathogens (HBV, HCV, and HIV), indication for post-exposure prophylaxis (PEP) for HIV, and appropriate follow-up of the exposed individual should be based on the New York State Department of Health AIDS Institute guidelines, *HIV Prophylaxis Following*

Occupational Exposure, which can be downloaded and reviewed at <http://www.hivguidelines.org>.¹⁹

A procedure should be in place in the event that an occupational exposure occurs. Dental worker education about preventing and treating occupational injuries should be ongoing.

The risk of transmission of HIV to oral health care providers following occupational exposure is low. Through June 2000, 56 cases of documented seroconversion following occupational HIV exposure were reported to the CDC.²⁰ None of these documented cases occurred among oral health care providers. Six instances of *possible* HIV transmission to oral health care providers were reported among 138 cases of occupational exposure reported to the CDC. These 6 cases were identified after exclusion of other behavioral or transfusion risks; each reported percutaneous or mucocutaneous exposure to HIV, but seroconversion was not documented. Excellent reviews on the management of health care workers infected with bloodborne pathogens are available.²¹

Injury data specific to oral health care providers reveal a 3-fold decrease in the number of reported/observed injuries with a current average of 3 to 4 per year. The risk of bloodborne pathogen transmission associated with these injuries is very low, because most are not deep and have low volumes of blood (only 45% with visible blood in CDC surveillance study), and many are preventable with appropriate devices and work practices. Health care workers are not over-represented among AIDS cases reported to the CDC.

HIV-infected patients have an increased risk of co-infection with other bloodborne pathogens (e.g., HBV or HCV). The potential for contracting these pathogens exists independently of HIV status. Seroconversion rates following exposure to HBV and HCV (ranging from 6% to 30% and 0% to 7%, respectively) are significantly higher than for HIV.²² Hepatitis B carriers who are HBeAg positive have a higher likelihood of transmission than those who are only HBsAg positive. Occupational exposure protocols should include testing for these pathogens.

HBV infection can be prevented by receiving a full course of one of several approved recombinant hepatitis B vaccines and by ensuring an adequate serologic response [i.e., developing antibodies to the hepatitis B surface antigen (HBsAg)].²³ Occupational exposure protocols should indicate circumstances for the administration of hepatitis B immunoglobulin (HBIG) to oral health care workers not immunized against HBV. There is presently no available vaccine or post-exposure prophylaxis medication for HCV.

HIV PEP is recommended for transcutaneous or mucous membrane exposure to blood or visibly bloody oral secretions associated with potential HIV transmission. The basis for PEP is derived from the results of a case-control study demonstrating a reduction of 81% in HIV transmission among health care workers who received zidovudine prophylaxis.²⁴ With new antiretroviral drugs and classes, highly active antiretroviral therapy (HAART) is

currently recommended for PEP.^{19,25,26} PEP should be initiated ideally within 2 hours (but up to 36 hours) after exposure occurs to optimize effectiveness (see Figure 6-1). For specific recommendations on PEP following occupational exposure, refer to the New York State Department of Health AIDS Institute's *HIV Prophylaxis Following Occupational Exposure* guidelines,¹⁹ which can be obtained at <http://www.hivguidelines.org>.

All individuals placed on PEP should be re-evaluated within 72 hours of their exposure. This allows for further clarification of the nature of the exposure, review of available source patient serologies, and evaluation of adherence to and toxicities associated with the PEP regimen. A special consent form is available for testing the source patient (see Appendix VI). The worker should have baseline HIV antibody testing with follow-up testing at 4, 12, and 26 weeks post-exposure to document possible seroconversion. The dental worker should be educated to report any symptoms that might indicate primary HIV infection (e.g., fever, lymphadenopathy, rash, flu-like syndrome). The worker should practice risk-reduction behaviors until HIV infection is ruled out. When the source is co-infected with HBV or HCV, exposed individuals should follow recommended New York State Department of Health and CDC protocols for post-exposure management of HBV/HCV.²⁷⁻²⁹

