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for

Occupational Safety and Health in collaboration with the Center for

Infe

ctious Diseases, Centers for Disease Control. Introduction

## Background

This document is a response to recently enacted legislation, Public

Law 100-607, The Health Omnibus Programs Extension Act of 1988,

Title

II, Programs with Respect to Acquired Immune Deficiency Syndrome

("AIDS

Amendments of 1988"). Subtitle E, General Provisions, Section

253(a) of

Title II specifies that "the Secretary of Health and Human

Services,

acting through the Director of the Centers for Disease Control,

shall

develop, issue, and disseminate guidelines to all health workers,

public safety workers (including emergency response employees) in

the

United States concerning--

(1) methods to reduce the risk in the workplace of becoming infected with the etiologic agent for

acquired immune deficiency syndrome; and

(2) circumstances under which exposure to such etiologic agent may occur."

It is further noted that "The Secretary of Health and Human Services

shall transmit the guidelines issued under subsection (a) to the Secretary of Labor for use by the Secretary of Labor in the development

of standards to be issued under the Occupational Safety and Health Act

of 1970," and that "the Secretary, acting through the Director of the

Centers for Disease Control, shall develop a model curriculum for emergency response employees with respect to the prevention of exposure

to the etiologic agent for acquired immune deficiency syndrome during

the process of responding to emergencies."

Following development of these guidelines and curriculum, "The Secretary shall--

(A) transmit to State public health officers copies of the guidelines

and the model curriculum developed under paragraph (1) with the request

that such officers disseminate such copies as appropriate throughout

the State; and

(B) make such copies available to the public."

## 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. This document also includes information on medical management of persons who have sustained an exposure at the workplace to these viruses (e.g., an emergency medical technicians who incur a needle-stick injury while performing professional duties). These guidelines are intended for use by a technically informed audience. As noted above, a separate model curriculum based on the principles and practices discussed in this document is being developed for use in training workers and will contain less technical wording.

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).

This document was developed primarily to provide guidelines for fire-service personnel, emergency medical technicians, paramedics, and

law-enforcement and correctional-facility personnel. Throughout the

report, paramedics and emergency medical technicians are called "emergency medical workers" and fire-service, law-enforcement, and correctional-facility personnel, "public-safety workers."

Previously issued guidelines address the needs of hospital-, laboratory-, and clinic-based health-care workers (4,5). A condensation of general guidelines for protection of workers from transmission of blood-borne pathogens, derived from the Joint Advisory Notice of the Departments of Labor and Health and Human Services (6), is provided in section III.

#### 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 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 (7). The probability of the source of the blood being  
HBsAg

positive from 1 to 3 per thousand in the general population to  
5%-15%

in groups at high risk for HBV infection, such as immigrants from  
areas

of high endemicity (China and Southeast Asia, sub-Saharan Africa,  
most

Pacific islands, and the Amazon Basin); clients in institutions for  
the

mentally retarded; intravenous drug users; homosexually active  
males;

and household (sexual and non-sexual) contacts of HBV carriers. 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 (7).

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% (4,5). 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 1 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.

#### D. Transmission of Hepatitis B Virus to Workers

Health-care workers

In 1987, the CDC estimated the total number of HBV infections in the

United States to be 300,000 per year, with approximately 75,000 (25%)

of infected persons developing acute hepatitis. Of these infected individuals, 18,000-30,000 (6%-10%) will become HBV carriers, at risk

of developing chronic liver disease (chronic active hepatitis,

cirrhosis, and primary liver cancer), and infectious to others.

CDC has estimated that 12,000 health-care workers whose jobs entail

exposure to blood become infected with HBV each year, that 500-600 of

them are hospitalized as a result of that infection, and that 700-1,200

of those infected become HBV carriers. Of the infected workers, approximately 250 will die (12-15 from fulminant hepatitis, 170-200

from cirrhosis, and 40-50 from liver cancer). Studies indicate that

10%-30% of health-care or dental workers show serologic evidence of

past or present HBV infection.

## 2. Emergency medical and public-safety workers

Emergency medical workers have an increased risk for hepatitis B infection (8,9,10). The degree of risk correlates with the frequency

and extent of blood exposure during the conduct of work activities.

A

few studies are available concerning risk of HBV infection for other

groups of public-safety workers (law-enforcement personnel and correctional-facility workers), but reports that have been published do



not document any increased risk for HBV infection (11,12,13).

Nevertheless, in occupational settings in which workers may be routinely exposed to blood or other body fluids as described below,

an

increased risk for occupational acquisition of HBV infection must

be

assumed to be present.

Vaccination for hepatitis B virus

A safe and effective vaccine to prevent hepatitis B has been

available

since 1982. Vaccination has been recommended for health-care

workers

regularly exposed to blood and other body fluids potentially

contaminated with HBV (7,14,15). In 1987, the Department of Health

and

Human Services and the Department of Labor stated that hepatitis B

vaccine should be provided to all such workers at no charge to the

worker (6).

