hydrocarbons (PAH). Therefore a study has been carried out with a view to determine the degree of dermal exposure at the Finnish coke oven and to plan measures for protection.

33 coke oven workers participated in the study. Find upon questionnaire the results of 23 non-smokers who had not eaten smoked or barbecued food selected to the assessment of exposure routes. Samples from skin surface, personal air samples and urine samples were collected for the evaluation of exposure. Pyrene and 1-hydroxypyrene were used as marker compounds.

Evaluation of skin exposure was done using the results of oil wash samples taken from hands. The average concentration of pyrene on hands during the shift was 15 ng/cm^2 (variation 1 - 150, n=23). The average concentration of pyrene in the breathing zone was 1.5 mg/m^3 (variation 0.1 - 19, n=23) and the average urinary 1-hydroxypyrene concentration 4.3 nmol/l which approximate 0.5 mmol/mol creatinine. Using the model of Leung and Paustenbach it may be estimated that 25% of 1-hydroxypyrene in urine after the work shift originated from inhaled air. The dermal absorption from hands was calculated to produce 28 % of 1-hydroxypyrene extreted in urine. The regression coefficient between pyrene and exctreted 1-hydroxypyrene was 0.93 ($p<0.0001$, n=23) and that between the pyrene concentration in air and urinary 1-hydroxypyrene 0.92 ($p<0.0001$, n=23).

The results of the study indicate that the skin contamination caused by PAHs is significant among Finnish coke oven workers. It is evident that prevention measures should be focused on the reduction of dermal contamination and that personal factors influence skin contamination of PAHs. These are personal hygiene, individual working methods, use of protective clothing and the frequency of laundering.

181.

ASSESSMENT OF DERMAL EXPOSURE TO INDUSTRIAL CHEMICALS IN EUROPE. J. van Hemmen, TNO Chemistry, Zeist, Netherlands

In a large project funded by the European Commission (RISKOFDERM, QLK4-1999-01107), 15 European Institutes work together to develop validated predictive models for estimating dermal exposure for generic risk assessment of single chemicals, and a practical dermal exposure toolkit for small and medium-sized enterprises (SMEs). The work is done in four interactive work parts: 1) qualitative survey of tasks, processes and determinants relevant for dermal exposure, 2) quantitative survey on dermal exposure and determinants in selected situations, 3) building predictive dermal exposure models using all relevant variables, 4) development of a risk assessment and management toolkit for SMEs from data on hazard, exposure and controls.

The project started early 2000 and runs four years. Pilot studies have been carried out for work parts 1 and 2. The main studies have been started for completion in mid-2002. It was observed that dermal exposure situations vary extensively in scope and determinants. For work part 3 a set of basic predictive models has been developed on theoretical grounds using variables taken from literature and confirmed in the pilot studies. These models will be developed further, using the results of the main studies from work parts 1 and 2. The models will be validated/benchmarked with a set of sophisticated biological monitoring studies using well-chosen model liquid and solid compounds in a few exposure scenarios. In work part 4 the building blocks for the hazard and exposure assessment are currently almost completed for testing in the main studies and, independently, by a large group of practicing occupational hygienists.

The project was designed to collect information in an appropriate manner with strict control on data collection, archiving and analysis. Results will be important for regulatory authorities and industries involved in risk assessment of the use of chemicals in Europe.

182.

DERMAL DECONTAMINATION. H. Maibach, R. Wester, University of California, San Francisco, CA

Decontamination of a chemical from the skin is commonly done by washing with water only, or soap and water. In the home and the workplace, the traditional soap-and-water system is usually available for removing any chemical that may contact skin. In some workplace, the emergency water shower is also available. Traditionally, it has been assumed that this washing will remove the chemical. However, this may not be the case, and chemical left on the skin after traditional washing procedures can have toxic consequences. Our in vivo studies show there is a time element to decontamination where early washing after exposure is most effective. With time, the ability to decontaminate decreases. Chemically, water alone (emergency shower) may offer some help with hydrophilic contaminants, but soap is needed for lipophilic contaminants. Skin binding of lipophilic chemicals relative to water decreases with the addition of soap. Still, some chemicals will not decontaminate with soap and water washing. Clean looking hands do not validate decontamination. Solvents are enhancers of percutaneous absorption and will only worsen the situation if used for decontamination. Soaps can contain skin irritants and repetitive washing may damage skin and be counterproductive. Other potential decontaminants are available, but they need to be validated as to safety and effectiveness.

183.

