



MMWRTM

Morbidity and Mortality Weekly Report

www.cdc.gov/mmwr

Recommendations and Reports

August 1, 2008 / Vol. 57 / No. RR-6

Recommendations for Postexposure Interventions to Prevent Infection with Hepatitis B Virus, Hepatitis C Virus, or Human Immunodeficiency Virus, and Tetanus in Persons Wounded During Bombings and Similar Mass-Casualty Events — United States, 2008

Recommendations of the Centers for Disease Control and Prevention (CDC)

INSIDE: Continuing Education Examination

**DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION**

The *MMWR* series of publications is published by the Coordinating Center for Health Information and Service, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30333.

Suggested Citation: Centers for Disease Control and Prevention. [Title]. *MMWR* 2008;57(No. RR-#):[inclusive page numbers].

Centers for Disease Control and Prevention

Julie L. Gerberding, MD, MPH
Director

Tanja Popovic, MD, PhD
Chief Science Officer

James W. Stephens, PhD
Associate Director for Science

Steven L. Solomon, MD
Director, Coordinating Center for Health Information and Service

Jay M. Bernhardt, PhD, MPH
Director, National Center for Health Marketing

Katherine L. Daniel, PhD
Deputy Director, National Center for Health Marketing

Editorial and Production Staff

Frederic E. Shaw, MD, JD
Editor, MMWR Series

Susan F. Davis, MD
(Acting) Assistant Editor, MMWR Series

Teresa F. Rutledge
(Acting) Managing Editor, MMWR Series

David C. Johnson
(Acting) Lead Technical Writer-Editor

Jeffrey D. Sokolow, MA
Project Editor

Peter M. Jenkins
(Acting) Lead Visual Information Specialist

Lynda G. Cupell
Malbea A. LaPete
Visual Information Specialists

Quang M. Doan, MBA
Erica R. Shaver
Information Technology Specialists

Editorial Board

William L. Roper, MD, MPH, Chapel Hill, NC, Chairman

Virginia A. Caine, MD, Indianapolis, IN

David W. Fleming, MD, Seattle, WA

William E. Halperin, MD, DrPH, MPH, Newark, NJ

Margaret A. Hamburg, MD, Washington, DC

King K. Holmes, MD, PhD, Seattle, WA

Deborah Holtzman, PhD, Atlanta, GA

John K. Iglehart, Bethesda, MD

Dennis G. Maki, MD, Madison, WI

Sue Mallonee, MPH, Oklahoma City, OK

Stanley A. Plotkin, MD, Doylestown, PA

Patricia Quinlisk, MD, MPH, Des Moines, IA

Patrick L. Remington, MD, MPH, Madison, WI

Barbara K. Rimer, DrPH, Chapel Hill, NC

John V. Rullan, MD, MPH, San Juan, PR

Anne Schuchat, MD, Atlanta, GA

Dixie E. Snider, MD, MPH, Atlanta, GA

John W. Ward, MD, Atlanta, GA

CONTENTS

Introduction	1
Methods	3
Bloodborne Pathogens of Immediate Concern	3
Tetanus	6
Recommendations	8
Vaccine and Antitoxin Supply	11
Counseling	11
Special Situations	11
Responders and Other Personnel	12
Contraindications and Precautions	13
Reporting Adverse Events	13
Information Sources	14
Acknowledgments	14
References	14
Continuing Education Activity	CE-1

Disclosure of Relationship

CDC and our content experts wish to disclose that they have no financial interests or other relationships with the manufacturers of commercial products, suppliers of commercial services, or commercial supporters discussed in these recommendations.

Information included in these recommendations might not represent FDA approval or approved labeling for the particular product or indications in question. Specifically, the terms “safe” and “effective” might not be synonymous with the FDA-defined legal standard for product approval.

This report does not include any discussion of the unlabeled use of a product or a product under investigational use with the exception of the discussions of:

1. use of antiretroviral medications for human immunodeficiency virus postexposure prophylaxis.
2. off-label use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine (Tdap) in the following situations:
 - a. the interval between tetanus and diphtheria toxoids vaccine (Td) and Tdap might be shorter than the 5 years indicated in the package insert,
 - b. the interval between doses of Td might be shorter than the 5 years indicated in the package insert,
 - c. a dose of Tdap may be administered to a person who has already received Tdap,
 - d. a dose of Tdap may be administered to a person aged <7 years or >64 years, and
 - e. Tdap may be used as part of the primary series for tetanus and diphtheria.

Recommendations for Postexposure Interventions to Prevent Infection with Hepatitis B Virus, Hepatitis C Virus, or Human Immunodeficiency Virus, and Tetanus in Persons Wounded During Bombings and Other Mass-Casualty Events — United States, 2008

Recommendations of the Centers for Disease Control and Prevention (CDC)

Prepared by
 Louisa E. Chapman, MD¹
 Ernest E. Sullivent, MD²
 Lisa A. Grohskopf, MD³
 Elise M. Beltrami, MD⁴
 Joseph F. Perz, DrPH⁵
 Katrina Kretsinger, MD⁶
 Adelisa L. Panlilio, MD⁴
 Nicola D. Thompson, PhD⁵
 Richard L. Ehrenberg, MD⁷
 Kathleen F. Gensheimer, MD^{8,9}
 Jeffrey S. Duchin, MD^{10,11}
 Peter H. Kilmarx, MD³
 Richard C. Hunt, MD²

¹Immunization Services Division, National Center for Immunizations and Respiratory Diseases,

²Division of Injury Response, National Center for Injury Prevention and Control

³Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention

⁴Division of Healthcare Quality Promotion, National Center for Preparedness, Detection, and Control of Infectious Diseases

⁵Division of Viral Hepatitis, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention

⁶Division of Bacterial Diseases, National Center for Immunizations and Respiratory Diseases

⁷Office of Emergency Preparedness and Response, National Institute for Occupational Safety and Health

⁸Council of State and Territorial Epidemiologists, Atlanta, Georgia

⁹Maine Department of Health and Human Services, Augusta, Maine

¹⁰National Association of County and City Health Officials, Washington, DC

¹¹Public Health – King County, Seattle, Washington

Summary

This report outlines recommendations for postexposure interventions to prevent infection with hepatitis B virus, hepatitis C virus, or human immunodeficiency virus, and tetanus in persons wounded during bombings or other events resulting in mass casualties. Persons wounded during such events or in conjunction with the resulting emergency response might be exposed to blood, body fluids, or tissue from other injured persons and thus be at risk for bloodborne infections. This report adapts existing general recommendations on the use of immunization and postexposure prophylaxis for tetanus and for occupational and nonoccupational exposures to bloodborne pathogens to the specific situation of a mass-casualty event. Decisions regarding the implementation of prophylaxis are complex, and drawing parallels from existing guidelines is difficult. For any prophylactic intervention to be implemented effectively, guidance must be simple, straightforward, and logistically undemanding. Critical review during development of this guidance was provided by representatives of the National Association of County and City Health Officials, the Council of State and Territorial Epidemiologists, and representatives of the acute injury care, trauma and emergency response medical communities participating in CDC's Terrorism Injuries: Information, Dissemination and Exchange (TIIDE) project. The recommendations contained in this report represent the consensus of U.S. federal public health officials and reflect the experience and input of public health officials at all levels of government and the acute injury response community.

The material in this report originated in the Coordinating Office for Terrorism Preparedness and Emergency Response, Rich Besser, MD, Director; the National Center for Immunizations and Respiratory Diseases, Anne Schuchat, MD, Director; the National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention, Kevin A. Fenton, MD, PhD, Director; the National Center for Preparedness, Detection, and Control of Infectious Diseases, Rima Khabbaz, MD, Director; the National Center for Injury Prevention and Control, Howard Frumkin, MD, Director, Division of Injury Response, Richard Hunt, MD, Director; and the National Institute for Occupational Safety and Health, John Howard, MD, Director.

Corresponding preparer: Louisa Chapman, MD, National Center for Immunizations and Respiratory Diseases, CDC, Mailstop D-68, 1600 Clifton Road, N.E., Atlanta, GA 30333. Telephone: 404-639-8921; Fax: 404-639-3500; E-mail: LChapman@cdc.gov.

Introduction

Public health authorities must consider how to provide care to injured persons in the event of acts such as bombings that result in mass casualties. During 1980–2005, of 318 acts of terrorism investigated by the Federal Bureau of Investigation (FBI) in the United States or territories, 208 (65%) involved attempted bombings; of these 208 attempts, 183 (88%) succeeded. The majority of these acts were committed by domestic extremist groups that intentionally targeted property and did not cause deaths or injuries in persons; however, 19 bombings (10% of those that were successful) resulted in 181 deaths and 1,967 injured survivors. These figures do not include mass-casualty incidents that occurred outside the United States and its territories or those that occurred on U.S. soil that were classified as crimes, accidents, unintended negligence, or terrorist incidents other than bombings (e.g., the 2,972 persons killed as a result of the terrorist attacks of September 11, 2001). A total of 1,967 (91%) persons injured during terrorist bombings in the United States and approximately 12,000 (80%) persons injured during the terrorist attacks of September 11, 2001, survived (1).

Military health-care providers frequently must respond to mass-casualty events. During October 7, 2001–March 1, 2008, of 35,630 casualties incurred by U.S. Department of Defense forces involved in Operation Enduring Freedom (OEF) in Afghanistan and Operation Iraqi Freedom in Iraq (OIF), 27,441 (77%) resulted from mass-casualty events. Explosive devices accounted for 23,277 (65%) of these casualties. Of 27,441 persons wounded during OEF- and OIF-related mass-casualty events, 24,433 (89%) survived (U.S. Department of Defense, unpublished data, 2008).

In August 2001, the Israeli health ministry announced that tissue from two suicide bombers had tested positive for evidence of hepatitis B virus (HBV) (2). A 2002 case report from Israel described evidence of hepatitis B virus in a bone fragment that had traumatically implanted into a bombing survivor (3). Traumatically implanted bone fragments removed from five survivors of the 2005 London bombings were taken directly to forensic custody without testing for bloodborne pathogens (4). These observations support the potential for explosions to result in transmission of infections among persons injured during the event and indicate that emergency responders and health-care providers in the United States need uniform guidance on prophylactic interventions appropriate for persons injured in bombings and other events resulting in mass casualties. Wounds resulting from mass-casualty events require the same considerations for management as similar injuries

resulting from trauma cases not involving mass casualties, including the risk for tetanus. In addition, exposure of wounds, abraded skin, or mucous membranes to blood, body fluids, or tissue from other injured persons (including suicide bombers and bombing casualties) might carry a risk for infection with a bloodborne virus. Injured survivors of mass-casualty events are at risk for infection with HBV, hepatitis C virus (HCV), or human immunodeficiency virus (HIV) and for tetanus.

Decisions regarding the administration of prophylaxis after a mass-casualty event are complex, and drawing direct parallels from existing guidelines regarding prophylaxis against bloodborne pathogens in occupational or nonoccupational settings is difficult. Assessment of risk factors commonly used to estimate the need for prophylactic intervention might not be possible in the setting of response to a mass-casualty event because responses to such events might overwhelm local emergency response facilities, and medical response staff will be focused primarily on rendering life-saving trauma treatments. Because no uniform guidance existed for postexposure interventions to prevent bloodborne infections and tetanus among U.S. civilians or military personnel wounded during mass-casualty event, CDC convened a Working Group comprising experts in injury response, immunizations, bloodborne infections, tetanus, and federal-, state-, and local-level public health response to develop such guidance.

