12. INFECTION AND HAZARD CONTROL

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1. What is the difference between infection control and exposure control?

Infection control encompasses all policies and procedures to prevent the spread of infection and/or the potential transmission of disease. A hewer term, exposure control, refers to procedures for preventing exposures to potentially infective microbial agents.

2. What are the major mechanisms by which diseases are transmitted?

Disease may be transmitted by direct contact with the source of microorganisms (e.g, percutaneous injury, contact with mucous membrane, nonintact skin, or infective fluids, excretions, or secretions) and by indirect contact with contaminated environmental surfaces or medical instruments and aerosols.

3. What is aerosolization?

Aerosolization is a process whereby mechanically generated particles (droplet nuclei) remain suspended in the air for prolonged periods, and may be capable of transmitting an airborne infection via inhalation. Aerosols are airborne particles, generally 5—10 .tm in diameter, that may travel for long distances. They may occur in liquid or solid form. True aerosols are different from other airborne particles, such as splash and spatter, which are large droplets that do not remain airborne but contribute to contamination of horizontal surfaces (indirect contact).

4. What barriers may be used to block the above routes?

A surgical mask or an appropriate face shield may provide some degree of protection from inhalation of airborne particles, even though surgical masks are not designed to provide respiratory protection. These and protective eyewear also help to prevent mucous membrane exposures, direct droplet contact, or ingestion of patient materials. Clinic attire and gloves offer skin contact protection. The basic idea is to put a barrier between exposed areas of the body and microbially laden materials.

5. What does the Occupational Safety and Health Administration (OSHA) require in a written exposure control plan?

OSHA requires at least the following three elements:

1. The employer's "exposure determination," which identifies at-risk employees

2. An implementation schedule and discussion of specific methods of implementing requirements of the OSHA Bloodborne Pathogens Standard.

3. The method for evaluating and documenting exposure incidents

6. How often must a written exposure control plan be reviewed?

OSHA's Bloodborne Pathogens Standard requires an annual review of a written exposure

control plan. The plan also must be reviewed and updated after any change in knowledge, practice, or personnel that may affect occupational exposure.

7. What is an exposure incident?

According to OSHA, an exposure incident is any reasonably anticipated eye, skin, mucous membrane, or parenteral contact with blood or other potentially infectious fluids during the course of one's duties. In more general terms, an exposure incident is an occurrence that puts one at risk of a biomedical or chemical contact/injury on the job.

8. What should be included in the procedure for evaluating an exposure incident?

At least the following factors should be considered in evaluating an exposure incident:

1. Where the incident occurred in terms of physical space in the facility

2. Under what circumstances the exposure occurred

3. Engineering controls and work practices in place at the time of the exposure

4. Policies in place at the time of the incident

5, Type of exposure and severity of the injury

6. Any information available about the source patient

9. How should an exposure incident be reported?

An exposure incident is a "recordable occupational injury" for OSHA's record-keeping obligations. A dental employer with 11 or more employees must record each exposure incident on OSHA Forms 101 (Supplemental Record of Occupational Injuries and Illnesses) and 200 (Log and Summary of Occupational Injuries and Illnesses). If there are fewer than 11 employees, the employer must prepare a report of the exposure incident but is not required to use forms 101 and 200. However, the information necessary to report an incident accurately is clearly defined on the forms, and it may be more prudent to use them, regardless of the size of the facility, to ensure that all required information has been recorded.

10. How does OSHA define a "source individual" in the context of an exposure incident?

The standard defines "source individual" as any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure.

11. Are students covered by OSHA standards?

In accordance with the Occupational Safety and Health Act of 1970, OSHA jurisdiction extends only to employees and does not cover students if they are not considered to be employees of the institution. If, however, the student is paid by the institution, he or she becomes an employee. Regardless of employee status, most aspects of the OSHA Bloodborne Pathogens Standard are considered to be standards of practice for all health care workers and are designed to prevent the potential transmission of disease. Therefore, the safe practices and procedures outlined in the standard should be followed by all health care workers.

12. How do you determine who is at risk for a bloodborne exposure?

The first step is to conduct a risk assessment, which begins by evaluating the tasks that are always done, sometimes done, and never done by an employee. If any one task carries with it an opportunity for contact with any potentially infective (blood or blood-derived) fluid or if a person may, even once, be asked to do a task that carries such an exposure risk, that employee is at risk and must be trained to abate or eliminate risk.

13. Can the receptionist help out in the clinic?

Only if he or she has been trained to work in a manner that reduces risk of an exposure incident, understands the risk, and has received (unless otherwise waived) the hepatitis B vaccine or demonstrates immunity from past infection.

14. What is an engineering control?

The term refers to industrial hygiene and is used by OSHA for technologically derived devices that isolate or remove hazards from the work environment. The use of engineering controls may reduce the risk of an exposure incident. Examples include ventilation systems and ergonomic design of equipment and furnishings.

15. Give examples of engineering controls used in dentistry.

A needle-recapping device is an engineering control, as is a sharps container. These items are designed to isolate sharps, wires, and glass. A rubber dam, which serves as a barrier between the operator and potentially infective patient fluids, is also an engineering control because it reduces aerosols and splashing and spattering of large droplets during dental procedures.

16. Where is the most reasonable location for a sharps container?

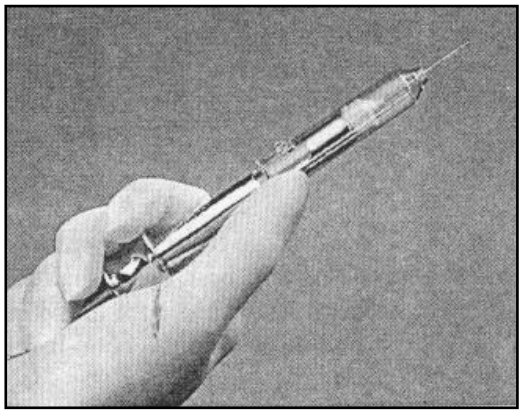
To be most effective in reducing the hazard associated with nonreusable sharps, the container should be placed in a site near where the sharps are used and not in a separate area that requires transport or additional handling.

17. What needle-recapping devices are acceptable?

First, any recapping must be done with a mechanical device or a technique that uses only one hand ("scoop technique"). Such techniques ens that needles are never pointed at or moved toward the practicing health care worker or other workers, either on purpose or accidentally. Newer, self-sheathing anesthetic syringes and needle devices do not require any movements associated with recapping.

Needle – recapping device

Self-sheathing syringe,



18. What is a work practice control? How does it differ from an engineering control?

Work practice controls are determined by behavior rather than technology. Quite simply, a work practice control is the manner in which a task is performed. Safe work practice controls sometimes require changing the manner in which a task is performed to reduce the likelihood of an exposure incident. For example, in recapping a needle, whether or how you use a device is the work practice. Something as simple as how you wash your hands is a work practice control as well.

19. What is the most appropriate work practice control in cleaning instruments?

Probably the best technique for cleaning instruments is to use an ultrasonic cleaner because of its potential to reduce percutaneous injuries. If an ultrasonic cleaner is not available, the work practice is to select one or two instruments at a time with gloved hands, hold them low in the sink under running water, and scrub them with a long-handled brush. Essentially, the strategy is to clean reusable instruments and items in a manner that minimizes hand contact.

20. What should a proper handwashing agent be expected to accomplish?

At a minimum, it should (I) provide good mechanical cleansing of skin; (2) have the capacity to kill a variety of microorganisms if it is used in a surgical setting; (3) have some residual antimicrobial effect to prevent regrowth of resident bacteria and fungi when used for surgical handwashing; and (4) be dispensed without risk of cross-contamination among workers.

The major concern, exclusive of surgery, is the transient flora on workers' hands. The primary idea is to wash off the flora, not just to kill them in situ with an antimicrobial agent. In surgery, antimicrobial products are the standard of care to address the health care worker's resident flora, which multiply under the glove. Surgical handwashing is used when a direct intent of the medical procedure is to break soft tissue.

21. Can dental charts be contaminated? How can you reduce the risk of cross-contaminating dental charts?

A dental chart may be contaminated if it is in area where it may come in contact with potentially infective fluids. This risk may be minimized if the charts are not taken into a patient or dinical area. If, however, they must be accessible during treatment, they should be appropriately handled with noncontaminated gloves. Overgioves worn atop clinic gloves for handling records is one possibility. Another is to protect the record with a barner.

PERSONAL PROTECTIVE EQUIPMENT

22. How do you determine what types of personal protective equipment (PPE) you should use?

The selection of PPE should be based on the type of exposure anticipated and the quantity of blood, blood-derived fluids, or other potentially infective materials that reasonably may be expected in the performance of one's duties. With normal use the material should prevent passage of fluids to skin, undergarments, or mucous membranes of the eyes, nose, or mouth.

23. Do gloves protect me from a sharps exposure?

To a limited degree at best. Some studies indicate that the mechanical action of a sharp passing through the glove may reduce the microbial load. However, even heavy-duty utility gloves do not block penetration. In addition, blunt instruments pose injury risks for the dental health care worker and patient.

24. Does clinic attire (lab coats) protect me from potentially infective fluid?

The intent of clinic attire is to prevent potentially infective fluids from reaching skin, especially nonintact skin, that can serve as a portal of entry for pathogenic organisms. Putting an effective barrier, such as a lab coat, between your body and these fluids reduces the risk of infection. Such garments are contaminated and should not be worn outside the clinic area.

25. Should clinic attire be long- or short-sleeved?

Because the OSHA standards are performance-based, the dental health care worker must determine whether the procedure is likely to result in contact with patient fluids or materials. If the answer is yes, the potential contact area should be covered.

26. How do you determine whether eyewear is protective?

The best way is to look to the standards of the American National Standards Institute (ANSI). These standards describe protective eyewear as impact-resistant, with coverage from above the eyebrows down to the cheek and solid side-shields to provide peripheral protection. The eyewear should protect not only from fluids but also from flying debris that may be generated during a dental procedure.

27. Is a surgical mask needed under a face shield?

Yes, unless the face shield has full peripheral protection at the sides and under the chin. The

mask protects the dental health care worker from splashes and spatters to the nose and mouth.

28. What type of protection do most masks used in dental offices offer?

The masks used in dental offices do not provide definable respiratory protection; their primary design is to protect the patient. However, the physical barrier certainly protects covered areas from droplet scatter generated during treatment. If respiratory protection is indicated, masks must be certified for respiratory protection. Read the product label,

29. How long can a mask be worn?

Basically, you can wear a mask until it becomes wet or torn. You must, however, use a new mask for each patient. Limited research indicates that the duration for use is about 1 hour for a dry field and 20 minutes for a wet field.