Available vaccines stimulate active immunity against HBV infection

and

provide over 90% protection against hepatitis B for 7 or more years

following vaccination (7). Hepatitis B vaccines also are 70%-88%

effective when given within 1 week after HBV exposure. Hepatitis B

immune globulin (HBIG), a preparation of immunoglobulin with high

levels of antibody to HBV (anti-HBs), provides temporary passive

protection following exposure to HBV. Combination treatment with hepatitis B vaccine and HBIG is over 90% effective in preventing hepatitis B following a documented exposure (7).

#### E. Transmission of Human Immunodeficiency Virus to Workers

##### Health-care workers with AIDS

As of September 19, 1988, a total of 3,182 (5.1%) of 61,929 adults with AIDS, who had been reported to the CDC national surveillance system and for whom occupational information was available, reported

being employed in a health-care setting. Of the health-care workers

with AIDS, 95% reported high-risk behavior; for the remaining 5% (169 workers), the means of HIV acquisition was undetermined.

Of these 169 health-care workers with AIDS with undetermined risk,

information is incomplete for 28 (17%) because of death or refusal to

be interviewed; 97 (57%) are still being investigated. The remaining

44 (26%) health-care workers were interviewed directly or had other follow-up information available. The occupations of these 44 were nine

nursing assistants (20%); eight physicians (18%), four of whom were

surgeons; eight housekeeping or maintenance workers (18%); six nurses (14%); four clinical laboratory technicians (9%); two respiratory therapists (5%); one dentist (2%); one paramedic (2%); one embalmer (2%); and four others who did not have contact with patients (9%). Eighteen of these 44 health-care workers reported parenteral and/or other non-needle-stick exposure to blood or other body fluids from patients in the 10 years preceding their diagnosis of AIDS. None of these exposures involved a patient with AIDS or known HIV infection, and HIV seroconversion of the health-care worker was not documented following a specific exposure.

## 2. Human immunodeficiency virus transmission in the workplace

As of July 31, 1988, 1,201 health-care workers had been enrolled and tested for HIV antibody in ongoing CDC surveillance of health-care workers exposed via needle stick or splashes to skin or mucous membranes to blood from patients known to be HIV-infected (16). Of 860 workers who had received needle-stick injuries or cuts with sharp objects (i.e., parenteral exposures) and whose serum had been tested for HIV antibody at least 180 days after exposure, 4 were positive,

yielding a seroprevalence rate of 0.47%. Three of these individuals

experienced an acute retroviral syndrome associated with documented

seroconversion. Investigation revealed no nonoccupational risk factors

for these three workers. Serum collected within 30 days of exposure

was not available from the fourth person. This worker had an HIV-seropositive sexual partner, and heterosexual acquisition of infection cannot be excluded. None of the 103 workers who had contamination of mucous membranes or nonintact skin and whose serum had

been tested at least 180 days after exposure developed serologic evidence of HIV infection.

Two other ongoing prospective studies assess the risk of nosocomial

acquisition of HIV infection among health-care workers in the United

States. As of April 1988, the National Institutes of Health had tested

983 health-care workers, 137 with documented needle-stick injuries and

345 health-care workers who had sustained mucousmembrane exposures to

blood or other body fluids of HIV-infected patients; none had

seroconverted (17) (one health-care worker who subsequently experienced

an occupational HIV seroconversion has since been reported from NIH

Ö18å). As of March 15, 1988, a similar study at the University of California of 212 health-care workers with 625 documented accidental

parenteral exposures involving HIV-infected patients had

identified one seroconversion following a needle stick (19).

Prospective studies in the United Kingdom and Canada show no evidence

of HIV transmission among 220 health-care workers with parenteral, mucous-membrane, or cutaneous exposures (20,21).

In addition to the health-care workers enrolled in these longitudinal

surveillance studies, case histories have been published in the scientific literature for 19 HIV-infected health-care workers (13 with

documented seroconversion and 6 without documented seroconversion).

None of these workers reported nonoccupational risk factors.

Emergency medical service and public-safety workers

In addition to the one paramedic with undetermined risk discussed above, three public-safety workers (law-enforcement officers) are classified in the undetermined risk group. Follow-up investigations of

these workers could not determine conclusively if HIV infection was acquired during the performance of job duties.

## II. Principles of Infection Control and Their Application to

### Emergency

and Public-Safety Workers

### General Infection Control

Within the health-care setting, general infection control procedures

have been developed to minimize the risk of patient acquisition of infection from contact with contaminated devices, objects, or surfaces

or of transmission of an infectious agent from health-care workers to

patients (1,2,3). Such procedures also protect workers from the risk

of becoming infected. General infection-control procedures are designed to prevent transmission of a wide range of microbiological

agents and to provide a wide margin of safety in the varied situations

encountered in the health-care environment.

General infection-control principles are applicable to other work environments where workers contact other individuals and where transmission of infectious agents may occur. The modes of transmission

noted in the hospital and medical office environment are observed

in

the work situations of emergency and public-safety workers, as well.

Therefore, the principles of infection control developed for hospital

and other health-care settings are also applicable to these work situations. Use of general infection control measures, as adapted to

the work environments of emergency and public-safety workers, is important to protect both workers and individuals with whom they work

from a variety of infectious agents, not just HIV and HBV.

