

ASTHMA MORTALITY

Since 2003, we are aware of 9 deaths from work-related asthma. Table 1 summarizes six of the deaths where the individual died after an acute asthma attack at work. The other 3 individuals died at home from asthma; they had previously been diagnosed with work-related asthma.

Michigan is in a unique position to recognize these asthma deaths. We are the only state with three CDC-funded surveillance projects which allow us to identify and investigate these deaths:

- ✓ Sentinel Event Notification System for Occupational Risks (SENSOR)
- ✓ Fatality Assessment and Control Evaluation (FACE)
- ✓ Asthma Fatality Surveillance

SENSOR has been in existence since 1988. This system tracks all work-related illnesses, with special emphasis on select conditions including asthma. FACE has been in existence since 2000, and tracks all acute traumatic work-related deaths. The Asthma Fatality Surveillance program has been in existence since 2001; it tracks asthma deaths for all ages and all causes of asthma.

We previously reported on a worker who died immediately after the application of a spray-on truck bed liner which contained isocyanates (PS News, Fall 2003 and Chester et al 2005). A second death from isocyanate-induced asthma occurred in late 2005 (report 05MI141 on www.oem.msu.edu, MIFACE). This individual died from exposure to isocyanates despite receiving repeated and ongoing medical care. The employee worked at a facility that made adhesives that contained isocyanates.

Table 2 shows for this second death the timeline of the patient's 18 medical encounters from the time he hired in at the company in December 2001 until his death in 2005. His medical encounters included 4 medical exams provided by the company, 5 urgent care visits, 7 visits to his primary care physician and 2 visits to a pulmonary specialist. He had hired in at the age of 45. He had no personal or family history of allergies or asthma per his family and medical records. He had smoked cigarettes since the age of 16. The results of his FEV₁ from the breathing tests provided by the company are shown in Table 3. At the time of hire (1/2002) his third FEV₁ was normal; two months before his death (October 2005) his FEV₁ had decreased over one

Table 1. Michigan Work-Related Asthma Deaths, Acute Attack at Work

| | | | |
|------|--------------------|----------------------------|---|
| 2003 | 43-year old male | Truck bed liner applicator | Methylene diisocyanate (MDI) (1) |
| 2004 | 19-year old female | Waitress in a bar | Second hand smoke (2) |
| 2004 | 75-year old female | Dairy farmer | Sodium hypochlorite/sodium hydroxide mixture used for tank cleaning mixed with acid |
| 2005 | 50-year old male | Adhesive manufacturer | MDI and Toluene diisocyanate |
| 2007 | 54-year old female | Laundry worker | Bleach |
| 2008 | 55-year old male | Auto parts manufacturer | Metal working fluid |

| 12/01 Began Work | | | |
|-------------------|-------------|--------------|---------------|
| Company Screening | Urgent Care | Primary Care | Pulmonologist |
| 01/02 | | | |
| | 07/02 | | |
| 09/02 | | | |
| | 12/02 | | |
| | 04/03 | | |
| | | 05/03 | |
| | 07/03 | 07/03 | |
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| 10/04 | | | |
| | | 11/04 | |
| | | 08/05 | |
| | | | 09/05 |
| | | | 10/05 |
| 12/05 DIED | | | |

following in the patient's chart:

"trouble with dyspnea from bronchospasm from occupational exposure to lung irritants. This has been going on for some time. He has been on prednisone, averaging one taper per month. It seems that is not the best route to go long term. He is considering leaving his work but if he leaves voluntarily on his own he loses his severance pay, so he is wondering if there is any medical reason for leaving his job, as this might help him to retain his severance. I recommend that we have him see a pulmonologist for further evaluation at this point."

The patient had two visits with the pulmonologist. The pulmonologist documented the patient had hyperreactivity with a 12% improvement in his FEV₁ with a bronchodilator. He had no evidence of COPD with a normal diffusing capacity and the absence of air trapping on lung volumes. At his second visit the pulmonologist wrote:

*"I do think that it is going to become necessary for them to try and minimize his exposure to isocyanates, since I do feel that he is most likely having flare from his work environment. Certainly, if they cannot do this, then we will proceed down the road to spirometry before work and spirometry after work to document changes in his flows and proceed down the road if becomes necessary."
"Return in 2 months time for clinical re-evaluation and spirometry."*

| Date | FEV ₁ | Pred | % Predicted |
|----------------|------------------|------|-------------|
| January 2002 | 3.75 L | 3.94 | 95 |
| September 2002 | 3.60 L | 3.77 | 96 |
| October 2003 | 3.27 L | 3.74 | 87 |
| October 2004 | 2.58 L | 3.54 | 73 |

liter (Table 3).

