SPR Ad Hoc Committee Report

Guidelines for Reducing the Risk of Disease Transmission in the Psychophysiology Laboratory

SPR Ad Hoc Committee on the Prevention of Disease Transmission:

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ABSTRACT

The acquired immunodeficiency syndrome (AIDS) pandemic has highlighted the need for safeguards against the inadvertent transmission of infectious disease in the psychophysiology laboratory. These Guidelines identify factors contributing to the risk of bloodborne disease transmission to subjects or technicians, and recommend procedures to minimize such risk, given current knowledge and techniques.

The lowest risk is associated with the application of devices, such as surface electrodes, to non-abraded, intact skin. Such devices should be clean, but do not require disinfection.

The potential risk of infection is higher when surface electrodes are applied to non-intact skin. Abrasion, or other breaks in the skin, can allow seepage of blood products carrying such pathogens as hepatitis B virus and the human immunodeficiency virus that causes AIDS. Thus electrodes require high-level disinfection before reuse on non-intact skin. In addition, technicians should wear gloves during skin preparation and should abrade the skin no more than necessary, using only sterile, preferably non-sharp materials.

The highest risk is that associated with items that enter sterile tissue, such as subdermal electrodes and the needles and lancets sometimes used in skin preparation. Such items must be sterile at the time of use and must be handled with extreme caution.

DESCRIPTORS: Laboratory safety, Disease transmission, Psychophysiology, Electrodes, Disinfection, AIDS, Hepatitis.

The acquired immunodeficiency syndrome (AIDS) pandemic has highlighted the need for safeguards against the inadvertent transmission of infectious disease to subjects or technicians in the psychophysiology laboratory. Although there are no published estimates, the risk of transmitting blood-

These guidelines have been compiled in order to stimulate psychophysicists to create optimal programs for infection control in their own laboratories. To this end, the authors have tried to compile recommendations based on current understanding and practice of infection control, as well as current practices in psychophysiology laboratories. The leadership of each psychophysiology laboratory is responsible for establishing the best procedures for that laboratory, given the organization of the laboratory, the response measures and transducers employed, and the personnel involved. The authors and the Society for Psychophysiological Research assume no responsibility for the policies and practices of any psychophysiology laboratory.

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borne disease in psychophysiological research is presumed to be extremely low. It arises primarily from the common practice of abrading the subject's skin in EEG, EKG, EMG, and other kinds of recording. Such abrasion, or other breaks in the skin, can result in seepage or leakage of whole blood, serum, or plasma, carrying such pathogens as the human immunodeficiency virus (HIV) that causes AIDS, and certain hepatitis viruses.

In August 1987, the Centers for Disease Control published their Recommendations for prevention of HIV transmission in health-care settings. That report, citing the increasing prevalence of the HIV virus, urged the adoption of universal blood and body-fluid precautions. In other words, all patients were to be considered potentially infected with HIV, and blood and body-fluid precautions were to be universally applied. Two subsequent reports (Centers for Disease Control, 1988, 1989) emphasized that universal precautions apply to blood-borne hepatitis transmission as well. These recommendations, although formulated specifically for health-care and public-safety workers, are also applicable to technicians in psychophysiology laboratories.

We have reprinted those portions of the Centers for Disease Control recommendations (1987, 1988, 1989) that are most applicable to psychophysiological research, specifically to biopotential recording. These excerpts are appended to this report. We urge researchers to study the Centers for Disease Control recommendations and to revise their protocols as necessary. (Note that "patient" can be read as "subject" and "health care worker" as "experimenter" or "laboratory technician." )

**Risk Factors in Psychophysiological Research**

Before recommending procedures to minimize the risk of bloodborne disease transmission in psychophysiological research settings, factors contributing to this risk must be identified. According to a classification scheme widely adopted for infection control, objects can be classified as noncritical, semicritical, or critical based on the potential for disease transmission associated with their use (Favero, 1985; Garner & Favero, 1986; Rutala, 1990). The lowest risk is associated with noncritical items, i.e., those that come in contact with intact skin and so are thought to rarely, if ever, transmit disease. In the psychophysiology laboratory, items such as surface electrodes, stethoscopes, or photoplethysmographs would be considered noncritical when they are applied to non-abraded and otherwise intact skin. Such items should be cleaned before reuse, but do not require disinfection.

The potential risk of infection is higher for semicritical items, that is, "those objects which come in contact with mucous membranes or with skin that is not intact" (Rutala, 1990, p. 101). Therefore, semicritical items must be free of microorganisms to prevent disease transmission. Surface electrodes come under this classification when they are applied to skin that has been purposely abraded or is not intact for other reasons, including cuts, scratches, chapping, or diseases of the skin. Before their use on non-intact skin, surface electrodes require high-level disinfection. Similarly, materials such as gauze pads or cotton swabs, when used to abrade the skin, are semicritical items and should be disinfected or sterile before use. Technicians can further reduce the risk of disease transmission by wearing gloves and by careful preparation of the subject's skin. These recommendations are described in detail under Risk-Reduction Procedures below.