Because emergency and public-safety workers work in environments that

provide inherently unpredictable risks of exposures, general infection-control procedures should be adapted to these work situations. Exposures are unpredictable, and protective measures may

often be used in situations that do not appear to present risk.

Emergency and public-safety workers perform their duties in the community under extremely variable conditions; thus, control measures

that are simple and uniform across all situations have the greatest

likelihood of worker compliance. Administrative procedures to ensure

compliance also can be more readily developed than when procedures

are

complex and highly variable.

## 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 (4). 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 (7).

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.

The unpredictable and emergent nature of exposures encountered by emergency and public-safety workers may make differentiation between

hazardous body fluids and those which are not hazardous very difficult

and often impossible. For example, poor lighting may limit the worker's ability to detect visible blood in vomitus or feces.

Therefore, when emergency medical and public-safety workers encounter

body fluids under uncontrolled, emergency circumstances in which differentiation between fluid types is difficult, if not impossible,

they should treat all body fluids as potentially hazardous.

The application of the principles of universal precautions to the

situations encountered by these workers results in the development of guidelines (listed below) for work practices, use of personal protective equipment, and other protective measures. To minimize the risks of acquiring HIV and HBV during performance of job duties, emergency and public-safety workers should be protected from exposure to blood and other body fluids as circumstances dictate. Protection can be achieved through adherence to work practices designed to minimize or eliminate exposure and through use of personal protective equipment (i.e., gloves, masks, and protective clothing), which provide a barrier between the worker and the exposure source. In some situations, redesign of selected aspects of the job through equipment modifications or environmental control can further reduce risk. These approaches to primary prevention should be used together to achieve maximal reduction of the risk of exposure.

If exposure of an individual worker occurs, medical management, consisting of collection of pertinent medical and occupational history,

provision of treatment, and counseling regarding future work and personal behaviors, may reduce risk of developing disease as a result

of the exposure episode (22). Following episodic (or continuous) exposure, decontamination and disinfection of the work environment, devices, equipment, and clothing or other forms of personal protective equipment can reduce subsequent risk of exposures. Proper disposal of contaminated waste has similar benefits.

### III. Employer Responsibilities

#### General

Detailed recommendations for employer responsibilities in protecting workers from acquisition of blood-borne diseases in the workplace have been published in the Department of Labor and Department of Health and Human Services Joint Advisory Notice and are summarized here (6). In developing programs to protect workers, employers should follow a series of steps: 1) classification of work activity, 2) development of standard operating procedures, 3) provision of training and education, 4) development of procedures to ensure and monitor compliance, and

5)

workplace redesign. As a first step, every employer should classify work activities into one of three categories of potential exposure (Table 3). Employers should make protective equipment available to all workers when they are engaged in Category I or II activities. Employers should ensure that the appropriate protective equipment is used by workers when they perform Category I activities.

As a second step, employers should establish a detailed work practices program that includes standard operating procedures (SOPs)

for all activities having the potential for exposure. Once these SOPs are developed, an initial and periodic worker education program to assure familiarity with work practices should be provided to potentially exposed workers. No worker should engage in such tasks or activities before receiving training pertaining to the SOPs, work practices, and protective equipment required for that task.

Examples of personal protective equipment for the prehospital setting (defined as a setting where delivery of emergency health care takes place away

from a hospital or other health-care setting) are provided in Table

4.

(A curriculum for such training programs is being developed in conjunction with these guidelines and should be consulted for further

information concerning such training programs.)

To facilitate and monitor compliance with SOPs, administrative procedures should be developed and records kept as described in the

Joint Advisory Notice (6). Employers should monitor the workplace to

ensure that required work practices are observed and that protective

clothing and equipment are provided and properly used. The employer

should maintain records documenting the administrative procedures used

to classify job activities and copies of all SOPs for tasks or activities involving predictable or unpredictable exposure to blood or

other body fluids to which universal precautions apply. In addition,

training records, indicating the dates of training sessions, the content of those training sessions along with the names of all persons

conducting the training, and the names of all those receiving training

should also be maintained.

Whenever possible, the employer should identify devices and other approaches to modifying the work environment which will reduce exposure

risk. Such approaches are desirable, since they don't require individual worker action or management activity. For example, jails

and correctional facilities should have classification procedures that

require the segregation of offenders who indicate through their actions

or words that they intend to attack correctional-facility staff with

the intent of transmitting HIV or HBV.

#### Medical

In addition to the general responsibilities noted above, the employer

has the specific responsibility to make available to the worker a program of medical management. This program is designed to provide for

the reduction of risk of infection by HBV and for counseling workers

concerning issues regarding HIV and HBV. These services should be provided by a licensed health professional. All phases of

medical management and counseling should ensure that the confidentiality of the worker's and client's medical data is

protected.

## Hepatitis B vaccination

All workers whose jobs involve participation in tasks or activities

with exposure to blood or other body fluids to which universal

precautions apply (as defined above on page ) should be vaccinated

with

hepatitis B vaccine.