EFFECTIVENESS OF DECONTAMINATION PRODUCTS AND NITRILE GLOVES IN REDUCING ISOCYANATE SKIN EXPOSURE IN AUTO BODY SHOPS: A PILOT ASSESSMENT. Y. Liu, M. Stowe, M. Cullen, F. Walsh, J. Sparer, C. Holm, C. Redlich, Yale University, New Haven, CT; S. Woskie, University of Massachusetts, Lowell, MA; M. Boeniger, NIOSH, Cincinnati, OH

Surface and skin decontamination and use of nitrile gloves may be important interventional measures in reducing isocyanate skin exposures in auto body shops, but their effectiveness needs to be evaluated before recommendation for larger scale interventions is made. This pilot study was designed to assess such effectiveness. Three auto body shops with 40 workers were selected to participate in the testing with 5 painters actually evaluated the products. A plant oil based skin cleanser and a cleanser-containing towel were used to clean isocyanates on hands after a paint mixing, clear coating or wet sanding task was performed. The hands were qualitatively assessed for isocyanate contamination before and after the cleaning using a color change indicator. An isocyanate surface decontamination product was used to clean mixing benches, painting equipment and gun cleaning tools. The effectiveness of cleanness was assessed with a similar color indicator. Two brands of nitrile gloves were evaluated during painting sessions for their isocyanate breakthroughs using a commercial glove breakthrough indicator. Painters were also asked to subjectively evaluate the effectiveness and acceptance of these cleaning products. Results showed that skin areas found positive in contamination detection became negative after cleaning with both the skin cleanser and the paper towel. Surfaces highly contaminated were found well-cleaned with no positive color changes detected. All workers regarded both skin cleanser and surface decontamination solution as good in cleaning effect and acceptable as a safety product. No isocyanate breakthrough was found with nitrile gloves from several painting sessions. These results suggest nitrile gloves protect skin well from isocyanate contamination. The surface decontamination solution and the skin cleansing products are effective in removing surface and skin contamination. They may be recommended for daily use in auto body shops and as measures to reduce isocyanate skin exposure in larger-scale intervention studies.

184.

TESTING THE EFFICACY OF SKIN PROTECTANTS WITH THE REPETITIVE IRRITATION TEST. A. Klotz, A. zur Muhlen, M. Veeger, Stockhausen Skin Care, Krefeld, Germany

In addition to engineering and work practice measures, skin protectants are a way of protecting the skin against on-the-job stressing. There is discussion whether special stress-matched

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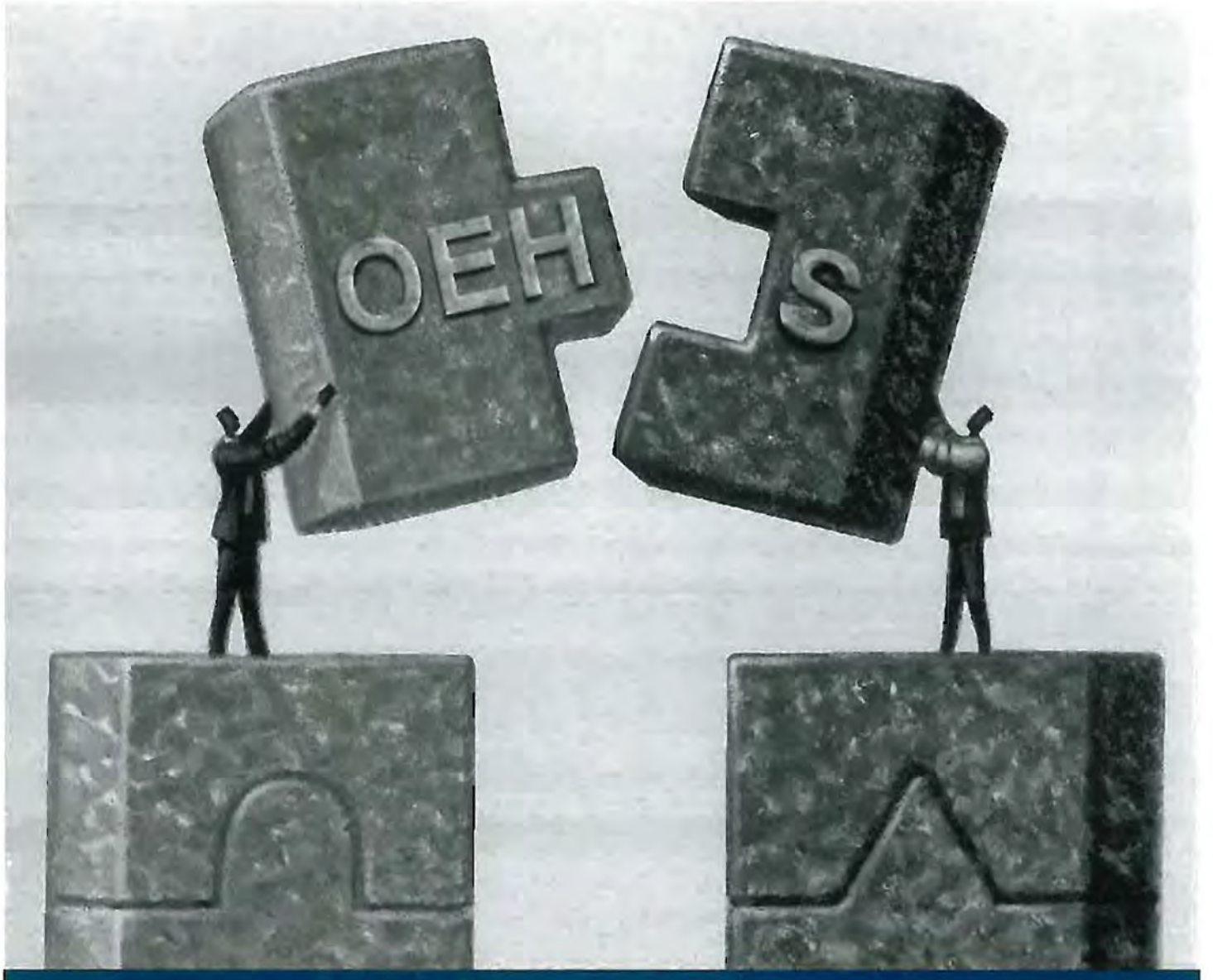