This employee first sought medical care at an Urgent Care Facility 6 months after beginning work. The impression from that encounter was "acute bronchitis with mild bronchospasm." On subsequent visits to the Urgent Care Facility his symptoms were noted to occur at work. After the care visit he was referred to a primary care doctor. The primary care doctor diagnosed him with asthma and prescribed Advair. On subsequent visits the primary care doctor noted: "was exposed to chemical at work again" and "exposed to isocyanate." The primary care doctor referred him to a pulmonologist in August of 2005 when the primary care doctor recorded the

The patient collapsed at work and died prior to the scheduled third visit. He died in the hospital after never regaining consciousness. An autopsy ruled out an acute myocardial infarction, pulmonary emboli, stroke or acute rupture of an organ. His pulmonary finding showed chronic changes of asthma.

The records of the company doctor, a family practitioner who provided occupational health services to the company noted the patient was under care for asthma in his 10/2003 encounter and in his 10/2004 encounter that the patient had

abnormal spirometry. The medical note from the 10/2004 encounter urged the patient to stop smoking cigarettes. There were no notes in the chart that the company doctor gave any consideration to a medical restriction regarding exposure to isocyanates.

Review of the family practitioner's records for 18 of the 20 workers at this facility was performed. Five other workers had changes that suggested the need for medical follow-up: 3 had abnormal spirometry; one had significant loss of FEV₁ over time; and one had been diagnosed with asthma requiring increasing medication. The medical surveillance provided by the family practitioner did not include any questions about respiratory symptoms but only a history of medical diagnoses. Questionnaires were administered by our FACE program to 14 of the workers, one worker experienced daily chest tightness at work. Only one of the 14 workers who completed a questionnaire was among the 5 workers whose medical records were reviewed.

Any one of the three doctors could have prevented this patient's death by writing a medical restriction that the patient must be removed from exposure to isocyanates. Removal from exposure to the agent causing work-related asthma is the primary recommended treatment for patients with work-related asthma (3). Those removed soon after onset of symptoms are the individuals who have the best prognosis and are the most likely to have cessation of their asthma and reduction or elimination of their medication.

Recommendations made to the company included:

- ✓ Companies using isocyanates need to provide medical surveillance performed by a doctor knowledgeable in how to diagnose and manage isocyanate-induced asthma.
- ✓ Results of medical screening need to be integrated into management decisions regarding health and safety, and job assignments.

Although the company and company doctor had direct responsibility for the deceased's isocyanate exposure, an important part of managing asthma for all health care providers is the elimination of asthma triggers. Although the primary care doctor recognized the relationship with work he

did not initiate limiting the patient's exposure but rather waited until the patient requested a medical restriction. The primary care doctor then did not feel comfortable providing such a restriction and referred the patient to a pulmonologist. Again the pulmonologist recognized the association. The pulmonologist, however, did not act quickly enough to prevent the patient's death.

Fortunately asthma deaths are rare, approximately 120 per year in Michigan. However, many practitioners fail to address the management of the patient's asthma triggers, and this failure also contributes to increased morbidity from asthma.

★ An excellent review on diagnosing and managing ★
★ work-related asthma was recently published: ★
★ Glazer CS, Pachecco K. Making the Diagnosis of ★
★ Occupational Asthma: When to Suspect it and ★
★ What to Do. Primary Care Clinical Office Practice ★
★ 2008; 35:61-80. ★
★ ★
★ Our web site, www.oem.msu.edu has previous ★
★ copies of our quarterly newsletter, the PS News. ★
★ The Spring 2007 issue Volume 18 (2) and the Fall ★
★ 2005 issue Volume 16 (4) are particularly relevant ★
★ to the diagnosis and management of work-related ★
★ asthma. ★
★ ★
★ Ken Rosenman, M.D. remains available at 1-800- ★
★ 446-7805 if you wish to discuss an individual pa- ★
★ tient. ★
★

References

1. Chester DA, Hanna EA, Pickelman BG, Rosenman KD. Asthma Death after Spraying Polyurethane Truck Bedliners. American Journal of Industrial Medicine 2005; 48:78-84.
2. Stanbury M, Chester D, Hanna EA, Rosenman, KD. How Many Deaths will it Take? A Death from Asthma Associated with Work-Related Tobacco Smoke. American Journal Industrial Environmental Medicine 2008; 51:111-116.
3. Nicholson P, Cullinan P, Newman-Taylor AJ, Burge PS. Evidence Based Guidelines for the Prevention, Identification and Management of Occupational Asthma. Occupational Environmental Medicine 2005; 62:290-299.

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News

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