The recommendations in this report pertain only to bombings and other mass-casualty events and are not meant to supplant existing recommendations for other settings. In a situation involving a substantial number of casualties, the ability to assess medical and vaccination histories or the risks associated with the source of exposures might be limited, as might the supply of biologics. For this reason, in certain instances, the recommendations provided in this report differ from standard published recommendations for vaccination and prophylaxis in other settings. These recommendations are not meant to supplant existing recommendations for other settings and apply only to the specific situation of an event involving mass casualties. In addition, the recommendations provided in this report are limited to issues regarding initial postexposure management for bloodborne pathogens and tetanus prophylaxis. Other prophylactic measures that might be appropriate (e.g., use of antibiotics for the prevention of bacterial infection) are not discussed in this report.

Federal law requires the use of a Vaccine Information Statement (VIS) before the administration of vaccines against HBV or tetanus. VIS forms are available at <http://>

www.cdc.gov/vaccines/pubs/vis/default.htm. Whenever feasible, a VIS form should be provided to patients or guardians before vaccination.

Individual states set forth their own legal requirements as to what constitutes the nature of informed consent that might be required before certain medical interventions. In general, these statutes also provide for exemptions in emergency circumstances. It is these state-specific laws that should guide response when informed consent would be applicable, but the circumstances of response to a mass-casualty event might preclude adherence to standard informed consent processes. Emergency responders and health-care providers should consult with their legal counsel for guidance regarding the relevant laws of their jurisdictions in advance of any mass-casualty event.

Methods

This report was developed through consultation among persons with expertise in immunization and other prophylactic interventions against bloodborne and other infections, physicians who specialize in acute injury-care medicine (trauma and emergency medicine), and local, state, and federal public health epidemiologists. Thus, the recommendations in this report represent the best consensus judgment of expert opinion.

This report adapts existing recommendations on the use of immunization and postexposure prophylaxis in response to occupational and nonoccupational exposures to bloodborne pathogens in the United States to the specific mass-casualty event setting while acknowledging the difficulty of drawing direct parallels. This adaptation also draws on guidance and practices developed previously and in use in the United Kingdom and Israel (2,5–7).

These recommendations were adopted through a process of expert consultation and consensus development. First, CDC drafted proposed preliminary recommendations on the basis of relevant existing U.S. guidance and practices of Israel and the United Kingdom (2,5–7). These proposed recommendations were discussed by representatives of the U.S. and international trauma response community at a May 2006 meeting in Atlanta, Georgia; following this discussion, the initial draft was revised. A working group then was convened comprising CDC staff members with expertise in injury response, tetanus, viral hepatitis, HIV infection, immunization and postexposure prophylaxis, and occupational safety and health, and representatives of the National Association of County and City Health Officials and the Council of State and Territorial Epidemiologists

with experience in local and state level public health response. This group worked through the draft section by section to revise, update, and refine the recommendations; this revised document was shared again with representatives of the U.S. and international trauma response community for additional comment during a meeting in Atlanta, Georgia, in August 2007. Because this guidance met the requirements established by the Office of Management and Budget (OMB) for a Highly Influential Scientific Assessment (HISA) (available at <http://www.whitehouse.gov/omb/memoranda/fy2005/m05-03.html>), the recommendations underwent a final process of external review in addition to undergoing internal CDC review for scientific content. As part of the OMB HISA peer review, the document was posted on CDC's website for public comment. An external expert panel subsequently reviewed and critiqued the document, the public comments, and CDC's response to those comments, and the document was revised a final time in response to the external review process.

Bloodborne Pathogens of Immediate Concern

Although transfusions and injuries from sharp objects (e.g., needlestick) have been associated with the transmission of multiple different pathogens (8,9), three bloodborne pathogens merit specific consideration in mass-casualty situations: HBV, HCV, and HIV. All three viruses are endemic at low levels in the United States and can be transmitted by exposure of infectious blood to an open wound or, more rarely, to skin abrasions or through exposure to intact mucous membranes. These viruses also can be transmitted by similar exposures to other body fluids or tissues from infected persons. Infection risks and options for postexposure prophylaxis vary, depending on the virus and the type of injury and exposure. Because hepatitis A virus (HAV) is transmitted via the fecal-oral route and is not considered a bloodborne pathogen (10), HAV prophylaxis is not recommended during a mass-casualty event.

The information typically used in occupational settings to guide prophylactic intervention decisions (including the circumstances of the injury, background prevalence of disease, or risk for infection of the source of exposure) might not be as clearly interpretable or as readily available in a mass-casualty setting. For example, both the extent of exposed disrupted skin and the volume of blood contributing to the exposure might greatly exceed that of usual occupational exposures. In addition, injured persons might

be exposed to blood from multiple other persons or to biologic material from the body of a bomber or another injured person. The HBV, HCV, and HIV status of the source(s) usually will be unknown, and timely ascertainment might not be practical. If the circumstance in which each victim was injured can be characterized, this information can be used to assess the likelihood that an injured person was exposed to another person's blood. However, when such information is not readily available for persons injured during blast-related mass-casualty events, such blood exposure should be assumed.

Hepatitis B Virus

The prevalence of chronic HBV infection in the United States is approximately 0.4%. Prevalence varies by race, ethnicity, age group, geographic location, and individual history of risk behaviors (11).

Newly acquired HBV infection often is asymptomatic; only 30%–50% of children aged >5 years and adults have initial clinical signs or symptoms (11). The fatality rate among persons with reported cases of acute symptomatic hepatitis B is 0.5%–1.0% (11). No specific treatment exists for acute hepatitis B. Acute hepatitis B infection fails to resolve and instead progresses to chronic HBV infection in approximately 90% of those infected as infants, 30% of children infected at age <5 years, and <5% of persons infected at age \geq 5 years (11). Overall, approximately 25% of persons who become chronically infected during childhood and 15% of those who become chronically infected after childhood die prematurely from cirrhosis or liver cancer (11). Therapeutic agents approved by the U.S. Food and Drug Administration (FDA) for treating chronic hepatitis B can achieve sustained suppression of HBV replication and remission of liver disease for certain persons (11).

HBV is transmitted by percutaneous or mucosal exposure to infectious blood or body fluids. Although hepatitis B surface antigen (HBsAg) has been detected in multiple body fluids, only serum, semen, and saliva have been demonstrated to be infectious (11). Serum has the highest concentration of HBV, with lower concentrations in semen and saliva. HBV remains viable for 7 days or longer on environmental surfaces at room temperature (11). Among susceptible health-care personnel, the risk for HBV infection after a needlestick injury involving an HBV-positive source is 23%–62% (12). Prompt and appropriate postexposure prophylaxis (PEP) intervention reduces this risk. Many infections that occurred before widespread vaccination of health-care personnel probably resulted from unapparent exposures (e.g., inoculation into cutaneous scratches, lesions, or mucosal surfaces) (12).

Both passive-active PEP with hepatitis B immune globulin (HBIG) combined with hepatitis B vaccine and active PEP with hepatitis B vaccine alone have been demonstrated to be highly effective in preventing transmission after exposure to HBV (12). HBIG alone has been demonstrated to be effective in preventing HBV transmission. However, since hepatitis B vaccine became available, HBIG is used typically (and preferentially) as an adjunct to vaccination (11). The major determinant of effectiveness of PEP is early administration of the initial dose of vaccine (or HBIG). The effectiveness of PEP diminishes the longer after exposure it is initiated (12). Studies are limited on the maximum interval after exposure during which PEP is effective, but the interval is unlikely to exceed 7 days for perinatal and needlestick exposures (12). No data are available on the efficacy of HBsAg-containing combination vaccines when used to complete the vaccine series for PEP, but the efficacy of combination vaccines is expected to be similar to that of single-antigen vaccines because the HBsAg component induces a comparable antibody response (12). Antiviral PEP is not available for HBV.

A policy of liberal use of hepatitis B vaccine for PEP after bombings or in other mass-casualty situations is recommended because of the high concentration of HBV in blood of infected persons, the durability of HBV in the environment, and the efficacy and relative ease of administration of vaccine (11). Such use is consistent with existing recommendations for administering the hepatitis B vaccine series as PEP for persons (e.g., health-care personnel or sexual assault victims) exposed to a source with unknown HBV infection status (11,12). In general, PEP for HBV will be warranted for previously unvaccinated persons if wounds, nonintact skin, or intact mucous membranes might have been exposed to blood or body fluids from another person or persons. In a mass-casualty setting, failure to provide hepatitis B vaccination when needed could result in preventable illness, whereas unnecessary vaccination is unlikely to cause harm (11). Completion of primary vaccination at the time of discharge or during follow-up visits should be ensured for all persons who receive an initial hepatitis B vaccine dose as part of the acute response to a mass-casualty event.

If hepatitis B vaccine is in short supply, assessing how likely a person is to have been vaccinated previously might be necessary. In general, hepatitis B vaccination rates are highest among children aged <17 years (80%–90%) and health-care personnel (approximately 80%) (Table 1) (13–15) (see Pathogen-Specific Management Recommendations).

TABLE 1. Estimated percentage of persons vaccinated against hepatitis B virus infection, by age group and selected characteristics — United States, 2001–2006

Group	No. doses	% vaccinated	(95% CI*)	Source
Infants aged 19–35 mos	3	93.4	(92.8–94)	National Immunization Survey, 2001–2006†
Adolescents aged 13–17 yrs	3	81.3	(79.4–83.1)	National Immunization Survey, 2001–2006§
Adults aged 18–49 yrs	≥1	34.6	(33.5–35.6)	National Health Interview Survey, 2004¶
Health-care personnel	≥1	80.5	(77.3–83.4)	
Police/firefighters	≥1	63.3	(56.6–70.1)	
Adults at high risk**	≥1	45.4	(41.7–49.2)	

* Confidence interval.

† CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2006. MMWR 2007;56:880–5.

§ CDC. National vaccination coverage among adolescents aged 13–17 years—United States, 2006. MMWR 2007;56:885–8.

¶ CDC. Hepatitis B vaccination among adults—United States, 2004. MMWR 2006;55:509–11.

** Includes persons who reported having a sexually transmitted disease other than human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome during the previous 5 years, persons who consider themselves at high risk for HIV infection, and persons who reported any one of the following risk factors: hemophilia with receipt of clotting factor concentrates, men who have sex with men, injection-drug use, trading sex for money or drugs, testing positive for HIV, or having sex with someone with any of these risk factors.

Hepatitis C Virus

The prevalence of chronic HCV infection in the United States is approximately 1.3% (16). Prevalence varies by race/ethnicity, age group, geographic location, and individual history of risk behaviors (16,17).

Persons with acute HCV infection typically either are asymptomatic or have a mild clinical illness. Antibody to HCV (anti-HCV) can be detected in 80% of patients within 15 weeks after exposure and in 97% of patients by 6 months after exposure. Chronic HCV infection develops in 75%–85% of infected persons. The majority remain asymptomatic until onset of cirrhosis or end-stage liver disease, which develops within 20–30 years in approximately 10%–20% of infected persons (17).

HCV is transmitted primarily through exposure to large amounts of blood or repeated direct percutaneous exposures to blood (i.e., transfusion or injection-drug use). HCV is not transmitted efficiently through occupational exposures to blood; the average incidence of anti-HCV seroconversion after accidental percutaneous exposure from an HCV-positive source is 1.8% (range: 0–7%), with one study indicating that transmission occurred only from hollow-bore needles (17). Transmission rarely occurs through mucous membrane exposures to blood, and in only one instance was transmission in a health-care provider attributed to exposure of nonintact skin to blood (18). The risk for transmission from exposure to fluids or tissues other than HCV-infected blood has not been quantified but is expected to be low. The exact duration of HCV viability in the environment is unknown but is at least 16–23 hours (19,20).