The highest risk of disease transmission is that associated with critical items, i.e., those that enter sterile tissue or the vascular system (Favero, 1985; Garner & Favero, 1986; Rutala, 1990). In the psychophysiology laboratory, critical items would include subdermal recording electrodes, as well as the needles and lancets sometimes used in skin preparation. These items must be sterile at the time of use, and must be handled with utmost care to prevent accidental puncture wounds. Wormser, Rabkin, and Joline (1988) have estimated the risk of HIV transmission associated with accidental needle stick injury to a health care worker to be approximately 0.35%, given a needle previously injected into an HIV-infected patient. This is close to the Centers for Disease Control (1989) estimate (see Appendix). On the other hand, a considerably higher risk of 6–30% has been estimated for hepatitis transmission by an infected needle (Centers for Disease Control, 1989). Given the associated risks, the use of critical items in the psychophysiology laboratory, if not absolutely necessary, should be avoided.
Any risk that does exist in psychophysiological research can be minimized by taking the relatively straightforward precautions outlined below. These recommendations concern three important areas in which research protocols may need revision: use of gloves, preparation of skin, and disinfection of electrodes.\(^1\) Consult the Centers for Disease Control reports (1987, 1988, 1989) for important details and additional recommendations. The procedures recommended for preventing transmission of the harder and more infectious hepatitis B virus will also minimize risk of transmission of AIDS (Centers for Disease Control, 1985). These precautions against transmission of bloodborne infectious diseases should be universally applied to all research in which there is a possibility of blood leakage through the non-intact skin of subject or experimenter.

**Risk-Reduction Procedures**

**Use of Gloves**

Wear sterile surgical gloves or non-sterile examination gloves, either vinyl or latex, during skin abrasion and cleaning as well as during electrode preparation, application, and removal. This applies to any technician whose hands will be in direct contact with the electrode surface, the electrolyte, or the subject’s abraded skin. The use of gloves is especially important if a technician’s hand has cuts, scratches, or other breaks in the skin. However, any technician with “exudative lesions or weeping dermatitis” should refrain from direct contact with subjects, following the Centers for Disease Control’s recommendations (1985, 1987) for personal service workers (e.g., hairdressers, barbers, cosmetologists, manicurists, pedicurists) and health care workers.

Note that glove use does not obviate the need for handwashing before and after working with the subject; handwashing is perhaps the single most important procedure for preventing infection (Garner & Favero, 1986). Dispose of gloves between subject contacts; do not attempt to wash or disinfect them. Gloves are generally available from pharmacies or hospital supply companies.

**Preparation of the Skin**

Given that the risk of disease transmission in psychophysiological research arises primarily from skin abrasion, this risk can be reduced by not abrading the skin more than is necessary to achieve an acceptable recording. Only disinfected or sterile items should be used to abrade the skin, and they should be disposed of immediately after use.

Although gloves will reduce the risk of contamination of, or via, the technician’s hands, they will not prevent accidental penetration by needles or lancets. In light of this risk, sharp items should be used to abrade the skin only if absolutely necessary, and technicians should handle and dispose of such items with considerable care to avoid injury and contamination to themselves and to others. Needles and lancets must be sterile before use, and should be disposed of immediately after use in puncture-resistant containers.

**Reprocessing Electrodes**

“Reprocessing” refers to the cleaning, disinfection, or sterilization that is required before electrodes are reused. Disposable electrodes that will not be reused do not need to be cleaned or disinfected after use. However, they should be considered contaminated and disposed of immediately. The degree of reprocessing required by reusable electrodes varies with potential risk of infection. Thus, whether a reusable electrode must be sterilized, high-level disinfected, or merely cleaned before reuse depends on whether its use classifies it as *critical, semicritical,* or *noncritical,* respectively. Because surface electrodes applied to non-abraded, intact skin are considered *noncritical* items, they require only cleaning (e.g., with detergent and water) before reuse. The same electrodes, when applied to abraded or otherwise non-intact skin, are classified as *semicritical* and require high-level disinfection. Subdermal electrodes are *critical* items and must be sterile at the time of use. Procedures for disinfecting and sterilizing electrodes are described below.