30. What is the purpose of heavy-duty utility gloves?

Heavy-duty utility gloves, such as those made of nitrile rubber, should be worn whenever contaminated sharps are handled. They are worn for safe pick-up, transport, cleaning, and packing of contaminated instruments. They also should be used for housekeeping procedures such as surface cleaning and disinfection. Routine cleaning and disinfection are necessary because the gloves also become contaminated. They should not be worn when handing or contacting clean surfaces or items. **Note:** Exam gloves are not appropriate for instrument cleaning or reprocessing or any housekeeping procedure.

How to Select Task-appropriate Gloves

FOR THIS TASK	USE THIS GLOVE
Contact with sterile body cavities	Sterile Latex gloves
Routine intraoral procedures, routine contact with mucous membranes	Latex exam gloves
Routine Contact with mucous membranes, cases of Latex allergy	Vinyl exam or other non-Latex glove
Nonclinical care or treatment procedures, such as processing radiographs and writing in a patient record	Copolymer gloves or over gloves
Contact with chemical agents, contaminated sharps, and other potential exposure incidents not related to patient treatment	Nitrile rubber gloves

31. What is irritant dermatitis?

It is a nonallergic process that damages superficial layers of skin. It is caused mostly by contact that physically or chemically challenges the skin tissue.

32. What are its symptoms?

In general, the top layer of the skin becomes reddened, dry, irritated, or cracked.

33. What causes of dermatitis are associated with health care workers' hands?

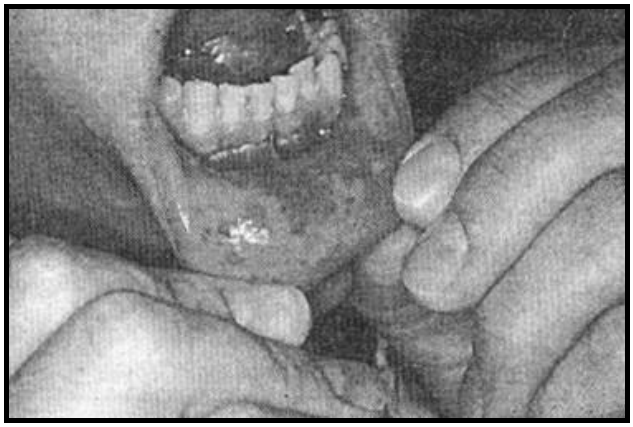
Nonallergic irritant dermatitis is the most common form of adverse reactions. It is often caused by (1) contact with a substance that physically or chemically damages the skin, such as frequent antimicrobial handwash agents on sensitive skin; (2) failure to rinse off chemical antiseptic completely; (3) irritation from corn starch powder in gloves; and (4) failure to dry hands properly and thoroughly.

34. What common types of hypersensitivity symptoms are caused by Latex gloves and other Latex items?

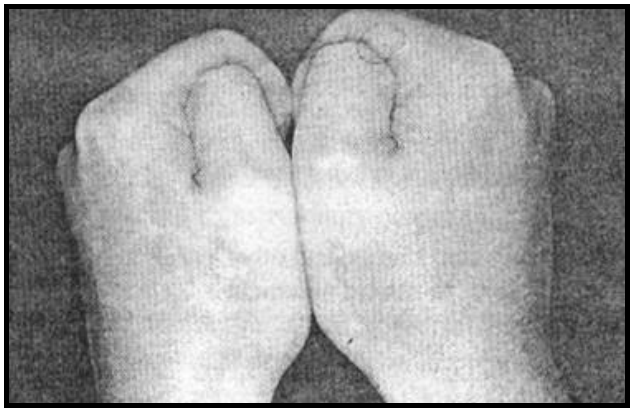
1. **Cutaneous anaphylactic reaction** (type I hypersensitivity) typically develops within minutes after an allergic person either comes into direct contact with allergens via tissues or mucous membranes (donning Latex examination or surgical gloves) or is exposed via aerosolization of allergens. Natural rubber Latex

proteins adhering to glove powder particles can remain suspended in the air for prolonged periods after gloves are placed on hands and when new boxes of gloves are opened. Wheal and flare reaction (i.e., urticaria, hives) may develop along with itching and localized edema. Coughing, wheezing, shortness of breath, and/or respiratory distress may occur, depending on the person's degree of sensitization. Type I hypersensitivity can be a life-threatening reaction; appropriate medical supplies (e.g., epinephrine) should always be immediately available.

2. **Contact dermatitis** (delayed type IV hypersensitivity) is characterized by a several hour delay in onset of symptoms and reaction that peaks in 24—48 hours. This slow-forming, chronic inflammatory reaction is well demaycated on the skin and is surrounded by localized erythema. Healing may take up to 4 days with scabbing and sloughing of affected epithelial sites.



Type I hypersensitivity reaction in the oral mucosa.



Type IV hypersensitivity reaction on the skin of the hands.

35. What should be done for health care workers who develop symptoms or reactions that may be due to Latex hypersensitivity?

The first step is to determine that you are dealing with a true reaction to Latex. The most common type of hand dermatitis is actually nonspecific irritation and not an immunologic response. Nonspecific irritation can have a similar appearance to type I or type IV reactions but often results from improper hand care, such as not drying hands completely before putting on gloves. In addition,

allowing dry hands to go untreated, especially during colder seasons, may lead to development of chapped, broken areas in the epithelium.

When a condition has been diagnosed as hypersensitivity to Latex by the appropriate medical practitioner, specific treatment and avoidance of offending substances can proceed. Affected health care workers should look for non-Latex gloves and other items that both prevent further exacerbations and allow suitable tactile sensation and protection. In an alert to health professionals in 1991, the FDA also suggested that persons with severe Latex sensitivity should wear a medical identification bracelet in case they require emergency medical care and are unable to alert hospital personnel.

36. What risk factors are associated with Latex allergy?

1. Frequent exposure to Latex
2. History of surgery
3. Spina bifida
4. Frequent catheterization
5. Allergies to certain food, such as bananas, avocados, kiwi fruit, and chestnuts

37. What are the official recommendations for protection of health care workers with ongoing exposure to Latex?

The National Institute for Occupational Safety and Health (NIOSH) recommends the following steps for worker protection:

1. Use non-Latex gloves for activities that are not likely to involve contact with infectious materials (e.g., food preparation, routine housekeeping and maintenance).

2. When appropriate barrier protection is necessary, choose powder-free Latex gloves with reduced protein content.

3. When wearing Latex gloves, do not use oil-based hand creams or lotions unless they have been shown to reduce Latex-related problems.

4. Frequently clean work areas contaminated with Latex dust.

5. Frequently change the ventilation filters and vacuum bags in Latex-contaminated areas.

6. Learn to recognize the symptoms of Latex allergy: skin rashes and hives; flushing and itching; nasal, eye, or sinus symptoms; asthma; and shock.

7. If you develop symptoms of Latex allergy, avoid direct contact with Latex gloves and products until you see a physician experienced in treating Latex allergy.

8. Consult your physician about the following precautions:

- Avoid contact with Latex gloves and products.
- Avoid areas where you may inhale the powder from Latex gloves worn by others.
- Tell your employer(s), physicians, nurses, and dentists that you have Latex allergy.
- Wear a medical alert bracelet.

9. Take advantage of all Latex allergy education and training provided by your employer.

38. A patient reports a Latex allergy and says that if a glove touches her, she will break out. What type of glove should be used in place of Latex?

Newer, better non-Latex (synthetic) gloves provide adequate barrier protection and reduce concern for an allergic response. However, depending on the severity of the allergy, more serious responses may occur merely in the presence of Latex. You may wish to consult with the patient's allergist for additional recommendations.

39. Why are lanolin hand creams contraindicated with glove use?

The fatty acids in lanolin break down the Latex (wicking) and create a build-up of film on the hands.

BLOODBORNE INFECTIONS AND VACCINATION

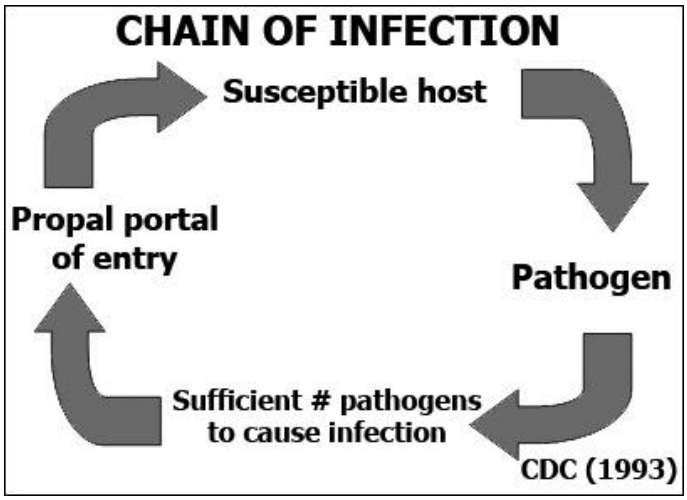
40. What are universal precautions?

Universal precautions a concept of infection control, assume that any patient is potentially infectious for a number of bloodborne pathogens. Blood, blood-derived products, and certain other fluids that are contaminated with blood are considered infectious for human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and other bloodborne pathogens. Standard precautions are procedure-specific, not patient-specific. In dentistry, saliva is normally considered to be blood-contaminated.

41. What is the chain of infection?

The chain of infection refers to the prerequisites for infection (by either direct or indirect contact):

1. A susceptible host
2. A pathogen with sufficient infectivity and numbers to cause infection
3. An appropriate portal of entry to the host (e.g., a bloodborne agent must gain access to the bloodstream, whereas an enteric agent must enter the mouth [tract]).



Chain of infection. (From U.S. Department of Health and Human Services, Centers for Disease Control and Prevention: Practical Infection Control in the Dental Office. Washington, DC, U.S. Department of Health and Human Services, 1993.)

42. Which factor is easiest to control: agent, host, or transmission?

Agent and host are more difficult to control than transmission. Standard precautions are directed toward interrupting the transfer of microorganisms from patient to health care worker and vice versa.

43. What is one of the single most important measures to reduce the risk of transmission of microorganisms?

Handwashing is one of the most important measures in reducing the risk of transmission of microorganisms. Hands should always be thoroughly washed between patients, after contact with blood or other potentially infective fluids, after contact with contaminated instruments or items, and after removal of gloves. Gloves also play an important role as a protective barrier against cross-contamination and reduce the likelihood of transferring microorganisms from health care workers to patients and from environmental surfaces to patients. A cardinal rule for safety is never to touch a surface with contaminated gloves that will subsequently be touched with ungloved hands.

44. What are standard procedures?

Standard procedures are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in hospitals. They are a combination of universal precautions and body substance isolation precautions and apply to blood, all bodily fluids (whether or not they contain blood), nonintact skin, and mucous membranes.

45. Is exposure synonymous with infection?

No. An exposure is a contact that has a reasonable potential to complete the chain of infection and result in disease of the host.