Immune globulin and antiviral agents are not recommended for PEP after exposure to HCV-positive blood. No vaccine against HCV exists. In the absence of PEP for HCV, recommendations for postexposure management are

intended to achieve early identification of infection and, if present, referral for evaluation of treatment options. No guidelines exist for administration of therapy during the acute phase of HCV infection. However, limited data indicate that antiviral therapy might be beneficial when started early in the course of HCV infection. When HCV seroconversion is identified early, the person should be referred for medical management to a knowledgeable specialist (12,17).

Testing is not routinely recommended in the absence of a risk factor for infection or a known exposure to an HCV-positive source (17). However, current public health practice often does include advising testing for potential exposures to unknown sources (e.g., playground incidents involving needlestick or health-care exposures involving possible needle or syringe reuse or inadequately disinfected equipment). In the setting of a bombing or other mass-casualty event, both the extent of exposed disrupted skin and the volume of blood contributing to the exposure might greatly exceed that of usual occupational exposures. Thus, baseline and follow-up HCV testing should be considered for persons injured during bombings or other mass-casualty events whose penetrating injuries or nonintact skin are suspected to have come into contact with another person's blood or body fluids (see Pathogen-Specific Management Recommendations).

Human Immunodeficiency Virus

The overall prevalence of HIV infection in the United States was estimated to be 311.5 per 100,000 population (0.31%) in 2005, with wide geographic variability (range: 26.4 per 100,000 population [0.03%] [North Dakota]–2,060 per 100,000 population [2.06%] [Washington, DC]) (21). Prevalence might vary greatly among subpopulations within the same communities (e.g., residents of a

nursing home compared with residents of transitional housing associated with a drug treatment program). The principal means of transmission in the United States is through sexual contact or through sharing of injection-drug use equipment with an infected person (21). Exposures also occur in occupational settings (principally among health-care personnel) and infrequently can result in transmission. Guidelines for the use of antiretroviral PEP in both occupational and nonoccupational settings have been published previously (22–24), but these documents do not specifically address situations involving mass casualties.

Potentially infectious materials include blood and visibly bloody body fluids, semen, and vaginal secretions. Cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid also are considered infectious, but the transmission risk associated with them is less well defined. Feces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus are not considered infectious unless visibly bloody. Exposures that pose a risk for transmission include percutaneous injuries, contact of mucous membranes, or contact of nonintact skin with potentially infected fluids (22–24).

In studies of health-care personnel, the average risk for HIV transmission has been estimated to be approximately 0.3% (95% confidence interval [CI] = 0.2%–0.5%) after a percutaneous exposure to HIV-infected blood and approximately 0.09% (95% CI = 0.01%–0.5%) after a mucous membrane exposure. Transmission risk from nonintact skin exposure has not been quantified but is estimated to be less than that for mucous membrane exposure. Risk following percutaneous exposure is correlated positively with exposure to a larger quantity of blood, direct penetration of a vein or artery, a deep tissue injury, or exposure to blood from a source person with terminal illness (25), presumably related to high viral load.

Use of PEP with antiretroviral medications, initiated as soon as possible after exposure and continuing for 28 days, has been associated with a decreased risk for infection following percutaneous exposure in health-care settings (22). PEP also is recommended following nonoccupational sexual and injection-drug use–related exposures (24). Because of the potential toxicities of antiretroviral drugs, PEP is recommended unequivocally only for exposures to sources known to be HIV-infected. The decision to use PEP following unknown-source exposures is to be made on a case-by-case basis, considering the information available about the type of exposure, known risk characteristics of the source, and prevalence in the setting concerned.

In the majority of instances involving bombings or other mass-casualty events, the working group concluded that the risk for exposure to HIV-infected materials probably is low and that therefore PEP is not indicated. On this basis, PEP is not routinely recommended for treating persons injured in mass-casualty settings in the United Kingdom (7). For the same reason, HIV PEP should not be administered universally in mass-casualty settings in the United States unless recommended by the local public health authority. Such instances might occur for mass-casualty events in certain specific settings judged by public health authorities to be associated with higher risk for HIV exposure (e.g., a research facility that contained a large archive of HIV-infected blood specimens). In the rare situation in which PEP is recommended, it should be initiated as soon as possible after exposure, and specimens from the exposed person should be collected for baseline HIV testing. However, PEP should not be delayed for the results of testing. If PEP is used, certain other laboratory studies also are indicated. Consultation from health-care professionals knowledgeable about HIV infection is ideal, and is particularly important for pediatric patients and pregnant women. All persons for whom HIV PEP has been initiated should be referred to a clinician experienced in HIV care for follow up.

Tetanus

Clostridium tetani, the causative agent of tetanus, is ubiquitous in the environment and distributed worldwide. The organism is found in soil and in the intestines of animals and humans. When spores of *C. tetani* are introduced into the anaerobic or hypoaerobic conditions found in wounds or devitalized tissue, they germinate to vegetative bacilli that elaborate toxin and cause disease. This now infrequent but often fatal disease has been associated with injuries to otherwise healthy persons, particularly during military conflicts. During 1998–2000, the case-fatality ratio for reported tetanus in the United States was 18% (26). Although tetanus is not transmitted from person to person, contamination of wounds with debris might increase the risk for tetanus among persons injured in mass-casualty settings. Proper wound care and debridement play a critical role in tetanus prevention.

Serologic tests indicate that immunity to tetanus toxin is not acquired naturally. However, protection against tetanus is achievable almost universally by use of highly immunogenic and safe tetanus toxoid-containing vaccines. The disease now occurs almost exclusively among persons

who were not vaccinated adequately or whose vaccination histories are unknown or uncertain (27,28). Universal primary vaccination, with subsequent maintenance of adequate antitoxin levels by means of appropriately timed boosters, protects persons among all age groups.

The age distribution of recent cases and the results of serosurveys indicate that many U.S. adults are not protected against tetanus (29). The proportions of persons lacking protective levels of circulating antitoxins against tetanus increase with age; at least 40% of persons aged ≥ 60 years might lack protection. In the United States, tetanus is primarily a disease of older adults (27,28). Children are much more likely to have received age-appropriate vaccination; rates for receipt of 3 doses among children aged 19–35 months exceed 96% (28). During 1992–2000, only 15 cases of tetanus were reported in the United States among children aged < 15 years. Parental philosophic or religious objection to vaccination accounted for the absence of immune protection for 12 (80%) affected children (30). Foreign-born immigrants, especially those from regions other than North America or Europe, also might be relatively undervaccinated (29,31).

Available evidence indicates that complete primary vaccination with tetanus toxoid provides long-lasting protection. After routine childhood tetanus vaccination, the Advisory Committee on Immunization Practices (ACIP) recommends routine booster vaccination with tetanus toxoid-containing vaccines every 10 years. For clean and minor wounds, a booster dose is recommended if the patient has not received a dose within 10 years. For all other wounds, a booster is appropriate if the patient has not received tetanus toxoid during the preceding 5 years.

In the setting of acute response to a mass-casualty event, failure to provide a tetanus vaccination when needed could result in preventable illness, whereas unnecessary vaccination is unlikely to cause harm (26–29,32,33). A substantial proportion of patients in this setting might be unable to provide a history of vaccination or history of contraindications to tetanus toxoid-containing vaccines, and the majority of wounds sustained will be considered tetanus-prone because they are likely to be exposed to dirt or feces. Thus, a wounded adult patient who cannot confirm receipt of a tetanus booster during the preceding 5 years should be vaccinated with tetanus and diphtheria toxoids vaccine (Td) or tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis vaccine (Tdap); adults aged ≥ 65 years should receive Td (26). Similarly, a child with an uncertain vaccination history should receive a tetanus booster as

age-indicated by the standard childhood immunization table (pediatric diphtheria and tetanus toxoids and acellular pertussis vaccine [DTaP] if aged < 7 years, Td if aged 7–10 years, and Tdap if aged ≥ 11 years) (32,34).

ACIP recommends that patients without a complete primary tetanus series who sustain a tetanus-prone wound routinely receive passive immunization with tetanus immune globulin (TIG) and tetanus toxoid (33). In the setting of acute response to a mass-casualty event, many wounded patients probably will be unable to confirm previous vaccination histories, and thus TIG normally would be indicated. However, this might not be feasible in a mass-casualty setting if supplies of TIG are limited. All decisions to administer TIG depend on the number of casualties and the readily available supply of TIG. If the supply of TIG is adequate, consideration might be given to providing both tetanus toxoid and passive immunization with TIG at the time of management of tetanus-prone wounds. TIG is indicated if completion of a primary vaccination series is uncertain for an adult or if prior receipt of age-appropriate vaccinations is uncertain for a child. If TIG is in short supply, it should be reserved for patients least likely to have received adequate primary vaccination. In general, this group includes persons aged ≥ 60 years and immigrants from regions other than North America or Europe who might be less likely to have adequate antitetanus antibodies and who thus would derive the most benefit from TIG (32).

The TIG prophylactic dose that is recommended currently for wounds is 250 units administered intramuscularly (IM) for adult and pediatric patients. When tetanus toxoid and TIG are administered concurrently, separate syringes and separate sites should be used (35). In circumstances in which passive protection is clearly indicated but TIG is unavailable, intravenous immune globulin may be substituted for TIG. Postexposure chemoprophylaxis with antimicrobials against tetanus is not recommended.

ACIP recommends that adults and adolescents with a history of uncertain or incomplete primary vaccination complete a 3-dose primary series for tetanus, diphtheria, and pertussis (26,30–34). In the setting of acute response to a mass-casualty event, completion of the primary vaccination series of any vaccine provided initially during acute response during follow-up visits should be ensured at the time of discharge for inadequately vaccinated patients of all ages. Special precautions regarding management of pregnant women in the setting of emergency delivery have been identified (see Special Situations).

Recommendations

Risk Assessment

To determine appropriate actions in response to evaluation of casualties of bombings or other mass-casualty events, health-care providers should

- assess individual exposure risk by categorizing the patient into one of three exposure risk categories (Box 1) that are numbered sequentially from the highest (category 1) to the lowest (category 3) level of exposure risk and assign each person to the highest level risk category for which he/she qualifies,
- identify the appropriate risk category- and pathogen-specific management recommendation(s) (Box 1), and
- determine the appropriate action to take (see Pathogen-Specific Management Recommendations) in response to management recommendations.

When evaluating management choices for casualties of bombings or other mass-casualty events, health-care providers should assume that exposure to blood from other injured persons is likely unless available information on the circumstances of injury suggests otherwise. Blast injuries result occasionally in traumatic implantation of bone or other biologic material that is alien to the wounded person. Testing of such matter is not recommended as a useful adjunct for clinical management of wounded persons. Public health authorities can provide assistance in assessing exposure risk for affected groups of injured persons. Tetanus risk is not dependent upon blood exposure.

Pathogen-Specific Management Recommendations

Hepatitis B Virus

Unless an injured person who is unable to communicate an accurate medical history or for whom medical records are not readily available is accompanied by a person able to function as a health-care proxy, responders should assume the absence of a reliable hepatitis B vaccination history and no contraindication to vaccination with hepatitis B vaccine (see Contraindications and Precautions). If administration of hepatitis B vaccine to a large number of persons after a mass-casualty event is anticipated to result in shortages of hepatitis B vaccine products, or if such shortages already exist, assistance with vaccine supply is available (see Vaccine Supply).