**Disinfecting reusable surface electrodes.** Fortunately, the HIV virus can be relatively easily inactivated by common disinfectants such as sodium hypochlorite (household bleach), hydrogen peroxide, and glutaraldehyde, used in the proper concentration for the proper contact time (American Electroencephalographic Society, 1986; Rutala, 1990). For sterilization or high-level disinfection, the Centers for Disease Control (1987) recommends

\(^1\)Our recommendations deal primarily with recording electrodes and devices used to prepare the skin for biologic recording. They do not address unique problems posed by other transducers occasionally used in psychophysiological research. Some of these transducers, such as blood pressure cuffs and photoplethysmographs used externally, are clearly *noncritical* items and are not considered a source of risk. At the other extreme are transducers such as penile or vaginal measurement devices or transducers that are swallowed or inserted into eyes, nose, mouth, or rectum. Many of these would be classified as *critical* devices; users should consult both device manufacturers and infection control experts for advice on their proper sterilization techniques.
the use of standard hospital sterilization procedures as detailed in Favero (1985) and Garner and Favero (1986). Such procedures include steam, gas, and dry heat sterilization, as well as immersion in chemical germicides registered as "sterilants" with the U.S. Environmental Protection Agency. Alternatively, "a solution of sodium hypochlorite (household bleach) prepared daily is an inexpensive and effective germicide" (Centers for Disease Control, 1987, see Appendix). Such a solution is also effective against the hepatitis B virus and Creutzfeldt-Jakob disease (American Electroencephalographic Society, 1986). Glutaraldehyde solutions that are registered sterilants may prove useful with certain electrodes for which bleach is too corrosive.

Immediately after each use, reusable electrodes should be cleaned with soap and water, rinsed thoroughly, and then high-level disinfected or sterilized following the manufacturer's instructions. From the standpoint of disease prevention, it is better to use a disinfectant that may harm the electrode than none at all. However, this practice may introduce unknown artifacts into one's recordings. We recommend that psychophysiologists either reprocess their semicritical electrodes using an effective disinfection or sterilization procedure of known compatibility, or use disposable electrodes. Table I provides information on several germicides that appear to be compatible with one or more reusable surface electrodes used by psychophysiologists.

Before their reuse on non-intact skin, surface electrodes should be subject to a level of disinfection sufficient to inactivate not just HIV but also the harder hepatitis B virus. Unfortunately, contact times required to inactivate the latter have not been firmly established. Rutala (1990) is among those who maintain that high-level disinfection, without sterilization, is sufficient to inactivate the hepatitis B virus. However, in the absence of an officially approved protocol for testing the efficacy of disinfectants against the hepatitis B virus, germicide manufacturers are prohibited from making such efficacy claims for high-level disinfection. Thus, for commercial germicides, Table I presents concentrations and contact times required for sterilization as well as for high-level disinfection. The concentrations and exposure times required to inactivate HIV are considerably less demanding (see Rutala, 1990, Table 3); they are not given in Table I because they are not adequate to inactivate the hepatitis B virus.

Information is rapidly changing regarding both the effectiveness of specific germicides and their compatibility with specific electrodes. Therefore, the procedures described in Table I are for illustrative purposes; they should not be considered permanent recommendations. Efficacy testing of all registered sterilants is currently being conducted under the direction of the Environmental Protection Agency. Having failed such a test, one glutaraldehyde-phenate solution recommended in a preliminary version of these guidelines (Putnam, Johnson, & Roth, 1991) was recently recalled (Leary, 1991). Although Cidex™ has passed the efficacy test, other sterilants mentioned in Table I have not yet been tested. As these products are tested, results will be available through the National Pesticide Telecommunications Network.

Information in Table I will also need to be updated as more electrode manufacturers are able to provide users with specific recommendations regarding the reprocessing of their electrodes. Because the metals, housings, and lead wires used in different types of electrodes vary widely, it is not possible to specify a universal procedure for precleaning, disinfecting, rinsing, drying, and storing. In tailoring disinfection/sterilization procedures to specific electrodes, electrode manufacturers can more efficiently communicate with germicide manufacturers and test electrodes for compatibility than can individual researchers. Researchers should ask their electrode manufacturers/distributors to supply detailed instructions for high-level disinfection or sterilization of their electrodes using an effective procedure proven to be compatible with them. Generally these instructions will call for thorough precleaning to remove organic debris and gel residue, followed by soaking in bleach or a commercially available "sterilant," and finally, rinsing thoroughly with water. In order for the disinfectant to be effective, it is absolutely essential that electrodes be adequately precleaned. Details of these procedures should be provided by the electrode manufacturer.

The National Pesticide Telecommunications Network is a toll-free hot line (800-858-7378) that provides around-the-clock information on the efficacy and proper use of disinfectants and other "pesticides."

Researchers are encouraged to contact their electrode manufacturer/distributor not only for advice concerning compatible disinfection procedures, but also for sources of germicides, gloves, sterile cotton swabs, and related supplies. Increasingly, electrode distributors are offering these related products.
Note that germicides are hazardous chemicals which can be harmful if inhaled and caustic to the skin and eyes, thus they entail their own precautions concerning ventilation and skin exposure. Read the manufacturer’s warnings and follow carefully the manufacturer’s recommendations with regard to mixing, storage, and shelf life. Mixing should be performed in well-ventilated areas by laboratory personnel wearing protective gloves and goggles. Containers used for storage and electrode soaking should be covered and clearly labelled.

