CDC

MMWR

Morbidity and Mortality Weekly Report

Weekly September 6, 2002 / Vol. 51 / No. 35

Self-Reported Increase in Asthma Severity After the September 11 Attacks on the World Trade Center — Manhattan, New York, 2001

Asthma is a chronic condition that affects approximately 14 million persons in the United States and is characterized by airway inflammation, reversible airway obstruction, and airway hyperresponsiveness to a variety of triggers (*1*). Both environmental and psychological factors can trigger asthma exacerbations (*2–4*), and a seasonal increase in asthma morbidity occurs in the fall (*5*). This report summarizes the results of a telephone survey conducted among Manhattan residents 5–9 weeks following the September 11, 2001, terrorist attacks on the World Trade Center (WTC) in lower Manhattan in New York City. The findings indicate that among the 13% of adult respondents with asthma, 27% reported experiencing more severe asthma symptoms after September 11. Although a normal seasonal increase in asthma severity was expected, increased severity was reported more commonly among asthmatics reporting psychological distress associated with the attacks and/or difficulty breathing because of smoke and debris during the attacks. Persons with asthma and their clinicians should be aware of the role environmental and psychological factors might play in worsening asthma after disasters.

The study data were collected as part of a survey focused primarily on the psychological impact of the attacks (*6*). Telephone interviews were conducted during October 16–November 15, through a random-digit–dialed sample of persons aged ≥18 years living south of 110th Street in Manhattan. Households were screened for geographic eligibility, and an adult with the most recent birthday was selected to be interviewed. Sample weights based on the number of telephones and adults in each household were applied to adjust for varying probabilities of being interviewed. The response rate was 64.3%. A total of 1,008 persons were interviewed, of whom 20 were excluded from the analysis because of missing weight variables. Psychological factors, including life-stressors*, depression, and risk for post-traumatic stress disorder (PTSD), were assessed by using questions documented previously (*7*).

Among participants, 134 (13.4%) reported having been told previously by a doctor that they had asthma; 75 (58.2%) of those with diagnosed asthma were women. The median age of the 134 participants with asthma was 36 years (range: 18–78 years); 86 (70.7%) were non-Hispanic whites, 66 (64.8%) had an annual household income of ≥$40,000, and 99 (72.2%) had a college or graduate degree. Of the 134 persons with asthma, 17 (12.1%) reported that they lived or were present south of Canal Street (i.e., 15 blocks north of the WTC site) at the time of the attacks.

Of the 134 respondents with diagnosed asthma, 34 (27.0%) reported worsening of asthma symptoms after the September 11 terrorist attacks, defined as having moderate to severe symptoms during the weeks since September 11 compared with having none to mild symptoms during the 4 weeks before

* Include death of a close family member; serious illness or injury; change in marital status, family, or work situation; or emotional problems.

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References

1. Nelson DE, Holtzman D, Waller M, Leutzinger CL, Condon K. Objectives and design of the Behavioral Risk Factor Surveillance System. Proceedings of the section on survey methods, American Statistical Association National Meeting, Dallas, Texas, 1998.
2. Remington PL, Smith MY, Williamson DF, Anda RF, Gentry EM, Hogelin CG. Design, characteristics, and usefulness of state-based behavioral risk factor surveillance:1981–1987. Public Health Rep 1988;103:366–75.

Notice to Readers

Occupational Health Guidelines for Remediation Workers at *Bacillus anthracis*-Contaminated Sites — United States, 2001–2002

Remediation workers involved in clean up and decontamination are potentially exposed to *Bacillus anthracis* spores while working in contaminated buildings along the paths of letters implicated in bioterrorism-related anthrax. Federal guidelines and Occupational Safety and Health Administration (OSHA) regulations for hazardous waste operations and hazardous material response workers (HAZWOPER) (*1,2*) provide information about surveillance for hazardous exposures, the use of personal protective equipment (PPE) and clothing, and a generic medical program but do not address anthrax specifically. CDC has developed the following guidelines to provide medical protection for current and future workers responsible for making *B. anthracis*-contaminated buildings safe for others to enter and occupy. This information will benefit medical directors and consultants who design and supervise medical components of the OSHA-required health and safety plan (HASP), health-care providers who implement these programs for onsite workers or who care for workers offsite, and site health and safety officers who coordinate onsite programs.