## 2.Management of percutaneous exposure to blood and other infectious

body fluids

Once an exposure has occurred (as defined above), a blood sample

should be drawn after consent is obtained from the individual from

whom

exposure occurred and tested for hepatitis B surface antigen

(HBsAg)

and antibody to human immunodeficiency virus (HIV antibody). Local

laws regarding consent for testing source individuals should be

followed. Policies should be available for testing source

individuals

in situations where consent cannot be obtained (e.g., an

unconscious

patient). Testing of the source individual should be done at a

location where appropriate pretest counseling is available;

posttest

counseling and referral for treatment should be provided. It is

extremely important that all individuals who seek consultation for any

HIV-related concerns receive counseling as outlined in the "Public Health Service Guidelines for Counseling and Antibody Testing to Prevent HIV Infection and AIDS" (22).

Hepatitis B virus postexposure management For an exposure to a source individual found to be positive for

HBsAg,

the worker who has not previously been given hepatitis B vaccine should

receive the vaccine series. A single dose of hepatitis B immune globulin (HBIG) is also recommended, if this can be given within 7 days

of exposure. For exposures from an HBsAg-positive source to workers

who have previously received vaccine, the exposed worker should be tested for antibody to hepatitis B surface antigen (anti-HBs), and given one dose of vaccine and one dose of HBIG if the antibody level in

the worker's blood sample is inadequate (i.e., 10 SRU by RIA, negative by EIA) (7).

If the source individual is negative for HBsAg and the worker has not

been vaccinated, this opportunity should be taken to provide hepatitis

B vaccination.



If the source individual refuses testing or he/she cannot be identified, the unvaccinated worker should receive the hepatitis B vaccine series. HBIG administration should be considered on an individual basis when the source individual is known or suspected to be at high risk of HBV infection. Management and treatment, if any, of previously vaccinated workers who receive an exposure from a source who refuses testing or is not identifiable should be individualized (7).

b. Human immunodeficiency virus postexposure management

For any exposure to a source individual who has AIDS, who is found to be positive for HIV infection (4), or who refuses testing, the worker should be counseled regarding the risk of infection and evaluated clinically and serologically for evidence of HIV infection as soon as possible after the exposure. In view of the evolving nature of HIV postexposure management, the health-care provider should be well informed of current PHS guidelines on this subject. The worker should be advised to report and seek medical evaluation for any acute febrile

illness that occurs within 12 weeks after the exposure. Such an illness, particularly one characterized by fever, rash, or lymphadenopathy, may be indicative of recent HIV infection.

Following

the initial test at the time of exposure, seronegative workers should

be retested 6 weeks, 12 weeks, and 6 months after exposure to determine

whether transmission has occurred. During this follow-up period (especially the first 6-12 weeks after exposure, when most infected

persons are expected to seroconvert), exposed workers should follow

U.S. Public Health Service (PHS) recommendations for preventing transmission of HIV (22). These include refraining from blood donation

and using appropriate protection during sexual intercourse (23).

During all phases of follow-up, it is vital that worker confidentiality

be protected.

If the source individual was tested and found to be seronegative, baseline testing of the exposed worker with follow-up testing 12 weeks

later may be performed if desired by the worker or recommended by the health-care provider.

If the source individual cannot be identified, decisions regarding appropriate follow-up should be individualized. Serologic testing

should be made available by the employer to all workers who may

be concerned they have been infected with HIV through an

occupational

exposure as defined above.

Management of human bites

On occasion, police and correctional-facility officers are

intentionally bitten by suspects or prisoners. When such bites

occur,

routine medical and surgical therapy (including an assessment of

tetanus vaccination status) should be implemented as soon as

possible,

since such bites frequently result in infection with organisms

other

than HIV and HBV. Victims of bites should be evaluated as

described

above for exposure to blood or other infectious body fluids.

Saliva of some persons infected with HBV has been shown to contain

HBV-DNA at concentrations 1/1,000 to 1/10,000 of that found in the

infected person's serum (5,24). HbsAg-positive saliva has been

shown

to be infectious when injected into experimental animals and in

human

bite exposures (25-27). However, HBsAg-positive saliva has not

been

shown to be infectious when applied to oral mucous membranes in

experimental primate studies (27) or through contamination of

musical

instruments or cardiopulmonary resuscitation dummies used by HBV carriers (28,29). Epidemiologic studies of nonsexual household contacts

of HIV-infected patients, including several small series in which HIV

transmission failed to occur after bites or after percutaneous inoculation or contamination of cuts and open wounds with saliva from

HIV-infected patients, suggest that the potential for salivary transmission of HIV is remote (5,30-33). One case report from Germany

has suggested the possibility of transmission of HIV in a household setting from an infected child to a sibling through a human bite (34).

The bite did not break the skin or result in bleeding. Since the date

of seroconversion to HIV was not known for either child in this case,

evidence for the role of saliva in the transmission of virus is unclear

(34).)

Documentation of exposure and reporting

As part of the confidential medical record, the circumstances of exposure should be recorded. Relevant information includes the activity in which the worker was engaged at the time of exposure,

the

extent to which appropriate work practices and protective equipment

were used, and a description of the source of exposure.

Employers have a responsibility under various federal and state

laws

and regulations to report occupational illnesses and injuries.