**Sterilizing subdermal electrodes.** Because subdermal (needle or fine-wire) electrodes enter sterile body tissues, they must be sterile at the time of use. Exposure to contaminated blood or blood products carries with it the highest risk of transmission of HIV or the hepatitis B virus in the psychophysiology laboratory. Thus, technicians must handle subdermal electrodes carefully to avoid accidental puncture wounds. After use, subdermal electrodes should be considered contaminated. If they are to be reused, they should be sterilized immediately, following the manufacturer’s recommended procedures. Rutala (1990) lists five methods for sterilizing critical items: heat (e.g., steam autoclaving), ethylene oxide gas, glutaraldehyde-based formulations, demand-release chlorine dioxide, and stabilized hydrogen peroxide. Although any one of these methods may be adequate to sterilize subdermal electrodes, it should not be used for that purpose without the recommendation of the electrode manufacturer. In addition, some methods of sterilization have a narrow margin of safety (Favero, 1985), so it is essential that the recommended procedures be carefully followed. After sterilization, the electrodes must be stored in such a way as to guarantee sterility at the time of use. Subdermal electrodes that will not be reused should be disposed of immediately in a puncture-resistant container.

**Conclusion**

The risk of bloodborne disease transmission due to standard procedures in the psychophysiology laboratory is extremely small, and can be minimized by observing the simple procedures outlined above concerning use of gloves, preparation of the skin, and reprocessing (e.g., disinfection) of electrodes. We recommend that these procedures be incorporated into the protocols of every laboratory in which electrodes are applied to non-intact skin. By following the procedures recommended to prevent transmission of the hardier and more infectious hepatitis B virus, researchers will also be preventing transmission of AIDS (Centers for Disease Control, 1985, 1989).

More stringent precautions than those noted above are called for if the subject is known to have or is suspected of having Creutzfeldt-Jacob Disease, a very rare bloodborne disease (American Electroencephalographic Society, 1986; Jarvis, 1982; Rutala, 1990). Some published guidelines also call for more stringent precautions in patients known to be infected by HIV or by hepatitis B (American Association of Electromyography and Electrodiagnos-
is, 1986; American Electoencephalographic Society, 1986). The more recent Guidelines for selection and use of disinfectants of the Association for Practitioners in Infection Control (Rutala, 1990), on the other hand, states that standard sterilization and disinfection procedures are adequate for reprocessing equipment contaminated with HIV or hepatitis B virus. This is consistent with the Centers for Disease Control recommendation of universal precautions (1987, 1988, 1989).

These guidelines for the psychophysiology laboratory have been formulated on the basis of the best information currently available. As understanding of the epidemiology of AIDS and hepatitis B increases, public health policies will continue to undergo a process of reassessment, and inevitably some recommendations will be revised. In addition, recommendations specific to psychophysiological research are likely to change as new disinfectants and electrodes become available, and as our knowledge of the effects of specific germicides on different types of electrodes increases. Researchers are advised to monitor new developments and to update their procedures accordingly.

REFERENCES


Appendix

Excerpts from the
U.S. Department of Health and Human Services
Public Health Service
Centers for Disease Control

Guidelines for Prevention of Transmission of
Human Immunodeficiency Virus and Hepatitis B Virus
to Health-Care and Public-Safety Workers


I. Introduction

B. Purpose and Organization of Document

The purpose of this document is to provide an overview of the modes of transmission of human immunodeficiency virus (HIV) in the workplace, an assessment of the risk of transmission under various assumptions, principles underlying the control of risk, and specific risk-control recommendations for employers and workers. These guidelines are intended for use by a technically informed audience.

Information concerning the protection of workers against acquisition of the human immunodeficiency virus (HIV) while performing job duties, the virus that causes AIDS, is presented here. Information on hepatitis B virus (HBV) is also presented in this document on the basis of the following assumptions:

• the modes of transmission for hepatitis B virus (HBV) are similar to those of HIV,
• the potential for HBV transmission in the occupational setting is greater than for HIV,
• there is a larger body of experience relating to controlling transmission of HBV in the workplace, and
• general practices to prevent the transmission of HBV will also minimize the risk of transmission of HIV.

Blood-borne transmission of other pathogens not specifically addressed here will be interrupted by adherence to the precautions noted below. It is important to note that the implementation of control measures for HIV and HBV does not obviate the need for continued adherence to general infection-control principles and general hygiene measures (e.g., hand washing) for preventing transmission of other infectious diseases to both worker and client. General guidelines for control of these diseases have been published (1,2,3).

