

ABSTRACTS MONDAY, JUNE 9, 2008

Oral sessions

COHORT STUDIES ON CANCER

Mo-O-1 MIS-SPECIFIED AND NON-ROBUST MORTALITY RISK MODELS FOR NASOPHARYNGEAL CANCERS IN THE NCI FORMALDEHYDE COHORT STUDY

*Morfeld P, Youk A, Marsh G.

Background and aims: IARC categorized formaldehyde as a Group 1 carcinogen. This decision was mainly driven by the analysis of the NCI (National Cancer Institute, USA) cohort (25,619 workers, follow-up until 1995, 8486 deaths) comprising sub-cohorts from 10 plants (Hauptmann et al. 2004). The authors emphasized the relationship found between highest formaldehyde peak exposure and death from nasopharyngeal cancer (NPC, 10 cases), and argued that adjusting for plant did not substantially change the results. Marsh and Youk (2005) carried out an analysis of the same data emphasizing that there is a cluster of 6 NPC cases in one specific plant (plant 1). They argued that the increased NPC mortality was restricted to that plant. Both groups of scientists used different statistical approaches and model assumptions.

Methods: One target of this re-analysis of the NCI cohort was to examine whether it would be necessary to consider an interaction term between working at a plant/plant group (1 vs. 2-10) and peak exposure. The extended model combined both analytical approaches of Hauptmann et al. (2004) and Marsh and Youk (2005). The second aim was to consider the impact of the small number of NPC cases. The robustness of the results (coefficients, p-values) was explored by adding only one more pseudo-case of NPC to the data repeatedly. These pseudo-cases were identified by stratified random sampling from all survivors.

Results: According to this re-evaluation, Hauptmann et al. (2004) missed an interaction between the plant group (1 vs. 2-10) and the exposure variable which prohibits a generalization of the plant 1 findings. In addition, the sensitivity analysis demonstrated considerable uncertainties in the risk estimates particularly related to plant 1. This instability of the NPC risk estimates was not reflected in the confidence intervals and p-values published.

Discussion and conclusions: Clearly, the results of this reanalysis of the NCI study did not support the suggestion of a causal association with formaldehyde exposure and NPC. The decision of the working group at IARC to classify formaldehyde as a Group 1 substance should therefore be reconsidered. Both statistical approaches (interaction analysis, sensitivity analysis) should also be carried out in the upcoming NCI analysis of the extended follow-up.

Mo-O-2 CANCER MORBIDITY IN BRITISH MILITARY VETERANS INCLUDED IN CHEMICAL WARFARE AGENT EXPERIMENTS AT PORTON DOWN

Carpenter L, Linsell L, Brooks C, Keegan T, Langdon T, Doyle P, Maconochie N, Fletcher T, Nieuwenhuijsen M, Beral V., *Venables KM

Background and Aims: Members of the British armed forces who took part in chemical warfare agent tests at Porton Down were exposed to a wide range of chemicals. A cohort was formed who were tested between 1941 and 1989 and their mortality and cancer morbidity studied.

Methods: All Porton Down veterans in the mortality study, and a similar group of non-Porton Down veterans, were considered for inclusion. Those known to have died or been lost to follow-up before 1 January 1971, when the UK cancer registration system commenced, were excluded. Remaining cohort members were followed to 31 December, 2004. Cancer morbidity in Porton Down and non-Porton Down veterans was compared using rate ratios (RRs), with 95% confidence intervals (CI), adjusted for age and calendar period. Cancers in any part of the death certificate were included as well as registered cancers and the first in any of 16 pre-determined site/type groups was analysed. Registration rates were also compared with rates in the general population. The same chemical exposure groups as for the mortality study were formed, with the addition of benzene.

Results: 18,276 Porton Down and 17,600 non-Porton Down veterans were in the mortality analysis and 17,013 and 16,520 respectively were included in the analysis of cancer morbidity. Over 500 chemicals

were identified in the Porton Down records for this period. Considering the carcinogens, 57% of the Porton Down veterans were recorded as being involved in at least one test with sulphur mustard, 9% with Lewisite, 6% with nitrogen mustard, and 5% with benzene. A total of 6,801 veterans developed at least one cancer during follow-up.

Discussion and Conclusions: While it has not been possible to present results at EPICOH 2008, the approach generates several discussion points, including on the large number of chemical exposures and of potential outcomes of interest.

Mo-O-3 CANCER MORBIDITY AND MORTALITY IN SWEDISH IRON FOUNDRIES

*Westberg HB, Ohlson C, Bryngelsson I, Andersson L.

Background and aims: The International Agency for Research on Cancer (IARC) has considered iron and steel founding carcinogenic, essentially based on a doubled risk of lung cancer. The exposures of concern are respirable quartz and polycyclic aromatic hydrocarbons. As part of an exposure survey a register based cohort study on cancer morbidity and mortality was carried out in Swedish iron foundries investigating correlations between quartz exposure and cancer risk.

Methods: The cohort of 3460 men employed between 1913 and 2004 was followed up for mortality from 1952 to 2003 and for cancer morbidity from 1958 to 2004. Employment time and job held were extracted from foundry personnel registers. The cohort was linked to the National Cancer registry and the causes of Death registry. In all, 2841 exposure measurements of respirable quartz from 1968 to 2006 were available for exposure-response analysis

Results: The overall mortality and cancer morbidity were close to the expected, SMR=1.08 (95% CI 1.01-1.16) and SIR=0.96 (95 % CI 0.86-1.06). Among the diseases of the respiratory system an increased mortality was seen, SMR =1.34 (95% CI 1.02 - 1.73) including 9 cases of silicosis and 7 deaths more than expected in chronic obstructive airway disease (COL) SMR=1.58 (95 % CI 0.95-2.47). In total, 53 cases of lung cancer among men versus 35 expected were found, SIR=1.51 (95 % CI 1.13-1.97). Information from surveys of smoking habits by the Swedish National Bureau of Statistics and questionnaire data from own cohort suggested a slightly higher incidence of smoking among the foundry workers compared to national reference data. After adjusting for smoking habits, the relative risk of lung cancer decreased to SIR=1.28 (95 % CI 0.93 –1.72).

Discussion and conclusions: A statistically significant risk of lung cancer for iron foundry workers was detected. A higher proportion of smokers among the foundry workers was considered partly responsible for the elevated risk. The exposure to respirable quartz could be attributed to an increased lung cancer risk of about 25 %, although no clear exposure-response could be established.

Mo-O-4 CANCER MORBIDITY OF FOUNDRY WORKERS IN KOREA

*Ahn Y, Park R, Won J.

Background and aims: Foundry workers are potentially exposed to a number of carcinogens. This study was conducted to describe the cancer incidence associated with employment in small-sized Korean iron foundries and to compare findings to those previously reported in other countries.

Methods: Cancer morbidity in more than two hundred Korean foundries was analyzed using the Standardized Incidence Ratio (SIR) and Standardized Rate Ratio (SRR). Work histories were merged with national cancer registry data for 17,098 workers (14,611 men, 2,487 women) who were followed during 1992 - 2002.

Results: 279 cancers (242 men, 37 women) in 1.6 percent of the population were diagnosed over 11 years. Overall cancer morbidity in foundry workers (SIR=1.01, 95%CI=0.86-1.08) was similar to Korean general population. Only for lung cancer in production workers was significantly high (SIR=1.56, 95%CI=1.02-2.02) compared to Korean general population. Stomach cancer in fettling – cleaning of castings – (SRR=2.99, 95%CI=1.19-7.55) and lung cancer in molding (& core making) (SRR=4.99, 95%CI=1.13-22.10) and in fettling (SRR=5.02, 95%CI=1.13-22.34) were there significant elevations compared to office workers.

Discussion and conclusions: This study describes work-related cancer morbidity in small-scale Korean foundry operations in relation to the national population and demonstrates the importance of addressing issues of selection confounding, such as the healthy worker and survivor effects, in analyzing exposure health effects. The interpretation of these findings is hampered by the small numbers of cases and the limited exposure history available for individual workers.

Mo-O-5 CANCER MORTALITY AMONG CHRYSOTILE WORKERS: 34 YEARS FOLLOW-UP

*Yano E, Wang X, Wang Z, Wang M, Lan Y.

Background and aims: As for the carcinogenicity of asbestos, there has been a claim that only amphibole but not chrysotile causes cancer (Amphibole Hypothesis). Also there have been reports that workers of chrysotile textile plant showed a higher incidence of lung cancer compared to raw chrysotile miners (Textile Mystery). In order to examine the carcinogenicity of chrysotile asbestos in textile plant, we have followed a fix cohort of 522 male workers in an asbestos plant in Chongqing, China since the beginning of 1972 and analyzed the mortality data of workers. In the plant, using mostly chrysotile from Chinese mines, asbestos textile, asbestos cement, flooring materials, friction materials, etc, have been manufactured. Our previous observation by matched case-control (1:5) study using workers who developed lung cancer sometime between 1975 and 2001 as case group demonstrated odds ratio of more than 4 for lung cancer by exposure to asbestos at the highest level compared to the lowest.

Methods: In 2006, we summarized further follow up of the cohort and found that, in addition to the 131 deaths until the end of 25th year, 101 of the cohort were deceased during the last 9 years, and among them, 29 were from lung cancer (total: 47 lung cancers during the 34 years). Workers are divided into 7 departments and depending on the concentration of fiber, they were re-categorized into 3 groups.

Results: Compared to the administration and asbestos cement workers, workers in raw material and textile departments showed higher hazard ratio (95% CI) for lung cancer of 3.3 (1.6-6.5) by Cox proportional hazard model analysis. Similarly, hazard ratios for total cancer and total death were 1.8 (1.1-2.9) and 2.4 (1.6-3.6), respectively. Multivariate analysis controlling for age, smoking, and working time did not change the results greatly.

Discussion and conclusions: The results of the present study confirm the strong association of chrysotile to lung cancer. Results of the fiber type analysis in relation with the Textile Mystery and different carcinogenicity by the fiber type would be discussed.

Mo-O-6 CANCER MORTALITY IN THE FRENCH COHORT OF AREVA NC WORKERS: EXTENDED FOLLOW-UP 1977-2004

*Metz-Flamant C, Rogel A, Caër S, Samson E, Laurier D, Quesne B, Acker A, Tirmarche M.

Background and aims: The French cohort of workers employed at the company specialized in nuclear fuel cycle (AREVA NC ex COGEMA) has been established in order to evaluate the mortality risk of workers exposed to low level of ionizing radiation. We present here a new analysis of the cancer mortality based on an extended follow-up of the cohort by 10 years.

Methods: Individual vital status was ascertained through a national database and causes of death were determined according to death certificates. Standardized Mortality ratios (SMR) were computed to compare the mortality of AREVA NC workers with the French national population. All-cancer SMR was detailed for characteristics like calendar year, age, duration of employment, time since hired and cumulative exposure lagged for 10-years. Trend tests were computed for each specific cancer site to assess the association between mortality and exposure.

Results: The total cohort comprises 9,285 workers. The mean duration of follow-up is 22 years. Workers lost to follow-up represent less than 1% of the cohort. A total of 482 cancer deaths is observed up to 2004. Mean age at end of follow-up was 56 years. A strong deficit was observed for all cancer mortality. No significant excess was found for any of the cancer sites studied. No significant trend in all-cancer SMR was observed with duration of employment and time since hired. The all-cancer SMR increased significantly with cumulative dose, but after adjusting on socioeconomic status (SES), these positive trends were no longer statistically significant. Among cancer sites studied, significant trends were observed for colon cancer and liver cancer.

Discussion and conclusions: AREVA NC workers exposed to ionizing radiation have a lower mortality than the French national population, partly due to the Healthy Worker Effect. It is important to adjust on SES in the dose-effect relationship analysis. Although follow-up has been extended by 10 years, statistical power is still low. Isolated significant trends of one or two cancer sites studied have to be carefully interpreted, in regard of the large number of trend tests performed. A larger cohort, including other French nuclear workers, is planned in near future; AREVA NC workers will be part of it.

RESPIRATORY HEALTH 1

Mo-O-7 EXPOSURE-RESPONSE ANALYSIS AND LIFETIME RISK ESTIMATION FOR SILICOSIS AMONG A COHORT OF CHINESE TUNGSTEN MINERS

*Bochmann F, Chen W, Sun Y.

Background and aims: In order to quantify the relation between various patterns of silica dust exposure and the incidence and lifetime risk of silicosis, an extended follow-up was conducted among a cohort of 7362 dust exposed workers employed at least for one year since 1950 in 4 Chinese tungsten mines.

Methods: Incident cases of silicosis were identified using well-established silicosis registry during a follow-up time period between 1960 and 2003. Individual exposure to respirable silica was estimated based on about 2 million historical industrial hygiene data collected since 1950. The association between various patterns of silica dust exposure (combination of average exposure, highest exposure and exposure duration), latency period and the incidence of silicosis was estimated by time dependant Poisson regression analysis adjusted for age and smoking. Lifetime risk of silicosis was quantified for a 45 year silica exposure from the age of 20 until the age of 65 with consideration of different exposure patterns, dust measurement strategies and competing risks.

Results: The analysis demonstrated a clear exposure-response relationship between silica exposure and silicosis. The incidence of silicosis depends strongly on the exposure patterns and latency period and reaches the highest value about 30 – 35 year after the exposure. The lifetime risk of silicosis is about 5/1000 in a 45 year exposure under an average exposure level of ≤ 0.1 mg/m³ and a highest exposure of ≤ 0.5 mg/m³ (German measurement strategy) or an average exposure level of ≤ 0.05 mg/m³ and a highest exposure of ≤ 0.25 mg/m³ (US measurement strategy), respectively.

Discussion and conclusions: For the first time, this study results demonstrate that in risk quantification and communication of silicosis not only the overall dose but also the different combinations of average exposure and highest exposure is important.

Mo-O-8 MATRIX OF POTENTIAL EXPOSURE AS AN INSTRUMENT TO SURVEILLANCE AND PREVENTION OF SILICOSIS

*Ribeiro FS, Bernales B, Partanen T.

Background and aims: Silicosis is probably the most ancient occupational illness. Silica exposure still persists as a worldwide important public health problem, not only for silicosis but also cancer and other diseases. The ILO/WHO Global Program for the Elimination of Silicosis was established in 1995. Brazil, China, Chile, India, Thailand, Vietnam, and South Africa have established their National Programs. As proposed in the second international meeting of International Plan for Americas in 2007, effectiveness of interventions requires the estimation of numbers and distribution of exposed. Exposure mapping may then be undertaken with a Matrix of Potential Exposure (MPE). The objective of the study was to estimate the numbers of workers exposed to silica in Brazil, Chile and Costa Rica, and to create a methodology compatible with MPEs in other countries of America.

Methods: An MPE was developed in Brazil, following the conception of the CAREX database, and applied also in Chile. Previous CAREX estimations were available for Costa Rica. The results were compared, and the exposure situation of each economical section (industry) was analyzed.

Results: The main between-country differences were marked, and a model is being built considering variations in the work process. There are about 2 million workers exposed to crystalline silica (5.3 % of the employed) in Brazil; and in Chile, 374.843 workers (5.4% of the employed) in 2005. A rougher method applied in Costa Rica in 2000 resulted in 27,100 workers exposed (2.1%).

Discussion and conclusions: This methodology for the estimation of the number of exposed is being proposed for all countries in Latin America. A map of occupational silica exposure in Americas is being constructed by the efforts of Brazil, Chile and Costa Rica through a compatible MPE. Recommended interventions for prevention include the complete elimination of the use of crystalline silica and substitution with less hazardous materials. Engineering control programs would be cost effective in both developed and developing countries for reducing silica exposure. Obligatory notification of silicosis is needed in all countries.

Mo-O-9 OCCUPATIONAL EXPOSURES IN ASTHMA EPIDEMIOLOGY STUDIES OF HEALTHCARE WORKERS: COMPARISON OF SELF-REPORT VERSUS A JOB-EXPOSURE MATRIX

*Delclos GL, Gimeno D, Arif AA, Benavides FG, Zock J.

Background and aims: In asthma studies of general populations, self-reported occupational exposures appear to be influenced by both individual asthma status and community prevalence of asthma. Whether this occurs in industry-specific studies of workplace asthma is not known. We addressed this issue by comparing self-reported occupational exposures, obtained through a mail survey of asthma in 5600 Texas healthcare professionals, to a recently developed asthma risk-factor job-exposure matrix (JEM).

Methods: Development of the questionnaire and JEM have been previously described (Occ Environ Med 2006; 63:173-179; Am J Resp Crit Care Med 2007; 175:667-675). For asthmatics and non-asthmatics, we separately evaluated sensitivity, specificity, and chance-independent agreement (ϕ) values of self-reported exposures to cleaning agents (used in patient care, for medical instrument cleaning or applied to general cleaning surfaces), powdered latex glove use, aerosolized medications and adhesives/glues/solvents in comparison to JEM-based exposure classification.

Results: Among persons with a prior physician diagnosis of asthma and/or wheezing in the previous 12 months, median sensitivity of self-reported exposures was 74% (range, 53%-90%), and specificity was 64% (range, 27%-74%). For non-asthmatics, median sensitivity was 67% (range, 40%-88%), and specificity was 70% (range, 33%-82%). Sensitivity was significantly higher among asthmatics for exposures to cleaning products and adhesives/glues/solvents; specificity was higher among non-asthmatics for medical instrument cleaning and use of adhesives/glues/solvents on building surfaces ($p < 0.05$). "False-positives" (i.e., those who self-reported exposure but the JEM did not) were high overall, but without major differences between asthmatics and non-asthmatics. Asthmatics tended to show slightly stronger point estimates of chance-independent agreement with the JEM than non-asthmatics for patient-care related cleaning ($\phi = 0.51$ versus 0.40) and administration of aerosolized medications ($\phi = 0.48$ versus 0.45), but there was little difference with respect to medical instrument cleaning, latex glove use or exposures to adhesives/glues/solvents. In virtually all cases, however, confidence intervals for agreement among asthmatics and non-asthmatics overlapped.

Discussion and conclusions: Among healthcare professionals, there is a differential recall bias which favors using an externally developed JEM rather than self-reported exposures in studies of workplace asthma.

Mo-O-10 PESTICIDE EXPOSURE AND RESPIRATORY HEALTH OF INDIGENOUS WOMEN IN COSTA RICA

*Fieten KB, van Wendel B, Kromhout H, Heederik D.

Background and aims: In Costa Rica, use of synthetic pesticides in agriculture is widespread. Several studies demonstrated a correlation between pesticide exposure and the occurrence of respiratory or atopic symptoms. Most of these studies investigated male workers. The present study was conducted to investigate the association of pesticide exposure with respiratory symptoms and ventilatory lung function among female workers.

Methods: The study population was selected in the BriBri indigenous reserve in Costa Rica. Women ($n=134$) between 24 and 58 years of age were asked to participate, of whom 95% joined the study ($n=127$). Exposed women ($n=69$) all worked at plantain plantations, unexposed women ($n=58$) worked at organic banana plantations or another location. Study participants were interviewed with use of a questionnaire to estimate pesticide exposure, occurrence of respiratory symptoms and atopy. Spirometry tests were taken to obtain forced vital capacity (FVC) and forced expiratory volume in one second (FEV1).

Results: Among the exposed, the prevalence of wheeze was 20%, shortness of breath 36%, chronic cough 10%, asthma 10% and atopy 30%. Exposure to organophosphates chlorpyrifos and terbufos resulted in a sevenfold higher odds ratio for wheeze among non-smokers ($OR=7.5$; 95% CI 1.7-34.0) with increasing exposure resulting in higher odds ratios. Higher odds ratios were found for atopic symptoms among paraquat exposed women. No relation between pesticide exposure and FEV1 or FVC was found.

Discussion and conclusions: Prevalence of wheeze among exposed women was similar to previously reported prevalence in exposed men. Exposure to the organophosphates terbufos and chlorpyrifos in particular was associated with increased wheeze. Paraquat application was related to a significant increase in atopic symptoms, but no IgE was measured and a small number of women applied paraquat. Well-known predictors such as age and length influenced spirometric variables, but pesticide exposure did not. Since occupational pesticide exposure in women is increasing, further research is needed to determine whether there is a respiratory health threat for these women.

Mo-O-11 SMOKING INTERACTS WITH PESTICIDE POISONING TO REDUCE LUNG FUNCTION IN COLORADO FARM RESIDENTS

*Beseler CL, Stallones L.

Background and aims: Respiratory hazards contribute significantly to the burden of occupational disease among farmers. Pesticide exposure has been linked to an increased prevalence of respiratory symptoms in several farming populations. The purpose of this study was to evaluate the associations between respiratory symptoms, lung function, and pesticide poisoning in a cross-sectional survey of farm residents.

Methods: Farm operators and their spouses, residing in northeastern Colorado, were recruited from 1993 to 1997. A total of 761 individuals, representing 479 farms, were enrolled in the study. The response rate of eligible farms was 55%. A personal interview asked about pesticides used on the farm in the 12 months preceding the interview and whether the resident had experienced a pesticide poisoning. Respiratory symptoms assessed included cough and Organic Dust Toxic Syndrome (ODTS). Spirometric testing was performed on 196 individuals. Logistic regression was used to model the association of

pesticide poisoning with cough and ODTS. Linear regression was used to model the association of pesticide poisoning and forced vital capacity (FVC).

Results: In univariate analyses, pesticide poisoning was significantly associated with cough in all residents (OR 2.21; 95% CI 1.15, 4.25), and in non-smokers (n=677; OR 2.45; CI 1.23, 4.88), but not in current smokers (n=75; OR 0.94; CI 0.10, 8.39). Poisoning was significantly associated with ODTS in all residents (OR 2.27; CI 1.18, 4.38) and in non-smokers (OR 2.10; CI 1.04, 4.26), but not in current smokers (OR 4.13; CI 0.66, 26.1). In univariate analysis, poisoning was significantly associated with a decrease in FVC (t=2.13; p=0.03), and significantly interacted with smoking in age- and gender-adjusted models (t=2.81; p=0.006). After stratifying by smoking status, pesticide poisoning was associated with decreased FVC in current smokers (n=15; t=2.94; p=0.01), but not in non-smokers (n=178; t=0.85; p=0.40).

Discussion and conclusions: Pesticide poisoning was associated with cough and ODTS in unadjusted models and significantly interacted with smoking to reduce pulmonary function. Although this study should be replicated in a larger sample, it emphasizes the risks to respiratory health that can occur with multiple exposures. Further evaluation of the respiratory effects of pesticide exposure is warranted.

Mo-O-12

(Author did not attend conference)

REPRODUCTIVE DISORDERS

Mo-O-13 THE RISK OF MALE-MEDIATED CONGENITAL MALFORMATIONS IN OCCUPATIONS WITH PESTICIDE EXPOSURE: A STUDY IN THE DANISH NATIONAL BIRTH COHORT (DNBC).

*Kaerlev L, Toft G, Ramlau-Hansen C, Olsen J, Bonde JP.

Background and aims: Paternal pesticide exposure has been associated with cryptorchidism in male offspring. Pesticides may be involved in male-mediated developmental toxicity through genomic or epigenetic change of the sperm genome, or by maternal exposure to the fathers contaminated working clothes. We studied the risk of all congenital malformations and male genital malformations following paternal occupational exposure to pesticides in Denmark.

Methods: Prospectively collected data on 86,810 singleton pregnancies from DNBC. Information on the fathers work at the time of pregnancy was obtained by telephone interview around the 16th week of gestation. Job titles were classified according to DISCO-88. A coherent exposure assessment was performed blinded to the outcome by implementation of an established job-exposure matrix for pesticides [1]. Data on congenital malformations were obtained by linkage to the Medical Birth and the National Hospital Registers.

Results: The prevalence of fathers with likely or possibly occupational exposure to pesticides were 3,616 (4.2%) and 2,772 (3.2%), respectively, and the main occupations conferring exposure were carpenters, joiners, agricultural workers and military work (92% of exposed). The large study population provided narrow confidence intervals (CI). The prevalence of all malformations was 7.8%, and the odds ratios (OR) with 95% CI following likely and possible pesticide exposure were 0.92, (0.81-1.04) and 1.0 (0.86-1.14), respectively. The OR for cryptorchidism 0.92 (0.65-1.29) or hypospadias 1.0 (0.54-1.83) in male newborns was not increased following likely pesticide exposure.

Discussion and conclusions: No association was found between proxies of paternal occupational pesticide exposure and congenital malformations in their offspring. Pesticides seem unlikely to cause male-mediated congenital malformations in Danish workplaces. An increased risk of specific malformations cannot be ruled out but seems unlikely considering possible biological mechanisms.

Mo-O-14 IMPACTS OF PESTICIDE USE ON SEMEN CHARACTERISTICS AMONG RICE FARMERS IN KIENXUONG DISTRICT, THAIBINH PROVINCE, VIETNAM

*Vu TP, Wangsuphachart V.

Background and aims: Reduction of sperm count, lower motility and lower normal sperm morphology are associated with a higher probability of infertility. The adverse effects of pesticides to male reproductive system are major health problem all over the world. World pesticides use is high for all pesticides types. Imported pesticides have increased significantly in Southeast Asia and Vietnam. Results from several scientific studies have indicated temporal and regional changes in the male reproductive health. Additionally, a possible decline in semen characteristics has been observed and reported in many studies. Objectives of study were to describe the characteristics of sperm specimens among male farmers and to explore the association of pesticides exposure on sperm quality among male farmers.

Methods: This case-control study assessed the effects of pesticide use on semen characteristics among rice farmers of Kienxuong District, Thaibinh Province, Vietnam. Semen samples of 1,036 rice farmers were obtained by manual masturbation and screened at Commune Health Stations. Of these, 156 abnormal semen samples were identified; 314 rice farmers with normal semen were recruited as controls

Results: The semen characteristics (volume, sperm concentration, total sperm count, motility, vitality and morphology) of the cases were considerably poorer than the controls. Factors associated with abnormal semen after adjusting for age, smoking and alcohol drinking by logistic regression were: distance of less than 300 meters from household to rice fields and duration of work over 10 years as a farmer (adjusted OR = 3.16, 95% CI: 1.97 – 5.05 and adjusted OR = 3.98, 95% CI: 2.20 – 7.21, respectively). Rice farmers without personal protective equipment (PPE) when spraying pesticides and without pesticide training (adjusted OR = 3.05, 95% CI: 1.92 – 4.85 and adjusted OR = 1.90, 95% CI: 1.14 – 3.16, respectively) were also at risk for abnormal semen compared to controls.

Discussion and conclusions: These findings showed the strength of association between pesticide use and abnormal semen characteristics among rice farmers in Kienxuong District, Thaibinh Province, Vietnam.

Mo-O-15 DDE MATERNAL SERUM LEVEL AND HYPOSPADIAS IN THE OFFSPRING: AN ITALIAN CASE-CONTROL STUDY.

*Giordano F, Abballe A, Carbone P, De Felip E, Ferro F, Grammatico P, Ingelido A, Marrocco G, Marra V, Figà-Talamanca IP.

Background and aims: Although DDT was banned in Italy in 1978, because of its stability and persistence in the environment, it is still present in the adipose tissue of the population. Possible long-term adverse effects on humans include carcinogenicity and reproductive health problems. Exposures in utero to DDT, because of its estrogenic and antiandrogenic properties, is considered an Endocrine Disrupting Chemical (EDC). According to the Testicular Dysgenesis Syndrome, DDT exposure in utero might be associated with an increased risk of hypospadias. The objective of the present case control study was to evaluate the possible risk of hypospadias in the offspring in relation to the DDE concentration in the maternal serum.

Methods: Cases and controls were recruited between the years 2005 and 2007 in two hospitals of Rome where hypospadias children are surgically treated. Cases were patients that underwent to surgical treatment for any form of hypospadias. Controls were healthy children without any birth defect. Both cases and controls were males aged two or younger. Parents of 80 cases and 80 controls were administered a detailed questionnaire to ascertain environmental and occupational EDCs exposures. We obtained blood samples from a subgroup of 37 primiparous mothers among cases and 21 among controls.

Results: In addition to being all primiparous, mothers of cases and controls were similar in age and breast-feeding duration. Mean of DDE maternal serum level of cases (1.28 ng/g of serum; SD=0.71) was not statistically different in comparison with control's (0.96 ng/g of serum; SD=0.56). Among mothers with DDE serum level above the median of the pooled group, the odds ratio for hypospadias was OR=2.25 (95%CI 0.58-8.72) after adjustment for confounding for BMI, and percent lipids in the serum.

Discussion and conclusions: Mean of DDE maternal serum concentration is in line with that found in other studies performed in the same period. Our findings partially support the hypothesis of a possible association between the risk of hypospadias in relation to maternal DDE serum concentration, but the association should be explored in studies with more statistical power.

Mo-O-16 RISK OF GENITAL MALFORMATIONS CONFERRED BY OCCUPATIONAL EXPOSURE TO ENDOCRINE DISRUPTING CHEMICALS: A STUDY IN THE DANISH NATIONAL BIRTH COHORT (DNBC)

*Bonde JP, Toft G, Jensen MS, Ramlau-Hansen C, Kærlev L, Thulstrup A, Olsen J.

Background and aims: Maternal exposure to endocrine disrupting chemicals (EDC) may increase the risk of genital malformations in both sexes, but so far the human evidence is scanty. The objective was to examine the risk of cryptorchidism, hypospadias and female genital malformations following occupational exposure to chemicals with the potential to interfere with the hormonal homeostasis.

Methods: We analysed prospectively collected data on 86,810 singleton pregnancies from DNBC. Information on work during pregnancy was obtained by telephone interview around the 16th week of gestation. Job titles were classified according to DISCO-88 and a coherent exposure assessment was performed blinded to the outcome by implementation of an established job-exposure matrix for EDCs[1]. Data on congenital malformations were obtained by linkage to the Medical Birth and the National Hospital Registers

Results: 6.3% of pregnancies were classified as possibly exposed to at least one of seven groups of EDCs and 4.0% were probably exposed. The most prevalent occupations conferring likely exposure to EDCs

were cleaners, laboratory technicians, hairdressers and agricultural workers (58% of all exposed). The prevalence of cryptorchidism was 2.0% (882 cases), of hypospadias 0.6% (257 cases) and of female urogenital malformations 0.1% (46 cases). The adjusted risk of hypospadias was increased in both likely exposed [OR 2.0 (95% CI 1.3-3.1)] and possibly exposed singleton pregnancies [OR 1.8 (95% CI 1.2-2.7)], while the risk of cryptorchidism and female genital malformations was not

Discussion and conclusions: Male genital organs may be at risk from occupational exposure to endocrine disrupting chemicals. Findings need cautious interpretation because of crude exposure assessment and results should be corroborated or refused in other studies.

(1) van Tongeren M, Nieuwenhuijsen MJ, Gardiner K et al. A job-exposure matrix for potential endocrine-disrupting chemicals developed for a study into the association between maternal occupational exposure and hypospadias. *Ann Occup Hyg* 2002;46:465-77

Mo-O-17 THE EFFECTS OF WORK-RELATED MATERNAL RISK FACTORS ON TIME TO PREGNANCY, PRETERM BIRTH AND BIRTH WEIGHT: THE GENERATION R STUDY.