46. What are hepatitis B and delta hepatitis?

Hepatitis B is one of most common reportable diseases in the United States. HBV is transmitted through blood and sexual fluids: it is highly transmissible because of the large numbers of virus in the blood of infected persons (about 100 million per ml). Delta hepatitis is caused by a defective virus (hepatitis D virus [that relies on HBV for its pathogenicity and can infect only in the presence of HBV. HBV and HDV coinfection, however, results in a fulminant course of liver disease.

47. Why is hepatitis B vaccination so important?

HBV is the major infectious occupational hazard to health care workers. Transmission has been documented from providers to patients and vice versa. In 1982, a vaccine became available to provide protection from HBV infection. The first-generation vaccine was plasma-derived, but the vaccine in current use is genetically engineered. The safety and efficacy of the vaccine are well established, and there is no current recommendation for booster doses. Furthermore, protection from I-JBV also confers protection from HDV.

48. If you are employed in a dental practice, who pays for the HBV vaccine—you or your employer?

If an employee may be exposed to blood or other potentially infectious fluids during the course of work, it is the obligation of the employer to offer and pay for the series of vaccinations. The employer is not required to pay titer test costs because this test is not recommended by the United States Public Health Service (USPHS), the agency on which OSHA relies for advice.

49. What if I refuse the vaccination?

In most states, you have a right to refuse the vaccination. You should realize, however, that without the HBV vaccination series or evidence of previous infection you remain at risk for acquiring HBV infection. Because OSHA considers the HBV vaccination one of the most important protections that a health care worker can have, the agency requires the employee to sign a waiver if the vaccination is refused. Signing the waiver does not mean that, if you change your mind in the future, the employer does not have to pay.

50. What is the risk of acquiring HBV infection from a percutaneous exposure to blood known to be infected with HBV?

The risk of becoming infected with HBV is about 17—30%.

51. What is the risk of HIV transmission associated with percutaneou mucous membrane exposures to blood known to be HIV-positive?

The risk is about 0.3% (1/300) for percutaneous and about 0.09% (1/900) for mucous membrane exposures. Many factors, however, influence the likelihood of transmission (see question 62). Accumulated data from studies involving health care worker exposures suggest a 0.2—0.4% risk of HIV infection with the worst-

case scenario of a severe percutaneous injury involving exposure to blood from a terminal HIV patient.

52. Have injuries to dental health care workers increased or decreased over the past decade?

Injuries have decreased from reports of 12 per year to 3—4 per year by 1991. More recent data suggest that currently 2—3 injuries are reported per year.

53. Where do most injuries occur?

Most reported injuries occur outside the mouth, mainly on the hands of the practitioner. Burrs have been cited as the most common source of injury. For oral surgery, wires are frequently cited as the cause of injury.

54. Are any of these injuries avoidable?

Yes. Data indicate that most reported injuries were avoidable.

55. What is the major fact in prevention of bloodborne pathogen transmission in health care settings?

Work practice controls have the greatest impact on preventing bloodborne disease transmission. Over 90% of the injuries leading to disease transmission have been associated with syringes and sharp instruments. Injuries also may be prevented by engineering controls, particularly the use of safer medical devices. A safe device will not prevent an injury unless it is properly used. The overall message is to maintain consistent levels of attention and to take personal care.

Management Protocol for Accidental Exposures

1. *Most importantly,* give appropriate first aid to contain or stop bleeding; then clean the wound:

Parenteral	Bleed the wound, and cleanse it.
Mucous membrane	Flush the exposed area with copious amounts of water.
Nonintact skin	Cleanse area with antimicrobial agent.

2. Report incident to employer or other designated personnel to initiate written documentation.
3. Determine source patient if possible. Employer or other designated personnel must discuss incident with source patient and offer to test his or her blood for the presence of HIV or HBV with written informed consent.
4. If the source patient with written informed consent releases information about HIV or HBV status, this information may be conveyed to the exposed worker. Employees should be aware of laws protecting confidentiality of medical history and prohibiting disclosure of HIV status.

5. Contact designated health care professional for immediate medical evaluation of incident, HIV counseling, and HIV/HBV testing.
6. If baseline HIV test is not desired, counsel or recommend drawing a blood sample for storage at test site. Within 90 days, employee may have blood sample tested for HIV.
7. Zidovudine (ZDV) or other anti-HIV agents taken as a chemoprophylactic measure should be started immediately and no longer than about 2 hours after incident.*
8. Follow OSHA steps for reporting, including the use of OSHA form 101 (or equivalent if practice employs fewer than 11 persons).
9. Ensure health care professional treating the incident has been provided all information required by OSHA, including but not limited to:
   - Injury report form
   - Description of exposed employee's tasks
   - Information about source patient with written consent for release
   - Copy of OSHA Bloodborne Standard
   - Information about exposed employee's vaccination status
10. The health care professional must report to the employer within 15 days of the medical evaluation. The report contains only information about vaccination status and whether HBV vaccination was provided. All other information is confidential.
11. Ensure appropriate follow-up.

* Please refer to question 63 for mm-c details.

Hepatitis B Virus Postexposure Management •

EXPOSED WORKER	TREATMENT WHEN SOURCE IS FOUND TO BE: HBsAG-POSITIVE	HBsAG-NEGATIVE	UNKNOWN OR NOT TESTED
Unvaccinated	1. Initiate hepatitis B vaccine and 2. Worker should receive single dose of hepatitis B immunoglobulin (HBIG) as soon as possible and within 24 hr if possible	Initiate hepatitis B vaccine	Initiate hepatitis B vaccine
Previously vaccinated Known responder	Test exposed worker for anti-HBs: 1. If adequate*,no treatment 2. If inadequate, hepatitis B vaccine booster dose	No treatment	No treatment
Known nonresponder	Worker should receive: 1. 2 doses HBIG (give second dose 1 mo after first dose)*or* 2. 1 dose HBIG plus 1 dose hepatitis B vaccine	No treatment	In known high-risk source, may treat worker as if source were HBsAg- positive
Response unknown	Test exposed worker for anti-HBs: 1. If inadequate, 1 dose HBIG plus hepatitis B vaccine booster dose 2. If adequate, no treatment	No treatment	Test exposed worker for anti-HBs: 1. If inadequate, hepatitis B vaccine booster dose 2. If adequate, no treatment

• Once an exposure has occurred, the blood of the source individual should be tested for hepatitis B surtace (HBsAg). Based on recommendations from 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 40(RR-13): 1—25, 1991.

* Adequate anti-HBs is ≥ 10 milli-international units.

Human Immunodeficiency Virus Postexposure Management •

TREATMENT OF EXPOSED WORKER WHEN SOURCE INDIVIDUAL		
Has AIDS or is HIV-positive *or* refuses to be tested	Is tested and found seronegative and has no clinical manifestations of AIDS or HIV infection	Cannot be identified
1. Exposed worker should be counseled about risk of infection 2. Exposed worker should be evaluated clinically and serologically for evidence of HIV infection as soon as possible after exposure. 3. Exposed worker should be advised to seek and report medical evaluation for any febrile illness within 12 wk after exposure 4. Exposed worker should be advised to refrain from blood donation and to use appropriate protection for sexual intercourse during follow-up period, especially first 6—12 wk after exposure. Exposed worker who tests negative initially should be retested 6 wk, 12 wk, and minimum of 6 mo after exposure	No further follow-up unless: 1. Evidence suggests that source may have been recently exposed. 2. Desired by worker or recommended by health care provider, If testing is done, guidelines in first column may be followed,	Decisions about appropriate follow-up should be individualized. Serologic testing should be done if worker is concerned that transmission may have occurred.

• Based on recommendations from Public Health Service statement on management of occupational exposure to human immunodeficiency virus, including considerations regarding zidovudine post exposure use, MMWR 39(RR-l):l—l4, 1990.

56. If I injure myself while working on a patient, can I call the patient's personal physician for additional medical history information?

In almost all states, you must first obtain a written informed consent from the patient. Calling without this consent may be a violation of medical confidentiality. You may discuss the situation with the patient, however, to ask permission or further information about his or her health. Regardless of the answer, you should be evaluated by an appropriate health care provider as soon as feasible if the injury warrants.

57. What treatment options are available to a health care worker who has been exposed to HBV?

The health care worker may consider having a hepatitis B antibody titer to determine HBV serostatus. However, treatment should be initiated within 24 hours. If the health care worker was not vaccinated against HBV or does not have demonstrable antibody titer against hepatitis B surface antigen (anti-HB5Ag), hepatitis B immunoglobulin (HBIG) should be administered as soon as possible.

The HBV vaccination series should be initiated at the same time. An exposed health care worker also may need to consider the possibility that HIV and/or HCV exposure may have occurred simultaneously.

58. When must a percutaneous exposure (i.e., needlestick) be reported to OSHA?

Any occupational exposure or injury must be recorded on either OSHA forms or the practice's forms if it is work-related, required medical evaluation and/or follow-up, or resulted in seroconversion. Seroconversion, as the result of occupational exposure, also should be reported to the appropriate state agencies and the Centers for Disease Control and Prevention (CDC).

59. If I am a hepatitis B carrier, can I continue work that involves patient contact?

In many states you may continue clinical care as long as you adhere strictly to standard (universal) precautions. However, you should check with your department of public health, board of registration, or professional association for copies of the guidelines for HBV- or HIV-infected health care workers. Although based on guidelines developed by the CDC, they differ among states.

60. If I am not hepatitis B e antigen (HBeAg)-positive, am I still able to transmit hepatitis B?

Recently published data about four surgeons who were carriers of HBV and transmitted HBV to their patients indicate that surgeons, even in the absence of detectable levels of HBeAg in the serum, can transmit HBV during surgical procedures involving inapparent exposures of patients to small amounts of infective blood or serum.

61. How is such transmission possible?

A mutation that prevents the expression of HBeAg while the virus persists in a carrier state was discovered during the investigation of the surgeons.

62. What factors are associated with an increased risk of HIV transmission after a percutaneous injury?

1. First and foremost is whether the exposure was related to a large quantity of blood. Associated factors include (a) whether the device was visibly contaminated with the patient's blood; (b) whether the procedure involved a needle placed directly in a vein or artery; and (c) whether it was a deep injury or associated with actual injection of patient material.

2. Risk also increases for exposure to blood from source patients with terminal illness (i.e., the last 6 months of life), which is probably indicative of higher viral titers. The risk may depend on the source patient's experience with antiretrovirals.

3. Also important is the health care worker's use of postexposure chemoprophylaxis. Surveillance reports suggest that ZDV (an retroviral) decreased the risk of HIV seroconversion by 79% after controlling for factors other than ZDV use alone.

63. What does the USPHS recommend for chemoprophylaxis after HIV exposure?

The USPHS recommends that in certain cases health care workers should take ZDV and other antireti-oviral drugs[1] after exposure on the job to reduce the risk of becoming infected. These drugs are recommended for the highest-risk exposures, such as needlesticks contaminated with the blood of a patient in the late stages of AIDS. For lower-risk exposures, such as a blood splash to the eye, drugs should be offered to the worker; however, considerable thought should be given to taking drugs for lower-risk exposures because the possible side effects in healthy (i.e., not HIV-infected) persons are not well known. The following table summarizes the current USPHS recommendations.