HAZWOPER Guidelines and Regulations

A medical program for remediation workers should be part of a site-specific HASP that also includes 1) environmental surveillance of health hazards; 2) engineering and administrative controls and use of PPE; 3) training about exposures, potential adverse health events, and preventive measures; and 4) an emergency response plan (*1,2*). The medical program should be designed and administered by a licensed physician in conjunction with the site health and safety officer. The administering physician should be knowledgeable about all of the relevant areas of occupational medicine (e.g., toxicology, industrial hygiene, medical screening, and occupational health surveillance) (*3*) and should be able to interpret information about potential exposures, PPE, work schedules, work practices, and relevant regulations. Because work sites might be remote from the home base, health-care providers implementing the program should be selected for accessibility to workers, access to diagnostic resources and a reliable system for hospital referral, and the ability to conduct around-the-clock coverage for work-related medical care. Baseline medical evaluations should identify pre-existing conditions affecting a worker's fitness for duty, ability to use PPE safely, and susceptibility to adverse work-related health outcomes. Periodic evaluations should be scheduled to detect symptoms and signs related to workplace exposures and to reassess fitness for duty. Active surveillance for exposure incidents (e.g., PPE breaches) and adverse health outcomes should determine the need for additional evaluations. Exit evaluations should identify changes from the person's baseline and any new risk factors.

Selection of specific PPE should be based on an assessment of potential exposures and activities; the highest level of protection (i.e., level A) might be required (*4*). Examining physicians should be familiar with the physical requirements and limitations imposed on workers by the selected PPE (e.g., water-impermeable, chemical-resistant suits prevent evaporative cooling and contribute to dehydration and heat stress; facepieces might aggravate claustrophobia; respirator air-flow resistance and the weight of self-contained breathing apparatuses [SCBAs] might aggravate respiratory and heart conditions; and PPE materials might contribute to skin problems).

When notifying the employer of a worker's fitness for duty, health-care providers should maintain confidentiality of medical information according to ethical and legal requirements. Workers should be notified of the results of their own evaluations.

Medical Measures to Prevent Anthrax

Despite the use of PPE, remediation workers are at risk for exposure to *B. anthracis* spores because spores might be reaerosolized (R. E. McCleer, CDC, personal communication, 2002), PPE is not 100% protective (*5*), individual work practices might lead to exposure (*5*), breaches in PPE and environmental controls might occur, and some breaches might go unrecognized. Neither the infective dose for development of inhalational anthrax nor the level of exposure to *B. anthracis* during remediation activities has been characterized adequately. Because of these uncertainties and because anthrax is potentially fatal, workers entering *B. anthracis*-contaminated sites should be vaccinated adequately with anthrax vaccine or protected with antibiotic prophylaxis. This recommendation also applies to workers entering areas that already have been remediated but have not yet been cleared for general occupancy. The use of medical measures for preventing anthrax does not eliminate requirements for use of PPE when entering uncleared areas. The initial medical evaluation should screen for contraindications to anthrax vaccine or antibiotic use, and periodic evaluations should monitor for adverse effects (Table). Workers should be educated about possible adverse effects and antibiotic interactions with food and drugs.

To prevent anthrax, CDC has recommended 60 days of antibiotic prophylaxis after exposure to *B. anthracis* (*6*). Unvaccinated remediation workers should begin antibiotic prophylaxis at the time of their first entry and continue until at least 60 days after last entry into a contaminated area.

Remediation workers with repeated entries into contaminated sites over a prolonged period of time require antibiotic coverage for considerably longer than the 60 days recommended for persons with a one-time exposure. Some remediation workers have been treated with antibiotics for >6 months, and remediation projects are not yet complete. Prolonged antibiotic use might cause side effects (frequently mild but occasionally severe) and might also result in the development of resistant microorganisms. Although supplies for civilian use remain severely limited, CDC recommends anthrax vaccine adsorbed (BioThrax™, formerly known as AVA, BioPort Inc, Lansing, Michigan) for workers who will be making repeated entries into known contaminated areas and is making BioThrax™ available to workers meeting these criteria. This ultimately will reduce the need for antibiotic prophylaxis and associated side effects for vaccinated persons. The recommended pre-exposure course of BioThrax™ is 6 doses (at 0, 2, and 4 weeks and at 6, 12, and 18 months) with annual boosters (*7*). If BioThrax™ is administered while the risk for exposure continues, CDC recommends concomitant antibiotic prophylaxis throughout the period of risk for exposure and for 60 days after the risk for exposure has ended unless the 6-dose initial series has been completed and annual boosters are up to date.

Anthrax-Related Medical Monitoring and Follow-up

No validated methods exist for monitoring a person's exposure to *B. anthracis*. Nasal swabs and serology might be useful as epidemiologic tools but are not appropriate for medical surveillance of potentially exposed individual workers. Results of these tests should not be used to assess individual exposure or to make decisions about antibiotic prophylaxis (*8*).