*Burdorf A, Brand T.

Background and aims: To investigate the influence of maternal working conditions on fertility and pregnancy outcomes.

Methods: In a large prospective birth cohort women (n=8880) were enrolled during early pregnancy (76%), mid pregnancy (21%) or late pregnancy (3%) with an estimated participation around 61%. The required information was collected in the questionnaire during mid-pregnancy, with complete information available for 6,302 women (response 71% of the enrollment). Outcomes were defined as delayed time-to-pregnancy (> 6 months), preterm birth (< 37 weeks), and decreased birth weight (< 3000 g). Self-reported exposure to chemical agents was based on a limitative list of chemicals. Questions on physical load concerned manual materials handling, prolonged sitting and long periods of standing. With respect to chemical exposure a job-exposure matrix was also used, linking the reported job title to an expert judgment on relevant exposure to chemicals at the workplace within jobs. Logistic regression analysis was used to evaluate association between maternal occupational exposure and fertility and pregnancy outcomes, adjusted for age, education, ethnicity, parity, smoking, and alcohol use.

Results: In general, women in paid employment had better fertility and pregnancy outcomes than those without paid employment. Women in jobs with regular handling of loads > 5 kg had better fertility and pregnancy outcomes. Maternal occupational exposure to phthalates was associated with a delayed time to pregnancy (OR=2.13) and maternal occupational exposure to pesticides was associated with a decreased birth weight (OR=2.45). The population attributable risks were small with 0.7% for phthalates and 0.7% for pesticides.

Discussion and conclusions: This population-based birth cohort study has presented evidence for a health-based selection into the workforce and for adverse effects of maternal occupational exposure to phthalates and pesticides on fertility and pregnancy outcomes.

Mo-O-18 ENDOCRINE DISRUPTORS: RISK FACTORS FOR CRYPTORCHIDISM?

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Background and aims: Cryptorchidism is the most common birth defect in boys with a largely unknown etiology. Environmental and occupational exposures to endocrine disruptors have been put forward as risk factors for cryptorchidism, although substantial epidemiological evidence is lacking. The authors conducted a case-referent study on risk factors for cryptorchidism, focusing on maternal and paternal exposures to endocrine disruptors.

Methods: Cases and referents were 203 boys with surgically corrected cryptorchidism and 629 boys with middle ear infection, who were recruited at 5 hospitals in the Eastern part of the Netherlands. Referents were frequency matched with the cases on regional postal codes to obtain similar geographical distributions. Both parents of cases and referents filled out postal questionnaires. Confounder adjusted odds ratios (OR) with 95 percent confidence intervals (CI) were estimated using unconditional logistic regression.

Results: Corresponding with the literature, cryptorchidism was associated with low birth weight: OR 2.2 (95%CI 1.1-4.2), multiple gestation: OR 2.2 (95%CI 0.9-5.3), and familial occurrence of the disorder: OR 3.2 (95%CI 2.0-5.1). Use of oral contraceptives after conception also seemed to increase the risk of cryptorchidism: OR 3.6 (95%CI 1.0-12.5). Indications were found for associations with gestational preeclampsia and prescriptive drug use of both parents. Fathers of cases slightly more often reported daily use of body lotion: OR 1.7 (95%CI 1.0-2.9) and occupational exposure to cosmetics, which are potential sources of exposure to endocrine disrupting substances, such as phthalates and parabenes. Maternal occupational exposure to cosmetics appeared to be associated with cryptorchidism as well: OR 3.0

(95%CI 0.9-9.9). Additionally, mothers of cases more often reported occupational exposure to dust of diverse origins: OR 5.1 (1.6-16.4). No associations were found between cryptorchidism and parental exposure to pesticides, paints, adhesives, or thinners.

Discussion and conclusions: The findings reflect a number of risk factors for cryptorchidism in general, but provide only some support for a role of endocrine disruptors in its etiology. However, the associations with occupational exposures need a re-evaluation using more valid exposure assessment methods, which is currently being done.

MINISYMPOSIUM: INFORMAL SECTOR

Mo-O-19 WORKING UNDER FIXED-TERM EMPLOYMENT CONTRACT IN FINLAND

*Nurminen M.

Background and aims: Fixed-term work is today prevalent in the Finnish labour force. This form of employment contract is marked by fragmentary work periods, demands for flexibility in working hours and concern for multiple insecurities. The problems that arise from temporary employment confront both the employees and the employers: financial instability, loose commitment to work and uncertainty of the future working life are among the common concerns. Yet there exist no statistics on the total duration of fixed-term employment.

This article gives an overview of fixed-term employment in Finland. It considers its implications in relation to age, gender, generation, occupational health, disability pension, old-age retirement, labour legislation and other social policy issues. Some comparative observations from Australian and other international casual employment contracts are also made. The empirical study estimated the future time that a person is expected to be employed in either fixed-term or permanent work.

Methods: Multistate regression modelling was applied to time series from Labour Force Surveys conducted by Statistics Finland in 1997-2006.

Results: A Finnish male is expected to work a total of 4 years under a fixed-term employment contract, combined over consecutive or separate time spans; that is 8 per cent of his maximum career until retirement. For females the expectancy is longer, 6 years or 12 per cent.

Discussion and conclusions: Insecurities pertaining to fixed-term employment are likely to beget serious labour market and societal repercussions. This labour market development calls for devising standards for flexibility and guarantees for security in the fragmented future working lives of non-permanent employees.

Mo-O-20 HEALTH DETERMINANTS OF PRECARIOUS INFORMAL WORKERS: MIGRANTS IN LOS SANTOS, COSTA RICA

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Background and aims: Health data on temporary immigrants are scanty and suffer from biases from health selection, short follow-up, and underreporting. Data on physical and social health determinants at route and destination are less vulnerable to such biases. These determinants are likely to be conditioned also by gender, ethnicity and nationality of the migrants

Methods: In the agroexport Zone of Los Santos in San José province, southwest mountains of Costa Rica, coffee is seasonally harvested by transborder and domestic migrants. Health determinants and current illnesses of 8,783 migrants in 1,099 temporary dwellings at 520 farms were assessed during the 2004-2005 season by interviews, observation and Geographical Information System.

Results: Seventy-six percent of the immigrants came from Panama and Nicaragua; 58% were indigenous; 63% were men. Twenty-two descriptors characterized the temporary dwellings. A 30% lived in improvised shacks or hovels. Structural deficiencies were observed in half of the dwellings, deficient water quality in 38%, improper disposal of garbage in 79%, >3 persons/bedroom in 50%, and distance to basic services with >2 km and with slope >25 degrees in 43%. The descriptors were reduced into seven orthogonal factors: structural deficiencies, isolation, crowding, insufficient facilities, lack of radio/television, deficient basic installations, and deficient cooking facilities. Regression models revealed that the indigenous and the non-Costa Ricans shared the poorest conditions as independent and joint effects, adjusted for geography. Potentially subject to the biases mentioned, the highest point prevalences of reported illnesses were for respiratory (4.6%), digestive (2.1%), and cardiovascular (2.0%) and allergic (1.9%) diseases. Reluctance to use mainstream public health services was widespread and concentrated on foreign and indigenous immigrants and the geographically isolated.

Discussion and conclusions: A number of strategies were initiated to reduce health hazards and preventable illness, and to improve the living and working conditions.

Mo-O-21 INFORMAL JOBS AND NON-FATAL OCCUPATIONAL ACCIDENTS – A LONGITUDINAL DATA ANALYSIS

*Santana VS, Lisboa M.

Background and aims: Workers without a formal job contract or in the informal economy usually are not covered by health and safety programs or legal labor protection norms, leading them to be at increased risk of occupational accidents. However findings from studies conducted in Brazil show no differences on cumulative or incidence rate of occupational for informal or formal workers. In this study the association of informal jobs and non-fatal occupational accidents are examined from 2000 to 2006 with data from a longitudinal study.

Methods: This is a community-based study carried out with a one-stage random cluster area sample of the residents of Salvador, a city with 3 mi inhabitants, the capital of the state of Bahia, northeast Brazil. Since 2000, the study population has been interviewed every two years to obtain socio-demographic, occupational and health data.

Results: The estimated annual cumulative incidence at the baseline was 5.8% for informal workers and 5.3% among those having formal contracts, with no statistical significant difference. Similar findings were estimated for the other study years, except in 2004, when the overall relative risk was RR=1.32; 95% CI: 1.04-1.67), which remains statistically significant among males (RR=1.4; 95% CI: 1.03-2.04). No positive association was estimated among female workers throughout the study period.

Discussion and conclusions: This study shows that nonfatal work injuries are a common health problem among adults in urban Brazil, with no major differences according to the type of job contract or gender. Since Brazil holds high proportions of informal workers and informal economy, its role for the reinforcement of labor protection programs and norms in the formal economy need to be further evaluated. These findings support the need to improve workers' health and safety programs for formal and informally hired workers.

Mo-O-22 HEALTH RISK ASSESSMENT AND INTERVENTIONS AMONG INFORMAL STONECRUSHERS IN DAR-ES-SALAAM, TANZANIA, IN 2006

*Kessy FM, Naidoon R, Mlingi LB.

Background and aims: The informal sector in Tanzania employs approximately 50–60% of the economically active population. The informal construction sector in Dar-es-Salaam consists of 26,400 workers, of whom about 6500 work in stonecrushing. This study aimed at determining risks to stone crushers in terms of the likelihood of exposure occurring and the severity of outcome of exposure, and the development of appropriate interventions

Methods: A walkthrough survey guided by a checklist developed specifically for informal workplaces was used to characterize and evaluate hazards . Quantitative area measurements for dust and noise were done using standardised protocols. Area dust sampling was done in five sub-sections including hand-drilling, blasting, crushing, screening and loading. Noise measurements were done at six selected points. Through consultation with workers, engineers, trade unions and non-governmental organisations, comprehensive health and safety training programmes were implemented and ergonomic interventions were designed.

Results: Hazards were rated using a risk matrix in terms of probability of exposure, exposure frequency and severity of the outcome.. The most highly rated hazards were ergonomic hazards, exposures to extreme heat, noise and dust. Respirable dust levels ranged from 7.5mg/m³ – 10.3mg/m³, with a mean of 9.8mg/m³. Noise levels ranged from 70.5 – 88.4 dB(A). Ergonomic interventions which included designs of handtools and workstations have shown a reduction in crush injuries and musculoskeletal complaints. Training interventions have shown increase in knowledge and awareness of hazards.

Discussion and conclusions: Informal stonecrushers in Dar-es-Salaam in Tanzania are exposed to a variety of hazards in their work environment, including high levels of silica dust, noise and extremes of heat and abnormal postures, all of which predispose this marginalised population to considerable health risks. The ability of workers themselves to address these risks with meaningful interventions is limited given their self-employment status and lack of resources to invest in hazard control. This sector requires the direct involvement of government in the development of policy frameworks, investment in training and the implementation of cost-effective interventions to protect the health of these workers.

Mo-O-23 ORGANISATIONAL INFLUENCES ON SAFETY AND HEALTH IN THE SHORT-HAUL TRUCKING INDUSTRY

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Background and aims: Precarious or contingent employment, like casual or temporary work, labour leasing and self-employed subcontracting is increasing in many countries. Employers and media often claim that it provides flexibility, improves work-family balance and other lifestyle benefits to workers.

Recent research shows, however, that contingent or precarious employment is associated with poorer occupational safety and health outcomes. In many countries the short-haul trucking industry is large, expanding and heavily reliant on contingent workers, but there have been few studies of occupational health and safety in this sector. The aim of this study was to examine looks at occupational health and safety outcomes and the role and influence of contingent employment in short haul trucking.

Methods: A total of 217 Australian short-haul drivers were surveyed. Multivariate analysis first looked at the work characteristic predictors of occupational health and safety outcomes for short-haul drivers as a whole and second at the distinguishing characteristics of permanent employees and contingent drivers: casual employees and owner-drivers.

Results: The results showed that contingent work is a characteristic of short-haul trucking in Australia especially for contractor or owner-drivers. The main predictor of adverse occupational health and safety outcomes was high work-life conflict. A number of characteristics distinguished permanent and contingent drivers but they had both positive and negative effects. Owner-drivers had individual workplace contracts and productivity-based remuneration, greater work intensification during the week, but less weekend work. Casual drivers were distinguished by irregular work schedules, but less work overall. Neither contingent group differed from permanent employees on occupational health and safety variables.

Discussion and conclusions: This study demonstrated the importance of work-life balance for maintaining good occupational health and safety outcomes and that the effects of contingent work need to be distinguished from those of permanent and predictable employment arrangements.

SOCIAL AND PSYCHOLOGICAL FACTORS

Mo-O-24 SOCIAL INEQUALITIES IN INJURY OCCURRENCE AND IN DISABILITY

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Background and aims: Inequalities in injury related disability retirement may be due to differences in injury risk and or differences in retirement given injury. The aim of the present study was to measure social inequalities in injury occurrence and injury related disability retirement.

Methods: All people in the Danish labour force aged 20-59 years 1 January 1997 were followed for injury related hospital contacts during 1997 and all people in the Danish labour force aged 21-54 years 1 January 1998 were followed for injury related hospital contacts during 1997 and for disability retirements during 1998-2002. As inequality indices we used excess fractions (EF) i.e. the proportions of the cases that would not have occurred if the risks in each social group had been as low as they were in the occupational group with the highest skill requirements.

Results: With regard to the risk that an injury will occur, the EF was 36% among men and 10% among women. With regard to the risk that an injury will lead to disability retirement, the EF was 43% among men and 47% among women. The combined effect of the two types of inequalities rendered an EF for injury related disability retirement of 64% among men and 53% among women. The correlation between the case disability rate ratios among men and those among women was low ($r = -0.110$, $P = 0.795$).

Discussion and conclusions: The social inequality in injury related disability retirement lies only to some degree in the differences in the injury risk. More important are differences in the consequences of an injury. This was especially pronounced among the women.

Mo-O-25 THE PREVALENCE OF WORKPLACE VIOLENCE IN EUROPE: A MULTILEVEL APPROACH

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Background and aims: Psychosocial risks at the workplace, including violence and harassment, are widely recognized as a major challenge to occupational health and safety. Incidence rates of physical violence in Europe have increased in the past decade, according to the European Working Conditions Survey (from 4% in 1995 to 6% in 2005, EU-15 and from 3% in 2000 to 4% in 2005, EU-12). National surveys show similar trends. The increase may be partly due to raised awareness of these issues. However, structural changes in the workplace such as the intensification of work and the shift towards a more service oriented economy might also be responsible for the increase. This study aimed to describe trends in exposure to workplace violence among workers in the European Union between 1995 and 2005, as well as to identify factors that explain these trends. Also, differences between 'old' and 'new' member states were examined.

Methods: A representative sample of workers that participated in the European Working Conditions Survey of 1995, 2000 and 2005 was used. Interviews were conducted face-to-face in the respondent's household. The total sample size consisted of approximately 78.000 respondents. Multi-level logistic

regression analyses were performed to investigate associations between work characteristics and the prevalence of violence, both at subject and country level.

Results: The increase in workplace violence is significant and could partly be explained by changes in the work situation of European workers. A higher prevalence of workplace violence was found in old member states than in new member states. Differences between old and new member states could largely be explained by the frequency of client contacts that were reported by workers in these states. Cross-country differences however are getting less strong in time. Finally, an interaction effect was found for gender and being employed in old or new member states, where women in new member states had a smaller chance of being exposed to violence.

Discussion and conclusions: This study shows the importance of incorporating labour market factors into monitoring research on workplace violence. Also, since old and new member states show different prevalence profiles, it is important to integrate a gender perspective in developing preventative measures.

Mo-O-26 HEALTH-RELATED PREDICTORS OF SICKNESS ABSENCE FOR MORE THAN 2 WEEKS IN A COHORT OF 14,241 WORKERS FROM THE GENERAL WORKING POPULATION IN DENMARK

*Andersen JH.

Background and aims: Musculoskeletal pain and mental ill-health has long been acknowledged as important predictors for work-related sick leave. The aim of this study was to estimate the risk for sick leave for more than 2 weeks from a broad range of health-related factors.

Methods: The data is based on a postal questionnaire to 21,313 employees between 18 and 64 years of age. 14,241 returned the questionnaire resulting in a response rate of 70%. The questionnaire included items on perceived stress, general health, mental health, vitality, musculoskeletal pain, and questions on specific diseases.

Sickness absence was taken from the Danish Ministry of Employment's DREAM register which contains weekly information on social transfer payments for the Danish population. The first two weeks are paid by the employer and for this reason DREAM only contains information for those spells of sickness absence that lasts for more than 2 weeks.

We calculated the number of weeks between answering the questionnaire and onset of first spell of sickness absence registered in DREAM register in 1½ years from the time of the answering. Only those weeks where the participants were under risk of being sick-listed were counted. Those participants who immigrated, retired or died during the follow-up period were censored. Hazard ratios (HRs) were calculated by the use of Cox regression models with 95% confidence intervals.

Results: Perceived stress, mental ill-health, general health, vitality and musculoskeletal pain were all associated with higher sick leave in partly adjusted models (adjusted for gender, age and social group), but only general ill-health and high level of musculoskeletal pain remained significant in the fully adjusted models. Participants with general ill-health, musculoskeletal pain and self-reported disease had a HR of 2.7 (95% CI 2.2 -3.3) for sick leave for more than 2 weeks.

Discussion and conclusions: The combined effect of musculoskeletal pain, general ill-health and disease predicted sickness absence in this cohort of workers from the general working population.

Mo-O-27 THE INFLUENCE OF JOB DEMANDS ON HYPERTENSION RISK IN MALE AND FEMALE ALUMINUM MANUFACTURING EMPLOYEES

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Background and aims: Studies of health risks associated with job strain have generally shown improvements in cardiovascular health among white collar workers with increased control and decreased demands. It is less clear, however, whether these models apply to manufacturing (i.e., blue-collar) populations, or whether job grade effects on health are significantly modified by gender.

Methods: We examined the association between externally-reported measures of job-specific demand and control and onset of hypertension, based on health claims data for a cohort of 6,919 male and 620 female blue-collar aluminum manufacturing employees distributed across eight U.S. states. Sex-stratified models were developed to separately identify key predictors of blue-collar status and to correct for socioeconomic confounding. We then used time-weighted logistic regression to examine sex-specific associations between job strain and hypertension, after adjusting for SES and other risk factors.

Results: Among men, we found that relative to high demand jobs, medium-demand jobs posed higher risk (Adj OR = 1.27 (95 % CI = 1.17 – 1.38), while low-demand jobs posed no excess risk (Adj OR = 0.99 (0.91 – 1.08)). Risk was highest for high control jobs, with low- and medium-control jobs protective against hypertension (Adj OR = 0.74 (0.68 – 0.81), and 0.91 (0.84 – 0.99)), respectively. For women, low- and medium-demand jobs were both protective relative to high-demand jobs (Adj OR = 0.66 (95 %

CI = 0.49 – 0.88) and 0.71 (0.53 – 0.97, respectively)), as were low- and medium-control jobs (Adj OR = 0.60 (0.45 – 0.81), and 0.68 (0.51 – 0.91)), respectively.

Discussion and conclusions: Our results are in contrast to expectations that higher-control jobs are beneficial to health, and raise questions regarding the constructs of demand and control for manufacturing populations.

Mo-O-28 RISK OF MYOCARDIAL INFARCTION RELATED TO EMPLOYEES' PERCEPTION OF WORK CLIMATE AND PSYCHOSOCIAL JOB STRAIN: A PROSPECTIVE FOLLOW-UP STUDY

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Background and aims: Several prospective cohort studies lend support to the hypothesis that psychosocial job strain may be part of the causal web leading to ischaemic heart disease (IHD), but the issue is still a matter of scientific conjecture. Using aggregated work unit level data on employees' perception of demands and decision latitude as measure of exposure this study was designed to address limitations of exposure assessment in earlier studies. The aim was to investigate if low satisfaction with work climate and high job strain at the workplace are related to an increased risk of hospitalisation for myocardial infarction.

Methods: Hospital admissions under the discharge diagnosis IHD (ICD10 codes I20-25) were identified in a cohort of 18,252 Danish public service workers, from 1.1.2002 through 31.12.2005, by linkage to the national inpatient hospital register. Individual self-reports of psychosocial factors at work including satisfaction with the work climate and dimensions of Karaseks job strain model were obtained by self-administered questionnaires (response rate 77,2%). Each employee was assigned the average score value of all employees at his/her managerial work unit [1094 units with in average 18 employees (range 3-120)]. The incidence of IHD was examined according to level of satisfaction and psychosocial strain by Cox regression, adjusted for gender, age, marital status, socio-economic class and education.

Results: In total 116 IHD cases were identified during 58.794 years at risk during follow-up. The adjusted hazard ratio (HRadj) was 1.2 (95% CI 0.7-1.9) among the quartile of the employees that rated job climate satisfaction lowest compared to the quartile that rated work climate highest. High job strain defined as the combination of high demands and low decision authority was related to an increased risk of IHD among municipality employees (HRadj 2.0, 95% CI 0.8-5.2), but not among the larger group of county service workers (HRadj 0.9, 95% CI 0.6-1.4).

Discussion and conclusions: Findings do not lend consistent support to the hypothesis that psychosocial factors at work are important determinants of IHD. Exposure contrast between more than one thousand work units was large, but attenuation of effects because of exposure misclassification at the individual level cannot be ruled out with confidence.

Mo-O-29 THE ROLE OF PSYCHOSOCIAL FACTORS ON THE FERTILITY OF FEMALE WORKERS IN NON-FERROUS METALLURGY

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Background and aims: In non-ferrous metallurgy workers are exposed to a variety of noxious agents, such as Pb, Cd, Zn, As, mainly to high levels of lead, responsible for causing spontaneous abortions in exposed females. Negative psychosocial factors (PSF) may also influence the fertility of exposed females. The aim of this study is to evaluate this prediction/hypothesis.

Methods: Air monitoring in workplaces concerning lead was done during a 10-year period. Statistically representative groups were selected: A. exposed to lead with negative PSF (n=110), B. exposed to lead without negative PSF (n=97), C. non-exposed with negative PSF(n=110), D. non-exposed without negative PSF (n=102). Indicators of exposure (blood-Pb, urinary-Pb) and of biological effects (urinary-DALA) in female workers were monitored. Clinical examinations were done, including their reproductive system. A computed fertility questionnaire was conducted to collect data related to PSF as stress, education, life-conditions, family income, resting time and smoking. Collected data were evaluated with Comparative Score Method (CSM). Fertility indicators (rate of spontaneous abortions-RSA) in females were evaluated.

Results: Mean concentration of lead-level in air of workplaces was ranging from 0.9+/-0.1 to 9.2+/-1.3mg/mc. Mean age of examined females was 35.45±7.33yrs and mean length in profession was 15.49±3.02yrs. Mean values of laboratory examinations were: blood-Pb=47.2±2.3ug/dL; urinary-Pb=199.8±10.3ug/l; urinary-DALA=24.6±2.9mg/l. No differences were found regarding the reproductive system of the examined females. The fertility questionnaire underlined: a) medico-obstetrical history of women from gr.A. (score:71) was significantly worst (p<0.01) vs. the medico-obstetrical history of those from gr.D. (score:9) and (p<0.05) vs. the medico-obstetrical history of those from gr.B. (score:21), b) RSA was significantly higher (p<0.01) for women from gr.A. (0.58) compared to the RSA of females

from gr.D. (0.07) and ($p < 0.05$) compared to the RSA of females from gr.B. (0.27), c) among negative PSF there are: stress (score:96), low familial income (score:83), negative life-conditions (score:79), low education (score:55), low resting time (score:47) and smoking (score:39).

Discussion and conclusions: The cumulative effect of lead-exposure and negative PSF increased significantly the RSA in females. RSA was also increased in females exposed to lead without negative PSF that demonstrate the toxic effect of lead on female reproductive system. In non-exposed females with strong accumulation of negative PSF, the RSA was also high. It is mandatory to reduce the lead-level in all workplaces and to improve the life conditions in females.

HEART AND HEARING

Mo-O-30 MODIFICATION BY VASCULAR FUNCTION OF PARTICULATE ASSOCIATED DECLINES IN HEART RATE VARIABILITY AMONG WELDERS

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Background and aims: Evidence suggests that conditions associated with clinically impaired vascular function result in greater declines in heart rate variability (HRV) in response to fine particulate matter (PM_{2.5}) exposure. We conducted a panel study to investigate whether sub-clinical vascular function modifies particle-related declines in HRV among workers regularly exposed to PM_{2.5}.

Methods: Twenty-three male welders were monitored simultaneously and continuously by ambulatory electrocardiogram (ECG) and a personal direct-reading particle instrument for up to 24 hours on either or both a welding day and a non-welding day for a total of 36 person-days. The standard deviation of normal-to-normal intervals (SDNN) was calculated for all 5-minute segments from the ECG tapes. Moving PM_{2.5} averages in the preceding 1 through 4 hours of each 5-minute epoch were calculated. Prior to the start of monitoring, three vascular parameters were measured: the augmentation index (AIx), mean arterial pressure, and pulse pressure. Linear mixed effects models were used for statistical analysis, controlling for fixed and time-varying covariates. Data were analyzed for the entire monitoring period as well as for working hours only.

Results: An inverse association between the preceding 1-hour PM_{2.5} average and 5-minute SDNN was observed. Greater declines in SDNN were observed for AIx values in the upper 25th percentile and pulse pressure values in the lower 75th percentile. During working hours, similar yet stronger patterns were observed between SDNN and 1-hour PM_{2.5}.

Discussion and conclusions: Vascular function as assessed by AIx and pulse pressure appears to modify the association between PM_{2.5} exposure and HRV in relatively young and healthy workers.

Mo-O-31 VENTRICULAR ECTOPIC BEATS IN BOILERMAKER CONSTRUCTION WORKERS EXPOSED TO METAL RICH FINE PARTICLES

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Background and aims: Epidemiologic and toxicologic studies suggest a link between metal-rich particle exposures and cardiovascular autonomic responses such as changes in heart rate variability, yet the occurrence of cardiac arrhythmias, has not been investigated. We sought to investigate the exposure-response relationship between ventricular ectopic beats (VEBs) and metal-rich particulate matter with an aerodynamic diameter $\leq 2.5 \mu\text{m}$ (PM_{2.5}) among boilermaker construction workers exposed to welding fumes.

Methods: Using a panel study, we monitored workers by ambulatory electrocardiogram (ECG) over workdays during and following welding fume exposures and on non-workdays. ECGs were analyzed and the presence of VEBs (≥ 1 VEB over 1 hour period) was recorded. Workers were also simultaneously and continuously monitored for personal PM_{2.5} exposures. Using mixed effects models to account for the repeated measures data, we estimated the exposure-response relationship between hourly VEB and PM_{2.5} exposures after adjusting for smoking status, high blood pressure, season and time of day.

Results: The 72 male participants were monitored for an average of 41 hours (Range: 4 -163 hours). The mean (SD) hourly PM_{2.5} exposure was 0.27 (0.75) mg/m³ during all periods and 0.80 (1.16) mg/m³ while welding. There were 670 hours with one or more VEBs over the 2961 monitored person-hours. As compared to when welding did not occur, there was an increased odds of one or more hourly VEB while welding (OR: 1.61, 95% CI: 0.74, 3.51). When exposure was categorized using tertiles into low (0 to 0.02 mg/m³), medium (0.02 to 0.10 mg/m³) and high (0.10 to 13.50 mg/m³), there was an increased odds of VEB in the medium (OR 1.80; 95% CI: 0.78, 4.13) and high (OR 3.81; 95% CI: 1.56, 9.29) exposure categories, relative to the low exposure category.

Discussion and conclusions: PM_{2.5} exposure was associated with VEBs in workers exposed to welding fume. The role of workday exposure to metal-rich PM_{2.5} on cardiovascular response warrants further investigation. (Supported by NIEHS ES009860 and ES00002, T42 OH008416, T32 ES 07069)

Mo-O-32 FROM PROSPECTIVE FOLLOW-UP OF MORBIDITY TO PREVENTION

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Background and aims: The aim was to investigate long-term health effects of foundry work on cardiovascular and respiratory health and to evaluate the use of the findings as tools for prevention.

Methods: The study comprised 931 men hired in 1950-72, still active in 1972. They took part in a health examination in 1973. They were followed until 2002 through registers and via questionnaires. The statistical method was person-year analysis and Cox regression.

Results: Disease Follow-up year Results Rate ratios, Significances. The results from several follow-ups are summarized by disease groups.

RESPIRATORY DISEASES: Chronic bronchitis 1973: A dose-response relation (dust: RR=6.1; smoking: RR=7.9, dust and smoking: RR=9.9, p<0.001). Lung function tests 1973: The most evident effect due to smoking. Disability 2002: Higher in steel than in iron foundries: RR=2.0(1.1-3.6). Mortality 2002: No excess.

CARDIOVASCULAR DISEASES: Hypertension 1973: Higher blood pressures for CO-exposed smokers than for nonexposed nonsmokers: p<0.05. Angina pectoris 1973: A dose-response relation (CO: RR=4.5; smoking: RR=5.9; CO and smoking: RR=6.9, p<0.01). ECG findings 1973: No evidence of past myocardial infarction or CHD related to CO-exposure. CVD mortality 1973: No excess. Hypertension 1987: Higher medication incidence for CO-exposed smokers than for unexposed nonsmokers: RR=2.3 (1.0-6.4). IHD mortality 1987: Higher mortality for CO-exposed smokers than for unexposed nonsmokers: RR=4.4 (1.3-15.1). IHD mortality 1993. Significant predictors were: age: RR=1.1 (1.1-1.1), pathological ECG findings in 1973: RR=1.6(1.1-2.3), regular CO exposure: RR=2.2(1.0-4.6), abundant drinking: RR=4.2(1.4-12.0).

COMORBIDITY: In 1992 infectious respiratory diseases significantly predicted IHD: [Infectious: RR=2.1 (1.5-2.9), Noninfectious: RR=1.2 (0.9-1.8)].

MULTIPLE MORBIDITY: Multiple morbidity rates in 1992 higher than disability or mortality rates. The first disease occurrences revealed morbidity several years earlier, p<0.001.

LUNG CANCER: Mortality 1973: Excessive [SMR=1.7 (1.1-2.7); highest for iron foundry molders: SMR=3.3 (1.1-7.8)]. Mortality 2002: Excessive [SMR=1.4 (1.1-1.9); iron foundries SMR=1.4 (1.0-2.0)]. Morbidity 2002: Excessive for heavily PAH-exposed iron foundry workers, increasing by latency [>25 years' latency: RR=1.8 (1.03-2.83); >50 years' latency RR=4.7, p=0.03]. Morbidity 2002: Chronic bronchitis, emphysema and asthma predicted lung cancer: RR=2.4 (1.13-5.07).

