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Workers' Memorial Day — April 28, 2013

Workers' Memorial Day recognizes workers who died or suffered from exposures to hazards at work. In 2011, a total of 4,069 U.S. workers died from work-related injuries (*1*). Most fatalities from work-related illness are not captured by national surveillance systems, but an estimate for 2007 was 53,445 deaths (*2*). Several national surveillance systems report new cases of nonfatal work-related injuries and illnesses, although no system captures all cases. In 2011, nearly 3 million injuries and illnesses to private industry workers and 821,000 to state and local government workers were reported by employers (*3*). In the same year, an estimated 2.9 million work-related injuries were treated in emergency departments, resulting in 150,000 hospitalizations (CDC, unpublished data, 2013).

Based on methods that focus on medical costs and productivity losses, the societal cost of work-related fatalities, injuries, and illnesses was estimated at $250 billion in 2007 (*2*). Methods that include consideration of pain and suffering would result in a higher estimated societal cost (*4*). CDC is working to better describe the burden of fatalities, injuries, and illnesses suffered by workers; additional information is available at http://www.cdc.gov/niosh/programs/econ/risks.html.

References

1. Bureau of Labor Statistics. Economic news release: table 2: fatal occupational injuries by industry and selected event or exposure, 2011 (preliminary). Washington, DC: US Department of Labor, Bureau of Labor Statistics; 2012.
2. Leigh JP. Economic burden of occupational injury and illness in the United States. Millbank Q 2011;89:728–72.
3. Bureau of Labor Statistics. Economic news release: workplace injury and illness summary. Washington, DC: US Department of Labor, Bureau of Labor Statistics; 2012.
4. Haddix AC, Teutsch SM, Corso PS, eds. Prevention effectiveness: a guide to decision analysis and economic evaluation. New York, NY: Oxford University Press;2003:74.

Fatal Injuries in Offshore Oil and Gas Operations — United States, 2003–2010

During 2003–2010, the U.S. oil and gas extraction industry (onshore and offshore, combined) had a collective fatality rate seven times higher than for all U.S. workers (27.1 versus 3.8 deaths per 100,000 workers). The 11 lives lost in the 2010 Deepwater Horizon explosion provide a reminder of the hazards involved in offshore drilling. To identify risk factors to offshore oil and gas extraction workers, CDC analyzed data from the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI), a comprehensive database of fatal work injuries, for the period 2003–2010. This report describes the results of that analysis, which found that 128 fatalities in activities related to offshore oil and gas operations occurred during this period. Transportation events were the leading cause (65 [51%]); the majority of these involved aircraft (49 [75%]). Nearly one fourth (31 [24%]) of the fatalities

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occurred among workers whose occupations were classified as "transportation and material moving." To reduce fatalities in offshore oil and gas operations, employers should ensure that the most stringent applicable transportation safety guidelines are followed.

CFOI, a cooperative program between the BLS and state governments, is the most comprehensive national surveillance system for work-related fatalities in the United States. Multiple data sources are used to collect information on each fatality. A fatal injury is considered work-related if the event leading to the injury occurred while the employee was working, based on confirmation by two independent sources.

The oil and gas extraction industry includes three types of companies, defined according to the North American Industry Classification System (NAICS): oil and gas operators who control and manage leased areas (NAICS 211), drilling contractors who drill the wells (NAICS 213111), and well-servicing companies who provide all other types of support operations that prepare a well for production and completion (NAICS 213112). Offshore oil and gas operations include all activities involved in the extraction of crude oil and natural gas from reservoirs found beneath the seafloor. CFOI does not include a variable to specifically identify offshore fatalities. Further, not all workers involved in offshore operations are directly employed in the oil and gas extraction industry, and therefore would not be captured in one of the three NAICS codes above.

To accurately identify all workers killed during offshore oil and gas operations, CDC and BLS identified cases two ways: 1) the fatality was included in one of the industry's three NAICS codes, and the CFOI variable denoting the location was coded as a body of water, or 2) the fatality contained any one of the following key words in the CFOI narrative: "offshore," "off shore," "platform," "boat," "ship," "barge," or "helicopter," and further examination of the case revealed that the incident was related to offshore oil and gas operations. Cases identified during 2003–2010 were analyzed by year, age, race/ethnicity, event type, nature and source of injury, and NAICS code. CFOI narrative data were reviewed to identify factors involved in helicopter events. Annual fatality rates were calculated using a count of active offshore drilling rigs as the denominator, which included fixed and semisubmersible drilling rigs, mobile offshore drilling units, and drillships. A Poisson regression model was used to measure trends.

During 2003–2010, a total of 128 fatalities occurred in activities related to offshore oil and gas operations in the United States, an average of 16 per year. All but one fatality occurred in Gulf of Mexico operations. All decedents were male with a mean age of 41.4 years. The majority were non-Hispanic whites (101 [79%]). Despite a 63% decrease in the number of active offshore drilling rigs during 2003–2010, the number of annual fatalities during offshore operations remained stable, resulting in a statistically significant increase in the number of fatalities per rig rate (Figure).

Transportation events were the leading cause of fatalities (65 [51%]), followed by contact with objects or equipment (21 [16%]), fires and explosions (17 [13%]), and exposure

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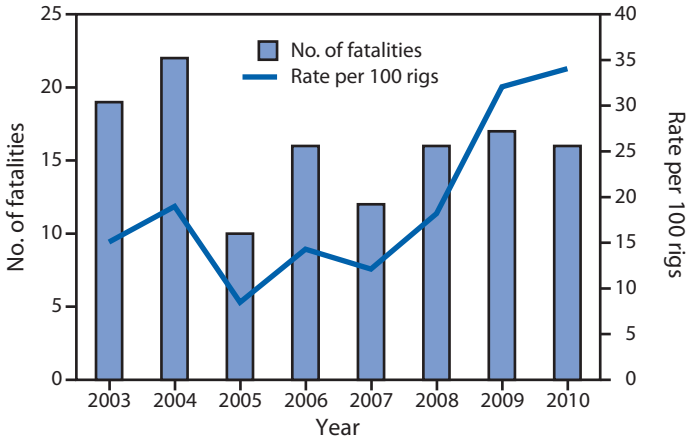
FIGURE. Number and rate of fatal injuries among workers involved in offshore oil and gas operations (N = 128), by year — United States, 2003–2010*



Sources: U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries. Baker Hughes, Inc., North America Rotary Rig Count.

* Significant increase in fatality rate during 2003–2010 (linear regression $\chi^2 = 20.66$; $p<0.01$). Fatality rate calculated per 100 active drilling rigs, which include fixed semisubmersible drilling rigs, mobile offshore drilling units, and drillships, but exclude producing platforms.

to harmful substances/environments (16 [13%]) (Table). Seventy-five percent of transportation events were associated with aircraft, all of which were helicopters (49 fatalities). Seventeen helicopter events occurred; 11 of these resulted in 43 (88%) of the fatalities. CFOI narratives noted that mechanical failure or loss of engine power was associated with five events (eight fatalities), and bad weather played a role in three of the events (seven fatalities). In five events, a total of nine fatalities involved occupants who survived the initial impact but later drowned. All of the helicopter events occurred in Gulf of Mexico offshore operations.

Two thirds of the fatalities involved workers employed in the oil and gas extraction industry (87 [68%]). Of those, half involved workers employed by well servicing companies (43 [49%]), followed by drilling contractors (26 [30%]), and oil and gas operators (18 [21%]). The remainder involved workers in offshore oil and gas operations who were classified as employees in another industry, including transportation and warehousing (23 [18%]), construction (10 [8%]), and all other industries (eight [6%]). Nearly one fourth (31 [24%]) of the decedents worked in occupations classified as "transportation and material moving" that transported workers and their equipment to and from offshore drilling platforms.

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TABLE. Number and percentage of fatal injuries among workers involved in offshore oil and gas operations, by event — United States, 2003–2010

Event	No.	(%)
Transportation events	65	(50.8)
Aircraft events*	49	(38.3)
Water vehicle events	16	(12.5)
Contact with objects and equipment	21	(16.4)
Fires and explosions	17	(13.3)
Exposure to harmful substances/environments	16	(12.5)
Other event types	9	(7.0)
Total	**128**	**(100.0)**

Source: U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries.

* All involved helicopters.

Editorial Note

Catastrophic events like the Deepwater Horizon explosion attract intense media attention but do not account for the majority of work-related fatalities during offshore operations. This report found that transportation events (specifically helicopter crashes) were the most frequent fatal event in this industry.

The findings in this report are consistent with previously reported data. Mechanical failures and bad weather were identified as the most common factors in helicopter crashes related to offshore oil and gas operations in the Gulf of Mexico during 1983–2009 (*1*). That study also found that two thirds of all forced or precautionary landings resulting from mechanical failures occurred in water; aircraft floatation devices either failed to deploy or malfunctioned in 20% of nonfatal crashes (*1*). Another study analyzed Canadian civilian helicopter crashes into water and found that lack of warning time, sinking, and helicopter inversion were major contributing factors in fatalities (*2*). The same study found that drowning was the primary cause of death in helicopter crashes over water and, even when available, use of life jackets among pilots and passengers was inconsistent (*2*). Other studies also indicate drowning and exposure as post-impact hazards to survival (*3,4*).

