60.

CARCINOGEN-DNA ADDUCTS ARE INCREASED IN EXFOLIATED UROTHELIAL CELLS OF WIVES OF SMOKERS: BIOLOGICAL MONITORING OF PASSIVE SMOKE EXPOSURE. S. Henn, B. Schumann, P. Succop, G. Talaska, University of Cincinnati, Cincinnati, OH

Tobacco smoking is the most important environmental carcinogen, increasing the rate of urinary bladder cancer 2 to 9 times. The risk of this cancer in passive smokers has been more difficult to assess. Passive smoke contains more of the urinary bladder carcinogen, 4-aminobiphenyl, on a per weight basis than does mainstream smoke. We attempted to use carcinogen biomarkers to reduce misclassification associated with this exposure. We obtained first morning urine samples from 21 wives of non-smokers and 22 wives of smokers and measured exfoliated urothelial cell DNA adduct and 1HP levels.

1HP levels increased non-significantly in the wives of the smokers (mean= 0.27:g/l, SE= 0.06, versus 0.192:g/l, SE= 0.02)(p= 0.17). This is an estimate of exposure for the preceding 24 hours. Daily exposure variability of smokers' wives contributes heavily to the inability to see significant differences in spot sample. There was a statistically significant difference in the levels of DNA adducts in the exfoliated urothelial cells of the wives of smokers (2.8 adducts per 108 nucleotides, SE = 0.8) versus the wives of non-smokers (1.1/108 nucleotides, SE = 0.4, $p < 0.05$). DNA adduct levels integrate exposure over a much longer time and these data indicate that the variation in daily exposure (as indicated by 1HP levels) is smoothed by the measurement of DNA adducts. The correlation between individual 1HP and the DNA adduct levels was not significant (r=0.3), which further suggests that at these low levels of exposure there is too much daily exposure variation to accurately predict biological effect from a single measurement. A biological monitoring program including both metabolite and DNA adduct analysis, in particular, repeated measurements of the excretion of metabolites is needed to better assess daily variation in exposure. (Supported by NIOSH T42-CCT-510420 and NIEHS P30-ES0-6096.)

61.

REDUCTION OF PAH EXPOSURE AND EFFECTS IN AUTO MECHANIC TRAINEES: IMPACT OF A SIMPLE INTERVENTION EVALUATED BY CARCINOGEN BIOLOGICAL MONITORING. A. Booth-Jones, NIOSH and Univeristy of Cincinnati, Cincinnati, OH; S. Pinney, L. Goldenhar, G. Lemasters, G. Talaska, University of Cincinnati, Cincinnati, OH

We have shown previously in an animal model that prompt washing reduces the levels of adducts in skin and lung DNA of mice exposed to used engine oil. We used these results to design a simple exposure intervention for a group of young auto mechanic trainees at local technical schools. The intervention consisted of a review of the animal data emphasizing the importance of proper hand washing and care. Hand cleaners (GOJO Industries, Inc. Akron, OH) were provided gratis to the participants. Hand wipes, blood and urine samples were obtained from volunteers at the time of the intervention, and at the end of the study. The levels of polycyclic aromatic compounds (PAC), leukocyte DNA adducts and 1-hydroxypyrene (1HP) were measured in the 3 matrices, respectively.

The levels of PAC, DNA adducts and urinary 1HP were reduced in the post-intervention samples in the majority of the participants. The average leukocyte DNA adduct level was reduced from 9.4 adducts per 109 nucleotides (SE = 4.2) to 2.9 adduct per 109 nucleotides (SE = 1.6) in the post-intervention samples ($p< 0.1$). These data suggest that a simple data-driven intervention can be effective in reducing occupational exposure and effects to potentially carcinogenic materials. Other data are being analyzed to determine interactions. (Supported in part by NIOSH T42-CCT-510420 and NIEHS P30-ES0-6096.)

62.

BIOLOGICAL MONITORING OF EXPOSURE TO ORGANOPHOSPHATE PESTICIDES. K. Jones, J. Cocker, H. Mason, S. Garfitt, Health & Safety Laboratory, Sheffield, United Kingdom

Organophosphate pesticides (OPs) are widely used and readily absorbed through the skin. Biological monitoring is an essential component of any comprehensive assessment of exposure. Historically this was biological effect monitoring (reduction of blood cholinesterase activity), but for the last 10 years we have been measuring six dialkyl phosphates (DAP), the metabolites of many OPs, in urine. This alternative, non-invasive approach allows exposure assessment below that which might depress cholinesterase.

Over the last 10 years we have been involved in occupational studies of formulators, sheep dippers, pest control workers, orchard sprayers, hop sprayers and nursery workers. In addition to studies of control groups we have conducted human volunteer studies looking at the absorption and elimination of chlorpyrifos, propetamphos, diazinon and malathion (in head-lice shampoo).

In people (n = 463) not occupationally exposed to OPs 90% of the total urinary DAPs were less than 51 umol/mol creat. The highest occupational levels were found in formulators (n = 147) in regular daily contact with OPs. In this group 90% of the total urinary dialkyl phosphates were less than 188 umol/mol creat. but the maximum value was 915 umol/mol creat. In the chlorpyrifos volunteer study (n=5) the highest urinary DAP levels (mean 160 umol/mol creat) were seen 7 hours after a ~1mg oral dose. In the diazinon volunteer study, the peak urinary DAP concentrations (mean 750 umol/mol creat) were seen 2 hours after an oral dose of ~1 mg. In the propetamphos study, the peak urinary metabolite concentrations (after hydrolysis) was 404 and 229 umol/mol creat. 1 hour after an oral dose and 4 hours after the end of a dermal dose respectively. In urine from people (n = 9) exposed to malathion-based head-lice shampoo the mean and maximum urinary DAP values were 2,400 and 5,000 umol/mol creat. respectively.

