

### CRYSTALLINE SILICA EXPOSURE AMONG 16,000 GERMAN PORCELAIN WORKERS: HISTORICAL QUANTITATIVE ASSESSMENT FOR AN EPIDEMIOLOGICAL STUDY

R. Adams, ENVIRON International Corporation, Princeton, NJ; T. Birk, ENVIRON International Corporation, Essen, Germany; W. Parsons, K. Mundt, ENVIRON International Corporation, Amherst, MA; K. Guldner, BG der Keramischen und Glas-Industrie, Wurzburg, Germany.

For decades, crystalline silica exposure has been linked with silicosis risk. However, few studies have quantified the exposure level at which silicosis risk is increased. While historic exposure data are often limited in epidemiological studies, a substantial pool of silica measurement data was located for the German porcelain and fine ceramics industries. Measurements have been conducted since 1959 by the German Berufsgenossenschaften (BG), the accident insurance and prevention institutions in Germany. Since the 1970s, measurements have been compiled in the MEGA database, a chemical exposure database of the Institute for Occupational Safety and Health of the BG. More than 3,000 respirable quartz measurements were available for the exposure assessment in a cohort study of nearly 18,000 employees from more than 100 different plants. Because of the small number of measurements for most plants, an industry-wide exposure assessment approach was used. Exposure estimates were developed in six primary and several subcategory job classifications. An industry-wide approach was determined to be adequate because production of porcelain and fine ceramics employs similar materials and processes in all of the plants and, historically, technical changes and improvements in industrial hygiene conditions developed similarly over time. A job exposure matrix was constructed that provided for the assignment of an exposure value to each member of the cohort over their entire work history. Because information on previous employment was available for nearly all cohort members, a qualitative assessment of the probability and duration of silica exposure prior to employment in this industry could be estimated. Using this quantitative exposure estimation approach, the German porcelain and fine ceramics cohort study is expected to generate results that can be used in quantitative risk assessments of occupational silicosis and lung cancers.

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#### A QUALITATIVE SCREENING METHOD FOR ASSESSING DERMAL EXPOSURES IN THE WORKPLACE

J. Sahmel, ChemRisk, Inc., Boulder, CO.

Dermal exposure assessments are rarely conducted as frequently or as methodically as inhalation exposure assessments. However, the comprehensive exposure assessment picture for employees is quite incomplete without this

component. A qualitative method for systematically evaluating and prioritizing dermal exposures will be discussed. This method is based on the straightforward strategy outlined in AIHA's publication *A Strategy for Assessing and Managing Occupational Exposures*, and the intention of the method is to allow for the screening and prioritization of dermal exposures across a wide range of tasks and substances of concern in the workplace. Much of the information generated using this qualitative approach will be applicable to semiquantitative approaches to dermal exposure assessment, and will be valuable for subsequent modeling and monitoring evaluations if those must also be conducted. Finally, a brief overview will be provided of options for useful quantitative assessment methods when further information or detail on dermal exposures is needed.

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#### BENZENE EXPOSURE IN REFINERY WORKERS: BAYTOWN, TX (1978-2006)

J. Panko, A. Burns, K. Unice, M. Kreider, ChemRisk, Pittsburgh, PA; S. Gaffney, D. Paustenbach, ChemRisk, San Francisco, CA; L. Booher, Exxon Mobil Corporation, Fairfax, VA; R. Gelatt, ExxonMobil Biomedical Sciences Inc., Clinton, NJ.

Historical exposures to benzene were quantified for workers at the Exxon Mobil Baytown, TX, refinery from 1978 to 2006. The purpose of this study was to understand the variability in workers' benzene exposures over time throughout the facility and during different job tasks. Workers' exposures were grouped by operational status including normal refinery operations and turnarounds, as well as specific job tasks. Because the dock workers and others involved in overland shipping had exposures to benzene from handling of both refinery products and those from the chemical plant, they were analyzed separately and not presented here. The results of more than 9,000 industrial hygiene air samples were evaluated for inclusion in this analysis. Approximately 3,900 long term (>2 hr) personal samples and approximately 1,000 short term (<2 hr) personal samples were considered. The results of more than 1,900 area air samples were used to estimate worker exposures where limited or no personal samples were available. The majority of area and personal air samples were taken to evaluate tasks and activities in the refinery, which involved the direct handling of benzene containing materials. The resulting air sampling dataset was lognormally distributed and the benzene detection frequency was approximately 40% for the refinery air samples and 60% for the docks/overland shipping air samples. The geometric mean, median, and 95 percentile value of long-term samples for all workers at the site were approximately 0.03, 0.02, and 0.44 ppm, respectively. The geometric mean, median, and 95 percentile value of the short term samples were approximately 0.04, 0.03, and 3.2 ppm, respectively. For the vast majority of sampling events, the full-shift and task level short term personal air sample results were

found to be less than the contemporaneous OELs for those employed at this refinery.

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#### LEAD ¼ LEAD¼ EVERYWHERE? EVALUATING POTENTIAL EXPOSURE TO HEAVY METALS IN CONSUMER PRODUCTS

R. Kalmes, G. Brorby, Exponent, Oakland, CA.

Newspapers have been crowded with headlines regarding inadvertent discoveries of lead (or other heavy metals) in consumer products, particularly products manufactured outside of the United States. Such discoveries have presented manufacturers, and even retailers, with the challenge of reassuring themselves, regulatory agencies, and the public that their products are safe. This paper will briefly discuss the compliance and quality issues that led to the recent recall of several consumer products. An overview of various federal (e.g., Consumer Products Safety Commission, Food and Drug Administration) and state (e.g., California Proposition 65) programs for evaluating consumer product exposure and compliance with existing standards will be presented. In addition, various sampling and analytical schemes, including the efficacy of screening analytical procedures such as X-ray diffraction (XRF), will be discussed. Case examples will be provided that present the technical challenges and recommend specific strategies for better evaluating potential to heavy metals in consumer products. Finally, what these case studies tell us regarding any "real" exposure to consumers, especially through inadvertent hand-to-mouth contact or mouthing, will be discussed.

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#### MONTE CARLO APPLICATION AND DEMONSTRATION OF A GENERALIZED SIMILAR EXPOSURE GROUP (SEG) CONCEPT TO RETROSPECTIVE EXPOSURE ASSESSMENT (REA) OF INDIVIDUALS

E. Rasmuson, J. Rasmuson, R. Strode, D. Hall, Chemistry & Industrial Hygiene, Inc., Wheat Ridge, CO.

Performing a retrospective exposure assessment (REA) for an individual can be challenging because of potential uncertainty in exposure history, varying work practices, spatial and ventilation conditions, and other variables. In addition, there is a need to continue to standardize this process. Utilizing the standardized exposure assessment paradigm described in current and past editions of the Exposure Assessment Strategies Committee's publications, *A Strategy for Assessing and Managing Occupational Exposures and Mathematical Models for Estimating Occupational Exposure to Chemicals*, provides a recognized approach to address these needs for standardization. One base concept in the standardized exposure assessment paradigm is to classify workers into Similar exposure groups (SEGs). This paper describes an approach that involves numerical assessment of exposure