Existing programs in the

National Institute for Occupational Safety and Health

(NIOSH), Department of Health and Human Services; the Bureau of

Labor

Statistics, Department of Labor (DOL); and the Occupational Safety

and

Health Administration (DOL) receive such information for the

purposes

of surveillance and other objectives. Cases of infectious disease,

including AIDS and HBV infection, are reported to the Centers for

Disease Control through State health departments.

Management of HBV- or HIV-infected workers

Transmission of HBV from health-care workers to patients has been

documented. Such transmission has occurred during certain types of

invasive procedures (e.g., oral and gynecologic surgery) in which

health-care workers, when tested, had very high concentrations of

HBV

in their blood (at least 100 million infectious virus particles per milliliter, a concentration much higher than occurs with HIV infection), and the health-care workers sustained a puncture wound while performing invasive procedures or had exudative or weeping lesions or microlacerations that allowed virus to contaminate instruments or open wounds of patients (35,36). A worker who is HBsAg positive and who has transmitted hepatitis B virus to another individual during the performance of his or her job duties should be excluded from the performance of those job duties which place other individuals at risk for acquisition of hepatitis B infection. Workers with impaired immune systems resulting from HIV infection or other causes are at increased risk of acquiring or experiencing serious complications of infectious disease. Of particular concern is the risk of severe infection following exposure to other persons with infectious diseases that are easily transmitted if appropriate precautions are not taken (e.g., measles, varicella). Any worker with an impaired immune system should be counseled about the potential risk associated with

providing health care to persons with any transmissible infection  
and  
should continue to follow existing recommendations for infection  
control to minimize risk of exposure to other infectious agents  
(2,3).

Recommendations of the Immunization Practices Advisory Committee  
(ACIP)

and institutional policies concerning requirements for vaccinating  
workers with live-virus vaccines (e.g., measles, rubella) should  
also  
be considered.

The question of whether workers infected with HIV can adequately  
and

safely be allowed to perform patient-care duties or whether their  
work

assignments should be changed must be determined on an individual  
basis. These decisions should be made by the worker's

personal physician(s) in conjunction with the employer's medical  
advisors.

### 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.

#### 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 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 (e.g., in the ambulance or, if sharps are carried to the scene of victim assistance from the ambulance, a small puncture-resistant container should be carried to the scene, as well).

Reusable needles should be left on the syringe body and should be placed in a puncture-resistant container for transport to the reprocessing area.



## 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 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 health-care workers contain more detailed descriptions (4).

#### 4. Cleaning and decontaminating spills of blood

All spills of blood and blood-contaminated fluids should be promptly

cleaned up using an EPA-approved germicide or a 1:100 solution of household bleach in the following manner while wearing gloves.

##### Visible

material should first be removed with disposable towels or other appropriate means that will ensure against direct contact with blood.

If splashing is anticipated, protective eyewear should be worn along

with an impervious gown or apron which provides an effective barrier to

splashes. The area should then be decontaminated with an appropriate

germicide. Hands should be washed following removal of gloves.

##### Soiled

cleaning equipment should be cleaned and decontaminated or placed in an

appropriate container and disposed of according to agency policy.

Plastic bags should be available for removal of contaminated items from

the site of the spill.

Shoes and boots can become contaminated with blood in certain instances. Where there is massive blood contamination on floors, the

use of disposable impervious shoe coverings should be considered.

Protective gloves should be worn to remove contaminated shoe coverings. The coverings and gloves should be disposed of in plastic bags. A plastic bag should be included in the crime scene kit or the car which is to be used for the disposal of contaminated items.

Extra plastic bags should be stored in the police cruiser or emergency vehicle.

## 5. Laundry

Although soiled linen may be contaminated with pathogenic microorganisms, the risk of actual disease transmission is negligible.

Rather than rigid procedures and specifications, hygienic storage and

processing of clean and soiled linen are recommended. Laundry facilities and/or services should be made routinely available by the

employer. Soiled linen should be handled as little as possible and

with minimum agitation to prevent gross microbial contamination of the

air and of persons handling the linen. All soiled linen should be bagged at the location where it was used. Linen soiled with blood should be placed and transported in bags that prevent leakage.

Normal laundry cycles should be used according to the washer and detergent

manufacturers' recommendations.

## 6. Decontamination and laundering of protective clothing

Protective work clothing contaminated with blood or other body fluids

to which universal precautions apply should be placed and transported

in bags or containers that prevent leakage. Personnel involved in the

bagging, transport, and laundering of contaminated clothing should wear

gloves. Protective clothing and station and work uniforms should be

washed and dried according to the manufacturer's instructions.

### Boots

and leather goods may be brush-scrubbed with soap and hot water to remove contamination.

## 7. Infective waste

The selection of procedures for disposal of infective waste is determined by the relative risk of disease transmission and application

of local regulations, which vary widely. In all cases, local regulations should be consulted prior to disposal procedures and followed. Infective waste, in general, should either be incinerated or

should be decontaminated before disposal in a sanitary landfill.

### Bulk

blood, suctioned fluids, excretions, and secretions may be  
carefully  
poured down a drain connected to a sanitary sewer, where permitted.

Sanitary sewers may also be used to dispose of other infectious  
wastes  
capable of being ground and flushed into the sewer, where  
permitted.

