personal exposure and hygienic characteristics of working conditions correctly.

4 NIGHT SHIFT WORK AND EXPOSURE TO HAZARDOUS AGENTS PRESENT AT THE WORK ENVIRONMENT IN LODZ, POLAND

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Objectives In 2007, shift work involving circadian disruption was classified as probably carcinogenic to humans (Group 2A) by the International Agency for Research on Cancer. In most instances, the exposure in the occupational settings is complex and rarely only one hazardous occupational factor is present. Little is known so far about industrial exposures occurring in the manufacturing plants where night shift work system operates.

Methods We collected data on the night shift work systems and hazardous agents present in 44 enterprises, based on a short survey filled in by the inspectors of safety and hygiene employed at the manufacturing plants. All identified hazardous factors were classified according to the IARC list of carcinogens and the European classification of carcinogens.

Results The most common system of work employs 3 (8-hour) shifts within a 5-day cycle. Altogether, as many as 153 occupational exposures occurring in the environment of the plants were identified, with noise, carbon oxide, and formaldehyde recorded among the most common exposures. Night shift work was not noted as the sole hazardous occupational factor present at the work environment in the plants. We identified 20 factors that have been evaluated by IARC, 11 of them classified to Group 1 - carcinogenic to humans. 10 factors have been classified as carcinogens according to the regulation of the European classification of carcinogens.

Conclusions Our study shows that in most instances, real life exposure circumstances at work places are complex and involve a variety of factors that may affect human response to night shift work involving circadian rhythm disruption.

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5 DESCRIPTIVE ANALYSIS OF THE FRENCH OCCUPATIONAL EXPOSURE DATABANKS COLCHIC AND SCOLA

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Objectives Knowledge of historical exposures conditions in the workplace plays an important role in occupational health. Several countries have built databases of occupational hygiene measurements from prevention or compliance activities conducted over the years. The aim of this work was to describe the contents of two French databanks, COLCHIC and SCOLA, started respectively in 1987 and 2007.

Methods COLCHIC data results from prevention activities conducted by hygienists from laboratories related to governmental occupational health insurance. Its initial aims included, among others, support for epidemiological studies and

implementation of prevention policies. On the other hand, SCOLA was created to store data collected in the context of mandatory verification of compliance to legal occupational exposure limits in France. Despite different objectives, COLCHIC and SCOLA share the same structure. Ancillary information includes industry, occupation, task, local and general ventilation, as well as representativeness and sampling strategies. Extracts from these two databases were obtained for the period until November 2012.

Results COLCHIC and SCOLA contain respectively 830 000 and 119 000 records. Data in COLCHIC cover 40 substances with more 4 000 measurements, 48 607 sampling visits in 24 520 factories. Data in SCOLA include 11 substances with more 1 000 measurements, 33075 sampling visits in 4384 factories. The 5 most frequent substances in COLCHIC are respirable dust (62876), toluene (31766), acetone (28763), lead (24614), xylene (21768). The 5 most frequent substances in SCOLA are asbestos (63886), wood dust (12625), crystalline silicate (4353), lead (3135) and toluene (2505). The main industrial activities in both databanks are manufacturing, construction, and waste management and remediation.

Conclusions COLCHIC and SCOLA both represent important sources of information on occupational exposures. However they do not result from probabilistic sampling and their representativeness of historical exposure in France is unknown.

6 SIGNIFICANCE OF OCTANOL-WATER PARTITION COEFFICIENT AND MOLECULAR WEIGHT AS MOLECULAR DESCRIPTORS IN PREDICTING SKIN PERMEABILITY OF CHEMICAL SUBSTANCES

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Objectives The occupational hazard of chemical absorption via dermal route was frequently assessed by evaluating the skin permeability (Kp) of chemical. In addition to *in vitro* testing using human skin, the quantitative structure-activity relationship (QSAR) has been employed as an alternative source to providing Kp. In the early Kp QSARs the octanol-water partition coefficient (log K_{OW}) and molecular weight (MW) were commonly applied as dominant properties to describe transdermal transport of chemical. This study examined the efficacy of log K_{OW}/MW-based QSARs in Kp prediction.

Methods One hundred and fifty-eight chemicals of known Kp determined *in vitro* using human skin were used to evaluate the goodness of fit (R²) of the model estimates approximating the measured Kp for six log K_{OW}/MW-based Kp QSARs reported in Wilschut *et al.* (1995) and Mitragotri (2002). A new Kp QSAR consisting of additional descriptors for the same compounds was developed by identification of key descriptors from a pool of 3,224 descriptors supported by Dragon[®] followed by stepwise regression.

Results For the log K_{OW}/MW-based Kp QSARs, the regression of model estimates against experimentally determined Kp yielded R² of 0.314 to 0.744, with the lowest value observed for the model employing log K_{OW} alone. In the new QSAR, in addition to log K_{OW} the electrostatic distribution in the molecular space appeared to be a significant factor affecting Kp, while the MW exerted its influence as a sub-domain, thus under constraints, of antineoplastic properties.