Discussion and conclusions: Thirty years' follow-up revealed not only excess morbidity but also chains of subsequent diseases and their associations with occupational exposures. The multiple disease analysis can work as a tool for preventive epidemiology to find out work-related diseases earlier and with new disease combinations.

Mo-O-33

(Author did not attend conference.)

Mo-O-34 IMPAIRMENT OF HEARING AND BALANCE IN AIRCRAFT MAINTENANCE TECHNICIANS

*Guest M, D'Este C, Attia J, Boggess MM.

Background and aims: In order to determine if there was evidence to support the anecdotal reports of adverse health problems, including deficiencies in sensory functions in aircraft maintenance technicians who undertook deseal/reseal activities on the Australian Air Force's F-111 aircraft at Amberley Air Base, a general health and medical study was undertaken. The deseal/reseal process required the personnel to enter the fuel tanks where there were excessive exposures to formulations containing solvents such as MEK, toluene (aromatic naphtha), thiophenol, and propylene glycol (monomethyl ether acetate). This would also apply to primers and sealants containing chromates, unreacted isocyanates and curing agents. In this presentation we present the results from analysis of hearing thresholds and balance.

Methods: Hearing thresholds were assessed in both ears of 614 exposed personnel, 513 technical trades comparisons and 403 non-technical comparisons using pure-tone audiometry (air conduction) at the frequencies of 0.1, 1, 2, 3, 4, 6, and 8 kHz. A percentage loss of hearing was subsequently calculated. Balance was assessed using the functional reach test. The results were compared using regression models, controlling for possible confounding variables.

Results: The ordered logistic regression analyses showed that percentage loss of hearing was no different for the non-technical and technical trades comparison groups, relative to the exposed group. However, the linear regressing analysis of balance showed a significant difference of -1.07 units (95% CI -2.01 to -0.12) for the non-technical comparison group and -1.37 (95% CI -2.26 to -0.48) for the technical trades comparison group.

Discussion and conclusions: Although percentage loss of hearing was not statistically significant between the groups studied, the mean percentage loss was 5% with the highest value observed 96%. For balance the magnitude of the difference is small; on a scale of 0 to 60 centimetre (cm), the threshold of the DSRS group was on average 1 cm lower than the comparison groups. Further analysis is continuing to determine whether both cochlear functions are affected in these groups studied.

Mo-O-35 WALKIE-TALKIE EARPHONE EXPOSURE ASSOCIATED WITH HEARING IMPAIRMENT AMONG AIRCRAFT MAINTENANCE WORKERS

* Tse L, So CT, Lee Y, Yu K, Yu TI.

Background and aims: Aircraft maintenance workers need to wear ear protectors for hearing protection and adopt walkie-talkie earphone for internal communication during the course of work. The study aims to investigate the association between walkie-talkie earphone usage and the risk of hearing impairment among aircraft maintenance workers at Hong Kong international airport.

Methods: This is a cross-sectional study conducted in 2007. A total of 101 airport maintenance ground crew currently employed in Hong Kong International Airport were invited to participate in the survey with a response rate of 80.2%. All 81 participants were asked to go through an otoscopic examination and an audiometric screening test in a very quiet room with the mean noise level of 33.5dB(A), and completed a standardized questionnaire including occupational noise exposure and walkie-talkie with earphone usage. Sound level meter and dosimeter were used for measuring environmental noise exposure of the subjects. Hearing impairment of this study was referred to presumptive Noise Induced Hearing Loss (PNIHL). Multiple logistic regression analysis was used to analyze the association between the use of walkie-talkie earphone and hearing loss after controlling for potential confounding variables.

Results: A total of 65 workers met the inclusion criteria (otoscopic examination: normal). Fifteen nine workers (90.1%) were walkie-talkie earphone users with average duration of 1.02 (SD: 0.83) years. The prevalence of age-corrected PNIHL was 26.1% (95%CI: 16.2-38.5%) and the pattern of hearing threshold showed a dip at 6 KHz. Multiple logistic regression analyses revealed that the risk of hearing impairment was increased among workers using walkie-talkie earphone for more than 2 months (OR=2.59, 95%CI: 0.55-12.31). Environmental noise measurements on sound level produced by walkie-talkie with earphone showed high in quiet office room (83db(A)) but very high in apron or hangar (105 dB(A)).

Discussion and conclusions: Aircraft maintenance workers adopting walkie-talkie earphone were exposed to very high noise level and hearing impairment risk was associated with the duration of walkie-talkie earphone usage.

BREAST CANCER

Mo-O-36 OCCUPATIONAL EXPOSURE TO CHEMICALS AND RISK OF MALE BREAST CANCER: A EUROPEAN CASE-CONTROL STUDY

*Guenel P, Fevotte J, Sara V, Sitruk A.

Background and aims: Several occupational exposures have been suspected to play a role in breast cancer etiology, including organochlorine pesticides or other endocrine disrupting chemicals, polycyclic aromatic hydrocarbons (PAHs), and organic solvents, but epidemiological studies of breast cancer have produced inconsistent results. Although male breast cancer is a rare disease, the study of breast cancers in men offers several advantages over a study of breast cancer in females because occupational exposures are usually much higher, and hence more easily assessed in men than in women, and because confounding from reproductive risk factors cannot occur.

Methods: We investigated occupational risk factors for male breast cancer in a European multicenter population-based case-control study. The study included 104 cases of male breast cancer aged 35 to 70 years and 2106 controls in eight countries. Controls were selected from population registers in most countries, or among colon cancer patients in Spain and Portugal. All study subjects were interviewed using the same structured questionnaire including a detailed work history. Occupational exposures to pesticides, PCBs, PAHs, alkylphenols, bisphenol-A, and phthalates were identified through a job-exposure matrix and then individually assessed by an expert using the detailed job description. A job-exposure matrix for petroleum solvents (e.g., benzene, white spirit) was also used. Analyses are carried

out to identify the job groups at increased risk for male breast cancer and to examine breast cancer risk according to exposure indicators for specific chemicals.

Results: Statistically significant increased risks were observed in printers (OR=2.8 95%CI), painters (OR=2.5 95%CI 1.1-5.7), foundry workers (OR=4.6 95% CI 1.3-17.0), and motor vehicle mechanics (OR=2.0 95% CI 1.1-4.8). Elevated risks were also observed for occupational exposures to phthalates, alkylphenols and petroleum solvents. Confounding from other risk factors for male breast cancer such as alcohol drinking could not explain these results.

Discussion and conclusions: Our results confirm that occupational factors may play a role in breast cancer, and suggest that additional studies on environmental factors in female breast cancer should be conducted.

Mo-O-37 OCCUPATIONAL EXPOSURES AND POSTMENOPAUSAL BREAST CANCER: RESULTS FROM A CASE-CONTROL STUDY

*Labreche F, Goldberg MS, Valois M, Nadon L.

Background and aims: Breast cancer rates have been steadily increasing in Canadian postmenopausal women since 1969, and although the increase appears to have stabilised since 1999, it has not shown a frank decrease as in other jurisdictions. This study was set up to determine whether organic solvents and other chemical and physical agents in the workplace confer a higher risk of developing postmenopausal breast cancer.

Methods: This population case-control study, conducted in all Montreal hospitals between 1996 and 1997, included incident histologically-confirmed cases of malignant breast cancer among postmenopausal women (aged 50-75 years). Control subjects were selected from other histologically-confirmed sites of cancer, matched for age, date of diagnosis and hospital. Information on nonoccupational risk factors and on each occupation held by each subject was obtained through face-to-face or telephone interviews, and industrial hygienists then attributed exposure to about 300 chemical and physical agents for each job. For each substance, average frequency of exposure in a working day and at specific intensities was coded. Unconditional logistic regression was used to estimate adjusted odds ratios (OR) and 95% confidence intervals (95% CI).

Results: A total number of 556 cases and 613 controls were included in this analysis. Odds ratios were increased for the usual risk factors for breast cancer and, adjusting for these, we found no significantly increased risk for lifetime exposure to organic solvents or to other occupational agent when looking at the complete data set. However, the risks increased systematically for women exposed before age 36 (the age around which breast cells stop proliferating), and for estrogen receptor-positive/progesterone receptor-negative tumors. The agents reaching statistical significance for several subgroups were synthetic fibers, C5 to C17 alkanes, monoaromatic hydrocarbons and polyaromatic hydrocarbons originating from petroleum. A few other agent displayed dose-response gradients in certain subanalyses, namely organic solvents, ammonia and leaded engine emissions.

Discussion and conclusions: Small numbers precluded a refined analysis of individual occupational exposures. However, systematically increased risks for postmenopausal breast cancer among women exposed at an earlier age, and for tumors with certain hormonal receptor status warrant further explorations.

Mo-O-38

(Author did not attend conference.)

Mo-O-39 THE IMPACT OF PESTICIDE EXPOSURE ON BREAST CANCER INCIDENCE

*Santamaria C, Palloni A.

Background and aims: Breast cancer is the most prevalent cancer and the leading cause of death from cancer in women worldwide. The low percentage of cases that are related to reproductive history and to genetics suggests that the environment may be playing an important role. This study tests whether breast cancer incidence in Costa Rica is related to environmental pesticide exposure, after controlling for access to health care, fertility rate, late age at first full-term pregnancy and socioeconomic status

Methods: Breast cancer incidence was analyzed at the district level for the 1996-2000 period. Computerized record linkage between various registries was employed using unique personal IDs. Main sources of information were: National Tumor Registry, Population Census, Vital Statistics, Voter Registration Lists, access to health care data, and pesticide exposure indicator data. Cases were assumed to be generated from a Poisson distribution. The model was tested for spatial autocorrelation, and a geographically weighted regression approach was also used

Results: The pesticide exposure index had a statistically significant direct association with breast cancer for women 45 years or older. The corresponding incidence rate ratio for pesticide exposure index is 1.29.

This means that after controlling for other risk factors, moving a district to the next decile of pesticide exposure was associated with 29% increase in breast cancer incidence for women 45 or older. The geographically weighted Poisson regression showed that the significance of pesticide exposure is not homogeneously distributed in the country. It has significant coefficients only in specific rural and agricultural regions of the country, after controlling for other risk factors

Discussion and conclusions: There seems to be an actual relation between breast cancer and pesticides. Since pesticide exposure is a preventable risk factor, this is an important public health issue to be debated. Paying more attention to health consequences that derivate from environmental exposure would imply a shift toward the application of the precautionary principle

Mo-O-40 META-ANALYSES OF BREAST AND PROSTATE CANCER RISKS IN FLIGHT PERSONNEL AND SHIFTWORKERS IDENTIFY CHALLENGES FOR CHRONODISRUPTION RESEARCH

*Erren TC, Reiter RJ, Pape HG, Piekarski C.

Background and aims: Research into health effects of chronodisruption (CD), a relevant disturbance of the circadian organization of physiology, endocrinology, metabolism and behaviour, is evolving at a rapid pace. With regard to malignancies, key experiments indicate that CD can play a causal role for cancer growth and tumor progression in animals. To humans, IARC concluded in 2007, “shift-work that involves circadian disruption is probably carcinogenic” (Group 2A). With our meta-analyses of epidemiological studies of breast and prostate cancer in flight personnel and shift-workers we wanted to investigate systematically whether biologically plausible insights into cancer development from studies in animals, cells or circadian genes can be really valid in humans and relevant for public health.

Methods: Fixed- and random-effects summaries were computed for various combinations of studies with information on breast or prostate cancer risks in flight and shift personnel.

Results: Our meta-analyses of 30 epidemiological studies evince that flight personnel and shift-workers exposed to chronodisruption may have increased cancer risks: summary relative risks (RRs) for investigations of flight personnel and of shift-workers suggested a 70 and 40% increase in the risk of breast cancer, respectively, and excess relative risks of prostate cancer in nine studies in flight personnel (40%) and in two studies in male shift-workers. There was a remarkable indication of homogeneity of results from the individual studies that contribute to the average statistics.

Discussion and conclusions: In view of doubts about whether the differing assessments of CD can really be regarded as valid reflections of the same causative phenomenon and the lack of control of covariates in the majority of studies, it is premature to conclude that the risk observations reflect a real, rather than spurious, association with CD. The challenge for future observational investigations of the biologically plausible links between chronodisruption and human cancers is to conduct studies which appreciate details of transmeridian travelling, of shift-work and of covariates for the development of the diseases. To avoid tens of epidemiological studies employing uncomparable assessments of shift-work exposures in a near future, we suggest to have IARC and/or the NIEHS convene an authoritative panel of scientists to develop the much-needed shift-work exposure metrics.

Mo-O-41 OCCUPATIONAL EXPOSURE TO ORGANIC SOLVENTS AND BREAST CANCER RISK: THE RESULTS OF A POLISH POPULATION-BASED BREAST CANCER CASE-CONTROL STUDY

*Peplonska B, Stewart P, Szeszenia-Dabrowska N, Lissowska J, Brinton LA, Gromiec JP, Brzezniacki S, García-Closas M.

Background and aims: Although about thirty different organic solvents have been shown to cause malignant mammary gland tumors in rodents, the epidemiological evidence on the possible associations between occupational exposures to organic solvents and breast cancer in women is limited.

Methods: We evaluated job histories of 2383 incident breast cancer cases, and 2502 controls who participated in a large population-based case-control study conducted in Poland during 2000-2003. Based on an expert exposure assessment approach, semiquantitative metrics for total organic solvents, and for benzene in particular, were developed, for exposure intensity, frequency, probability, confidence, cumulative exposure, highest intensity, duration and latency. Unconditional logistic regression analyses calculated odds ratios (ORs) and 95% confidence intervals (CIs) as the measure of association between various metrics of exposure to organic solvents or benzene and breast cancer risk after controlling for potential confounders. Stratified analyses examined potential modification by menopausal status, age and alcohol consumption. We also assessed organic solvents and breast cancer relationships by estrogen (ER) and progesterone (PR) receptor status and by other pathological characteristics of the tumours.

Results: Overall women who ever worked at jobs with organic solvent exposures were at a marginally increased breast cancer risk (OR=1.17, 95%CI: 0.99-1.37). We observed a statistically significant

increased risks of breast cancer in ER negative and PR negative cases (OR= 1.34, 95%CI: 1.06-1.68 and OR=1.37, 95%CI: 1.11-1.69, respectively) but not in cases with positive receptors (OR=1.07, 95%CI:0.88-1.31, and OR=1.01, 95%CI 0.82-1.24 for ER+ and PR+ cases, respectively). A formal tests for heterogeneity revealed statistically significant modifications of the associations between organics solvents exposures and breast cancer risk when cases with both ER/PR negative receptors were compared to ER/PR positive ones (p for heterogeneity of the trends < 0.05 for total organic solvents exposure, duration, frequency, latency, probability and cumulative exposure). No significant associations for benzene and breast cancer risk were observed in our study. Menopausal status, age and alcohol consumption did not significantly modify the observed associations.

Discussion and conclusions: Our study provides weak evidence for an association between occupational exposure to organic solvents and breast cancer risk, and suggests that the association might be restricted to estrogen and progesterone negative breast cancer.

Mo-O-42

(Author did not attend conference.)

OCCUPATIONAL COHORT STUDIES

Mo-O-43 OCCUPATIONAL MORTALITY IN ENGLAND AND WALES: 1991-2000

*Coggon D, Bennett J, Palmer K, Rice S, Brown T.

Background and aims: Even in countries such as the UK, which have relatively effective provisions for health and safety in the workplace, occupational exposures and activities are still an important preventable cause of early death. To explore what are currently the major work-related contributors to mortality, we analysed newly available data on deaths by occupation nationally

Methods: The Office of National Statistics provided us with information about sex, age at death, underlying cause of death, last occupation and social class for all men aged 16-74, who died during 1991-2000 in England and Wales (n > 1.2 million). All of the information came from death certificates. Occupations were classified to 181 job groups, and causes of death to 230 categories based on aggregates of ICD 9 codes. Proportional mortality ratios (PMRs) by job group and cause of death were calculated with standardisation for age (in five-year bands) and social class. Deaths from diseases such as silicosis that are specific to work were all classed as occupational. For other established occupational hazards excess work-related mortality was calculated as the observed minus the expected number of deaths in relevant occupations.

Results: In total, some 4000 deaths could be attributed to occupational causes with reasonable confidence. The largest excesses of deaths associated with established occupational hazards were from injury and poisoning (1084 excess deaths), chronic obstructive pulmonary disease (COPD) (809), cancer of the pleura (690) and coal workers' pneumoconiosis (498). The occupations associated with the highest attributable excesses of deaths were "other coal miners" (996 excess deaths), lorry drivers (264) and farmers (211). Occupations with high individual risks of work-related mortality included "other coal miners", in which the excess mortality from COPD and pneumoconiosis accounted for 4% of all deaths, and aircraft flight deck crew in whom 10% of deaths before age 65 were from air traffic accidents.

Discussion and conclusions: Analysis of this sort is constrained by limitations of the available data on occupation. Nevertheless, the findings highlight several priorities for further investigation or preventive action.

Mo-O-44 UPDATE OF HEALTH WATCH STUDY FINDINGS 2007

*Glass DC, Del Monaco A, Friesen M, Cui J, Sim MR.

Background and aims: Health Watch is a prospective cohort study of about 18,000 mainly male, Australian petroleum industry workers who have worked in the industry for more than 5 years. It commenced in 1981 with a face-to-face survey and this survey was repeated in 1986, 1991 and 1996. At the surveys, subjects provided demographic details, health status information and details of their work history. Only a quarter of the cohort now remains in employment in the industry.

Methods: In 2007, the cohort was matched to Australian death and cancer registries and the findings compared to age standardised national rates.

Results: The all cause Standardised Mortality Ratio (SMR) and (95%CI) is 0.72(0.68-0.76) for men and 0.65(0.45-0.91) for women. For men, death rates in each of the major disease categories were significantly reduced. A significant reduction in all-cause mortality is seen among men in each workplace type e.g. refinery, terminal. The overall cancer SMR is 0.81(0.75-0.88) for men and 0.88(0.54-

1.34) for women. The overall cancer Standardised Incidence Ratio (SIR) is 0.99(0.94-1.04) for men and 0.89(0.68-1.15) for women. Male lung cancer incidence is lower than expected but the incidence of mesotheliomas and melanomas are elevated. Within the male members of the cohort risk of smoking-related diseases are predicted by amount of tobacco smoked. 3-yearly serial analyses of melanoma, leukaemia, NHL and multiple melanoma SIRs in men show that all these have fallen since 1987.

Discussion and conclusions: The healthy worker effect remains strong. There is no evidence of increasing cancer incidence or increasing cancer mortality with any of the following: • increasing duration of employment; • increasing time since first employment; • time period of first employment. The overall melanoma SIR in the cohort has fallen over time and varies by state probably as a result of differences in sun exposure. When compared to state melanoma rates there is a significant excess only in New South Wales. As the cohort has aged, the effects of smoking have become more pronounced and the dose-response relationship has become stronger. Quitting reduces these risks, especially that of heart disease.

Mo-O-45 THIRTY-YEAR MORTALITY FOLLOW-UP AMONG FRENCH URANIUM CONVERSION WORKERS COHORT

*Guseva Canu I, Metz-Flamant C, Caër S, Auriol B, Tirmarche M.

Background and aims: The French uranium conversion workers cohort was constructed to investigate effects of internal radiation due to uranium intake. All male workers employed for at least 6 months at the AREVA NC Pierrelatte facility from 1960 through 2005 were included. The Pierrelatte facility was dedicated to uranium hexafluoride enrichment during the period 1960-1996 and to chemical conversion of various uranium compounds since 1982. Here we report mortality results for a period from 1968 through 2005.

Methods: The cohort mortality was compared with that of the French population by computation of the Standardized Mortality Ratio (SMR) with their 95% Confidence Interval, [95%CI]. For all-death, all-cancer, and lung cancer mortality trend and heterogeneity tests were computed in order to study SMRs variation by job characteristics and according to external ionizing radiation exposure.

Results: The cohort included 2709 workers (73511 person-years) with median attained age of 63 years, median employment duration of 20 years. Only 272 from 1455 workers monitored for external radiation exposure were actually exposed (mean cumulative dose=6.28 mSv). We observed a statistically significant deficit in mortality due to all causes (SMR=0.55 [0.50-0.61], n=411), all cancers (SMR=0.70 [0.60-0.81], n=193), and to main specific cancer sites, including lung (n=48), upper aerodigestive tract (n=24), and kidney (n=5), known as target organs of uranium. Non-significant increase in mortality was observed for non Hodgkin's lymphomas (SMR=1.32 [0.57-2.60], n=8) and pleura cancer (SMR=2.04 [0.79-5.73], n=5). For all-death and all-cancer SMRs, we observed a statistically significant positive trend according to time since hiring. No consistent results were observed according external radiation exposure.

Discussion and conclusions: This cohort presents a positive overall mortality pattern as classically observed among nuclear workers. The healthy worker effect, especially healthy hire effect seems to be important and explains a part of a low overall mortality compared to the national population. Further analysis of this cohort will focus on comparison with AREVA NC workers' mortality with adjustment for confounding. The increase in lymphoma mortality among uranium workers was already reported. We will investigate this result by using a specific Pierrelatte job-exposure matrix in the study of the relationship between cancer mortality and uranium exposure.

Mo-O-46 THE FRENCH NATIONAL PROGRAM FOR POST-OCCUPATIONAL SURVEILLANCE OF SUBJECTS EXPOSED TO ASBESTOS

*Rolland P, Carton M, Homère J, Nachtigal M, Bonnaud S, Goldberg M, Imbernon E.

Background and aims: The French national Institutes for Public Health Surveillance (InVS) and for Medical Research (Inserm) have established a surveillance program for retired subjects exposed to asbestos during their working life. Its objectives are to identify exposed workers and to propose them a medical follow-up, to describe past exposures and their long-term health effects, and to assess the program in terms of benefits for health and compensation.

Methods: Since 2005, two prospective cohorts of retired workers have been set up among former male employees ("Spirale" cohort) and self-employed craftsmen ("Espri" cohort). In 2008, both cohorts cover 30 French "départements" (covering one third of the population). Each year, a questionnaire is mailed to new retirees (50.000 employees and 4.500 craftsmen) to detect past occupational asbestos exposure. The exposure assessment is made by medical and industrial hygiene experts. The medical follow-up is proposed to subjects according to exposure criteria. The French national medical databases are used for the cohort follow-up.

Results: During the pilot stage (2005-2007), the participation rate was 30% for employees (without reminder) and 68% for craftsmen (with one reminder). Heavy exposure was found for occupations in

construction, ship-building and fabrication of metal products, and also for motor vehicle mechanics. First estimates of the lifelong prevalence of occupational asbestos exposure indicated that about one half of retired craftsmen have been exposed during their working life, versus one quarter of the employees. Among craftsmen who had a chest CT scan, about one quarter showed asbestos-related radiological abnormalities, essentially pleural plaques.

Discussion and conclusions: The first results from the French national program for post-occupational surveillance highlighted the expectation of retired workers for surveillance of past occupational exposures. Its expansion to the whole territory is planned and will include about 250.000 new retired employees and 17.000 self-employed craftsmen per year. The evaluation of the impact of the program on compensation and health benefits during the cohort follow-up will provide guidance for public policy about post-occupational surveillance of workers exposed to carcinogenic agents.

Mo-O-47 OCCUPATIONAL EXPOSURE TO ASBESTOS AND MORTALITY AMONG ASBESTOS REMOVAL WORKERS: A POISSON REGRESSION ANALYSIS

*Frost G, Harding A, Darnton A, McElvenny D, Morgan D.

Background and aims: The British Asbestos Survey was established in 1971 to monitor the long-term health of workers. Legislation prohibiting the use or manufacture of asbestos led to the decline of the asbestos manufacturing industry and the rise of the asbestos removal industry. The aim of this analysis was to report the overall mortality experience of the removal workers and investigate predictors of risk for particular diseases.

Methods: The study population consisted of 31,302 asbestos removal workers who participated in the survey, and followed-up to December 2005. Standardised mortality ratios (SMR) were calculated using British mortality rates. Poisson regression was used to estimate relative risks (RR) for causes of death with elevated SMRs and sufficient numbers. Risk factors considered included dust suppression technique, type of respirator used, hours spent stripping asbestos, smoking status and length of exposure to asbestos.

Results: During the 350,296 person-years of follow-up 985 deaths occurred. SMRs were significantly elevated for all deaths (SMR 123, 95% CI 119-183), all cancers, cancers of the rectum, larynx, lung, peritoneum, pleura, kidney, mesothelioma, and for circulatory, cerebrovascular, and respiratory disease, and finally asbestosis. Dust suppression technique and respirator type were not associated with increased mortality risks for any cause. Spending more than 40 hours per week stripping rather than less than 10 increased mortality risk from all causes (RR 1.4, 95% CI 1.2-1.7), circulatory disease (RR 1.7, 95% CI 1.2-2.4) and ischaemic heart disease (RR 1.9, 95% CI 1.2-2.8). Elevated mesothelioma risks were observed for those first exposed at young ages or exposed for more than 30 years. Current smokers had a greater risk than never smokers for all causes (RR 2.5, 95% CI 2.0-3.0), all cancers (RR 2.8, 95% CI 1.9-3.9) including lung cancer, circulatory disease, ischaemic heart disease and respiratory disease.

Discussion and conclusions: Mortality among asbestos removal workers was significantly higher than in the British population, which was at least partly due to their high smoking prevalence. There was no evidence that use of a particular dust suppression technique during asbestos removal was associated with reduced mortality. Further follow-up will allow the impact of more recent regulations to be assessed.

Mo-O-48 OCCUPATION AND CAUSE OF DEATH: THE COSMOP SURVEILLANCE PROGRAM

*Geoffroy-Perez B, Julliard S, Fouquet A, Goldberg M, Imbernon E.

Background and aims: The Cosmop program is a national surveillance program on mortality and causes of death by occupational groups. It aims at providing indicators contributing to guide and evaluate national health policy as regards occupational risks.

Methods: This program relies on existing permanent sources of data collected at the French population scale. Present analyses were based on the "Échantillon Démographique Permanent", a 1% representative sample of the French population, set up at the 1968 census. For each individual, census occupational data's and vital status were prospectively collected. The causes of 95 percent of all deaths observed were obtained by linkage with the French National Death Registry. For different causes, relative risks of premature death (i.e. before age 65) were calculated for economic sectors involving more than 3,000 men by reference to all others, taking into account the distribution of social categories among sectors. Analyses were performed for the period 1968-1999, then for two different periods (1968-1981 and 1982-1995).

Results: The 187,938 men (20,084 deaths) active during the study period, were selected for analysis. A significant excess of premature death was observed in the sectors of production and manufacturing industries, while agriculture, trade and services showed lower mortality risks. An excess of death from malignant diseases was observed among construction (RR=1.28), metallurgy (RR=1.17), restaurants

(RR=1.19), transportation (RR=1.20) and construction materials production (RR=1.29) workers, while agricultural, selling, education, health and financial sectors showed lower mortality risks. Main results for cardiovascular diseases and injuries will also be presented.

Discussion and conclusions: For the first time in France, this study provides mortality indicators by cause of death and economic activity. The advantage and the perspectives of such a program for the surveillance of working population will be discussed.

Mo-O-49 MORTALITY OF BRITISH MILITARY PARTICIPANTS IN HUMAN EXPERIMENTAL RESEARCH INTO CHEMICAL WARFARE AGENTS AT PORTON DOWN

*Venables K, Brooks C, Linsell L, Keegan T, Langdon T, Fletcher T, Nieuwenhuijsen M, Maconochie N, Doyle P, Beral V, Carpenter L.

Background and Aims: The UK has had a research facility at Porton Down since World War 1. It has been suggested there may be long-term effects on the participants in experimental research conducted there related to chemical warfare agents. This study evaluated their mortality.

Methods: A cohort of 18,276 servicemen who went to Porton Down to take part in the "human volunteer programme" between 1941 and 1989 was followed to 31 December, 2004 for mortality, together with a comparison group of 17,600 similar veterans who did not take part. Rate ratios (RR) and 95% confidence intervals (CI) were calculated for Porton Down versus non-Porton Down veterans, adjusting for age and calendar period, and SMRs were also calculated with reference to the general population. Chemical exposure groups were formed of exposure to any vesicant, any nerve agent, any other chemical, and any of each of 8 specific chemicals to which 1,000 or more veterans were exposed.

Results: 73% of Porton Down veterans were born before 1940, 79% in England, 70% had joined up as teenagers, 62% into the Army, 99% at the lowest rank, and 72% during periods of conscription (median year of enlistment 1951). The non-Porton Down veterans were similar except in duration of military service. Fewer Porton Down than non-Porton Down veterans stayed for less than two years (2% versus 16%) and more for 10 or more years (28% versus 18%). The median duration of military service was 6.2 years (inter-quartile range 4.2 to 11.4) for Porton Down and 5.0 (2.1 to 7.5) for non-Porton Down veterans. At the end of follow-up, 14,206 veterans had died.

Discussion and Conclusions: While it has not been possible to present results at EPICOH 2008, the approach generates several discussion points, including on the comparability of Porton Down and non-Porton Down veterans.

MUSCULOSKELETAL DISORDERS 1

Mo-O-50 EFFECTIVENESS OF A PARTICIPATORY ERGONOMIC INTERVENTION ON MUSCULOSKELETAL HEALTH: A CLUSTER RANDOMIZED CONTROLLED STUDY

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Background and aims: Musculoskeletal (MS) disorders are associated with both biomechanical and psychosocial factors at work. Based on the evidence, models of causal pathways have been developed. The basic elements in these models are work organization, workstation and tools, physical work demands, psychosocial factors and individual characteristics. Having such a model as our theoretical framework our aim was to study the effect of developing ergonomics on preventing musculoskeletal disorders.

Methods: In four big cities 119 municipal kitchens with 504 workers were randomized in blocks (series) of 8 to the intervention (n=59) and control group (n=60). Participatory intervention to develop ergonomics was supported with 8 workshops guided by an ergonomist. Control kitchens continued their normal activity. The intervention lasted from 11 to 14 months in each series, followed by a 12-month follow-up phase. Data on health and intermediate outcomes (perceived physical load, psychosocial factors) were collected with the 3-monthly questionnaires. Response rates exceeded 90%. Data analysis (hierarchical modeling) was based on cross-sectional data of the open population and on the subgroup of workers who remained in the same kitchen throughout the study. Physical load factors were also assessed via walk-through observations, video recordings and before-after measurements. For process evaluation we used questionnaire data, focus group interviews and research diaries.

Results: The process evaluation indicated that the intervention was successfully conducted. Expert assessment of physical load showed favorable changes in some work tasks but no changes were observed in perceived physical load at work. A major reorganization of food services during the study in two of the cities resulted in significant adverse effects on psychosocial factors. The prevalence rates of MS disorders remained similar in the intervention and control kitchens. The results of the subgroup analysis were similar.

