

Lead and Methylene Chloride Exposures Among Automotive Repair Technicians

Richard T. Enander,¹ Howard J. Cohen,² David M. Gute,³ Linfield C. Brown,³ Anne Marie C. Desmaris,³ and Richard Missaghian⁴

¹Rhode Island Department of Environmental Management, Pollution Prevention Program, Providence, Rhode Island

²University of New Haven, School of Public Safety and Professional Studies, West Haven, Connecticut

³Tufts University, Department of Civil and Environmental Engineering, Medford, Massachusetts

⁴University of Rhode Island, Department of Chemical Engineering, Kingston, Rhode Island

Abstract

Potential exposures among repair technicians engaged in vehicle resurfacing operations prior to spray painting have not been thoroughly characterized. Environmental and personal air monitoring conducted in the State of Rhode Island have shown that automotive repair technicians may be exposed to metal particulates in sanding dust and methylene chloride vapors during vehicle paint removal operations. Hand wipe samples demonstrated that metals in sanding dust adhered to the hands of workers throughout the duration of the work day and were available for incidental ingestion from the handling of food/nonfood items and hand-to-mouth contact. A blood lead (PbB) screening effort among 21 workers at 2 facilities showed that 4 non-/less-exposed workers had mean PbB levels at the U.S. geometric mean of 2.8 µg/dL, while 2 out of 9 (22%) dedicated vehicle repair technicians had PbB levels at or above 30 µg Pb/dL whole blood—the level for potential adverse reproductive effects. Methylene chloride exposures were also found to exceed the Occupational Safety and Health Administrations (OSHA) 8-hr time-weighted average (TWA) action level and permissible exposure limit (PEL) in a limited number of samples (120 and 26 ppm, integrated work shift samples). Our findings suggest that thousands of professional technicians and vocational high school students may be at increased risk of adverse reproductive and/or other systemic effects.

Journal of Occupational and Environmental Hygiene, 1: 119–125

ISSN: 1545-9624 print /1545-9632 online

Copyright 2004 JOEH, LLC

DOI: 10.1080/15459620490275911

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE

Am. J. Ind. Med. 44:312-320, 2003. © 2003 Wiley-Liss, Inc.

Commentary

The Concordance of Pollution Prevention and Occupational Health and Safety: A Perspective on U.S. Policy

Richard T. Enander, PhD¹ David M. Gute, PhD, MPH,² and Howard J. Cohen, PhD, CIH³

¹Rhode Island Department of Environmental Management, Providence, Rhode Island

²Department of Civil and Environmental Engineering, Tufts University, Medford, Massachusetts

³School of Public Safety and Professional Studies, University of New Haven, West Haven, Connecticut

Correspondence to: Richard T. Enander, Rhode Island Department of Environmental Management, 235 Promenade Street (Suite 250), Providence, Rhode Island 02908-5767.

E-mail: renander@dem.state.ri.us

Background

Occupational health and pollution prevention, although conceptually linked by the common goals of preventing exposure to toxic materials and lowering risk functions, have been largely confined to separate patterns of practice and professional development. Some analysts see this as a missed opportunity for synergy and raising the level of protection afforded to both the worker and the ambient environment. By using current specific examples we show how

strategies that integrate pollution prevention and occupational health practices can be effective at reducing chemical exposures and environmental releases beyond the levels normally achieved using traditional methods alone.

Methods

Similarities in approaches to addressing chemical hazards at the source, are analyzed in the context of U.S. policy and recent state and federal initiatives. Results obtained from the analysis of multi-pathway risks found within the automotive refinishing sector serve as examples of how best to select engineering and control strategies.

Results

Industry survey, metal speciation, and methylene chloride usage data from studies conducted in Rhode Island, coupled with case reports from other settings, demonstrate that opportunities exist to concurrently mitigate multiple environmental and occupational health hazards.

Conclusions

The collaborative initiatives undertaken in the automotive refinishing industry sector demonstrate that an integrated environmental and occupational health approach can more effectively address multiple chemical releases and workplace exposures. Such synergy should be advanced in the future by similar integrative and collaborative strategies.

We have a policy in the United States, when something is found to cause disease, we almost never ban it. We say it will be subject to control. We opt for control but we fail to put in place effective measures for control.

