

Occupational Lung Diseases

What are occupational lung diseases?

Occupational lung disease is the number one cause of work-related illness in the United States in terms of frequency, severity and preventability.

Many occupational lung diseases are related to a specific occupation or exposure to hazardous materials, such as asbestosis, coal workers' pneumoconiosis (black lung), silicosis (exposure to fine sand as in ceramic workers), berylliosis, byssinosis (brown lung, exposure to raw cotton) and farmer's lung. Workplace exposures can cause or worsen adult-onset asthma, chronic obstructive pulmonary disease (COPD, which includes emphysema and chronic bronchitis) and lung cancer.

Occupational lung cancer is the most frequent occupational cancer and is caused by exposure to substances such as asbestos, arsenic, chloroethers, chromates, ionizing radiation, nickel and polynuclear aromatic hydrocarbons. The National Institute for Occupational Safety and Health estimates that millions of workers are exposed to substances that have been tested and found to be cancer-causing, although only two percent of all chemicals in commerce have undergone such testing.¹

These occupational exposures account for about 10.3 percent of lung cancer cases worldwide.² An estimated 14 percent of COPD is due to occupational exposure.³

Want to learn more about lung cancer? Please view the disease listing at <http://www.lungusa.org/lcfacts>

Occupational or work-related asthma is the most common form of occupational lung disease. An estimated 15 percent to 23 percent of new adult asthma cases in the United States are due to occupational exposures. These exposures in the workplace also can worsen pre-existing asthma.⁴ Symptoms usually occur while the worker is exposed at work but, in some cases, they develop several hours after the person leaves work and then subside before the worker returns to the job. In later stages of the disease, symptoms may occur away from work after exposure to common lung irritants such as air pollution or dust.

Occupational asthma is usually reversible, but permanent lung damage can occur if exposure continues. According to one study, men working in forestry and with metals and women in the service industries (waitresses, cleaners and dental workers) have the highest risk for occupational asthma.⁵

Want to learn more about asthma? Please view the fact sheet at <http://www.lungusa.org/asthmainadultsfactsheet>

Asbestosis is a disease that worsens over time. It involves a scarring of lung tissue as a result of exposure to asbestos. Asbestos was previously widely used as an insulator and fire retardant until it became known that its microscopic fibers cause disease, including cancer.^{6,7}

An estimated 1.3 million employees in construction and general industry face significant asbestos exposure on the job.⁸ Between 1999 and 2004, there were 3,211 deaths due to asbestosis in the United States.⁹ According to a study by the Environmental Working Group, almost 10,000 deaths per year in the United States, or close to 30 deaths per day, are due to asbestos-related diseases, including mesothelioma (cancer of the lung lining), asbestosis, lung cancer and gastrointestinal cancer, and the number may be increasing.¹⁰ Smoking combined with asbestos exposure increases the risk of lung cancer.¹¹

Want to learn more about asbestos and lung disease? Please view the asbestos page at <http://www.lungusa.org/asbestos>

Mesothelioma, an otherwise rare cancer of the lining of organs, is caused by asbestos exposure in 70 percent to 80 percent of cases.¹² Over the next decade, mesothelioma may be responsible for 35,000 U.S. deaths. Mesothelioma takes a long time to develop, with symptoms appearing 30 to 50 years after asbestos exposure.¹³ An estimated 2,000 to 3,000 new cases occur each year in the United States. Mesothelioma affects men five times more often than women and is more common in Whites. The average survival period is just one year because by the time a patient shows symptoms, the disease has advanced to a late stage.¹⁴

Want to learn more about mesothelioma? Please view the fact sheet at <http://www.lungusa.org/mesotheliomafactsheet>

Byssinosis (brown lung disease) is a chronic condition involving obstruction of the small airways, severely harming lung function. It is caused by exposure to dusts from hemp, flax and cotton processing. In the United States, byssinosis is almost completely limited to workers who handle unprocessed cotton.