To increase pilots' situational awareness and improve safety, the Federal Aviation Administration (FAA) worked with the oil and gas industry and aircraft operators in the Gulf of Mexico to implement Automatic Dependent Surveillance-Broadcast (ADS-B) technology, which uses satellites to transmit information to air traffic controllers and to other aircraft equipped with ADS-B avionics (*5*). This technology provides flight tracking, improved communications capabilities, enhanced weather information, and terrain and traffic information. Before the implementation of this technology, radar coverage did not pick

What is already known on this topic?

The oil and gas extraction industry has an elevated occupational fatality rate that is consistently among the highest of any U.S. industry. The causes of the most frequent fatalities among onshore oil and gas extraction workers are well known. However, little is known about the unique risk factors faced by workers during offshore oil and gas operations.

What is added by this report?

During 2003–2010, a total of 128 fatalities occurred among offshore oil and gas workers. Transportation fatalities (65 [51%]) were the most common. A total of 49 (75%) transportation fatalities were associated with helicopters. All of the helicopter fatalities occurred in Gulf of Mexico operations.

What are the implications for public health practice?

Employers should ensure that the transportation safety guidelines developed by the International Association of Oil and Gas Producers are followed. Pilots and passengers should wear life jackets during flights over water and complete helicopter underwater escape training, and helicopters should be equipped with survival equipment specific to their operating environment.

up low-flying aircraft and traditional radio communications had limited capability, and therefore were not effective in warning pilots of rapidly changing weather conditions. Since late 2009, when ADS-B was implemented in the Gulf of Mexico, no weather-related fatal helicopter crashes during oil and gas operations have occurred as of the end of 2012 (*6*).

The findings in this report are subject to at least two limitations. First, the level of detail and quality of narrative source information in CFOI used to identify one third of the fatalities in this report and identify factors related to helicopter events might vary from case-to-case. A narrative might exclude important information if it was not included in the source documents used to develop the CFOI case record. Conversely, mention of a given factor in the CFOI case record does not necessarily mean that the factor caused or contributed to the incident. Second, occupational fatality rates based on the number of offshore workers or the number of offshore flight hours could not be calculated because those data were not available. As a result, the number of active offshore drilling rigs, an estimate of industry activity that does not include offshore producing platforms, was used to calculate occupational fatality rates.

To reduce fatalities in the offshore oil and gas industry, employers should ensure that the most stringent applicable transportation safety guidelines are followed. The International Association of Oil and Gas Producers (OGP) has developed guidelines for aircraft operations in the oil and gas industry that exceed FAA safety regulations (*7*). According to the OGP guidelines, pilots and passengers should complete helicopter underwater escape training and wear life jackets during flights over water. Floatation gear fitted to the helicopter should automatically inflate on impact with water and be capable of supporting the helicopter on the surface of the water. Companies should provide personal locator beacons for pilots, passengers, and life rafts. Life rafts should be externally mounted on the helicopters. Where appropriate, engine and vibration monitoring equipment should be installed to detect incipient failure.

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Census of Fatal Occupational Injuries Program, Bureau of Labor Statistics, US Dept of Labor; Devin Lucas, Alaska Pacific Office, Jason Burton, Western States Office, National Institute for Occupational Safety and Health, CDC.

References

1. Baker SP, Shanahan DF, Haaland W, Brady JE, Li G. Helicopter crashes related to oil and gas operations in the Gulf of Mexico. Aviat Space Environ Med 2011;82:885–9.
2. Brooks CJ, MacDonald CV, Donati L, Taber MJ. Civilian helicopter accidents into water: analysis of 46 cases, 1979–2006. Aviat Space Environ Med 2008;79:935–40.
3. Chen CT, Muller M, Fogarty KM. Rotorcraft ditchings and water-related impacts that occurred from 1982 to 1989, Phase I. Atlantic City, NJ: US Department of Transportation, Federal Aviation Administration Technical Center; 1993. Available at http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA279164.
4. Muller M, Bark LW. Rotorcraft ditchings and water-related impacts that occurred from 1982 to 1989, Phase II. Atlantic City, NJ: US Department of Transportation, Federal Aviation Administration Technical Center; 1993. Available at http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA276473.
5. Federal Aviation Administration. Fact sheet: automatic dependent surveillance-broadcast (ADS-B). Washington DC: US Department of Transportation, Federal Aviation Administration; 2010. Available at http://www.faa.gov/news/fact_sheets/news_story.cfm?newsid=7131.
6. National Transportation Safety Board. National Transportation Safety Board aviation accident database and synopses. Available at http://www.ntsb.gov/aviationquery/index.aspx.
7. International Association of Oil and Gas Producers. Aircraft management guidelines. London, United Kingdom: International Association of Oil and Gas Producers; 2011. Available at http://www.ogp.org.uk/pubs/390.pdf.

Obliterative Bronchiolitis in Workers in a Coffee-Processing Facility — Texas, 2008–2012

Obliterative bronchiolitis, a rare, irreversible form of fixed obstructive lung disease, has been identified in workers exposed to flavoring chemicals while working in the microwave-popcorn and flavoring-manufacturing industries (*1*); the occupational risk to workers outside these industries is largely unknown. This report describes two cases of obliterative bronchiolitis identified in workers employed in a small coffee-processing facility. Both patients' illness was misdiagnosed before they received a diagnosis of work-related obliterative bronchiolitis, which had not been identified previously in the coffee-processing industry. These cases reinforce the need for exposure evaluation in all industries in which workers are exposed to flavoring chemicals. Additionally, a high index of suspicion is required when these potentially exposed workers have progressive shortness of breath. If obliterative bronchiolitis is suspected, immediate protection from further exposure is crucial to prevent further deterioration of lung function.

Case Reports

Patient 1. In October 2007, a nonsmoking, previously healthy Hispanic woman aged 34 years began work at the coffee-processing facility. Initially hired to work in the quality control laboratory, after 3 months she moved briefly to housekeeping, and then to the flavoring room. There, whole roasted coffee beans were mixed with liquid flavorings in an open process, ground, and packaged. Her primary tasks included operating the grinding and packing machines for these flavored coffee beans. After 1 year in this room, in January 2009, she transferred to a similar job in the unflavored coffee area, and in October 2011, she was dismissed.

The woman first sought care in November 2008, approximately 1 year after beginning work at the facility. She reported cough, shortness of breath on exertion, and occasional wheezing, which did not improve when away from work. Additional concerns included fatigue, throat dryness, constant thirst, and vertigo. Initial lung function testing showed severe obstruction responsive to bronchodilators (Table). She was hospitalized, and upon discharge was placed on antihistamines, inhaled steroids, and bronchodilators for possible asthma.

Despite initial improvement, 1 year later the woman visited a pulmonologist, describing worsening symptoms. Workup included repeat lung function testing, which demonstrated a worsening obstructive defect. Inspiratory and expiratory high-resolution computed tomography (HRCT) of the chest showed diffuse bronchial wall thickening, a prominent mosaic pattern, mild cylindrical bronchiectasis, and a small amount of fibrotic upper lobe scarring. Although inhaled steroids and mucus clearance therapy improved her cough, her dyspnea continued to worsen; an open lung biopsy was performed, which revealed constrictive bronchiolitis (the histopathologic correlate of obliterative bronchiolitis) with both narrowed and obliterated airways with surrounding fibrous tissue and a variable mixed chronic inflammatory cell infiltrate. Based on this result, she received a diagnosis of obliterative bronchiolitis.

At the patient's most recent evaluation in April 2012, she continued to describe symptoms of severe shortness of breath with even light exertion, paroxysmal cough, and an inability to tolerate smells. Lung function testing at that time showed continued air trapping and severe obstruction marginally responsive to bronchodilators, and HRCT demonstrated disease progression. The patient currently is awaiting a lung transplant.

Patient 2. In October 2009, a previously healthy, nonsmoking, Hispanic man aged 39 years went to work at the coffee-processing facility as an unloader, removing sacks of green coffee beans from trucks. Over the next 3 months he moved to maintenance, and then to the flavoring room, where he worked as a mixer. His job involved open bench-top weighing of liquid flavorings, which he poured into barrels of roasted coffee beans. A machine rotated these open barrels while he stood nearby to monitor the process. He worked there for about 19 months before moving to become a packer for unflavored coffee until placed on medical leave in 2012.

The man first noticed symptoms in April 2011, after working at the company for about 18 months. Although his initial concern was dyspnea with heavy exertion, he soon became short of breath with moderate activity. He received a diagnosis of bronchitis and was treated with steroids without significant improvement. He was subsequently placed on nasal and oral steroids, his workup failed to identify an allergic etiology, and he was referred to a pulmonologist in December 2011.

