

post shift < pre shift benzene ~ [benzene] air

P059 How to assess possible health effects of solvent exposure: the Perchloroethylene Pilot Project I

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Background. Epidemiological studies consistently show increased risk for cervical cancer among women dry-cleaning workers. Over 90% of an estimated 50,000 U.S. drycleaning shops currently use perchloroethylene (PCE) as their primary dry cleaning solvent. PCE is a recognized animal carcinogen classified by the International Agency for Research on Cancer (IARC) as a probable human carcinogen. Increased risk in dry cleaners has been attributed to life-style or medical access risk factors in previous epidemiological studies of cervical cancer in solvent-exposed workers. PCE might increase the risk of cervical cancer by acting as a tumor growth promoter, or reactive PCE metabolites might interact directly with components of cervical cells to initiate tumors.

Methods. The pilot project was designed to explore the feasibility of and refine the methods to be used in a full-scale study. The experimental design, review of epidemiologic studies, and sample collection success rates are presented here. Eighteen women working in dry cleaning were compared with 20 women working in industrial laundries, matched by age, race, and smoking status.

Results. In the field, we succeeded in following the complex schedule of collections of environmental samples and biological specimens and in processing and distributing samples and specimens to laboratories. We collected 97% of scheduled blood specimens, 95% of gynecological specimens, 100% of four core urine specimens requested from each participant and 86% of urine specimens requested from exposed participants to analyze variability over a three-week exposure period, and sent aliquots to 15 laboratories across the United States. Over thirty biomarkers of exposure, effect, and susceptibility were analyzed.

Conclusion. It was not expected with a group of this size to find significant health status differences between dry-cleaning and laundry workers. However, there were results (significantly more recent infections in dry cleaners) suggestive of an effect of PCE on health. These results, as well as the findings of multiple lifestyle risk factors, warrant a full-scale study, for which changes in study design have been suggested. A similar study design could be used to investigate a group exposed to another solvent.

P060 Cross-sectional study on exposure to low levels of benzene, individual susceptibility, and early haematological effects among filling station attendants and urban policemen in Milan, Italy

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Background. A multicentre European Study sponsored by the European Commission investigated exposure to benzene, interindividual biological variability, early haematologic effects and cancer risk. Different occupational groups exposed to benzene (petrochemical workers, filling station attendants, bus drivers, urban policemen) in Italy (Genoa and Milan) and Bulgaria were identified, followed-up for mortality, and surveyed in a cross-sectional study. We summarise here the preliminary findings on biomarkers of exposures, susceptibility, and haematologic effects of the cross-sectional study performed in Milan.

Methods. In the period January-June 2000, 78 filling station attendants, 77 urban policemen, and 58 referent subjects not occupationally exposed to benzene were monitored for benzene exposure during morning work shift using passive samplers. Spot urine samples were collected at the beginning (early morning) and at the end (after mid-day). We measured the excretion of benzene metabolites t,t-muconic

acid (t,t-MA, begin and end of shift) and S-phenylmercapturic acid (S-PMA, end of shift), cotinine (end of shift), and benzene (begin and end of shift). A blood sample was collected the day following exposure monitoring and urine collection; DNA single strand breaks in leukocytes (SSB) in a selected subsample of subjects and differential white blood cell counts (WBC) were determined. Two metabolic polymorphisms involved in benzene metabolism were determined as markers of susceptibility: CYP2E1 and NQO1. Information on life-style habits and occupation variables was collected through a self-administered questionnaire.

Results. Median levels of airborne benzene were 84 $\mu\text{g}/\text{m}^3$ (filling station attendants), 30 (urban policemen), and 10 (referents). Urinary benzene levels were significantly associated with airborne benzene, while urinary t,t-MA determinations were not. Analyses of urinary S-PMA are being completed. (Urinary biomarkers are discussed in an abstract in the Exposure Assessment section in this symposium). SSB levels showed no association with other variables. Total WBC and lymphocyte counts were positively associated with smoking and cotinine levels, but not with other biomarkers. Polymorphisms were not associated with urinary exposure biomarkers and WBC counts.

Conclusions. Preliminary analyses showed a positive relationship between airborne benzene levels and some of the urinary metabolites (urinary benzene). At these low levels of exposure early haematologic effects were not influenced by airborne benzene nor exposure biomarkers levels, and no significant role was found for the investigated genetic polymorphisms.

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P062 Work-related injuries and occupational health and safety factors in smaller enterprises. A prospective study

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Background. The aim of this study was to determine whether any of the health, environment and safety (HES) factors registered by visiting small mechanical enterprises in Norway at the start of the study could predict the risk of occupational injuries in subsequent years.

Methods. Twelve HES factors, including injury awareness, program for action, employee participation, training and use of personal safety devices, were registered. A questionnaire was completed by interviewing the employer and observing production.

Results. Two variables based on observation of the use of safety equipment were significantly correlated with occupational injuries.

Conclusion. There is potential for prevention in smaller enterprises by increasing the use of personal protection devices and safety equipment on machines. Frequent inspection with feedback to the workers is probably the most effective means of attaining the desired result of reducing injuries.

P063 Associations between individual characteristics and occupational injuries. A community-based study

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Background. A few epidemiological studies have addressed the role of individual characteristics in occupational injuries. This study assessed

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