Recommendation: Intervene:

- Persons for whom neither a reliable history of completed vaccination against HBV nor a known contraindication to vaccination against HBV exist should receive the first dose of the HBV vaccine series as soon as possible (preferably within 24 hours) and not later than 7 days after the event.
- Persons who receive or are identified as candidates for a dose of hepatitis B vaccine while undergoing evaluation or treatment in immediate response to a mass-casualty event should be discharged with referrals for follow-up and written information on predischarge

BOX 1. Recommended postexposure management by risk category and specific pathogen

Risk category	HBV*	HCV†	HIV§	Tetanus
Category 1. Penetrating injuries or nonintact skin exposures [¶]	Intervene	Consider testing	Generally no action	Intervene
Category 2. Mucous membrane exposures**	Intervene	Generally no action	Generally no action	No action
Category 3. Superficial exposure of intact skin ^{††}	No action	No action	No action	No action

* Hepatitis B virus.
† Hepatitis C virus.
§ Human immunodeficiency virus.
¶ Penetration of skin by a sharp object that was in contact with blood, tissue, or other potential infectious body fluid (i.e., semen, vaginal fluid, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid or any other visibly bloody body fluid or tissue) before penetration. Nonintact skin exposure is defined as contact of nonintact skin with any of these potentially infectious tissues or fluids.
** Contact of mucous membranes (i.e., eyes, nose, mouth, or inner surfaces of the gut or genital areas) with blood, tissue, or other potential infectious body fluid (i.e., semen, vaginal fluid, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid or any other visibly bloody body fluid or tissue).
†† Superficial exposure of intact skin (but not of mucous membranes) with blood, tissue, or other potential infectious body fluid (i.e., semen, vaginal fluid, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid or any other visibly bloody body fluid or tissue).

treatment to facilitate the ability of primary health-care providers to evaluate and, if appropriate, initiate or complete age-appropriate vaccinations or vaccination series (Appendix 1).

Recommendation: No action:

- No action is necessary to prevent HBV infection.

Hepatitis C Virus

Recommendation: Consider testing:

- Testing should be considered when an HCV-infected source is known or thought to be likely on the basis of the setting in which the injury occurred or exposure to blood or biologic material from a bomber or multiple other injured persons is suspected.
- Public health authorities can provide assistance in assessing exposures and therefore treatment for affected groups of injured persons. A decision to perform testing of specific persons might be made on the basis of the judgment of the treating physician and the preferences of the individual patient; testing during a follow-up referral might be a more feasible logistical option in the setting of response to a mass-casualty event.

If a decision is made to perform testing:

- baseline testing for anti-HCV and alanine aminotransferase (ALT) should be performed within 7–14 days of the exposure;
- follow-up testing for anti-HCV and ALT should be performed 4–6 months after exposure to assess seroconversion, preferably arranged as part of discharge planning;
- HCV RNA testing should be performed at 4–6 weeks if an earlier diagnosis of HCV infection is desired; and
- positive anti-HCV with low signal-to-cutoff value should be confirmed using a more specific supplemental assay before communicating the results to the patient; and
- persons who are tested or are identified as a candidate for testing regarding exposure to HCV while undergoing evaluation or treatment in immediate response to a mass-casualty event should be discharged with a referral for follow-up and written information on pre-discharge treatment (Appendix 1).

Recommendation: Generally no action:

- Exposure of mucous membranes to blood from a source with unknown HCV status generally poses a minor risk for infection and does not require further action.

- However, in settings in which exposure to an HCV-infected source is known or thought to be highly likely, testing for early identification of HCV infection following mucous membrane exposure may be considered. The decision to perform testing should be made on the basis of the judgment of the treating physician and the preference of the individual patient.

Recommendation: No action

- No action is necessary to prevent HCV infection.

Human Immunodeficiency Virus

Recommendation: Generally no action:

- In general, HIV PEP is not warranted. HIV PEP might be considered only in settings in which exposure to an HIV-infected source is known or thought to be highly likely (e.g., a blast injury incident that occurred in a research facility that contained a large archive of HIV infected blood specimens).
- HIV PEP should not be administered universally in response to mass-casualty events unless recommended by the local public health authority.
- In the rare event that HIV PEP is considered, it should be initiated as soon as possible after exposure. The patient should be counseled about the availability of PEP and informed of the potential benefits and risks and the need for prompt initiation to maximize potential effectiveness. If PEP is thought to be indicated on the basis of exposure risk, administration should not be delayed for HIV test results. Specific guidance on how to administer HIV PEP in unusual circumstances when it is warranted is available (see Special Situations).
- Persons who receive or are identified as candidates for HIV PEP while undergoing evaluation or treatment in immediate response to a mass-casualty event should be discharged with referrals for urgent follow-up. Written information on pre-discharge treatment should be provided to facilitate a primary health-care provider's ability to evaluate and, if appropriate, complete age-appropriate vaccinations or vaccination series (Appendix 1).
- In all health-care settings, opt-out screening for HIV (performing HIV screening after notifying the patient that the test will be performed, with assent inferred unless the patient declines or defers testing) is recommended for all patients aged 13–64 years. In the setting of response to a mass-casualty event, testing during a follow-up referral might be a more feasible logistic

option unless a decision to administer PEP has been made (35).

Recommendation: No action:

- No action is necessary to prevent HIV infection.

Tetanus

All persons who sustain tetanus-prone injuries in mass-casualty settings should be evaluated for the need for tetanus prophylaxis. Tetanus-prone injuries include but are not limited to puncture and other penetrating wounds with the potential to result in an anaerobic environment (wounds resulting from projectiles or by crushing) and wounds, avulsions, burns, or other nonintact skin that might be contaminated with feces, soil or saliva.

All persons who are not accompanied by either medical records or a health-care proxy and whose ability to communicate an accurate medical history is uncertain for any reason should be deemed to lack a reliable tetanus toxoid vaccination history and to have no contraindication to vaccination with tetanus toxoid (see Contraindications and Precautions). If compliance with recommendations is anticipated to result in a shortage of tetanus toxoid products or TIG, assistance with product supplies is available (see Vaccine Supply).

Recommendation: Intervene:

- Appropriate wound care and debridement are critical to tetanus prevention.
- Age-appropriate vaccines should be used if possible. However, in a mass-casualty setting, this might not be possible, and any tetanus vaccine formulation might be used, because the tetanus toxoid content is adequate for tetanus prophylaxis in any age group. In this setting, the benefit of supplying tetanus prophylaxis outweighs the potential for adverse reactions from formulations from a different age indication.
- Adult patients who cannot readily confirm receipt of a tetanus booster during the preceding 5 years and who do not have known contraindication to tetanus vaccination should be vaccinated with Tdap (or with Td if Tdap is unavailable) or with Td if aged ≥ 65 years.
- Pediatric patients with uncertain vaccination history and with no known contraindication to tetanus vaccination should receive a tetanus booster according to the following schedule:
 - DTaP if aged < 7 years
 - Td if aged 7–10 years
 - Tdap (or Td if Tdap is unavailable) if aged ≥ 11 years.

- In a mass-casualty situation, unusually high demand might result in shortages of age-specific vaccine formulations, and logistic considerations might make differentiating patients by age category prohibitive. If supplies of DTaP are inadequate, health-care providers might consider substituting Tdap or Td for DTaP because the amount of tetanus toxoid in all formulations is adequate to induce an immune response in a child. Similarly, if supplies of Td are inadequate, health-care providers might consider substituting Tdap for Td for persons aged ≥ 65 years. Pediatric DTaP generally is not indicated in persons aged ≥ 7 years; the increased diphtheria toxoid content is associated with higher rates of local adverse reactions in older persons (26,32). However, in a mass-casualty setting, other options might not exist.
- TIG might be indicated if completion of a primary vaccination series is uncertain for an adult, or prior receipt of age-appropriate vaccinations is uncertain for a child.
 - If TIG is in short supply, use of TIG should be reserved first for persons aged ≥ 60 years and for immigrants from regions other than North America or Europe. All decisions to administer TIG depend on the number of casualties and the readily available supply of TIG.
 - The recommended prophylactic dose of TIG is 250 units IM for adult and pediatric patients. When tetanus toxoid and TIG are administered concurrently, separate syringes and separate sites should be used (34).
- Persons who receive or are identified as candidates for tetanus toxoid-containing products or TIG while undergoing evaluation or treatment in immediate response to a mass-casualty event should be discharged with referrals for follow-up if possible. Written information on predischarge treatment should be provided to facilitate the ability of primary health-care providers to evaluate and, if appropriate, complete age-appropriate vaccinations or vaccination series (Appendix 1).

Recommendation: No action:

- No action is necessary to prevent tetanus. Exposure to blood or other bodily fluids generally is not considered a risk factor for tetanus.
- However, responders or persons engaged in debris clean up and construction are candidates for prophylaxis even if they do not sustain any wounds. When feasible, as a routine public health measure, tetanus toxoid vaccina-

tion with Tdap or Td should be offered to all persons whose last tetanus toxoid-containing vaccine was received ≥ 10 years previously and who either are responders or are engaged in either debris clean-up or construction and who thus might be expected to encounter further risk for exposure (36–39).

Vaccine and Antitoxin Supply

Adherence to these recommendations might increase the acute demand for tetanus toxoid-containing vaccine, TIG, and hepatitis B vaccine beyond the available local supply. In that event, local authorities might have to rely on local and state health departments, mutual aid agreements, or commercial vendors to supplement the supply of needed biologic or pharmaceutical products. If a local authority's capacity to respond to an emergency is exceeded and other local or regional resources are inadequate, local and state public health jurisdictions can, through their established communication channels for health emergencies, work with CDC and others as appropriate to assist with product shortages.

CDC's Strategic National Stockpile (SNS) maintains bulk quantities of pharmaceutical and nonpharmaceutical medical supplies for use in a national emergency. Tetanus toxoid, tetanus immune globulin, and hepatitis B vaccine are not included in the stockpile formulary. However, SNS has purchasing agreements for acquiring medical materials in large quantities, subject to commercial availability. CDC maintains stockpiles of pediatric vaccine products purchased by the Vaccines for Children Program that might be used to assist state, territorial, and tribal health departments in meeting emergent local demands for vaccines. CDC also can work with manufacturers and with state and local health authorities to assist with supply of vaccines that are not available in either the SNS or other CDC vaccine stockpiles.

Counseling

Hepatitis B and C Viruses

Persons undergoing postexposure management for possible exposure to HBV- or HCV-infected blood do not need to take any special precautions to prevent secondary transmission during the follow-up period (12,17). The exposed person does not need to modify sexual practices or refrain from becoming pregnant. An exposed nursing mother might continue to breastfeed. However, exposed persons should

refrain from donating blood, plasma, organs, tissue, or semen until follow-up testing by the health-care provider has excluded seroconversion (12,17).

Human Immunodeficiency Virus

Persons known to be exposed to HIV should refrain from blood, plasma, organ, tissue, or semen donation until follow-up testing by the health-care provider has excluded seroconversion. In addition, measures to prevent sexual transmission (e.g., abstinence or use of condoms) should be taken, and breastfeeding should be avoided until HIV infection has been ruled out (22).

Special Situations

When HIV PEP is Initiated

HIV PEP should be considered only under exceptional circumstances. In the rare event that HIV PEP is considered, it should be initiated as soon as possible after exposure. The patient should be counseled about the availability of PEP and informed about the potential benefits and risks and the need for prompt initiation to maximize potential effectiveness. If PEP is thought to be indicated on the basis of exposure risk, administration should not be delayed for HIV test results.

In the rare event that HIV PEP is administered, specimens should be collected for baseline HIV testing on all patients provided with PEP using a blood or oral fluid rapid test if available; otherwise, conventional testing should be used. Testing should be discussed with the patient if the patient's medical condition permits. Procedures for testing should be in accordance with applicable state and local laws. PEP can be initiated and test results reviewed at follow-up. If the HIV test result is positive, PEP can be discontinued and the patient referred to a clinician experienced with HIV care for treatment.