Provisional Public Health Service Recommendations for Chemoprophylaxis after Occupational Exposure to HJV [1]

TYPE OF EXPOSURE	SOURCE MATERIAL [2]	ANTIRETROVIRAL PROPHYLAXIS [3]	ANTIRETROVIRAL REGIMEN [4,5]
Percutaneous	Blood [6]		
	Highest risk	Recommend	ZDV+3TC+IDV
	Increased risk	Recommend	ZDV+3TC±IDV [7]
	No increased risk	Offer	ZDV+3TC
	Fluid containing visible blood, other potentially infectious fluid,[8] or tissue	Offer	ZDV+3TC
	Other body fluid (e.g.,urine)	Not offer	
Mucous membrane	Blood	Offer	ZDV+3TC+IDV [7]
	Fluid containing visible blood, other potentially infectious fluid,[8] or tissue	Offer	ZDV±3TC
	Other body fluid (e.g.,urine)	Not Offer	
Skin			
Increased risk [9]	Blood	Offer	ZDV+3TC±IDV [7]
	Fluid containing visible blood, other potentially infectious fluid,[8] or tissue	Offer	ZDV±3TC
	Other body fluid (e.g.,urine)	Not Offer	

(1) Adapted from Center for Disease Control and Prevention: Update: Provisional Public Health Service rec oinmendations for chemoprophylaxis after Occupational exposure to HIV. MMWR 45:468, 1996.

(2) Any exposure to concentrated HIV (e.g., in research laboratory or production facility) is treated as percuta neous exposure to blood with highest risk.

(3) **Recommend:** postexposure prophylaxis (PEP) should be recommended to the exposed worker with coun seling; **offer:** PEP should be offered to the exposed worker with counseling; **not offer:** PEP should not be offered because these are not occupational exposures to HIV.

(4) Regimens: ZDV (zidovudine), 200 mg 3 x/day. If IDV is not available, saquinavir may be used, 600 mg 3 x/day. For full prescribing information, toxicities, contraindications, and drug interactions, see package inserts.

(5) For strains known to be resistant to ZDV and 3TC or if the drugs are contraindicated or not tolerated, the optimal regimen is uncertain.

(6) **Highest risk: both** larger volume of blood (e.g., deep injury with large-diameter hollow needle previously in source patient's vein or artery, especially involving an injection of source patient's IlfOd) **and** blood containing a high titer of HIV (e.g., source with acute retroviral illness or end-stage AIDS). **Increased risk: either** exposure to larger volume of blood **or** blood with high titer of HIV. **No increased risk: neithe**r exposure to larger volume of blood nor blood with higher titer of HIV (e.g., solid suture injury from source patients with asymptomatic HIV infection).

(7) Possible toxicity of additional drug may not be warranted.

(8) Includes semen, vaginal secretions, cerebrospinal, synovial, pleural, peritoneal, pericardial, and amniotic fluids.

(9) For skin, risk is increased for exposures involving a high titer of HIV, prolonged contact, an extensive area, or an area in which skin integrity is visibly compromised. For skin exposures without increased risk, the risk for drug toxicity outweighs the benefit of PEP.

1. Chemoprophylaxis should be recommended to exposed workers after occupational exposures associated with highest risk for HIV transmission. For exposures with a lower, but non-negligible risk postexposure prophylaxis (PEP) should be offered, balancing the lower risk against the use of drugs having uncertain efficacy and toxicity. For exposures with negligible risk, PEP is not justified [table].Exposed workers should be informed that:

a. knowledge about the efficacy and toxicity of PEP is limited;

b. for agents other than ZDV, data are limited regarding toxicity in persons without HIV infection or who are pregnant; and

c. any or all drugs for PEP may be declined by the exposed worker.

2. At present, ZDV should be considered for all PEP regimens because ZDV is the only agent for which data support the efficacy of PEP in the clinical setting. 3TC should usually be added to ZDV for increased antiretroviral activity and activity against many ZDV-resistant strains. A protease inhibitor (preferably IDV because of the characteristics summarized in MMWR, Vol 45/No. 22, June 7, 1996) should be added for exposures with the highest risk for HIV transmission [table]. Adding a protease inhibitor also may be considered for lower risk exposures if ZDV-resistant strains are likely, although it is uncertain whether the potential additional toxicity of a third drug is justified for lower risk exposures. For HIV strains resistant to both ZDV and 3TC or resistant to a protease inhibitor, or if these are contraindicated or poorly tolerated, the optimal PEP regimen is uncertain; expert consultation is advised. (Special Note: resistant strains are more likely in a patient who has been exposed to the drug for a prolongedtime period such as 6—12 months or more or associated with more advanced HIV infection.)

3. PEP should be initiated promptly, preferably within 1—2 hours postexposure. Although animal studies suggest that PEP probably is not effective when started later then 24—36 hours postexposure, the interval after which there is no benefit from PEP for humans is unidentified. Initiating therapy after a long interval (i.e., 1—2 weeks) may be considered for the highest risk exposures; even if infection is not prevented, early treatment for acute HIV infection maybe beneficial. The optimal duration of PEP is unknown; because 4 weeks of ZDV

appeared protective, PEP should probably be administered for 4 weeks, if tolerated.

4. If the source patient or the patient's HIV status is unknown, initiating PEP should be decided on a case-by-case basis, based on the exposure risk and likelihood of HIV infection in known or possible source patients. If additional information becomes available, decisions about PEP can be modified.

5. Workers with occupational exposures to HIV should receive follow-up counseling and medical evaluation, including HIV-antibody tests at baseline and periodically for at least 6 months postexposure (e.g., 6 weeks, 12 weeks, 6 months), and should observe precautions to prevent secondary transmission. If PEP is used, drug toxicity monitoring should include a complete blood count and renal and hepatic chemical function tests at baseline and 2 weeks after starting PEP. If subjective or objective toxicity is noted, dose reduction or drug substitution should be considered with expert consultation, and further diagnostic studies may be indicated.

6. Since July 15, 1996, healthcare providers in the U.S. have been encouraged to enroll all workers who receive PEP in an anonymous registry developed by CDC, Glaxo Wellcome, Inc., and Merck & Co., Inc. to assess toxicity. Unusual or severe toxicity from antiretroviral drugs should be reported to the manufacturer and/or the FDA (telephone 800-332-1088). Updated information about HIV PEP is available from theIntemet at CDC's home page (http://www.cdc.gov); CDC's fax information services, telephone 404-332-4565 (Hospital Infections Program directory); the National AIDS Clearinghouse, telephone 800-458-5231; and the HIV/AIDS Treatment Information Services, telephone 800-448-0440.

64. For how long must prophylactic drugs be taken?

The current recommendation is to take the drugs for 4 weeks.

65. Do antiretrovirals prevent occupational infection?

Postexposure prophylaxis does not prevent all occupational infections. There have been at least 12 reports of ZDV failing to prevent infection in health care workers. Following current infection control recommendations and using safer needle devices are the primary means of preventing occupationally acquired HIV infection. However, if an exposure occurs, the risk of infection is usually low; when warranted, taking drugs as soon as possible (within 2 hours) after exposure may reduce the risk further.

66. Does the employer have to pay for the antiretroviral drugs?

OSHA has made no official statement. However, because OSHA relies on the most current USPHS recommendations, the agency may well expect the employer to pay for the chemoprophylactic regimen. This rapidly evolving area may change further as the USPHS reviews its recommendations, which are based on

surveillance studies demonstrating that antiretroviral therapy is beneficial if talcen immediately after a significant exposure incident,

67. What is a prudent course for postexposure chemoprophylaxis?

It is important to discuss the postexposure management options in advance of an exposure incident. The discussion should include the potential risk associated with various injuries, source patient factors, selection of a health care professional, and availability of antiretrovirals, if indicated.

68. What percent of AIDS cases have occurred among health care workers?

Health care workers represent about 5% of the AIDS cases reported to the CDC and about 5% of the U.S. workforce. As of December 1996, 424 dental health care workers were among the reported AIDS cases, but not as occupational cases.

69. Has HIV seroconversion been documented among dental health care workers as the result of an occupational exposure?

No, not as of December 1996.

70. Have any dental health care workers possibly seroconverted as the result of an occupational exposure?

Yes. As of December 1996, about 7 dental health care workers of 111 total health care workers have been reported to the CDC as possible cases of occupational exposure.

71. What is the difference between a documented occupational transmission and a possible occupational transmission of HIV?

The difference is in the testing. A documented occupational transmission requires that the exposed health care worker be tested for HIV at the time of the incident and that the baseline test be negative. If, after a designated time, HIV seroconversion occurs, it is considered to be the result of the exposure incident. In the possible category, health care workers have been found to be without identifiable behavioral or transfusion risk. Each reported percutaneous exposure to blood or body fluids or lab solutions containing HJV, but HIV seroconversion specifically resulting from an occupational exposure was not documented. There was no baseline testing at the time of the incident to prove that the health care worker was HIV-negative before the incident.

72. What is the purpose of baseline testing after an occupational exposure incident?

Baseline HIV antibody and HBV testing allows the health care professional who evaluates the exposed worker to determine whether any subsequently diagnosed disease was acquired as the result of the exposure incident. Blood is

tested soon after the injury occurs to dete the health care worker's HBV and/or HIV serologic status.

73. Can an employee refuse baseline testing?

An employee may decline testing or choose to delay testing of collected blood for 90 days. If a delay is chosen, the blood must be drawn but not tested until consent is given.

74. If I consent to baseline blood collection but not testing, then what?

If within 90 days the employee consents to testing of the baseline sample, it should be done as soon as possible. If consent is not given within the 90 days, the sample may be discarded.

75. What is the difference between confidential and anonymous HIV testing?

Confidential testing with consent means that the test results become part of your confidential medical record and cannot be released without your consent and in accordance with state laws. The test results are linked to your name, even if only in your medical record. Anonymous testing refers to a system whereby test results are linked to a number or code and not a name. Therefore, you are the only one who will know the results; they will not be part of your medical record. Whether a coded result will suffice as evidence of baseline testing for the purposes of documenting an exposure incident has not been challenged. If you are reluctant to have any HIV test information in your medical record but are concerned about documenting an incident, you may wish to consider baseline blood collection at both an anonymous and a confidential test site. Have the anonymous sample tested, and store the confidential sample for not more than the 90 days allowed. Thus you have time to consider testing and an opportunity tp find out whether you are seronegative.

76. Who pays the cost of HIV testing?

The employer is responsible for the cost of HIV testing under the obligation to provide medical evaluation and follow-up of an exposure incident.

77. Is the employer responsible for costs associated with treatment of disease if transmission occurs?

No. The employer is not expected to pay the costs associated with long-term treatment of disease—only for the immediate evaluation and postexposure prophylaxis as prescribed by OSHA in accordance with USPHS recommendations.