Sharp items should be placed in puncture-proof containers and other

blood-contaminated items should be placed in leak-proof plastic  
bags

for transport to an appropriate disposal location.

Prior to the removal of protective equipment, personnel remaining  
on

the scene after the patient has been cared for should carefully  
search

for and remove contaminated materials. Debris should be disposed  
of as  
noted above.

#### IV. Fire and Emergency Medical Services

The guidelines that appear in this section apply to fire and  
emergency

medical services. This includes structural fire fighters,  
paramedics,

emergency medical technicians, and advanced life support personnel.

Fire fighters often provide emergency medical services and therefore encounter the exposures common to paramedics and emergency medical technicians. Job duties are often performed in uncontrolled environments, which, due to a lack of time and other factors, do not allow for application of a complex decision-making process to the emergency at hand.

The general principles presented here have been developed from existing principles of occupational safety and health in conjunction with data from studies of health-care workers in hospital settings. The basic premise is that workers must be protected from exposure to blood and other potentially infectious body fluids in the course of their work activities. There is a paucity of data concerning the risks these worker groups face, however, which complicates development of control principles. Thus, the guidelines presented below are based on principles of prudent public health practice.

Fire and emergency medical service personnel are engaged in delivery of medical care in the prehospital setting. The following guidelines

are

intended to assist these personnel in making decisions concerning

use

of personal protective equipment and resuscitation equipment, as

well

as for decontamination, disinfection, and disposal procedures.

### Personal Protective Equipment

Appropriate personal protective equipment should be made available

routinely by the employer to reduce the risk of exposure as defined

above. For many situations, the chance that the rescuer will be

exposed to blood and other body fluids to which universal

precautions

apply can be determined in advance. Therefore, if the chances of

being

exposed to blood is high (e.g., CPR, IV insertion, trauma,

delivering

babies), the worker should put on protective attire before

beginning

patient care. Table 4 sets forth examples of recommendations for

personal protective equipment in the prehospital setting; the list

is

not intended to be all-inclusive.

### Gloves

Disposable gloves should be a standard component of emergency

response

equipment, and should be donned by all personnel prior to

initiating

any emergency patient care tasks involving exposure to blood or other

body fluids to which universal precautions apply. Extra pairs should

always be available. Considerations in the choice of disposable gloves

should include dexterity, durability, fit, and the task being performed. Thus, there is no single type or thickness of glove appropriate for protection in all situations. For situations where large amounts of blood are likely to be encountered, it is important

that gloves fit tightly at the wrist to prevent blood contamination of

hands around the cuff. For multiple trauma victims, gloves should be

changed between patient contacts, if the emergency situation allows.

Greater personal protective equipment measures are indicated for situations where broken glass and sharp edges are likely to be encountered, such as extricating a person from an automobile wreck.

Structural fire-fighting gloves that meet the Federal OSHA

requirements for fire-fighters gloves (as contained in 29 CFR

1910.156

or National Fire Protection Association Standard 1973, Gloves for



Structural Fire Fighters) should be worn in any situation where sharp or rough surfaces are likely to be encountered (37).

While wearing gloves, avoid handling personal items, such as combs and pens, that could become soiled or contaminated. Gloves that have become contaminated with blood or other body fluids to which universal

precautions apply should be removed as soon as possible, taking care to

avoid skin contact with the exterior surface. Contaminated gloves should be placed and transported in bags that prevent leakage and should be disposed of or, in the case of reusable gloves, cleaned and disinfected properly.

Masks, eyewear, and gowns

Masks, eyewear, and gowns should be present on all emergency vehicles

that respond or potentially respond to medical emergencies or victim

rescues. These protective barriers should be used in accordance with

the level of exposure encountered. Minor lacerations or small amounts

of blood do not merit the same extent of barrier use as required for

exsanguinating victims or massive arterial bleeding. Management of

the

patient who is not bleeding, and who has no bloody body fluids present,

should not routinely require use of barrier precautions. Masks and

eyewear (e.g., safety glasses) should be worn together, or a faceshield

should be used by all personnel prior to any situation where splashes

of blood or other body fluids to which universal precautions apply are

likely to occur. Gowns or aprons should be worn to protect clothing

from splashes with blood. If large splashes or quantities of blood are

present or anticipated, impervious gowns or aprons should be worn.

An e

xtra change of work clothing should be available at all times.

Resuscitation equipment

No transmission of HBV or HIV infection during mouth-to-mouth resuscitation has been documented. However, because of the risk of salivary transmission of other infectious diseases (e.g., herpes simplex and Neisseria meningitidis) and the theoretical risk of HIV and

HBV transmission during artificial ventilation of trauma victims, disposable airway equipment or resuscitation bags should be used.

Disposable resuscitation equipment and devices should be used once

and

disposed of or, if reusable, thoroughly cleaned and disinfected

after

each use according to the manufacturer's recommendations.

Mechanical respiratory assist devices (e.g., bag-valve masks,

oxygen

demand valve resuscitators) should be available on all emergency vehicles and to all emergency response personnel that respond or potentially respond to medical emergencies or victim rescues.