If PEP is administered, the health-care provider also should obtain baseline complete blood count, renal function, hepatic function tests, and, in women, a pregnancy test. Because efavirenz might be teratogenic, it should not be administered until pregnancy test results are available (12,22). Otherwise, test results need not be available before PEP initiation but should be reviewed in follow-up.

Selection of antiretroviral regimens should aim for simplicity and tolerability. Because of the complexity of selection of HIV PEP regimens, consultation with persons having expertise in antiretroviral therapy and HIV transmission is

strongly recommended. Resources for consultation are available from the following sources:

- local infectious diseases, hospital epidemiology, or occupational health consultants;
- local, state, or federal public health authorities;
- PEpline at <http://www.nccc.ucsf.edu/Hotlines/PEpline.html>, telephone 888-448-4911;
- HIV/AIDS Treatment Information Service at <http://aidsinfo.nih.gov>; and
- previously published guidance (see Information Sources).

Nevirapine should not be included in HIV PEP regimens because of potential severe hepatic and cutaneous toxicity. Efavirenz should not be used if pregnancy is known or suspected because of potential teratogenicity (12,22).

PEP should be started as soon after exposure as possible and continue for 4 weeks. For ambulatory patients, a starter pack of 5–7 days of medication should be provided, if possible. Alternatively, for hospitalized patients, the first dose should be taken in the emergency department, and follow-up orders should be written for completion of the course in the hospital.

Patients on PEP should be reassessed for adherence, toxicity, and for follow-up of HIV testing (if rapid testing was not available at baseline) within 72 hours by an infectious disease consultant. Patients continuing on PEP should have follow-up laboratory evaluation as recommended previously (22–24), including a complete blood count and renal and hepatic function tests at baseline and at 2 weeks postexposure, and HIV testing at baseline, 6 weeks, 3 months, and 6 months postexposure.

Persons begun on HIV PEP should be discharged with written instructions and a referral to ensure follow-up care with a clinician experienced with HIV care and information on the age-appropriate dose and schedule (Appendix 1).

Simultaneous Administration

When tetanus toxoid and TIG are administered concurrently, separate syringes and separate anatomic sites should be used (40). Hepatitis B vaccine and tetanus toxoid-containing vaccines might be administered at the same time using separate syringes and separate sites (36).

Treatment with an antimicrobial agent generally is not a contraindication to vaccination (40). Antimicrobial agents have no effect on the responses to vaccines against tetanus or hepatitis B.

Administration of Blood Products

The administration of hepatitis B vaccine or tetanus toxoid-containing products does not need to be deferred in persons who have received a blood transfusion or other blood products.

Pregnancy

Pregnancy is not a contraindication to vaccination against hepatitis B. Limited data suggest that a developing fetus is not at risk for adverse events when hepatitis B vaccine is administered to a pregnant woman. Available vaccines contain noninfectious HBsAg and should cause no risk for infection to the fetus (11).

Pregnancy is not a contraindication for HIV PEP. However, use of efavirenz should be avoided when pregnancy is known or suspected (11,22).

Pregnant adolescents and adults who received the most recent tetanus toxoid-containing vaccine ≥ 5 years previously generally should receive Td in preference to Tdap when possible (41).

Responders and Other Personnel

Responders and persons engaged in debris removal or construction often are at risk for incurring wounds throughout the duration of response and clean up work. As a routine public health measure, health-care providers should offer tetanus toxoid vaccination to all response workers who do not have a reliable history of receipt of a tetanus toxoid-containing vaccine during the preceding 10 years, regardless of whether the health-care visit was for a wound (38,39). Such persons might encounter potential exposure situations throughout the duration of their work in response to a mass-casualty situation.

Health-care personnel, emergency response, public safety and other workers (e.g., construction workers and equipment operators) who are injured and exposed to blood while providing assistance after a mass-casualty event should be managed according to existing guidelines and standards for the management of occupational exposures (10,22,42). Health-care personnel and first responders whose activities involve contact with blood or other body fluids should have been previously vaccinated against HBV and tetanus (12,22).

Contraindications and Precautions

Hepatitis B Vaccine

Hepatitis B vaccination is contraindicated for persons with a history of anaphylactic allergy to yeast or any vaccine component (11). On the basis of CDC's Vaccine Study Datalink data, the estimated incidence of anaphylaxis among children and adolescents who received hepatitis B vaccine is 1 case per 1.1 million vaccine doses distributed (95% CI = 0.1–3.9) (11). Persons with a history of serious adverse events (e.g., anaphylaxis) after receipt of hepatitis B vaccine should not receive additional doses. Vaccination is not contraindicated in persons with a history of multiple sclerosis, Guillain-Barré syndrome, autoimmune disease (e.g., systemic lupus erythematosus or rheumatoid arthritis), or other chronic diseases (11).

Antiretroviral Therapy

Nevirapine should not be included in HIV PEP regimens because of potential severe hepatic and cutaneous toxicity. Efavirenz should not be used if pregnancy is known or suspected because of potential teratogenicity (12,22).

Preparations Containing Tetanus Toxoid

The only contraindication to preparations containing tetanus toxoid (TT, Td, or Tdap) is a history of a neurologic or severe allergic reaction following a previous dose. Local side effects alone do not preclude continued use (26,30,31). If a person has a wound that is neither clean nor minor and for which tetanus prophylaxis is indicated, but also a contraindication to receipt of tetanus toxoid-containing preparations, only passive immunization using human TIG should be administered.

Reporting Adverse Events

Vaccine Adverse Events Reporting System

Any clinically significant adverse events that occur after administration of any vaccine should be reported to the Vaccine Adverse Events Reporting System (VAERS) even if causal relation to vaccination is uncertain. The National Childhood Vaccine Injury Act requires health-care providers to report to VAERS any event listed by the vaccine manufacturers as a contraindication to subsequent doses of

the vaccine or any event listed in the Reportable Events Table (available at <http://vaers.hhs.gov/reportable.htm>) that occurs within the specified period after vaccination. VAERS reporting forms and information can be requested 24 hours a day at telephone 800-822-7967 or by accessing VAERS at <http://vaers.hhs.gov>. Web-based reporting also is available, and providers are encouraged to report adverse events electronically at <http://secure.vaers.org/VaersDataEntryintro.htm>.

Reporting Adverse Events Associated With Antiretroviral Drugs and TIG

Unusual or severe toxicities believed to be associated with use of antiretroviral agents or TIG should be reported to FDA's MEDWATCH program (<http://www.fda.gov/medwatch>) at MedWatch, HF-2, Food and Drug Administration, 5600 Fishers Lane, Rockville, MD 20857; telephone 800-332-1088.

National Vaccine Injury Compensation Program

The National Vaccine Injury Compensation Program (NVICP) was established by the National Childhood Vaccine Injury Act and became operational on October 1, 1988. Intended as an alternative to civil litigation under the traditional tort system (in that negligence need not be proven), NVICP is a no-fault system in which persons thought to have suffered an injury or death as a result of administration of a covered vaccine may seek compensation. Claims may be filed on behalf of infants, children and adolescents, or by adults receiving VICP-covered vaccines. Other legal requirements (e.g., the statute of limitations for filing an injury or death claim) must be satisfied to pursue compensation. Claims arising from covered vaccines must be adjudicated through the program before civil litigation can be pursued. The program relies on a Reportable Events Table listing the vaccines covered by the program and the injuries, disabilities, illnesses, and conditions (including death) for which compensation might be awarded. Additional information about NVICP is available at <http://www.hrsa.gov/vaccinecompensation> or from the National Vaccine Injury Compensation Program, Health Resources and Services Administration, Parklawn Building, Room 11C-26, 5600 Fishers Lane, Rockville, MD 20857; telephone 800-338-2382.

Information Sources

Recommendations for immediate prophylactic interventions have been summarized (Table 2). Recommendations for issues that might arise in association with immediate prophylactic intervention also have been summarized (Table 3).

In addition to the guidance provided in these recommendations, information on specific vaccines or other prophylactic interventions also is available (Box 2). ACIP recommendations regarding vaccine use are published by *MMWR*. Electronic subscriptions are available free of charge at <http://www.cdc.gov/subscribe.html>. Printed subscriptions are available at Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9235, telephone 202-512-1800.

Acknowledgments

Contributors to this report included the National Association of County and City Health Officials, the Council of State and Territorial Epidemiologists, the Terrorism Injuries: Information Dissemination and Exchange (TIIDE) partnership, and the following persons: Italo Subbarao, DO, Center for Public Health Preparedness and Disaster Response, American Medical Association; Richard Sattin, MD, Division of Injury Response, National Center for Injury Prevention and Control; Richard McCluskey, MD, Coordinating Office for Terrorism Preparedness and Emergency Response; Jeanne Santoli, MD, Immunization Services Division, National Center for Immunizations and Respiratory Diseases; William Atkinson, MD, Immunization Services Division, National Center for Immunizations and Respiratory Diseases, CDC.

References

1. Federal Bureau of Investigation. Terrorism 2002–2005. Washington, DC: US Department of Justice, Federal Bureau of Investigation; 2006. Available at http://www.fbi.gov/publications.terror/terrorism2002_2005.htm.
2. Siegel-Itzkovich J. Israeli minister orders hepatitis B vaccine for survivors of suicide bomb attacks. *BMJ* 2001;323:417.
3. Braverman I, Wexler D, Oren M. A novel mode of infection with hepatitis B: penetrating bone fragments due to the explosion of a suicide bomber. *Isr Med Assoc J* 2002;4:528–9.
4. Wong J M-I, Marsh D, Abu-Sitta G, et al. Biological foreign body implantation in victims of the London July 7th suicide bombings. *J Trauma* 2006;60:402–4.
5. Israel Ministry of Health. Hepatitis B vaccination protocol in survivors of mass casualty bombings. Israel Ministry of Health Medical Guidelines 2001(35)/1/13(Communique 57/2001).
6. Israel Ministry of Health. Hepatitis B vaccination protocol in survivors of mass casualty bombings—revision. Israel Ministry of Health Medical Guidelines 2001(35)/2/13(Communique 72/2001).
7. Health Protection Agency. Post exposure prophylaxis against hepatitis B for bomb victims and immediate care providers. Consideration of other blood borne viruses (hepatitis C and HIV). London, United Kingdom: Health Protection Agency; 2005.

BOX 2. Online information sources

Vaccines

Advisory Committee on Immunization Practices (ACIP) recommendations, available at <http://www.cdc.gov/vaccines/pubs/ACIP-list.htm>.

CDC vaccines and immunization website, available at <http://www.cdc.gov/vaccines>.

American Academy of Pediatrics (AAP) Red Book, available at <http://aapredbook.aappublications.org>.

Downloadable Vaccine Information Statements, available at <http://www.cdc.gov/vaccines/pubs/vis/default.htm>.

Childhood, adolescent and adult immunization tables

Harmonized childhood, adolescent and adult immunization tables, available at <http://www.cdc.gov/vaccines/recs/schedules/default.htm>.

Postexposure prophylaxis (PEP) against HIV

CDC. Antiretroviral postexposure prophylaxis after sexual, injection-drug use, or other nonoccupational exposure to HIV in the United States. *MMWR* 2005;54(No. RR-2). Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5402a1.htm>.

CDC. Updated U.S. Public Health Service guidelines for management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. *MMWR* 2001;50(No. RR-11). Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5011a1.htm>.

CDC. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HIV and recommendations for postexposure prophylaxis. *MMWR* 2005;54(No. RR-9). Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5409a1.htm>.

