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NIOSH eNews

Volume 8 Number 1 May 2010

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From the Director's Desk

John Howard, M.D.
Director, NIOSH
May eNews 2010

The 9/11 Responder Health Literature: Recent Additions

The images are indelibly fixed in our collective memory. More than 8 years have passed, but we vividly remember the terrible plume of pulverized materials—the dust cloud—that billowed through Lower Manhattan as the twin towers of the World Trade Center (WTC) collapsed in the September 11, 2001, terrorist attack. We remember the lingering pall of smoke, dust, and ash that confronted rescue and recovery workers at the Ground Zero site. For the responders, adverse health effects associated with exposures to those contaminants continue to impose a heavy burden.

Since these tragic events, more than 51,000 responders and 2,000 residents of Lower Manhattan have been served through multicenter clinical programs made available with federal funding administered by the National Institute for Occupational Safety and Health (NIOSH) (see <https://www.cdc.gov/wtc/>). For responders, the multicenter occupational health programs provide standardized exposure assessment, medical and mental health assessments, occupational health education, and targeted treatment and support services. Medical examinations include a physical exam, pre- and post-bronchiodilator spirometry, blood cell counts and chemistry, urinalysis, and chest radiography. The monitoring program continues to inform our scientific understanding of the health impacts associated with working the 9/11 WTC disaster site (<https://www.cdc.gov/wtc/>).

Recently published studies from these programs highlight persistent changes in responders' lung functions and explore the pathophysiology—that is, the nature and processes—of lung diseases in those who served the nation in this heroic response and recovery effort. Two most recently published articles are the following:

Lung Function in Rescue Workers at the World Trade Center After 7 years [Aldrich et al. 2010].

Case Report: Lung Disease in World Trade Center Responders Exposed to Dust and Smoke: Carbon Nanotubes Found in the Lungs of World Trade Center Patients and Dust Samples [Wu et al. 2010].

In the study by Aldrich et al. [2010], pre-9/11 occupational health records were available to study the impacts of the WTC exposures on responders from the Fire Department of New York City (FDNY). In the first year after those responders' service in 9/11 duties, FDNY fire fighters expelled 439 ml less air in the first second of forced exhalation than they had in baseline medical tests of lung function preceding 9/11. Emergency medical service workers at FDNY showed a loss of 267 ml. Those included in the analyses had never smoked. These declines in lung function persisted 7 years later, with little or no recovery.

A recent study by Wu et al. [2010] describes clinical, pathologic, and mineralogic findings in seven previously healthy responders who developed severe respiratory impairment, or unexplained changes in the lungs that were identified on x-rays, after being exposed to WTC dust on either September 11 or September 12, 2001. Pathologic evaluations showed interstitial and small airways disease. Mineralogical studies of lung tissues demonstrated the presence of aluminum and magnesium silicates in unusual platy (sheet) structures, chrysotile asbestos, calcium phosphate, calcium sulfate, small shards of glass, and carbon nanotubes of various sizes and lengths. Platy silicates and carbon nanotubes were not found in lung tissue samples from people not exposed to WTC dust. Carbon nanotubes were also unexpectedly found in WTC dust samples. The authors suggest that the carbon nanotubes found in dust samples and lung biopsy specimens were generated as incidental contaminants during the disaster by combustion and high temperatures in the presence of carbon and metals. For NIOSH and others who research occupational exposures to engineered carbon nanotubes, the implications of those findings are unclear. The study by Wu et al. does not attempt to address the complex question of possible causality—that is, what individual contaminants in WTC dust might have been linked with specific health effects?

A critical element in the occupational health monitoring of the 9/11 responders is an assessment of lung function using spirometry. Spirometry is an unusual medical test in that doing the test requires the active participation of patients. Thus, accuracy depends not only on quality control of spirometry equipment, but also on the training and consistent performance proficiency of spirometry technicians in coaching patients to do the test. NIOSH provides training materials and certifies spirometry training courses for those doing the test (see <https://www.cdc.gov/niosh/topics/spirometry/training.html>). A recent publication, *Quality of Spirometry Performed by 13,599 Participants in the World Trade Center Worker and Volunteer Medical Screening Program* [Enright 2010], describes the intensive efforts of the WTC Worker and Volunteer Medical Screening Program to perform spirometry tests of the highest possible quality.

These WTC medical monitoring centers are also looking for additional health burdens that might emerge over time. Environmental monitoring identified airborne and settled dust containing toxic combustion products and pulverized building materials, including asbestos, silica, and polycyclic aromatic hydrocarbons (PAH)-agents that may cause cancer or pneumoconiosis over the long term. Last year, eight cases of multiple myeloma were detected in one of the clinical centers, with four cases in law enforcement officers under the age of 45. Those findings were reported in *Multiple Myeloma in World Trade Center Responders: A Case Series* [Moline 2009].

Unfortunately, actual WTC occupational exposures were not well characterized, many cancers have multiple contributing factors, and these rare events occur with varying latency—all of which will challenge epidemiological study. While we await the numbers, responders may be enduring disease that will be difficult to scientifically attribute to exposure using Austin Bradford Hill's criteria for causation, a standard reference [Hill 1967]. As such, legislative efforts continue to advocate for long-term funding to support the clinical programs and extend the care needed by those afflicted [James Zadroga 9/11 Health and Compensation Act of 2009 (H.R. 847)]. NIOSH has encouraged its partners to publish peer-reviewed studies that will provide a scientific basis for decision-making. For the sake of the 9/11 responders and all who are working diligently to address their health needs, we are pleased that this literature continues to grow. (I want to thank Dori Reissman, M.D., Senior Medical Advisor, NIOSH Office of the Director, for her assistance in preparing this month's column.)