Coal workers' pneumoconiosis (black lung disease) is a chronic condition caused by inhaling coal dust that becomes imbedded in the lungs, causing them to harden and making breathing very difficult. An estimated 2.8 percent of coal miners are affected and about 0.2 percent have scarring in the lungs, the worst form of the disease.¹⁵ Between 1999 and 2004, an average of 355

people died from black lung disease each year (an age-adjusted death rate of 1.2 per 1,000,000).¹⁶

Silicosis is caused by exposure to free crystalline silica, which comes from chipping, cutting, drilling or grinding objects such as or containing soil, sand, granite or other minerals. Quartz is the most common form of crystalline silica. Inhaling this dust can cause swelling in the lungs, either gradually over many years or in a very short amount of time. Severe forms of the disease include fluid buildup in the lungs and sometimes lung tissue scarring (fibrosis).¹⁷

Approximately two million U.S. workers are estimated to be occupationally exposed to free crystalline silica dusts, including more than 100,000 in high-risk jobs such as abrasive blasting, foundry work, stonecutting, rock drilling, quarry work and tunneling.¹⁸ Glass workers and sand blasters also are exposed to silica dust. Wearing protective equipment can limit the amount of silica dust inhaled.¹⁹ Evidence shows that workers who do not actually have silicosis but who have experienced long exposures to silica dust may be at increased risk of developing tuberculosis. The American Thoracic Society recommends that tuberculosis tests be given to persons with silicosis and to those without silicosis who have at least 25 years of occupational exposure to crystalline silica.²⁰

Want to learn more about tuberculosis? Please view the disease listing at <http://www.lungusa.org/tuberculosis>

Hypersensitivity pneumonitis (farmer's lung) is caused by repeated exposure to organic dusts, fungus, mold or other foreign substances. Other causes include breathing in dust from moldy hay, bird droppings, contamination in humidifiers or air conditioners and certain chemicals. Hypersensitivity pneumonitis causes the lung's air sacs to become inflamed. Parts of the lungs then may develop fibrous scar tissue, which causes breathlessness.²¹ Deaths where hypersensitivity pneumonitis was the underlying cause, although still quite few, have been generally increasing from 10 in 1979 to 53 in 2004.²²

Want to learn more about hypersensitivity pneumonitis? Please view the disease listing at <http://www.lungusa.org/hypersensitivitypneumonitis>

Sick building syndrome can be the diagnosis when a large number of people in a building experience symptoms that do not fit the pattern of any particular illness and are difficult to trace to any specific source.

Many buildings are now sealed tightly due to rising energy costs, while modern ventilation systems mostly recycle indoor air. Workers breathe the same air again and again, which may also be made more harmful by pollutants from furnishings, appliances or building materials. If a ventilation system is not carefully designed or maintained, fresh air may not reach the workers. In fact, according to the National Institute of Allergy and Infectious Disease, poorly ventilated office spaces aid in the transmission of the organism that causes pneumonia, a disease that strikes three million people annually. Productivity losses due to sick building syndrome are estimated to cost \$50 million annually.²³

Risk Factors for Occupational Lung Diseases

Occupational lung diseases are caused primarily by long-term exposure to irritating or toxic agents in the workplace (mineral and/or organic dusts, smoke, fumes, gases, mists, sprays and vapors). It is possible, however, to develop occupational lung diseases from several or single exposures, the latter usually due to industrial accidents such as chlorine spills.

Smoking can increase the severity of occupational lung diseases. Smokers who also are exposed to cancer-causing agents, such as asbestos (as mentioned earlier) and radiation, greatly increase their chances of developing lung cancer and other lung diseases.

The mechanism through which exposure to air pollution increases the risk of disease and death is not fully understood, but the exposure impacts both the lung and circulatory systems. One study recorded problems with blood vessel widening in healthy men 24 hours after exposure to diesel exhaust. This research built on and supported a similar study that found blood vessel expansion immediately after diesel exhaust exposure. Such research offers insight into the possible connection between lung disease and exposure to air pollution or other occupational hazards.²⁴

Although occupational lung diseases may not be cured, they can be prevented. Improving ventilation, wearing protective equipment, changing work procedures and educating workers about on-the-job hazards are the key factors for prevention.

Who has occupational lung diseases?

According to the U.S. Department of Labor, 4.1 million workplace injuries and illnesses occurred (a rate of 4.4 per 100 workers) in 2006, a decline from 4.2 million in 2005. In 2006, there were about 228,000 newly reported cases of occupational illness in private industry, of which 17,700 involved respiratory conditions. Overall, 1.9 per 10,000 full-time workers developed nonfatal occupational respiratory illnesses in 2006.²⁵

