RESEARCH

Postexposure Immunization and Prophylaxis of Bloodborne Pathogens Following a Traumatic Explosive Event: Preliminary Recommendations

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ABSTRACT

Background: No definitive guidelines have been established in the United States for postexposure immunization and prophylaxis (PEP) to hepatitis B and C viruses (HBV, HCV) and human immunodeficiency virus (HIV) in the event of a traumatic explosive event.

Methods: The American Medical Association's Center for Public Health Preparedness and Disaster Response assembled a US-Israeli panel of experts, including representatives from disaster medicine, trauma surgery, occupational health, and infectious disease to determine guidelines for adult and pediatric victims following a traumatic explosive event. The panel reviewed the existing Israeli and United Kingdom protocols, previously published Centers for Disease Control and Prevention guidance on occupational and nonoccupational exposures to HBV, HCV, and HIV, before reaching consensus on preliminary guidelines for the United States.

Results: These guidelines recommend an age-appropriate dose and schedule for HBV PEP for individuals presenting from the scene with nonintact skin or mucous membrane exposure, and they also consider HCV and HIV testing in individuals presenting with possible nonintact skin or mucous membrane exposure. The guidelines do not recommend PEP for individuals presenting from the scene with possible superficial skin exposure.

Conclusions: These recommendations offer PEP guidance for bloodborne pathogens and are limited in scope. These recommendations do not address general wound PEP such as tetanus or the need for antibiotics. It is hoped that these guidelines will fill an urgent gap in preparedness until definitive, comprehensive guidelines from the Centers for Disease Control and Prevention are published. (*Disaster Med Public Health Preparedness.* 2007;1:106–109)

Key Words: suicide bombing, postexposure immunization and prophylaxis, mass casualty, hepatitis B, hepatitis C, HIV

Preparedness efforts in the United States have focused predominantly on the threat posed by nonconventional weapons such as biological, chemical, and radiation devices; however, conventional weapons and contemporary explosive devices continue to be the weapons used most commonly throughout the world by terrorists. Bombing events such as those that occurred in Madrid in 2004 and London in 2005, and the failed car bomb attempts in London and Glasgow in summer 2007 underscore the need for public health preparedness to respond to a traumatic explosive event such as a suicide bomber or vehicle-borne improvised explosive device. Victims presenting from the scene of an explosive event as well as individuals participating in recovery and transport efforts, including first responders, are at risk for exposure to bloodborne pathogens via bodily fluids and biological inanimate foreign bodies such as bony fragments or contaminated weapon debris or other debris.[1] Secondary blast injuries are caused by the debris set in motion by the initial blast wave and are the most common injuries.[1] For victims in proximity to the scene, biological foreign bodies such as bone can become projectiles that contribute to the spectrum of blast injury.[2–5]

As noted in the US Public Health Service guidelines for occupational exposure of health care workers, exposure to blood and other bodily fluids increases the risk for exposure to hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV; see Table 1).[6] However, no definitive US guidelines exist for postexposure immunization and prophylaxis (PEP) to HBV, HCV, and HIV following a traumatic explosive event. Both Israel and the United Kingdom have established protocols for PEP to HBV, HCV, and HIV following a trau-

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TABLE 1

Health Care Workers' Risk for Exposure to Hepatitis B and C Viruses and Human Immunodeficiency Virus

	HBV	HCV	HIV
Prevalence in US population*	0.4%[19]	1.6%[21,22]	0.3%[22]
Risk of transmission from needle stick in susceptible personnel	23%–62%[6]	1.8%[20]	0.3%[6,23,24]

*Varies by race/ethnic group, geographic location, and individual history of risk behaviors.

matic explosive event (K.P., Israeli protocol, personal communication, 2007).[7] Both protocols recommend HBV PEP for any victim who presents from the scene with blood or biological foreign body exposure and evidence of nonintact skin.[7] Neither protocol recommends PEP for HIV or HCV. To this end the American Medical Association's Center for Public Health Preparedness and Disaster Response convened an expert panel to determine preliminary guidelines for adult and pediatric victims following a traumatic explosive event.

METHODS

To determine preliminary US PEP guidelines for adult and pediatric victims following a traumatic explosive event, a literature search on Medline using search terms *suicide bombing, traumatic explosive event,* and *improvised explosive device*, combined with *post-exposure prophylaxis, hepatitis B, hepatitis C, human immunodeficiency virus,* and *occupational exposure* was executed to produce an evidence base for review. In addition, peer-reviewed articles focusing on specific traumatic explosive events including the Oklahoma City bombing[8–12] Madrid train bombing,[13] London train bombing,[5,14] and Israel suicide bombings were also reviewed.[2–4,15–18] A US-Israeli expert panel including representatives from disaster medicine, trauma surgery, occupational health, and infectious disease was assembled. The expert panel reviewed the relevant literature as well as the Israeli and United Kingdom protocols and previously published CDC guidance on occupational and nonoccupational exposure to HBV, HCV, and HIV, including the recently released *Revised Recommendations for HIV Testing of Adults, Adolescents, and Pregnant Women in Health Care Settings*, before reaching preliminary consensus on US guidelines. [6,19–28]

RESULTS

The literature search yielded a paucity of cases (<5) from which to derive an evidence base. There was only 1 case of confirmed allogenic foreign body implantation of tissue that tested positive for HBV[2]; the patient received PEP and did not seroconvert. No reported evidence of confirmed HCV or HIV allogenic foreign body implantation was found. Interestingly, pathological specimens obtained from 3 suicide bombers indicated hepatitis B–positive status.[18]

In the absence of a substantial evidence base, the recommendations presented here are based on expert review of global protocols and previously published CDC guidance on occupational and nonoccupational exposures to HBV, HCV, and HIV, including the recently released CDC *Revised Recommendations for HIV Testing.* [6,19–28] The recommendations for adult and pediatric victims are made under the assumption of an unknown source status because one will not necessarily be able to confirm an exact source of the contaminating blood or tissue, and multiple sources may be involved.