Although no longer working with flavorings, the man continued to describe cough, weight loss, and irritated eyes. Spirometry revealed severe obstruction. After 3 weeks of treatment with inhaled steroids, further testing confirmed this finding, and additionally demonstrated air trapping and a lack of bronchodilator response. HRCT of the chest showed a subtle mosaic abnormality with marked and diffuse air trapping, a few scattered centrilobular nodules, bronchial wall thickening, and mild bilateral cylindrical bronchiectasis. Consequent open lung biopsy revealed chronic and subacute small airways injury morphologically consistent with constrictive bronchiolitis. His doctors diagnosed his illness as obliterative bronchiolitis. At follow-up in May 2012, the patient said that although his

TABLE. Lung function test results for two coffee-processing workers with obliterative bronchiolitis, by month and year of test — Texas, 2008–2012

Test	Patient 1				Patient 2	
	Nov 2008	Dec 2009*	Feb 2010	Apr 2012	Dec 2011	Dec 2011
FVC % predicted	51	66	82	79	45	64
FEV1 % predicted	20	32	35	35	20	28
FEV1/FVC %	49	42	38	37	36	35
Bronchodilator response†	Yes	—§	No	Yes	—	No
TLC % predicted	117	134	—	—	—	111
RV % predicted	236	289	—	225	—	212
ERV % predicted	56	48	—	74	—	22
DLCO % predicted	Normal	Normal	—	Normal	—	Normal

Abbreviations: FVC = forced vital capacity; FEV1 = forced expiratory volume in 1 second; TLC = total lung capacity; RV = residual volume; ERV = expiratory reserve volume; DLCO = diffusing capacity of the lung for carbon monoxide.
* DLCO and lung volumes were performed 1 week after spirometry.
† Bronchodilator response was defined as a ≥12% change in FEV1 or FVC after bronchodilator administration.
§ Not reported.

cough had improved, his shortness of breath with exertion was worsening, and he was troubled by fatigue in the evenings.

In addition to their youth and shared work environment, these patients have much in common. Both initially had cough and dyspnea on exertion; their illness initially was misdiagnosed, and they were unsuccessfully treated with steroids and bronchodilators. In each case, a diagnosis of work-related obliterative bronchiolitis was made on the basis of lung function testing showing obstruction and hyperinflation, supportive HRCT and lung biopsy findings, and the temporal relationship between symptom onset and work exposure.

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Editorial Note

These two cases of obliterative bronchiolitis in a coffee-processing facility suggest expansion of the number of workers potentially at risk for flavoring-chemical related disease. They raise concerns about the current adequacy of identification of at-risk workers and workplace controls, and about possible underreporting of disease. Especially of note is the short employment tenure of affected workers and their apparent rapid decline in lung function. Although these patients were symptomatic within <18 months of work, their illness initially was unrecognized, leading to a diagnostic delay of 8–14 months. This is consistent with the natural history of obliterative bronchiolitis, which differs significantly from much chronic obstructive lung disease, where decline is slow and risk factors more apparent. Despite these differences, obliterative bronchiolitis often is misdiagnosed in such workers as asthma or chronic obstructive pulmonary disease, and therefore might be underreported.

CDC currently is evaluating health hazards at this facility to identify other potential cases, understand occupational exposures, and prevent new cases. Diacetyl, implicated as the cause of obliterative bronchiolitis in workers exposed to flavorings (*2,3*), was present in this workplace, according to some material safety data sheets accompanying flavoring materials to which affected workers were exposed. Yet other flavorings might have contained undeclared diacetyl because material safety data sheets only must mention recognized hazards of components comprising ≥1% of a product (*4*). Therefore, exposure assessment is necessary in this plant. Additionally, one substitute for diacetyl used in this facility has shown toxicity similar to diacetyl in laboratory animals (*5*).

Currently, no specific federal regulations govern workers exposed to diacetyl or its substitutes. CDC has drafted a recommended standard for occupational exposure that provides a quantitative risk assessment (*6*). One of the crucial recommendations, in addition to limitation of exposure, is regular hazard assessment in industries that use flavorings. Whereas most studies have focused on the microwave popcorn and flavoring industries, this report shows that other industries might benefit from the recommendations.

The findings in this report are subject to at least three limitations. First, the exposure of the two patients was not quantified; data on exposure of workers at the facility currently are being collected as part of the CDC health hazard evaluation. Second, diacetyl is produced by many foods, including coffee during the roasting process (*7,8*). Volatile organic compounds, including diacetyl, can be released during grinding (*9*). The relative contribution of diacetyl from flavorings and roasting or grinding to these two cases is unknown. Finally, production practices vary throughout the industry; therefore, it is possible this facility is not representative of other coffee-processing facilities.

Patients with a potential occupational exposure to flavoring chemicals should be considered at risk for obliterative bronchiolitis, and a high index of suspicion should be maintained.

What is already known on this topic?

Obliterative bronchiolitis is a severe, irreversible lung disease that can be caused by diacetyl in flavorings, as seen previously among workers in the microwave popcorn and flavoring production industries. The extent of obliterative bronchiolitis in other areas of the food industry is not known.

What is added by this report?

This report describes two cases of obliterative bronchiolitis in workers in a coffee-processing facility, an industry in which obliterative bronchiolitis had not been identified previously. Both patients experienced symptoms within <18 months exposure. Both have severe illness that was misdiagnosed for >8 months, and one is awaiting a lung transplant.

What are the implications for public health?

Obliterative bronchiolitis might be underdiagnosed in workers in the food and flavoring industries. The absence of recognized cases at facilities that use or produce flavoring chemicals does not mean absence of risk. Diagnosis requires a high index of suspicion, and early removal from the exposure is crucial to reducing respiratory morbidity and mortality from this irreversible disease.

Because risk was not recognized previously in this industry, these two cases support the need for widespread hazard assessment in all industries using flavoring chemicals or generating diacetyl. For those patients suspected of having obliterative bronchiolitis, immediate intervention by removal from exposure is crucial to reducing respiratory morbidity and mortality.

Acknowledgments

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References

1. Kanwal R. Bronchiolitis obliterans in workers exposed to flavoring chemicals. Curr Opin Pulm Med 2008;14:141–6.
2. CDC. Fixed obstructive lung disease in workers at a microwave popcorn factory—Missouri, 2000–2002. MMWR 2002;51:345–7.
3. CDC. Fixed obstructive lung disease among workers in the flavor-manufacturing industry—California, 2004–2007. MMWR 2007;56:389–93.
4. Day G, LeBouf R, Grote A, et al. Identification and measurement of diacetyl substitutes in dry bakery mix production. J Occup Environ Hyg 2011;8:93–103.
5. Hubbs AF, Cumpston AM, Goldsmith WT, et al. Respiratory and olfactory cytotoxicity of inhaled 2,3-pentanedione in Sprague-Dawley rats. Am J Pathol 2012;181:829–44.
6. National Institute for Occupational Safety and Health. Draft criteria for a recommended standard: occupational exposure to diacetyl and 2,3-pentanedione. Cincinnati, OH: US Department of Health and Human Services, CDC, National Institute for Occupational Safety and Health; 2011. Available at http://www.cdc.gov/niosh/docket/archive/docket245.html.
7. Occupational Safety and Health Administration. Sampling and analytical methods: acetoin and diacetyl. Washington, DC: US Department of Labor, Occupational Safety and Health Administration; 2008. Available at http://www.osha.gov/dts/sltc/methods/validated/1012/1012.html.
8. Daglia M, Papetti A, Aceti C, Sordelli B, Spini V, Gazzani G. Isolation and determination of alpha-dicarbonyl compounds by RP-HPLC-DAD in green and roasted coffee. J Agric Food Chem 2007;55:8877–82.
9. Akiyama M, Murakami K, Ohtani N, et al. Analysis of volatile compounds released during the grinding of roasted coffee beans using solid-phase microextraction. J Agric Food Chem 2003;51:1961–9.

Progress in Introduction of Pneumococcal Conjugate Vaccine — Worldwide, 2000–2012

Pneumococcal conjugate vaccines (PCVs) are safe and effective for reducing illness and deaths caused by *Streptococcus pneumoniae* (*1*). Recommendations for PCV use from the World Health Organization (WHO) (*1,2*) and funding from the GAVI Alliance have resulted in an increase in PCV introductions into national immunization programs, especially in lower-income countries. Additionally, new formulations that cover more serotypes commonly causing disease in lower- and middle-income countries have become available. This report uses WHO data from 2000–2012, stratified by country disease burden characteristics and World Bank country income groups, to describe global progress in PCV introduction. As of December 2012, a total of 86 (44%) WHO member states have added PCV to the routine infant immunization schedule of their national immunization programs; among those, 23 have introduced PCV with GAVI Alliance support. PCV introduction among WHO member states was most common in the Americas Region (60% of member states), followed by the Eastern Mediterranean Region (50%), European Region (49%), African Region (41%), and Western Pacific Region (33%); none of 11 WHO member states in the South-East Asia Region have introduced PCV. Proportions of low- and middle-income countries with PCV introductions were similar. The proportion of the world's birth cohort living in countries with PCV in national immunization programs increased from 1% in 2000 to 31% in 2012. These findings suggest that efforts to increase PCV introduction and use globally are succeeding; however, gaps in PCV use remain in Asia and countries with large birth cohorts, where concerted efforts should be focused.