CDC. Notice to readers: updated information regarding antiretroviral agents used as HIV postexposure prophylaxis for occupational HIV exposures. *MMWR* 2007;56:1291–2. Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5649a4.htm>.

PEpline, available 24-hours/day at telephone 888-448-4911 (preferred) or at <http://www.ucsf.edu/hivcntr/Hotlines/PEpline.html>.

HIV/AIDS Treatment Information Service, available at <http://aidsinfo.nih.gov>.

Postexposure Prophylaxis (PEP) Against HBV and HCV in Occupational Settings

CDC. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. *MMWR* 2001;50(No. RR-11). Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5011a1.htm>.

TABLE 2. Summary of recommendations for immediate prophylactic intervention

Type of injury or blood exposure	HBV*	HCV†	HIV§	Tetanus
Category 1. Penetrating injury/nonintact skin¶	For persons for whom no reliable history of hepatitis B vaccination exists and for whom no contraindication to vaccine is known, initiate hepatitis B vaccine series, preferably within 24 hours and not later than 7 days.	No prophylaxis recommended. Consider testing (immediately or during a follow-up referral) if exposure is to a known or likely HCV-infected source or multiple sources. If testing is performed, obtain baseline (within 7-14 days) and follow-up (4-6 months) anti-HCV and ALT.	Generally, no PEP** is warranted; consider only if exposure is to a known or highly likely HIV-infected source.	Clean and debride wound as appropriate. Give age-appropriate tetanus toxoid vaccine if date of receipt of last dose is unknown and no known history of vaccine contraindication exists. May consider administering TIG (in addition to tetanus toxoid) if no reliable history of tetanus primary series exists (always use separate syringes and separate administration sites). If TIG is in short supply, persons aged ≥60 yrs and immigrants from regions other than Europe or North America are most likely to derive benefit.
Category 2. Mucous membranes††	For persons for whom no reliable history of hepatitis B vaccination exists and for whom no contraindication to vaccine is known, initiate hepatitis B vaccine series, preferably within 24 hours and not later than 7 days.	Generally no action. Testing for early identification of HCV infection following mucous membrane exposure should be considered only in settings in which exposure to an HCV-infected source is known or thought to be highly likely.	Generally, no PEP** is warranted. Consider only if exposure is to a known or highly likely HIV-infected source.	No action
Category 3. Superficial exposure of intact skin††	No action	No action	No action	No action

* Hepatitis B vaccine.

† Hepatitis C vaccine.

§ Human immunodeficiency virus.

¶ Penetration of skin by a sharp object that was in contact with blood, tissue, or other potential infectious body fluid (i.e., semen, vaginal fluid, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid or any other visibly bloody body fluid or tissue) before penetration. Nonintact skin exposure is defined as contact of nonintact skin with any of these potentially infectious tissues or fluids

** Postexposure prophylaxis. HIV PEP rarely is indicated. If PEP is indicated, the following procedures should be undertaken: 1) PEP should be started as soon as possible after exposure, without waiting for HIV test results; 2) PEP should be continued for 4 weeks; 3) Specimens should be collected for baseline testing, including HIV, complete blood count, liver function, creatinine, and pregnancy tests; 4) testing should be conducted in accordance with applicable state and local laws; 5) expert consultation should be obtained; sources of expert consultation include local persons with infectious diseases, hospital epidemiology, or occupational health expertise; local, state, or federal public health authorities; PEpline (available 24 hours/day via telephone 1-888-448-4911 [preferred] or online at <http://www.nccc.ucsf.edu/Hotlines/PEpline.html>); or the HIV/AIDS Rx information service at <http://aidsinfo.nih.gov>; 6) PEP should be continued for 4 weeks; 7) the patient should be discharged with written information, a 5-7 day supply of medication, and a follow-up appointment; and 8) an HIV specialist should reassess the patient's condition within 72 hours.

†† Contact of mucous membranes (i.e., eyes, nose, mouth, or inner surfaces of the gut or genital areas) with blood, tissue, or other potential infectious body fluid (i.e., semen, vaginal fluid, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid or any other visibly bloody body fluid or tissue).

†† Superficial exposure of intact skin (but not of mucous membranes) with blood, tissue, or other potential infectious body fluid (i.e., semen, vaginal fluid, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid or any other visibly bloody body fluid or tissue).

TABLE 3. Summary of recommendations for issues in special situations potentially associated with immediate prophylactic intervention

Issue/Situation	HBV*	HCV†	HIV§	Tetanus
Vaccine supply shortage	Local public health departments, mutual aid agreements, or commercial vendors should be relied on. If local capacity is exceeded, local public health authorities should work through established communication channels with CDC and others.	NA¶	NA	Age-appropriate vaccines are preferred. If age-appropriate vaccine supply is expended, any tetanus vaccine formulation may be used, as the tetanus toxoid content is adequate for tetanus prophylaxis in any age group. In this setting, the benefit of supplying tetanus prophylaxis outweighs the potential for adverse reactions from formulations from a different age indication. Local public health departments, mutual aid agreements, or commercial vendors should be relied on. If local capacity is exceeded, local public health authorities should work through established communication channels with CDC and others.
Counseling	Exposed persons should refrain from donating blood, plasma, organs, tissue, or semen.	Exposed persons should refrain from donating blood, plasma, organs, tissue, or semen.	Exposed persons should refrain from donating blood, plasma, organs, tissue, or semen. In addition, persons known to be exposed to HIV should avoid breastfeeding and organ/tissue donation and take precautions to avoid sexual transmission until HIV infection has been ruled out.	NA
HIV PEP** is initiated	NA	NA	HIV PEP rarely is indicated. If it is, recommended procedures should be followed.††	

* Hepatitis B vaccine.

† Hepatitis C vaccine.

§ Human immunodeficiency virus.

¶ Not applicable.

** Postexposure prophylaxis.

†† If PEP is indicated, the following procedures should be undertaken: 1) PEP should be started as soon as possible after exposure, without waiting for HIV test results; 2) PEP should be continued for 4 weeks; 3) specimens should be collected for baseline testing, including HIV, complete blood count, liver function, creatinine, and pregnancy tests; 4) testing should be conducted in accordance with applicable state and local laws; 5) expert consultation should be obtained; sources of expert consultation include local persons with infectious diseases, hospital epidemiology, or occupational health expertise; local, state, or federal public health authorities; PEpline (available 24 hours/day at telephone 1-888-448-4911 [preferred] or at <http://www.nccc.ucsf.edu/Hotlines/PEpline.html>); or the HIV/AIDS Rx information service, available at <http://aidsinfo.nih.gov>; 6) PEP should be continued for 4 weeks; 7) the patient should be discharged with written information, a 5–7 day supply of medication, and a follow-up appointment; and 8) an HIV specialist should reassess the patient's condition within 72 hours.

TABLE 3. (Continued) Summary of recommendations for issues in special situations potentially associated with immediate prophylactic intervention

Issue/Situation	HBV	HCV	HIV	Tetanus
Simultaneous administration	HBV vaccine and tetanus toxoid can be administered concurrently; use separate syringes and anatomic sites.	NA	NA	Separate syringes and anatomic sites should be used for concurrent administration of TIG ^{§§} and tetanus toxoid.
Administration of blood products	Receipt of blood products does not require deferral of vaccination.	NA	NA	Receipt of blood products does not require deferral of vaccination.
Pregnancy	Pregnancy is not a contraindication to HBV vaccination.	NA	Pregnancy is not a contraindication to HIV PEP. Efavirenz should be avoided if pregnancy is suspected.	Td is preferred to Tdap for pregnant adolescents and adults who received their most recent tetanus toxoid product >5 yrs previously.
Responders and other personnel	Workers should be managed according to existing guidelines for management of occupational exposures.	Workers should be managed according to existing guidelines for management of occupational exposures.	Workers should be managed according to existing guidelines for management of occupational exposures.	Tetanus toxoid vaccination should be offered proactively if no reliable history exists of a booster within the past 10 years; unwounded workers remain at risk for wounds throughout response.
Contraindications and precautions	Vaccine is contraindicated if history of anaphylactic allergy to yeast or to any vaccine component or of serious adverse event after prior receipt of HBV vaccine.	NA	Nevirapine should not be used for HIV PEP because of liver toxicity. Efavirenz should not be used if pregnancy is known or suspected. Persons with HIV PEP expertise should be consulted if possible.	Contraindicated if history of neurologic or severe allergic reaction to a previous dose. If wound is at risk and vaccine is contraindicated, TIG should be used.
Reporting adverse events	Vaccine Adverse Events Reporting System (VAERS), telephone, 1-800-822-7967 or http://vaers.hhs.gov .	NA	MEDWATCH http://www.fda.gov/medwatch or telephone 1-800-332-1088.	VAERS, telephone 1-800-822-7967 or http://vaers.hhs.gov . MEDWATCH http://www.fda.gov/medwatch or telephone 1-800-332-1088..
National Vaccine Injury Compensation Program	Health Resources and Services Administration (HRSA), telephone 1-800-338-2382 or http://www.hrsa.gov/vaccinecompensation .	NA	NA	Health Resources and Services Administration (HRSA), telephone 1-800-338-2382 or http://www.hrsa.gov/vaccinecompensation .

§§ Tetanus immune globulin.