C. Modes and Risk of Virus Transmission in the Workplace

Although the potential for HBV transmission in the workplace setting is greater than for HIV, the modes of transmission for these two viruses are similar. Both have been transmitted in occupational settings only by percutaneous inoculation or contact with an open wound, nonintact (e.g., chapped, abraded, weeping, or dermatitic) skin, or mucous membranes to blood, blood-contaminated body fluids, or concentrated virus. Blood is the single most important source of HIV and HBV in the workplace setting. Protection measures against HIV and HBV for workers

1Reprints of the complete Centers for Disease Control publications, of which excerpts are reprinted here, can be obtained from the National AIDS Information Clearinghouse, P.O. Box 6003, Rockville, MD 20850, 800-458-5231. Request documents D030, D031, and D423, respectively, to receive the 1987 Guidelines, the 1988 Update, and the 1989 Guidelines.
should focus primarily on preventing these types of exposures to blood as well as on delivery of HBV vaccination.

The risk of hepatitis B infection following a parenteral (i.e., needle stick or cut) exposure to blood is directly proportional to the probability that the blood contains hepatitis B surface antigen (HBsAg), the immunity status of the recipient, and on the efficiency of transmission (5). The probability of the source of the blood being HBsAg positive varies from 1 to 3 per thousand in the general population to 5%-15% in groups at high risk for HBV infection... Of persons who have not had prior hepatitis B vaccination or postexposure prophylaxis, 6%-30% of persons who receive a needle-stick exposure from an HBsAg-positive individual will become infected (5).

The risk of infection with HIV following one needle-stick exposure to blood from a patient known to be infected with HIV is approximately 0.5% (6,7). This rate of transmission is considerably lower than that for HBV, probably as a result of the significantly lower concentrations of virus in the blood of HIV-infected persons. Table I (not reprinted here) presents theoretical data concerning the likelihood of infection given repeated needle-stick injuries involving patients whose HIV serostatus is unknown. Though inadequately quantified, the risk from exposure of nonintact skin or mucous membranes is likely to be far less than that from percutaneous inoculation.

II. Principles of Infection Control and Their Application to Emergency and Public-Safety Workers

B. Universal Blood and Body Fluid Precautions to Prevent Occupational HIV and HBV Transmission

In 1985, CDC developed the strategy of “universal blood and body fluid precautions” to address concerns regarding transmission of HIV in the health-care setting (6). The concept, now referred to simply as “universal precautions” stresses that all patients should be assumed to be infectious for HIV and other blood-borne pathogens. In the hospital and other health-care setting, “universal precautions” should be followed when workers are exposed to blood, certain other body fluids (amniotic fluid, pericardial fluid, peritoneal fluid, pleural fluid, synovial fluid, cerebrospinal fluid, semen, and vaginal secretions), or any body fluid visibly contaminated with blood. Since HIV and HBV transmission has not been documented from exposure to other body fluids (feces, nasal secretions, sputum, sweat, tears, urine, and vomitus), “universal precautions” do not apply to these fluids. Universal precautions also do not apply to saliva, except in the dental setting, where saliva is likely to be contaminated with blood...

For the purpose of this document, human “exposure” is defined as contact with blood or other body fluids to which universal precautions apply through percutaneous inoculation or contact with an open wound, nonintact skin, or mucous membrane during the performance of normal job duties. An "exposed worker" is defined, for the purposes of this document, as an individual exposed, as described above, while performing normal job duties.

III. Employer Responsibilities

C. Disinfection, Decontamination, and Disposal

As described in Section I. C... , the only documented occupational risks of HIV and HBV infection are associated with parenteral (including open wound) and mucous membrane exposure to blood and other potentially infectious body fluids. Nevertheless, the precautions described below should be routinely followed.

I. Needle and sharps disposal

All workers should take precautions to prevent injuries caused by needles, scalpel blades, and other sharp instruments or devices during procedures; when cleaning used instruments; during disposal of used needles; and when handling sharp instruments after procedures. To prevent needle-stick injuries, needles should not be recap, purposely bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand. After they are used, disposable syringes and needles, scalpel blades, and other sharp items should be placed
in puncture-resistant containers for disposal; the puncture-resistant containers should be located as close as practical to the use area...

2. Hand washing

Hands and other skin surfaces should be washed immediately and thoroughly if contaminated with blood, other body fluids to which universal precautions apply, or potentially contaminated articles. Hands should always be washed after gloves are removed, even if the gloves appear to be intact. Hand washing should be completed using the appropriate facilities, such as utility or restroom sinks. Waterless antiseptic hand cleanser should be provided on responding units to use when hand-washing facilities are not available. When hand-washing facilities are available, wash hands with warm water and soap. When hand-washing facilities are not available, use a waterless antiseptic hand cleanser. The manufacturer's recommendations for the product should be followed.

