

The Occupational Health Clinical Centers are part of the New York State's network of such clinics; we are housed in the State University of New York (SUNY) Upstate Medical University. Our mission is to accurately diagnose diseases caused by occupational and environmental hazards. We also bring attention to preventable diseases through education and other interventions.

The main focus of our comments is on the use of MDI as a spray foam insulation material. We do this in a green chemistry framework that is integral to the practice of occupational health.

Over the past several years, we have seen home owners and installation workers who became ill due to the use of MDI spray foam insulation projects. A summary of these cases is in Appendix 1.

It's been known for more than 30 years that the key ingredients of spray foam --isocyanate-based chemical systems -- cause breathing problems. The major health hazard of concern is asthma. Some individuals become sensitized and react to extremely low levels of isocyanates. Asthma can be a very disabling -- and sometimes fatal -- disease. Skin, eye, and lung irritation has also been reported in workers using isocyanate foams.

The Clinic's hygienist and outreach/education director (also a hygienist) presented some of this information at a recent green building New York State conference in Syracuse. Our presentation included discussion of "the real world experience with spray foam products". Points made included:

- ❑ more than 90 percent of in-the-field exposure measurements in Vermont and Massachusetts (done by state OSHA consultation hygiene staff) were above the relevant occupational exposure limits (OELs);
- ❑ there is routine failure to provide adequate worker protections on the job (ventilation, skin and breathing protection, and lack of training);
- ❑ building occupants are reacting to these products as well; and
- ❑ application variables such as thickness, temperature and humidity are crucial.

We also noted that historic measurements are most likely under-estimates because of sampling techniques, and there are serious challenges to collect samples that represent true exposures. Meanwhile, when OELs are used:

- ❑ only a few isocyanates have OELs/PELs (eg TDI, MDI)
- ❑ isocyanate OELs are among the lowest set by OSHA and NIOSH
 - OSHA: 0.02 ppm ceiling (MDI)
 - NIOSH: 0.005 ppm, 0.02 ppm ceiling (MDI)
- ❑ California's OEHHA recommends for MDI:
 - acute reference level: 0.0012 ppm
 - 8-hour reference level: 0.000015 ppm

- chronic reference level: 0.000008 ppm
- for comparison, formaldehyde:
 - OSHA: 0.75ppm, 2ppm STEL
- even these extremely low OELs do not protect sensitized people

Factors that contributed to the effects seen in our case examples include:

- possible improper application of the foam;
- inadequate respiratory protection and ventilation for workers;
- spray foaming when the building was occupied;
- re-occupying too soon (estimated at 23-72 hours but there is little evidence to support current recommendations); and
- lack of warning about the health hazards of spray foam insulation for the home owners and workers.

In addition to the adverse health effects reported by our patients, we also are greatly concerned about the loss of employment and permanent disability for the installation workers and the inability of others to occupy their homes. Thus it is not surprising that in Canada, with similar building conditions to the United States, the government has made MDI and some related substances priorities for assessment of hazards to the environment and human health (see <http://www.chemicalsubstanceschimiques.gc.ca/fact---fait/glance---bref/diisocyanate---eng.php>).

We are not the only occupational health professionals concerned about the use of MDI in spray foam products. Dr. Ken Rosenman of Michigan State University, who has a particular interest in pulmonary disease, joined others to oppose the Green Seal organization allowing isocyanate-containing spray foam products to have its third-party certification. To paraphrase him:

.. insulation workers, firefighters, employers and home residents will pay the price if Green Seal certifies products containing MDI and other toxic chemicals. This standard is an opportunity to push for the development of less toxic building materials, to go beyond the current situation. The small unventilated spaces in which foam insulation is applied present a serious challenge to implement engineering controls and PPE – a challenge better met through informed substitution. Otherwise, you leave small and large businesses, workers they employ, and all who inhabit or work in spaces where insulation is applied, to grapple with environments that are much less healthy and safe than they could and should be.

