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Potential Exposures to Airborne and Settled Surface Dust in Residential Areas of Lower Manhattan Following the Collapse of the World Trade Center—New York City, November 4–December 11, 2001

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dence for the diagnosis and did not identify an alternative diagnosis. CDC and state health departments also receive reports of other events that are associated temporally with smallpox vaccination. Reported adverse events are not necessarily associated with vaccination, and some or all of these events might be coincidental.

During January 24–February 14, 2003, smallpox vaccine was administered to 4,213 civilian health-care workers in 27 jurisdictions. No potentially life threatening or moderate-to-severe adverse events have been reported. Among seven vaccinees with reported nonserious adverse events, the most common signs and symptoms were fever (n=two), rash (n=two), malaise (n=two), pruritus (n=two), hypertension (n=two), and pharyngitis (n=two). Surveillance for adverse events during the civilian smallpox vaccination program is ongoing. Regular surveillance reports will be published in *MMWR*.

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Potential Exposures to Airborne and Settled Surface Dust in Residential Areas of Lower Manhattan Following the Collapse of the World Trade Center—New York City, November 4–December 11, 2001

MMWR. 2003;52:131-135

2 tables, 1 figure omitted

FOLLOWING THE TERRORIST ATTACKS OF September 11, 2001, which destroyed the World Trade Center (WTC) in

lower Manhattan, the New York City (NYC) Department of Health and Mental Hygiene (DOHMH) and the Agency for Toxic Substances and Disease Registry (ATSDR), with assistance from the U.S. Public Health Service (PHS) Commissioned Corps Readiness Force* and the WTC Environmental Assessment Working Group,† assessed the composition of outdoor and indoor settled surface and airborne dust in residential areas around the WTC and in comparison areas. This report summarizes the results of the investigation, which found (1) similar levels of airborne total fibers in lower and in upper Manhattan, (2) greater percentage levels of synthetic vitreous fibers (SVF) and mineral components of concrete and building wallboard in settled dust of residential areas in lower Manhattan than in upper Manhattan, and (3) low levels of asbestos in some settled surface dust in lower Manhattan residential areas.¹ Based in part on the results of this investigation, the U.S. Environmental Protection Agency (EPA) is cleaning and sampling residential areas as requested by lower Manhattan residents. In addition, to assess any short- or long-term health effects of smoke, dust, and airborne substances around the WTC site, DOHMH and ATSDR are developing a registry that will track the health of persons who were most highly exposed to these materials.

During November 4–December 11, 2001, air and settled surface dust samples were collected in and around 30 residential buildings within three concentric circles surrounding the WTC site in lower Manhattan, including 59 residential units.² In addition, five residential units in four buildings located north of 59th Street (approximately 5 miles northeast of the WTC site) were sampled for purposes of comparison. Attention was focused on building material constituents (1) that have irritant properties (e.g., SVF, including fiberglass and gypsum) or might have negative long-term health effects (e.g., crystalline silica and asbestos) and (2) that were reasonably presumed to be either in the initial WTC collapse dust cloud or in dust gen-

erated by subsequent rescue and recovery activities at the WTC site. All samples collected during the investigation were analyzed for the presence of asbestos, SVF, crystalline mineral components of concrete (e.g., silica, calcite, and portlandite), and crystalline mineral components of building wallboard (e.g., gypsum, mica, and halite).

At each sampling location, time-weighted air sampling was conducted for three or four particulate matter (PM) fractions (i.e., PM 100 microns, 10 microns, 4 microns, and 2.5 microns).³⁻⁵ Each PM fraction was analyzed for crystalline minerals by using X-ray diffraction (XRD) analysis.⁶ The XRD analysis for crystalline minerals was semi-quantitative (i.e., estimated). Air samples for fibers were analyzed first by phase contrast microscopy (PCM).⁵ If the concentration of total fibers was higher than the maximum concentration of fibers found in the comparison homes (0.003 fibers per cubic centimeter of air [f/cc]), the sample was re-analyzed for asbestos fibers by using transmission electron microscopy (TEM).⁵ In addition, scanning electron microscopy (SEM) to look for SVF was used for PCM fiber counts >0.003 f/cc if the settled surface dust sample from that area contained SVF.

Settled surface dust samples also were taken at each sampling location and analyzed for crystalline minerals and fibers. Fiber analysis of settled dust samples for asbestos and SVF was conducted by using polarized light microscopy (PLM).⁷ If asbestos levels were below the detection limit (i.e., <1%), samples were re-analyzed by using TEM.⁷ The dust samples also were analyzed for crystalline mineral content by using XRD.