3. Cleaning, disinfecting, and sterilizing

Table 5 [not reprinted here] presents the methods and applications for cleaning, disinfecting, and sterilizing equipment and surfaces in the prehospital setting. These methods also apply to housekeeping and other cleaning tasks. Previously issued guidelines for healthcare workers contain more detailed descriptions of these procedures and may be found in [the 1987 excerpts].

VI. References


Excerpts from the
U.S. Department of Health and Human Services
Public Health Service
Centers for Disease Control

Update: Universal Precautions for Prevention of Transmission of Human Immunodeficiency Virus, Hepatitis B Virus, and Other Bloodborne Pathogens in Health-Care Settings


Introduction

The purpose of this report is to clarify and supplement the CDC publication entitled "Recommendations for Prevention of HIV Transmission in Health-Care Settings" (1). . . .

Since the recommendations for universal precautions were published in August 1987, CDC and the Food and Drug Administration (FDA) have received requests for clarification of the following issues: 1) body fluids to which universal precautions apply, 2) use of protective barriers, 3) use of gloves for phlebotomy, 4) selection of gloves for use while observing universal precautions, and 5) need for making changes in waste management programs as a result of adopting universal precautions.

Body Fluids to Which Universal Precautions Apply

Universal precautions apply to blood and to other body fluids containing visible blood. Occupational transmission of HIV and HBV to health-care workers by blood is documented (4,5). Blood is the single most important source of HIV, HBV, and other bloodborne pathogens in the occupational setting. Infection control efforts for HIV, HBV, and other bloodborne pathogens must focus on preventing exposures to blood as well as on delivery of HBV immunization.

. . .

Body Fluids to Which Universal Precautions Do Not Apply

Universal precautions do not apply to feces, nasal secretions, sputum, sweat, tears, urine, and vomitus unless they contain visible blood. The risk of transmission of HIV and HBV from these fluids and materials is extremely low or nonexistent.

. . .

Glove Use for Phlebotomy

Gloves should reduce the incidence of blood contamination of hands during phlebotomy (drawing blood samples), but they cannot prevent penetrating injuries caused by needles or other sharp instruments . . . . In universal precautions, all blood is assumed to be potentially infective for bloodborne pathogens, but in certain settings (e.g., volunteer blood-donation centers) the prevalence of infection with some bloodborne pathogens (e.g., HIV, HBV) is known to be very low. Some institutions have relaxed recommendations for using gloves for phlebotomy procedures by skilled phlebotomists in settings where the prevalence of bloodborne pathogens is known to be very low.

Institutions that judge that routine gloving for all phlebotomies is not necessary should periodically reevaluate their policy. Gloves should always be available to health-care workers who wish to use them for phlebotomy. In addition, the following general guidelines apply:

1. Use gloves for performing phlebotomy when the health-care worker has cuts, scratches, or other breaks in his/her skin.

2. Use gloves in situations where the health-care worker judges that hand contamination with blood may occur, for example, when performing phlebotomy on an uncooperative patient.

*The August 1987 publication should be consulted for general information and specific recommendations not addressed in this update.
3. Use gloves for performing finger and/or heel sticks on infants and children.

4. Use gloves when persons are receiving training in phlebotomy.

**Selection of Gloves**

The Center for Devices and Radiological Health, FDA, has responsibility for regulating the medical glove industry. Medical gloves include those marketed as sterile surgical or nonsterile examination gloves made of vinyl or latex. General purpose utility ("rubber") gloves are also used in the healthcare setting, but they are not regulated by FDA since they are not promoted for medical use. There are no reported differences in barrier effectiveness between intact latex and intact vinyl used to manufacture gloves. Thus, the type of gloves selected should be appropriate for the task being performed.

The following general guidelines are recommended:

1. Use sterile gloves for procedures involving contact with normally sterile areas of the body.

2. Use examination gloves for procedures involving contact with mucous membranes, unless otherwise indicated, and for other patient care or diagnostic procedures that do not require the use of sterile gloves.

3. Change gloves between patient contacts.

4. Do not wash or disinfect surgical or examination gloves for reuse. Washing with surfactants may cause "wicking," i.e., the enhanced penetration of liquids through undetected holes in the glove. Disinfecting agents may cause deterioration.

5. Use general-purpose utility gloves (e.g., rubber household gloves) for housekeeping chores involving potential blood contact and for instrument cleaning and decontamination procedures. Utility gloves may be decontaminated and reused but should be discarded if they are peeling, cracked, or discolored, or if they have punctures, tears, or other evidence of deterioration.