Worldwide, an estimated 14.5 million episodes of serious pneumococcal disease (including pneumonia, meningitis, and sepsis) occur each year in children aged <5 years, resulting in approximately 500,000 deaths, almost all of which occur in low- and middle-income countries (*3*). PCV was first licensed in 2000 as a formulation that provided protection against seven of the most common pneumococcal serotypes. In 2006, WHO recommended that PCV be included in all routine immunization programs, especially in countries with high pneumococcal disease burden, defined as >10% of deaths in children aged <5 years attributed to pneumonia or pneumonia mortality rate of >50 deaths per 1,000 live births among children aged <5 years (*1*). Beginning in 2010, new PCV formulations protecting against 10 and 13 serotypes have become available for use, offering better coverage for serotypes commonly causing disease in low- and middle-income countries (*4*).

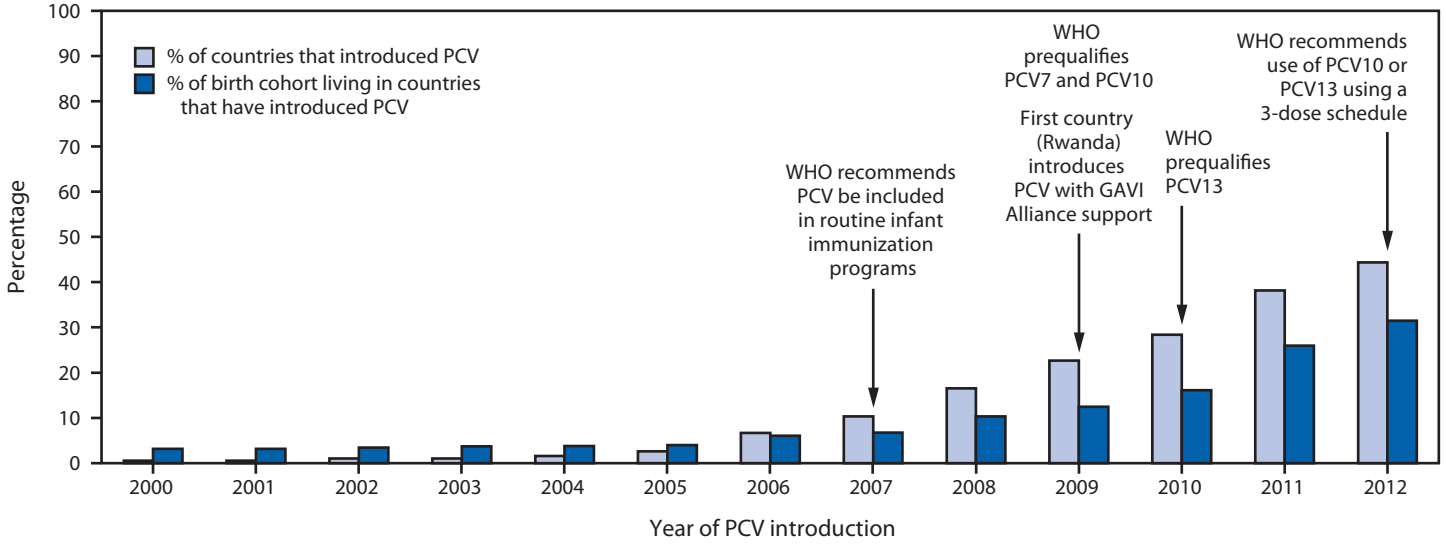
To assess the status of global PCV introduction, a WHO database tracking vaccine introductions was used to identify countries that included PCV in routine infant immunization schedules as of December 2012. PCV introductions were characterized by WHO region (*5*), eligibility for GAVI Alliance financial support,* World Bank income classification,† and pneumonia disease burden (*6*). The proportion of the global birth cohort living in countries that had introduced PCV was calculated using United Nations 2010 birth cohort estimates (*6*). For countries that introduced PCV during 2000–2009, WHO–United Nations Children's Fund (UNICEF) estimated coverage for the full 3-dose series of PCV was used, if available (*5*). Operational issues related to PCV introduction were identified through WHO post-introduction evaluations.

As of December 2012, 86 (44%) of 194 WHO member states had introduced PCV into national immunization programs, up from one (1%) in 2000 (Figure 1), representing 31% of all children born in WHO member states. PCV was introduced in national immunization programs in 21 (60%) of 35 member states in the Americas Region, 11 (50%) of 22 member states in the Eastern Mediterranean Region, 26 (49%) of 53 member states in the European Region, 19 (41%) of 46 member states in the African Region, nine (33%) of 27 member states in the Western Pacific Region, and none of 11 member states in the South-East Asia Region (Figure 2). By income level, 36 (73%) of 50 high-income countries introduced PCV; proportions were lower for remaining income strata: 13 (37%) of 36 low-income, 18 (35%) of 52 lower-middle income, and 18 (34%) of 53 upper-middle income countries. Among 72 countries that were eligible for phase II (2007–2010) financial support from the GAVI Alliance for PCV introduction, 23 (32%) introduced PCV and all low-income introductions occurred with GAVI Alliance support. By 2012, 21 (36%) of 59 high-mortality countries and 38 (37%) of 102 countries in which >10% of deaths in children aged <5 years were attributable to pneumonia had introduced PCV. Among countries

* Eligibility for phase II GAVI Alliance support (2007–2010) was based on having a gross national income (GNI), in U.S. dollars, of ≤$1,000 in 2003 and diphtheria-tetanus-pertussis vaccination coverage >50%.

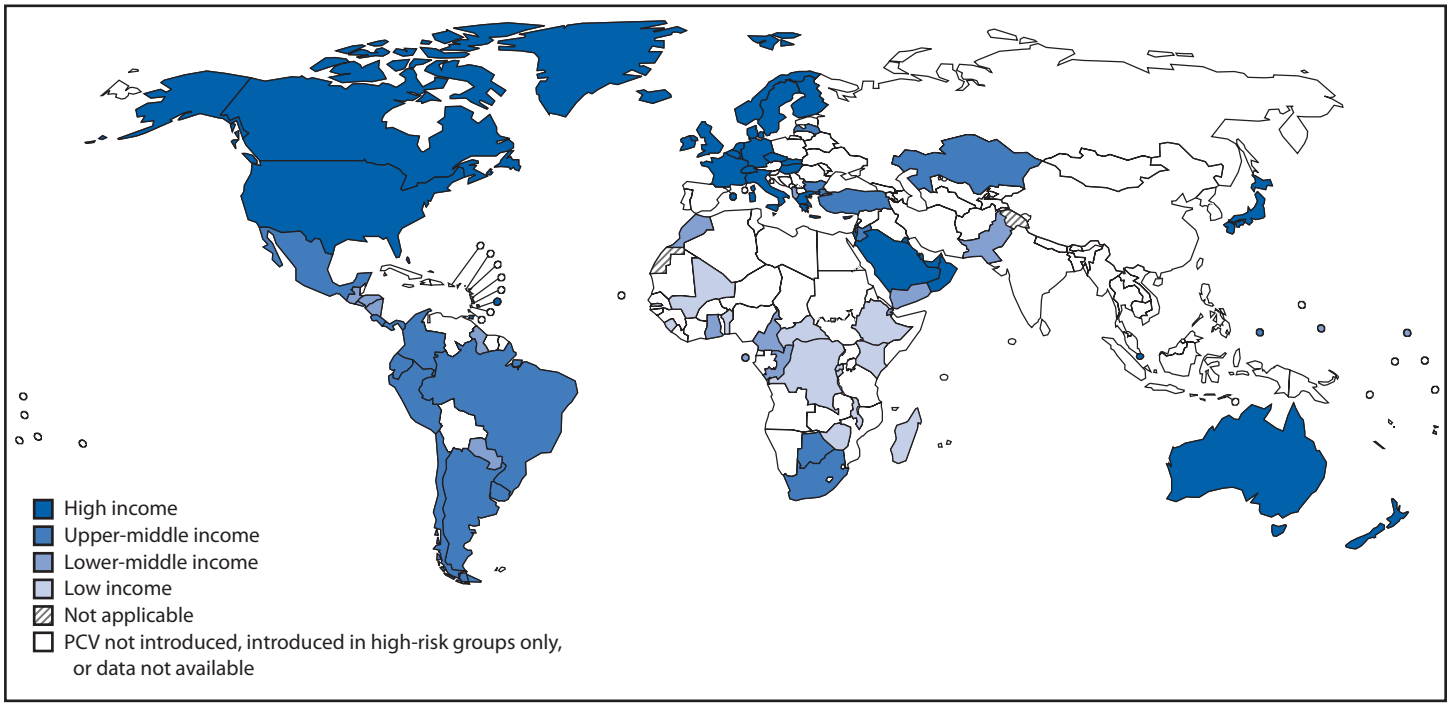
† World Bank income groups, in U.S. dollars, are defined as follows: high-income countries: countries with a 2011 GNI per capita ≥$12,476; upper-middle income countries: countries with a 2011 GNI <$12,476 and ≥$4,036; lower-middle income countries: countries with a 2011 GNI <$4,035 and ≥$1,027; and low-income countries: countries with a 2011 GNI ≤$1,026. Countries with no income status: Cook Islands, Nauru, Niue. Additional information is available at http://data.worldbank.org/indicator/ny.gnp.pcap.cd.