78. How long must an employer maintain employee medical records?

The employer must maintain employee medical records for the duration of employment plus 30 years in accordance with OSHA's Standard on Access to Employee Exposure and Medical Records, 29 CFR 1910.20. An employer may

contract with the health care professional to maintain the records as along as they are accessible to OSHA.

79. Who selects the health care professional for postexposure evaluation and follow-up?

The employer has the right to choose the health care professional who will treat exposure incidents.

Postexposure Evaluation and Follow-up Requirements under OSHA 's Standard for Occupational Exposure to Bloodborne Pathogens

Exposure incident occurs

↓

Employee	Employer	Health care professional (HCP)
• Reports incident → to employer	• Directs employee to HCP →	• Evaluates exposure incident
	• Sends to HCP:	• Arranges for testing of exposed employee and source patient (if not already known)
	• Copy of standard	
	• Job description of employee	• Notifies employee of results of all testing
	• Incident report (route, etc.)	• Provides counseling
	• Source patient's identity and FIB V/HIV status (if known) and other relevant medical	• Provides postexposure prophylaxis
		• Evaluates reported illnesses (above items are confidential)
	• Documents events on OSHA 200 and 101 (if applicable)	
	• Receives HCP's written ← opinion	• Sends (only) written opinion to employer: Documentation that employee was informed of evaluation results and need for any further follow-up and Whether HBV vaccine is indicated and if vaccine was received
• Receives copy ← of HCP's written opinion	• Provides copy of HCP's written opinion to employee (within 15 days of completed evaluation)	

Prepared by OSHA (February 1995). This document is not considered a substitute for any provisions of the Occupational Safety and Health Act of 1970 or for any standards issued by OSHA.

80. Does the employer have an obligation to former employees?

OSHA's standard on bloodborne pathogens requires immediate medical evaluation and follow-up of an employee. If an employee leaves the practice, the employer is no longer obligated to meet the obligations in the standard.

81. Does the employer have any obligation to temporary workers under OSHA standards?

The responsibility to protect temporary workers from workplace hazards is shared by the agency that supplies a temporary worker. The agency is required to ensure that all workers have been vaccinated and are provided follow-up evaluations. The contracting employer is not responsible for vaccinatidns and follow-up unless the contract so specifies. However, the contracting employer is expected to provide gloves, masks, and other personal protective equipment.

82. How accurate is the HIV antibody test?

At 6 months after an exposure incident, the current serum test has the ability to detect the presence of HIV antibody with 99.9% accuracy. After 1 year, it is 99.9999% accurate. In addition to the traditional serum test, a new saliva collection system is available. The accuracy of the saliva test is reported to be comparable to the serum test. Home test kits that use serum samples are also available.

83. What should you recommend to a health care worker who has been potentially infected with HIV?

The first step is to seek voluntary, anonymous testing and counseling services. Early medical intervention is most important in light of the new multidrug combinations for anti-HIV therapy. In addition, it is important to consult state guidelines for HIV/HB V-infected health care workers, your professional association, or a legal advocate.

84. Have there been any recent reports of HBV transmission from dentists to patients?

Since 1987 there have been no reports of HBV transmission from a dentist to a patient. From 1970—1987, nine clusters were reported in which HBV infection was associated with dental treatment by an infected dental health care worker. Reasons for the current lack of reports of HBV transmission may include the following:

1. Increased adherence to standard (universal) precautions
2. High compliance with HBV vaccination among dental health care workers
3. Reporting bias, incomplete reporting, or failure to correlate HBV transmission with previous dental treatment .

Factors that enhanced the transmission of HBV in the past included failure to use gloves routinely during patient care, failure to receive HBV vaccination, noncompliance with universal precautions, and inability to detect disease in dental health care workers.

85. What is the relationship between hepatitis C and non-A, non-B hepatitis (NANBH)?

The designation NANBH was first used in the l970s, when sera from certain patients with signs and symptoms of hepatitis were found to be serologically negative for immunologic markers of hepatitis A and hepatitis B virus infection. The occurrence of manifestations typically associated with liver inflammation (i.e., jaundice, dark urine, chalky colored stools) without a defined etiology was exacerbated by the observation that some of the patients showed definite signs of a chronic carrier state. In 1989, investigators isolated the predominant cause of NANBH in the United States, a single-stranded RNA virus designated hepatitis C virus (HCV).

86. How is HCV transmitted? What are the implications for health care workers?

HCV is spread primarily via a parenteral route; sexual and maternal-fetal (vertical) transmission is a minor mode of viral passage. Health care workers should follow universal precautions as indicated.

87. What other information about HCV is important for health care workers?

1. No postexposure prophylaxis is available.
2. No vaccine is available.
3. Health care workers should be educated about risk and prevention.
4. Policies about testing and follow-up should be established.
5. There are no current recommendations for restriction of practice for HCV-infected health care workers.
6. Risk of transmission from health care worker to patient appears low.
7. Appropriate control recommendations for prevention of bloodborne disease transmission should be followed.

88. Does the CDC have specific policy recommendations for follow-up after percutaneous or permucosal exposure to HCV-positive blood?

As of July 4, 1997, the CDC recommends that minimal policies should include the following:

1. For the source, baseline testing for antibody to HCV (anti-HCV)
2. For the person exposed to an anti-HC V-positive source, baseline and follow-up testing

(e.g., 6 month) for anti-HCV and alanine aminotransferase activity

3. Confirmation by supplemental anti-HCV testing of all anti-HCV results reported as repeatedly reactive by enzyme immunoassay (EIA)
4. Recommendation against postexposure prophylaxis with immunoglobulin or antiviral agents (e.g., interferon)
5. Education of health care workers about the risk for and prevention of bloodborne infections, with routine updates to ensure accuracy

89. In the absence of postexposure prophylaxis, what other issues should be considered?

The CDC recommends consideration of at least six issues in defining a protocol for the follow-up of health care workers occupationally exposed to HCV:

1. Limited data suggest that the risk of transmission after a needlestick is between that for HBV and HIV. Data for other routes of exposure are limited or nonexistent.
2. Available tests are limited in their ability to detect infection and determine infectivity.
3. The risk of transmission by sexual and other exposures is not well defined; all anti-HCV- positive persons should be considered potentially infectious.

4. Benefit of therapy for chronic disease is limited.
5. Costs associated with follow-up.
6. A postexposure protocol should address medical and legal implications, such as counseling about an infected health care worker's risk of transmitting HCV to others, therapy decisions, and individual worker concerns.

90. What counseling recommendations may help to prevent transmission of HCV to others?

Persons who are anti-HCV-positive should refrain from donating blood, organs, tissues, or semen, and household contacts should not share toothbrushes and razors. There are no recommendations against pregnancy or breastfeeding or for change in sexual practices with a steady partner. Transmission of HCV can occur in sexual contact, but the risk among steady partners is low; nonetheless, the risk associated with sexual activity should be explained.

91. What is the relationship between viral load and potential rate of transmission to health care workers for HBV,Hiv, and HCV?

Potential Transmission Risks to Health Care Workers

Pathogen	CONCENTRATIONIML IN SERUM/PLASMA	TRANSMISSION RATE(%) AFTER NEEDLESTICK INJURY
HBV	1,000,000—100,000,000	6.0-30.0
HCV	10—1,000,000	2.7-6.0
HIV	10—1,000	0.3

92. Are the guidelines for preventing transmission of airborne disease different from those for preventing transmission of bloodborne disease?

Yes. In October 1994, the CDC issued their final version of the Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Facilities, which emphasize the importance of the following: (1) the hierarchy of control measures, including administrative and engineering controls and personal respiratory protection; (2) the use of risk assessments for developing a written tuberculosis (TB) control plan; (3) early identification and management of persons who have TB; (4) TB screening programs for health care workers; (5) training and education of health care workers; and (6) evaluation of TB infection control programs.

93. What are specific recommendations for preventing TB transmission in dental settings?

Recommendations for the Prevention of the Transmission of TB in Dental Settings

1. A risk assessment should be done periodically, and TB infection control policies should be based on the risk assessment. The policies should include provisions for detection and referral of patients who may have

undiagnosed active TB; management of patients with active TB, relative to provision of urgent dental care; and employer-sponsored health care worker education, counseling, and screening.

2. While taking patients' initial medical histories and at periodic updates, dental health care workers should routinely ask all patients whether they have a history of TB disease and symptoms suggestive of TB.
3. Patients with a medical history or symptoms suggestive of undiagnosed active TB should be referred promptly for medical evaluation of possible infectiousness. Such patients should not remain in the dental care facility any longer than required to arrange a referral. While in the dental care facility, they should wear surgical masks and should be instructed to cover their mouths and noses when coughing or sneezing.
4. Elective dental treatment should be deferred until a physician confirms that the patient does not have infectious TB. If the patient is diagnosed as having active TB, elective treatment should be deferred until the patient is no longer infectious.
5. If urgent care must be provided for a patient who has, or is strongly suspected of having, infectious TB, such care should be provided in facilities that can provide TB isolation. Dental health care workers should use respiratory protection while performing procedures on such patients. (Note: dental facilities may want to research appropriate referral facilities prior to the need for referral).
6. Any dental health care worker who has a persistent cough (i.e., a cough lasting 3 weeks), especially in the presence of other signs or symptoms compatible with active TB (e.g., weight loss, night sweats, bloody sputum, anorexia, and fever), should be evaluated promptly for TB. The health care worker should not return to the workplace until a diagnosis of TB has been excluded or until the health care worker is on therapy and determination has been made that the health care worker is noninfectious.
7. In dental care facilities that provide care to populations at high risk for active T be appropriate to use engineering controls similar to those used in general use areas (e.g., waiting rooms) of medical facilities that have a similar risk profile.

Centers for Disease Control and Prevention: Recommendations for the prevention of the transmission of TB in dental settings. MMWR 43:(RR-13):52—53, 1994.

94. What is the risk of TB transmission in dental settings?

The risk is probably quite low and is determined by a number of factors, including community profiles and patient population characteristics. TB infection control policies are linked to a facility's level of risk, which is determined by risk assessment.