Inhalational exposure to a high dose of *B. anthracis* spores might result in rapid death. Therefore, in the absence of PPE, exposure to aerosolized powder known or strongly suspected to be contaminated with *B. anthracis* spores should be treated as a medical emergency (i.e., requiring prompt initiation of antibiotic prophylaxis). Fully vaccinated workers wearing appropriate PPE would not require antibiotic prophylaxis unless they had a breach in their PPE that allowed inhalation of ambient air, for example, a disruption of their respiratory protection. All workers should be trained to recognize and report exposure incidents and early symptoms and signs of anthrax, understand the importance of immediate medical attention, and know how to access emergency medical care. Medical follow-up should be provided as long as the risk for anthrax exists, whether the worker is onsite, off duty (including vacation or holiday), or no longer working at the remediation site. Because remediation work is transient and the workforce highly mobile, special arrangements are necessary for following workers after they leave the worksite.

Summary

Despite the apparently low disease rate from exposure, protection for remediation workers at *B. anthracis*-contaminated sites is warranted because inhalational anthrax is rapidly progressive and highly fatal, PPE does not guarantee 100% protection, and the risk for developing disease cannot be characterized adequately. The guidelines described here go beyond HAZWOPER requirements and include recommendations for treating inhalation exposure to *B. anthracis* spores as a medical emergency, medical follow-up as long as the risk for anthrax persists or a worker is receiving antibiotic prophylaxis, accommodation of a mobile workforce, and assurance that workers understand the need for immediate medical attention should symptoms of anthrax occur. Completion of the 6-dose series of anthrax vaccine followed by annual booster doses will decrease the reliance on antibiotics for the prevention of anthrax. Measures to protect workers must include both medical measures (i.e., vaccination, antibiotic prophylaxis, or a combination of both) and measures to prevent exposure (e.g., PPE and environmental controls).

References

1. National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, U.S. Coast Guard, and U.S. Environmental Protection Agency. Medical program. In: Occupational safety and health guidance manual for hazardous waste site activities. Washington, DC: U.S. Department of Health and Human Services, Public Health Service, CDC, National Institute for Occupational Safety and Health, 1985; DHHS publication no. NIOSH85-115.
2. Code of Federal Regulations. Title 29. Hazardous waste operations and emergency response. Section f. Medical Surveillance (29 CFR 1910.120). Washington, DC: U.S. Government Printing Office, 1992.
3. Wesdock JC, Sokas RK. Medical surveillance in work-site safety and health programs. Am Fam Physician 2000;61:2785–90.

TABLE. Recommendations for medical program components to prevent anthrax among remediation workers*

Concern	Information needed by administering physician	Medical program components	Content	Time of evaluation
Anthrax	From site health-and-safety officer: • Site-specific characteristics about contamination and control measures, plans, practice, and effectiveness • Occupational health and safety program re: *B. anthracis* and anthrax	Targeted medical history about predisposing conditions	• Skin conditions • Immunodeficiency disorders	Before assignment
		Information dissemination and counseling	Worker knowledge and understanding of: • Characteristics of disease and diagnostic difficulties • Urgent need for medical attention as soon as symptoms begin	Before, during, and at end of assignment
Antibiotic prophylaxis	Antibiotic recommendations[†,§]	Monitoring for disease	• Signs and symptoms of inhalational and cutaneous anthrax • Follow-up of absenteeism	Throughout assignment and ≥60 days afterward
		Targeted medical history	• Drug allergies, medication use, problems with prior use of antibiotics, pregnancy	Before assignment
		Information dissemination and counseling Administration of antibiotic prophylaxis Monitoring antibiotic use	• Informed consent • Risk for disease versus risk for adverse drug effects • Duration of antibiotic use, adverse effects, food and drug interactions • Monitoring compliance and adverse effects	While on medication
Anthrax vaccine	Vaccine recommendations[¶]	Targeted history	• Anthrax vaccine status • Pregnancy, contraindications	Before assignment
		Information dissemination and counseling Administration of vaccine Medical monitoring	• Informed consent • Risk of disease versus risk of adverse effects • Need for antibiotics during development of an immune response • Local side effects: pain and swelling at site of injection • Systemic side effects (rare)	Before and during administration of vaccine
Surveillance	From site health-and-safety officer: • Environmental monitoring results • Exposure incidents	Data collection and assessment of environmental and medical information	• Level of protection • Breaches of PPE and environmental controls • Offsite sources of contamination	Throughout assignment
	From health-care providers: • Reports of symptoms and other health outcomes		• Skin lesions, symptoms of inhalational anthrax • Adverse effects of antibiotic use or vaccine, compliance • Evaluation of trends in workforce (e.g., symptoms, absenteeism)	Throughout assignment and ≥60 days afterward
Logistics	From site health-and-safety officer: • Workforce characteristics (e.g., geographical considerations)	Provision of medical care and follow-up	Arrangements and agreements with health-care providers	Before and during assignment and ≥60 days afterward
		Information dissemination and counseling	Indications and procedures for accessing emergency and nonemergency medical care and follow-up	

* These recommendations are not exhaustive and might change as new information becomes available. See the CDC Public Health Emergency Preparedness and Response website (http://www.bt.cdc.gov/) or search *MMWR* (http://www.cdc.gov/mmwr/mmwrsrch.htm).