8. Jagger J, De Carli G, Perry J, Puro V, Ippolito G. Occupational exposure to bloodborne pathogens: epidemiology and prevention. In: Wenzel R, ed. *Prevention and control of nosocomial infections*. 4th ed. Baltimore, MD: Lippincott, Williams and Wilkins; 2003.
9. Alter HJ, Stramer SL, Dodd RY. Emerging infectious diseases that threaten the blood supply. 1. *Semin Hematol* 2007;44:32–41.
10. CDC. Prevention of hepatitis A through active or passive immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2006;55(No. RR-7).
11. CDC. A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP). Part II: Immunization of adults. *MMWR* 2006;55(No. RR-16).
12. CDC. Updated U. S. Public Health Service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. *MMWR* 2001;50(No. RR-11).
13. CDC. National, state, and local area vaccination coverage among children aged 19–35 months—United States, 2006. *MMWR* 2007;56:880–5.
14. CDC. National vaccination coverage among adolescents aged 13–17 years—United States, 2006. *MMWR* 2007;56:885–8.
15. CDC. Hepatitis B vaccination among adults—United States, 2004. *MMWR* 2006;55:509–11.
16. Armstrong GL, Wasley A, Simard EP, McQuillan GM, Kuhnert WL, Alter MJ. The prevalence of hepatitis C virus infection in the United States, 1999 through 2002. *Ann Intern Med* 2006;144:705–14.
17. CDC. Recommendations for prevention and control of hepatitis C virus (HCV) infection and HCV-related chronic disease. *MMWR* 1998;47(No. RR-19).
18. Beltrami EM, Kozak A, Williams IT, et al. Transmission of HIV and hepatitis C virus from a nursing home patient to a health care worker. *Am J Infect Control* 2003;31:168–75.
19. Kamili S, Krawczynski K, McCaustland K, Li X, Alter MJ. Infectivity of hepatitis C virus in plasma after drying and storing at room temperature. *Infect Control Hosp Epidemiol* 2007;28:519–24.
20. Patel PR, Larson AK, Castel AD, et al. Hepatitis C virus infections from a contaminated radiopharmaceutical used in myocardial perfusion studies. *JAMA* 2006;296:2005–11.
21. CDC. HIV/AIDS surveillance report, cases of HIV infection and AIDS in the United States and dependent areas, 2005. Vol 17. Revised June 2007. Atlanta, GA: US Department of Health and Human Services, Public Health Service, CDC; 2007.
22. CDC. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HIV and recommendations for postexposure prophylaxis. *MMWR* 2005;54(No. RR-9).
23. CDC. Notice to readers: updated information regarding antiretroviral agents used as HIV postexposure prophylaxis for occupational HIV exposures. *MMWR* 2007;56:1291–2.
24. CDC. Antiretroviral postexposure prophylaxis after sexual, injection-drug use, or other nonoccupational exposure to HIV in the United States. *MMWR* 2005;54(No. RR-2).
25. Bell DM. Occupational risk of human immunodeficiency virus infection in health-care workers: an overview. *Am J Med* 1997;102:9–15.
26. CDC. Preventing tetanus, diphtheria and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP) and Recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for use of Tdap among health-care personnel. *MMWR* 2006;55(No. RR-17).
27. Pascual FB, McGinley E, Zanardi L, et al. Tetanus surveillance—United States, 1998–2000. In: *CDC Surveillance Summaries*, June 20, 2003. *MMWR* 2003;52(No. SS-3).
28. Srivastava P, Brown K, Chen J, Kretsinger K, Roper M. Trends in tetanus epidemiology in the United States, 1972–2001 [Presentation]. Presented at the 39th National Immunization Conference, Washington, DC; March 21–24, 2005. Available at http://cdc.confex.com/cdc/nic2005/techprogram/paper_7813.htm.
29. McQuillan GM, Kruszon-Moran D, Deforest A, et al. Serologic immunity to diphtheria and tetanus in the United States. *Ann Intern Med* 2002;136:660–6.
30. Fair E, Murphy T, Golaz A, Wharton M. Philosophic objection to vaccination as a risk factor for tetanus among children younger than 15 years. *Pediatrics* 2002;109:E2.
31. Talan DA, Abrahamian FM, Moran GJ, et al. Tetanus immunity and physician compliance with tetanus prophylaxis practices among emergency department patients presenting with wounds. *Ann Emerg Med* 2004;43:305–11.
32. CDC. Preventing tetanus, diphtheria, and pertussis among adolescents: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2006;55(No. RR-3).
33. CDC. Diphtheria, tetanus, and pertussis: recommendations for vaccine use and other preventive measures: recommendations of the Immunization Practices Advisory Committee (ACIP). *MMWR* 1991;40(No. RR-10).
34. CDC. Childhood, adolescent and adult immunization schedules. Atlanta, GA: US Department of Health and Human Services, CDC; 2007. Available at <http://www.cdc.gov/vaccines/recs/schedules/default.htm>.
35. CDC. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *MMWR* 2006;55(No. RR-14).
36. CDC. Interim immunization recommendations for disaster responders: Hurricane Katrina. Atlanta, GA: US Department of Health and Human Services, CDC; 2005. Available at <http://www.bt.cdc.gov/disasters/disease/responderimmun.asp>.
37. CDC. Emergency wound care after a natural disaster. Atlanta, GA: US Department of Health and Human Services, CDC; 2005. Available at <http://www.bt.cdc.gov/disasters/woundcare.asp>.
38. CDC. Update: NIOSH warns of hazards of flood cleanup work. Atlanta, GA: US Department of Health and Human Services, CDC; 1997. NIOSH publication no. 94-123. Available at <http://www.cdc.gov/niosh/flood.html>.
39. Occupational Safety and Health Administration. Fact sheets on natural disaster recovery: flood cleanup. Washington, DC: US Department of Labor, Occupational Safety and Health Administration; 2008. Available at <http://www.osha.gov/OshDoc/floodCleanup.html>.
40. CDC. General recommendations on immunization. recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2006;55(No. RR-15).

-
41. CDC. Prevention of pertussis, tetanus, and diphtheria among pregnant and postpartum women and their infants: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2008;57(No. RR-4).
42. Bloodborne Pathogens Standard, 29 C.F.R. Sect. 1910.1030 [56 FR 64004, Dec. 06, 1991, as amended at 57 FR 12717, April 13, 1992; 57 FR 29206, July 1, 1992; 61 FR 5507, Feb. 13, 1996; 66 FR 5325 Jan., 18, 2001; 71 FR 16672 and 16673, April 3, 2006].
-

Appendix 1

Sample Information to Be Provided to Patients at Discharge, With a Copy Retained on the Patient Chart

Discharge instructions for the health-care provider of: _____

Patient Name

This patient was discharged from _____ Outpatient Clinic of _____
 _____ Emergency Department Institution
 _____ Hospital

On Date: _____/_____/_____
 Month / Day / Year

This patient received pre-discharge administration of:

_____ Tetanus toxoid-containing vaccine
 _____ DTaP Manufacturer _____ Lot # _____
 _____ Tdap Manufacturer _____ Lot # _____
 _____ Td Manufacturer _____ Lot # _____
 _____ TT Manufacturer _____ Lot # _____
 _____ Tetanus Immune Globulin (TIG)
 _____ Dose Manufacturer _____ Lot # _____
 _____ Hepatitis B vaccine
 Manufacturer _____ Lot # _____
 Product: _____ Dose: _____

This patient will need further evaluation regarding whether administration of a vaccine or completion of an immunization series is needed.

Evaluate need for immunization series completion:

_____ Tetanus
 _____ Hepatitis B
 _____ Other: _____

Assess need for evaluation of seroconversion to:

_____ Hepatitis C infection

- Baseline testing for anti-HCV and alanine aminotransferase (ALT) within 7–14 days of the exposure
- Follow-up testing for anti-HCV and ALT 4–6 months after exposure to assess seroconversion
- HCV RNA test at 4–6 weeks if earlier diagnosis of HCV infection is desired
- Confirm positive anti-HCV with low signal-to-cutoff results using a more specific supplemental assay before communicating results to patient

_____ HIV infection

Follow up on the following tests collected during the acute care visit:

_____ AST/ALT
 _____ Hepatitis C virus serology
 _____ HIV serology

Antibiotic or other antimicrobial given:

Specific discharge instructions that need further medical evaluation:

Wound care instructions:

Other:

Appendix 2

Abbreviations Used in This Report

AAP	American Academy of Pediatrics	IM	Intramuscularly
ACIP	Advisory Committee on Immunization Practices	LFT	Liver function test
AIDS	Acquired immunodeficiency syndrome	NACCHO	National Association of County and City Health Officials
ALT	Alanine aminotransferase	NVICP	National Vaccine Injury Compensation Program
BID	Twice daily	PEP	Postexposure prophylaxis
CBC	Complete blood count	RNA	Ribonucleic acid
CI	Confidence interval	SNS	Strategic National Stockpile
CSTE	Council of State and Territorial Epidemiologists	Td	Adult and adolescent tetanus and diphtheria toxoids vaccine
DTaP	Pediatric diphtheria and tetanus toxoids and acellular pertussis vaccine	Tdap	Adult and adolescent tetanus and diphtheria toxoids and acellular pertussis vaccine
FDA	U.S. Food and Drug Administration	TIG	Tetanus immune globulin
HAV	Hepatitis A virus	TIIDE	Terrorism Injuries: Information, Dissemination, and Exchange
HBV	Hepatitis B virus	TT	Tetanus toxoid vaccine
HBIG	Hepatitis B immune globulin	VAERS	Vaccine Adverse Events Reporting System
HBsAg	Hepatitis B surface antigen		
HCV	Hepatitis C virus		
HIV	Human immunodeficiency virus		



MMWR™

Morbidity and Mortality Weekly Report
www.cdc.gov/mmwr

Recommendations and Reports
August 1, 2008 / Vol. 57 / RR-6

Continuing Education Activity Sponsored by CDC

Recommendations for Postexposure Interventions to Prevent Infection with Hepatitis B Virus, Hepatitis C Virus, or Human Immunodeficiency Virus, and Tetanus in Persons Wounded During Bombings and Similar Mass-Casualty Events — United States, 2008 Recommendations of the Centers for Disease Control and Prevention (CDC)

EXPIRATION — August 1, 2010

You must complete and return the response form electronically or by mail by **August 1, 2010**, to receive continuing education credit. If you answer all of the questions, you will receive an award letter for 2.5 hours Continuing Medical Education (CME) credit; 0.2 Continuing Education Units (CEUs); 2.5 contact hours Continuing Nursing Education (CNE) credit; or 2.5

contact hours Certified Health Education Specialist (CHES) credit. If you return the form electronically, you will receive educational credit immediately. If you mail the form, you will receive educational credit in approximately 30 days. No fees are charged for participating in this continuing education activity.

INSTRUCTIONS

By Internet

1. Read this *MMWR* (Vol. 57, RR-6), which contains the correct answers to the questions beginning on the next page.
2. Go to the *MMWR* Continuing Education Internet site at <http://www.cdc.gov/mmwr/cme/conted.html>.
3. Select which exam you want to take and select whether you want to register for CME, CEU, CNE, or CHES credit.
4. Fill out and submit the registration form.
5. Select exam questions. To receive continuing education credit, you must answer all of the questions. Questions with more than one correct answer will instruct you to "Indicate all that apply."
6. Submit your answers no later than **August 1, 2010**.
7. Immediately print your Certificate of Completion for your records.

By Mail or Fax

1. Read this *MMWR* (Vol. 57, RR-6), which contains the correct answers to the questions beginning on the next page.
2. Complete all registration information on the response form, including your name, mailing address, phone number, and e-mail address.
3. Indicate whether you are registering for CME, CEU, CNE, or CHES credit.
4. Select your answers to the questions, and mark the corresponding letters on the response form. To receive continuing education credit, you must answer all of the questions. Questions with more than one correct answer will instruct you to "Indicate all that apply."
5. Sign and date the response form or a photocopy of the form and send no later than **August 1, 2010**, to
Fax: 404-498-2388
Mail: MMWR CE Credit
CCHIS, Centers for Disease Control and Prevention
1600 Clifton Rd, N.E., MS E-90
Atlanta, GA 30333
6. Your Certificate of Completion will be mailed to you within 30 days.

ACCREDITATION

Continuing Medical Education (CME). CDC is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians. CDC designates this educational activity for a maximum of 2.5 hours in category 1 credit toward the AMA Physician's Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

Continuing Education Unit (CEU). CDC has been reviewed and approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1620 I Street, N.W., Suite 615, Washington, DC 20006. CDC has awarded 0.2 CEUs to participants who successfully complete this program.

Continuing Nursing Education (CNE). CDC is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center's Commission on Accreditation. CDC will award 2.5 contact hour(s) in CNE credit.

Certified Health Education Specialist (CHES). CDC is a designated provider of continuing education contact hours (CECH) in health education by the National Commission for Health Education Credentialing, Inc. This program is a designated event for CHESs to receive 2.5 category I contact hour(s) in health education. The CDC provider number is GA0082.

Goal and Objectives

The goal of this report is to provide uniform guidance on prophylactic interventions appropriate for persons injured in bombings and similar events resulting in mass casualties. Upon completion of this educational activity, the reader should be able to 1) describe the indications for hepatitis B vaccine during response to a bombing or a similar mass-casualty event, 2) describe the indications for tetanus toxoid-containing vaccines during response to a bombing or a similar mass-casualty event, 3) describe the issues that should influence a decision to initiate postexposure prophylaxis against human immunodeficiency virus infection during response to a bombing or a similar mass-casualty event, 4) describe the issues that should influence a decision to initiate testing to evaluate for infection with hepatitis C virus during response to a bombing or a similar mass-casualty event, and 5) list the mechanisms for accessing assistance in the United States if adherence to these guidelines results in an acute shortage of vaccines during response to a bombing or a similar mass casualty event.

To receive continuing education credit, please answer all of the following questions.