Elements of a TB Control Program for Dental Facilities

ELEMENT	RISK CATEGORY*	
	MINIMAL	VERY LOW
Designate a TB control individual	Recommended	Recommended
Conduct baseline risk assessment	Recommended	Recommended
Review community TB profile	Yearly	Yearly
Written TB control plan	Recommended	Recommended
Reassessment of risk	Yearly	Yearly
Protocol for identifying, managing, and referring patients with active TB (includes providing/referring for urgent dental care but allows delay/referral for elective care)	Recommended	Recommended
Education and training	Recommended	Recommended
Counseling oral health care workers about TB	Recommended	Recommended
Protocol to identify/evaluate oral health care workers with signs/symptoms of active TB	Recommended	Recommended
Baseline purified protein derivative (PPD) testing of oral health care workers	Optional	Recommended
Periodic PPD screening of oral health care workers	Not applicable	Yearly
Protocol for evaluating and managing oral health care workers with positive PPD tests	Recommended	Recommended
Protocol for managing oral health care workers with active TB	Recommended	Recommended
Protocol for investigating PPD conversions and active TB in oral health care workers	Recommended	Recommended
Protocol for investigating possible patient-patient transmission of TB	Recommended	Recommended
Note: In addition, for dental facilities in a low-risk category, all of the above apply, but there are stronger recommendations for engineering controls and respiratory protection programs		

* Risk categories are determined by a number of factors, including community profile and patient population. If, after a review of the community profile and the patient profile, it is determined that there are no TB pa tients in a facility or community, then a "minimal" risk classification is indicated. However, if a review in dicates the presence of TB patients, then further analysis is necessary to complete the risk assessment including evaluation of health care worker screening. If screening is negative, no TB patients were identi fied in the previous year, and a plan is in place to refer patients with suspected or confirmed TB to a collab orating facility, the classification is "very low" risk.

Adapted from the Centers for Disease Control and Prevention: Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Facilities. Atlanta, Centers for Disease Control and Prevention, 1994, pp 12—15.

INSTRUMENT REPROCESSING AND STERILIZATION

95. What is the difference between sterilization and disinfection?

Sterilization is the act or process of killing all forms of microorganisms on an instrument or surface, including high numbers of highly resistant bacterial endospores if they are present. **Disinfection** is the process of destroying pathogenic organisms, but not necessarily all organisms.

96. Describe the types of sterilization procedures.

1. Steam under pressure, or autoclaving, is the most widely used method.

2. Dry-heat sterilization involves placing instruments in a dry heat sterilizer cleared for marketing as a medical device by the FDA. Instruments must remain in the unit for a specified period of heating at a required temperature.

3. Unsaturated chemical vapor sterilization uses a specific chemical solution, which, when heated under pressure, forms a sterilized vapor phase with a low concentration of water.

Note: Manufacturer's directions for each sterilizer must be followed closely.

97. What is the underlying doctrine of sterilization?

Do not disinfect or "cold-sterilize" what you can sterilize with a heat-based process: "Don't dunk it, cook it." If an item or instrument is heat-stable, it should be heat-sterilized. No other methods (e.g., gases or liquids) have equivalent potency and safety assurance.

98. According to the Spaulding classification, what are critical, semicritical, and noncritical items?

CDC/Spaulding Classification of Surfaces

	DESCRIPTION	EXAMPLES	DISEASE TRANSMISSION RISK	REPROCESSING TECHNIQUE
Critical	Pointedlsharp Penetrates tissue Blood present	Needles Cutting instruments Implants	High	Sterile,disposable Heat sterilization
Semicritical	Mucous membrane contact No tissue penetration No blood or other secretions present	Medical "scopes" Nonsurgical dental instruments Specula Catheters	Intermediate	Heat sterilization High-level disinfection
Noncritical	Unbroken skin contact	Face masks Clothing Blood pressure cuffs Diag electrodes	LOW	Sanitize(no blood) Intermediate-level disinfection (blood present)
Environmental surfaces Medical equipment	Usually no direct patient contact	Knobs, handles of x-ray machine Dental units	Minimal	Sanitize(no blood) Intermediate-level disinfection
Housekeeping		Floors, walls Countertops	Least	

Table courtesy of James A. Cottone, D.M.D., MS., April 1993. Modified for this edition.

Because the vast majority, if not all, of dental instruments are heat-stable, they should be sterilized using a heat-based method (e.g., autoclaving). High-level disinfection using liquid chemical/sterilant germicides is *not* the current standard of practice in dentistry.

99. How are critical and semicritical items treated after use?

If reusable, all heat-stable critical and semicritical instruments should be sterilized with a heat process. Semicritical items require either heat or chemical-vapor sterilization.

100. To what does the term "cold sterilization" refer in dentistry?

In dentistry, cold sterilization refers to the use of immersion (liquid chemical) disinfectants for semicritical instruments and items used in patient care. Cold sterilization is no longer recommended or acceptable for reusable items or instruments, since virtually every dental instrument in current use is heat-stable.

101. What is the appropriate use of a glutaraldehyde solution in a dental operatory or laboratory?

There is no longer any appropriate use for this or any other sterilant/disinfectant liquid chemical germicide in dentistry.

102. What are the major negative characteristics of glutaraldehydes?

They are contact and inhalation hazards and require appropriate protective clothing and ventilation. In addition, they are expensive and unstable.

103. What is the best way to reprocess a handpiece?

The best way is to follow the manufacturer's instructions, which should indicate that a handpiece must be heat-treated between patients. The manufacturer's instructions also should outline clearly the steps for cleaning and lubrication and the most appropriate heat-treatment method. All handpieces manufactured since the late l980s are heat-stable; older units, if still in working condition, may be modified to withstand heat sterilization.

104. What is the only function of a so-called glass bead sterilizer?

The glass bead sterilizer is used during endodontic procedures to decontaminate endodontic files while they are used on the same patient. It is not a sterilizer, and this designation is a long-standing misnomer in FDA classification. Recently, these devices have been recalled by the FDA for submission of supplemental data to substantiate or refute classification as sterilizers.

105. Can a disposable saliva ejector be reused?

No. It is a single-use item only and cannot be adequately sterilized between patients.

106. How must a reusable air-water syringe tip be reprocessed?

The only acceptable methods of reprocessing are steam heat under pressure, dry heat, or unsaturated chemical vapor.

107. What is the minimal temperature required for sterilization by an autoclave?

1210 Celsius. Manufacturer's instructions should be followed closely.

108. Discuss the advantages and disadvantages of an autoclave.

Advantage

• It is the gold standard for sterilization—nothing better is available to the dental setting.

Disadvantages

• Instrument cutting surfaces and burrs may become dulled.
• Carbide-steel items may corrode.
• Time is spent precleaning and wrapping instruments.

109. What is the method of choice for sterilizing burrs and diamonds?

If burrs are not discarded after use, dry heat is the least expensive sterilization method and does not corrode or dull cutting edges. If you must use an autoclave for burrs, they should be dipped into a 1% sodium nitrite emulsion preparation to prevent corrosion.

110. In a forced-air dry heat oven preheated to 160—170° C, how long does it take to sterilize instruments?

Sterilization is achieved in 2 hours in a properly working unit. However, additional time may be necessary for cool down before metal items can be used.

111. What are the advantages and disadvantages of dry-heat sterilizers?

Advantages

• They do not dull sharp instruments.
• They are equivalent to a steam autoclave in germicidal potency in a completed cycle.

Disadvantages

• Cycle time is long
• Most plastics, paper, and fabrics char, melt, or burn and cannot be sterilized in this manner.

112. Can a dental handpiece withstand dry-heat sterilization?

Currently, it cannot, and manufacturers do not recommend dry-heat sterilization. Handpieces, however, may be appropriately sterilized by saturated steam under pressure or unsaturated chemical-vapor sterilization,

113. Which agency is responsible for regulating handpieces?

The FDA, Center for Devices and Radiological Health, Dental and Medical Services Branch, in accordance with the Safe Medical Devices Act, clears medical

devices, including sterilizers, for marketing. The user, however, must be aware that clearance to market proves neither efficacy nor manufacturer's claims,

114. What packaging material is compatible with autoclaves?

The most suitable material for use in an autoclave is one that the steam can penetrate; for example, paper or certain plastics. It is best to read the manufacturer's instructions and follow them precisely.

115. What packaging material cannot be used in dry-heat sterilizers?

The manufacturer's instructions specify that you cannot use most of the plastics (pouch or wrap) and paper wrap commonly used for steam autoclaves. They melt or burn at high temperatures.

116. What packaging material is compatible with unsaturated chemical-vapor sterilizers?

The manufacturer's instructions make clear that perforated metal trays and paper are suitable for use in chemical-vapor sterilizers. The vapor must be able to penetrate the material. Chemical-vapor sterilizers also rely on high levels of heat and pressure for efficacy.

117. What is an easy method to demonstrate that sterilization conditions have been reached in a cycle?

Process indicators and other chemical integrators demonstrate that some conditions to achieve sterilization were reached.

118. What is the definition of sterile?

The state of sterility is an absolute term: an item is either sterile, or it is not sterile. Sterility is the absence of all viable life forms, and the term reflects a carefully designed and monitored process used to ensure that an item has a very low probability of being contaminated with anything at time of use. For surgical instruments, this probability is one in one million—i.e., a sterility assurance level (SAL) of 10 to the minus 6th.

119. What are the most common reasons for sterilization failure in an autoclave?

1. Inadequate precleaning of instruments
2. Improper maintenance of equipment
3. Cycle time too short and/or temperature too low
4. Improper loading or overloading
5. Incompatible packaging material
6. Interruption of a cycle to add or remove items

Multiple investigations have found that the most frequent cause of sterilizer failure is human error.

120. What is the difference between process (chemical) indicators and biologic (spore) monitors?

Biologic spore monitors more precisely reflect the potency of the sterilization process by directly measuring death of high numbers of highly resistant bacterial endospores, whereas simple chemical indicators merely reflect that the temperature of sterilization has been reached. Other chemical indicators (i.e., Integrators) are becoming more sophisticated and reflect both time and temperature during the process. There are insufficient data to indicate whether the two processes are equivalent. Current recommendations suggest that simple chemical indicators be placed in the center of every individual instrument pack to show the user that the package went through a heating process. In using any process monitor, the instructions provided by the monitor manufacturer or the monitor testing service should be followed precisely.

121. In biologic monitoring of sterilization equipment, which nonpathogenic organisms are used for each type of unit?

For autoclaves and chemical-vapor sterilizers, *Bacillus stearothermophilus* spores are used. For dry-heat and ethylene oxide units, *Bacillus subtilis* is used. Placement of the monitor in a load is critical; manufacturer's instructions should be followed closely.

122. How often should biologic monitoring of sterilization units be performed?

At a minimum, on a weekly basis.

Indications for More Frequent Biologic Monitoring of Sterilization Units

1. If the equipment is new and being used for the first time
2. During the first operating cycle after a repair
3. If there is a change in packaging material
4. If new employees are using the unit or being trained in use of equipment or procedure for monitoring
5. After an electrical or power source failure
6. If door seals or gaskets are changed
7. If cycle time and/or temperature is changed
8. For all cycles treating implantable items or materials
9. For all cycles to render infectious waste as noninfectious, as mandated by state law*
10. If the method of biologic monitoring is changed

* This may not apply in all states; contact the appropriate state agency.

123. What is the rationale for use of a holding solution?

A holding solution is a good idea if the circumstance warrants; for example, when it is not possible to clean instruments or items immediately after patient use. It is easier to clean the instruments safely and efficiently if the material is not

dried. The intent of a holding solution is only to keep debris moist; if it dries, cleaning becomes more difficult. Holding solutions are not intended for disinfection, and chemical disinfectants should not be used as holding solutions.