Air Sampling Results

For 111 (94.9%) of the 117 air samples, the concentrations of fibers found in lower Manhattan residential areas were similar to the concentration of fibers found in comparison areas (<0.003 f/cc). The six lower Manhattan areas that had elevated total fiber counts were re-examined by TEM and SEM to determine the types of fibers; the results indicated that neither asbestos nor SVF

(e.g., fiberglass) contributed to the elevated total fiber counts.

Air sampling results for minerals detected quartz and other building material constituents in lower Manhattan. No other forms of crystalline silica were detected in any air samples except for a one-time detection of cristobalite (15 micrograms per cubic meter [$\mu\text{g}/\text{m}^3$]†). The estimated concentrations of these minerals in air were low. In some locations, mineral components of concrete (quartz [not detected (ND)–19 $\mu\text{g}/\text{m}^3$ †], calcite [ND–14 $\mu\text{g}/\text{m}^3$ †], and portlandite [ND–95 $\mu\text{g}/\text{m}^3$ †]) and mineral components of building wallboard (gypsum [ND–15 $\mu\text{g}/\text{m}^3$ †], mica [ND–43 $\mu\text{g}/\text{m}^3$ †], and halite [ND–19 $\mu\text{g}/\text{m}^3$ †]) were detected at higher estimated levels in air samples in lower Manhattan than in samples collected in comparison areas. Gypsum was the only mineral detected in the comparison building air samples (ND–5 $\mu\text{g}/\text{m}^3$ †). No other minerals tested (i.e., quartz, calcite, portlandite, mica, and halite) were detected in comparison building air samples.

Settled Surface Dust Results

In lower Manhattan, asbestos and SVF were found in some indoor settled dust samples from residential units and common areas. No asbestos or SVF was detected in the comparison area dust samples. Quartz, calcite, portlandite, and gypsum comprised a higher percentage of the dust in 29 samples from buildings in lower Manhattan compared with eight samples from comparison area buildings. Only two (2.1%) of the 97 dust samples collected provided enough bulk material for pH analysis. The samples, which were collected from two outdoor locations in lower Manhattan, had pH values of 8.6 and 9.8, respectively.

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CDC Editorial Note: Exposure to substantial amounts of SVF, mineral com-

ponents of concrete, and mineral components of building wallboard might cause skin rashes, eye irritation, and upper respiratory irritation, all of which were reported more frequently than expected seasonal rates by community members and first responders after the collapse of the WTC towers.⁸⁻¹⁰ If the reported irritant effects were associated with WTC-related materials, these effects would subside once exposure to SVF, mineral components of concrete, and mineral components of building wallboard ceased. Persons with pre-existing heart or lung diseases (e.g., asthma) or a previous history of occupational exposure to these materials might be more sensitive to their irritant effects.

Settled surface dust might become airborne if disturbed, potentially causing exposures to occur through inhalation. Several worst-case assumptions were made to assess the potential long-term public health risks for inhaling airborne asbestos and quartz. These assumptions included (1) that no cleaning of indoor spaces had occurred or would occur, (2) that all airborne fibers were asbestos, and (3) that the highest levels detected during sampling represented long-term air levels. Under these worst-case conditions, prolonged exposure (i.e., decades) to airborne asbestos and quartz might increase the long-term risk for persons developing lung cancer and other adverse lung health effects (approximately one additional case per 10,000 persons exposed). However, persons who clean their residences frequently as recommended¹ or who participate in the EPA cleaning and sampling program are unlikely to be exposed to worst-case conditions.

The findings of this investigation are subject to at least two limitations. First, the results do not necessarily reflect conditions found in other buildings, the time period immediately after the collapse, or the time period after December 12, when the sampling was completed. Second, a limited number of samples were obtained from comparison areas to determine NYC background levels of asbestos, SVF, mineral components of concrete, and mineral components of building wallboard.

The comparison area results might not reflect NYC background levels.

Following the investigation, DOHMH and ATSDR made three recommendations.¹ First, because more asbestos, SVF, mineral components of concrete and building wallboard were found in settled surface dust in lower Manhattan residential areas than in comparison residential areas, residents of lower Manhattan were advised to continue cleaning frequently with high-efficiency particulate air (HEPA) filter vacuums and damp cloths/mops to reduce the potential for exposure. Second, to ensure the effectiveness of the recommended cleaning, DOHMH and ATSDR recommended additional monitoring of residential areas in lower Manhattan and an investigation to define background levels specific to NYC for asbestos, SVF, mineral components of concrete, and mineral components of building wallboard. EPA is implementing this recommendation and conducting this investigation. Finally, lower Manhattan residents concerned about possible WTC-related dust in their residential areas were advised to request cleaning and testing from EPA no later than December 31, 2002. EPA is conducting the requested cleaning and testing of lower Manhattan residential areas.