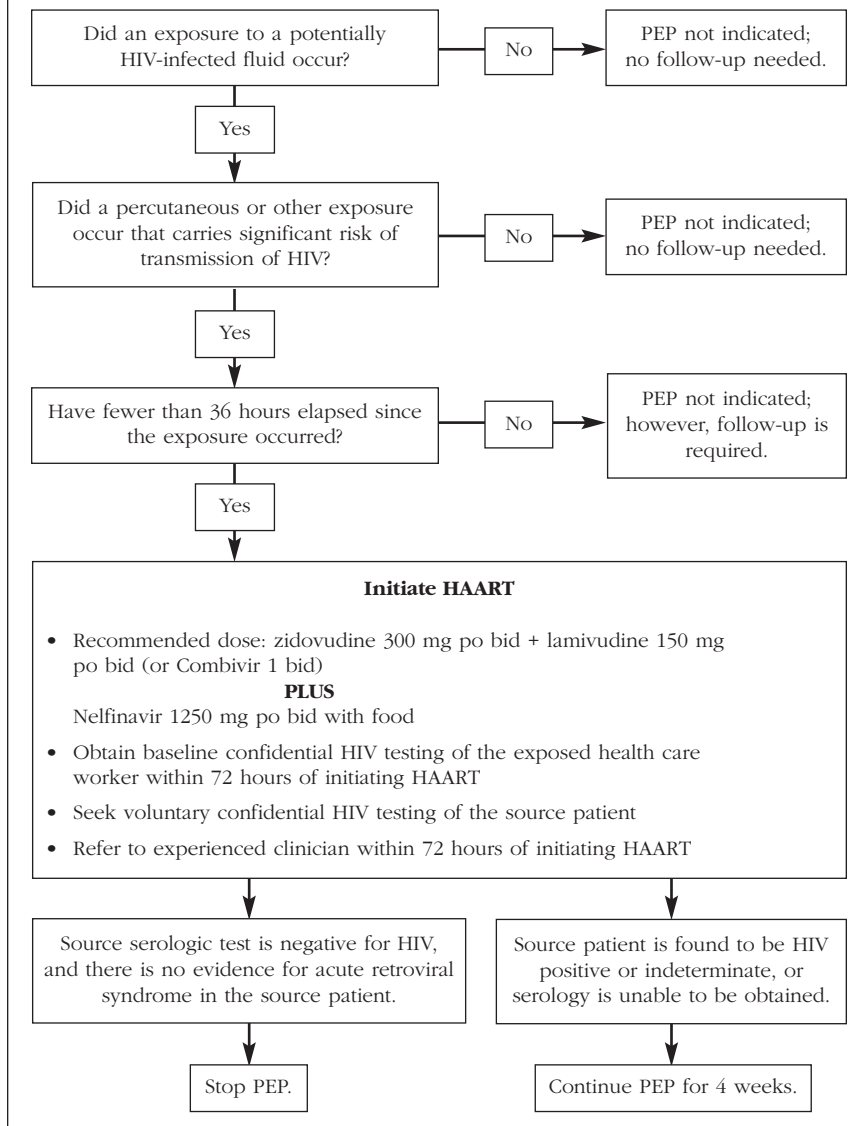
IV. WATERBORNE INFECTION CONTROL

RECOMMENDATION:

Oral health care providers should be aware of the potential for dental unit waterline contamination.

Dental unit waterline contamination is an emerging infection control issue but not a public health crisis.³⁰ Pathogenic microorganisms, including *Legionella* and *Pseudomonas* species, have been cultured from dental unit water, although studies demonstrating infections caused by such microorganisms are equivocal. When a boil-water advisory or other drinking water advisory has been made public, water from the public water supply should not be used.³¹ The oral health care provider may want to consider provision of only urgent care. Oral health care workers who wish to monitor or improve dental unit water are encouraged to learn more about new products by contacting equipment manufacturers or infection control resources such as CDC,³² Office Sterilization and Asepsis Procedures (OSAP) Research Foundation,^{3,31} or the New York State Department of Health Bureau of Public Water Supply Protection at the Center for Environmental Health (phone: 1-800-458-1158, extension 27650).

FIGURE 6-1
PEP FOLLOWING OCCUPATIONAL EXPOSURE



Reprinted from *HIV Prophylaxis Following Occupational Exposure*. New York State Department of Health AIDS Institute, 2001.