Clinical Risk for Exposure

Individuals presenting from the blast scene can subsequently be grouped into 3 major risk-for-exposure categories (see also Table 2):

- Category 1: Possible nonintact skin exposure to another person's blood, bodily fluids, or penetrating injuries (eg, bone implantation)
- Category 2: Possible mucous membrane exposure to another person's blood or bodily fluids
- Category 3: Superficial intact skin exposure to blood or bodily fluids and no evidence of skin penetration or mucous membrane involvement.

Recommendations Categories 1 and 2

HBV

Initiate the HBV vaccination series following an age-appropriate dose and schedule.[29] The first vaccination should be administered within 7 days of presentation. The vaccine should be administered to those who

- Lack a reliable history of immunization against HBV
- Have no previous history of contraindication to immunization against HBV

*Please see special considerations regarding PEP recommendations below.

HCV

- Consider testing at time of presentation and at 4 to 6 months postexposure.

TABLE 2

Recommendations for Postexposure Immunization and Prophylaxis

	Categories 1 and 2	Category 3
HBV	Initiate vaccination series	No PEP warranted
HCV	Consider testing	No PEP warranted
HIV	Consider testing*	No PEP warranted

*Generally no PEP for HIV.

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HIV

- Generally, no PEP warranted; however, consider basic 2-drug postexposure prophylaxis in settings where exposure to HIV-infected source (blood or bodily fluids) is known or likely (laboratories or areas of known high HIV prevalence; under special circumstances [eg, delayed exposure report, pregnancy in the exposed person, toxicity of the PEP regimen], consultation with local experts and/or the National Clinicians' Post-Exposure Prophylaxis Hotline [PEPline: 888-448-4911 or *www.ucsf.edu/hivcntr*] and/or the Hepatitis Hotline [888-443-7232 or *www.cdc.gov/hepatitis*] is advised.). HIV PEP should not be given universally in mass casualty settings, unless recommended by the local public health authority.
- Consider testing at time of presentation and through at least 6 months postexposure.

Special Considerations Regarding PEP Recommendations

Consultation with health care specialists knowledgeable about HBV, HCV, and HIV is ideal, particularly for pediatric patients and pregnant women. Health care professionals should be knowledgeable about consulting existing guidelines and recommendations regarding contraindications and precautions, counseling and education, testing, medical follow-up, and, if PEP is initiated, management of adverse events. In addition, it should be recognized that following these recommendations in response to a mass casualty incident could create a demand for hepatitis vaccine that exceeds local resources. All wounds should be cleansed and debrided as appropriate. Tetanus prophylaxis should be considered for any wound.

Recommendations Category 3

HBV

- No PEP warranted

HCV

- No PEP warranted

HIV

- No PEP warranted

DISCUSSION

These guidelines recommend HBV PEP for individuals presenting from the scene with nonintact skin or mucous membrane exposure. These guidelines also consider HCV and HIV testing in individuals who present from the blast scene with possible nonintact skin or mucous membrane exposure. The guidelines do not recommend PEP for individuals presenting from the scene with possible superficial skin exposure.

Considerations for HCV and HIV Testing for Categories 1 and 2

It is recommended that HCV testing be considered for individuals in categories 1 and 2 at the time of presentation and again at 4 to 6 months postevent. Although there is no PEP at this time for HCV exposure, establishing victims' status at the time of potential exposure is important for building an evidence base (currently absent). Follow-up testing to determine whether infection has occurred is not only good health care but it also completes the loop for obtaining data about the risks for HCV transmission during these traumatic events. HIV testing should also be considered at the time of presentation and at least 6 months postexposure. This recommendation is supported by the recent *Revised Recommendations for HIV Testing*.[28] Considerations for testing may provide an opportunity to generate an evidence base and may inform future guidance.

It is worth noting that testing should not detract from the treatment of casualties in a limited resource environment as seen during a mass casualty incident. Therefore, referral for testing may be more appropriate in the acute response. In addition, when testing is performed, the patient should be educated regarding the rationale for the testing to alleviate any unwarranted concerns he or she may have regarding risk for transmission of HCV or HIV from his or her exposure during the mass casualty incident.

Considerations for HIV PEP for Penetrating Bone Implantation

Although the theoretical risk of HIV transmission exists in the event of a penetrating foreign body bone injury, there is insufficient evidence at this time to indicate that the benefit of HIV PEP in this specific situation outweighs the risks. Thus, no general HIV PEP is recommended.

Limitations

These recommendations only offer PEP guidance for bloodborne pathogens and are limited in scope. These recommendations do not address general wound PEP such as tetanus or the need for antibiotics. It is hoped that these guidelines will address an urgent gap in preparedness until definitive comprehensive guidelines from the CDC are published.

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