



Chemical reaction



By Carey Tarr

A silent killer could be lurking in such common construction materials as paints, spray foams, and floor finishings.

When a 43-year-old, self-employed car painter died en route to hospital, a chemical analysis confirmed the presence of isocyanates in the paint he was using.

Although the case – first released by the West-Virginia based National Institute for Occupational Safety and Health (NIOSH) – is more than 20 years old, it reveals the car painter was previously diagnosed with occupational asthma induced by isocyanates. The worker had been advised to change his job or avoid the use of polyurethane paints, which contain isocyanates. But he continued to work as a car painter, and thereby expose himself to deadly toxins.

While polyurethane products are widely used for their durability, awareness about the presence of isocyanates, and the ill health effects associated with long-term exposure, has been slow to develop.

Grant McMillan, president of the Council of Construction Associations, says that materials containing isocyanates are commonly used in the construction industry – and can be used safely with appropriate controls – but word is only beginning to spread about the ways employers can reduce the rate of exposure for their workers.

“Occupational hygiene issues have tended to receive less attention than occupational injuries,” McMillan says. “They rarely make headlines, unlike a story, say, about a crane collapsing.”

WorkSafeBC occupational hygiene officer Jeff Pasternak notes that polyurethanes were developed as part of a process to replace the shortage of natural rubber during World War II. They’re now used extensively in the manufacturing of many common household and commercial products, many of which are then used in the construction industry, including paints, spandex fibers, chemicals, insulation materials, and surface coatings, as well as furniture, clothes, and adhesives.

“They stand up well to harsh environments, Pasternak says. “Polyurethanes make a really good product. On the flip side,

◀ **Spray foam installer Justin Bagnell of Greer Spray Foam prepares to safely spray polycarbonate insulation on an exterior wall.**

they're hazardous to workers."

Isocyanates are the essential raw materials that make up polyurethane products. These reactive chemicals are considered hazardous products by WHMIS (Workplace Hazardous Materials Information System) standards.

In the short term, isocyanates are irritants to the skin and respiratory system, causing coughing, chest pain, difficulty breathing, and irritation or burns to the eyes, nose, and throat.

In the long term, isocyanates are sensitizers. Health Canada describes sensitizers as materials that can cause severe skin and respiratory responses after minimal exposure. Exposure over time can produce significant health effects, including inflammation of the skin, or asthma in a sensitized worker.

"When a person becomes sensitized, the condition is irreversible," Pasternak says.

After a sensitized worker is permanently removed from exposure to isocyanates, asthma may persist, and any exposure may cause asthma attacks. Symptoms may develop immediately, or after several hours of exposure.

According to WorkSafeBC senior occupational hygienist Geoff Clark, an estimated one in 20 people who work with isocyanates will become sensitized to these compounds over time. What's more, isocyanate exposure has been linked to cancer in animals.

Because of the severity of these toxins, occupational exposure limits for isocyanates are very low. The allowable exposure limit in B.C. is an eight-hour, time-weighted average (TWA) of 0.005 parts per million (ppm) and a ceiling value (not to be exceeded) of 0.01 ppm.

"We're trying to prevent these exposures in the first place," Pasternak says. "The concern we have as a compensation board is we want to prevent workers from becoming sensitized to isocyanates."

Three steps to controlling exposure

Pasternak says a hierarchy exists when it comes to controlling worker exposure to isocyanates.

1. **Avoid exposure.** Whenever possible, substitute isocyanate-containing products for those that do not contain isocyanates.

When using products that might contain isocyanates, review Material Safety Data Sheets for ingredients

containing the words isocyanate or diisocyanate. The abbreviations of some commonly used isocyanates are TDI, MDI, HDI, and IPDI. Isocyanates may be in the form of monomers, oligomers, prepolymers, or polymers.

The best line of defence is to avoid exposure completely, so substitution is the first step when considering exposure control.

If isocyanates must be used, Clark says some isocyanates are better than others in terms of worker safety. For example, MDI is better than TDI, since MDI has a lower vapour pressure and will not vaporize as easily as TDI when it is applied.

Continued on page 28

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Plant growth

For Wilchewski, that means he can spend his time working on special cases, sharing the subsequent insights with management, and then bringing the lessons learned from those cases to the health and safety committee.

On an average day, staff members arrive at work, meet with their group to discuss the day's activities, and work through a safe plan of action for each of those activities. "We have standardized safety procedures we review regularly, and we're in constant communication at all times," Wilchewski says. "If we spot any potential, unforeseen dangers, work is stopped immediately and those hazards are reviewed."

Plant manager puts safety at the forefront

Doug Rosenlund, Teamsters Local 213 representative at the plant, says Armoogum's respect for others plays a major role in his managerial success.

"Horace is a people-person who takes time to make you feel welcome, and it's difficult not to participate in a program he's passionate about."

Tom Day, vice-president of Suncor's Edmonton refinery, says he watched and encouraged Armoogum as he implemented his safety initiatives over the past eight years. "Horace had a vision on safety, and he walks the walk and talks the talk –

putting words into action."

The injury-free decade at Burrard Products Terminal has certainly meant cost savings for Suncor, but the financial implications are a lower priority for Armoogum.

"Our focus is on people not getting hurt," he says. "At the same time, we recognize that financial benefits follow a strong safety culture."



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2. Engineering Controls. Once workers at risk have been identified, you're required to put a number of control measures in place, including a combination of engineering controls and personal protective equipment.

In B.C., workers must use air-supplied respirators while spraying products containing isocyanates. Be sure you have the appropriate ventilation system, spill control supplies, and an emergency eyewash station to prevent unwanted exposure or to deal with accidents.

3. Exposure Control Plan. If you're using isocyanates in the workplace, make sure you have an exposure control plan (ECP), according to section 5.54 of the Occupational Health and Safety Regulation (OHSR). The ECP should include the following elements:

- a statement of purpose and responsibilities
- risk identification, assessment, and control
- education and training
- written work procedures
- hygiene facilities and decontamination procedures
- health monitoring
- documentation

Visit WorkSafeBC.com or check out the OHSR for further details on supplying the best ECP for your workplace.

Who's at risk?

Workers in most industries are at risk of exposure to isocyanates, especially those in construction and manufacturing, including:

- painting
- automotives
- foam-blowing
- manufacturing of polyurethane products, such as chemicals, polyurethane foam, insulation materials, surface coatings, car seats, tires, furniture, foam mattresses, under-carpet padding, packaging materials, shoes, laminated fabrics, polyurethane rubber, and adhesives.