Sincerely

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***OHCC experiences with
isocyanate foam insulation episodes
as of December, 2016***

Case #1 (Home owner D):

Patient presented on 5/13/13 with respiratory symptoms which developed following isocyanate spray foaming insulation installed in the basement of her home (two months prior to this visit). She was physically in the basement moving boxes while the crew was spraying foam on the walls of the basement which lasted about 5 hours. No ventilation or respiratory protection was used by the crew during this work.

That evening she noted strong “fumes” in the house and started coughing excessively; after calling 911 the fire department responded. The fire department advised her to open the windows and stay out of the home for a few days.

She continued with coughing spasms while out of the house. She returned to the house the next day and experienced throat irritation, coughing and burning eyes.

She stayed away from the home for several days, and then returned to live with windows and doors open. Her eye irritation, shortness of breath, and cough continued, as well as the strong smell in the house.

The pulmonologist diagnoses her with isocyanate-induced asthma. Several months after the foaming work, she continues to have throat irritation, congestion, heightened sense of smell, chest tightness, and SOB. Her diagnosis is: reactive airways; upper and lower airway irritation; asthma exacerbation.

Approximately one year after foam insulation work, she was homeless for a period of time (living in her car) because she could not occupy her home; she now has found alternative housing. She continues to struggle with asthma, throat tightness, breathing difficulty which is triggered by some odors (e.g., nail polish, gasoline vapours).

Environmental testing for MDI monomer and oligomer found levels below detection limits in the home six months after the foam insulation work.

Issues: Isocyanate spray foaming without adequate precautions for workers and occupant; occupied home during installation; residual health effects years after foam installation in the home owner; unable to occupy home, the home owner was homeless for a period of time; disruption of day-to-day life.

CASE #2 (Home owner JF):

Patient presented on 10/28/14 for symptoms (burning eyes and lungs, GI upset, hoarse voice, mouth and tongue tingling, sinus congestion) following exposure to isocyanate spray foam insulation work in her home. Two other occupants also developed symptoms.

Installation of foam took place in April 2014, in the basement areas of the home. She occupied the home during this work, which lasted a full day. Contractor told her to open windows due to strong odors in the home and that the odor would dissipate. She occupied the house during the day for the following three weeks.

Company inspector claimed nothing was wrong with the installation. The contractor added a temporary fan to ventilate the basement. She is unable to live in home and, when visiting, symptoms such as headache, and voice trouble occur.

On-going symptoms include dry cough, lips, tongue, and eyes burn, with vision problems. She is also reacting to general odors in her day-to-day activities, with headache and cough (e.g., to diesel exhaust).

Unable to occupy her home, she is currently attempting to sell the house.

Issues: Isocyanate spray foaming without adequate precautions for occupant and perhaps for the work crew; occupied home during installation of foam; developed adverse health effects subsequent to foaming work; unable to occupied home and continues to have symptoms.

CASE #3 [Home owner JR and family (3 people)]:

Group of three family members presented in October, 2011 with symptoms (watery eyes, sore throat, tight chest, nasal congestion, headaches, dry mouth, raspy voice, and cold sweats) following installation of isocyanate foam insulation in their home.

The insulation material did not cure properly and continued to release chemical odors. which caused adverse health reactions in family members when they entered the home. Family members were not in the home

during installation work; however, they returned within hours after it was completed.

Several inspections found the foam was incorrectly applied (too thick). The contractor removed it with temporary air ventilation added to remove chemical odors.

Although the foam was removed, family members are unable to occupy the home and have found alternative housing. Several family members continue to have symptoms outside the home such as in stores, near wood and from tobacco smoke. These symptoms include sore throat, eye irritation, nasal congestion, severe headaches, and raspy voice.

Issues: Isocyanate spray foaming without adequate precautions for occupant and perhaps for work crew; re-occupied home within hours of completion of foam installation; installed foam not properly installed; developed adverse health effects subsequent to foaming work; unable to occupy home and continues to have symptoms which are being triggered by day-to-day chemical exposures.