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Wu M, Gordon RE, Herbert R, Paclita M, Moline J, Mendelson D, Little V, Travis WD, Gil J [2010]. Case report: lung disease in world trade center responders exposed to dust and smoke: carbon nanotubes found in the lungs of World Trade Center patients and dust samples. *Environ Health Perspect* 118(4):499-504.

NIOSH Offers Resources for Oil Spill Responder Safety

As federal, state, and local governments mobilize efforts to assist in the containment and cleanup of the Deepwater Horizon oil spill in the Gulf of Mexico, NIOSH posts a web page with resources for protecting response workers from potential safety and health risks. <https://www.cdc.gov/niosh/topics/oilspill/response/>

Workers Memorial Day: A Day to Mourn, a Day to Honor, a Day to Rededicate

On Workers Memorial Day, April 28, the nation honored men and women who have suffered job-related injury, illness, and death. In a Workers Memorial Day 2010 statement, NIOSH Director John Howard, MD, reflected on the toll of workers' pain, impairment, and death; the role of NIOSH in national efforts to prevent such tragedies; and the challenges of occupational safety and health in today's world (<http://www.cdc.gov/niosh/updates/upd-04-22-10.htm>). NIOSH's commemoration of Workers Memorial Day was highlighted in a recent MMWR article (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5915a1.htm>), supplemented with a NIOSH research article on risk of occupational injury and death for young workers (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5915a2.htm>).

Safe and Sound Radio Highlights Exposomes

NIOSH researchers Gayle DeBord and Paul Middendorf were interviewed about the exposome by the American Industrial Hygiene Association's (AIHA) Safe and Sound radio program on April 21. The exposome is addressed by a new NIOSH initiative that focuses on the lifetime exposures of an individual and their relationship to disease. The broadcast is available through AIHA's Web site (<http://www.aiha.org>) or directly at <http://www.aiha.org/podcasts/safe/Episode12Exposome.mp3>.

NIOSH Announces Associate Director, Deputy Associate Director for Emergency Preparedness

Congratulations to Jim Spahr and Lisa Delaney. Jim was appointed Associate Director for Emergency Preparedness and Response in the NIOSH Office of the Director, effective April 28, and Lisa was appointed Deputy Associate Director for Emergency Preparedness and Response. Both have served in interim capacities since February. The Office of Emergency Preparedness and Response in the Office of the Director provides rapid on-site support to protect emergency response providers and others in the event of a disaster and advances research to support such efforts.

News Coverage Highlights NIOSH Mine Safety Research

Recent news articles in the wake of the Upper Big Branch Mine disaster highlighted NIOSH's research and technical resources for mining safety and health.

USA Today, April 27: NIOSH researcher Patrick Coleman notes lost-workday data as a gauge of mine safety. http://www.usatoday.com/news/nation/2010-04-27-miners_N.htm?loc=interstitialskip

New York Times, April 23: Technical information from Thomas Novak, NIOSH deputy associate director for mine safety and health research, contributes to a diagram of mine safety features. <http://www.nytimes.com/imagepages/2010/04/23/us/23mine-graphic1.html?ref=us>

National Public Radio, April 16: NIOSH public health analyst Anita Wolfe and NIOSH epidemiologist Mike Attfield discuss efforts to prevent coal workers' pneumoconiosis, also known as black lung. <http://www.npr.org/templates/story/story.php?storyId=126021059>

Download a NIOSH Chemical Hazards App for your iPad

The NIOSH Chemical Hazard Guide application, or App as they are sometimes called, is now available for iPad (a version of the iPhone application of the same name).

National Nanotechnology Initiative Review Results Released

On March 25, the President's Council of Advisors on Science and Technology released its review of the National Nanotechnology Initiative, noting the importance of health, safety, and environmental research to the success of nanotechnology and NIOSH's role in that research.

Project Seeks to Increase Adoption of the NIOSH E-Stop Among Commercial Fishermen

Researchers from NIOSH's Alaska Pacific Regional Office will gather information at ports in Alaska this spring to assess barriers to the adoption of an innovative safety device. In 2007, NIOSH licensed the device, the emergency stop or E-Stop for capstan winches, to Emerald Marine of Seattle, WA. Since that time the system has been used by commercial fishermen in Alaska and Washington to reduce the likelihood of injury from entanglement in their deck winches, though adoption of the technology has been slower than anticipated. NIOSH researchers will engage fishermen and ascertain what barriers remain to the adoption of what has been shown to be a reliable and useful safety technology for fishermen on purse seine vessels. Information gathered in the field will be used to develop a social marketing and traditional marketing program in partnership with the NIOSH E-Stop to address fishermen's concerns about the E-Stop. For more information on the product go to <http://www.cdc.gov/dailymirror.com/?pid=198&id=8701> or contact Ted Teske at teske@cdc.gov or 509-354-8070.

Journal Posts Research Paper on Biodegradation of Carbon Nanotubes

Dr. Anna Shvedova of NIOSH and outside colleagues reported on the discovery that carbon nanotubes were biodegraded by an enzyme found in white blood cells—neutrophils. The results, published in *Nature Nanotechnology*, are important for scientists in evaluating the biological effects of carbon nanotubes, particularly their fate and role in inflammation. More research is needed for determining the applicability of the findings in assessing potential risk in occupational exposures. <http://www.nature.com/nano/journal/vaop/ncurrent/abs/nano.2010.44.html>

NIOSH and USAF Initiate Study of Cancer Among Firefighters

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