FIGURE 1. Progress of pneumococcal conjugate vaccine (PCV) introductions and proportions of birth cohorts living in countries that have introduced PCV into routine infant immunization schedules, by year — World Health Organization (WHO), worldwide, 2000–2012



Abbreviations: PCV7 = 7-valent PCV; PCV10 = 10-valent PCV; PCV13 = 13-valent PCV.

FIGURE 2. Countries that have introduced pneumococcal conjugate vaccines in their national Immunization programs, by income status* — worldwide, 2012



Data sources: World Health Organization/Immunization Vaccines and Biologicals/Expanded Programme on Immunization 2013 database, and World Bank list of economies (July 2012).

* World Bank income groups are defined (in U.S. dollars) as follows: high-income countries = countries with a 2011 gross national income (GNI) per capita ≥$12,476; upper-middle income countries = countries with a 2011 GNI <$12,476 and ≥$4,036; lower-middle income countries = countries with a 2011 GNI <$4,035 and ≥$1,027; and low-income countries = countries with a 2011 GNI ≤$1,026. No income status was reported for Niue. Additional information is available at http://data.worldbank.org/indicator/ny.gnp.pcap.cd.

using PCV, coverage with 3 doses of PCV assessed at age 12–24 months was highest among high- and low-income countries (median: 92% and 95%, respectively); less among upper-middle income countries (median: 76%), and lowest among lower-middle income countries (median: 44%) (Table).

Reports from 11 postintroduction evaluations conducted during 2010–2012 in low- and middle-income African countries described programmatic issues related to PCV introductions. First, programs need accurate data to define target populations, accompanied by clear messages to health workers and the community to prioritize target populations. In several countries, children outside the target infant age group also were brought for vaccination and, in most cases, were vaccinated, creating shortages of PCV for the target age group. Second, health worker knowledge that PCV provides protection against only one cause of pneumonia was crucial to ensure that they educated caretakers about other options for prevention and treatment of pneumonia. Third, weaknesses were identified in the underlying capacity of the immunization systems, including needs for 1) innovative training approaches to address the complexity of messages relating to use of new vaccines, 2) improvement of supportive supervision, and 3) further enhancement of injection safety, injection waste management, and monitoring of adverse events after immunization.

Reported by

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Editorial Note

Use of PCV has increased substantially since 2000, especially in low- and middle- income countries, where the burden of pneumococcal disease and deaths is high. A critical factor enabling vaccine introductions in low-income countries has been support from the GAVI Alliance. As of the first quarter of 2013, 24 countries have introduced PCV with GAVI Alliance support, and 27 additional countries have been approved for GAVI Alliance–supported PCV introductions (*7*). However, important gaps in PCV introduction remain, notably in the WHO South-East Asia Region and in countries with large birth cohorts. The lack of PCV introduction in several large countries is reflected in the gap between the proportion of

TABLE. Numbers of countries with pneumococcal conjugate vaccine (PCV) introductions and PCV coverage, by World Bank income group* and characteristics associated with high burden of pneumococcal disease — worldwide, 2012

	High income (n = 50)		Upper-middle income (n = 53)		Lower-middle income (n = 52)		Low income (n = 36)		No income status† (n = 3)		Total (N = 194)	
PCV introduction status/coverage	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**
Number of countries with PCV introductions												
Added PCV to the routine infant immunization schedule	36	(73)	18	(34)	18	(35)	13	(37)	1	(33)	**86**	**(44)**
Offering PCV for high-risk populations only	3	(6)	2	(4)	0	—	0	—	0	—	**5**	**(3)**
No PCV introduction to date	11	(22)	33	(62)	34	(65)	23	(64)	2	(67)	**103**	**(53)**
Number of countries with PCV introductions among countries with high burden of pneumococcal disease												
Phase II GAVI Alliance–eligible countries	0	—	3	(6)	33	(63)	36	(100)	0	—	**72**	**(38)**
PCV introductions with GAVI Alliance support	NA	—	0	—	10	(30)	13	(36)	NA	—	**23**	**(32)**
Countries with mortality >50 per 1,000 live births among children aged <5 years (i.e., high child mortality rate)	1	(2)	4	(8)	22	(42)	32	(89)	0	—	**59**	**(31)**
PCV introductions in high child mortality rate countries	0	—	1	(25)	7	(32)	13	(41)	NA	—	**21**	**(36)**
Countries with >10% deaths attributed to pneumonia among children <5 years	2	(4)	20	(38)	43	(83)	35	(97)	2	(67)	**102**	**(53)**
PCV introductions in countries with high rates of child pneumonia deaths	1	(50)	7	(35)	16	(37)	13	(37)	1	(50)	**38**	**(37)**
PCV coverage												
Number of countries reporting 2011 coverage for 3 doses of PCV	21		12		4		2		1		**40**	
Median coverage for 3 doses of PCV in 2011		(92)		(76)		(44)		(95)		(99)		**(90)**
Range		(1–99)		(46–98)		(23–67)		(93–97)				**(1–99)**

Abbreviation: NA = not applicable.

* World Bank income groups are defined (in U.S. dollars) as follows: high-income countries = countries with a 2011 gross national income (GNI) per capita ≥$12,476; upper-middle income countries = countries with a 2011 GNI <$12,476 and ≥$4,036; lower-middle income countries = countries with a 2011 GNI <$4,035 and ≥$1,027; and low-income countries = countries with a 2011 GNI ≤$1,026. Additional information is available at http://data.worldbank.org/indicator/ny.gnp.pcap.cd.

† Countries with no income status: Cook Islands, Nauru, and Niue.

countries having introduced PCV (44%) and the proportion of the world's birth cohort living in countries that have introduced PCV (31%). Low- and middle-income countries lagged behind high-income countries, with all low-income introductions attributed to GAVI Alliance support. Middle-income countries are not eligible for GAVI Alliance support and need to weigh vaccine procurement and operational costs against costs of other health priorities. Additionally, only two companies (Pfizer and GlaxoSmithKline) manufacture any of the three PCV formulations; each formulation is supplied by one company and insufficient supply has led to delays in planned introductions in some countries. Although pneumonia is a leading killer of children in the majority of countries, the disease burden preventable by PCV might be unrecognized, decreasing local demand for the vaccine. Improved data on the impact of PCV vaccination in reducing and preventing disease caused by *Streptococcus pneumoniae* will help guide policy decisions about PCV introduction and sustained use (*1*).

The findings of this report are subject to at least two limitations. First, the vaccination coverage estimates might differ from actual coverage because of inaccurate reporting of target population size or number of doses administered. Additionally, coverage estimates were only from countries using PCV for at least 2 years and might not be reflective of coverage achieved in all settings.

In spite of these challenges, the rate at which PCV has been introduced into childhood immunization programs worldwide has been faster than that of other new vaccines in the past (*8*). In addition to WHO recommendations and GAVI Alliance support, other measures are encouraging PCV use around the world. WHO and UNICEF promote PCV use in the integrated *Global Action Plan for Pneumonia and Diarrhoea (GAPPD)* as a comprehensive approach to reducing pneumonia morbidity and mortality and as an important strategy for achieving United Nations Millennium Development Goal 4 to reduce child mortality (*9*). Further information on the magnitude of PCV benefits in low- and middle-income countries might encourage more policy makers to introduce PCV into immunization programs; studies are ongoing and data on the impact and effectiveness of PCV in reducing disease caused by *Streptococcus pneumoniae* in these settings is being prepared for publication. A WHO manual for measuring the impact of the *Haemophilus influenzae* type b conjugate vaccine and PCV can assist with designing studies to determine how PCV performs in a variety of settings.[§] The progress of PCV introductions noted in this report and anticipated PCV introductions in coming years will help reduce the burden of pneumonia and pneumococcal disease worldwide.

[§] Available at http://www.who.int/immunization/documents/WHO_IVB_12.08/en/index.html.

What is already known on this topic?

Globally, *Streptococcus pneumoniae* is a significant cause of pneumonia, meningitis, and sepsis in children aged <5 years and leads to an estimated 14.5 million episodes of serious disease and approximately 500,000 deaths annually. Pneumococcal conjugate vaccines (PCVs) are safe and effective for prevention of this disease, and the World Health Organization (WHO) recommends that PCV be included in all routine immunization programs.

What is added by this report?