**References**


saliva, tears, breast milk, cerebrospinal fluid, amniotic fluid, and urine and is likely to be isolated from other body fluids, secretions, and excretions. However, epidemiologic evidence has implicated only blood, semen, vaginal secretions, and possibly breast milk in transmission.

The increasing prevalence of HIV increases the risk that health-care workers will be exposed to blood from patients infected with HIV, especially when blood and body-fluid precautions are not followed for all patients. Thus, this document emphasizes the need for health-care workers to consider all patients as potentially infected with HIV and/or other blood-borne pathogens and to adhere rigorously to infection-control precautions for minimizing the risk of exposure to blood and body fluids of all patients.

The recommendations contained in this document consolidate and update CDC recommendations published earlier for preventing HIV transmission in health-care settings. They have been developed for use in health-care settings and emphasize the need to treat blood and other body fluids from all patients as potentially infective. These same prudent precautions also should be taken in other settings in which persons may be exposed to blood or other body fluids.

Precautions to Prevent Transmission of HIV

Universal Precautions

Since medical history and examination cannot reliably identify all patients infected with HIV or other blood-borne pathogens, blood and body-fluid precautions should be consistently used for all patients. This approach, referred to as “universal blood and body-fluid precautions” or “universal precautions,” should be used in the care of all patients.

1. All health-care workers should routinely use appropriate barrier precautions to prevent skin and mucous-membrane exposure when contact with blood or other body fluids of any patient is anticipated. Gloves should be worn for touching blood and body fluids, mucous membranes, or non-intact skin of all patients, for handling items or surfaces soiled with blood or body fluids. Gloves should be changed after contact with each patient.

2. Hands and other skin surfaces should be washed immediately and thoroughly if contaminated with blood or other body fluids. Hands should be washed immediately after gloves are removed.

3. All health-care workers should take precautions to prevent injuries caused by needles, scalpel blades, and other sharp instruments or devices during procedures; when cleaning used instruments; during disposal of used needles; and when handling sharp instruments after procedures. To prevent needlestick injuries, needles should not be recapped, purposely bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand. After they are used, disposable syringes and needles, scalpel blades, and other sharp items should be placed in puncture-resistant containers for disposal; the puncture-resistant containers should be located as close as practical to the use area.

5. Health-care workers who have exudative lesions or weeping dermatitis should refrain from direct patient care and from handling patient-care equipment until the condition resolves.

6. Pregnant health-care workers are not known to be at greater risk of contracting HIV infection than health-care workers who are not pregnant; however, if a health-care worker develops HIV infection during pregnancy, the infant is at risk of infection resulting from perinatal transmission. Because of this risk, pregnant health-care workers should be especially familiar with and strictly adhere to precautions to minimize the risk of HIV transmission.

Precautions for Laboratories†

Blood and other body fluids from all patients should be considered infective. To supplement the universal blood and body-fluid precautions listed above, the following precautions are recommended for health-care workers in clinical laboratories.

†Additional precautions for research and industrial laboratories are addressed elsewhere (22,23).
5. Use of needles and syringes should be limited to situations in which there is no alternative, and the recommendations for preventing injuries with needles outlined under universal precautions should be followed.

7. Contaminated materials used in laboratory tests should be decontaminated before reprocessing or be placed in bags and disposed of in accordance with institutional policies for disposal of infective waste (24).

8. Scientific equipment that has been contaminated with blood or other body fluids should be decontaminated and cleaned before being repaired in the laboratory or transported to the manufacturer.

9. All persons should wash their hands after completing laboratory activities and should remove protective clothing before leaving the laboratory.

Environmental Considerations for HIV Transmission

No environmentally mediated mode of HIV transmission has been documented. Nevertheless, the precautions described below should be taken routinely in the care of all patients.

Sterilization and Disinfection

Standard sterilization and disinfection procedures for patient-care equipment currently recommended for use (25,26) in a variety of health-care settings—including hospitals, medical and dental clinics and offices, hemodialysis centers, emergency-care facilities, and long-term nursing-care facilities—are adequate to sterilize or disinfect instruments, devices, or other items contaminated with blood or other body fluids from persons infected with blood-borne pathogens including HIV (21,23).

Instruments or devices that enter sterile tissue or the vascular system of any patient or through which blood flows should be sterilized before reuse. Devices or items that contact intact mucous membranes should be sterilized or receive high-level disinfection, a procedure that kills vegetative organisms and viruses but not necessarily large numbers of bacterial spores. Chemical germicides that are registered with the U.S. Environmental Protection Agency (EPA) as “sterilants” may be used either for sterilization or for high-level disinfection depending on contact time.

Medical devices or instruments that require sterilization or disinfection should be thoroughly cleaned before being exposed to the germicide, and the manufacturer’s instructions for the use of the germicide should be followed. Further, it is important that the manufacturer’s specifications for compatibility of the medical device with chemical germicides be closely followed. Information on specific label claims of commercial germicides can be obtained by writing to the Disinfectants Branch, Office of Pesticides, Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460.

