Diisocyanates and Work-related Asthma: Findings from California, Massachusetts, Michigan, and New Jersey, 1993–2008

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Objective: To characterize work-related asthma (WRA) cases associated with exposure to diisocyanates using data collected from four state-based occupational health surveillance systems.

Relevance: WRA is asthma that is caused by or exacerbated by work-related factors. Diisocyanates were first reported to cause WRA in the early 1960s and remain a leading cause of WRA in industrialized countries. From 1978 to 2005, the production of aromatic diisocyanates — toluene diisocyanate (TDI) and methylene bisphenyl diisocyanate (MDI), have more than tripled in the United States.

Methods: We reviewed reports of WRA cases associated with exposure to diisocyanates collected from California, Massachusetts, Michigan, and New Jersey during 1993–2008. Association with exposure to diisocyanates was determined using the Association of Occupational and Environmental Clinics (AOEC) exposure codes. WRA was classified as new-onset (i.e., asthma in a person with no prior history of asthma), or work-aggravated asthma (i.e., pre-existing asthma exacerbated by workplace exposures). New-onset cases were further sub-classified as reactive airways dysfunction syndrome (RADS) and as occupational asthma (OA). For each case we examined the 1987 Standard Industrial Classification (SIC) code.

Results: A total of 367 cases of WRA were associated with diisocyanate exposure; the mean age was 42.5 years (range: 19–78 years), 224 (61%) were male, 280 (76%) were white, and 295 (80%) were non-Hispanic. Of the 367 WRA cases, 346 (94%) were classified as new-onset asthma, 14 (4%) were classified as work-aggravated asthma; for seven (2%) no information was available to classify. New-onset asthma cases were sub-classified as RADS (n=18, 5%) and as OA (n=328, 95%). Exposure to a specific diisocyanate was known for 195 (53%) cases; the most common diisocyanates reported were MDI (n=87, 22%) and TDI (n=86, 22%). WRA cases were associated with 30 industries. Two industries, Transportation Equipment Manufacturing (SIC 37, 155 cases) and Auto Repair Services (SIC 75, 23 cases) accounted for 48% of the cases. The remaining cases were reported among 28 other industries, including: Sporting and Athletic Goods Manufacturing (SIC 39, 10 cases) where diisocyanates were used in the manufacturing of products such as golf balls; Health Services (SIC 80, 7 cases) where exposures included MDI-containing synthetic orthopedic casting and immobilization cradles; and Textile Mill Products (SIC 22, 2 cases) where diisocyanates were used in the lamination process.

Conclusions: In addition to identifying WRA cases in industries where diisocyanate exposure and WRA are known to occur, we identified numerous industries not traditionally associated with diisocyanate exposure.

Implications: These findings underscore the need for further preventive actions including education, periodic medical screening by employers, and engineering and industrial hygiene interventions, particularly in those industries not traditionally associated with diisocyanate exposure.

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Early Diagnosis of Occupational Asthma and Exposure Control : Results from a Stepped Care Program in Montreal Targeted at Auto Body Shop Workers

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Background and rationale: Asthma induced by exposure to isocyanates rank first in terms of compensated occupational asthma in Québec. A major source of exposure has been linked to work in auto body shops, where poor environmental control is common. Painters are particularly a high risk group. It is well established that early identification and optimal management of these cases can improve prognosis and reduce the burden of illness. Environmental control of exposure can reduce the incidence of occupational asthma in these small businesses. In this paper, we report the results of a stepped care program focusing on both aspects of asthma control in the workplace, early identification and referral of symptomatic workers, and improved environmental control.

The intervention: The target population included all 284 auto body shops in business during the period between 2001-2005 on Montreal Island. Occupational health teams (a nurse and a technician) from five local health units (CLSC) conducted individual field visits of auto body shops. During the visit, a technician made an assessment of environmental control measures, focusing on spray booths, air-supplied respirators and compliance with occupational standards.

We followed the following clinical algorithm for the early identification of occupational asthma:

1. A short screening questionnaire was completed during the on site visit
2. Positives cases were submitted to a more detailed questionnaire adapted from a research questionnaire
3. The questionnaires were reviewed by an occupational physician from each CLSC
4. If indicated, referral was made to a specialized occupational and environmental health clinic
5. If asthma was confirmed, final referral for compensation and management was made to a tertiary health care center

Results:

Environmental control: We noted a dramatic increase from 36% to 80% in the proportion of shops where air-supplied masks were available. The proportion of spray booths meeting air flow standards increased slightly.

Early identification of occupational asthma: A total of 648 workers completed the short questionnaire on asthma symptoms. Of these, 11% had a positive questionnaire; 8% had asthma symptoms confirmed by the detailed questionnaire. In total, 6% were referred to the occupational health clinic for clinical evaluation. An important proportion did not consult and were lost to follow-up. Only 5 cases were seen by the tertiary care center for suspected occupational asthma and no worker received a confirmed diagnosis of occupational asthma.

Discussion: Encouraging results were seen in terms of primary prevention in these shops. In contrast, the prevalence of asthma was low among these workers and many did not complete the clinical process. Our hypothesis is that many personal and social factors, as well as factors related to the provision of health care are involved and need to be further studied. This intervention shows the complexities of managing occupational asthma on a population basis.

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