DOHMH and ATSDR are developing a registry of those persons who were most highly exposed, including persons living, working, or attending school in lower Manhattan; persons who responded to the emergency; persons working at the WTC site or the Staten Island landfill following the attacks; and persons working in buildings that were damaged or destroyed in the attacks. The registry will track the health of participants to determine whether their exposures to smoke, dust, and airborne substances around the WTC site might have any short- or long-term impacts on their physical health. Additionally, the registry is intended to track the mental health of the approximately 100,000-200,000 persons who might enroll.

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*A cadre of PHS Commissioned Corps officers who can be mobilized during disaster, strife, or other public health emergencies and in response to domestic or international requests.

†A group formed on September 15, 2001, that comprises representatives of the U.S. Department of Health and Human Services, Environmental Protection Agency (EPA), Department of Labor, and New York State and NYC government and private organizations to coordinate public health and occupational sampling and data review among the three federal agencies in support of state and city health departments.

‡Estimated.

Increase in Coccidioidomycosis—Arizona, 1998-2001

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Two figures, one table omitted

COCCIDIOIDOMYCOSIS IS A SYSTEMIC infection caused by inhalation of airborne spores from *Coccidioides immitis*, a fungus found in soil in the southwest-

ern United States and in parts of Mexico and Central and South America.¹ Infection occurs usually following activities or natural events that disrupt the soil, resulting in aerosolization of the fungal arthrospores.² Clinical manifestations occur in 40% of infected persons and range from an influenza-like illness (ILI) to severe pneumonia and, rarely, extrapulmonary disseminated disease.³ Persons at higher risk for disseminated disease include blacks, Filipinos, pregnant women in their third trimester, and immunocompromised persons.⁴ During 2001, the Arizona Department of Health Services (ADHS) reported a coccidioidomycosis incidence of 43 cases per 100,000 population, representing an increase of 186% since 1995.³ To characterize this increase, CDC analyzed data from the National Electronic Telecommunications System for Surveillance (NETSS) and the Arizona Hospital Discharge Database (AHDD), and environmental and climatic data, and conducted a cohort study of a random sample of patients with coccidioidomycosis. This report summarizes the findings of this investigation, which indicate that the recent Arizona coccidioidomycosis epidemic is attributed to seasonal peaks in incidence that probably are related to climate. Health-care providers in Arizona should be aware that peak periods of coccidioidomycosis incidence occur during the winter and should consider testing patients with ILI.

Surveillance and Hospitalizations

Coccidioidomycosis became a nationally reportable disease at the southwest regional level through NETSS in 1995, at which time a case definition was adopted that required laboratory confirmation.* During 1997, laboratory reporting of coccidioidomycosis became mandatory in Arizona, after which a marked increase was noted in the number of reported cases. However, incidence continued to increase in subsequent years. NETSS data for 1998-2001 were analyzed to calculate incidence by using U.S. Census 2000 data for denominators.

During 2001, a total of 2,203 cases were reported to ADHS (rate: 43 cases per 100,000 population), compared with 1,551 cases in 1998 (rate: 33). Persons aged ≥ 65 years had the highest incidence (79 during 2001), although incidence in all age groups increased. The youngest age groups experienced the largest increase in incidence during the surveillance period: during 2001, incidence of coccidioidomycosis among patients aged < 20 years increased 121%, from approximately five in 1998 to 11 in 2001. Analysis by season demonstrated peak periods of disease incidence during the winter months (November-February). The baseline rate between peak periods was stable, indicating that the seasonal periods were responsible for the overall annual increase in reported cases.

AHDD was reviewed to identify patients with a primary or secondary discharge diagnosis of coccidioidomycosis (*International Classification of Diseases, Ninth Revision* codes 114.0-114.3 and 114.5-114.9). Hospitalizations caused by coccidioidomycosis increased substantially during the study period. During 2001, a total of 598 persons were discharged with a primary or secondary diagnosis of coccidioidomycosis, compared with 69 persons during 1998; 154 (26%) of the 598 hospitalized patients had disseminated coccidioidomycosis. Persons aged ≥ 65 years comprised 34% of all hospitalized patients during the study period and had the highest rate of hospitalization (29 per 100,000 population during 2001).

Cohort Study

To explain peak periods and to further characterize the epidemic, CDC conducted a cohort study of patients from NETSS who had coccidioidomycosis to evaluate host factors, exposures, and outcomes. Patients reported with coccidioidomycosis were divided into four groups based on inclusion in peak or nonpeak periods and year of disease. Of 208 randomly selected persons contacted by telephone, 196 (94%) completed a ques-