Discussion and conclusions: Although the intervention was successfully conducted and favorable changes were found in some work tasks, the perceived physical load remained similar. This may partly explain that the intervention did not show effectiveness on health outcomes. More intensive "micro ergonomic intervention" or more comprehensive redesign of work organization and processes might be warranted. There is a need for further trials to elucidate these issues.

Mo-O-51 PATIENT HANDLING AND LOW BACK PROBLEMS IN NURSING: A PARTICIPATORY ERGONOMIC INTERVENTION.

*Fallentin N, Wolff C, Gyntelberg F.

Background and aims: The health care sector is one of the major employment sectors in Europe. At the same time the sector is facing a preponderance of working environment problems. Ergonomic factors, however, seems to constitute the main problem. Manual handling of patients and the associated back injuries affects a large proportion of the workforce and has a marked impact on the sector.

In 2002 the present intervention study was started in an orthopaedic ward at a Copenhagen hospital with the aim of improving working conditions.

Methods: Using information from a questionnaire-based survey, a controlled trial was conducted by assigning one of the five sub-units in the ward as intervention unit, while the remaining units served as controls. Interventions were planned, initiated and surveyed by a participatory ergonomics team. Pre-intervention exposure levels were obtained from the questionnaire and compared with post-intervention levels obtained through a second questionnaire distributed to the ward in 2004, one year after the intervention.

Results: The study population consisted of 179 employees at baseline (2002), while 187 was eligible in 2004. The intervention focused on providing technical aids for patient handling. Ceiling lifts and other equipment were purchased and implemented (including hands-on-training) at the intervention unit. The results indicated a general, positive improvement in working conditions at the entire ward from 2002 to 2004, partly due to organizational changes in the control units. The observed improvements, however, were consistently higher at the intervention unit than in the control group e.g. number of personnel with >10 daily patient transfers decreased 14 percentage points in the intervention units and 1.2 in the control group, a physical load index decreased 7.3 percentage points in the intervention group vs. 2.2 in the control group while the number of staff reporting a high physical work load decreased 23 and 13 percentage points, respectively.

Discussion and conclusions: The study faced a number of external factors (i.e. conflicting interventions, high labour turnover) which in some cases made it difficult to obtain statistically well founded results. At the same time, however, the coherency of the information obtained and the consistency of results pointed to a clear positive effect of the intervention.

Mo-O-52 USING INDIVIDUAL PARTICIPANT DATA META-ANALYSIS TO STUDY THE RELATIONSHIP BETWEEN WORKPLACE MECHANICAL FACTORS AND LOW BACK PAIN

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Background and aims: Systematic reviews and meta-analyses are popular in health research and have been increasingly used in occupational health. However, even high quality reviews have only been able to use summary data from published papers. Our aim is to overcome this limitation by obtaining original study data from authors and undertake an individual participant data (IPD) meta-analysis of the relationship between workplace mechanical factors and low back pain (LBP).

Methods: We contacted authors identified through a systematic search of LBP studies in workers to request their individual-level data. There was little consistency in outcome or exposure definitions. We used a Delphi consensus process to determine which LBP outcomes could be meaningfully combined in a meta-analysis. Because of the great differences in the exposure measures we decided to convert them to a common metric. We developed a set of six 7-point scales to represent exposure from posture (peak and cumulative), weight (peak and total) and spinal load (peak and cumulative). Graduate students in a biomechanics program were recruited to translate exposure measures reported in the IPD studies to the common metrics. We used GEE regression to estimate Odds Ratios (OR) while accounting for the clustering of participants within studies. We adjusted the estimates for study design (cohort or cross-sectional), age and sex and other potential confounders and tested for potential interactions.

Results: We identified 221 eligible studies published between 1968 and 2005 through our systematic search; 156 cross-sectional, 11 case-control, and 54 cohort. The sample sizes ranged from 37 to 85,191 with a median of 617 and the studies were conducted in 37 countries. We obtained individual data from 48 studies. At the point of writing we have done preliminary analyses but have not completed the main analysis using the translated exposure data.

Discussion and conclusions: There is still some controversy as to whether meta-analysis of observational studies should be undertaken. This reflects the complexity of the issues around combining the results of studies with different study designs, outcome measures, exposure measures and levels of adjustment for potential confounders. We will discuss our approach to dealing with the many issues and make general recommendations based on our experience.

Mo-O-53 MUSCULOSKELETAL PAIN AT MULTIPLE SITES AND ITS EFFECTS ON THE ABILITY TO WORK

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Background and aims: Some earlier studies have reported high co-occurrence of musculoskeletal pain. Little is known to what extent multi-site pain is related to self-rated work ability and plans to retire early.

Methods: A comprehensive health examination survey (The Health 2000 Survey) was carried out among a representative sample (n=8028) of the Finnish adult population in 2000-2001. The analyses concerned 4071 subjects (30 to 64 years) who held a job during the preceding 12 months. Pain in the low back, neck, upper and lower extremities, and self-rated work ability and intentions to retire early (from the standardized Work Ability Index) were assessed with interview.

Results: One third of the subjects reported pain in one area during the preceding month, whereas 20%, 10% and 4% reported pain in 2, 3 and 4 areas, respectively. The prevalence of multi-site pain increased by age and was higher among the women. Age- and gender-adjusted odds ratio for poor work ability was 2.1 (95% CI 1.5-2.9) for those with single-site pain, increasing up to 13.9 (95% CI 8.9-21.5) for 4 sites. After stepwise adjustment for several covariates, the risk remained significantly elevated for 3 and 4 pain sites, e.g., odds ratios being 4.6 (95% CI 2.8-7.8) for pain in 4 sites. Results were similar regarding future work ability and were not modified by gender. Gender affected retirement plans, however: those men with 2 to 4 pain sites had significantly more often plans to retire early than those with 0-1 pain sites. Among the women, this association did not remain statistically significant after multiple adjustments. The risk of poor current work ability was highest among those 50 years or older subjects with multi-site pain, and regarding future work ability among 40-49-years of age.

Discussion and conclusions: Every third working Finnish adult has experienced pain in multiple sites during the preceding month. Multi-site pain had a strong association with current and future work ability, and was also associated with retirement plans in men. Prospective studies using more objective outcomes are warranted. In conclusion, workers with multi-site pain may benefit from better targeted preventive measures in order to sustain their ability to work.

Mo-O-54 SELF-REPORTED PHYSICAL EXPOSURE ASSESSMENT FOR OCCUPATIONAL EPIDEMIOLOGICAL RESEARCH OF MUSCULOSKELETAL DISORDERS: METHODOLOGICAL ISSUES AND FUTURE DIRECTIONS

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Background and aims: Self-reports are the most frequently used method for physical exposure assessment in occupational epidemiological research of musculoskeletal disorders. While the accuracy of self-reported data has been widely criticized, the extent to which low documented validity is due to the employed methods for validity testing is not well known. This study aims to examine the effect of 1) the lack of comparability between self-reports and reference methods and 2) the heterogeneity of the study population with regard to the exposure of interest on the reported validity of self-reported physical exposure data.

Methods: A search for original articles about the criterion validity (inter-method reliability) of self-reported occupational physical exposures published in English between 1990 and 2007 was conducted in Pubmed, Ebsco, Applied Science Abstracts and ISC Web. Validity assessments were classified according to the degree of correspondence existing between the tested self-report and the employed reference method with regard to the exposure period and construct of interest. We compared the correlations reported in validity assessments having a higher correspondence level with those having a lower level of correspondence. Similarly, the reported correlation of studies testing self-reports in more heterogeneous populations were compared with those of studies testing self-reports in less heterogeneous populations.

Results: Three-hundred and sixteen validity assessments reporting correlations presented in 33 field validity studies were identified. Forty-seven percent of these validity assessments tested self-reports against reference methods for which either one or both, evaluated period of time or construct did not match the self-report. Validity assessments with a better match tended to report higher correlations. Similarly, studies using heterogeneous populations in the validity study tended to report higher correlation levels between the studies.

Discussion and conclusions: The methodological characteristics of validity studies are likely to explain to a great extent the frequently low reported correlations in validity studies. Improved methods for

validity testing, that include the use of accurate reference methods and control over the exposure distribution in the studied population are crucial to better understand the true capabilities and limitations of self-reported physical exposure data.

Mo-O-55 PROGNOSIS FACTORS OF UPPER EXTREMITY MUSCULOSKELETAL DISORDERS OF WORKERS HIGHLY EXPOSED TO REPETITIVE WORK

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Background and aims: Despite strong evidence of an association between occupational exposure and upper extremity musculoskeletal (UEMS) disorders, little is known about the factors associated with prognosis. Our objective was to study the factors associated with the outcome of UEMS symptoms or disorders over a three year period, in a population highly exposed to repetitive work.

Methods: The data came from a survey focusing on the health effects of repetitive tasks, with a self-administered questionnaire and a standardized physical examination by an occupational physician, in 1993-1994 and again in 1996-1997. All workers with UEMS symptoms or disorders in 1993-1994 were included. The three year outcome of UEMS symptoms or disorders was classified into three categories in 1996-1997: neither UEMS disorder nor symptoms; UEMS symptoms only; UEMS disorder. The role of various risk factors possibly associated with the outcome, as assessed by questionnaire in 1993-1994, was analysed using bivariate and multivariate analyses (multinomial non ordinal logistic regressions).

Results: A total of 464 workers were included (125 men, 339 women). At baseline, most of them suffered from a UEMS disorder (n=421, 90.7%), and only 43 had only UEMS symptoms without disorder (7.2%). The prognosis for these 43 workers was better than for the others, with a higher proportion of absence of symptom and disorder in 1996-1997 (23.3% versus 12.1% respectively, $P < 0.05$). According to the multivariate model, age, exposure to forceful work and pain intensity at baseline were significantly associated with the three year outcome ($P < 0.05$), especially with a UEMS disorder in 1996-1997.

Discussion and conclusions: In this population exposed to repetitive work, a large proportion of workers have persistent UEMS symptoms or disorders. Those with symptoms without disorder had a better prognosis than those with a disorder at baseline. Age and pain intensity at baseline were associated with a poor prognosis, but occupational exposure also played a role in the prognosis.

Mo-O-56 DIFFERENCES IN RATES OF HOSPITAL TREATED CARPAL TUNNEL SYNDROME BETWEEN BLUE-COLLAR WORKER, WHITE-COLLAR WORKERS AND HOUSEWIVES: A POPULATION-BASED STUDY IN TUSCANY, ITALY

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Background and aims: Carpal tunnel syndrome (CTS) is a socially relevant disabling condition. The entity of lifetime risks associated with occupational factors is debated, and the relevance of domestic chores has been little studied. We compared rates of severe chronic CTS among blue-collar (and white-collar) workers and full-time housewives in the general population.

Methods: We estimated numbers of hospital treated cases of CTS among residents of Tuscany (Italy) during 1997–2000 (when out-of-hospital CTS surgery was extremely rare), based on codified demographic and diagnostic/intervention data in obligatory discharge records from all Italian public/private hospitals, archived (according to residence) on Tuscany's regional database (Tuscan hospitals also collect information on occupation, including full-time housewife status). Population data were extracted from the 2001 census.

Results: After excluding repeated admissions we identified 18,608 cases (79% women), then, after excluding pensioners and jobless 11,682 entered the analysis (including 84% of 11,519 cases aged <60 years). With respect to reference categories (same-sex white-collar workers), women blue-collar workers experienced a 4.7-fold higher standardized rate; housewives a 2.7-fold excess; men blue-collar workers a 5.2-fold excess. Blue-collar workers of both sexes showed significantly higher age-specific rates with respect to white-collar workers (ranging from about 3- to 7-fold). Patterns of age-related incidence curves appeared remarkably similar for women blue-collar workers and housewives (who displayed only slightly lower rates at all ages). Shapes of the age-related rate ratio curves were remarkably similar for women blue-collar workers and housewives.

Discussion and conclusions: Hospital treated CTS appeared to be 3 to 7 times more common (depending on age/gender) in blue-collar than in white-collar workers—magnitudes that are difficult to attribute only to differences in body weight or other individual factors. Thus, occupational risk factors seem relevant throughout working life. The high rates recorded for full-time housewives suggest domestic chores may be a relevant risk factor for CTS.

EXPOSURE ASSESSMENT

Mo-O-57 GIS MODELLING IN STUDIES ON NEIGHBOURHOOD HEALTH IN AREAS WITH CONFINED ANIMAL FEEDING OPERATIONS

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Background and aims: Potential adverse health effects of confined animal feeding operations (CAFOs) are of public concern in many countries. As previously shown in our Lower Saxony Lung Study, a large number of CAFO in the neighbourhood may be associated with lower lung function in residents without occupational or private contact to farming facilities (the “non-farm subjects”). However, number of CAFO is only a crude proxy of exposure to potentially harmful substances. We aimed to improve exposure assessment by combining objective measurements with GIS modelling. Ammonia was used as a surrogate for exposure to CAFO emissions and emissions from the surrounding fields (liquid manure).

Methods: We measure ammonia in one of our four study towns over one year, in monthly intervals, at 22 sampling points. Location of the sampling points was optimized using cluster analysis. Individual mean annual ammonia exposure was estimated using inverse-distance weighing method for the home address of 149 non-farm subjects for whom lung function and specific IgE measurements were available. Results were validated by the leaving-one-out method. Exposure was dichotomized at the upper quartile. Logistic and linear regression adjusting for age, sex, smoking, level of education, number of siblings, and parental atopy were used to assess the association between mean annual ammonia exposure and respiratory health.

Results: Mean estimated annual ammonia levels ranged between 16 and 24 $\mu\text{g}/\text{m}^3$. Participants with a mean annual ammonia exposure in the highest quartile (\square 19.7 $\mu\text{g}/\text{m}^3$) were more likely to be sensitized against ubiquitous allergens than were those with lower exposure (adjusted OR 4.2; 95% CI 1.2-13.2). In addition, we confirmed the inverse association between exposure and 1-second forced expiratory volume (FEV1) (adjusted mean difference in % predicted (-6%); 95% CI (-11%) - (-1%)).

Discussion and conclusions: Using improved exposure assessment, we found further evidence that CAFO may contribute to the burden of respiratory disease among neighbouring residents. Therefore, environmental impact of industrial settings is still an issue in occupational epidemiology. Finally, our findings underline the usefulness of objective exposure assessment combined with GIS modelling in occupational and environmental epidemiology.

Mo-O-58 DWELLING COORDINATE FOR EXPOSURE ASSESSMENT IN EPIDEMIOLOGICAL STUDIES

*Tondel M.

Background and aims: Individual exposure assessment is desirable in all epidemiological studies, but seldom possible to achieve in large cohort studies. Digital data and Geographical Information System (GIS) can be used for this purpose. In Sweden the deposition of caesium-137 after the Chernobyl accident in 1986 and the Terrestrial Gamma Radiation (TGR) are available in digital maps (200x200 metre grid). The population has digital dwelling coordinates, possible to link to these two exposures. With this technique we have studied the incidence of malignancies, but it is also suitable for other outcomes.

Methods: Annual aerial measurements have been performed since the Chernobyl accident resulting in a digital map backdated to 1986. For TGR a corresponding map was complete in 2007. Each dwelling in Sweden has a coordinate with an accuracy of 100 metres. With a geometric join we have linked the exposure data with the population using GIS. In one study 1.1 million individuals were linked to caesium-137 and in another one 0.5 million persons were linked to TGR. In the latter study we also linked annual coordinates with the TGR map creating cumulative exposure taking into account changes of dwellings during follow-up.

Results: Exposure to caesium-137 after the Chernobyl accident and TGR in Sweden can be assessed on an individual level using GIS. The distribution (ground activity) was skewed for caesium-137 (mean 29.3, median 19.0 kBq/m²), but less so for TGR (mean 69.4, median 72.0 nGy/h).

Discussion and conclusions: It is possible to link digital exposure information with population dwelling coordinates in large studies with individual classification of exposure. In our studies only outdoor exposure could be assessed, ignoring radiation from indoor gamma- and radon-emitting building material, food- and water-intake of radionuclides, occupation and medical examinations. These sources affect the effective dose, but the confounding properties have to be explored in each study. When creating exposure categories the distributions must be taken into account i.e. creating a reference category large enough for robust risk estimates and maximum contrast. Using coordinate for linking digital datasets is a cost effective way to study different outcomes, especially rare ones when large populations are needed for statistical power.

Mo-O-59 ELF MAGNETIC FIELDS EXPOSURE IN VARIOUS OCCUPATIONS IN ITALY

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Background and aims: Extremely Low Frequency-Magnetic Fields (ELF-MF) are suspected carcinogens in humans. Epidemiological data have indicated that long term exposure greater than 0.4 μT is linked to a doubling of the risk of childhood leukaemia, but results in adults are inconclusive. One of main causes for the scarce coherence of the results is an inadequate evaluation of exposure in epidemiological studies. Aim of this study was to obtain a representative evaluation of occupational exposure to ELF-MF in workers engaged in some of the main occupations in Italy.

Methods: 543 workers employed in 55 different occupations in 9 occupational settings were examined. Using personal dosimeters we monitored ELF-MF exposure during two complete work-shifts. Environmental non-occupational exposure was also monitored for 2 days. For each subject about 5.600 measurements were collected during work and other 11.550 in non-working periods. Exposure is expressed as Time-Weighted Average (TWA) values (μT)

Results: The median of individual TWA exposure during work resulted 0.14 μT (5th-95th percentiles: 0.04 – 2.5 μT). Exposure was lower than 1 μT and 0.4 μT in about the 90% and 80% of the workers respectively. In two jobs only occupational exposure (median of the TWA values of all workers engaged in that job) was greater than 1 μT , while in other 2 jobs exposure was between 0.4 and 1 μT . In all other activities, representing the 93% of all examined occupations, exposure was lower than 0.4 μT . Nevertheless in some occupations, as in electricians in tile production, a high variability resulted among workers. Non-occupational exposure was lower than 0.4 μT in more than 96% of the sample, and lower than the occupational exposure in 98 % of the examined subjects.

Discussion and conclusions: We have evaluated personal exposure to ELF-MF in a large group of workers. With a few exceptions, non-occupational exposure was lower compared to the occupational exposure. TWA exposure levels resulted lower than the thresholds for known short-term adverse effects, and also for the suspected long-term effects, in the large majority of the main occupations in Italy.. In some occupations a high variability of job-related exposure was observed.

Mo-O-60 THORACIC AEROSOL EXPOSURE IN CEMENT PRODUCTION FACILITIES – MODELLING DETERMINANTS OF EXPOSURE FOR THEIR USE IN A JOB EXPOSURE MATRIX
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Background and aims: A cohort study is performed in the period of 2007-2011 in 24 cement plants in 8 European countries. Exposure to thoracic aerosol and lung function is monitored. One aim is to identify exposure determinants that can be used in the assessment of cement dust exposure in the whole cohort, including also employees not subjected to exposure measurements.

Methods: Selected employees representative of performed work tasks in the plant (excluding administration-only employees) carried 37 mm Millipore filter holders mounted to BGI 2.69 thoracic cyclones with a flow rate of 1.6L/min and whole shift sampling. At the end of the shift workers filled out questionnaires about their job and specific tasks performed that day. Filters were analysed by gravimetry. The log-transformed aerosol masses served as the dependent variable in multiple linear regression modelling using questionnaire-based information to define determinants of exposure.

Results: The GM of thoracic dust in 476 samples was 0.53 mg (GSD 4.2). A model based on job categories (production, plant cleaning, maintenance, laboratory, administration, foreman, other) explained 23% of the variance of thoracic aerosol, while a model based on time spent in tasks hypothesised as main determinants of exposure explained 36% of variance. Introducing time spent in different putative high-exposure level tasks into the model increased the explained variance to 42%. Utilizing all questionnaire information, a model explaining 51% of the variance was obtained. Between the four plants, levels differed within a factor of 1.8, adjusted for job type and tasks.

Discussion and conclusions: In the evaluation of the lung function effects of cement dust, the thoracic aerosol fraction may be more relevant than either inhalable or respirable aerosol, as the bronchial tree may be the target for hypothesised harmful effects. We demonstrated a large variation of whole shift exposure levels. More than 50% of the variation was explained by the operations considered in our questionnaires. A high explained variance of determinants is a prerequisite for their use in the main study, aiming to assess any exposure-related decline in lung function related to the aerosol levels found in cement production plants, and further, to quantify such effect if they exist.

Mo-O-61 CORRELATES OF SERUM DIOXIN TO SELF-REPORTED EXPOSURE FACTORS
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Background and aims: Questionnaires are invaluable tools used to collect historical exposure data. However, the potential for misclassification when using these self-reported data is well known. Biomonitoring of dioxin exposures can provide questionnaire validation, but collecting blood can be invasive, expensive, and impractical for some study subjects. The aim of the current analysis was to

understand the correlates of dioxin exposure as observed from current serum levels and a questionnaire addressing potential dioxin exposures from occupation, residence and general diet.

Methods: We collected both serum and questionnaire data from 346 workers at a New Zealand chemical plant that manufactured and formulated the herbicide, 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). Exposure to the contaminant 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) was possible. Using linear regression, we modeled current levels of serum TCDD with covariates related to past occupational exposure to TCDD, responses to the questionnaire, as well as personal characteristics of age, body mass index (BMI), race and sex.

Results: Stepwise regression selecting only variables with a p value of 0.10 explained more than half of the variance (51%). As expected, age and BMI were significantly associated with increasing serum TCDD. Having an indigenous Maori background, exposure to TCDD as modeled from work history records; recent weight loss and past jobs in hazardous waste and timber treatment were also positively correlated with serum TCDD. Negative correlations were observed for years since leaving employment at the plant, gaining weight and working with brush eradication. The model with just age and BMI explained less than a quarter of the variance (24%). When the group was stratified by TCDD levels (i.e., < 3 ppt and 3 ppt-lipid adjusted), other factors were predictive of exposure.

Discussion and conclusions: We confirmed that current age and BMI are highly predictive of serum TCDD. For workers with occupational exposure to TCDD, some job-related covariates were also predictive even many years after exposure ended. However, questions on diet and residence were not predictive and other questions of occupational dioxin exposures produced equivocal findings. We recommend further efforts to develop and validate questionnaires to better evaluate environmental sources of TCDD.

Mo-O-62 SURVEILLANCE FOR WORK-RELATED ASBESTOS EXPOSURE IN CANADA

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Background and aims: Asbestos exposure in Canada peaked in the early 1970's and then dropped quickly due to restrictions on use. However, recent efforts to identify the burden of asbestos-related disease in British Columbia (BC), a region with approximately 13% of the Canadian population, have estimated that there are at least 250-300 new cases of asbestosis or cancer per year. Extrapolating up to the Canadian population, there may be 1900-2300 new cases of asbestos-related disease diagnosed annually. However, there are no estimates of the number of people exposed to asbestos currently or in the past. Efforts are now underway, as part of the CAREX Canada project, to make these estimates.

Methods: The original CAREX Canada project (based on methods developed by the Finnish Institute for Occupational Health) was designed to estimate exposure to workplace carcinogens in 2 Canadian provinces (BC and Ontario). The prevalence of exposure within industries in Finland and the US were used in combination with Census data to develop preliminary estimates of the number of residents exposed to workplace carcinogens. For the new national CAREX Canada project, estimates will be made not only of the number of people exposed, but also levels of exposure. To facilitate the latter component, the Canadian Workplace Exposure Database (CWED) will be created to include data (where possible) from provincial and federal agencies, Canadian researchers, and proactive employers.

Results: Initial results from CAREX Canada estimated that 7200 workers were exposed to asbestos in BC in 2001 and 21700 in Ontario. The main industry of importance was construction, although smaller numbers of workers in many industries were exposed. Work has begun to create CWED and 1787 asbestos samples collected by the Ministry of Labour in Ontario and 4718 collected by WorkSafeBC were identified.

Discussion and conclusions: Based on a critical review, the preliminary estimates based on conditions in Finland in 1990's and the US in the 1980's do not accurately capture current Canadian conditions. Despite mitigation strategies, many Canadians are likely still exposed to asbestos at work. By identifying workers who are likely to have current exposure, this project will help to develop targeted interventions to prevent further exposure and disease.

Mo-O-63 ASSESSMENT OF EXPOSURE TO SECOND-HAND SMOKE USING SALIVA COTININE IN HOSPITALITY WORKERS

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Background and aims: In Serbia 44.5% of employees are exposed to second-hand tobacco smoke (SHS) at their workplaces. According to the Law, smoking is not banned in hospitality premises and is widespread, leading to occupational exposure to SHS of hospitality workers. The aim of our study was to estimate the salivary cotinine, a metabolite of nicotine in hospitality workers – non-smokers.

Methods: Two groups of non-smoking hospitality workers were selected total of 94: exposed group in restaurants and cafes where smoking was permitted and non-exposed group where smoking was banned.

Saliva samples were collected using salivettes prior to and after their working shift, in winter and summer seasons.

Results: Exposed hospitality workers were significantly older than non-exposed workers (33.9 vs. 24.6 years, respectively), and were predominantly men (64.4% vs. 35.6%). Almost 2/3 of subject in both groups were with high school. Using paired sample T-test, increased levels of salivary cotinine were observed during the shift in both types of restaurants and cafes and in both seasons. However, in winter, both levels of cotinine and the increase were more pronounced, being among non-exposed workers 4.22 ng/ml prior to work, and 6.17 ng/ml after the work ($p=0.078$). Among exposed hospitality workers, pre-shift cotinine level was 7.19 ng/ml, and post-shift 8.49 ng/ml, respectively ($p=0.033$).

Discussion and conclusions: Our study found that salivary cotinine was higher in post-shift salivary samples, more pronounced in winter and in premises where smoking is permitted. However, pre-shift levels are considerably high, and only 21.3% of all participants - non-smokers had no traces of cotinine in their body at pre-shift samples. A possible explanation can be the widespread exposure to SHS, first, at work in crew rooms of both types of the restaurants and cafes during the coffee and lunch breaks where smoking is allowed and, second, at home, where 40.0% in exposed subjects and 59.2% of non-exposed live with a smoker, and where 79.5% and 83.7%, respectively, allows smoking in their homes. Our results confirmed that exposure to SHS is one of the major occupational risks of the hospitality workers. This should be used as a strong argument in banning smoking in all hospitality sectors.

MINISYMPOSIUM: REPRODUCTIVE HEALTH IN RELATION TO PESTICIDES AND AGRICULTURAL WORK

Mo-O-64 EXPOSURE ASSESSMENT ISSUES IN REPRODUCTIVE PESTICIDE STUDIES

*Roeleveld N.

Background and aims: Most epidemiological studies on the health effects of occupational or environmental pesticide exposure use qualitative exposure assessment methods, based on, for instance, job titles, self-reported data from questionnaires or interviews, expert judgement, or regional differences in use of pesticides. Complicating factors are the vast number of pesticides formulations on the market, shifts in use of specific pesticides over time, and seasonal and other time-dependent fluctuations in pesticide use. The latter is especially important in reproductive studies in which long-term exposure is usually not an issue, but the timing of exposure and the exposure pattern are critical for the effects that could be expected. The large variation in application methods, work practices, and exposure situations further complicates exposure assessment. Especially for women, pesticide exposure is often 'invisible' as they usually do not apply pesticides themselves, but get exposed through re-entry work in crops that have been treated with pesticides and/or by living on a farm or in a pesticide-exposed area.

Methods: A literature study was undertaken to find all studies on reproductive disorders in relation to occupational pesticide exposure or agricultural work. In addition, the literature on exposure assessment for pesticides was reviewed.

Results: During the mini-symposium, an overview will be given of the different exposure assessment methods used in reproductive pesticide and agricultural studies and their consequences for validity and comparability of the results. In addition, several exposure assessment issues that are specific to studying reproductive disorders will be addressed, such as the variability in critical exposure time windows (e.g. life-time exposure, preconceptional exposure, month-by-month exposure during pregnancy) and exposure metrics (e.g. continuous exposure, repeated short-term exposure, peak exposure) related to different effect parameters, as well as male versus female and combined exposure.

Discussion and conclusions: Eventually, the advantages and disadvantages of using qualitative, semi-quantitative, and quantitative exposure assessment methods in reproductive pesticide studies will be explored from both a practical and a methodological point of view.

Mo-O-65 PESTICIDE EXPOSURE AS A REPRODUCTIVE HAZARD FOR CHILDHOOD LEUKEMIA IN COSTA RICA

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Background and aims: Workforce includes women of reproductive age who are exposed to workplace hazards, such as chemical toxicants (heavy metals, pesticides, endocrine disruptors) and physical, environmental or biological-infectious agents. Exposure transmission through parents includes a) transplacental transmission during gestation and b) postnatal direct contact with plants, pets and soil; parents' take home exposures; direct physical contact with parents (hand-body contact, breastfeeding) and indoor surface contamination.

Leukemias are the most common pediatric cancers in most populations and have multifactorial etiologies and mother-fetus exposure transmission involving interactions between environmental and genetic aspects. This is a review of the plausibility, mechanisms and exposure routes involved, proposed in the empirical data on the pesticide-related etiology of cancer.

Methods: In a case-control study of childhood leukemia and its association with parents' occupational exposure to pesticides performed in Costa Rica, mothers' and fathers' exposures to pesticides during pregnancy were associated with the risk. We compare here our epidemiological findings with available mechanistic data.

Results: Excesses of total leukemia were found for mothers and fathers exposed to organophosphates and for fathers exposed to benzimidazoles. The specific pesticides that showed an association were picloram, benomyl, paraquat, phoxim, mancozeb and malathion, compounds not addressed in previous epidemiological studies, with the exception of malathion. Human, animal and mechanistic data suggest carcinogenic potential for benomyl, mancozeb and malathion; some of the mechanisms suggested are: genotoxic damage, aneuploidy, apoptosis and chromosome aberrations. An association with adult human leukemia has been found for mancozeb.

Discussion and conclusions: Epidemiological, animal and mechanistic evidence related to carcinogenicity in the offspring of particular pesticides compounds is still limited. Existing epidemiological evidence for childhood leukemia risk can be associated with other cancer-related evidence for benomyl, mancozeb and malathion. Both initiator and later effects are possible. Pesticides ought to be of serious concern for health promotion programs of women in reproductive age.

Mo-O-66 EXPOSURE TO PESTICIDES AND FERTILITY

*Sallmen M.

Background and aims: Pesticides are a widely used group of toxic chemicals. The aim of the paper is to present epidemiological evidence on the impact of pesticide exposure on fertility.

Methods: A literature survey was conducted on studies on pesticide exposure and couple fertility published in 1983 to 2008. Outcomes of interest included time to pregnancy, infertility, or delayed conception with a reference to fertilization success among in vitro fertilization patients (IVF) and fertility in the second generation. In total, 19 studies on male effects and 13 studies on female effects were found. The studied populations consisted of occupational cohorts (10 male and 6 female studies), population samples (3 and 4 studies), and clients in infertility clinics (6 and 3 studies).