Many schools still regularly use pesticides and others may be affected by pesticide drift from surrounding farms. Both of these factors create the potential for pesticide exposure among students and school staff, which can lead to a range of illnesses. From 1998 to 2002, the incidence rate for pesticide exposure-related illness was 7.4 and 27.3 cases per million children and full-time employees, respectively. The rate greatly increased in children over this time period, from 5.6 per million in 1998 to 7.8 per million in 2002. From 1998 to 2002, there were 2,593 pesticide-related acute illnesses reported; only 3 cases were highly severe (0.1%), while 275 were moderate (11%) and 2315 were classified as low severity (89%). Of the 278 cases deemed moderate or high severity, 135 reported respiratory symptoms associated with their pesticide-related illness. Further research on the impact of exposure, types of chemicals and other factors could lead to improvements in pesticide-use policies.²⁶

Want to learn more about occupational lung diseases? Please view the fact sheet at <http://www.lungusa.org/oldfactsheet>

Certain racial and ethnic groups are traditionally employed in lower-wage sectors of the workforce where they can be exposed to occupational respiratory hazards. They are more likely to be employed in industries such as agriculture, mining (coal, silica), textiles, demolition, manufacturing (asbestos) and service maintenance (cleaning supplies). All of these occupations have been associated with lung disease.

In 2006, Blacks made up 21.7 percent of the nation's 63,000 textile workers. Blacks also account for 18.7 percent of the 2.1 million building cleaners, 6.6 percent of the 9.5 million construction workers and 11.5 percent of the 68,000 agricultural graders and sorters.²⁷

Currently, Hispanics represent 14.5 percent of the total U.S. population but account for 49.5 percent of textile workers, 26.8 percent of building cleaners, 29.3 percent of construction workers and 44.5 percent of agricultural graders and sorters.²⁸

Native Americans have been disproportionately employed in uranium mines. One study found that over the 25-year period following the end of mining for the Navajo Nation, uranium mining was greatly linked to lung cancer among Navajo men in New Mexico and Arizona due to exposure to radon byproducts. When uranium decays, it produces radium; when the radium then decays, it produces radon. Sixty-seven percent of the lung cancers among Navajo men occurred in former uranium miners. The risk of developing lung cancer is over 28 times greater for Navajo miners exposed to uranium than those not exposed. This represents a unique example of how occupational exposure to risk factors accounts for the majority of lung cancer seen in a population.²⁹

Want to learn more about occupational lung diseases in diverse communities? Please view the *State of Lung Disease in Diverse Communities 2007* report at <http://www.lungusa.org/solddc-old>

What are the health impacts of occupational lung diseases?

Occupational lung diseases are a leading cause of lost work productivity. A total of 2,591 work-related respiratory illnesses with days away from work (2.4 per 100,000 workers) occurred in private workplaces in 2000. The highest total for days away from work due to respiratory illnesses was in the service sector (750), though the mining industry had the highest rate at 6.9 per 100,000 workers.³⁰

The direct costs (medical expenses, etc.) of occupational injuries and illnesses are estimated at \$45.8 billion, and indirect costs (lost wages, etc.) may range up to \$229 billion.³¹

According to the U.S. Department of Energy, improving buildings and indoor environments could reduce health care costs and sick leave and increase worker performance, resulting in an estimated productivity gain of \$30 billion to \$150 billion annually. For the United States, the corresponding annual health care savings, plus productivity gains, include:

- \$6 billion to \$19 billion from reduced lung disease,
- \$1 billion to \$4 billion from reduced allergies and asthma,
- \$10 billion to \$20 billion from reduced sick building syndrome symptoms and
- \$12 billion to \$125 billion from direct improvements in worker performance unrelated to health.³²

What is the American Lung Association doing about occupational lung diseases?

The American Lung Association supports researchers studying the causes of and cures for occupational lung diseases.

One such research project is studying proteins that are involved in wound repair in the lungs. Toxins and pollutants are constantly contacting the epithelium, a layer of cells inside the lung that seal out such hazards. Studying how the lungs repair this cell damage will increase understanding of injury response and lung disease prevention.

Want to learn more about research funded by the American Lung Association on occupational lung diseases? Please use the search tool available at **<http://www.lungusa.org/researchawardsnationwide>**

Other researchers supported by the American Lung Association are pursuing a variety of leads (a dozen unique studies) concerning lung cancer treatment, from new drugs to different treatment methods. A laboratory at the University of Iowa is hoping to improve knowledge of treatment for asbestosis and other pulmonary fibrosis diseases by studying the role of certain cells in the development of asbestosis. A host of other studies also are focusing on pulmonary fibrosis and obstructive lung diseases.

Thousands of advocates have joined the American Lung Association to tell Congress that more needs to be done to fight occupational lung diseases. Join us to win the battle against lung disease by visiting <http://lungaction.org>.

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