Pocket mouth-to-mouth resuscitation masks designed to isolate

emergency

response personnel (i.e., double lumen systems) from contact with victims' blood and blood-contaminated saliva, respiratory

secretions,

and vomitus should be provided to all personnel who provide or

potential

ly provide emergency treatment.

## V. Law-Enforcement and Correctional-Facility Officers

Law-enforcement and correctional-facility officers may face the

risk of

exposure to blood during the conduct of their duties. For example,

at

the crime scene or during processing of suspects, law-enforcement officers may encounter blood-contaminated hypodermic needles or weapons, or be called upon to assist with body removal.

Correctional-facility officers may similarly be required to search

prisoners or their cells for hypodermic needles or weapons, or subdue

violent and combative inmates.

The following section presents information for reducing the risk of acquiring HIV and HBV infection by law-enforcement and correctional-facility officers as a consequence of carrying out their

duties. However, there is an extremely diverse range of potential situations which may occur in the control of persons with unpredictable, violent, or psychotic behavior. Therefore, informed

judgment of the individual officer is paramount when unusual circumstances or events arise. These recommendations should serve as

an adjunct to rational decision making in those situations where specific guidelines do not exist, particularly where immediate action

is required to preserve life or prevent significant injury.

The following guidelines are arranged into three sections: a section

addressing concerns shared by both law-enforcement and correctional-facility officers, and two sections dealing separately

with law-enforcement officers and correctional-facility officers, respectively. Table 4 contains selected examples of personal protective equipment that may be employed by law-enforcement and

correctional-facility officers.

## Law-Enforcement and Correctional-Facilities Considerations

### Fights and assaults

Law-enforcement and correctional-facility officers are exposed to a

range of assaultive and disruptive behavior through which they may potentially become exposed to blood or other body fluids containing

blood. Behaviors of particular concern are biting,

attacks resulting in blood exposure, and attacks with sharp

objects.

Such behaviors may occur in a range of law-enforcement situations

including arrests, routine interrogations, domestic disputes, and

lockup operations, as well as in correctional-facility activities.

Hand-to-hand combat may result in bleeding and may thus incur a

greater

chance for blood-to-blood exposure, which increases the chances for

blood-borne disease transmission.

Whenever the possibility for exposure to blood or

blood-contaminated

body fluids exists, the appropriate protection should be worn, if

feasible under the circumstances. In all cases, extreme caution

must

be used in dealing with the suspect or prisoner if there is any

indication of assaultive or combative behavior. When blood is

present

and a suspect or an inmate is combative or threatening to staff,  
gloves  
should always be put on as soon as conditions permit. In case of  
blood  
contamination of clothing, an extra change of clothing should be  
available at all times.

#### Cardiopulmonary resuscitation

Law-enforcement and correctional personnel are also concerned about  
infection with HIV and HBV through administration of  
cardiopulmonary  
resuscitation (CPR). Although there have been no documented cases  
of  
HIV transmission through this mechanism, the possibility of  
transmission of other infectious diseases exists. Therefore,  
agencies  
should make protective masks or airways available to officers and  
provide training in their proper use. Devices with one-way valves  
to  
prevent the patients' saliva or vomitus from entering the  
caregiver's  
mouth are preferable.

#### B. Law-Enforcement Considerations

##### Searches and evidence handling

Criminal justice personnel have potential risks of acquiring HBV or

HIV infection through exposures which occur during searches and

evidence handling. Penetrating injuries are known to occur, and puncture wounds or needle sticks in particular pose a hazard during

searches of persons, vehicles, or cells, and during evidence handling.

The following precautionary measures will help to reduce the risk of infection:

An officer should use great caution in searching the clothing of suspects. Individual discretion, based on the circumstances at hand,

should determine if a suspect or prisoner should empty his own pockets

or if the officer should use his

own skills in determining the contents of a suspect's clothing.

A safe distance should always be maintained between the officer and the suspect.

Wear protective gloves if exposure to blood is likely to be encountered.

Wear protective gloves for all body cavity searches.

If cotton gloves are to be worn when working with evidence of potential latent fingerprint value at the crime scene, they can be worn

over protective disposable gloves when exposure to blood may occur.

Always carry a flashlight, even during daylight shifts, to search

hidden areas. Whenever possible, use long-handled mirrors and flashlights to search such areas (e.g., under car seats).

If searching a purse, carefully empty contents directly from purse, by turning it upside down over a table.

Use puncture-proof containers to store sharp instruments and clearly marked plastic bags to store other possibly contaminated items. To avoid tearing gloves, use evidence tape instead of metal staples to seal evidence. Local procedures for evidence handling should be followed. In general, items should be air dried before sealing in plastic.

Not all types of gloves are suitable for conducting searches.

Vinyl or latex rubber gloves provide little protection against sharp instruments, and they are not puncture-proof. There is a direct trade-off between level of protection and manipulability. In other

words, the thicker the gloves, the more protection they provide, but

the less effective they are in locating objects. Thus, there is no

single type or thickness of glove appropriate for protection in all

situations. Officers should select the type and thickness of glove which provides the best balance of protection and search



efficiency.

Officers and crime scene technicians may confront unusual hazards, especially when the crime scene involves violent behavior, such as

a

homicide where large amounts of blood are present. Protective

gloves

should be available and worn in this setting. In addition, for

very

large spills, consideration should be given to other protective

clothing, such as overalls, aprons, boots, or protective shoe

covers.