Studies have shown that HIV is inactivated rapidly after being exposed to commonly used chemical germicides at concentrations that are much lower than used in practice (27-30). Embalming fluids are similar to the types of chemical germicides that have been tested and found to completely inactivate HIV. In addition to commercially available chemical germicides, a solution of sodium hypochlorite (household bleach) prepared daily is an inexpensive and effective germicide. Concentrations ranging from approximately 500 ppm (1:10 dilution of household bleach) sodium hypochlorite to 5,000 ppm (1:10 dilution of household bleach) are effective depending on the amount of organic material (e.g., blood, mucus) present on the surface to be cleaned and disinfected. Commercially available chemical germicides may be more compatible with certain medical devices that might be corroded by repeated exposure to sodium hypochlorite, especially to the 1:10 dilution.

Survival of HIV in the Environment

The most extensive study on the survival of HIV after drying involved greatly concentrated HIV samples, i.e., 10 million tissue-culture infectious doses per milliliter (31). This concentration is at least 100,000 times greater than that typically found in the blood or serum of patients with HIV infection. HIV was detectable by tissue-culture techniques 1–3 days after drying, but the rate of inactivation was rapid. Studies performed at CDC have also shown that drying HIV causes a rapid
(within several hours) 1–2 log (90%–99%) reduction in HIV concentration. In tissue-culture fluid, cell-free HIV could be detected up to 15 days at room temperature, up to 11 days at 37 °C (98.6 °F), and up to 1 day if the HIV was cell-associated.

When considered in the context of environmental conditions in health-care facilities, these results do not require any changes in currently recommended sterilization, disinfection, or housekeeping strategies. When medical devices are contaminated with blood or other body fluids, existing recommendations include the cleaning of these instruments, followed by disinfection or sterilization, depending on the type of medical device. These protocols assume "worst-case" conditions of extreme virologic and microbiologic contamination, and whether viruses have been inactivated after drying plays no role in formulating these strategies. Consequently, no changes in published procedures for cleaning, disinfecting, or sterilizing need to be made...

Implementation of Recommended Precautions

Employers of health-care workers should ensure that policies exist for:

1. Initial orientation and continuing education and training of all health-care workers—including students and trainees—on the epidemiology, modes of transmission, and prevention of HIV and other blood-borne infections and the need for routine use of universal blood and body-fluid precautions for all patients.

2. Provision of equipment and supplies necessary to minimize the risk of infection with HIV and other blood-borne pathogens.

3. Monitoring adherence to recommended protective measures. When monitoring reveals a failure to follow recommended precautions, counseling, education, and/or re-training should be provided, and, if necessary, appropriate disciplinary action should be considered.

Professional associations and labor organizations, through continuing education efforts, should emphasize the need for health-care workers to follow recommended precautions.

Serologic Testing for HIV Infection

Background

A person is identified as infected with HIV when a sequence of tests, starting with repeated enzyme immunoassays (EIA) and including a Western blot or similar, more specific assay, are repeatedly reactive. Persons infected with HIV usually develop antibody against the virus within 6–12 weeks after infection...

Testing of Patients

... Adherence to universal blood and body-fluid precautions recommended for the care of all patients will minimize the risk of transmission of HIV and other blood-borne pathogens from patients to health-care workers. The utility of routine HIV serologic testing of patients as an adjunct to universal precautions is unknown...

Testing of Health-Care Workers

Although transmission of HIV from infected health-care workers to patients has not been reported,* transmission during invasive procedures remains a possibility. Transmission of hepatitis B virus (HBV)—a blood-borne agent with a considerably greater potential for nosocomial spread—from health-care workers to patients has been documented. Such transmission has occurred in situations (e.g., oral and gynecologic surgery) in which health-care workers, when tested, had very high concentrations of HBV in their blood (a concentration much higher than occurs with HIV infection), and the health-care workers sustained a puncture wound while performing invasive procedures or had exu-

*But see the more recent report: Centers for Disease Control, Update: Transmission of HIV Infection during an invasive dental procedure. Morbidity and Mortality Weekly Report, 1/18/91, No.2]
dative or weeping lesions or microlacerations that allowed virus to contaminate instruments or open wounds of patients (33,34).

The hepatitis B experience indicates that only those health-care workers who perform certain types of invasive procedures have transmitted HBV to patients. Adherence to recommendations in this document will minimize the risk of transmission of HIV and other blood-borne pathogens from health-care workers to patients during invasive procedures. Since transmission of HIV from infected health-care workers performing invasive procedures to their patients has not been reported and would be expected to occur only very rarely, if at all, the utility of routine testing of such health-care workers to prevent transmission of HIV cannot be assessed.

References


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