Conclusions As the Kp QSAR continues to evolve, attention may be required of on interpreting the limitations of MW as a

Kp descriptor. Four of the investigated Kp QSARs show a R^2 close to 0.7 or higher when predicting Kp, suggesting a consistent performance of these models to serve as a tool of dermal hazard characterisation.

7 STATISTICAL MODELLING OF OCCUPATIONAL EXPOSURE TO POLYCYCLIC AROMATIC HYDROCARBONS USING OSHA DATA

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Objectives Polycyclic aromatic hydrocarbons (PAHs) are a group of chemicals consisting primarily of fused aromatic rings. As environmental pollutants, PAHs are of concern because some variants are carcinogenic. Our objective is to predict probabilities of PAH exposure based on industry to allow assessment of individual PAH exposure through occupational history.

Methods The Occupational Safety and Health Administration (OSHA) provided access to two PAH exposure databanks of U.S. workplace compliance testing compiled between 1979 and 2010. Multivariable logistic mixed-effects models were used to predict, for each industry, the probability of a PAH measurement exceeding OSHA's permissible exposure level (exceedance fraction, PEL = 0.200 mg/m³). Time, databank, and industry were included as fixed-effects while inspection number, i.e. an identifier for the compliancy inspector, was included as a random-effect. Industry codes, represented by Standard Industrial Classification or North American Industry Classification System, were maintained or collapsed based on the number of measurements per cell to ensure sufficient sample size.

Results Databank records were amalgamated to yield 2,509 day-specific personal measurements representing 756 companies across 45 states. Regardless of industry code used, analysis revealed that for 1980 less than 5% of industry codes had an exceedance fraction (EF) greater than 0.8. The remaining industry codes were equally distributed between an EF range of 0.2–0.8 and an EF less than 0.2. Overall, more than 80% of industry codes had an EF less than 0.5, databank indicator was marginally significant ($p < 0.10$), and there was an inverse temporal trend of exceeding the PEL, with lower risk in most recent years (albeit not statistically significant).

Conclusions These statistical models allow identification of industries with different risks of elevated PAH exposure. However, because exposure may not be homogeneous within industry codes, future work will involve incorporating information on jobs/occupations with industries to more accurately identify PAH exposure.

8 EMPLOYMENT CIRCUMSTANCES AND CHEMICAL CONTROL MEASURES PROVIDED TO WORKERS WITH DERMAL EXPOSURE TO CHEMICALS - RESULTS FROM A POPULATION-BASED SURVEY

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Objective Chemical exposures in workplaces are an important occupational health and safety problem; however, there is little

published information available about the provision of basic exposure controls to workers with dermal chemical exposures across industrial sectors. This analysis investigated relationships between occupational, workplace and demographic factors and the provision of personal protective measures and/or provision of administrative controls among survey respondents exposed to chemicals at work.

Methods The inaugural Australian National Hazard Exposure Worker Surveillance (NHEWS) survey was a large, population-based telephone survey of workers from all industries. Respondents who reported dermal chemical exposure at work were asked about protective measures provided to them in the workplace, which we classified as administrative measures or personal protective measures. An ordered logistic model was used to investigate the odds of having chemical exposure protections provided by workplace and demographic variables.

Results Workplace size was the strongest predictor for the provision of exposure protection systems incorporating both administrative measures and personal protective measures. Compared to workplaces with fewer than five employees, workers in workplaces with 200 or more employees were more likely to have more comprehensive exposure protection systems, incorporating both administrative and personal protective measures (OR 4.96, 95% CI 2.97–8.28). Permanent and fixed-term employment was also associated with more comprehensive exposure protection systems compared with temporary/casual employment (OR 1.56, 95% CI 1.09–2.22) and self-employment (OR 1.69, 95% CI 1.18–2.42).

Conclusion In the NHEWS survey, employment in small workplaces, non-permanent and self-employment arrangements were associated with less comprehensive exposure protection systems. This suggests that small workplaces and non-permanent or self-employed workers may be important intervention targets for improving workers' exposure protection. Further research investigating exposure control provision in small workplaces and among insecurely employed workers as well as evaluation research of interventions to reach these workers is recommended.

Session: B. Other

9 BLOOD LEAD DETERMINANTS AND PREVALENCE OF NEUROPSYCHIATRIC SYMPTOMS IN FIREARM USERS

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Background Blood lead continues to be a health risk for Mexican workers.

Objective To identify blood lead predictors and the prevalence of neuropsychiatric symptoms in firearm users.

Material and Methods A cross-sectional study was performed on 65 males. We obtained socio-occupational and determined venous blood lead (BPb), as well as neuropsychiatric symptoms using the Q-16 questionnaire.

Results The mean (SD) [min-max] age was 34.8 (6.9) [21–60] years; mean number of years working at the company was 14 (8.5) [1–48] years. Twenty percent (13) used leaded glazed clay pottery (PbGC) in the kitchen. During practice they fired a mean 72 shots (60) [20–250], and during their employed life 5483 (8322.5) [200 to 50 000]. Mean BPb was 6.4 (2.8) [2.7–14.4] mcg/dL. Two caretakers at the firing range had 29.6 and