They should be changed if torn or soiled, and always removed prior

to

leaving the scene. While wearing gloves, avoid handling personal

items, such as combs and pens, that could become soiled or contaminated.

Face

masks and eye protection or a face shield are required for

laboratory

and evidence technicians whose jobs which entail potential

exposures to

blood via a splash to the face, mouth, nose, or eyes. Airborne

particles of dried blood may be generated when a stain is scraped. It is

recommended that protective masks and eyewear or face shields be

worn

by laboratory or evidence technicians when removing the blood stain

for

laboratory analyses.

While processing the crime scene, personnel should be alert for the presence of sharp objects such as hypodermic needles, knives, razors, broken glass, nails, or other sharp objects.

## 2. Handling deceased persons and body removal

For detectives, investigators, evidence technicians, and others who may have to touch or remove a body, the response should be the same as for situations requiring CPR or first aid: wear gloves and cover all cuts and abrasions to create a barrier and carefully wash all exposed areas after any contact with blood. The precautions to be used with blood and deceased persons should also be used when handling limbs, hands, or other body parts. Such procedures should be followed after contact with the blood of anyone, regardless of whether they are known or suspected to be infected with HIV or HBV.

## 3. Autopsies

Protective masks and eyewear (or face shields), laboratory coats, gloves, and waterproof aprons should be worn when performing or

attending all autopsies. All autopsy material should be considered infectious for both HIV and HBV. Onlookers with an opportunity for exposure to blood splashes should be similarly protected.

#### Instruments

and surfaces contaminated during postmortem procedures should be decontaminated with an appropriate chemical germicide (4). Many laboratories have more detailed standard operating procedures for conducting autopsies; where available, these should be followed.

#### More

detailed recommendations for health-care workers in this setting have been published (4).

#### 4. Forensic laboratories

Blood from all individuals should be considered infective. To supplement other worksite precautions, the following precautions are recommended for workers in forensic laboratories.

a. All specimens of blood should be put in a well-constructed, appropriately labelled container with a secure lid to prevent leaking

during transport. Care should be taken when collecting each specimen

to avoid contaminating the outside of the container and of the laboratory form accompanying the specimen.

b. All persons processing blood specimens should wear gloves. Masks

and protective eyewear or face shields should be worn if mucous-membrane contact with blood is anticipated (e.g., removing tops from vacuum tubes). Hands should be washed after completion of specimen processing.

c. For routine procedures, such as histologic and pathologic studies

or microbiological culturing, a biological safety cabinet is not necessary. However, biological safety cabinets (Class I or II) should

be used whenever procedures are conducted that have a high potential

for generating droplets. These include activities such as blending,

sonicating, and vigorous mixing.

d. Mechanical pipetting devices should be used for manipulating all liquids in the laboratory. Mouth pipetting must not be done.

e. 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.

f. Laboratory work surfaces should be cleaned of visible materials and

then decontaminated with an appropriate chemical germicide after a spill of blood, semen, or blood-contaminated body fluid and when

work

activities are completed.

g. Contaminated materials used in laboratory tests should be decontaminated before reprocessing or be placed in bags and disposed of in accordance with institutional and local regulatory policies for disposal of infective waste.

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

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

j. Area posting of warning signs should be considered to remind employees of continuing hazard of infectious disease transmission in the laboratory setting.

## C. Correctional-Facility Considerations

### Searches

Penetrating injuries are known to occur in the correctional-facility

setting, and puncture wounds or needle sticks in particular pose a hazard during searches of prisoners or their cells. The following precautionary measures will help to reduce the risk of infection:

A correctional-facility officer should use great caution in searching the clothing of prisoners. Individual discretion, based on the circumstances at hand, should determine if a prisoner should empty his own pockets or if the officer should use his own skills in determining the contents of a prisoner's clothing.

A safe distance should always be maintained between the officer and the prisoner.

Always carry a flashlight, even during daylight shifts, to search hidden areas. Whenever possible, use long-handled mirrors and flashlights to search such areas (e.g., under commodes, bunks, and in vents in jail cells).

Wear protective gloves if exposure to blood is likely to be encountered.

Wear protective gloves for all body cavity searches.

Not all types of gloves are suitable for conducting searches.

Vinyl or latex rubber gloves can provide little, if any, protection against sharp instruments, and they are not puncture-proof. There is a direct trade-off between level of protection and manipulability. In other

words, the thicker the gloves, the more protection they provide, but the less effective they are in locating objects. Thus, there is

no single type or thickness of glove appropriate for protection in all situations. Officers should select the type and thickness of glove which provides the best balance of protection and search efficiency.

#### Decontamination and disposal

Prisoners may spit at officers and throw feces; sometimes these substances have been purposefully contaminated with blood.

Although

there are no documented cases of HIV or HBV transmission in this manner

and transmission by this route would not be expected to occur, other

diseases could be transmitted. These materials should be removed with

a paper towel after donning gloves, and the area then decontaminated

with an appropriate germicide. Following clean-up, soiled towels and

gloves should be disposed of properly.

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