PCV use increased from one (1%) WHO member state in 2000 to 86 (44%) in 2012. Gaps in PCV introductions were noted in Asia and in countries with large birth cohorts; only 31% of the world's birth cohort currently has access to PCV. WHO recommendations for use, financial support through the GAVI Alliance for PCV introduction in lower-income countries, and newer PCV formulations that protect against additional serotypes likely contributed to the increased use of PCV.

What are the implications for public health practice?

Increased use of PCV will help reduce the incidence of pneumonia and pneumococcal disease worldwide. The success of PCV introductions and the lessons learned from countries that have added PCV to their immunization programs will help guide decisions about future PCV introductions and sustained use.

References

1. World Health Organization. Pneumococcal vaccines; WHO position paper—2012. Wkly Epidemiol Rec 2012;87:129–44.
2. World Health Organization. Pneumococcal conjugate vaccine for childhood immunization—WHO position paper. Wkly Epidemiol Rec 2007;82:93–104.
3. O'Brien KL, Wolfson LJ, Watt JP, et al. Burden of disease caused by *Streptococcus pneumoniae* in children younger than 5 years: global estimates. Lancet 2009;374:893–902.
4. Johnson HL, Deloria-Knoll M, Levine OS, et al. Systematic evaluation of serotypes causing invasive pneumococcal disease among children under five: the pneumococcal global serotype project. PLoS Med 2010;7(10):pii:e1000348.
5. World Health Organization. Immunization surveillance, assessment and monitoring: data, statistics and graphics. Geneva, Switzerland: World Health Organization; 2012. Available at http://www.who.int/immunization_monitoring/data/en.
6. United Nations Children's Fund. The state of the world's children 2012: children in an urban world. New York, New York: United Nations Children's Fund; 2012. Available at http://www.unicef.org/sowc2012/index.php.
7. GAVI Alliance. Countries approved for support. Geneva, Switzerland: GAVI Alliance; 2013. Available at http://www.gavialliance.org/results/countries-approved-for-support.
8. Levine OS, Knoll MD, Jones A, Walker DG, Risko N, Gilani Z. Global status of *Haemophilus influenzae* type b and pneumococcal conjugate vaccines: evidence, policies, and introductions. Curr Opin Infect Dis 2010;23:236–41.
9. World Health Organization, United Nations Children's Fund. Ending preventable child deaths from pneumonia and diarrhoea by 2025: the integrated Global Action Plan for Pneumonia and Diarrhoea (GAPPD). Geneva, Switzerland: World Health Organization; 2013. Available at http://www.who.int/maternal_child_adolescent/documents/global_action_plan_pneumonia_diarrhoea/en/index.html.

National Shortage of Purified-Protein Derivative Tuberculin Products

Tubersol, a product of Sanofi Pasteur Limited, is in short supply nationwide until at least the end of May 2013. Tubersol is one of two purified-protein derivative (PPD) tuberculin products licensed by the Food and Drug Administration (FDA). The manufacturer has notified CDC that 50-dose vials of Tubersol will remain unavailable until the end of May 2013 and that supplies of 10-dose vials are still being reestablished: the product is available only by contacting Sanofi directly (at https://www.vaccineshoppe.com/index.cfm? or telephone, 800-822-2463). JHP Pharmaceuticals, LLC, the manufacturer of Aplisol, the other PPD tuberculin product licensed by FDA, has notified FDA that the product is available in restricted quantity. Acute local shortages of Aplisol also have been reported to CDC by TB control officials, as health-care providers switch from Tubersol to Aplisol. The shortages of Aplisol probably will diminish as Tubersol supplies are restored to their preshortage availability in the normal distribution networks. This report advises public health officials, clinicians, and workers in occupational health and infection control about how to adapt to the shortage.

Two kinds of immunologic methods are used for detecting *Mycobacterium tuberculosis* infection: tuberculin skin tests (TSTs) and interferon-γ release assay (IGRA) blood tests. The indications for use of these tests are the same, although one or the other method is preferred for certain populations (*1*), and this could play a role in setting priorities when one of the methods is unavailable. Together, these tests are the only means for detecting latent *M. tuberculosis* infection, and they contribute to diagnosing tuberculosis (TB) disease. When findings such as chest radiography, nucleic acid amplification test of sputum, and/or mycobacterial cultures are sufficient for confirming or excluding TB, the results from a TST or an IGRA blood test might not be needed (*2*). A negative TST or IGRA result does not exclude the possibility of TB infection because some persons can have a compromised ability to react to tests for TB infection. However, most persons diagnosed with TB in the United States have had a positive TST or IGRA blood test that has contributed to that diagnosis. When TB disease is strongly suspected, specific treatment should be started regardless of results of a TST or an IGRA blood test (*1*,*3*).

In controlled studies, the agreement between TST results from Tubersol and Aplisol is high. The agreement between results from a TST and an IGRA blood test or between results from the two commercial IGRA blood tests is lower (*1*).

CDC recommends any of the following three general approaches for addressing the shortages of TST antigens:

1. Substitute IGRA blood tests for TSTs. Although the costs associated with the blood tests themselves can be greater than the cost of TSTs, the use of the blood tests might be more cost-effective in certain settings because their improved specificity in persons who have had previous Bacille Calmette-Guérin (BCG) immunization or exposure to nontuberculous mycobacteria might allow for better targeting of preventive therapy. The blood tests require phlebotomy, preparation of blood specimens, and specific laboratory services for analysis; these tests are not available in all practice settings. Clinicians who use the IGRA blood tests should be aware that the criteria for test interpretation are different from criteria for interpreting TSTs (*1*).
2. Allocate TSTs to priority indications, such as TB contact investigations, as determined by public health authorities. This might require deferment of testing some persons. CDC does not recommend testing persons who are not at risk for TB (*4*).
3. Substitute Aplisol for Tubersol for skin testing. In cross-sectional studies, the two products give similar results for most patients. Shortages of Aplisol are expected to become more widespread, limiting the feasibility of this approach.

Some surveillance programs for TB infection control rely on routine serial TSTs. Switching products or methods might make changes in serial results difficult to interpret: the apparent conversions of results from negative to positive or reversions from positive to negative could be caused by inherent interproduct or intermethod discordance (*1*,*5*). In settings with a low likelihood of TB exposure, the deferment of routine serial testing should be considered in consultation with public health and occupational health authorities.

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References

1. CDC. Updated guidelines for using interferon gamma release assays to detect *Mycobacterium tuberculosis* infection—United States, 2010. MMWR 2010;59(No. RR-5).
2. American Thoracic Society. Diagnostic standards and classification of tuberculosis in adults and children. Am J Respir Crit Care Med 2000; 161(4 Pt 1):1376–95. Available at http://www.cdc.gov/tb/publications/pdf/1376.pdf.
3. CDC. Treatment of tuberculosis. MMWR 2003;52(No. RR-11).
4. CDC. Targeted tuberculin testing and treatment of latent tuberculosis infection. MMWR 2000;49(No. RR-6).
5. CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. MMWR 2005;54(No. RR-17).

Notes from the Field

Acute Pesticide-Related Illness Resulting from Occupational Exposure to Acrolein — Washington and California, 1993–2009

Acrolein is an aquatic herbicide used in the western United States to prevent impaired water flow in irrigation canals. Despite its toxicity, few cases of acrolein-related illness have been reported in the literature. On August 15, 2012, an irrigation district notified the Washington State Department of Labor & Industries (L&I) of acrolein-related illness in one of its pesticide applicators. L&I inspected the site and interviewed the exposed worker, coworkers, and employer. The Washington State Department of Health assisted by obtaining medical records, interviewing the patient and hospital staff, and reviewing information obtained from L&I. To look for additional cases, CDC reviewed data from the SENSOR-Pesticides program* and the California Department of Pesticide Regulation for 1993–2009, the most recent years of data availability, and identified seven additional cases of acute acrolein-related illness.

A licensed aquatic pesticide applicator aged 57 years, previously healthy and employed for 15 years by an irrigation district in Washington, was exposed to acrolein while monitoring an application† to an irrigation canal in the Quincy-Columbia Basin. The man was not wearing the label-required respiratory protection, gloves, or a long-sleeved shirt§ when he investigated a leak in the connection between the acrolein tank and the metal assembly through which acrolein flows.

Almost immediately after exposure to the leak the worker had burning, watery eyes. Within 2 hours he experienced throat tightness, difficulty breathing, inability to swallow, moderate phlegm production, vomiting, and inability to talk because of dyspnea. He was admitted to the intensive-care unit and approximately 6 hours after exposure developed right facial droop but no other weakness or paresthesias. Supportive treatment was provided, including administration of epinephrine. Approximately 48 hours after exposure, the patient went into ventricular fibrillation and concomitantly experienced a grand mal seizure. His condition was ultimately stabilized, and he was discharged to home after a 3-week hospitalization. He received a diagnosis of lateral medullary syndrome and continued to have dysphagia, right-sided facial droop, and left-sided altered thermal skin sensitivity. He returned to work at the irritation district for 1 month in January 2013 but is not currently working because of ongoing medical conditions.