ABSTRACTS

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2002 Abstract Index by Session Topic

PF 101 Agricultural Health and Safety

Papers 1–6

1.

RELATIONSHIPS BETWEEN WORK EXPOSURE AND RESPIRATORY OUTCOMES IN POULTRY WORKERS.

S. Kirychuk, J. Dosman, P. Willson, L. Dwernychuk, University of Saskatchewan, Saskatoon, SK, Canada; J. Feddes, A. Senthilselvan, C. Ouellette, University of Alberta, Edmonton, AB, Canada

A pilot study was conducted on 74 poultry barn workers in Western Canada during the winters of 1998–2000. General respiratory health, current, chronic and work related respiratory symptoms; general work duties, and work-site factors were ascertained, pre-exposure, by questionnaire. Personal airborne exposure levels and changes in symptoms and lung function were measured across the work-shift for all workers. Workers were classified according to the type of poultry operation (floor based, n=53; cage based, n=13) in which they worked. There was no significant difference in daily hours spent in the barn between those who worked with caged poultry (5.41±2.35 hours) and those who worked with floor-based poultry (4.42±2.48 hours). Age of birds was 47.10±58.36 days for floor based versus 155.91±63.01 days for cage based facilities. There were no significant differences in personal environmental measurements between cage-based and floor-based facilities (ammonia 13.22±13.70 ppm, 17.34±16.35 ppm; total dust 5.74±4.85mg/m^3, 10.01 ±8.84 mg/m^3; endotoxin 6046±6089 EU/m^3, 5457±5934 EU/m^3 respectively). There were no significant differences in across work-shift change in pulmonary function indices between workers from cage and floor-based operations. For the entire sample total dust dose (work hours/day x total dust) significantly correlated with across-shift change in FEV_1, whereas endotoxin dose and ammonia dose did not. Stocking density was significantly correlated with average ammonia (ppm, p=0.002) and ammonia dose (ppm x work hours/day; p=0.004) in floor based operations and with total dust (particles/ml, p=0.002) in cage based populations. Stocking density was also significantly correlated with chronic cough (p=0.003) and across work-shift cough (p=0.05) and chest tightness (p=0.06) for workers from floor based operations; and with phlegm when working (p=0.018) and chest tightness across the work-shift (p=0.004) for workers from cage based operations. Type of poultry production operation and therefore type of work exposures appear to significantly impact symptoms experienced by workers exposed to these atmospheres.

2.

DUST GENERATION SYSTEM FOR AGRICULTURAL SOIL DUST.

K. Lee, R. Domingo-Neumann, R. Southard, UC Davis, Davis, CA

Agricultural workers are prone to exposure to mixed dust of inorganic and organic compounds. Diverse working conditions and operations in agriculture make direct measurements of the mixed dust exposure difficult. This study was conducted to develop a new dust generation system to determine possible exposure potency indicators of soil samples. The dust generator consists of a blower, a rotating chamber and a settling chamber. The rotating chamber has inner baffles to provide sufficient agitation of the samples while the chamber is rotating. A blower provides air into the rotating chamber, and the suspended dust is moved to the settling chamber through a perforated pipe. A small fan inside the settling chamber helps maintain suspension of the dust. Various size fractions of dust are sampled on filters suspended in the chamber via outlet ports and attached pumps. Air pressure is released through a filter plate mounted on the wall of the settling chamber. Various operating conditions were evaluated: air intake from blower, speed of rotation, soil mass and sampling time. To evaluate the characteristics of dust from the system, we collected dust samples from agricultural fields while the soil was prepared for