63.

BIOLOGICAL INDICATORS IN THE INCIDENTAL AND SHORT-TERM EXPOSURE EVALUATION TO HYDROCARBONS & ALDEHYDES. K. Czarnocki, E. Czarnocka, Lublin University of Technology, Lublin, Poland

The rapid technological development makes the early epidemiological research of the results of occupational exposure to the new combination of chemicals very difficult, if possible. Some of the chemicals we meet in the work environment are or could be carcinogen or potentially carcinogen and mutagen factors. The great part of oncological illnesses is in direct relation to the environmental and occupational harmful factors. Aromatic hydrocarbons are one of the groups most commonly met in the occupational environment that worker exposure to may result the cancer process. The harmful chemicals concentrations vary dependably the technological operation, shift part or even the day of the week and/or month. In the described situation the classic methods of the valuation of worker exposure are not sufficient and may result in significant errors in estimation of health effect of the exposure. The alternative for the classic monitoring method seems to be BEI (Biological Exposure Indicator) monitoring. The goal of this study is to develop and validate major biological exposure indicators of aromatic hydrocarbons - BTX group and Aldehydes in different levels concentration of the chemicals and variable exposure changes. Biological samples were collected from 70 healthy workers currently exposed to aromatic hydrocarbons, PAH's and aldehydes at the petrochemical enterprises in Poland. The same number of healthy without current or previous occupational exposure to the above mentioned chemicals were enrolled from co-operating enterprises. Both vapor samples and biological samples (urine) were then prepared and analyzed by HPLC or/and GC. All exposure assessment was performed blinded with respect to the biomarkers analysis. The result confirmed statistically significant correlation of the BEI level and the exposure level for both short-term and prolonged exposure to chemicals.

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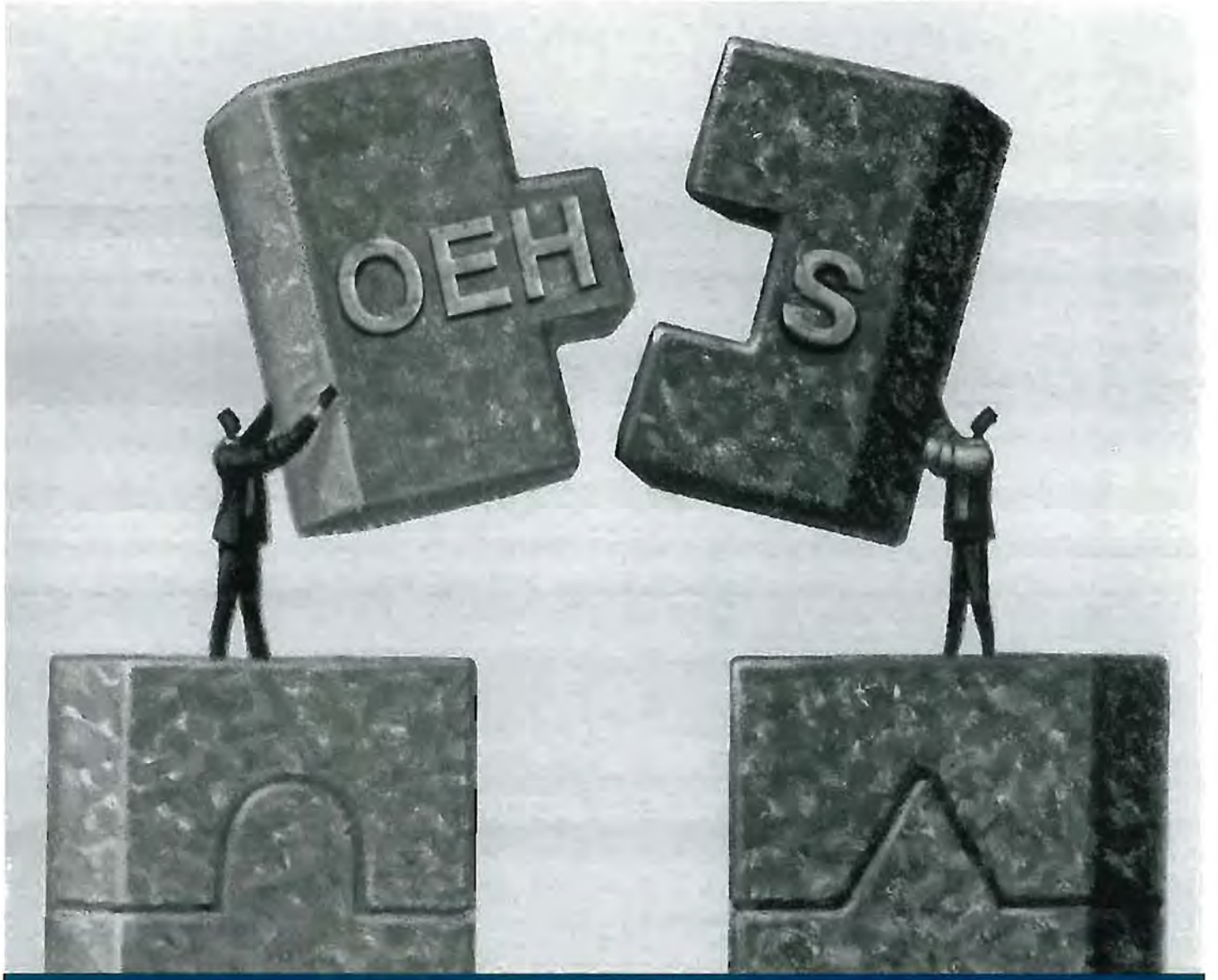

ABSTRACTS

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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