Results: Findings from three studies conducted in occupational settings indicated reduced fertility among men with occupational exposure to pesticides. Four studies either came up with a suggestive finding or simply observed an association for instance in a subset of primiparous couples, whereas three studies were entirely negative. Similarly, the studies focusing on pesticide exposure in women indicated mixed findings, although five of the six studies were either positive or suggestive. A two-generation study focused on fecundability in daughters of mothers exposed to DDT produced the following result: the higher mother's serum p,p'-DDT concentration, the lower the daughter's fecundability. However, the opposite effect was seen for the metabolite p,p'-DDE. IVF studies have shown a decreased fertilizing ability but an increased implantation rate in couples in which the male partner had been exposed to pesticides.

Discussion and conclusions: There is some evidence on declining fertility among male and female workers occupationally exposed to pesticides. The potential associations are difficult to attribute to specific pesticides because mixtures of pesticides have been used. Comparison between studies is difficult because pesticides used by workers and exposure levels vary across studies. Also, many studies suffer from methodological shortcomings such as selection bias, inadequate control of confounding, or exposure misclassification, including problems in ascertaining exposure for pregnancy attempt times. Fertility effects of pesticide exposure may extend to the next generation. IVF studies provide an opportunity to focus on the potential mechanisms of these effects.

Mo-O-67 BIOLOGICAL MARKERS OF MALE REPRODUCTIVE FUNCTION

*Toft G.

Background and aims: It has been known for decades that some pesticides may seriously harm male reproductive function, but the effects of common used pesticides on male reproductive function is less clear. The aim of the present presentation is to give an overview of the effects of occupational pesticide exposure on male reproductive function.

Methods: Effects of pesticide exposures on male reproductive function was identified through a Pubmed search, using the search string (semen or sperm or hormones) and pesticides and occupational, limited to human studies. Only studies evaluated as relevant based on the abstract was included. In addition, relevant references referred to in the identified papers were included.

Results: Dibromochloropropane (DBCP) seriously harm male reproductive function including findings of azoospermia and genetic alterations of sperm cells, in workers at DBCP factories or agricultural workers exposed to this product. These findings back in the 70s and 80s prompted a series of studies on male workers exposed to other pesticides. Fortunately, the effects of other pesticides has not been demonstrated to be as strong as DBCP, but several examples of pesticide induced alterations of male semen quality and reproductive hormones has been observed in almost every class of pesticide used. Generally, the present use of pesticides in industrialized countries is not suspected to cause major alterations of male reproductive function.

Discussion and conclusions: Pesticide induced alterations of semen quality has been observed in several occupational studies of farmers, gardeners or workers at pesticide producing plants.

Exposure in the prenatal period may be more sensitive to reproductive disturbances than adult exposure. It should be noted that the majority of the studies are conducted in industrialised countries, whereas the use of compounds with potential harm on male reproductive function is much less regulated and less safety precautions are taken while using these compounds in the less developed countries.

Mo-O-68 OCCUPATIONAL EXPOSURE TO PESTICIDES AND FEMALE REPRODUCTION: THE EPIDEMIOLOGIC EVIDENCE

*Figà-Talamanca I.

Background and aims: The hypothesis that exposure to pesticides may interfere with the human reproductive function was first documented among male workers exposed to DBCP almost thirty years ago. In the years that followed, many studies attempted to determine possible similar effects from other pesticides to both male and female workers. The investigations among females with well defined exposures to pesticides are not numerous, but often show negative reproductive effects such as spontaneous abortions, congenital defects and developmental effects. The evidence is not always consistent, mostly because the levels and types of exposures to pesticides are often ill defined

Methods: The paper is a selective review of the epidemiologic literature published after 2000.

Results: The most frequently studied outcome up to now has been spontaneous abortion, and delay in conception through time to pregnancy. The presentation will summarize the data of a few of the more recent studies on the possible association between occupational pesticide exposure of women and spontaneous abortion, LBW/SGA and selected birth defects of the newborn.

Greenhouse workers have repeatedly been shown to be more likely to suffer adverse reproductive effects, probably because of their exposure to pesticides is higher and more continuous. Reduction in fecundability was observed among greenhouse workers in Denmark, Finland and increased risk of fetal loss in Italy. There is sufficient evidence therefore that handling of pesticides by female workers might have negative effects on their reproductive health.

Additional evidence comes from studies of non occupational settings, where the population has been exposed to pesticides (ex. following residential treatment) or in ecological studies of large agricultural areas. In a study in Ontario for example, an excess in spontaneous abortion in the exposed population was associated specifically with the use of phenoxy herbicides. Two studies, where exposure was measured through biological monitoring of the metabolite (DDE) of one pesticide (DDT), found an association between maternal serum concentration of DDE and preterm and SGA babies, and the other found an association of serum levels of DDT with spontaneous abortion. Recent studies of dietary exposures to pesticides also provide useful evidence in this regard. The evidence on the possible link between maternal exposure to pesticides during pregnancy and the risk of these birth defects, is suggestive but not conclusive

Discussion and conclusions: Several of the more recent studies, (all conducted in western countries) find no significant association of occupational exposure to pesticides and negative pregnancy outcome, attributing this to efficient preventive measures. This positive result is unlikely to apply to the less developed countries

RISK REDUCTION

Mo-O-69 THE IMPACT OF SAFETY REPRESENTATIVES ON OCCUPATIONAL HEALTH: A EUROPEAN PERSPECTIVE (THE EPSARE PROJECT)

*Menéndez Fuster MP, Benach J, Vogel L.

Background and aims: Occupational health practice and interventions are deeply influenced by the values, political ideologies, and conflict of interests between management, government, unions and workers. The participation of workers is a key “protective” factor to effectively address occupational health hazards and problems. In the European Union (EU-27), the main approach to promote workers’

participation on occupational health takes place through the election of Health and Safety Representatives (HSR), ie., workers with the specific mandate to represent the workers' interest on occupational health issues. The EPSARE project ("The Impact of Safety Representatives on Occupational Health") has reviewed the conditions and factors that influence the effectiveness of HSR, and its potential impact at the EU level.

Methods: An extensive bibliographic review using a large range of sources of information including a comprehensive systematic review, epidemiological analyses from available surveys, and information from specific key informants. We also used a scientific "realist" perspective developing a theoretical model which includes macro social and political conditions, general conditions within firms, and the strategies and activities of HSR.

Results: Main conditions and factors related with the effectiveness of HSR include: (1) at the macro level, the distribution of power between management and labour determining the implementation of social policies and labour market regulations; (2) within firms, the union's ideological and political position on occupational health strategies and actions, the commitment of employers on health and safety, and the policies, programs and regulations from governments on occupational health; (3) the structure, organisation, and competences of HSR, including coverage, resources and support; (4) the empowerment and influence of HSR; and (5) the activities related to workers' health and safety protection and prevention.

Discussion and conclusions: HSR can lead to several health benefits to workers improving occupational health. Some of the main challenges include: (1) to implement a research agenda that show the hidden social dimensions behind most occupational health problems; (2) to develop activities in which collective bargaining incorporates the experiences of workers and HSR, with strategies to attend the most vulnerable workers; and (3) to increase the enforcement of legislations developing efficient instruments to apply regulations.

Mo-O-70 POSITIVE EFFECTS OF AN ON-SITE MULTIDISCIPLINARY APPROACH TO INJURY MANAGEMENT

*Guest M, Boggess MM, Deon V.

Background and aims: The social and financial costs of workplace injuries remain problematic. Multiple interventions were introduced at an Australian workplace to improve the outcome of workplace injuries.

This longitudinal study aims to determine the effectiveness of a revised injury management system.

Methods: The study population were all employees at the workplace from 1/012005 to 30/5/2007. The injury management interventions were introduced in 3/2006. The interventions were active participation in rehabilitation procedures, improved communication system, identification and management of psychosocial background, and focussed education of the workforce in occupational health and safety matters. Data including injuries, clinic visits, medical treatments, lost time hours and restricted duty hours are recorded daily into a database maintained by the workplace health service. These were extracted from the database for each department and for each month for the duration of the study. Linear regression modelling was used to determine the effectiveness of the interventions. Outcomes compared were the number of injuries, number of persons on restricted duties and lost time hours per month. Confounding variables examined were department, production and overtime hours worked.

Results: Three production departments were studied. The results show that the intervention was effective in significantly reducing the number of injuries in the potrooms (from 14 to 6/month). Restricted duties were reduced in all departments (potrooms: from 12 to 7 persons/month, cast house: 3 to 1 persons /month, carbon plant: 3 to 1 persons /month). Lost time injury hours were significantly reduced in the potrooms (from 244 to 61 hours/month).

Discussion and conclusions: This study has demonstrated the positive outcomes of a multidisciplinary approach to injury management. Injured employees took responsibility for their injuries and became active participants in their own rehabilitation. Active participation in exercise therapy was more beneficial than passive approaches. The immediate electronic communications system gave the injured employees a sense of control over their return-to-work pathway. The identification and management of any psychosocial issues was a part of the rehabilitation procedures. Finally, the regular newsletters conveyed current occupational health and safety issues and provided employees insight and acceptance of evidence based medical and rehabilitation modalities.

Mo-O-71 A LEARNING-BASED INTERVENTION STUDY OF SAFETY CULTURE AND WORK INJURIES AMONG APPRENTICES IN THE BUILDING INDUSTRY

*Rasmussen K, Grytnes R, Nielsen K.

Background and aims: Studies from many Western countries demonstrate that young workers in the age group 15-24 years have an approximate double risk of work injuries than the work force as a whole. This also applies in Denmark, where the overall injury rate has been stable during the last 20 years. Despite technological improvements and introducing a lot of new measures, there has even been a 15% increase in work injuries over the last 4 years, highest among young workers. The building and construction industry is a high risk trade. The aim of this study was to investigate the effect of a practice near safety education among apprentices in the building industry.

Methods: The study group included 480 apprentices under education as bricklayers, carpenters and plumbers from 2 technical schools - 240 in the intervention group and 240 served as a control group. The intervention was a new educational module and a training course for technical school teachers focusing on dialog and process learning, followed by coaching of the teachers. The study period of 3 ½ years involved before-after measurements (T1 and T2), comparison with the control group, and 1 ½-year measurements of long term effect (T3). Outcome measures are mainly based on questionnaire responses on safety climate/culture and self-reported accident rates.

Results: During the first half year with practise-based education between 73% and 92% of respondents experienced an occupational accident. A set of items estimating risk-taking attitude found this attitude as dominating character trait in between 23% and 32 %. Safety prioritising was illustrated by questions on bending of safety rules, which was frequent, occurring among 45-50% of this population. Knowledge of safety rules was measured by 10 items, and the mean of correct answers increased significantly from 4.5 to 5.6 from before to after the first half year of the school period (T1 – T2).

Discussion and conclusions: Work accidents occur frequently and a risk-taking culture is prevalent among apprentices in the building trades. Safety knowledge was improved during the traditional training. Intervention is ongoing while long-term follow-up after (T3) will be performed after 1 ½ years.

Mo-O-72 USING EXISTING DATA FOR OCCUPATIONAL HEALTH RESEARCH IN CANADA

*Koehoorn M, McLeod CB, Tamburic L, Demers PA.

Background and aims: In this electronic age, many large datasets have been collected for purposes other than (occupational) research, such as administrative billing records and national health surveys. We developed an innovative partnership between policy-makers and researchers to maximize the use of these data for occupational health surveillance in the province of British Columbia (BC), Canada. This presentation will highlight examples for work-related asthma, cancer, and injury.

Methods: For asthma surveillance, workers' compensation claims were linked with hospitalizations and physician visits at the individual-level to identify diagnosed asthma symptoms among the BC workforce in 2001. Individuals with asthma symptoms attributable to work (PAR=15%) were compared to those with compensated asthma claims to estimate the prevalence of under-recognized work-related asthma. For mesothelioma surveillance, cases in the provincial cancer registry were linked with cases in the workers' compensation records to investigate trends in incidence and compensation rates from 1970-2005. For injury surveillance, rates of self-reported work injury in the past year were calculated using the Canadian Community Health Surveys (2000, 2003, 2006) and compared over time by age, gender and province.

Results: For asthma surveillance, 8,891 individuals were identified with active asthma attributable to work in 2001, of which 103 (1.2%) had a workers' compensation claim. For cancer surveillance, mesothelioma cases increased over the follow-up period from 10 cases/year in the 1970s to 65 cases/year in the 2000s, a trend that has yet to plateau. The overall compensation rate was 33%. For injury surveillance, the work injury rate declined in Canada with the exception of two provincial jurisdictions. In BC, the adjusted injury rate increased from 5.6 injuries/100 workers in 2003 to 6.3 injuries in 2006. This increase was pronounced among young males.

Discussion and conclusions: The partnership's research is designed to optimize the linkage of data for occupational surveillance and to help develop evidence-based policies and programs. Findings to date have helped to a) inform a decision to include work-aggravated asthma as a compensable illness in BC, b) implement a campaign to increase awareness of mesothelioma as an occupational disease among physicians, and c) develop a research agenda to investigate increases in the BC injury rate.

Mo-O-73 THE US ENVIRONMENTAL PROTECTION AGENCY'S PESTICIDE WORKER PROTECTION PROGRAM: IMPLEMENTATION OF THE WORKER PROTECTION STANDARD AND NATIONAL STRATEGIES FOR HEALTH CARE PROVIDERS: PESTICIDES INITIATIVE

*Evans EE.

Background and aims: It is well documented that pesticide poisonings are widely misdiagnosed and underreported. Several factors contribute to this situation, such as: barriers to health care access for some subpopulations; difficulties with making an accurate diagnosis due to symptoms that may mimic more

common and non-pesticide-related clinical conditions, and, health care provider failure to report a suspect pesticide poisoning to their local or state agency. The lack of familiarity with pesticide poisonings among health care providers can be partly explained by the minimal training on occupational and environmental medicine found in the school curricula of many physicians, nurses, and other health care providers. To address this problem, EPA, in conjunction with other federal agencies and organizations, leads the National Strategies for Health Care Providers: Pesticides Initiative which is aimed at increasing awareness among health care professionals on how to identify and treat pesticide poisonings.

Methods: EPA is working through three cooperative agreements to implement the Initiative objectives and create institutional change through education, professional training, and the development of new resources and tools on pesticide-related health conditions.

Results: By implementing the objectives from the National Strategies for Health Care Providers: Pesticides Initiative, EPA is responding to the resolutions from the American Medical Association and the Institute of Medicine urging congress and the federal government to support improved strategies for health care provider training on environmental health issues, including the prevention of pesticide exposure risks.

Discussion and conclusions: An update on the status and progress of the National Strategies for Health Care Providers: Pesticides Initiative will be presented. This will include an overview of related grant activity, including: 1) Pacific Northwest Agricultural Safety and Health Center project to insert training on treatment of pesticide poisonings into the medical and nursing school curricula at the University of Washington; 2) Migrant Clinician's Network project to train practicing clinicians to recognize and respond to pesticide poisonings; 3) the development of the 6th edition of the Recognition and Management of Pesticide Poisonings manual. Additionally, an overview of the Worker Protection Standard (40 CFR 170), and the proposed protective revisions to this regulation, will be provided.

Mo-O-74 ETHICS IN OCCUPATIONAL HEALTH PROFESSIONAL PRACTICE: FROM THEORY TO PRACTICE IN SELECTED LATIN AMERICAN COUNTRIES

*Rodríguez-Guzmán J.

Background and aims: The occurrence of social security reforms, the reinforcement of free trade agreements, and the opening of free markets caused many changes in the working world in most countries of Latin America. Occupational Health (OH) professionals have needed to adapt to all these changes, and at the same time, interact with different groups of interested parties. Governmental agencies, employers and their associations, workers and their organizations, workers' compensation and healthcare insurances, clinical care providers, and scientific organizations, within others, are some of the interested parties interacting. Prevention, screening, diagnosis and treatment of occupational injuries and diseases have become a core issue where all of these stakeholders have interest, for either protecting and improving workers' health, or compensating the injured or ill worker.

Methods: OH professionals must maintain fair and objective judgment to provide the services and the benefits required by the workers. Country Survey held in 2006 demonstrated that they many times confront or contain some forces implicated in the legitimate act of defining the occupational origin of the accident, the disease or the death of a worker. Ethical dilemmas arise when conflicts of interest put pressure on their decisions, making it very difficult to be solved. Perverse incentive policies were detected in healthcare organizations for accelerating or denying the compensation processes running under the responsibility of the OH professionals.

Results: Laws and regulations on medical ethics either do not exist or have not yet been updated to solve this type of dilemma. Most countries of the region use ICOH's code of ethics as a guideline for solving these conflicts of interest. Yet, many cases are invisible to the law, finally being unfavorable for the worker. Countries like Argentina and Colombia have managed to move forward facing these challenges trying to overcome many limitations.

Discussion and conclusions: Strict professional commitment and practice should be enforced with strong ethical and deontological practices. Further follow up should be done, to avoid corruption and other unethical practices. Law reinforcement, regulation, standardization and quality assurance for providing OH and healthcare service are a good opportunity to improve ethics in OH practice.

Poster Exhibition

CANCER 1

Mo-P-1 CANCER INCIDENCE IN A PETROCHEMICAL INDUSTRY AREA

*Axelsson G, Barregård L, Sällsten G, Holmberg E.

Background and aims: There are relatively few studies on the occurrence of cancer close to petrochemical industries. Increased incidence of cancer in liver and lung as well as increased cancer mortality has been reported. Also leukaemia and lymphoma have been found to be increased close to such industries. Brain tumours have been reported to be more common among employees in the petrochemical industry. In Sweden, a large part of the petrochemical industry is mainly located in a community with 12000 inhabitants on the West coast. The industrial complex includes a large cracker producing ethylene, and in other plants polyethylene, PVC, amines, surfactants and oxo-alcohols are produced. Ambient air is polluted with established or suspected carcinogens, like ethylene, benzene, 1,3-butadiene, propene, ethylene oxide and vinyl chloride. The aim of this study was to compare the number of cases of leukaemia, lymphoma, liver, brain and lung cancer as well as the total number of cases in this community in 1974-2005 with the expected number, and in particular the number of cases of lymphoma and leukaemia in the area with highest exposure to ethylene.

Methods: The incident number of cases of cancer was collected for each year in 1974-2005 from the regional cancer registry. Expected numbers of cases were based on age- and sex-specific incidence rates in the reference area. Historical emission data were used for a retrospective exposure assessment of ethylene to make a more detailed classification within the community.

Results: The total number of cancer cases in the community was 1208 compared to 1181.4 expected, SIR=1.02 (0.97-1.08). The incidence of leukaemia, lymphoma and brain cancer was close to expected (SIR=0.82, 0.91 and 0.98), while 14 cases of liver cancer had occurred compared to 9.3 expected. Leukaemia and lymphoma was not more common in the highest exposed area. Lung cancer was more common in this community than in the reference area; SIR=1.37 (1.10-1.69)

Discussion and conclusions: There is no support for the hypothesis that exposure to emissions from petrochemical industries has increased the cancer risk in general or the risk for leukaemia or lymphoma. The increase in lung cancer should be analysed at an individual level to assess possible causes.

Mo-P-2 PRELIMINARY ANALYSIS ON CANCER MORTALITY IN WORKERS EXPOSED TO CHLORINATED HYDROCARBONS IN KOREA

*Ahn Y, Lee K.

Background and aims: Chlorinated hydrocarbons are commonly used as solvents and contain many kinds of solvents. According to the kinds of solvent, carcinogenicity is different and still controvertible except Group 1 or 2A carcinogens by IARC. Thus the cancer mortality of workers exposed to chlorinated hydrocarbons is described for the first time in Korea.

Methods: Medical surveillance for exposure to occupational hazards (168 chemicals and 8 physical agents) has been conducted for Korean workers since 1972 and the data have been electronically constructed from 2000. Using these electronic data, cancer mortality from 2000 to 2006 was analyzed in cohort contained 31,800 chlorinated hydrocarbon (10 kinds of chlorinated hydrocarbons-1,2-dichloroethane, 1,2-dichloroethylene, carbon tetrachloride, 1,1,2,2-tetrachloroethane, chloroform, trichloroethylene, 1,1,1-trichloroethane, dichloromethane, tetrachloroethylene, and 1,1,2-trichloroethane) exposed male workers and 238,821 non-exposed. Non-exposed workers were selected among just exposed to noise in this cohort. Standardized Mortality Ratios (SMR) and Standardized Rate Ratios (SRR) were estimated by Poisson regression methods.

Results: The 182 deaths observed during 7 years of followup represented a large healthy worker effect (HWE) for all causes (SMR=0.51, 95%CI=0.44-0.59) and for all-cancer (SMR=0.62, 95%CI=0.47-0.81). Almost all kinds of cancer mortality (stomach ca SMR=0.51, 95%CI=0.22-1.01; liver ca SMR=0.63, 95%CI=0.36-1.03; lung ca SMR=0.70, 95%CI=0.32-1.34; brain ca SMR=0.44, 95%CI=0.01-2.45; non-Hodgkins lymphoma SMR=0.49, 95%CI=0.01-2.70) except leukemia were non-significantly low compared to the Korean general population. Just leukemia in chlorinated hydrocarbon exposed workers was non-significantly higher than that of Korean general population (SMR=1.49, 95%CI=0.48-3.49). Compared to noise-exposed workers, chlorinated hydrocarbons workers displayed significant decreased all-cancer mortality (SRR=0.70, 95%CI=0.60-0.82) and non-significant decreased almost all kinds of cancer mortality except leukemia (SRR=1.85, 95%CI=0.71-4.85).

Discussion and conclusions: This chlorinated hydrocarbon worker cohort with short follow-up periods exhibits a strong HWE. Leukemia appeared to be elevated but causal interpretation is constrained by limited statistical power due to small numbers of deaths. Liver cancer known to be carcinogenic in workers exposed to some kinds of chlorinated hydrocarbons was not elevated comparing to Korean general population and noise-exposed workers. More detailed investigation of confounding variables and future follow-up of this cohort will better define health risks in chlorinated hydrocarbon-exposed workers.

Mo-P-3 THE IARC MONOGRAPHS PROGRAMME: SOME INDUSTRIAL AND COSMETIC DYES AND RELATED EXPOSURES

*Secretan B, Baan R, Straif K, Grosse Y, El Ghissassi F, Bouvard V, Tallaa L, Coglianò VJ.

Background and aims: In February 2008, a Working Group invited by IARC will re-evaluate the carcinogenicity of some industrial and cosmetic dyes and related exposures. These evaluations will be published in Volume 99 of the IARC Monographs. Production of auramine, technical-grade auramine, benzidine, benzidine-based dyes and the aromatic amines 4-aminobiphenyl and 2-naphthylamine were amongst the first agents being reviewed by IARC, in 1972 and 1974 (Vol. 1 and 4), and were last updated in 1987 (Supplement 7). Production of magenta, magenta containing CI Basic Red 9, the aromatic amine 4,4'-methylenebis(2-chloroaniline) (MOCA), occupational exposure as a hairdresser or barber, and personal use of hair colourants were all last evaluated in Volume 57; the evaluations of the aromatic amines ortho-toluidine and 4-chloro-ortho-toluidine date from 2000 (Volume 77).

Methods: Putting aside those agents defined as occupational or personal exposures (production of magenta, production of auramine, occupational exposure as a hairdresser or barber, and personal use of hair colourants), all agents under review are established carcinogens in experimental animals. Additional evidence will therefore be sought from either epidemiological or mechanistic data to: identify the causal agents involved (production of magenta and of auramine), up-date the body of epidemiological data (hairdresser or barber, personal use of hair colourants, some aromatic amines), or elucidate the mechanisms of carcinogenicity, which may be used to place an agent in a category of higher concern on mechanistic grounds (auramine, benzidine-based dyes, magenta and the aromatic amines).

Results: Summary findings and evaluations for these Monographs, in particular, the Working Group's reasoning in making the final evaluations, will be presented.

Discussion and conclusions: The IARC Monographs have been published continuously since 1971. Volume 100 will review all human carcinogens identified to date (IARC Group-1 agents). The volume will contain approximately 100 agents, grouped under 6 major topics, two of which include occupational exposures (particles, fibres and metals; and chemicals and related exposures). More details on the planning of the meetings involving occupational carcinogens will be presented. As a further development on the data summarised, two related scientific publications will be developed: 1) Tumour-site concordance between humans and experimental animals; 2) Mechanisms involved in human carcinogenesis.

Mo-P-4 OCCUPATIONAL EXPOSURE TO WOOD DUST AND RISK OF SINONASAL CARCINOMA AND – A FINNISH CASE-CONTROL STUDY

*Heikkilä P, Cyr D, Wolff H, Heikkilä E, Husgafvel-Pursiainen K, Luce D, Pukkala E.

Background and aims: Epidemiologic studies suggest that exposure to wood dust at work increases the risk of sinonasal cancer (SNC), adenocarcinoma in particular. In Finland, wood used is mainly soft wood, spruce and pine. We investigated the association between sinonasal cancer and wood dust exposure in Finland.

Methods: The 167 cases included in the analysis were patients with incident histologically confirmed SNC diagnosed between 1989-2000, identified from the Finnish Cancer Registry. Five controls (matched by age and sex) for each adenocarcinoma case and three for other type of cancer cases were selected from the Finnish Population Register. The Finnish Centre for Pensions provided the names of the employers and working periods since 1963 for the cases and controls. Information on occupation in 1970, 1975, 1980, 1985, and 1990 was received from the Finnish Population Census. Occupational exposure to wood dust and to other substances was assessed for the whole work history by an industrial hygienist. Probability of occupational exposure was categorised as possible, probable or definite. Odds-ratios and 95% confidence intervals were estimated by conditional logistic regression.

Results: Preliminary results show that exposure to medium to high levels of wood dust is significantly (OR 4.5, 95% CI 1.4-14.6) associated with the risk of nasal adenocarcinoma. All cases and controls exposed to wood dust had been exposed to softwood. The increase in risk of adenocarcinoma was slightly stronger for hardwood (OR 6.7, 95% CI 1.7-27.0) or composite wood (OR 8.5, 95% CI 2.1-34.4). However, the three types of wood exposure were highly correlated. Other histological types, in particular squamous cell carcinoma, were not found to be associated with exposure to wood dust

Discussion and conclusions: We found an increased risk of adenocarcinoma among workers exposed to medium to high level of wood dust. Ongoing analyses, distinguishing different species of wood, may help clarify these results.

Mo-P-5 OCCUPATIONAL RISK FACTORS FOR PROSTATE CANCER

*Fritschi L, Girschik J, Glass D, Leavy J, Ambrosini G, Tabrizi J.

Background and aims: There are few identified risk factors for prostate cancer, and little is known about occupational risk factors for this disease.

Methods: We undertook a population based case-control study in Western Australia. Subjects were 606 males with a diagnosis of prostate cancer and 471 male controls randomly selected from the electoral roll. Occupational histories were collected from all subjects, and further information on selected jobs was obtained from a computer-assisted telephone interview. An expert reviewed all data to assess exposure to pesticides, fertilizers, metals, wood dust, oils, diesel exhaust and polyaromatic hydrocarbons. Multivariate logistic regression was used to compare occupations and exposures between cases and controls.

Results: With regard to occupations, miners were found to be at significantly decreased risk of developing prostate cancer. No statistically significant relationships were found between the occupations of fire fighter, farmer, railway worker and electrical power worker, and risk of prostate cancer. An increased prostate cancer risk was observed in men reporting they had been deployed with the military in Vietnam although this was not statistically significant (OR = 2.16; 95% CI = 0.91-5.14). With regard to specific chemicals, non-significant excess risks were observed for prostate cancer following exposure to oils other than mineral oil (OR= 1.54, 95% CI: 0.95, 2.51) and for exposure to toxic metals at a non-substantial level (OR= 1.25, 95% CI: 0.96, 1.61). A non-statistically significant protective effect for prostate cancer was seen for exposure to organophosphate pesticides (OR= 0.69, 95% CI: 0.43, 1.12). No dose-response relationships were seen.

Discussion and conclusions: The results of this study suggest that occupational factors are not major contributors to the risk of prostate cancer. The protective effect of mining has been seen in previous studies but it is difficult to imagine a causal mechanism.

Mo-P-6 OCCUPATIONAL EXPOSURE TO POLYCHLORINATED BIPHENYLS AND RISK OF BREAST CANCER

*Whelan EA, Silver SR, Deddens JA, Steenland K, Nilsen N, Waters MA, Prince M, Ruder A, Yong LC, Hein MJ, Ward EM.

Background and aims: Despite the endocrine system activity exhibited by polychlorinated biphenyls (PCBs), recent studies have shown little association between PCB exposure and breast cancer mortality. To evaluate the relation between PCB exposure and breast cancer incidence, a more sensitive endpoint than mortality, we studied women exposed to PCBs while employed in capacitor manufacturing facilities.

Methods: We followed 5,754 women employed at least a year in three facilities in the United States, identifying cases via questionnaire, cancer registries, and death certificates through 1998. We collected lifestyle and reproductive information via questionnaire from participants or next of kin and used semi-quantitative job exposure matrices (JEMs) for inhalation and dermal exposures combined. We generated standardized incidence ratios (SIRs) and standardized rate ratios (SRRs) and used Cox proportional hazards regression models to evaluate potential confounders and effect modifiers.

Results: Overall, the breast cancer SIR was 0.81 (95% CI 0.72, 0.92, n=257) and regression modeling showed little effect of duration or cumulative exposure. However, for the 362 women of questionnaire-identified races other than white, we observed positive, significant responses for duration and cumulative exposure; only smoking, birth cohort, and self or proxy questionnaire completion had significant explanatory power when added to models with exposure metrics.

Discussion and conclusions: Overall, we found no elevation in breast cancer risk following occupational exposure to PCBs, but observed significant exposure-related risk elevations among non-white workers. The small number of cases (twelve) limits interpretation, but the finding warrants additional investigation, as the usual reproductive risk factors accounted for little of the increased risk.

Mo-P-7 OCCUPATION AND RISK OF RENAL CELL CANCER IN CENTRAL AND EASTERN EUROPE

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Background and aims: Central and Eastern Europe is a region with a high incidence of renal cell cancer. Few studies have been conducted in these areas on the possible role of occupational exposures in this cancer.

Methods: From 1999-2003, we conducted a hospital-based case-control study in seven areas of the Czech Republic, Poland, Romania and Russia. A detailed occupational history was collected from cases and controls, together with information on potential confounders (tobacco smoking, body mass index, and hypertension). Odds ratios (OR) of renal cell cancer were calculated by comparing ever- vs. never-employment in selected jobs and industries, with follow-up analyses examining duration of employment.

Results: A total of 876 cancer cases and 1,469 controls were included in the analysis. An increased risk of renal cell cancer was observed for workers in agricultural labor and animal husbandry (OR=1.57, 95% CI 1.00, 2.48), with greater risks seen with longer employment (>10 years). Elevated estimates, based on a small number of cases, were also seen for employment in firefighting, petroleum refining, and work as a launderer or dry cleaner. Increases were also seen with employment as an electrical engineer (OR=2.01, 95% CI 1.24, 3.28), although no pattern by duration of employment was seen.