CDC identified seven additional cases of acute acrolein-related illness in the United States during 1993–2009, all in California. Five cases were among workers employed by irrigation districts, of whom four were pesticide applicators and one maintained pesticide application equipment. Six of the workers were men, and the mean age was 41 years (range: 24–53 years). Four workers had low severity illness, and three had illness of moderate severity.¶ Common symptoms were eye irritation (five workers), headache (three), dyspnea (two), and skin irritation or burns (two). No worker was hospitalized, but two lost time from work.

Acrolein is highly volatile, producing an extremely irritating vapor that is highly reactive and acts by degrading cellular structures by cross-linking proteins (*1*). Acrolein also can produce inflammation of the heart, and ventricular fibrillation can occur in the setting of epinephrine administration combined with an acrolein-induced catecholamine release (*2*). Although acrolein is measureable in blood and urine, these tests are not commonly available and are not useful in assessing exposure (*3*).

Because of its toxicity, acrolein is applied only through closed systems, which prevents its release into the air. Such systems are not closed during set up and break down, and visual inspection of application equipment can involve exposure to leaks; therefore, applicators must comply with stringent requirements for personal protective equipment (PPE) when performing these activities (*1*). Use of a closed application system combined with annual training, applicator certification,** adherence to the manufacturer's other operating procedures for acrolein (*4*), and compliance with PPE requirements are expected to

* Additional information available at http://www.cdc.gov/niosh/topics/pesticides/overview.html.

† Magnacide H Herbicide, Baker Petrolite Corporation, EPA registration number 10707-9.

§ Label-required PPE includes a long-sleeved shirt and long pants, shoes, and socks, chemical-resistant gloves made of butyl rubber, and a National Institute of Occupational Safety and Health–approved full-face respirator with either an organic-vapor-removing cartridge with a prefilter approved for pesticides or a canister approved for pesticides.

¶ Severity of illness and injury of cases can be categorized into four groups using standardized criteria for state-based surveillance programs: low, moderate, high, and death. In low severity cases, illness/injury usually resolves without treatment and <3 days are lost from work. Moderate severity cases involve non–life-threatening health effects that are generally systemic and require medical treatment. No residual disability is detected, and time lost from work is ≤5 days. Additional information available at http://www.cdc.gov/niosh/topics/pesticides/pdfs/pest-sevindexv6.pdf.

** Additional information available at http://www.epa.gov/oppfead1/safety/applicators/applicators.htm.

effectively prevent exposures of concern to workers (*1*). Use of nonchemical means to prevent clogging of irrigation canals with weeds and algae (e.g., mechanical harvesting, sediment removal, canal lining, and replacing the canal with piping) have been considered by irrigation districts in Washington but found not feasible because of cost and the potential for increased risk for injury to workers (*5*).

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References

1. US Environmental Protection Agency. Reregistration eligibility decision document for acrolein. Washington DC: US Environmental Protection Agency; 2008. Available at http://www.epa.gov/oppsrrd1/REDs/acrolein_red.pdf.
2. Beauchamp RO Jr, Andjelkovich DA, Kligerman AD, Morgan KT, Heck HD. A critical review of the literature on acrolein toxicity. Crit Rev Toxicol 1985;14:309–80.
3. Agency for Toxic Substances and Disease Registry. Toxicological profile for acrolein. Atlanta, GA: US Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry; 2007. Available at http://www.atsdr.cdc.gov/toxprofiles/tp124.pdf.
4. Baker Petrolite. Magnacide H herbicide application and safety manual. Bakersfield, CA: Baker Petrolite Corporation; 2005.
5. Washington State Department of Ecology. Fact sheet for the irrigation system aquatic weed control National Pollutant Discharge Elimination System (NPDES) and state waste discharge general permit. Olympia, WA: Washington State Department of Ecology; 2012. Available at http://www.ecy.wa.gov/programs/wq/pesticides/irrigation/docs/irrigationfsrtc051612.pdf.

Notes from the Field

Exposures to Discarded Sulfur Mustard Munitions — Mid-Atlantic and New England States 2004–2012

Before the 1970s, the United States sometimes disposed of at sea excess, obsolete, or unserviceable munitions, including chemical munitions (*1*). Chemical munitions known to have been disposed of at sea included munitions filled with sulfur mustard, a vesicant (i.e., an agent that causes chemical burns or blisters of the skin and mucous membranes) (*2*). Signs and symptoms of exposure to a mustard agent can include redness and blistering of the skin, eye irritation, rhinorrhea, hoarseness, shortness of breath, and (rarely) diarrhea and abdominal discomfort. Since 2004, CDC has received notification of three separate incidents of exposure to sulfur mustard munitions. In one incident, a munition was found with ocean-dredged marine shells used to pave a driveway. The other two incidents involved commercial clam fishing operations. This report highlights the importance of considering exposure to sulfur mustard in the differential diagnosis of signs and symptoms compatible with exposure to a vesicant agent, especially among persons involved with clam fishing or sea dredging operations.

Case Reports

Case 1. In 2004, U.S. Air Force Explosive Ordnance Disposal (EOD) personnel responded to discovery of an artillery shell protruding from a Delaware driveway paved with crushed clamshells (*3*). They recovered the shell and moved it to Dover Air Force Base for destruction using standard EOD procedures. During handling a "black, tar-like substance" began to drip, and two members required treatment for chemical burns after large pus-filled blisters developed on their hands and arms. One EOD team member required hospitalization as a result of the exposure. Sulfur mustard exposure was confirmed by chemical analysis. After this incident, the Department of Defense made the Army's policy and procedures for addressing liquid-filled munitions applicable to the Air Force and all other military services.

Case 2. In 2010, commercial fishermen recovered an unknown number of munitions during dredging for clams off the coast of Long Island, New York (*4*). During the effort to dump the munitions back in the ocean, a munition was dropped on the deck of the boat, resulting in the release of a black liquid substance. Drops of the substance also landed on the clothing covering the leg and arm of a crew member, and another crew member was exposed to fumes. After several hours, both crew members felt ill and were subsequently transported to a local hospital for evaluation. One crew member was evaluated and released. The other crew member developed small blisters on his forearm and upper thigh. These injuries were recognized by a nurse trained in chemical agent injuries as compatible with exposure to sulfur mustard. Sulfur mustard exposure was confirmed by chemical analysis.

Case 3. In 2012, a 75-mm projectile was recovered at a clam processing plant in Delaware. Reportedly, it had been brought to the plant accidentally during dredging operations for clams in Delaware Bay. An EOD team removed the munition for disposal (*5*). The munition involved was determined to contain mustard agent. None of the potentially exposed persons developed signs or symptoms of exposure to mustard. Clam fishermen told investigators that they routinely recover munitions that often "smell like garlic," a potential indication of the presence of a chemical agent.

Diagnosis and Management of Suspected Cases

Mustard agent is listed in the Chemical Weapons Convention as an agent used in chemical munitions. Clinicians suspecting mustard exposure should consult with their state or local health department and poison control center regarding the need for follow-up and investigation of potential exposures. CDC's Chemical Weapons Elimination Program can provide technical consultation and laboratory services to assist clinicians with testing, diagnosis, and management of suspected cases. Program staff members can be contacted through the duty officer at the CDC Emergency Operations Center at 770-488-7100.

Additional information regarding the U.S. Army Chemical Material Activity programs is available by contacting the Public Affairs Office by telephone, 800-488-0648. Additional information regarding CDC programs associated with chemical weapons is available by telephone at 800-CDC-INFO.

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References

1. US Army Technical Center for Explosives Safety. Munitions at sea: a guide for commercial maritime industries. McAlester, OK: Defense Ammunition Center, US Army Technical Center for Explosives Safety. Available at http://www.history.navy.mil/library/online/munitionsatsea.htm.
2. Agency for Toxic Substances and Disease Registry. Toxic substances portal: sulfur mustard. Atlanta, GA: Available at Agency for Toxic Substances and Disease Registry; 2011. Available at http://www.atsdr.cdc.gov/toxfaqs/TF.asp?id=904&tid=184.
3. Carroll LS. Sulfur mustard: cutaneous exposure. Clin Toxicol 2005;43:55.
4. Weibrecht K, Rhyee S, Manuell ME, Longo C, Boyer EW, Brush E. Sulfur mustard exposure presenting to a community emergency department. Ann Emerg Med 2012;59:70–4.
5. WBOC 16. Delaware seafood facility evacuated after military ordnance found. July 2, 2012. Available at http://www.wboc.com/story/18915482/unexploded-ordnance-uncovered-at-del-clam-processing-facility.

Announcements

National Campaign to Prevent Falls in Construction — United States, 2013

Each day, on average, two construction workers die in the United States (*1*). In 2010, the 9.1 million construction workers (including self-employed workers) in the United States accounted for 7% of the national workforce (*2*), yet experienced 17.1% of fatal work-related injuries (*2*). In 2011, the rate of fatal injuries in construction was the second highest of any U.S. industry (*3*). Within the industry, falls at construction sites are the leading cause of death, accounting for 35% of deaths among private sector construction workers (not including government or self-employed workers) in 2011 (*1*); most of these deaths were attributed to falls from roofs, scaffolds, and ladders (*2*). Deaths and injuries from falls represent a major, persistent, yet preventable public health problem. Safe construction requires both skilled workers and responsible employers.

