

Abstract Book

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## Chemistry Impacts of Cleaning Solvents with

de Bruijne<sup>1</sup>, M. Doyle<sup>2</sup>, H.  
Chapel Hill, Chapel Hill, NC,  
Duqueroque, NM.

to biogenic-based solvents in cleaning  
product compositions based on ozone  
to these cleaning products cannot be  
more closely at the indoor chemistry and  
limonene, 2-butoxyethanol (2BE), and two  
containing d-limonene (HCLim) and one  
One Atmosphere chamber. Experiments  
to the chamber with techniques that  
their individual solvents, were mixed in  
found indoors. Detailed analyses of the  
performed. Cultured human respiratory  
the phases of the unreacted and reacted  
system. They were then analyzed for  
protein mediators. Results showed that  
d-limonene, and that HC2BE caused a  
toxic and inflammatory responses from  
E relative to exposures to the gases in  
potential health effects of both primary  
for evaluating the environmental and  
of individual compounds or chemical

## Health Risk Assessments

### Chrysotile Fiber Exposure to and Oligomers in the

der-French; University of

isocyanate (HDI) and its oligomers may  
asthma and occupational asthma. Rates  
between monomeric and polymeric  
inhalation and dermal exposure to  
ers. We have developed and evaluated  
method capable of quantifying HDI and  
samples collected in the automotive  
isocyanurate were synthesized by  
as analytical standards, and shown

to be stable (degradation <2.16% per week at -20 °C over a 2-month period) in occupational samples. The average recovery of HDI and its oligomers from tape was 100% and the limits of detection were 2 and 20 fmol/μl, respectively. Exposure assessments were performed on four automotive spray painters to evaluate the LC/MS method and the sampling methods under field conditions. Isocyanurate was the main component of the measured exposure (N = 9 paint tasks), with air and skin concentrations ranging from non-detectable to 24,400 μg/m<sup>3</sup> and 4,310 ng/cm<sup>2</sup>, respectively. Significant correlations were found between log-transformed dermal exposure and the log-transformed product of air concentration and paint time for workers exposed to isocyanurate (r = 0.86, p = 0.0027) and HDI (r = 0.73, p < 0.0001). This LC/MS method provides a valuable tool to investigate inhalation and dermal exposures to specific polyisocyanates and to explore how these isocyanates differ in absorption and reactivity with human tissues.

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#### Exposure to Chrysotile Asbestos Associated with Handling, Unpacking, and Repacking Boxes of Automobile Clutch Discs

G. C. T. Jiang, A. K. Madl, K. J. Ingmundson, D. M. Murbach, K. A. Fehling, B. L. Finley, D. J. Paustenbach; ChemRisk, Inc., San Francisco, CA

Industrial hygiene surveys of service garages have demonstrated that airborne asbestos levels associated with automobile brake and clutch repair were typically below contemporaneous occupational standards. The purpose of this study is to examine potential asbestos fiber releases in other friction products-handling occupational settings, e.g. inventory warehouses or retail auto parts stores. A simulation study involving the handling, unpacking, and repacking of 24 boxes of chrysotile-containing clutch discs (manufactured prior to 1980s) was conducted to evaluate airborne asbestos exposures in related occupational settings (i.e., inventory warehouse or retail auto parts store). Breathing zone samples on the lapel of a volunteer worker (N=100) and area samples at bystander (N=50), remote area (N=25), and ambient (N=9) locations were collected and analyzed for airborne fiber concentrations by Phase Contrast Microscopy (PCM) and Transmission Electron Microscopy (TEM). The 30-minute average PCM-adjusted results (obtained by applying the ratio of asbestos:total fibers to the PCM results) can be summarized as follows: 1) for a worker unpacking and repacking 1 or 2 boxes of clutches, the airborne chrysotile concentrations were  $0.026 \pm 0.004$  f/cc and  $0.100 \pm 0.017$  f/cc, respectively, 2) fiber concentrations at bystander locations were less than a tenth of the worker measurements, 3) cleanup and clothing handling activities resulted in fiber concentrations of  $0.003 \pm 0.001$  f/cc and  $0.003 \pm 0.002$  f/cc, respectively, 4) for a worker stacking 24 unopened boxes of clutches the airborne concentration was  $0.212 \pm 0.014$  f/cc. Applying these data to estimate asbestos exposures over a workday resulted in 8-hr TWA measurements ranging from 0.003 to 0.010 f/cc for a worker handling 1 or 2 boxes of clutches. The data from this study illustrate that handling boxes of asbestos-containing clutch discs do not result in exposures in excess of historical or current short-term and 8-hr occupational exposure limits for asbestos.

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#### Exposure and Risk Assessment for Residents and Contractors Associated with Vermiculite Attic Insulation

R. Reiss, E. Anderson, P. Turnham; Exponent, Alexandria, VA

Vermiculite attic insulation (VAI) was sold in the marketplace until 1984. There were trace levels of tremolite asbestos in the expanded vermiculite, which came from the former vermiculite mine in Libby, Montana. Some of the VAI is still in place today. Disturbance of the material may cause exposure to asbestos. The potentially exposed populations include residents of homes with VAI and contractors that may work in attic spaces in homes with VAI. Exposure simulations were conducted to measure asbestos concentrations in a home with VAI for activities including