

Invited Commentary

Deaths From Methylene Chloride Exposure When Chemicals Used at Home or Work Can Kill

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Methylene chloride (dichloromethane) is used in chemical manufacturing, as a solvent in various products, and as the active ingredient in paint-removing products. Exposure via inhalation or skin contact to as little as a tablespoon of methylene chloride can kill a person (US Environmental Protection Agency; <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/final-risk-evaluation-methylene-chloride>). In 2012, the European Union banned consumer paint-stripping products containing methylene chloride (<https://www.hse.gov.uk/aboutus/europe/euronews/dossiers/dichloromethane.htm>). So how are products containing 80% to 90% methylene chloride still allowed to be sold to consumers in the United States and to be used by workers?

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In this issue of *JAMA Internal Medicine*, Hoang and colleagues¹ report a large case series of deaths from methylene chloride exposure in the US. Their study establishes the adverse consequence of allowing the chemical's widespread use and the limitations of our public health system in identifying and preventing the hazard. Even after the risks of methylene chloride were recognized, shortcomings in the framework to regulate consumer products and workplace exposures have impeded actions to prevent injuries and deaths.

To assemble the series of 85 fatal cases from 1980 to 2018, Hoang and colleagues¹ had to rely on 10 data sources. Of the deaths, 66 were identified by governmental regulatory agencies; other major sources included newspaper articles and a compendium of legal cases. A major limitation recognized by the authors was that the case series probably undercounted the actual number of deaths. For all public health activity, surveillance data are essential to identify and target prevention, including chemical exposure-related conditions. Systems in the US to track consumer and work-related chemical illnesses are inadequate and underfunded.

The US Consumer Product Safety Commission (CPSC) regulates chemicals in consumer products. The CPSC does not encourage clinicians to report injuries or illnesses that occur from consumer products; indeed, the commission's website only allows consumers or businesses to report.^{2,3} Not until 2018, 6 years after the first report of 13 deaths following the use of methylene chloride-containing products to refinish bathtubs,⁴ did the CPSC recommend (not require) that manufacturers change product labels to indicate that inhalation of the vapor can kill and that these products should not be used in enclosed spaces, such as bathrooms, basements, or closets. Despite having the legal authority, the CPSC took no action to ban methylene chloride from consumer products.

In 2019, 7 years after the first report, the US Environmental Protection Agency (EPA) prohibited all retailers, including e-retailers, from distributing or selling any paint and coating

removal products that contained methylene chloride to consumers, but it allowed their continued use commercially by independent contractors and employees.⁵ The EPA action occurred only after all of the major retailers in the country had already withdrawn all methylene chloride-containing paint and coating removal products from sale in response to an effective effort led by Safer Chemicals, Healthy Families called the Mind the Store campaign.⁶ One aspect of this campaign was to hold press conferences featuring family members of individuals who had died after using these products. The Occupational Safety and Health Administration (OSHA) has not tightened the regulations on their use, and independent contractors and workers continue to be at risk of death when working with them.

Similar to the CPSC, the EPA does not encourage clinicians to report deaths or illnesses that occur from chemicals; the agency's website only discusses how companies should report adverse effects of chemicals.⁷ The best source for counts of nonfatal chemical injuries in the US is the number of calls to poison control centers; there were 37 201 calls about paint-stripping products from 1985 to 2017.⁸ The counts are likely incomplete, and the information compiled does not provide sufficient detail to develop strategies to reduce risk.

Of the 85 deaths in the case series by Hoang and colleagues,¹ 74 (87%) were following workplace exposure to methylene chloride products. In 1987, a National Academies of Sciences (NAS) report systematically identified deficits in the US system to count work-related injuries and illnesses.⁹ Although improvements were made, particularly related to the identification of acute traumatic fatalities, there was less progress in improving the surveillance of nonfatal work-related injuries and even less progress in improving the surveillance of both fatal and nonfatal work-related illnesses.

In 2018, another NAS report¹⁰ comprehensively described the deficits in the US work-related injury and illness surveillance system, summarized the systems in other countries, and proposed guiding principles for an ideal system. The report made many recommendations to the National Institute for Occupational Safety and Health (NIOSH), the US Bureau of Labor Statistics (BLS), and OSHA to improve the US system. The report strongly recommended the integration of state programs into an overall national plan. However, during the Trump administration, both BLS and OSHA paid little attention to the report. Although NIOSH prepared some initial plans, nothing was completed in the absence of cooperation from BLS and OSHA.

How can physicians who do not practice occupational or environmental medicine and who are not involved in public health policy contribute to the prevention of diseases related to exposure to chemicals? Any improvement in tracking systems to identify the adverse health effects of chemical expo-

sure starts with the recognition and documentation of chemical-related injuries and illnesses. Methylene chloride is volatile, heavier than air, and can have a toxic effect at levels below its odor threshold. It is rapidly absorbed in the lungs and through the skin. Because the chemical is a powerful central nervous system depressant, all of these properties are particularly dangerous.

Labels and safety data sheets on methylene chloride-containing products, which product users and clinicians may consult first when assessing potential hazards, have been inadequate, only warning that inhalation may cause dizziness, headache, or nausea and that contact may cause skin irritation. To address deficiencies in labels and safety data sheets, physicians can consult with their state poison control center or a specialist in occupational or environmental medicine.

Although clinicians understandably focus on treatment, basic information about where and what has occurred may be missing from the medical record, even for amputations, burns, and other acute injuries. The documentation of an exposure history is often even sketchier for chronic illnesses such as cancer or chronic obstructive pulmonary disease. Given the limited time for an office visit, the importance of medical records, including death certificates, to guide epidemiological analyses and interventions may be overlooked. A physician's responsibility to the community starts with ensuring that the collection and recording of key history components, including occupation, industry, location of exposure at work or home,

and when possible, the name or brand name of the product. The next step is reporting to public health authorities, including for injuries and illnesses that are potentially related to chemical exposures. Furthermore, NIOSH funds surveillance programs in 26 states, and it was a NIOSH-funded program that identified the initial case series of methylene chloride-related deaths.⁴ Practices and clinics that have been the most successful in complying with public health-reporting laws have a system where the clinician indicates that the case should be reported and a staff member submits the report.

The ongoing saga of deaths from methylene chloride highlights the deficiencies in the current approach to recognizing and regulating chemical-related hazards. The Biden administration has the opportunity to improve the systems. Important steps include (1) implementation of the 2018 NAS recommendations¹⁰ for identifying and following up on work-related injuries and illnesses; (2) improvements in how both the CPSC and the EPA identify health effects from chemicals; (3) implementation by the EPA of the 2016 Amendments to the Toxic Substances Control Act to further restrict the use of methylene chloride based on its completed risk evaluation; (4) a change from CPSC's voluntary approach to chemicals in consumer products, for which there are multiple examples of noncompliance, to use of the commission's regulatory authority to eliminate or reduce unacceptable hazards; and (5) a comprehensive approach by OSHA to update workplace regulations, including those for methylene chloride.

ARTICLE INFORMATION

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