124. Do instruments need to be cleaned before sterilization?

Instruments must be cleaned thoroughly before sterilization. Two methods of instrument cleaning are ultrasonic cleaning and handscrubbing. Ultrasonic cleaning is the method of choice, because it minimizes hand contact with contaminated sharps and may clean more thoroughly than handscrubbing. If an ultrasonic unit is not available, handscrubbing must be done in a safe manner to avoid injury. The preferred method is to clean one or two items at a time, holding them low in the sink under running water and scrubbing them with a long-handled brush. Regardless of cleaning method, contaminated instruments should be handled only while wearing reusable, heavy-gauge, industrial, or housekeeping gloves. Vinyl or Latex gloves are not appropriate.

125. How do you ensure that an ultrasonic cleaning unit is in proper working order?

A function test may be performed on a routine basis, according to the manufacturers' instructions. In general, a function test requires that fresh solution be activated in the unit, that a piece of aluminum foil of specified size be cut and placed vertically into the activated solution for exactly 20 seconds, and that the foil be removed and examined under a light source. A functional unit causes holes and/or pitting in the foil; if no holes are present or a uniform pitting pattern is not evident, the unit is not working properly and should be repaired.

USE AND MISUSE OF LIQUID CHEMICAL GERMICIDES

126. Which federal agencies are involved in the regulation of liquid chemical germicides?

The FDA regulates chemical germicides if they are used for terminal reprocessing of reusable medical devices. The Environmental Protection Agency (EPA) regulates and registers chemical germicides used to disinfect environmental surfaces. The FDA also regulates the instruments themselves, including autoclaves, dry-heat, and other sterilizers.

127. Upon what does the efficiency of a disinfectant depend?

1. Concentration of micI and organic material (bioburden) left on surfacesand/or items. Hence precleaning of surfaces is of utmost importance.
2. Proper concentration of the disinfectant
3. Length and temperature of exposure
4. Accuracy with which the operator follows specific instructions on the product label or inserted in the product package

128. Why is Mycobacterium tuberculosis used as a benchmark for testing chemical germicides used on environmental surfaces?

Mycobacterium tuberculosis is not spread by surfaces; TB is transmitted via aerosols and inhalation of infective particles. This organism was chosen for testing of potency solely because of its resistance to germicidal chemicals. According to EPA registration criteria, germicides capable of killing mycobacteria in addition to a variety of other bacteria, fungi, and viruses of lesser resistance have a label designation of "hospital disinfectant" with a claim for tuberculocidal activity. Such products are commonly referred to as intermediate-level disinfectants (see next question).

129. What are Spaulding's classifications of biocidal activity?

1. Sterilization is a process that kills all microorganisms, including high numbers of highly resistant bacterial endospores.

2. High-level disinfection is a process in which chemical sterilants are used in a manner that kills vegetative bacteria, tubercle bacillus (mycobacteria), lipid and nonlipid viruses, and fungi, but not all bacterial spores, if they are present in high numbers. Hot water pasteurization is also high-level disinfection. The application of high-level disinfection in dentistry is limited because virtually all dental instruments are heat-stable,

3. Intermediate-level disinfection kills vegetative bacteria and fungi, tubercle bacillus, and lipid and nonlipid viruses. These agents (phenols, chlorine compounds, iodophors, and alcohol-containing products) are designed for disinfecting environmental surfaces.

4. Low—level disinfection kills only vegetative bacteria, some fungi, and lipid viruses, but not tubercle bacillus. These products (mostly quaternary ammonium compounds) are designed for use on housekeeping surfaces.

130. Is household bleach acceptable for surface decontamination?

OSHA's Instruction CPL 2-2.44C, "Enforcement Procedures for The Occupational Exposure to Bloodborne Pathogens Standard," states that disinfectant products regi by the EPA as tuberculocidal are appropriate for the clean-up of blood-contaminated surfaces. Although generic sodium hypochlorite solutions are not registered as such, they are generally recommended by the CDC as an alternative to other proprietary germicides for disinfection of environmental surfaces. A dilution of 1:100 with water (approximately 500 ppm chloride) is acceptable after proper precleaning of visible material from surfaces. A usable approximation of this dilution can be achieved by mixing ¼ cup of household sodium hypochiorite bleach in a gallon of water. it is best to renew the dilution at least weekly and to dispense from a clearly labeled spray bottle. Use bleach dilutions with caution, because they are corrosive to metals, especially aluminum,

131. When and how should laboratory items and materials be cleaned and disinfected?

Items should be cleaned and disinfected after handling and certainly before placement in a patient's mouth. Before disinfecting, read the manufacturer's directions for specific material compatibility or contraindications for use. In general, an intermediate-level tuberculocidal hospital disinfectant with an EPA registration number on the label is a suitable choice.

132. Do I have to keep an environmental surface wet for 10 minutes for a disinfectant to be effective?

No. The legal label of an environmental germicide requires testing that reflects the worstcase situation of an uncleaned surf In a practical sense, if a surface has been thoroughly precleaned of organic material and mOistened with fresh, uncontaminated germicide, whenever it dries, it is "safe." Precleaning is of utmost importance.

133. What type of microorganisms do EPA-registered, tuberculocidal hospital disinfectants generally claim to kill?

Under EPA registration, the kill claim is for *Mycobacterium tuberculosis, Salmonella* spp., staphylococci, and *Pseudomonas* spp. Obviously, a wide variety of other types of less resistant microorganisms, including many pathogenic varieties, also are killed. A specific microorganism kill claim (e.g., HIV, HBV, or antibiotic-resistant strains) should not be a primary criterion for purchase or use. Such claims are printed on labels primarily for marketing purposes; most pathogens of contemporary concern have no unusual resistance levels and are susceptible to a wide range of germicidal chemicals.

134. What are the categories under which a manufacturer may apply for registration of a hospital disinfectant?

Under the disinfectant heading, a manufacturer can apply for four separate categories for registration: bactericidal, virucidal, pseudomicidal, and tuberculocidal activity. Other specific genera and species also may be listed in the label claim; however, the first four categories are the most important to determine general potency of a product.

135. In choosing a chemical disinfectant, what is the more important kill claim, Mycobacterium tuberculosis or HIV?

The more important claim is *M. tuberculosis,* which is one of the more resistant microbial forms. If mycobacteria are killed, all microorganisms of lesser resistance are assumed to be killed also. HIV is a highly sensitive microorganism and is easily killed by many, if not all, proprietary germicides.

136. Do EPA tests of germicidal chemicals indicate efficacy?

No. The EPA tests reflect potency, not efficacy. The EPA tests are standardized lab tests for comparing the potency of one germicide with another and are based on descending order of general microbial resistance to germicides.

Efficacy is established by inference according to the potency of the germicide and the manner in which the product is used by the worker.

137. How do you determine use and reuse life of a surface disinfectant?

The EPA requires that use and reuse life information be obvious on a label. As a general rule, it is important to follow the manufacturer's instructions for use.

138. What are the minimal label requirements for a disinfectant product to be appropriate for use in a dental setting?

For surfaces frequently contaminated by patient material (e.g., light handles, prophy trays, and other environmental surfaces that come in contact with contaminated instruments), registration as an EPA hospital disinfectant with additional label claim for tuberculocidal activity (under the Spaulding classification scheme, an intermediate-level disinfectant). For general housekeeping, such as floors or countertops in nonclinical areas, the label claim for hospital disinfectant alone is adequate.

139. What is an antiseptic?

An antiseptic is a chemical agent that can be applied to living tissue and can destroy or inhibit microorganisms. Examples are antimicrobial handwash agents and antimicrobial mouth rinses.

140. How does an antiseptic differ from chemical sterilants and disinfectants?

Chemical sterilants and disinfectants cannot be applied to living tissue, whereas antiseptics are designed for use on tissue rather than on environmental surf or medical instruments.

141. Should a disinfectant be used as a holding solution?

No. It is not necessary. The purpose of a holding solution is merely to keep debris moist on hand instruments until they can be cleaned and sterilized. Holding solutions cannot disinfect or sterilize. Presoaking in a disinfectant does not disinfect; it only adds unnecessary time and expense because the items still need to be heat-sterilized before use.

142. What is the preferred holding solution?

Soapy water, using a detergent that is noncorrosive or low in corrosives, is effective, Clinicians also may choose the ultrasonic solution used in their practice as an instrument holding solution. These solutions should be changed at least daily or as directed by the manufacturer.

143. What is the best source for safety information about a hazardous product?

The Material Safety Data Sheet (MSDS) provides the most comprehensive product information and is the best source for safety information as well as precautions, emergency procedures, and personal protective equipment requirements. The MSDS must be provided by the manufacturer or distributor of the product if it is covered under the Hazard Communication Standard (HazCom). The product label is also a good source of information, but it is not as complete as an MSDS.

144. If I transfer a chemical agent from its primary container to a secondary container,must I label the secondary container?

No—not if it is for your immediate use during the same work day. If, however, it is intended for use by other employees, it must be appropriately labeled.

145. What ventilation requirements are indicated during use of liquid chemical germicides?

All chemical agents are toxic to varying degrees and should be used in well-ventilated areas. Additional ventilation is not necessary (if the product is used according to instructions provided by the manufacturer) unless indicated by the manufacturer.

146. What are the special ventilation requirements for surface disinfectants?

Again, all chemical agents should be used in well-ventilated areas. The manufacturer's instructions, label, or MSDS may indicate special requirements or personal protective equipment.

147. Is a chemical exposure incident a reportable injury?

Yes. If it results in the need for medical follow-up, chemical exposure should be reported in accordance with OSHA standards.

148. What personal protective equipment is indicated during use of chemical agents?

At a minimum, protective eyewear, a mask, and task-appropriate gloves, such as heavy duty utility or nitrile gloves, should be worn for handling of chemical agents. The key point is barrier protection of skin and mucous membranes from potential contact with hazardous or caustic chemical agents.

HANDLING AND DISPOSAL OF DENTAL WASTE

149. Who regulates dental waste?

OSHA regulates how the waste is handled in a dental facility. Federal, state, and local laws govern the disposal itself.

150. What is the intent of the Resource Conservation and Recovery Act (RCRA) of EPA?

The intent of the RCRA is to hold the generator of a hazardous waste responsible for its ultimate disposal or treatment and for any clean-up costs associated with improper disposal. Each dentist, therefore, is r for ensuring proper disposal of waste, and improper disposal by an unscrupulous company is ultimately the responsibility of the dentist.

151. What is potentially infective waste?

It is waste contaminated by patient material and should be handled and disposed of accordingly.

152. Does the term "contaminated" refer to wet or dry materials or both?

Contaminated refers to both wet and dry materials. For example, HBV can remain viable in dried materials for at least 7 days and perhaps longer. However, HBV is easily killed by moderate levels of heat or by a wide variety of chemical germicides, including low-level germicides.