V. HEALTH CARE WORKERS WITH HIV OR OTHER INFECTIOUS DISEASES

RECOMMENDATIONS:

Health care workers should be counseled about the importance of learning their HIV and hepatitis B virus (HBV) status if they potentially have been infected through personal behavior or occupational exposure.

Courts have interpreted the State's Human Rights Law³³ and federal law (the Americans with Disabilities Act³⁴) to hold that HIV infection alone is not sufficient justification to limit the professional duties of health care professionals unless specific factors compromise a worker's ability to meet infection control standards or to provide appropriate patient care.

Health care workers with HIV infection who are exposed to TB should be aware of their increased risk for developing active tuberculosis and should therefore observe appropriate precautions.

HIV-infected health care workers with patient contact should practice standard infection control procedures.

The New York State Department of Health has developed guidelines indicating that the theoretical risk of transmission posed by health care workers with HIV is infinitesimally small.³⁵ HIV-infected health care workers should only be restricted in their practice if they are not competent to perform their duties. Health care facilities are responsible for establishing a mechanism for evaluating health care workers with HIV or HBV infection as part of their infection control process. Additional information regarding resources for HIV-infected dentists is available through the American Dental Association Well-Being Program [(312)-440-2622].

REFERENCES

1. Centers for Disease Control and Prevention. Recommended infection-control practices for dentistry, 1993. *MMWR Morb Mortal Wkly Rep* 1993;42(RR-8). Available at: <http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00021095.htm>
2. American Dental Association Infection Control Guidelines. Available at: <http://www.ada.org/prof/prac/issues/topics/iconrol.html>
3. Organization for Safety and Asepsis Procedures. Infection Control Guidelines. Available at: <http://osap.org/>
4. US Department of Labor, Occupational Safety and Health Administration. Controlling Occupational Exposures to Bloodborne Pathogens in Dentistry. 1992: Publication 3129. Available at: <http://www.osha-slc.gov/Publications/Osha3129.pdf>

5. Office of the Professions. New York State Education Requirement. Mandatory Training Related to Infection Control. Available at: <http://www.op.nysed.gov:80/icmemo.htm>
6. Centers for Disease Control and Prevention. Update: Universal precautions for prevention of transmission of human immunodeficiency virus, hepatitis B virus and other bloodborne pathogens in health care settings. *MMWR Morb Mortal Wkly Rep* 1988;37:377-388. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00000039.htm>
7. Centers for Disease Control and Prevention. Immunization of Health Care Workers: Recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practices Advisory Committee (HICPAC) 1997;46(RR-18):1-42. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00050577.htm>
8. Americans with Disabilities Act. Available at: <http://www.usdoj.gov/crt/ada/adahom1.htm>
9. Centers for Disease Control and Prevention. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health care facilities. *MMWR Morb Mortal Wkly Rep* 1994;43(RR-13). Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00035909.htm>
10. Centers for Disease Control and Prevention. Division of Tuberculosis Elimination. Surveillance Reports. Reported tuberculosis in the United States, 1998. August 1999;15. Available at: <http://www.cdc.gov/nchstp/tb/surv/surv.htm>
11. Centers for Disease Control and Prevention. Prevention and treatment of tuberculosis among patients with human immunodeficiency virus: Principles of therapy and revised recommendations. *MMWR Morb Mortal Wkly Rep* 1998;47(RR20):1-51. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00055357.htm>
12. Kramer F, Sasse SA, Simms JC, Leedom JM. Primary cutaneous tuberculosis after a needlestick injury from a patient with AIDS and undiagnosed tuberculosis. *Ann Intern Med* 1993;119:594-595.
13. Genne D, Siegrist HH. Tuberculosis of the thumb following a needlestick injury [see comments]. *Clin Infect Dis* 1998;26:210-211.
14. US Department of Health and Human Services Public Health Service, Centers for Disease Control and Prevention, and National Institute for Occupational Safety and Health, DHHS September 1999, Publication No. 99-143. TB Respiratory Protection Program in Health Care Facilities, Administrator's Guide. Available at: <http://www.cdc.gov/niosh/99-143.html>
15. Phelan JA, Jimenez V, Tompkins DC. Tuberculosis. *Dent Clin North Am* 1996;40:327-339.