Discussion and conclusions: This study suggests that occupation does not play a major role in renal cell carcinogenesis in Central and Eastern Europe. The excess risk among electrical engineers is possibly due to chance or bias.

Mo-P-8 NOCCA - THE NORDIC OCCUPATIONAL CANCER STUDY, FIRST PHASE

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Background and aims: The aim of the study was to investigate cancer risk by occupation in the Nordic countries. The large size of the study enables a specific focus on risk in occupations where a small number of individuals are employed, among women, and of rare cancers.

Methods: Individual census information on occupation on 15 million inhabitants of the Nordic countries aged 30 to 65 was collected in 1960, 1970, 1980 and/or 1990. Follow-up was obtained through linkages with national death and cancer registries through 2002-2005; 2.8 million incident cancer cases were identified. Occupational information was categorized into 53 occupational groups and one group of economically inactive persons. Cancer data were grouped into 48 main cancer sites and 27 histological or anatomical subgroups. The observed number of cancer cases in each group defined by country, gender, age, and period, was compared with the expected number calculated for a similarly defined group experiencing the incidence rates of the national populations. Results are presented as standardized incidence ratios (SIRs), defined as the ratio of the observed to the expected number, and 95% confidence intervals.

Results: Among men, a wide variation in risk was observed, from waiters (SIR 1.48) to farmers (SIR 0.85). Among women, SIRs varied between 1.27 in tobacco workers and 0.83 in gardeners. Farmers, gardeners, and teachers were groups showing low-risk profiles for most cancer sites in both genders. Established occupational risk factors were confirmed, such as risk of mesothelioma (due to asbestos exposure) among plumbers, seamen, mechanics, electrical workers, smelting workers, and others, and risk of nasal cancer among wood workers (due to exposure to wood dust). Gradients in risk according to socioeconomic status (SES) were observed, with higher risk for breast cancer in high SES groups and of stomach cancer in lower SES groups.

Discussion and conclusions: Cancer risk varies with occupation and socioeconomic status in the Nordic countries. Specific results will be presented and discussed. Linkage with a Nordic job-exposure matrix with the study database will allow investigation of specific etiological hypotheses. The study group calls for international research collaboration in this large and unique data set.

EXPOSURE ASSESSMENT

Mo-P-9 DETERMINANTS OF WOOD DUST EXPOSURE IN THE DANISH FURNITURE INDUSTRY

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Background and aims: The aim was to investigate determinants of wood dust exposure and trends in dust level in the furniture industry of Viborg County, Denmark, using data from two cross sectional studies six years apart.

Methods: During the winter 1997/98, 54 factories were visited (hereafter study 1). In the winter 2003/2004, 27 factories were revisited, and personal dust measurements were repeated. In addition 14 new factories were included (hereafter study 2).

A total of 2303 woodworkers participated in study 1, and 2358 measurements from 1702 workers were available. From study 2, 1581 woodworkers participated and 1355 measurements from 1044 workers were available. Information on occupational variables describing potential determinants of exposures like work task, exhaust ventilation, enclosure and cleaning procedures were collected. A total of 2627 measurements and 1907 persons were included in the final mixed model in order to explore determinants of exposure and trends in dust level.

Results: The overall inhalable wood dust concentration (GM (GSD)) has decreased from 0.95 mg/m³ (2.05) in study 1 to 0.60 mg/m³ (1.63) in study 2, representing a 7% annual decrease in dust concentration, which was confirmed in the mixed model. From study 1 to study 2 there has been a change

towards less manual work and more efficient cleaning methods, but on the contrary also more inadequate exhaust ventilation systems.

The following determinants were found to increase dust concentration: sanding; use of compressed air; use of full-automatic machines; manual work; cleaning of work pieces with compressed air; kitchen producing factories; and small factories (< 20 employees). The following determinants of exposure were found to decrease dust concentration: manual assembling/packing; sanding with adequate exhaust ventilation; adequate exhaust ventilation; vacuum cleaning of machines; and special cleaning staff.

Discussion and conclusions: Despite a substantial drop in the dust concentration during the last six years in the furniture industry in Viborg County, further improvements are possible. There should be more focus on improved exhaust ventilation, professional cleaning methods, and avoiding use of compressed air.

Mo-P-10 OBTAINING JOB HISTORIES ON LINE

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Background and aims: With increased access to the internet by the general population internationally, there is increasing interest in using the web to collect epidemiological information, including occupational information.

Methods: We undertook a small pilot survey to investigate use of the internet to collect job histories. The sample were parents of children with a genetic condition (Rett syndrome) who had previously registered with a web site on this condition. 180 families were invited to participate and 137 people agreed. They were asked to complete an on line form on OccIDEAS which is a web-based application which manages all aspects of the Expert Assessment Process for assessing occupational exposures in retrospective community-based studies (www.occideas.com). They were asked to provide details of all the jobs they had held during their lifetime. Of the 125 who completed the form, 37 completed an additional feedback questionnaire.

Results: The experience of these subjects was primarily positive. Most had no difficulties with completing the form, accessing the internet, the layout of the questionnaire, or the instructions for the form. Most found that completing the form was not too time consuming, with 15 taking less than 15 minutes to complete the form, and a further 16 taking between 15 and 30 minutes. They believed their memory for the job details we asked them was "very accurate" (22 subjects) or "mostly accurate" (15 subjects). Descriptions of the tasks within jobs tended to be more extensive than we have obtained in a similar written questionnaire.

Discussion and conclusions: This small sample found that job histories can be obtained via the web. The sample consisted of people who were already using the internet and these results may not be generalizable to people who are less familiar with web-based tools.

Mo-P-11 EXPOSICIÓN OCUPACIONAL A POLVO DE MADERA EN PEQUEÑOS TALLERES DE SARCHÍ, COSTA RICA

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Background and aims: El polvo de madera fue declarado cancerígeno por IARC desde. Adenocarcinoma nasal ha sido relacionado con exposición ocupacional a maderas duras. Cáncer sinonasal y nasofaríngeo ha sido relacionado con exposición ocupacional a maderas suaves. La exposición a polvo de madera se relaciona con enfermedades crónicas pulmonares obstructivas. Efectos irritantes en piel y vías respiratorias están bien documentados en la literatura. Costa Rica no tiene evaluaciones para conocer la situación a que se exponen trabajadores en transformación de madera. El estudio tuvo como objetivos: a) Caracterizar compañías, tipos de madera usados, controles ingenieriles y no ingenieriles de exposición y usos secundarios del polvo de madera. b) Investigar sobre posibles determinantes de exposición ocupacional a polvo de madera, c) Identificar políticas de control a nivel nacional y regional para pequeñas compañías

Methods: Se aplicaron Encuestas higiénicas en las empresas participantes que incluyeron entrevistas a patronos y trabajadores. Se realizaron Muestras ambientales (NIOSH 0500 y 0600) con bombas de alto caudal y filtros de celulosa. Los datos obtenidos fueron analizados en el software SPSS para el cálculo de estimadores de tendencia central y dispersión de las concentraciones ambientales.

Results: Las empresas cuentan con un promedio de 5 trabajadores y se agrupan en dos actividades económicas (muebles y artesanías). Para controlar la exposición a polvo pocas utilizan controles de ingeniería sin contar con diseños planificados profesionalmente. El equipo de protección personal no es utilizado ni existen procedimientos de trabajo que privilegien la prevención de la exposición. Hay prácticas laborales y extralaborales que aumentan la exposición. Se encontraron concentraciones ambientales con valores de tendencia central cercanos a 15 mg/m³.

Discussion and conclusions: Las condiciones de exposición de los trabajadores parecen ser diferentes a la referida para grupos similares en otros países.

Las acciones que se promuevan para disminuir la exposición a este agente deben contemplar las condiciones económicas de las empresas.

Las concentraciones ambientales evaluadas presentan una situación preocupante que requiere intervenciones inmediatas.

Las personas que laboran en las empresas desconocen el potencial cancerígeno del agente, aunque conocen muy bien otros efectos sobre la salud asociados.

Algunas empresas han desarrollado medios ingeniosos y de bajo costo para el control de exposición.

Mo-P-12 EXPOSURE MISCLASSIFICATION ARISING FROM THE APPLICATION OF A GENERAL POPULATION JOB-EXPOSURE MATRIX IN A MATCHED CASE-CONTROL STUDY: BAYESIAN ADJUSTMENT WHEN POSITIVE EXPOSURE-RESPONSE ASSOCIATION IS SUSPECTED

Liu J, Gustafson P, Cherry NM, *Burstyn I.

Background and aims: It is common to assess occupational exposure in a community-based case-control study using a job exposure matrix (JEM) that relates an occupational classification to binary exposure estimates, typically with some uncertainty. Here we consider an instance of an asthma-specific JEM applied in a 1:1 matched case-control study of new onset adult asthma. This JEM was designed to have specificity (SP<1) that is higher than sensitivity (SN<1). Our aim was to develop a Bayesian method to correct odds ratios (OR) resulting from the naïve analysis for suspected non-differential exposure misclassification (without validation data) and to explicitly acknowledge in the analysis that agents of interest are suspected to cause asthma with varying degrees of certainty.

Methods: The exposure model is in logistic form. We do not make distributional assumptions about the variation between matched pairs. Given conditional independence within a pair, we can rewrite the OR in terms of true probabilities of all four possible exposure patterns for a matched pair (thetas). To determine the posterior distribution of OR, we elicit from “experts” guesses about distributions of SN, SP, true OR, prevalence of exposure in general population (r_0), and the within pair correlation in exposure due to matching (ρ). This information allows us to set up the hyper-parameters in priors: Beta distributions for SN and SP, Dirichlet distribution for thetas.

Results: Initial results suggest that with defensible and weakly informative guesses the adjusted OR is further away from the null than the naïve OR. Thus, for animal antigens the following guesses of SN: mode (m)=0.7, 90% confidence interval (CI): 0.5,1; SP: m=0.9, 90%CI: 0.7,1; OR: mean=2.29, 95%CI: 1.26,4.18; r_0 : 90%CI: 0.05,0.2; ρ : 90%CI: 0,0.5 resulted in adjusted OR of 1.20, 95% credible interval (CrI): 0.63, 2.74, while the naïve OR was 0.99, 95%CrI: 0.76, 1.27.

Discussion and conclusions: The method we propose holds considerable promise because it explicitly corrects for imperfections in exposure assessment by JEM while emphasizing the strength of the JEM that exposures suspected of causing the disease of interest.

Mo-P-13 RELIABILITY OF THE DETERMINANTS OF DERMAL EXPOSURE RANKING METHOD (DERM)

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Background and aims: The method DERM consists of an algorithm to rate determinants of dermal exposure to pesticides and was proposed as an alternative for pesticide exposure assessment in subsistence farmers. According to this algorithm each determinant has to be assessed by two factors, the type of Transport process (T), and the Area of body surface exposed (A). In addition, the type of clothing worn during applications is included as a protection factor.

Methods: Two groups of five Industrial Hygienists, which have different years' experience (1 year or less of experience, and 6 or more), were asked to apply DERM to 5 videotapes of real pesticide applications. Hygienists attended a 2 hours course on dermal exposure methods and DERM. The course included an hour practice assessing videotaped pesticide applications. The Inter-rater Correlation Coefficient was calculated for the entire group and within groups. The agreement in the assessment of the factors T and A for each determinant was also evaluated.

Results: DERM scores on farmers range from 9.9 to 40.7, with a median of 20.9. The ICC of the DERM scores for the 10 raters was 0.67 [95% Confidence Interval (CI) = 0.37-0.95]. However, the ICC got better when hygienists are grouped by years of experience [≤ 1 year: 0.94 (CI) = 0.81-0.99; ≥ 6 years: 0.82 (CI)=0.54-0.98]. The agreement for T and A factor assessments were excellent, though when the determinant affected different body parts at the same time, the agreement for A factor was low.

Discussions and conclusions: The DERM approach has a good inter-rater agreement and high between rater consistency. Reliability is a necessary part of the validity process, though not sufficient. Thus the validity of DERM should be assessed.

Mo-P-14 NICAREX – UNA MATRIZ DE EXPOSICIÓN OCUPACIONAL A SUSTANCIAS CANCERIGENAS EN NICARAGUA.

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Background and aims: CAREX es un sistema de información internacional utilizado para estimar exposición a 139 sustancias cancerígenas, en relación a 55 actividades económicas, de la fuerza laboral de diferentes países. Este sistema fue desarrollado en Europa y recientemente adaptado por Costa Rica, donde revisaron 27 agentes cancerígenos y 50 actividades económicas (CIU Rev.2). Además, se incluyó 7 grupos de plaguicidas con alto riesgo de toxicidad. El objetivo principal del estudio fue estimar el número de trabajadores nicaragüenses expuestos a sustancias cancerígenas

Methods: Los datos de fuerza laboral se obtuvieron del Instituto Nicaragüense de Estadísticas y Censos, información de las sustancias se obtuvieron de instituciones autorizadas. Dada la similitud de actividades económicas y de exposición a sustancias que tienen Nicaragua y Costa Rica, se utilizaron las mismas proporciones de trabajadores expuestos que en Costa Rica, las mismas sustancias, la única diferencia es la inclusión del plaguicida metamidofos. Los datos generados fueron revisados en un panel por expertos nacionales provenientes de instituciones estatales, sindicatos de trabajadores y cámaras de la industria.

Results: Para el año 2005, Nicaragua contaba con una fuerza laboral de 2,080,898 (H: 1,296,626 y M: 784,272), agrupados en 50 actividades económicas. Los agentes cancerígenos con mayor número de expuestos fueron la radiación solar (620,000 trabajadores), las emisiones de diesel (496,324), el humo de tabaco ambiental (97,549), los compuestos de benceno (79,621), los compuestos de cromo hexavalente (61,990), el polvo de madera (46,813), el polvo de sílice (32,075), formaldehído (20,001), el plomo y sus compuestos inorgánicos (19,612), los compuestos aromáticos policíclicos (19,059) y Radón (18,926). Del grupo de plaguicidas el número de expuestos en forma decreciente fueron a paraquat y diquat (456,050), metamidofos (288678), mancozeb (145,007), clorotalonil (120,348), clorpirifos (109,697), benomil (64,351), clorfenoxi (30,228).

Las actividades de mayor riesgo fueron sector comercio, construcción y agricultura. Los hombres resultaron tener una mayor razón de exposiciones por individuo (2.42 vs. 0.79).

Discussion and conclusions: NICAREX permite identificar las actividades económicas de mayor exposición a cancerígenos y las sustancias de mayor riesgo, lo que permitirá a Autoridades realizar medidas correctivas para disminuir exposición y daños a la salud de los trabajadores.

Mo-P-15 CONSTRUCTION OF JOB-EXPOSURE MATRICES FOR THE NORDIC COUNTRIES

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Background and aims: The Nordic Occupational Cancer study (NOCCA) is a cohort study based on working populations in one or more censuses in Denmark, Finland, Iceland, Norway and Sweden. The large size of the cohort allows us to study rare cancers and even small to moderate risks by occupation and by specific occupational exposures.

Methods: Job-exposure matrices (JEMs) were constructed on the basis of a Finnish matrix (FINJEM) for each Nordic country by a team of experts to assess exposures in the NOCCA study. The selection of priority agent-occupation combinations and the adoption of general principles in the beginning of the work were necessary because of the high number of estimates to be evaluated (over 50,000/country).

Results: The structure of NOCCA-JEMs is three-dimensional (over 300 occupations, 28 agents, 4 periods covering 1945-1995). Exposure is characterized by country-, occupation- agent- and period-specific estimates of the prevalence (%) and level of exposure. Significant exposure differences between the Nordic countries were observed for many exposures.

Discussion and conclusions: The selective modification of an existing JEM for use in other countries was a feasible albeit challenging task because exposure data from Nordic data bases and information about the use of chemicals in the past was scanty. It will increase the validity of dose-response and risk estimates of occupational cancer to be expected soon as the main outcome of the NOCCA project.

Mo-P-16 SYSTEMATIC LITERATURE REVIEW OF USES AND LEVELS OF OCCUPATIONAL EXPOSURE TO PERCHLOROETHYLENE

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Background and aims: Perchloroethylene (PCE) has been one of the most widely used chlorinated solvents in the United States. Its major use has been as a dry cleaning solvent, but it has also been

important as a degreaser for metal parts in several industries. The purpose of this review is to provide a basis for PCE exposure assessment in population-based case-control studies.

Methods: To find literature to include in this review, we performed searches in MEDLINE, TOXLINE, NIOSHTIC, and the NIOSH Health Hazard Evaluation database using the search terms “chlorinated solvents” and “perchloroethylene.” The literature that contained PCE measurement data was compiled in a database that included the sample duration; the number of samples taken; the arithmetic mean (AM); minimum; maximum; geometric mean; geometric standard deviation; industry; and job title. Weighted AMs were calculated and compiled into three summary tables by type of operation: 1) dry cleaning; 2) degreasing; and 3) other operations.

Results: We identified 259 relevant papers and reports in our literature search, of which 180 (69%) contained useful descriptive information about PCE. Comparisons of measurements across studies were sometimes problematic because of variability in sampling and reporting methods. Within the dry cleaning industry, the overall AM for personal exposures was 21 ppm (range: 0.01-4636, n=944). Operators of machines that required transfer of wet garments to a dryer had the highest PCE exposure measurements (AM=68 ppm (range: 0.3-534, n=94)) of the jobs in this industry. The AM for personal exposure measurements associated with degreasing was 104 ppm (range: 0-1800, n=185). Additionally, we identified several other sources of substantial PCE exposure, including cleaning mining equipment, float and sink testing coal, cleaning and duplicating film, and landfills.

Discussion and conclusions: Exposure assessment in population-based case-control studies is a complex process requiring a substantial amount of resources. Researchers conducting these types of studies will be able to use the PCE measurement database compiled from our literature review to quantify PCE exposure levels in several distinct groups of workers.

Mo-P-17 EXPOSURE ASSESSMENT OF BENZENE IN THE SWEDISH REFINERY INDUSTRY

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Background and aims: Refinery workers are exposed to a mixture of hydrocarbons, including the human carcinogen benzene (IARC group 1). The aim of this study was to make a retrospective exposure assessment for different job titles in refineries as a part of a cohort cancer study. There are three refineries located on the west coast of Sweden with production since 1975 (Refinery 1), 1967 (Refinery 2) and 1949 (Refinery 3).

Methods: Measurement reports from the three refineries together with published articles regarding benzene exposure in the European refineries (Concawe 1984-85, 1986-92, 1993-98) have been collected and evaluated for different job categories. An expert group was formed including occupational hygienists and knowledgeable personnel (safety engineers with long experience) from the three refineries. Discussions were held within the expert group regarding the collected material and how different technical innovations and improvements throughout the years had affected the benzene exposure in different job categories. A retrospective exposure assessment was performed for operators, laboratory personnel and maintenance workers on the refineries.

Results: In refinery 1 and 2, the operators' mean benzene exposure was assessed to be about 7 mg/m³ prior to 1975, 3.5 mg/m³ between 1975-88, 1 mg/m³ 1989-90, 0.2 mg/m³ 1991-2000 and 0.1 mg/m³ after 2001. The assessment was similar for refinery 3 with only minor differences. The benzene exposure of maintenance workers was assessed to be 50 % of the exposure of an operator in all of the three refineries. At refinery 1 and 2 the mean benzene exposure for laboratory personnel was assessed to be 0.05 mg/m³ from the beginning until present time. In refinery 3 the exposure was higher; 3.5 mg/m³ between 1965-75, 0.5 mg/m³ 1976-80, 0.1 mg/m³ 1981-85, and similar to the others after 1986, 0.05 mg/m³.

Discussion and conclusions: The occupational benzene exposure of operators, laboratory personnel and maintenance workers at refineries has decreased over the years due to technical innovations and improvements, measurement programs and increased awareness.

Mo-P-18 DETERMINACIÓN DE LA EXPOSICIÓN A RIESGOS HIGIÉNICOS EN TRABAJADORES DE CARRETERAS.

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Background and aims: En estudios realizados en otros países sobre los efectos tóxicos por exposición a humos de asfalto en trabajadores de carreteras, se han evidenciado síntomas de irritación aguda de ojos, nariz y garganta; además, se han identificado riesgos de exposición a compuestos orgánicos volátiles (tolueno, xileno, benceno y metil-iso-butil cetona), procedentes de las emanaciones del asfalto, y a monóxido de carbono proveniente tanto de la maquinaria involucrada en el proceso como del tráfico

vehicular cercano. Se consideró necesario realizar un estudio exploratorio para conocer los niveles de exposición ocupacional a estos agentes.

Methods: Se evaluaron los niveles de exposición a compuestos orgánicos volátiles (benceno, tolueno, etilbenceno y xileno) y a CO, en un proyecto de mantenimiento en San José y uno de construcción de carreteras en Cartago (estudio preliminar). Además se medirá la exposición ocupacional a humos totales de asfalto (MPT) y la fracción soluble en benceno (FSB), en una muestra de siete empresas constructoras.

Results: Las concentraciones más probables de exposición a CO obtenidas para cada puesto en ambos proyectos evaluados se encontraron por debajo del TLV-TWA y el STV. Sin embargo, en labores de mantenimiento, 15 períodos de 35 evaluados sobrepasaron tanto el nivel de acción para el TLV-TWA como el STV. Para el caso de construcción de carreteras, 13 de 48 períodos presentaron la misma situación.

En cuanto a la exposición ocupacional a BTEX, se detectó únicamente la presencia de tolueno en concentraciones menores al TLV-TWA y el STV.

Discussion and conclusions: Los controladores de tránsito y peones de alcantarillado en Cartago presentaron los valores más altos de exposición a CO. Las concentraciones de CO que sobrepasaron los valores límite de exposición indican un posible riesgo para la salud, ya que estudios experimentales han evidenciado efectos por exposición crónica a niveles medios y bajos de monóxido de carbono. Durante el 2008 se evaluará la exposición a MPT y FSB para ofrecer un panorama de la situación actual que permita conocer los niveles por tarea realizada y establecer las medidas preventivas o correctivas necesarias para mantener la exposición de los trabajadores en niveles seguros.

Mo-P-19 RETROSPECTIVE ASSESSMENT OF CHEMICAL AND RADIOLOGICAL EXPOSURE FOR FRENCH URANIUM CONVERSION WORKERS

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Background and aims: In France monitoring for radiation exposure was always mandatory for workers potentially exposed to radiation. External dosimetry of workers is helpful for individual monitoring and regulations respect. Chemical exposure regulations were less important and no direct individual monitoring methods were available. Our objective was to assess the amount of chemical and radiological exposure in the uranium conversion facility in France by elaborating a specific job exposure matrix (JEM) for epidemiological purpose.

Methods: 23 experts made an inventory of all uranium compounds and other chemicals known as carcinogens, mutagens or toxics, used in the facility. Jobs were sorted in homogeneous exposure groups. For each job, active and retired workers were asked for assessing a level (from 0 to 3) of frequency and quantity of exposures for all categories of chemicals. Final level of exposures and internal consistency of the JEM was validated by experts. Furthermore, the JEM was validated quantitatively by comparison to the reference data. Since no systematic exposure measurement data was available, workers' medical records were used as reference. 35 workers' records were randomly selected from the cohort of 3080 uranium conversion workers.

Results: In total, 353 workers participated in assessment of the exposure level for 22 categories of chemicals in 73 occupational groups existing through 1960 to 2006. Only 4.5% of exposure levels were rectified by experts for internal consistency reasons. A final JEM had 73% sensibility and 83% specificity. Agreement between JEM and medical records was excellent (Kappa=83%) for chemicals derived from reprocessed uranium and good (Kappa=66%) for chemicals derived from natural uranium. For 20 other chemicals categories agreement was fair. It was poor (Kappa=8%) for asbestos. (There were few regulations for asbestos exposure survey before 1997).

Discussion and conclusions: In the context of missing exposure monitoring data, our JEM presents a valid alternative for exposure assessment in retrospective epidemiological studies among French cohort of uranium conversion workers. Medical records seem to be insufficient source to assess retrospectively chemical exposure other than exposure to uranium compounds. Direct individual monitoring methods of chemical exposure assessment should be developed and applied in the future prospective follow-up of workers.

Mo-P-20 PREDICTORS OF LEAD ACCUMULATION IN BONE IN MEXICAN WORKERS AT A LITHOGRAPHIC PRINTING WORKSHOP

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Background and aims: Lead in bone is a good indicator of cumulative lead exposure. The purpose of this investigation was to quantify lead levels in bone and identify the main predictors in workers at a lithographic printing workshop.

Methods: We studied 90 active workers and measured lead levels in patella and tibia by the K-X-ray fluorescence method. We applied a questionnaire to collect data on duration of exposure, tasks and hygiene. Many workers had a double job at another printing workshop and the years in the second full simultaneous employment were added to those of the first job. In addition, we quantified external current exposure through lead levels, air and on hands, and internal exposure through lead in blood. Multiple linear regression models were constructed for each bone to identify predictors.

Results: Mean age was 45 years (SD 13), mean time of employment was 10.6 years (SD 9.3, range 1 – 40 years) and after adding time at second job 20 years (SD 15.5). Lead in air was 0.54 mg/m³, geometric mean for lead on hand before washing was 848.1 mg/m² (range 27, 158537) and still considerably high after washing, 73.0 mg/m² (3, 1463). Mean lead level in blood was 12.3 mg/dl (SD 5.2, range 3.4, 30.3). Mean lead level in the patella bone was 43.3 µg Pb/g (SD 28.5) and in the tibia 25.9 µg Pb/g (SD 18.8). The strongest predictors for lead in bone were the duration of employment (sum of both simultaneous jobs) and intensity of exposure as defined by task categories (increasing coefficients with increasing intensity of exposures). Also current blood Pb concentration was weakly associated with bone lead levels, possibly because of absorption of lead in bone into the blood. The patella model explains 44%, and that of the tibia 55%, of bone Pb variability.

Discussion and conclusions: Current air levels are low and internal exposure levels in blood are not particularly high for most workers, whereas bone lead levels are as high as in smelters. The accumulation of lead in bone increases with the duration of employment, the length of the workday and the level of exposure according to job tasks.

Mo-P-21 DETERMINACIÓN DE LA EXPOSICIÓN A METALES PESADOS EN LA INDUSTRIA METALMECÁNICA EN COSTA RICA

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Background and aims: Estudios realizados sobre este tema en otros países revelaron que los niveles de exposición ocupacional sobrepasan varias veces los límites permitidos para hierro y cromo. La forma en que estos agentes químicos pueden llegar hasta el trabajador puede verse influenciada por una serie de factores como por ejemplo el tipo de materia prima, la ventilación, tipo de soldadura, posición del trabajador, entre otros; por lo que se planteó estudiar las variables relacionadas con la exposición ocupacional a metales pesados en una muestra de empresas dedicadas a procesos metalmecánicos de Costa Rica.

Methods: El estudio fue exploratorio de corte transversal, incluyó empresas dedicadas a la fabricación de estructuras y muebles metálicos, a las cuales se les aplicaron encuestas higiénicas con el fin de plantear las estrategias de muestreo, para luego cuantificar las muestras (Método OSHA 121), y así obtener los niveles de exposición a cobre, cromo, hierro, níquel y plomo, además se identificaron de forma cuali-cuantitativa los posibles determinantes de la exposición y se realizaron análisis de varianzas para las tareas de corte, soldadura y pulido, y entre subsectores.

Results: Participaron 15 empresas (173 muestras en total); se determinó que 7 de ellas sobrepasaron los límites de exposición permitidos para polvos y humos de Fe. La MG (DGE), en general, para las concentraciones de Fe fueron 0,12 (5,92)mg/m³, las de Cu 0,04 (4,98) mg/m³, Cr 0,07(6,34) mg/m³, Pb 0,07(0,06) mg/m³; el Ni no fue detectado. En tareas de corte, pulido y soldadura las concentraciones fueron 0,39(5,33) mg/m³, 0,66 (10,76) mg/m³ y 0,58(4,24) mg/m³ respectivamente y según los subsectores: estructuras metálicas 1,16 (4,77) mg/m³, soldadura pesada 0,42(4,95) mg/m³ y artículos de metal 0,28(3,28) mg/m³.

Discussion and conclusions: Los polvos y humos metálicos de Fe están presentes en el ambiente del 100% de las industrias. El Pb se encontró en el 13.3% de las empresas. El tipo de material, la ventilación y tipo de soldadura son algunos de los determinantes de la exposición. Además no hay diferencia significativa entre las tareas que se realizan, pero sí las hay entre las actividades.

Mo-P-22 PRESENCE OF AIRBORNE FIBERS IN TUNGSTEN REFINING AND MANUFACTURING PROCESSES

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Background and aims: In tungsten refining and manufacturing processes, a series of tungsten oxides (WO_x) are typically formed as intermediates in the production of tungsten powder. Studies in the Swedish tungsten refining and manufacturing industry have shown that intermediate tungsten refining processes can create WO_x fibers. The present study was conducted to characterize airborne tungsten-containing fiber dimensions, elemental composition, and concentrations in the U.S. tungsten refining and manufacturing industry.

Methods: During the course of normal employee work activities, seven personal breathing zone and 62 area air samples were collected and analyzed using standard fiber sampling and counting methods to determine dimensions, composition, and airborne concentrations of fibers. Mixed models were used to identify relationships between potential determinants and airborne fiber concentrations.

Results: Results from transmission electron microscopy analyses conducted indicate that airborne fibers with length > 0.5 µm, diameter > 0.01 µm, and aspect ratios > 3:1 were present on 35 of the 69 air samples collected. Overall, the airborne fibers detected had a geometric mean (GM) length of ~ 3 µm, and GM diameter of ~ 0.3 µm. Ninety-seven percent of the airborne fibers identified had an aerodynamic diameter < 10 µm, indicating that they were capable of reaching the thoracic regions. Energy dispersive x-ray spectrometry results indicate that airborne fibers prior to the carburization process consisted primarily of tungsten and oxygen, with other elements being detected in trace quantities. Based on NIOSH fiber counting "B" rules (length > 5 µm, diameter < 3 µm, aspect ratio > 5:1), airborne fiber concentrations ranged from below the limit of detection to 0.085 f/cc, with calcining being associated with the highest airborne concentrations. The mixed model procedure indicated that process temperature had a marginally significant relationship to airborne fiber concentration.

Discussion and conclusions: The finding that temperature was marginally significant was unexpected, since heated processes such as calcining created the highest airborne fiber concentrations. Until more is known about the durability and potential health effects associated with airborne tungsten-containing fibers, it would be prudent to take steps to limit or eliminate occupational exposures.

Mo-P-23 EVALUATION OF OCCUPATIONAL EXPOSURE TO MULTIPLE CHEMICALS IN LABORATORIES

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Background and aims: The aim of this study was to assess the profile of occupational exposure to chemicals in laboratories.