† CDC. Update: investigation of anthrax associated with intentional exposure and interim public health guidelines. MMWR 2001;50:889–93.

§ CDC. Investigation of bioterrorism-related anthrax and interim guidelines for exposure management and antimicrobial therapy. MMWR 2001;50:909–19.

¶ CDC. Use of anthrax vaccine in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2000;49(No. RR-15).

4. National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, U.S. Coast Guard, and U.S. Environmental Protection Agency. Personal protective equipment. Table 8-6. Sample protective ensembles. In: Occupational safety and health guidance manual for hazardous waste site activities. Washington, DC: U.S. Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health, 1985; DHHS publication no. NIOSH85-115.
5. Nicas M, Neuhaus H, Spear RC. Risk-based selection for respirators against infectious aerosols: application to anthrax spores. J Occup Environ Med 2000;42:737–48.
6. CDC. Update: investigation of bioterrorism-related anthrax and interim guidelines for exposure management and antimicrobial therapy. MMWR 2001;50:909–19.
7. CDC. Use of anthrax vaccine in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2000;49(No. RR-15).
8. CDC. Interim guidelines for investigation of and response to *Bacillus anthracis* exposures. MMWR 2001;50:987–90.

Notice to Readers

Protecting Building Environments from Airborne Chemical, Biologic, or Radiologic Attacks

In November 2001, following the discovery that letters containing *Bacillus anthracis* had been mailed to targeted locations in the United States, the Secretary of the U.S. Department of Health and Human Services requested site assessments of an array of public- and private-sector buildings by a team of engineers and scientists from CDC's National Institute for Occupational Safety and Health (NIOSH). In November 2001, this team assessed six buildings, including a large hospital and medical research facility, a museum, a transportation building, two large office buildings, and an office/laboratory building. In January 2002, additional building assessments were conducted at CDC campuses in Atlanta and, in April 2002, at a large, urban transportation facility. A total of 59 buildings were evaluated during this 5-month period.

The primary goal of these assessments was to determine the vulnerability of building air environments, including heating, ventilation, and air-conditioning (HVAC) systems, to a terrorist attack with chemical, biologic, and radiologic (CBR) agents and to develop cost-effective prevention and control strategies. At each facility, CDC investigators performed onsite evaluations to assess the building's vulnerability to CBR attack from internal and external sources. The investigators also reviewed security and safety plans at each facility. Facility owners received confidential reports identifying observed vulnerabilities and possible remedial options. Collectively, the field observations and prevention recommendations from the building assessments were combined with input from government and industry experts to identify general guidance that encourages building owners, facility managers, and engineers to review design, operational, and security procedures at their own facilities.

The recommendations include measures that can transform buildings into less attractive targets by increasing the difficulty of introducing a CBR agent, increasing the ability to detect terrorists before they carry out an intended release, and incorporating plans and procedures to mitigate the effects of a CBR release. These recommendations are presented in the recently completed NIOSH guidelines (*1*), which address physical security, airflow and filtration, maintenance, program administration, and staff training. The guidelines recommend that building owners and managers first understand their buildings' systems by conducting walk-through inspections of the HVAC, fire protection, life-safety, and other systems. Security measures should be adopted for air intakes and return-air grills, and access to building operation systems and building design information should be restricted. The guidelines also recommend that the emergency capabilities of the systems' operational controls should be assessed, filter efficiency should be evaluated closely, buildings' emergency plans should be updated, and preventive maintenance procedures should be adopted. The guidelines also caution against detrimental actions, such as permanently sealing outdoor air intakes.

The recommendations are intended for building owners, managers, and maintenance personnel responsible for public, private, and government buildings, including hospitals, laboratories, offices, retail facilities, schools, transportation facilities, and public venues. The recommendations do not address single-family or low-occupancy residences or higher-risk facilities such as industrial or military facilities, subway systems, or law-enforcement facilities. Copies of these recommendations are available at http://www.cdc.gov/niosh or by telephone, 800-356-4674.

References

1. National Institute for Occupational Safety and Health. Guidance for protecting building environments from airborne chemical, biological, or radiological attacks. Cincinnati, Ohio: U.S. Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health, 2002; DHHS publication no. NIOSH2002-139.