153. Is all contaminated waste potentially infective waste?

No—but all infective waste is contaminated. Some contaminated waste, although it contains potential pathogens, may not have sufficient quantity or type to initiate infection and disease.

154. What is toxic waste?

Toxic waste is capable of causing a poisonous effect.

155. What is hazardous waste?

Hazardous waste poses peril to the environment.

156. Is all hazardous waste toxic?

No. It may not have a poisonous effect.

157. If potentially infective waste is autoclaved, how can you guarantee its sterility?

If you use heat-sterilization equipment to treat potentially infective waste, most state regulations mandate that you must biologically monitor each waste load to ensure that the cycle was successfully completed. Each load must be labeled with a date and batch number so that if a sterilization failure occurs, the load can be retreated. Although required by many states, the merits or necessity for this degree of monitoring is highly controversial among experts.

158. What method should be used to dispose of potentially infective items such as gauze, extracted teeth, masks, and gloves?

Blood-soaked gauze, extracted teeth, and any other material that is contaminated by patient fluids, saliva, or blood should be considered potentially infective waste and disposed of according to federal, state, or local law. Masks, provided they are not blood-soaked, can be disposed of as ordinary trash. Contaminated gloves should be disposed of as potentially infective waste.

159. What is the most appropriate method for disposal of used needles and sharps?

Although needles may be recapped by a one-hand technique or mechanical device, they should not be bent or broken or otherwise manipulated by hand. An appropriate sharps container should be used for disposal of all spent sharps and needles.

DENTAL WATER QUALITY

160. Is there concern about the microbial biofilm known to populate dental unit water lines?

Biofilm contamination of dental unit water lines (DUWLs), although not a new phenomenon, has received widespread attention from the media and scientific community. There are few current data on which to formulate recommendations to control biofilm accumulation or to establish safe levels of microorganisms in dental unit water used for nonsurgical (restorative) procedures. The American Dental Association released a statement recognizing the microbial levels in DUWLs and urging improvement of the am microbiologic quality of water through research, product development, and training. Other organizations, such as the CDC and Office Sterilization and Asepsis Procedures Research Foundation (OSAP), have issued guidelines for DUWLS.

161. Have there been any documented cases of infection or disease in dental health care workers from microorganisms in DUWLs?

Some published reports suggest increased exposure of dental health care workers to legionellae from aerosolized dental unit water. DUWL water from an unmaintained dental unit may contain literally millions of bacteria and fungi per ml (many of them potential clinical pathogens); the lack of specific epidemiologic studies has prevented accurate assessment of the potential effect on public health. To date, however, a major public health problem has not been identified.

162. What is biofilm?

Microbial biofllms are found virtually anywhere that moisture and a suitable solid surface for bacterial attachment exist. Biofllms consist primarily of naturally occurring slime-producing bacteria and fungi that form microbial communities in the DUWL along the walls of small-bore plastic tubing in dental units that deliver coolant water from high-speed dental handpieces and air-water syringes. As water

flows through the microbial matrix, some microorganisms may be released. Dental plaque is the best-known example of a biofllm.

163. Where do the microorganisms come from?

The vast majority are indigenous to house water mains. Patient microorganisms may be transient "tourists" in the biofilm.

164. What is the purpose of flushing water lines?

Current recommendations are to flush water lines for at least 3 minutes at the beginning of the clinic day and for at least 15—20 seconds between patients. This process does not remove all contamination, but it may transiently lower the levels of free-floating microorganisms in the water. Removal of water line contamination requires a number of steps, such as chemical disinfection of the lines, a sterile water source, and a specific filtration system in the water line or a combination of these treatments. It has no effect whatsoever on biofllm contamination.

165. What is the purpose of an antiretraction valve?

To prevent aspiration of patient material into water lines and thereby reduce the risk of transmission of potentially infective fluids or patient material from one patient to another.

166. What should be done with the water supply on a dental unit when local health authorities issue a "boil water notice" after the quality of the public water supply is compromised?

Use of the dental unit should be stopped if it is attached to the public water supply or if tap water is used to fill the bottle of an isolated water supply to the unit. Immediately contact the unit manufacturer for instructions on flushing and disinfecting the water lines. Use of house water should not resume until the boil water notice is lifted by the local authorities.

BIBLIOGRAPHY

1. Bednarsh HS, Ekiund KE: CDC issues final TB guidelines. ACCESS 10:6—13, 1995.
2. Bednarsh HS, Eklund KE: TB prevention through screening and therapy. ACCESS 10: 1995.
3. Bednarsh HS, Eklund KE: CDC updates postexposure guidelines. ACCESS 10:38—44, 1996.
4. Bednarsh HS, Eklund KE, Mills 5: Check our dental unit water IQ. ACCESS 10:37—43, 1996.
5. Bell DM, Shapiro CN, et al: Risk of hepatitis B and human immunodeficiency virus transmission to a patient from an infected surgeon due to percutaneous injury during an invasive procedure: Estimates based on a model. Infect Agents Dis 1:263—269, 1992.
6. Centers for Disease Control and PrevefltiOn Recommended infection control practices for dentistry. MMWR 35:237—242, 19

7. Centers for Disease Control and prevention: Recommended infection control practices for dentistry. MMWR 42:(RR-8), 1993.
8. Centers for Disease Control and Prevention Guidelines for preventing the transmission of Mycobacterium tuberculosis in healthcare facilities, 1994. MMWR 43:(RR-123), 1994.
9. Centers for Disease Control and Prevention: Case-control study of HIV seroconversion in health-care workers after precutaneous exposure to HI V-infected blood—France, United Kingdom, and United States, Jan. 1988—August 1994. MMWR 44(50), 1995.
10. Centers for Disease Control and Prevention: HIV/AIDS Surveillance Report. Year-end edition through December 1996. Atlanta, Centers for Disease Control and Prevention, 1997. Centers for Disease Control and prevention: Update: Provisional Public Health Service recommenda tions for chemoprophylaXiS after occupational exposure to HIV. MMWR 45(22):468—472, 1996.
12. Centers for Disease Control and Prevention: Facts about Surveillance of Health Care Workers with HIV/AIDS. Atlanta, Centers for Disease Control and Prevention, 1997.
13. Centers for Disease Control and Prevention: Hepatitis Surveillance. Report No. 56. Atlanta, Centers for Disease Control and Prevention, 1996.
14. Centers for Disease Control and Prevention: Guidelines for prevention of transmission of HIV and HBV to health-crc and public safety workers. MMWR 38(No. S-6), 1989.
15. Centers for Disease Control and Prevention: Recommendations for preventing transmission of HIV and HBV to patients during exposure-prone invasive procedures. MMWR 40(RR-8), 1991.
16. Centers for Disease Control and Prevention: Recommendations for follow-up of health-care workers after occupational exposure to hepatitis C virus. MMWR 46(28), 1997.
17. Cleveland JL, et al: TB infection control recommendations from the CDC, 1994: Considerations for dentistry. JAm Dent Assoc 126:593—600, 1995.
18. Cottone JA, TeerezhalmY GT, Molinari J: Practical Infection Control in Dentistry. Philadelphia, Lea & Febiger, 1990, pp 98—104, 105—118.
19. Councils on Dental Materials, Instruments and Equipment, Dental Practice, Dental Therapeutics: Infection control recommendations for the dental office and dental laboratory. J Am Dent Assoc 116:241—248, 1988.
20. Food and Drug Administration (FDA): Heat sterilization on dental handpieceS. FDA Bulletin, March 1993.
21. Gooch BF, Cardo DM, et al: Percutaneous exposures to HIV-infected blood. JAm Dent Assoc 126: 1237—1242, 1995.
22. Incident Investigation Teams et al: Transmission of hepatitis B to patients from four infected surgeons without hepatitis B e antigen. N Engl J Med 336:178—184, 1997.
23. Lo B, Steinbrook R: Health care workers infected with the human immunodeficiency virus. JAMA 267:1992.
24. Martin MV: Infection Control in the Dental Environment. London, Martin Dunitz, 1991, pp 27—32.
25. Mayo JA, Oertling KIvI, Andrieu SC: Bacterial biofilm: A source of contamination in dental air-water syringes. Clin Prevent Dent 12:13—20, 1990.

26. Miller C: Cleaning, sterilization, and disinfection: Basics of microbial killing for infection control. Jam Dent Assoc 124:48—56, 1993.
27. Miller C: Sterilization and disinfection: What every dentist needs to know. JAm Dent Assoc 123:46—54, 1992.
28. Miller C: Update on heat sterilization and sterilization monitoring. Compendium l4(2):304—3l6, 1993.
29. Miller C, Palenik Ci: Sterilization, disinfection and asepsis in dentistry. In Bloc SS (ed): Sterilization, Disinfection and Preservation. Philadelphia, Lea & Febiger, 1991, pp 676—694.
30. Molinari JA, et al: Cleaning and disinfectant properties of dental surface disinfectants. J Am Dent Assoc 117:179—182, 1988.
31. Molinari JA, etal: Comparison of dental surface disinfectafltS. Gen Dent 35:171—175, 1987.
32. Molinari JA, et al: Waterbome microorganisms: Colonization, contamination, and disease potential. Part I. Compendium 15(lO):1 192—1196, 1994.
33. Molinari JA, et al: Waterbome microorganisms: Questions about healthcare problems and solutions. Part II. Compendium 16:130—132, 1995.
34. Molinari JA, et al: Tuberculosis in the 1990's: Current implications for dentistry. Compendium 14(3): 276—292, 1993.
35. National Institutes for Health: Management of Hepatitis C. NIH Consensus Statement. Rockville, MD, National Institutes of Health, 1997.
36. Occupational Safety and Health Administration: Regulations for protection against occupational exposure to bloodborne pathogens. 29 CFR 1919.1030: December 6, 1991.
37. Occupational Safety and Health Administration: Post-Exposure Evaluation and Follow-up Requirement under OSHA's Standard for Occupational Exposure to Bloodborne Pathogens: A Guide to Dental Employer Obligations. 1995.
38. Occupational Safety and Health Administration: Occupational Hazards communication Standard. 29 CFR 1810, 1200 (b) (4), 1983.
39. Occupational Safety and Health Administration: Hazardous Waste Operations and Emergency Response. Final Rule. 29 CFR Part III, 1989.
40. OSAP Position Paper: Dental Unit Waterlines. Dental Unit Waterline Working Group, l997.*
41. OSAP Position Paper: Instruments Processing. Instrument Processing Working Group, 1997. *
42. OSAP Position Paper: Percutaneous Injury. Percutaneous Injury Working Group, l997.*
43. Rizdon R, Gallagher K, Ciesielski C, et al: Simultaneous transmission of human immunodeficiency virus and hepatitis C virus from a needlestick injury. N Engl J Med 336:919—922, 1997.
44. Shearer BG: Biofllm and the dental office. J Am Dent Assoc 127:181—189, 1996.
45. Young JM: Dental air-powered handpieces: Selection, use, and sterilization. Compendium 14(3): 358—368, 1993.

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