Methods: A transversal study was carried out at the Petrobras Research Center in order to assess the profile of exposure to chemicals among 3,000 employees whose job was predominantly performed inside on 137 laboratories, in the petrochemical area, half of which were low concentration, lengthy exposures (the study was based on environmental assessments carried out in 2004). To assess the damage to health, result from occupational exposure to chemicals agents.

Results: 484 chemicals were identified (including 246 chemicals agents and 238 chemicals mixtures) in 243 workplaces. This resulted in 2,738 exposure situations with an average of 3.73 chemicals per location. The 1,563 workers under exposure were divided into 168 Homogeneous Exposure Groups (GHE) comprised by 1 to 44 subjects (mean = 4.55; median = 3; mode = 1). On average, 4.91 GHE were identified in each workplace. In 14% (382 situations) the frequency of exposure was dayle, at 82.1% (2,249 situations) the use ranged from two to three times a week and the remaining 3.9% (107 situations) use was sporadic (once week or less). 977 environmental samples were measured. Regarding the GHE, it was observed that 91.9% of the assessments showed results below action level. This is equivalent to 92.5% of the amount of workers and fits into the low concentration exposure category. It was also observed that 49.6% of GHE (i.e. 49.9% of workers) showed concentrations lower than detection limit in analytical techniques, whereas concentrations were equal to or greater than action level among 8.1% of GHE and 7.5% of workers.

Discussion and conclusions: Exposure to chemicals in laboratories occurs basically under varied, repetitive, multiple, in low concentration and predominantly to solvents.

Mo-P-24 ENVIRONMENTAL EXPOSURE TO ASBESTOS AROUND AN ASBESTOS-CEMENT PLANT IN QUITO, ECUADOR

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Background and aims: Asbestos imports and use are not banned in Ecuador and articles like asbestos cement plaques and brake linings are largely manufactured and used in the country. There are some plants producing asbestos-cement plaques situated close to living areas in Quito. One plant was studied, considering the internal process, the use of asbestos (chrysotile), the safety and hygienic controls and the program for waste disposal.

Methods: Samples of dust were taken around the industrial plant with personal active pumps and the filters were sent to the lab in Italy (Dipartimento di Ingegneria del Territorio, dell'Ambiente e delle Geotecnologie Prevenzione -Servizio Prevenzione e Sicurezza Ambienti di Lavoro, Sede di Civitanova Marche). A questionnaire, spirometries and X Rays were applied to 25 persons living in the surrounding more than 15 years. No asbestos effects were found in X Rays, but symptoms of respiratory diseases related to dust exposure were identified.

Results: Results showed the presence of asbestos dust in air samples collected around some houses close to the plant. The asbestos – similar fibres identified were sometimes in higher levels than those accepted for living environment.

Discussion and conclusions: Although health effects were not found (it could take many decades to see the asbestos effects) the identification of exposure indicates that this population is at risk and severe hygienic measures must be taken by the factory, inside and outside it. The facts that this company has environmental certification ISO 14.000 does not justify this procedure that are also against their own rules. Ban of asbestos in Ecuador is needed but in the meantime, these factories must be controlled and pressed to follow basic rules well known internationally for reduction of asbestos exposure.

Mo-P-25 DETERMINACION DE NIVELES DE RUIDO EN UN HOGAR INFANTIL DE SAN SALVADOR Y SUS EFECTOS EN LA SALUD DE LOS RESIDENTES

*Peraza SG.

Background and aims: Un hogar infantil está ubicado en una zona de alto tráfico vehicular de San Salvador. Los niños permanecen allí las 24 horas del día al menos seis días a la semana. Por eso se propuso: evaluar los niveles de ruido dentro y a fuera del hogar e identificar posibles efectos fisiológicos y psicológicos producidos por ruido en los niños que lo habitan.

Methods: Se hizo un mapa de ruido usando un sonómetro. Se realizaron 53 mediciones en 24 puntos dentro y afuera del hogar, entre las 5:30 – 20:50 horas. Cada medición duraba 20 minutos, con lecturas intermitentes cada 30 segundos. Se realizaron audiometrías en una muestra aleatoria de 14 niños. Se entrevistó a todos los niños (N=60) con un cuestionario sobre conducta agresiva, pérdida de sueño, sobresaltos, problemas digestivos y otros efectos que han sido asociados anteriormente con exposición a ruido.

Results: Las mediciones de ruido dentro el hogar mostraron un promedio de 72 decibeles (DbA) (mínimo 56 - máximo 87). Afuera del hogar los valores tenían un promedio de 80 DbA, un mínimo de 56 y un máximo de 104 DbA. Ocho de los 14 niños mostraron pérdidas auditivas leves. El 50% de los niños manifestó tener dificultad para conciliar el sueño, problemas de concentración, irritabilidad y otros efectos psicológicos.

Discussion and conclusions: Los niveles de ruido en el hogar infantil fueron superiores a la normativa ambiental vigente (55 dBA). Se entregó un informe a las autoridades del hogar con sugerencias para disminuir la exposición. Probablemente los niveles están afectando la salud física y mental de estos niños. Sin embargo, la interpretación de los datos se complica por no tener un grupo de referencia de niños de otro hogar infantil con las mismas características pero sin exposición a ruido. Es necesario repetir las pruebas audiométricas para confirmar la hipo-acusia leve en varios niños, e incluir un grupo de referencia en el estudio.

MISCELLANEOUS

Mo-P-26 RELIABILITY OF EXPERT ASSESSMENT OF HISTORICAL BENZENE EXPOSURE OF WORKERS IN CHINA

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Background and aims: Although many occupational epidemiological studies rely on expert assessment for quantitative evaluation of dose response relations, few have studied their reliability (reproducibility); we investigated reliability of expert assessment of benzene exposure, as part of an epidemiologic study of benzene exposure and cancer risk, the NCI/Chinese CDC Benzene Study.

Methods: We assessed assignments of exposure to benzene for 142 unique exposed job-titles (i.e. a combination of factory/ workshop/job), by experts in 12 cities in China during a 2-day re-scoring exercise. Each job-title was (re-)assessed by the expert from the city where the factory was located and by 5-6 experts from other cities, following an incomplete block design. Assessment was for up to 9 different time periods using 7 benzene exposure categories. Experts had access to historical exposure information, detailed factory and workshop plans, and summary information on production processes. Agreement was calculated comparing the (re-)score from the city expert where the job-title was held to that of the other experts (inter-rater agreement) and to the score that was given during the original assessment for the main study (intra-rater agreement). To allow more detailed analysis of the effect of potential modifying factors on absolute agreement, Generalized Linear Mixed Models (GLMM) were employed, using a logit-link and including job-title as a random effect.

Results: A total of 6,857 period-specific benzene exposure scores were available for analysis: 1,053 intra-rater and 5,804 inter-rater evaluations. Agreement for the inter-rater comparisons ranged from 65%

(absolute agreement) to 93% (agreement within 1 category) and from 71-94% for intra-rater agreement. Weighted kappa [95%CI] were 0.68 [0.67-0.70] and 0.74 [0.72-0.77] for inter- and intra-rater agreement respectively. GLMM analyses showed significant effects of period and individual experts on agreement, but discrepancies in percent agreement were generally <10%.

Discussion and conclusions: Results from this study showed good reproducibility of expert assessment of historical benzene exposure within the NCI/Chinese CDC Benzene Study.

Mo-P-27 APPLICATIONS OF GEOGRAPHIC INFORMATION SYSTEMS IN A PROJECT ON HEALTH OF WORKERS IN THE RURAL INFORMAL SECTOR, COSTA RICA

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Background and aims: Geographic Information Systems (GIS) are tools for processing geographic data. We applied GIS in the project on health of 12,000 temporary migrant coffee pickers in the mountainous Los Santos Zone, Costa Rica for cartography, location, photography, and quantitative description of physico-environmental health hazards and their determinants.

Methods: Existing cartographic data and aerial photography were utilized in the creation of a health-oriented atlas of the Zone, with locations of dwellings and health services. The locations of each temporary dwelling and of distributors of basic necessities were determined by Global Positioning System, and reaching distances and slopes with respect to the closest basic services were determined.

Results: The cartography was utilized in the identification and location of the temporary dwellings as the geographic units of the subsequent census of the migrant population of the Zone during the harvest 2004-2005. The atlas was distributed to the health service providers in the Zone to facilitate their contact with the migrant population. Geographic physico-environmental data were correlated with water quality sampling results. The distance by road and/or path to the nearest general store, village shop or equivalent shop was 2 km or more for 45% of the dwellings, and the slope was at least 25 degrees for 58% of the dwellings, indicating considerable physical and social isolation of the migrant population, which was particularly marked for the indigenous migrants.

Discussion and conclusions: GIS proved to be an excellent tool for the identification of some geographic and infrastructural determinants of health in a migrant population scattered in a vast mountainous zone. It helped directly or indirectly create geographically defined variables that can be linked with personal or familial epidemiologic data by multilevel modeling. Restructuring of health services and improvement of physical living conditions of the migrants is greatly enhanced by geographic targeting.

Mo-P-28 DOES RETURN TO WORK OCCURS EARLIER AFTER WORK-RELATED SICK LEAVE EPISODES THAN AFTER NON-WORK RELATED SICK LEAVE EPISODES? A RETROSPECTIVE COHORT STUDY IN SPAIN

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Background and aims: Studies on time to return to work after a sick leave episode have mainly focused on the nature of the health problems or on the exposure to working conditions, while the work or non-work origin of the health problem resulting in the sick leave has not been addressed. Earlier studies have suggested that differences in sick pay benefit were associated with more cumulative compensated work absence days. The Spanish social security system gives us an opportunity to assess indirectly the influence of benefit protection schemes and medical care providers on time to return to work after a sick leave episode. The aims of this study is to compare time to return to work after a sick leave episode between work and non-work related sick leave episodes.

Methods: A total of 62,376 work-related sick leave episodes and 76,932 non-work related sick leave episodes were followed-up a maximum of 18 months from a sample of 338,226 workers from 56,099 Spanish companies in 2002. The probability of remaining out from work was estimated by a non-parametric estimator of the marginal survival function (Wang&Chang), and the duration ratio between both types of sick leave was estimated using a log-logistic regression model with a frailty gamma distribution term, using the non-work related as the reference.

Results: Median (interquartile range) was 11 (6-21) days for work related and 9 (4-29) days for non-work related sick leave episodes. The time to return to work after a work-related sick leave episode was shorter than for non-work related episodes (ratio=0.95; 95%CI: 0.93-0.97). However, this difference disappeared after adjusting by gender (1.00; 0.98-1.02). Other adjustments (age, economic activity and region) did not alter this result.

Discussion and conclusions: Time to return to work after sick leave episodes is not associated to the work or non-work origin of the health problem resulting in the sick leave. Research including sick leave episodes with specific medical diagnosis is needed to extend the generalization of our findings.

Mo-P-29 A NEW SCALE OF PRECARIOUS EMPLOYMENT: PRELIMINARY FINDINGS OF THE PREVALENCE OF PRECARIOUSNESS AND ITS ASSOCIATION WITH SELF-PERCEIVED HEALTH IN SPAIN

*Vives V. A, Amable M, Muntaner C, Gimeno X, Moncada S, Llorens C, Benavides FG, Benach J.

Background and aims: Different forms of non-standard jobs have expanded in Spain in the last decades. In 2007, more than 30% of contracts, about 5.3 million workers, were temporary. In many cases these employment relationships can be defined as precarious, characterized by their instability, low wages and lack of social protection. Although there is consistent evidence that temporary employment and job insecurity have adverse effects on health, employment precariousness and its association with workers' health have not been assessed. The Employment Precariousness Scale (EPRES), consisting of six dimensions: temporary contract; empowerment to decide on employment conditions; vulnerability; wages; statutory rights; and capacity to exercise rights, was devised for use in epidemiological research. This study aims to use EPRES to measure the prevalence of employment precariousness in Spain and its association with self-perceived health.

Methods: Data comes from a representative sample of 7,650 dependent workers. Prevalence of exposure (%) to different levels of employment precariousness (none/low, moderate and high) and corresponding mean values (and 95% confidence intervals) for self-perceived general and mental health, measured with the Spanish version of the SF36 health questionnaire (values ranging from 0 (worst) to 100 (best)), were examined.

Results: Sample average age was 36.7 years; 49% were women; 59% of the women and 65% of the men were manual workers. Overall, 49.9% were unexposed, 42.9% were exposed to moderate and 7.2% to high employment precariousness. Prevalence of high precariousness was 8.7% in women and 5.7% in men; 4.8% in workers older than 30 and 11.8% in workers aged 30 or less; 2.9% in non-manual and 9.9% in manual occupations. Means for general health were 77.1 (76.6-77.6); 73.5 (72.9-74.1); and 69.9 (68.4-71.4) for low/none, moderate and high precariousness, respectively. Corresponding mental health means were 76.9 (76.3-77.4); 70.6 (69.9-71.2); and 65.2 (63.7-66.8).

Discussion and conclusions: To our knowledge, this is the first time that precarious employment prevalence is assessed multi-dimensionally. An important proportion of workers, especially women, young and manual workers, are exposed to some level of precariousness. As precariousness increases, self-perceived health worsens. Future research priorities include measuring precariousness within different contexts, analysing specific mechanisms through which it can damage health and different health outcomes.

REPRODUCTIVE DISORDERS

Mo-P-30 MATERNAL PESTICIDE EXPOSURES AND CENTRAL NERVOUS SYSTEM DEFECTS (CNSD) IN ALEXANDRIA CITY, EGYPT

*FARAG AT.

Background and aims: Maternal exposure to pesticides may represent a risk for pregnancy outcomes. The present study was conducted to investigate the relationship between the exposure to pesticides and central nervous system defects (CNSD) among infants in Alexandria City, Egypt.

Methods: Using a population –based medical birth registry linked to Egyptian Ministry of Health for 2 years (2005 and 2007), women who delivered babies with CNSD has been studied. As a group of reference, women who delivered normal babies through the same period were used. The technique used was an interviewing format which was constructed to be filled by each woman in one meeting. Information on sociodemographic characteristic, obstetric history, past medical and gynecological history, aspects of current pregnancy and delivery, occupational and a variety of exposure to pesticides were obtained through personnel contact interview with the mothers who delivered infants with CNSD from 2005 to 2006.

Results: The results reported that mothers used the household insecticides were two times at risk of delivered babies with CNSD than those are not. Agricultural activities of the index mothers were associated with more elevated risks to give births with CNSD compared to the controls. No specific relation between the types of CNSD and parents agricultural work and pesticide exposure in the work place and field.

Discussion and conclusions: There was significant correlation between maternal exposure to pesticides either in work place or home and increasing the rate of CNSD among infants who borne in Alexandria, Egypt.

Mo-P-31 RETROSPECTIVE ANALYSIS OF AN OUTBREAK OF NON-SUCCESSFUL PREGNANCIES IN A COMMUNITY NEARBY A MELON PLANTATION

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Background and aims: The objective of this study was to identify risk factors of non-successful pregnancies in a Costa Rican community during 2004. Out of twenty pregnancies, four resulted in stillbirths, three in miscarriages and one in a congenital malformation. The community inhabitants attributed this outbreak to the pesticide use in a nearby melon plantation.

Methods: Environmental, occupational, social, genetic, and health factors were compared between the non-successful pregnancies (cases, n=8) and successful (controls, n=12). Socio-spatial data were obtained through Geographical Information System (GIS) and a questionnaire about the location and characteristics of the cases and controls houses, and the melon plantation. In addition, cases and controls were interviewed using a structured questionnaire about problems during the pregnancy, working conditions, pesticide exposure, among others.

Odds ratios were estimated to identify risk factors. At present, we are interpreting the socio-spatial data.

Results: Preliminary results showed an increased risk for stillbirth (OR 1,71, 95% CI 1.06, 2.76) for parents whose direct family members suffered from hypertension. For stillbirths, increased (OR 1.5 to 3.0), but far from significant (95% CI 0.12 to 37.7) risks were observed for being conceived during periods of high pesticide use, living nearby the melon plantation and/or working at the melon plantation (one, or both parents), and pesticide use at home. For all non-successful pregnancies, increased but far from significant risks (OR 1.5 to 2.1, 95% CI 0.30 – 15.36) were observed for being conceived during periods of high pesticide use, living in the melon community, parents whose direct family members suffered from hypertension, and pesticide use at home.

Discussion and conclusions: Results from our study are non-conclusive due to small study population, but the risk estimates were increased in some of the variables.

Mo-P-32 CLUES TO THE AETIOLOGY OF CRYPTORCHIDISM: CONCORDANCE RATES AMONG HALF BROTHERS, FULL BROTHERS AND TWIN BROTHERS

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Background and aims: Adverse maternal lifestyle and environmental exposures during pregnancy are suspected to interfere with the normal testicular descent and increase the risk of cryptorchidism in the male offspring. The study's objective is to examine this hypothesis by describing concordance rates (i.e. the probability that a pair of individuals will both have cryptorchidism, given that one of the individuals has the condition) in pairs of boys with varying genetic relation, enabling evaluation of the risk contribution from the environment in utero and the genes.

Methods: We performed a population-based study in the entire population of 1,079,780 Danish boys born from January 1, 1973 to December 31, 2004. The following six groups of paired boys were identified: Randomly selected non-related boys (different parents), paternal half brothers (same father, different mothers), maternal half brothers (same mother, different fathers), full brothers (same parents), dizygotic twin brothers and monozygotic twin brothers. Status on each individual regarding diagnosed cryptorchidism and orchiopexy procedures were obtained by linkage to the Danish National Patient Register.

Results: The overall prevalence of diagnosed cryptorchidism and orchiopexy procedures was 2.7 % and 1.7 % respectively. Concordance rates of diagnosed cryptorchidism in the groups were as follows: Randomly selected non-related boys 2.8 % (95 % CI 2.4-3.3), paternal half brothers 3.3 % (2.2-4.6), maternal half brothers 6.1 % (4.6-8.0), full brothers 9.0 % (8.3-9.8), dizygotic twin brothers 24.1 % (16.0-33.6) and monozygotic twin brothers 27.3 % (15.5-41.2). A similar pattern of concordance rates was observed when orchiopexy procedures were studied.

Discussion and conclusions: The concordance rate was higher among maternal half brothers than paternal half brothers, and of equal magnitude in both twin groups. The results strongly support that the environment in utero is a major contributor to the appearance of cryptorchidism.

Mo-P-33 VALIDATION OF SELF REPORTED BIRTH DEFECTS AMONG PERSONNEL IN THE ROYAL NORWEGIAN NAVY

*Baste V, Moen BE.

Background and aims: Self reported reproductive health is used in many retrospective occupational studies, reporting both recent births and deliveries decades ago. The aim of this study was to validate the information on birth defects and test differences in reporting between time periods.

Methods: In a cross-sectional study among military employees in the Royal Norwegian Navy conducted in 2004, information about their offspring was reported on a paper questionnaire. For each child year of birth, birth defects and or chromosome deviation and perinatal mortality was obtained. Information from

the responders was linked to the Medical Birth Registry of Norway (MBRN) where all births in Norway after 1967 are registered. MBRN was set as the “gold standard”. Sensitivity and specificity of birth defects was investigated and also how this was affected by the gender of the parents, year of birth (time period: 1967-1982, 1983-1998, 1999-2004) and status at delivery (live borne or perinatal mortality).

Results: The total cohort was 19.500 employees in the Royal Norwegian navy in the period 1950 until 2002 (response rate 62.4%). A total of 430 and 16.364 children were reported by women and men respectively. Validation of birth defects with MBRN as “gold standard”, the sensitivity was 0.46 and 0.33 and specificity was 0.99 and 0.95 for women and men respectively. The sensitivity was 0.37 in first time period, 0.32 and 0.30 for the two last periods; the specificity was 0.94, 0.95 and 0.97 for the different time periods. There were 98 children registered as perinatal mortal and in this group; sensitivity (0.80) and specificity (0.44) were significant higher and significant lower, respectively, than not perinatal mortal children.

Discussion and conclusions: For the births reported more then two decades ago the sensitivity was higher (not significant) than for recent births. The results for perinatal mortality could be interpreted by the parents reporting more malformations if they had lost their child within the first week of life. The differences between groups should be taken into consideration when using self reported data.

Mo-P-34 EXPLORING THE RISK OF MORTALITY FROM CONGENITAL MALFORMATIONS IN THE OFFSPRING OF WORKERS IN SEMICONDUCTOR MANUFACTURING

*Lin C, Wang J, Hsieh G, Chang Y, Chen P.

Background and aims: Increased risks of prolonged time to pregnancy and spontaneous abortion have been reported in the female workers of semiconductor industry. To our knowledge the potential risk of congenital malformations in the offspring of the workers in this industry has not been published yet. Thus, we conducted a linkage of registries from the Department of Health, Taiwan to explore this risk in the liveborn children of the workers in the semiconductor industry.

Methods: We obtained the employment information of workers in eight semiconductor companies from the Bureau of Labor Insurance, Taiwan. A total of 19,816 male and 27,610 female workers had been employed in these companies during 1980-2000. We identified liveborn children in the National Birth Registry and deaths from congenital malformations in the National Death Registry. We used multiple logistic analysis models to calculate odds ratios and their 95% confidence intervals.

Results: A total of 14,812 and 24,223 children were born to male and female workers, respectively. After controlling for maternal age and children’s sex and year of birth, increased risks of deaths with congenital malformations [adjusted odds ratio (OR), 3.26; and 95% confidence interval (CI), 1.12 to 9.44] and heart anomalies (OR, 4.15; 95% CI, 1.08 to 15.95) were found in the male workers who employed in the industry during the two month before conception. However, there were no significant findings in the female workers who employed during the three months before and after conception.

Discussion and conclusions: We found evidence for a possible link between potential paternal preconceptional exposure and an increased risk of congenital malformations in the heart and circulatory system. The possible etiological hypothesis needs to be corroborated in the future.

Mo-P-35 THE RISK OF CONGENITAL MALFORMATIONS AND PRETERM BIRTH IN HOSPITAL WORKERS: A STUDY IN THE NATIONAL BIRTH COHORT IN DENMARK (DNBC).

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Background and aims: Sick leave during pregnancy is frequent among Danish hospital employees, and hospital workers may have an increased risk of adverse pregnancy outcomes. Possible exposures are much walking or standing, long working days, high work level, low job control, much lifting, infectious agents, chemicals, radiation and night or shift work.

We studied the risk of preterm birth and all congenital malformations following maternal occupations within hospitals in Denmark.

Methods: Using data from the DNBC, we conducted a prospective cohort study of 85,976 women with singleton pregnancies who were interviewed about their job title and work tasks during pregnancy around the 16th week of gestation. Job titles were classified according to DISCO-88. Data on congenital malformations were obtained by linkage to the Medical Birth and the National Hospital Registers. The adjusted Hazard ratios (HR) for congenital malformations (CM) and odds ratios (OR) for preterm birth with 95% CI were calculated.

Results: The prevalence of mothers with occupation within hospitals were 5,976 (7.0%), with laboratory technicians (n=170) and nursing aides (n=1,269). Preliminary **Results:** Laboratory technicians had a HR for all CM on 2.0 (0.7-5.2), and for major CM 1.9 (0.6-4.7). The OR for preterm birth was 1.8 (0.2-19.0).

Overall, nursing aides did not have an increased risk of all malformations (HR=1.0) or very preterm birth (OR=0.7).

Discussion and conclusions: Overall, no increased risk of adverse pregnancy outcomes in laboratory workers was found, but the risk estimates were elevated suggesting that subgroups may have an increased risk. Nursing aides did not have an increased risk of adverse pregnancy outcomes. The effect of specific exposures will be studied.

Mo-P-36 WORKSTRESS AND RISK OF FETAL DEATH

*Thulstrup AM, Bonde JP, Ramlau-Hansen CH, Nybo-Andersen A.

Background and aims: There is compelling evidence that severe emotional stress in early pregnancy increase the risk for developmental disorders but we know very little about effects of less severe stressors in the workplace. During the last decades a large minority of women have joined the work force, therefore there is an increasing need for scientific information and how to advice pregnant women. In the same period there has been focus on job stress. On this background we examine, whether job stress measured as a demand/control model increases the risk of fetal death.

Methods: Follow-up study, self-reported information on job demands/control and social support at the work place during pregnancy and outcome was obtained through The National Registration of Birth in Denmark. We interviewed 18377 pregnant women, who participated in the Danish National Birth Cohort during the period 1997-1999. During this period we registered 329 cases of late fetal death, which is a rate of 1.8%.

Results: There was no association between job stress and fetal death. However, the results suggested that women categorized as either high-strain or active individuals have a relative risk of fetal death of 1.25 (95% CI, 0.80-1.95) and 1.26 (95% CI, 0.96-1.66) respectively compared to low strain individuals. Furthermore, social support at the workplace did not modify the impact of job stress.

Discussion and conclusions: There was no significant relationship between job stress and fetal death among working Danish women but we are not able to exclude that women in high-strain and active jobs, have a slightly increased risk of fetal death compared to the low-strain women.

Mo-P-37 TIME TO PREGNANCY IN A SOUTH AFRICAN POPULATION - FINDINGS FROM A PRELIMINARY STUDY

*Bello B, Kielkowski D, Wilson K, Vundle Z, Kruger A, Heederik D.

Background and aims: Although the declining total fertility rate in South Africa has been largely attributed to education, contraceptive use and HIV/AIDS, the role of sub-fecundity is unknown. Time to pregnancy (TTP) is the number of non-contraceptive menstrual cycles (months) it takes a couple to conceive. It is a validated measure of fertility. A number of factors – e.g. social, reproductive, environmental and occupational – affect TTP. As more women take up jobs in occupational sectors from which they were previously excluded, and as the current work place presents new exposures, it is important to assess the effect of occupational exposures on fertility. This study aimed to pre-test a TTP questionnaire tool, being developed by the NIOH, in a South African population and to report preliminary findings.

Methods: This preliminary study included 166 volunteering eligible African women. For TTP analysis, accidental and unplanned pregnancies were excluded, and never-pregnant women were censored at the time of survey. Differences in categorical variables were assessed using the chi-squared test. Kaplan-Meier survival curves were used to describe TTP. Cox proportional hazard models were used to estimate fecundity hazard ratios.

Results: TTP information was available for 42% of participants. For women who became pregnant, the distribution of TTP had a positive skew towards longer values with a mode of 1 month, a median of 3 months, and a mean of 7.6 months. Compared to women who were not employed, employed women had a lower per-cycle probability of becoming pregnant (HR 0.55, CI: 0.31 – 0.96). This relationship remained significant even after adjusting for age, smoking, alcohol, urban status, contraception and gravidity (adjusted HR 0.38, CI: 0.19 – 0.76). Gravidity was also significantly related to TTP (adjusted HR 1.73 CI: 1.33 – 2.33). The prevalence of infertility (proportion of women trying to fall pregnant for more than 12 months) was 15.7% (95% CI; 6.7 – 24).

Discussion and conclusions: This study indicates that TTP measurement by means of a questionnaire in South Africa has face validity, and that being employed when trying to fall pregnant reduces the per-cycle probability of becoming pregnant. These results should be interpreted with caution because of possible selection bias.

Mo-P-38 TIME TO PREGNANCY AMONG NEWLY MARRIED COUPLES IN TWO AGRICULTURAL VILLAGES IN HEBRON DISTRICT, PALESTINE: A PROSPECTIVE STUDY

*Issa YY, Sallmen M, Nijem K, Bjertness E, Kristensen P.

Background and aims: Objective: Human fecundability is affected by environmental influences including occupational, social, and biological factors. The present study aimed to assess the effects of different factors on fecundability among newly married couples in Palestinian population living in agricultural villages.

Methods: **Methods:** A prospective study on time to pregnancy (TTP) was conducted among newly married, noncontracepting, sexually active and childless couples (n=207) in two Palestinian agricultural villages in Hebron district. All the couples participated. Couples were followed from the date of marriage until the wife got pregnant (defined by pregnancy test) or at maximum 12 months TTP (i.e., number of menstrual cycles till getting pregnancy) was used to estimate fecundability. After exclusions, 205 couples remained for analysis. Discrete proportional hazard regression model was used to calculate the adjusted fecundability density ratios (aFDR).

Results: **Results:** The overall cycle fecundability was 0.17 with unexpectedly low values during the first two cycles, a maximum (0.22) in cycle 3, and a decline thereafter. Older age of the woman (aFDR 0.70; 95% confidence interval [CI] 0.37–1.30), and elevated BMI (aFDR 0.56; CI 0.22–1.42) were suggestively associated with prolonged TTP. Male factors associated with low fecundability were older age (aFDR 0.67; CI 0.42–1.08) and higher education (aFDR 0.54; CI 0.35–0.84). Unexpectedly, we observed increased fecundability among overweight (BMI=25–29.9) and obese (BMI \geq 30) men (aFDRs 1.33; CI 0.90–1.95 and 2.09; CI 1.24–3.53, respectively). Female factors suggestively associated with short TTP were higher education (aFDR 1.55; CI 0.81–2.96) and long duration of menstruation (aFDR 1.42; CI 0.79–2.53).

Discussion and conclusions: Conclusion: Overall fecundability in the Palestinian rural population was 0.17. Work in farming was not clearly associated with fecundability either among men or women. Our findings on female age, BMI and education are in line with literature. However, contrary to other studies, we found fecundability increasing during the first three cycles of follow-up, and an increased fecundability among overweight and obese men. Social or cultural factors may in part explain these findings. The findings on fecundability found predominantly in the western countries may not all be universal.

Mo-P-39 CHARACTERISTICS OF MATERNAL EMPLOYMENT DURING PREGNANCY AND ADVERSE BIRTH OUTCOMES: RESULTS FROM THE TAIWAN NATIONAL BIRTH COHORT STUDY

*Yang S, Chang P, Hsieh W, Chuang Y, Lin S, Chen P.

Background and aims: Women with physically strenuous work, shift work and long working hours during pregnancy were considered having higher risk of adverse birth outcomes. The effects of characteristics of maternal employment remain controversial. We conducted this study to estimate whether the selected characteristics of maternal employment during pregnancy are associated with adverse birth outcomes.

Methods: We used the multistage stratified systematic sampling to recruit subjects from the Taiwan national birth registration data in 2005. Interviewers had a home interview, including characteristics of maternal employment and potential confounders, at the sixth month after the babies were born. A total of 20,661 subjects were included to analysis. We used logistic models to calculate odds ratios of selected characteristics on low birth weight, preterm and small for gestational age (SGA).

Results: Women who employed during pregnancy have a lower risk of preterm and SGA birth compared to unemployed women. Among employed women, a slight excess risk of preterm birth was observed for women having shift work (OR, 1.19; 95% CI, 1.00 to 1.42), and working more than 40 hours a week (OR, 1.25; 95% CI, 1.06 to 1.47). In addition, women with more unsatisfied (OR, 1.21; 95% CI, 1.04 to 1.41) and higher stress (OR, 1.21; 95% CI, 1.03 to 1.43) on their employment during pregnancy had a significantly higher risk of SGA birth.