CASE# 4: (Spray foaming worker ES):

Patient presented in March, 2015 with progressive shortness of breath over the last five years. Additional symptoms included cough, decreased sense of smell, memory problems, skin irritation, headaches, and sleep disturbance.

He has a work history significant for exposures to isocyanate spray foam insulation while working for a home energy contractor. Initially, he did spray foaming work for a year in all areas of buildings (basements, attics, crawl spaces), often in confined spaces with no ventilation, no personal protective equipment (PPE), and no training. During this time he would experience sudden-onset headaches, chest tightness, short of breath, cognitive effects, and fatigue. A co-worker also had similar health effects. A half mask respirator given to him was not effective.

As he continued working with spray foam operations, he developed severe headaches lasting several days. After an acute event of dizziness, shortness of breath, and chest tightness, he notified his supervisor.

In August, 2013 he received training and eventually was provided with an air supply respirator, ventilation fans, and other PPE. After working six years in spray foaming work, he was laid off and has not returned to this employment. Headaches are improving but the shortness of breath continues, as well as a decreased sense of smell. He was referred to a pulmonologist for his asthma /asthma-like symptoms.

Issues: Isocyanate spray foaming without adequate precautions (e.g., ventilation, training, and adequate respiratory protection for work crew); patient developed adverse health effects subsequent to foaming work with on-going skin and breathing problems, even after removal from this line of work.

CASE #5: (Spray foaming worker DD):

Patient presented in March, 2014 with shortness of breath which developed several years earlier. He was diagnosed with adult onset asthma by his treating pulmonologist. He was referred by his primary care provider to determine if his asthma was caused by his work.

His work history is significant for spray foaming insulation work for 2 ½ years. This work involved spraying isocyanate foam insulation in confined spaces such as attics and crawl spaces. He also spray foamed newly constructed buildings.

After one year of this work he developed a productive cough which progressed to a consistent morning “hacking” cough, and followed by coughing throughout the day. Chemical exposures at work resulted in significant coughing episodes. Other symptoms included eye irritation and chest tightness after working with foaming materials.

He received some training on foaming operations but was limited on health effects of isocyanate foaming. He did have a chemical cartridge half mask respirator that was fit tested, but it often slipped off due to work activities and sweating. The cartridge use was for one day of work, which he felt was inadequate. Supplied air respirators were eventually provided. Other PPE included eye protection, overall suits, and gloves.

Patient has left employment in this sector.

Issues: Isocyanate spray foaming without adequate precautions such as ventilation equipment, training, and adequate respiratory protection for the work crew. This patient developed occupational asthma subsequent to foaming work with on-going breathing problems even after removal from this line of work.

CASE #6: (Home owner JC):

Patient presented in December, 2016 with breathing problems related to recent spray foam insulation work in a newly-built addition to his home. His symptoms included chest tightness, burning sensation, and congested throat immediately after spraying had begun.

Symptoms that continued after two months after the foam installation project include chest tightness, cough, and shortness of breath, with fatigue. He also is intolerant of odors such as vehicle exhaust, perfumes, scents, reacting with chest tightness.

The spray foam insulation used a MDI system on the rim joist of the existing home and the walls of the new addition. The patient was in the work zone during the spraying to facilitate the work and inspect the operations. The patient may have had skin contact with partially cured foam during clean-up while foaming was taking place. An odor was present, even with windows open (no forced air ventilation was used during the spray foaming work).

Isolation of the sprayed areas from the existing living areas was recommended with consideration of removing the insulation. Contractor and foam insulation material supplier are not responsive to his concerns.

Issues: Isocyanate spray foaming without adequate precautions for occupant and perhaps for work crew; occupied home during foam installation work; installed foam not properly installed; developed adverse health effects subsequent to foaming work; continues to have symptoms which are being triggered by day-to-day chemical exposures; resolution process continues.