

FATAL WORK-RELATED ASTHMA

Fortunately death from asthma is infrequent. Of the 86,000 – 87,000 people who die each year in Michigan, approximately 150 are caused by asthma. Despite their relatively infrequent occurrences, deaths from asthma are tragedies made more poignant because they are preventable.

We recently became aware of a work-related asthma death:

A man in his mid-forties was reported to have had asthma for 10 years developed an acute asthmatic attack at work. Normally he had help but on the morning he died he had sent his helper to do something else while he installed a spray-on bed liner in a van. His helper returned 20 minutes later to find the work completed, the equipment turned off and the individual gasping for breath on his knees outside the building. The helper immediately took the individual to an urgent care clinic. The individual collapsed at the door of the urgent care clinic. A nurse at the clinic began CPR. An ambulance arrived nine minutes later. Despite attempted resuscitation and transport to a nearby hospital, he was pronounced dead 46 minutes later. Wheezing was noted on auscultation during bagging. On autopsy, on microscopic examination, he was found to have mucus and eosinophils in his airways and numerous eosinophils in his mucosa. The basement membrane was thickened with hyperplasia of the mucus glands. There were aggregates of pigment laden macrophages in the peribronchial alveoli. He was also noted to have diffuse pan lobular moderate to severe pulmonary emphysema, and diffuse and heavy anthracosis. His heart showed coronary arteriosclerosis, calcification, myocardial hypertrophy and perivascular fibrosis. The medical examiners impression was "Asthmatic reaction due to inhalation of chemicals."

The deceased had a history of allergies. He had never been hospitalized for his asthma. He had had three medical visits in the year prior to his death for: 1) a laceration of his hand; 2) low back pain; and 3) symptoms of shortness of breath and cough. The medical record from that last encounter indicated he inhaled "chemicals" two days prior at work while working with a bed liner and wasn't wearing a breathing pack. He was exposed for ten minutes, and within 10-15 minutes couldn't catch his breath. He received a nebulizer treatment. He was prescribed 40 mg prednisone and antibiotics for seven days, cough syrup with codeine and a Proventil inhaler.

His regular asthma medication consisted only of an albuterol inhaler. He had never had pulmonary function testing. He had smoked two packs of cigarettes per day but was tapering down. The deceased had worked as the manager at a small auto detailing facility which included two employees. The shop did vehicle detailing, rustproofing and spray-on truck bed liners. The deceased was the only individual who did the truck bed lining. After he died, his coworkers mentioned that he had difficulty breathing after previous spray liner applications. The deceased used a positive pressure respirator which supplied fresh air.

The spray for truck bed liners is a two component system of an isocyanate (MDI) and polyol. The components are mixed during the spray process. When mixed, polyurethane is formed which provides abrasion resistance, insulation and a watertight seal to the bed of the truck. The work is performed inside because no moisture can contact the bed liner. Typically this work is performed by small shops. The manufacturer of the product sells safety equipment including respirators and air lines as part of the kit for using the chemical. Potential exposure to the isocyanates would occur during the spraying as well as during the next 10-15 minutes while the liner is curing.

The State of Washington issued a hazard alert in March 2003 on this process after receiving five reports of either new onset asthma or aggravation of existing asthma. In their alert they indicated they were not aware of any fatalities. Sampling results from 13 companies in the state of Washington found that seven facilities had air levels for isocyanate above the OSHA allowable limits.

A Michigan OSHA inspection was conducted after the fatality. The company was cited for: 1) failure to develop and implement a respirator protection program; 2) failure to educate workers about the hazard of the chemicals they work with; 3) failure to have an eyewash station for an alkaline product that was used at the facility (not related to truck bed liners); 4) failure to notify OSHA within eight hours of the death; 5) failure to post an OSHA poster at the workplace; 6) failure to perform the spray activity in a spray room or spray booth; 7) failure to do hazard assessment on what personal protective equipment are needed and to train employees on the use of personal protective equipment. The total proposed penalties were \$1,750.

There have been a limited number of reports of fatal asthma in the literature. Of the ten reports, three have involved isocyanates, two were from bicycloheptadine dibromide in the pharmaceutical industry, one from gum arabic in a printing facility, one from papain powder in a laboratory, one from green coffee dust in a food processor, one from flour in a bakery and one from shark cartilage being ground for the herbal industry. The time from onset of asthma symptoms to death was six months to twenty years for these ten deaths (1).

The particulars of the death in this case suggest that the work exposure aggravated but did not cause his underlying asthma. He had the diagnosis of asthma prior to his beginning to spray truck bed liners with isocyanates. He was not receiving optimal treatment for his asthma. He continued to be exposed to a trigger that aggravated his symptoms and he was not using inhaled corticosteroids. On autopsy he had additional lung disease including emphysema. It is possible that his "asthma," prior to exposure to the isocyanate, was really COPD and he subsequently became sensitized to the isocyanate and developed increased symptoms from isocyanate caused asthma. One historian indicated he had asthma for 10 years, another said he had no breathing problems prior to his last job. He had never had pulmonary function tests to better characterize his lung condition before or after he began working with the isocyanate.

This case illustrates the most severe consequence of a healthcare provider not adequately addressing increased respiratory symptoms associated with work. This death also highlights the dangers to workers of the use of new technology by small employers who do not have the expertise or infrastructure to adequately address health and safety issues.

Reference

1. Ortega HG, Kreiss K, Schill DP, Weissman DN. Fatal Asthma From Powdering Shark Cartilage and Review of Fatal Occupational Asthma Literature. *American Journal of Industrial Medicine* 2002; 42:50-54.

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An abstract of a recent article describing asthma from exposure to cleaning agents in Michigan and three other states.

Cleaning Products and Work-Related Asthma

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To describe the characteristics of individuals with work-related asthma associated with exposure to cleaning products, data from the California, Massachusetts, Michigan, and New Jersey state-based surveillance systems of work-related asthma were used to identify cases of asthma associated with exposure to cleaning products at work. From 1993 to 1997, 236 (12%) of the 1915 confirmed cases of work-related asthma identified by the four states were associated with exposure to cleaning products. Eighty percent of the reports were of new-onset asthma and 20% were work-aggravated asthma. Among the new-onset cases, 22% were consistent with reactive airways dysfunction syndrome. Individuals identified were generally women (75%), white non-Hispanic (68%), and 45 years or older (64%). Their most likely exposure had been in medical settings (39%), schools (13%), or hotels (6%), and they were most likely to work as janitor/cleaners (22%), nurse/nurses' aides (20%), or clerical staff (13%). However, cases were reported with exposure to cleaning products across a wide range of job titles. Cleaning products contain a diverse group of chemicals that are used in a wide range of industries and occupations as well as in the home. Their potential to cause or aggravate asthma has recently been recognized. Further work to characterize the specific agents and the circumstances of their use associated with asthma is needed. Additional research to investigate the frequency of adverse respiratory effects among regular users, such as housekeeping staff, is also needed. In the interim, we recommend attention to adequate ventilation, improved warning labels and Material Safety Data Sheets, and workplace training and education. (J Occup Environ Med. 2003;45:556-563)

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Fatal Work-Related Asthma

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