CDC's National Institute for Occupational Safety and Health has engaged the construction sector through a government/labor/management partnership, representing state and federal government agencies, professional organizations, trade associations, labor organizations, and private industry. The goal, in part, is to develop a national campaign aimed at construction contractors, onsite supervisors, and workers to address and reduce falls, fall-related injuries, and fall-related fatalities among construction workers. On Workers' Memorial Day, April 28, 2013, a national information and media campaign will be launched again through this partnership.

References

1. Bureau of Labor Statistics. Census of Fatal Occupational Injuries (CFOI)—current and revised data. Washington, DC: US Department of Labor, Bureau of Labor Statistics; 2012. Available at http://www.bls.gov/iif/oshcfoi1.htm#2011.
2. CPWR—The Center for Construction Research and Training. The construction chartbook. 5th ed. Silver Spring, MD: CPWR; 2013. Available at http://www.cpwr.com.
3. Bureau of Labor Statistics. Economic news release: census of fatal occupational injuries summary, 2011 (preliminary results). Washington, DC: US Department of Labor, Bureau of Labor Statistics; 2012. Available at http://bls.gov/news.release/cfoi.nr0.htm.

Amyotrophic Lateral Sclerosis (ALS) Awareness Month — May 2013

May is Amyotrophic Lateral Sclerosis (ALS) Awareness Month. ALS, also known as Lou Gehrig's disease, is a progressive, fatal, neurodegenerative disorder of both the upper and lower motor neurons. Persons with ALS usually die within 2–5 years of diagnosis. The etiology of ALS is not well understood, and currently there is no cure.

In October 2010, the federal Agency for Toxic Substances and Disease Registry (ATSDR) launched the National ALS Registry to collect and analyze data regarding persons with ALS in the United States. The main goals of the registry are to determine the incidence and prevalence of ALS within the United States, characterize the demographics of those living with ALS, and examine the potential risk factors for the disease. The registry uses data from existing national databases, including the Centers for Medicare and Medicaid Services and the U.S. Department of Veterans Affairs, as well as information provided by persons with ALS through a secure online web portal, available at http://www.cdc.gov/als. At the web portal, registrants can take brief online surveys regarding potential risk factors for the disease.

To achieve the registry's goals, ATSDR is collaborating with the ALS Association (http://www.alsa.org), Muscular Dystrophy Association (http://www.als-mda.org), Les Turner Foundation (http://www.lesturnerals.org), and other organizations to make all persons with ALS and their families aware of the opportunity to register in the National ALS Registry. When sufficient data have been gathered to provide a representative picture of persons with ALS, ATSDR will begin analyzing the data and providing deidentified information so that researchers can gain a better understanding of the disease.

In addition to enrolling persons with ALS, ATSDR also has undertaken various initiatives to help strengthen the registry. These include implementing active surveillance activities to help evaluate the completeness of the registry in three states and eight metropolitan areas, funding a bioregistry feasibility study to link potential specimen data collected (e.g., blood, saliva, and tissue) with existing registry surveys, and funding external research on ALS risk factors and burden of disease. Additionally, ATSDR has launched a new research notification mechanism that puts researchers directly in contact with registry enrollees who are interested in taking part in new clinical trials and epidemiologic studies. Additional information regarding these initiatives and the National ALS Registry is available at http://www.cdc.gov/als.

Announcements

Healthy Vision Month — May 2013

The May 2013 theme for Healthy Vision Month is "Healthy Vision: Make It Last a Lifetime." CDC's Vision Health Initiative joins with the National Institutes of Health's National Eye Institute in encouraging everyone to make vision and eye health a lifetime priority.

In 2010, approximately 4 million persons in the United States aged ≥40 years had vision impairment (including low vision and blindness); by 2050, this number is projected to reach 13 million (*1*). Vision impairment is associated with inability to perform daily activities such as reading, driving a car, and preparing meals. Vision impairment also is associated with an increased risk for falls, fall-related injuries, depression, and reduced overall health (*2–4*). Millions of persons in the United States have undetected vision problems and eye diseases. Vision disorders are the seventh most common chronic condition for persons aged ≥65 years, the ninth most common for those aged 50–64 years, and the third most common for those aged ≤17 years (*5,6*).

Early detection, timely treatment, and the use of proper eye safety practices can prevent or delay vision impairment. The American Optometric Association and the American Academy of Ophthalmology recommend a regular, comprehensive dilated eye examination to potentially detect and treat vision problems early. Additional information about activities that promote prevention, early detection, and treatment of eye diseases leading to vision impairment is available at http://www.cdc.gov/visionhealth and http://www.nei.nih.gov/healthyeyes.

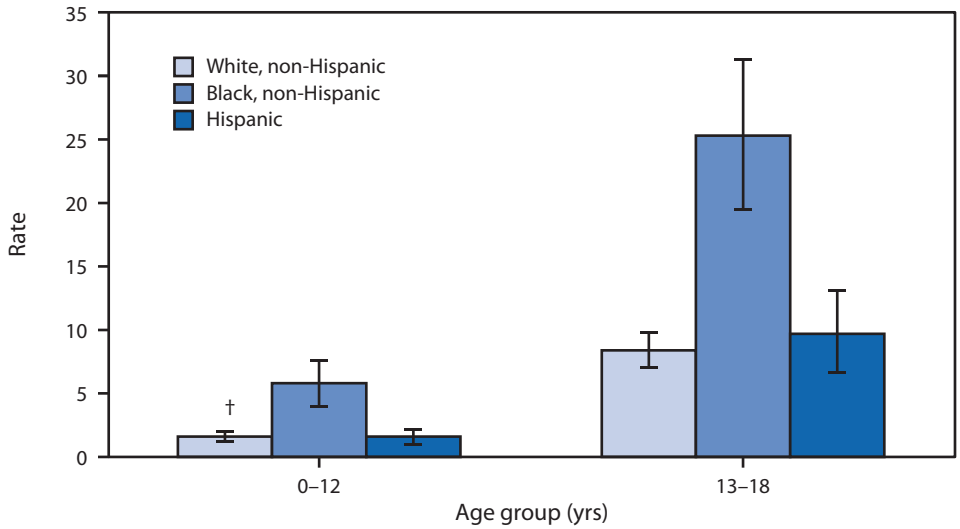
References

1. National Eye Institute. Projections for vision impairment (2010–2030–2050). Bethesda, MD: National Institutes of Health, National Eye Institute; 2010. Available at http://www.nei.nih.gov/eyedata/vision_impaired.asp#4.
2. Li Y, Crews JE, Elam-Evans LD, et al. Visual impairment and health-related quality of life among elderly adults with age-related eye disease. Qual Life Res 2011;20:845–52.
3. Wood JM, Lacherez P, Black AA, Cole MH, Boon MY, Kerr GK. Risk of falls, injurious falls, and other injuries resulting from visual impairment among older adults with age-related macular degeneration. Invest Opththalmol Vis Sci 2011;52:5088–92.
4. Zhang X, Bullard KM, Cotch MF, et al. Association between depression and functional vision loss in persons 20 years of age or older in the United States, NHANES 2005–2008. JAMA Ophthalmol 2013 Mar 7:1–9.
5. Anderson G. Chronic care: making the case for ongoing care. Princeton, NJ: Robert Wood Johnson Foundation; 2010. Available at http://www.rwjf.org/files/research/50968chronic.care.chartbook.pdf.
6. Martin LG, Freeman VA, Schoeni RF, Andreski PM. Trends in disability and related chronic conditions among people ages fifty to sixty-four. Health Aff (Millwood) 2010:29:725–31.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Average Annual Rate of Emergency Department Visits for Assault* Among Persons Aged ≤18 Years, by Age Group and Race/Ethnicity — United States, 2005–2010



* Per 1,000 population, based on 6-year annual average. Assault was determined if any one of the following was the first-listed E-code: 960–969, homicide and injury purposely inflicted by other persons; 979, terrorism; 999.1, late effect of injury due to terrorism.
† 95% confidence interval.

During 2005–2010, approximately 388,000 emergency department visits were made each year by persons aged ≤18 years who had been injured by assault, an overall rate of 5.0 visits per 1,000 persons per year. The visit rate for assault for non-Hispanic blacks aged 13–18 years was 25.3 per 1,000 population, which was higher than the 8.4 rate for non-Hispanic whites and the 9.7 rate for Hispanics. Among children aged 0–12 years, the visit rate also was higher among non-Hispanic blacks (5.7) than among non-Hispanic whites (1.6) or Hispanics (1.6).

Source: National Hospital Ambulatory Medical Care Survey 2005–2010. Available at http://www.cdc.gov/nchs/ahcd.htm.

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