16. Centers for Disease Control and Prevention. Infection Control in Dentistry. Airborne Disease Transmission. Available at: <http://www.cdc.gov/ncccdphp/oh/ic-airborne.htm>
17. DOL, OSHA 29 CFR parts 1904 and 1952. Occupational Injury and Illness Recording and Reporting Requirements, Final Rule Federal Register. January 19, 2001.
18. DOL, OSHA CPL 2-2.44 D. Enforcement Procedures for the Occupational Exposure to Bloodborne Pathogens. November 5, 1999.
19. Medical Care Criteria Committee. *HIV Prophylaxis Following Occupational Exposure*. New York: New York State Department of Health AIDS Institute; 2001. Available at: <http://www.hivguidelines.org>
20. US Department of Health and Human Services Public Health Service, Centers for Disease Control and Prevention. HIV/AIDS Surveillance Report, 2000, Midyear Ed;12:No. 1.
21. Henderson DK, Chiarello LA, Dickinson GM, et al. SHEA Position Paper. Management of healthcare workers infected with hepatitis B virus, hepatitis C virus, human immunodeficiency virus, or other blood-borne pathogens. *Infect Control Hosp Epidemiol* 1997;18:349-363.
22. Beltrami M, Williams IT, Shapiro CN, Chamberland ME. Risk and management of blood-borne infections in health care workers. *Clin Microbiol Rev* 2000;3:385-407.
23. Centers for Disease Control and Prevention. Hepatitis B virus: A comprehensive strategy for eliminating transmission in the United States through universal childhood vaccination: Recommendations of the Immunization Practices Advisory Committee (ACIP). *MMWR Morb Mortal Wkly Rep* 1991;40(RR-13):1-19. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00033405.htm>
24. Centers for Disease Control and Prevention. Case-control study of HIV seroconversion in health care workers after percutaneous exposure to HIV-infected blood: France, United Kingdom, and United States, January 1988—August 1994. *MMWR Morb Mortal Wkly Rep* 1995;44:929-933. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00039830.htm>
25. Centers for Disease Control and Prevention. Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Postexposure Prophylaxis. *MMWR Morb Mortal Wkly Rep* 2001;50(RR11):1-42. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5011a1.htm>
26. Chenoweth CE, Gobetti JP. Postexposure chemoprophylaxis for occupational exposure to HIV in the dental office. *J Am Dent Assoc* 1997;128:1135-1151.

27. Medical Care Criteria Committee. *Viral Hepatitis*. New York: New York State Department of Health AIDS Institute; 2001. Available at: <http://www.hivguidelines.org>
28. Centers for Disease Control and Prevention. Hepatitis B virus: A comprehensive strategy for eliminating transmission in the United States through universal childhood vaccination: Recommendations of the Immunization Practices Advisory Committee (ACIP)—Appendix A: Postexposure Prophylaxis for Hepatitis B. 1991;40(RR-13):21-25. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00033455.htm>
29. Centers for Disease Control and Prevention. Recommendations for the follow-up of health care workers after occupational exposure to hepatitis C virus. *MMWR Morb Mortal Wkly Rep* 1997;46:603-606. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00048324.htm>
30. Mills SE. The dental unit waterline controversy: Defusing the myths, defining the solutions. *J Am Dent Assoc* 2000;131:1427-1441.
31. US Department of Health and Human Services Public Health Service. Centers for Disease Control and Prevention suggested procedures for Dental Offices during boil-water advisories. December 23, 1998.
32. Centers for Disease Control and Prevention. Infection Control in Dentistry: Waterborne Disease Transmission. Available at: <http://www.cdc.gov/nccdphp/oh/ic-waterborne.htm>
33. New York State Human Rights Law, §292(21); 296(2).
34. Americans with Disabilities Act, 4 USC, §401 (1990).
35. New York State Department of Health Policy Statement and Guidelines to Prevent Transmission of HIV and Hepatitis B Through Medical/Dental Procedures. New York, NY: New York State Department of Health; 1992.