Irving J. Selikoff, MD

FN: Environmental Defense Fund Interview
Vol., XIX 1988 Newsletter

Accepted 12 May 2003

DOI10.1002/ajim.10261. Published online in Wiley InterScience
(www.interscience.wiley.com)

Chemical Characterization of Sanding Dust and Methylene Chloride Usage in Automotive Refinishing: Implications for Occupational and Environmental Health

Richard T. Enander,^a David M. Gute,^b Howard J. Cohen,^c Linfield C. Brown,^b Anne Marie C. Desmaris,^b and Richard Missaghian^d

^a Rhode Island Department of Environmental Management, Office of Technical and Customer Assistance, Pollution Prevention Program, 235 Promenade St., Providence, RI 02908-5767; E-mail: renander@dem.state.ri.us; ^bTufts University, Department of Civil and Environmental Engineering, Medford, MA 02155; ^cUniversity of New Haven, School of Public Safety and Professional Studies, West Haven, CT 06516; ^dUniversity of Rhode Island, Department of Chemical Engineering, Crawford Hall, Kingston, RI 02881

Abstract

Surface preparation activities conducted during automotive refinishing present several potential human health and environmental risks. This study examines the chemical composition of vehicle sanding dust and the prevalence of methylene chloride use as a basis for evaluating potential chemical exposures in the work environment, fugitive environmental releases, and take-home toxics. This article reports on the findings of (1) a statewide technology and work practices survey of 353 licensed auto body shops and (2) laboratory analyses of sanding dust representing

more than 200 vehicles, 10 commercial body filler compounds, and work shirts worn during vehicle sanding while using nonventilated equipment. Survey data revealed that the majority of shops (78%) do not use ventilated sanding equipment, that most workers (55%) take their work clothes and shoes home at the end of the workday, and that 17% of the respondents used a methylene chloride-based paint stripper as an adjunct to mechanical sanding. Laboratory results showed that Pb, As, Cr, Mn, and Ni were present in the sanding dust at every facility tested. Lead concentrations in sanding dust were found to be highest at facilities that performed complete vehicle refinishing (range 770 to 7300 ppm) and at a collision repair shop that used a high-lead content body filler compound (1800 ppm). Hexavalent chromium also was found in two vocational high school paint dust samples at concentrations of 54 and 710 ppm. When total lead and chromium concentrations reached 7300 and 2300 ppm, respectively, facility sanding dust samples failed the U.S. Environmental Protection Agency's Toxicity Characteristic Leaching Procedure for hazardous waste. Metals found in the sanding dust also were present on the work shirts of technicians—ranging from 0.06 (Cd) to 81 (Mg) mg/inch² of cloth—who sanded on paint without ventilated equipment. Results suggest that sanding dust and methylene chloride paint strippers used in vehicle resurfacing operations pose a potential hazard to human health and the environment.

American Industrial Hygiene Association Journal 63:741–749 (2002) Ms. #288
AIHA Journal (63) November/December 2002 741

Survey of Risk Reduction and Pollution Prevention Practices in the Rhode Island Automotive Refinishing Industry

Richard T. Enander,^a David M. Gute,^b and Richard Missaghian^c

^a Rhode Island Department of Environmental Management, Office of Technical and Customer Assistance, Pollution Prevention Program, 235 Promenade St., Providence, RI 02908-5767; E-mail: renander@dem.state.ri.us; ^bTufts University, Department of Civil and Environmental Engineering, Medford, MA 02155; ^cUniversity of Rhode Island, Department of Chemical Engineering, Crawford Hall, Kingston, RI 02881

Abstract

In 1996 a survey of pollution prevention, environmental control, and occupational health and safety practices was conducted in the Rhode Island automotive refinishing industry sector. In conjunction with project partners, the Rhode Island Department of Environmental Management developed a multidimensional survey instrument to identify risk reduction opportunities. Investigators sought to characterize the range of environmental and industrial hygiene controls employed by Rhode Island facilities for the purposes of focusing state technical and compliance assistance efforts. Data were collected on a diverse range of subject areas including work force demographics; source reduction; potential health hazards; worker protection and safety; solid and hazardous waste management; and air pollution control. Nearly one-half of the shops employ three or fewer people, and in many cases, spray painters double as body repair technicians thereby increasing their potential exposure to workplace contaminants. While nearly all of the shops reported that they use spray painting booths, only 38% own booths of the more effective downdraft design. Based on self-reported data, recently promulgated state air pollution control regulations (requiring the use of compliant coatings, enclosed or modified spray gun cleaners, and high-volume, low pressure spray guns) appear to be effective at motivating companies toward source reduction. A range of risk reduction opportunities were identified as input material changes, technology changes, and improved operating practices. Better methods of risk communication; a professional licensing requirement; and targeted training, compliance and technical assistance would help to achieve greater levels of risk reduction in this mature, high hazard industry.

American Industrial Hygiene Association Journal 59:478-489 (1998)