1. **Individual state medical consent laws define the nature of informed consent that might be required before certain medical interventions, provide for exemptions in emergency circumstances, and should guide response when circumstances preclude adherence to standard informed consent processes.**
 - A. True.
 - B. False.
2. **The bloodborne pathogens that merit consideration in the setting of response to a bombing or similar mass casualty include hepatitis B virus, hepatitis C virus (HCV), West Nile Virus, and human immunodeficiency virus (HIV).**
 - A. True.
 - B. False.
3. **Persons with penetrating injuries or nonintact skin exposed to blood from others are candidates for...**
 - A. the first dose of the hepatitis B vaccine.
 - B. consideration of testing for hepatitis C virus transmission.
 - C. HIV postexposure prophylaxis (PEP)
 - D. vaccination against tetanus.
 - E. A, B, and D.
4. **Persons who have intact mucous membranes exposed to blood from others are candidates for...**
 - A. the first dose of the hepatitis B vaccine.
 - B. testing for hepatitis C virus infection.
 - C. HIV PEP.
 - D. vaccination against tetanus.
 - E. all of the above.
5. **Persons who have superficial exposure of intact skin but not mucous membranes to blood from others are candidates for...**
 - A. the first dose of the hepatitis B vaccine.
 - B. consideration of testing for hepatitis C virus transmission.
 - C. HIV PEP.
 - D. vaccination against tetanus.
 - E. none of the above.
6. **To determine appropriate actions in response to evaluation of victims, assume that exposure to blood of other injured persons has occurred, HIV PEP is not indicated, the patient has no history of either vaccination with tetanus toxoid or hepatitis B vaccine, and no contraindication exists to receipt of either of these vaccines unless reliable available information contradicts these assumptions.**
 - A. True.
 - B. False.
7. **If adherence to these recommendations increases the acute demand for tetanus toxoid, tetanus immune globulin (TIG), and hepatitis vaccine beyond the available local or national supply, which of the following statements is true?**
 - A. Local authorities should rely on local and state health departments, mutual aid agreements, or commercial vendors to supply needed pharmaceuticals.
 - B. If local or regional resources are inadequate, local and state public health jurisdictions can, through their established communication channels for health emergencies, work with CDC and others as appropriate to assist with product shortages.
 - C. Both A and B.
8. **Tetanus is a potentially fatal disease that ...**
 - A. has been associated with injuries to otherwise healthy persons.
 - B. rarely occurs among persons known to be adequately vaccinated.
 - C. in the United States, might be more likely among older adults, foreign-born immigrants from regions other than North America or Europe, or children whose parents object to vaccination.
 - D. all of the above.
9. **Which of the following statements is true?**
 - A. Failure to provide a tetanus vaccination when needed could result in preventable illness, while unnecessary vaccination is unlikely to cause harm.
 - B. Failure to provide a hepatitis B virus vaccination when needed could result in preventable illness, while unnecessary vaccination is unlikely to cause harm.
 - C. Postexposure prophylaxis against HIV infection usually should be given to all victims of bombings and similar mass casualty events.
 - D. A. and B.
10. **Which statement about administration of TIG is true?**
 - A. The currently recommended TIG prophylactic dose is 250 units intramuscularly (IM) for adult and pediatric patients.
 - B. When tetanus toxoid and TIG are given concurrently, separate syringes and separate sites should be used.
 - C. If passive protection is clearly indicated, but TIG is unavailable, intravenous immune globulin (IVIG) may be substituted for TIG.
 - D. If TIG is in short supply, use should be reserved for patients least likely to have received adequate primary vaccination (persons aged 60 years or older, immigrants from regions other than North America or Europe, and children of parents who object to vaccination).
 - E. All of the above.
11. **Persons who received or are identified as candidates for any vaccine, testing related to hepatitis C virus transmission, or HIV PEP should be discharged with a referral for follow-up, with written information on pre-discharge treatment to facilitate a primary health-care provider's ability to evaluate and, if appropriate, initiate or complete age-appropriate treatment.**
 - A. True.
 - B. False.
12. **Which statement(s) are true about persons who are responders to and therefore may be evaluated in association with mass casualty events?**
 - A. Persons who are responders or engaged in debris clean up and construction are candidates for tetanus toxoid vaccine even if no wound is sustained.
 - B. Health-care personnel and other emergency response and public safety workers (e.g., police, firefighters) who are injured and exposed to blood while providing assistance in a mass casualty event should be managed according to existing guidelines for the management of occupational exposures.
 - C. Persons who are not health-care responders (e.g., construction workers or equipment operators) and who are injured and exposed to blood or body fluids during the course of response work should receive follow-up care consistent with existing guidelines for the management of occupational exposures of health-care and public safety personnel to blood and body fluids.
 - D. All of the above.

- 13. Which best describes your professional activities?
 A. Physician. D. Office staff.
 B. Nurse. E. Other.
 C. Health educator.
- 14. I plan to use these recommendations as the basis for ...*(Indicate all that apply.)*
 A. health education materials.
 B. insurance reimbursement policies.
 C. local practice guidelines.
 D. public policy.
 E. other.
- 15. Overall, the length of the journal report was...
 A. much too long. D. a little too short.
 B. a little too long. E. much too short.
 C. just right.
- 16. After reading this report, I am confident I can describe the indications for hepatitis B vaccine during response to a bombing or a similar mass-casualty event.
 A. Strongly agree. D. Disagree.
 B. Agree. E. Strongly disagree.
 C. Undecided.
- 17. After reading this report, I am confident I can describe the indications for tetanus toxoid-containing vaccines during response to a bombing or a similar mass-casualty event.
 A. Strongly agree. D. Disagree.
 B. Agree. E. Strongly disagree.
 C. Undecided.

- 18. After reading this report, I am confident I can describe the issues that should influence a decision to initiate postexposure prophylaxis against human immunodeficiency virus infection during response to a bombing or a similar mass-casualty event.
 A. Strongly agree. D. Disagree.
 B. Agree. E. Strongly disagree.
 C. Undecided.
- 19. After reading this report, I am confident I can describe the issues that should influence a decision to initiate testing to evaluate for infection with hepatitis C virus during response to a bombing or a similar mass-casualty event.
 A. Strongly agree. D. Disagree.
 B. Agree. E. Strongly disagree.
 C. Undecided.
- 20. After reading this report, I am confident I can list the mechanisms for accessing assistance in the United States if adherence to these guidelines results in an acute shortage of vaccines during response to a bombing or a similar mass-casualty event.
 A. Strongly agree. D. Disagree.
 B. Agree. E. Strongly disagree.
 C. Undecided.
- 21. The learning outcomes (objectives) were relevant to the goals of this report.
 A. Strongly agree. D. Disagree.
 B. Agree. E. Strongly disagree.
 C. Undecided.

(Continued on pg CE-4)

MMWR Response Form for Continuing Education Credit
August 1, 2008/Vol. 57/No. RR-6
Recommendations for Postexposure Interventions to Prevent Hepatitis B Virus, Hepatitis C Virus, or Human Immunodeficiency Virus Infection, and Tetanus for Persons Wounded During Bombings and Similar Mass Casualty Events — United States, 2008

To receive continuing education credit, you must
 1. provide your contact information (please print or type);
 2. indicate your choice of CME, CME for nonphysicians, CEU, CNE, or CHES credit;
 3. answer all of the test questions;
 4. sign and date this form or a photocopy;
 5. submit your answer form by August 1, 2010.
 Failure to complete these items can result in a delay or rejection of your application for continuing education credit.

Detach or photocopy.

Check One
 CME Credit
 CME for nonphysicians Credit
 CEU Credit
 CNE Credit
 CHES Credit

Last Name (print or type) _____ First Name _____
 Street Address or P.O. Box _____
 Apartment _____ or _____ Suite _____
 City _____ State _____ ZIP Code _____
 Phone Number _____ Fax Number _____
 E-Mail Address _____

Fill in the appropriate blocks to indicate your answers. Remember, you must answer all of the questions to receive continuing education credit!

- 1. [] A [] B [] C [] D [] E [] F
- 2. [] A [] B [] C [] D [] E [] F
- 3. [] A [] B [] C [] D [] E [] F
- 4. [] A [] B [] C [] D [] E [] F
- 5. [] A [] B [] C [] D [] E [] F
- 6. [] A [] B [] C [] D [] E [] F
- 7. [] A [] B [] C [] D [] E [] F
- 8. [] A [] B [] C [] D [] E [] F
- 9. [] A [] B [] C [] D [] E [] F
- 10. [] A [] B [] C [] D [] E [] F
- 11. [] A [] B [] C [] D [] E [] F
- 12. [] A [] B [] C [] D [] E [] F
- 13. [] A [] B [] C [] D [] E [] F
- 14. [] A [] B [] C [] D [] E [] F
- 15. [] A [] B [] C [] D [] E [] F
- 16. [] A [] B [] C [] D [] E [] F
- 17. [] A [] B [] C [] D [] E [] F
- 18. [] A [] B [] C [] D [] E [] F
- 19. [] A [] B [] C [] D [] E [] F
- 20. [] A [] B [] C [] D [] E [] F
- 21. [] A [] B [] C [] D [] E [] F
- 22. [] A [] B [] C [] D [] E [] F
- 23. [] A [] B [] C [] D [] E [] F
- 24. [] A [] B [] C [] D [] E [] F
- 25. [] A [] B [] C [] D [] E [] F
- 26. [] A [] B [] C [] D [] E [] F
- 27. [] A [] B [] C [] D [] E [] F
- 28. [] A [] B [] C [] D [] E [] F
- 29. [] A [] B [] C [] D [] E [] F
- 30. [] A [] B [] C [] D [] E [] F

Signature _____ Date I Completed Exam _____

22. The instructional strategies used in this report (text, tables, figures, boxes, and appendix) helped me learn the material.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

23. The content was appropriate given the stated objectives of the report.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

24. The content expert(s) demonstrated expertise in the subject matter.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

25. Overall, the quality of the journal report was excellent.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

26. These recommendations will improve the quality of my practice.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

27. The availability of continuing education credit influenced my decision to read this report.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

28. The *MMWR* format was conducive to learning this content.

- A. Strongly agree.
- B. Agree.
- C. Undecided.
- D. Disagree.
- E. Strongly disagree.

29. Do you feel this course was commercially biased? (*Indicate yes or no; if yes, please explain in the space provided.*)

- A. Yes.
- B. No.

30. How did you learn about the continuing education activity?

- A. Internet.
- B. Advertisement (e.g., fact sheet, *MMWR* cover, newsletter, or journal).
- C. Coworker/supervisor.
- D. Conference presentation.
- E. *MMWR* subscription.
- F. Other.

Correct answers for questions 1-12:
1. A; 2. B; 3. E; 4. A; 5. E; 6. A; 7. C; 8. D; 9. D; 10. E; 11. A; 12. D.

The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format. To receive an electronic copy each week, send an e-mail message to listserv@listserv.cdc.gov. The body content should read *SUBscribe mmwr-toc*. Electronic copy also is available from CDC's Internet server at <http://www.cdc.gov/mmwr> or from CDC's file transfer protocol server at <ftp://ftp.cdc.gov/pub/publications/mmwr>. Paper copy subscriptions are available through the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone 202-512-1800.

Data in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the following Friday. Data are compiled in the National Center for Public Health Informatics, Division of Integrated Surveillance Systems and Services. Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30333 or to mmwrq@cdc.gov.

All material in the *MMWR* Series is in the public domain and may be used and reprinted without permission; citation as to source, however, is appreciated.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

References to non-CDC sites on the Internet are provided as a service to *MMWR* readers and do not constitute or imply endorsement of these organizations or their programs by CDC or the U.S. Department of Health and Human Services. CDC is not responsible for the content of these sites. URL addresses listed in *MMWR* were current as of the date of publication.