Discussion and conclusions: Employed women did not show higher risks of adverse birth outcomes than unemployed women. However, maternal working stress and long working hours may still be associated with the risk of adverse birth outcome.

Mo-P-40 CHARACTERISTICS OF MATERNAL EMPLOYMENT DURING PREGNANCY AND PREGNANCY-INDUCED HYPERTENSION: RESULTS FROM THE TAIWAN NATIONAL BIRTH COHORT STUDY

*Chu L, Chang P, Hsieh W, Chuang Y, Lin S, Chen P.

Background and aims: Maternal employment during pregnancy and occupational stress has been considered risk factors for pregnancy-induced hypertension (PIH) but it is unclear what aspects of characteristics of employment might be important. The objective of this study is to evaluate the associations between characteristics of employment during pregnancy and PIH in a large birth cohort study.

Methods: We used the multistage stratified systematic sampling to recruit 21,248 postpartum women from the Taiwan National Birth Registration database in 2005. Interviewers had a home interview at the sixth month after their deliveries by using a structured questionnaire to obtain characteristics of maternal employment and potential confounders. Diagnosis of PIH including gestational hypertension and pre-eclampsia was obtained from the birth registration. After excluding mothers with multiple gestations and women less than 18 years old of age, 317 of 20,572 women had been diagnosed with gestational hypertension and 135 women were pre-eclampsia. We used logistic regression models to explore the effect of characteristics of maternal employment on PIH.

Results: Compared to women who employed during pregnancy, women with higher occupational stress had a slight higher risk to develop PIH (OR, 1.28; 95% CI, 1.01 to 1.63). In addition, women with more than 40 working hours per week (OR, 1.23; 95% CI, 1.00 to 1.53), working in service industry (OR, 1.39; 95% CI, 1.02 to 1.91), and unsatisfied with her job (OR, 1.48; 95% CI, 1.08 to 1.89) may increase the risk of PIH. However, these findings were not significant after controlling potential confounders.

Discussion and conclusions: There was no convincing evidence that maternal employment had a higher risk of PIH. However, further research is warranted to confirm these negative findings.

RESPIRATORY HEALTH

Mo-P-41 CHRONIC RESPIRATORY SYMPTOMS IN DUSTY INDUSTRIES IN TANZANIA

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Background and aims: Air pollution including occupational dust and irritating agents are major contributors to respiratory disorders at work places. However, while the global prevalence of occupational respiratory disorders is increasing, there are relatively few studies in this area from African countries. More information is needed for policy formulation and implementation of preventive measures.

Methods: Three cross sectional studies of respiratory disorders were performed in dusty industries in Tanzania, in cement production (one factory; 227 workers), in coal mining (one mine; 250 workers) and in sisal processing (six estates, 194 workers). The industries were located in three different areas and due to low numbers of female workers only male workers were included in the analyses. A modified British Medical Research Council Questionnaire was used for interviewing workers. All studies had control groups at the same work place. The prevalence of six chronic symptoms was compared for all workers, adjusting for smoking and previous diseases by use of logistic regression. Another analysis was performed comparing the three exposed groups alone and another comparing the three control groups alone. Dust exposure levels in the work places had been measured.

Results: There were significant differences between the exposed groups, but with different results for the different symptoms. Chronic sputum had highest prevalence among cement exposed workers (34%), whereas chest tightness was highest among sisal workers (48%). The most frequent symptom among coal miners was dyspnoea (34%). Most symptoms had higher prevalence in the exposed groups compared to controls. There were significant differences comparing the three control groups, with the highest prevalence of symptoms at the coal mine. Smoking habits differed a lot between the groups.

Discussion and conclusions: Differences in symptom prevalence among the exposed workers might be explained by the difference in dust exposure among these three types of work places. The differences among the control groups are not clear, but possibly related to differences in smoking habits, life style and cultural differences.

Mo-P-42 TALCOSILICOSIS: ENFERMEDAD LABORAL POCO FRECUENTE

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Background and aims: Identificar la asociación entre trabajadores expuestos a polvo de talco y la presencia de Talcossilicosis en una empresa de cosméticos.

Methods: Se realizó una encuesta descriptiva prospectiva, durante 2006. Se aplicaron 24 cedulas a trabajadores de las áreas de envasado y molienda de talco cosmético. A los 24 se les efectuó telerradiografía de tórax. Se agruparon por años de exposición en dos grupos el primero con antigüedad hasta 5 años de exposición a talco y el segundo con más de 5 años. Se realizaron monitoreos ambientales con bomba gravimétrica de alto flujo y filtros de cloruro de polivinilo. Se aplicó la prueba de Fisher para buscar diferencias estadísticas.

Results: Los 24 (100%) trabajadores expuestos presentaron cambios radiográficos, compatibles con Talcosis de acuerdo a los criterios de la OIT, 18 (75%) presentan Talcosis leve y 6 (25%) moderado. Se obtuvo un valor de OR: 3 (IC 95%, 1.174 – 7.667) con una $p = 0.028$, también se determinó la probabilidad de adquirir talcosis exponiéndose por más de 3 años a este polvo con un OR de 3 (IC95 1.174 - 7.667). Se realizaron un total de 12 monitoreos para polvos respirables, 8 ambientales y 4 personales, de los cuales reportaron 5 en niveles de polvo por arriba de los niveles máximos permisibles establecidos por la NOM-010-STPS-1999, en las áreas de molinos de compactos, molinos de talco, abastecedor de talco y talco línea final, se analizó el talco contenía más de 95% de sílice libre.

Discussion and conclusions: Se identificó una asociación significativa entre el tiempo de exposición mayor de 5 años y la presencia de talcosis determinada por la tele radiografía de tórax, lo anterior puede explicarse porque la exposición fue mayor a los valores considerados como seguros. Al total de trabajadores detectados con alteraciones pulmonares se les debe de incluir en un programa de vigilancia epidemiológica a fin de evitar la progresión en las lesiones pulmonares detectadas.

Mo-P-43 OCCUPATIONAL EXPOSURE TO SILICA IN CHILE

*Bernales B.

Background and aims: Exposure to silica dust is associated to works that alter the terrestrial bark. Rocks are removed and sand is used. Crystalline silica is a human carcinogen and causes silicosis, an irreversible and potentially lethal disease. Its prevalence is unknown in Chile. The aims are to know the levels of exposure to silica to which the workers are exposed and to estimate the number of workers exposed with a high probability to silica in the occupied workforce in Chile.

Methods: In 2004-2005, 132 companies were evaluated on 31 items and 364 air samples. The analyses complied with the modified NIOSH 7601 method and were conducted at the Laboratory of Occupational Health of the ISP, with good intercomparison performance with the International Program of the AIHA. For the estimation of the percentage of workers with high probability of exposure to silica (working over than 30 % of the weekly schedule with presence of silica dust) we applied an occupational exposure matrix with information from the National Statistics for labor force numbers, and expert assessment of exposure.

Results: A 33 % of the samples exceeded the permissible legal limit. A 5.4% of the workforce was estimated to be exposed to silica dust with high probability. Occupational exposure to silica occurs not only in mining, but is present in diverse activities.

Discussion and conclusions: We demonstrate that exposure control is possible in an important number of activities with simple measures of prevention such as wetting, encirclement, suitable procedures of work, and administrative measures. An exposure matrix provides a feasible approximation for the estimation of the number of workers exposed to silica. Our result must orient toward preventive efforts of the government and other actors. Silica exposure is a public health problem and a priority in the preventive programs of occupational health in Chile.

Mo-P-44 STUDY OF AIRWAY FUNCTION IN METAL EXPOSED WORKERS

*Amr DM, Amr MM.

Background and aims: Occupational exposure to metals in the workplace (i.e. smelters) with its adverse effects on human health and negative effects on the environment is one of the main industrial problems. The ultimate goal of this work is to study the Airway function in metal exposed workers. This work is designed to detect early, the airway obstruction due to metal(s) pollutant exposure, to implement a preventive and safety program.

Methods: Twenty workers from one smelter and 17 matched control (10 from the field and 7 from outside administrative offices), were studied for evidence of health effects with special concern to airway diseases during their exposure to metal(s) dust &/or fumes in the workplace. They were evaluated clinically & by ventilatory function, chest X-ray (P-A), ECG and other biochemical indicators including liver, kidney functions and glucose. Metals serum level (Cu,Pb,Al,Zn,Ni) for all participant (I, II, III) have been done by using atomic absorption.

Results: Metal exposed subjects are presented with different respiratory manifestations including COPD, Asthma, HRS and IPF. These manifestations are evident especially after prolonged exposures, usage or not of the protective devices and among smokers. Combined effect of these 5 metals (Al, Pb, Zn, Cu and Ni) fumes was previously confirmed by other authors. Chest X-ray abnormalities were among 100% among exposed subjects. Obstructive, restrictive and combined ventilatory defects were among 95% of exposed subjects, however, these effects are insignificant among the outdoor absolute control III. The study provided strong evidence of serious respiratory effects due to metal(s) exposure in smelters. The study discussed the relation of serum level of these metals and other parameters as age, duration of

exposure, smoking habit and education with the evident airway and parenchymatous lung lesions (i.e. bronchial hyperresponsiveness, asthma, COPD and IPF.)

Discussion and conclusions: Conclusion and remarks includes pre-and periodic medical examination, awareness and education programs for workers, using modern industrial hygiene techniques (enclosure systems & special respirators for workers) and monitoring the workplace hazards and agents as well as limiting the workers exposure time and compensation for the disabled ones.

Mo-P-45 HEALTH HAZARDS AMONG WORKERS IN NICKEL-ELECTROPLATING PROCESS

*El Safty A.

Background and aims: Electroplating processes result in the emission of aerosoles of soluble nickel compounds. We aim at investigating health hazards associated with nickel fume exposure in a nickel-electroplating workshop.

Methods: We performed personal interview, clinical examination including otolaryngeal examination of 50 male workers exposed to soluble nickel compounds and the results were compared to those obtained from 14 matched controls. Environmental assessment of the work place was performed. Investigations involved urinary and serum nickel, kidney and ventilatory function tests, IgA and IgE immunoglobulins.

Results: Serum urea, creatinine and retinol binding protein were statistically significantly higher in exposed workers compared to the controls. Low levels of IgA and high levels of IgE were reported among our exposed workers. Reduction of spirometric measurements but not to the level of significance was also demonstrated. The concentration of nickel in urine of workers averaged (2.9Ug/L) and in serum averaged (3.4 Ug/L). Statistically significantly positive correlation was found between serum levels of urea, creatinine, retinol binding protein and IgE and serum and urinary nickel of exposed workers.

Discussion and conclusions: We recommended periodic medical examination including chest and nasal x-rays annually. Nickel concentration in plasma and urine are helpful for screening and the biologic TLV of nickel in urine is considered as 150 Ug/L. In selected cases sputum cytology and nasal mucosal biopsy should be performed. Patients who developed or were suspected to be at increased risk of developing allergic asthma should be given a validated respiratory disease questionnaire and pulmonary function testing yearly.

Mo-P-46 SÍNTOMAS RESPIRATORIOS ASOCIADOS A ENFERMEDADES PULMONARES CRÓNICAS Y DETERIORO DE LA FUNCIÓN PULMONAR EN MINEROS DEL ORO DE PEQUEÑA ESCALA

*Castillo Vega SM, Carcache Mendoza JL, Téllez García MA.

Background and aims: En la minería los trabajadores están expuestos a agentes nocivos que provocan un deterioro en la función pulmonar. Entre éstos figuran los polvos y fibras inhalados, siendo uno de los más importantes el sílice. El objetivo de este estudio fue establecer si existe un exceso de riesgo de presentar síntomas respiratorios crónicos y deterioro de la función pulmonar en trabajadores en la minería del oro en comparación con trabajadores activos en otras ocupaciones procedentes de la misma zona minera.

Methods: El grupo de estudio estuvo formado por 85 mineros seleccionados a través de un muestreo aleatorio simple. El grupo de referencia lo conformaron 166 no mineros escogidos a partir de un muestreo aleatorio por conglomerados a partir del censo de la alcaldía de Santo Domingo. Para la investigación de los síntomas respiratorios crónicos se utilizó un cuestionario aplicado al total de sujetos incluidos en el estudio. Para la evaluación de la función pulmonar se realizaron espirometrías al total de mineros y solamente a 121 de los no mineros. Se calcularon razones de prevalencia (OR) e intervalos de confianza (IC 95%) crudos y ajustados, por medio de regresión logística.

Results: Se encontró que la prevalencia de síntomas respiratorios crónicos en el grupo de estudio varió de 7.1% a 51.2% según el síntoma evaluado; en el grupo de referencia, la prevalencia varió de 0.6% a 17.5%, advirtiéndose una diferencia estadísticamente significativa. La prevalencia de defectos ventilatorios fue de 83.5% en los mineros y de 80.2% en los no mineros, no distinguiéndose diferencia estadísticamente significativa entre grupos. El riesgo de los mineros de presentar alguno de los síntomas respiratorios crónicos fue de 4 a 19 veces en relación a los no mineros ("p" varió de 0.0004 a 0.041 según el síntoma evaluado). El riesgo de mostrar un defecto ventilatorio en los mineros fue de 1.16 veces (IC 95% 0.50-2.73) en comparación con los no mineros; la fuerza de asociación no fue estadísticamente significativa (p=0.730).

Discussion and conclusions: Los resultados del presente estudio sugieren que los trabajadores envueltos en la minería presentan un mayor riesgo de presentar síntomas respiratorios crónicos y deterioro de la función pulmonar.

Mo-P-47 MORTALITY AND LIFE EXPECTANCY OF YOKKAICHI ASTHMA PATIENTS, JAPAN: LATE EFFECTS OF SULFUR OXIDE AIR POLLUTION OCCURRED IN 1960-1970S

*Yokoyama K, Guo P, Kida H.

Background and aims: Bronchial asthma and other obstructive impairment are caused by occupational irritants such as sulfur dioxide (Eur Respir J 27:720-5, 2006). The present study is aimed at examining the late effects of bronchial asthma and chronic obstructive pulmonary disease (COPD) caused by sulfur oxide air pollution on the victims in Yokkaichi-city (Mie Prefecture, Japan). This may lead to understanding of a long term course of occupational respiratory disorders.

Methods: Mortality rate and life expectancy of asthma and COPD patients, registered between 1965 and 1988, were investigated from 1975 through 2000. These patients had been recognized as the victims of air pollution occurred in early 1960-70s in Yokkaichi-city. Report of new cases markedly decreased by the end of 1970s; no new cases have been found since 1988.

Results: Mortality rates for COPD and asthma in patients from Yokkaichi-city were significantly higher than in the whole population of Mie Prefecture. For all ages (except for males between 80 and 84 years in 1985), the life expectancy of both males and females were significantly reduced in patients from Yokkaichi-city as compared with the whole population of Mie Prefecture. The potential gains in life expectancy excluding the mortality for respiratory diseases including COPD and asthma were larger for all ages in patients from Yokkaichi-city.

Discussion and conclusions: Mortality and life expectancy were adversely affected in patients from Yokkaichi-city, despite the fact that the air pollution problem has been already solved. Assessment of late effects of occupational COPD and asthma by an epidemiological study seems necessary; the analysis of mortality and life-expectancy seems useful for this purpose.

Mo-P-48 OCCUPATIONAL RESPIRATORY DISEASES IN MONGOLIA

*Shagdarsuren O, Wang J.

Background and aims: Solid production of coal mining industry was increased 4 times and production of the mining of metal ores was increased 8 times in the last decade in Mongolia. Expenditure of occupational injuries and disease insurance fund for workers' compensation increased 5 times. Main occupational hazards are dust exposures and ergonomic factors. Most of the exposed people were excavator driver, driller, cutter and welder, who mainly work in the coal mining and construction.

Methods: In this study, we intended to establish the national cohort of patients with different occupational diseases and determine the incidence rates and proportions of major occupational diseases. During the last 2 decades, there were 4200 patients registered on the database of the National Centre for Occupational Diseases, Mongolia.

Results: The results showed that the annual incidence rate per 10,000 person-year for occupational respiratory diseases (ORD) was 1.61, musculoskeletal diseases 1.07, cardiovascular diseases 0.36, toxic hepatitis 0.14 and all types of poisoning 0.12. Incidence rate per 10-5 year⁻¹ of ORD for male was 2.81 and for female 0.62. From ORD, chronic bronchitis was the highest one (average 1.37, male 2.19 and female 0.54) and the second one is pneumoconiosis (average 0.33, male 0.57 and female 0.06). ORD are high for male workers aged between 36-55 years, educated in primary/ junior high level who are working as a driller, cutter and hewer for >5 years in coal and mineral mining factories. Excavator and heavy truck drivers and repairmen, welder were commonly suffered from dust induced bronchitis (22.6%), pneumoconiosis (19.2%) and lung cancer (28.6%). Pneumoconiosis was 40 times higher for male than female, aged older than 50s (65.1%). One out of three drillers/cutters/or hewers with ORD have diagnosed by tuberculosis (34.4%). Health care and laboratory workers have suffered more commonly from asthma (24.7%). Majority of the workers with ORD lost their work capacity by 41-70%.

Discussion and conclusions: We concluded that it has become increasingly important to prevent the occupational diseases and injuries by improving the working conditions, the knowledge and skills of workers on occupational health and safety, and enhancing the qualifications of occupational health and safety specialists and industrial hygienists.

Mo-P-49 HYPERCAPNIC VENTILATORY RESPONSE IS NOT IMPAIRED IN PROFESSIONAL OFFSHORE SATURATION DIVERS

*Segadal K, Thorsen E.

Background and aims: Retention of carbon dioxide (CO₂) is a risk in diving. It might be caused by increased dead space, insufficient CO₂ removal from the inhaled gas, increased breathing resistance and a reduced response to increased CO₂. Hypercapnia might lead to increased risk of nitrogen narcosis, oxygen toxicity (convulsions) and loss of consciousness. It has been found that some experienced air divers and breath-hold divers have a reduced hypercapnic ventilatory response (HCVR). In this study the HCVR in saturation divers was assessed.

Methods: Hyperoxic hypercapnia rebreathing (Read's method) was carried out under normal atmospheric conditions by 35 male professional offshore saturation divers (D) and 35 controls (C) matched for age, height, body mass and smoking habits. The HCVR was assessed by the slope (S) of the linear regression of ventilation versus the increasing end-tidal CO₂.

Results: Mean S for D (25 ± 13 l/min per kPa) was normal and not different from C (26 ± 11 l/min per kPa). There was no difference in the position of the regression lines (B) for the two groups.

Discussion and conclusions: In other studies of groups of divers doing mainly deep air diving, a significantly reduced HCVR was found. It is not known if this is inherent or acquired, but it has been speculated that it could be a result of a continuous selection process favouring divers with a low HCVR. It may be that a similar selection process is not taking place in saturation divers who breathe helium oxygen mixtures which have less gas density and is without narcotic potential. This is in line with the result of a recent study where military oxygen divers who only did very shallow diving had no reduction in HCVR. These other studies had groups of similar or smaller size compared to our groups. We conclude that professional offshore saturation divers do not have a reduced ventilatory response to CO₂. Why this is different compared with other groups of divers is not known.

Mo-P-50 PROBLEMAS RESPIRATORIOS EN LA POBLACIÓN INMIGRANTE RECOLECTORA DE CAFÉ. COSECHA 2004 – 2005. ZONA DE LOS SANTOS, COSTA RICA

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Background and aims: Desde hace más de dos décadas llegan a la zona de Los Santos gran cantidad de trabajadores/as inmigrantes temporales para la recolecta de café. Durante la cosecha 2004-2005, realizamos un censo en el 80% de los inmigrantes, incluyendo datos de padecimientos presentes durante la recolecta del café. Este informe examina factores que se relacionan con síntomas respiratorios.

Methods: La población censada comprende 8783 personas inmigrantes, de las cuales 603 presentaban síntomas respiratorios, 914 presentaban algún síntoma no relacionado con problemas respiratorios y 7266 personas no presentaban padecimientos. Se utilizó el modelo de regresión logística con las variables sexo, edad, etnia, nacionalidad, ocupación, personas por dormitorio, tipo de albergue, tipo de abastecimiento de agua, ubicación de la cocina, energía utilizada en la cocina, distritos (altura) y distancia de servicios públicos.

Results: De los doce factores de riesgo analizados se obtuvo el OR y el índice de confiabilidad (95% IC) tanto para análisis univariable como multivariable. Cuatro factores se relacionaron significativamente con problemas respiratorios: edad < 14 y > 60 años, dedicarse al cuidado de niños, cocinar fuera de la casa y vivir en clima frío.

Discussion and conclusions: Se encontró que la variable distancia a servicios > 2000 m y origen son factores protectores en la población inmigrante temporal. Se encontró una probabilidad de 2.45 veces más de presentar enfermedades respiratorias en aquellas personas que se dedican a cuidar niños y realizar actividades domésticas que cualquier otra ocupación.

Mo-P-51 EVALUATION OF RESPIRATORY HEALTH STATUS OF OCCUPATIONALLY EXPOSED MALE KITCHEN WORKER IN INDIA

*Padhi BK, Padhy PK.

Background and aims: Long-term exposure to indoor air pollution may accelerate the development and progression of respiratory diseases of occupationally exposed populations. In India, a large proportions of the population working in hotels and canteens for preparing food. Occupational exposure to kitchen smoke may cause numerous health problems including the onset of acute or chronic respiratory diseases and lung function deficit. The study examined the effect of solid biomass cooking fuel on indoor air quality and its impact on the prevalence of respiratory symptoms and diseases among male kitchen workers in India.

Methods: The air quality parameters (CO, CO₂, NO, NO₂, SO₂, O₃, TSPM including temperature and relative humidity) were investigated using YES – Plus multigas air quality monitor for gaseous and Kimoto handy samplers (HS-7) for TSPM. Nine hundred seventy five kitchen workers were included for this study. A questionnaire developed on the pattern of IUATLD (International Union Against Tuberculosis and Lung Disease) with some modifications were used for evaluation of respiratory health. The lung function parameters viz., Peak Expiratory Flow (PEF), Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV₁), Forced Expiratory Flow (FEF), and Slow Vital Capacity (SVC) were examined on an electronic Spiro Meter (Maestro Medline Ltd.). Anthropometry measures namely height, body weight, waist circumference and hip circumference were collected from participants using standard techniques. Effects of exposure to cooking smoke and prevalence of respiratory disease were estimated using logistic regression analysis. The analysis was carried out after statistically controlling for confounding factors.

Results: Results indicate that subjects working using solid biomass as cooking fuel have a significantly higher prevalence of respiratory disorders than do those working using cleaner fuels [odds ratio (OR) = 3.59; 95% confidence interval (95% CI), 3.17–4.05], even after controlling for the effects of a number of potentially confounding factors.

Discussion and conclusions: The findings have important program and policy implications for countries such as India, where large proportions of the population rely on polluting biomass fuels for cooking and space heating. More epidemiologic research with better measures of smoke exposure and clinical measures of asthma is needed to validate the findings.

RISK REDUCTION

Mo-P-52 HEALTH AND SAFETY MANAGEMENT AND THE INTERFACES OF THE ORGANIZATIONAL CULTURE IN THE BRAZILIAN SIDERURGIC SECTION WORK ENVIRONMENT: ARCELORMITTAL BRASIL GROUP – SÃO PAULO DRAWING MILL CASE.

*Arcioni AC, Pantuza WB.

Background and aims: In the context of the advances of organizational management of major corporations, estimating that the competitive advantages of health and safety management is associate with productivity and work that values human development, this study considers to contribute and to amplify the reflexion on organizational conditions and social-psychological work improvement, through the identification, analyses and evaluation of the human behavior interfaced with the industrial environment, and trying to explain that work accidents still occur in supposedly safe environments because the event on its own is not an isolated case, but sure an accumulation of previous facts and mistakes.

Methods: Study case of São Paulo Drawing Mill, a unit of ArcelorMittal Brasil S/A. based on the results obtained locally by consult activity between 2003 and 2007.

Results: Advances in the field of H&S are possible from a global vision, especially if talking about the incorporation of human behavior interfaced with the work environment, here conceived as a critical organizational factor. This way, there would be structured parameters to conceive, implement and keep H&S management system, under the perspective of its systemic integration. Therefore it is important that H&S is recognized by other organization acting areas as a part of the business.

Discussion and conclusions: Here the following particularities are distinguished: 1: The difficulty of absorption of a new globalized business culture, since the “new cultures” in H&S conflicts with the local culture (discipline, knowledge, values, creeds and attitude). 2: Facing the difficulties of the perception of workers risk related to qualification or capacity, the results reached can not be properly optimized. 3: The conflicts in the relation between personal life and the demands of the professional life (work and context of daily routine) constitute in an important obstacle to health and safety goal optimization in an organization scope.

Mo-P-53

(Author gave an oral presentation on Wednesday.)

Mo-P-54 CONTROLES DE EXPOSICIÓN OCUPACIONAL A POLVO DE MADERA PARA PEQUEÑOS TALLERES DE ARTESANÍA Y ELABORACIÓN DE MUEBLES EN LA COMUNIDAD DE SARCHÍ

*Araya-Solano TM, Mata-Montero CL, Medina-Escobar ML, Astorga E.

Background and aims: Alrededor del 2.5% de la población laboral costarricense tiene exposición directa a polvo de madera (Chaves, 2005) y es el sexto agente cancerígeno ocupacional más común (Partanen, 2003). Para talleres de artesanía y muebles de madera en la comunidad de Sarchí, se encontraron niveles que superan los límites permisibles (Mata, 2006). Objetivo: Evaluar cambios en la exposición ocupacional a polvo de madera, tras intervenciones sobre prácticas de trabajo y controles de ingeniería de bajo costo.

Methods: Diseño experimental, con valoración pre y post intervenciones con integración de resultados de técnicas cualitativas y cuantitativas para el diseño de productos organizativos y prototipos ingenieriles.

Results: Durante la fase de pre intervención se recolectó información con los talleristas sobre experiencias exitosas para controlar exposición, conocimientos, principios utilizados en soluciones implementadas y principales obstáculos. Se recolectaron 140 muestras ambientales en 9 talleres, encontrándose valores de 0,37-240 mg/m³, entre las máquinas de lijado, corte, torneado y esmerilado. El rango de los promedios de concentraciones para los talleres fue de 4,5-86 mg/m³ y por máquina de 6,6-

90 mg/ m³.

Discussion and conclusions: Muestreos realizados muestran concentraciones muy elevadas, reforzando la importancia de implementar controles ingenieriles y administrativos. Los resultados más altos corresponden a talleres de fabricación de muebles y a procesos de lijado, especialmente la lijadora de banda. Los trabajos con cierras reportaron las concentraciones más bajas. El EPR se consideró inadecuado en el 89% de los casos. Los talleristas participaron activamente durante las capacitaciones, manifestaron su preocupación e interés para diseñar y evaluar sistemas de ventilación. En el 2008, se seleccionará la maquinaria en la que cada taller implementará un control ingenieril. Una vez en funcionamiento, se realizarán nuevas mediciones para verificar su efectividad y se premiarán los mejores proyectos.

Mo-P-55 INFLUENCES ON CONSTRUCTION HEALTH AND SAFETY PROGRAMS, PRACTICES, AND ATTITUDES IN COSTA RICA

*Alvarado R, Camp JE, Keifer M.

Background and aims: Globalization and the influx of multinational corporations into developing countries bring new challenges for host country companies. Large multinational companies, partnering with local companies may be able to improve health and safety practices in host country firms. The purpose of this project was to describe the safety programs and the commitment to safety among Costa Rican construction companies, including the possible influence of multinational company clients. A secondary purpose was to determine the influence of University of Washington-directed OSHA Training Institute (OTI) courses on construction company safety performance.

Methods: This qualitative project used semi-structured interviews of company management from thirty, randomly selected Costa Rican construction companies to assess company safety programs and culture.

Results: The majority of companies were engaged in commercial and industrial construction. The companies varied according to their trade association membership, duration of contact with multinational corporations, the skill set of their workforce, and the extent of their safety programs. Companies with affiliation with the Chamber of Construction and The Alianza were more likely to have dedicated H&S staff and budget, have a written safety program, and note the importance of multinational company expectations in motivating their own commitment to a culture of safety. These influences apparently continued beyond the life of individual construction projects.

Most of the affiliated companies were aware of the UW OTI, though felt the trainings were not always relevant to the Costa Rican work situations. Many respondents noted the lack of commitment of the government in enforcing H&S regulations. Costa Rican construction companies have a range of commitment to safety and many are aware of the UW OTI. Several of the surveyed companies noted that multinational clients can influence the expectations and motivations of developing country construction firms to address health and safety challenges.

Discussion and conclusions: Costa Rican construction companies have a range of commitment to safety and many are aware of the UW OTI. Several of the surveyed companies noted that multinational clients can influence the expectations and motivations of developing country construction firms to address health and safety challenges.

Mo-P-56 HOW MUCH TIME IS SAFETY WORTH?

*Lipscomb H, Kucera K, Dement J.

Background and aims: Nail gun injuries are among the most common in wood frame construction. Despite evidence that the majority of injuries from unintentional firings could be prevented with a sequential trigger mechanism on the tools, the safer trigger has not been embraced in the fast-paced residential construction industry. An experiment was conducted in an attempt to realistically evaluate the magnitude of productivity concerns.

Methods: Ten journeymen carpenters built a yard shed on two occasions with nail guns with two different trigger configurations, alternately, under controlled conditions. Each project was videotaped with time stamping and edited for extraneous activity. Mean differences in time required, nails used and proper placement were evaluated considering the trigger used and whether the building was the carpenter's first or second project. To account for repeated measures on the same individual, mixed linear models were used (Proc Mixed, SAS Version 8.2) (21) to estimate adjusted means of total time required, nails used and inaccurate nail placement. In each model, the trigger mechanism on the tool being used and the order of the building were entered as dependent variables, and the participant identifier was entered as a random effect.

Results: The sequential trigger tool required a mean of 10 additional minutes of active nailing time which represented 10% of mean nailing time [97 minutes] but only 0.77% of the total mean work time [1298 minutes] for the construction of each shed. No significant differences were observed in nail count or

placement. The majority of the time variability was related to who was using the tool, rather than the type of tool in their hand.

Discussion and conclusions: Productivity concerns should focus more on improving the skill of the carpenter rather than on the trigger mechanism. Failure to place tools with the safer trigger configuration, which requires the nose piece be depressed before the trigger is pulled, in the hands of workers does not make sense given the frequency and potential repercussions of injuries associated with the use of these tools in wood framing. The work demonstrates the use of an experimental design and mixed models in addressing an occupational injury issue.

Mo-P-57 KNOWLEDGE TRANSLATION AND OCCUPATIONAL HEALTH: A CASE STUDY OF MACHINE SHOPS AND EXPOSURE TO METAL WORKING FLUIDS
Nicol AM, *Hurrell AC.

Background and aims: A feature of occupational health research is that it is often possible to translate research results into direct prevention activities in the workplace. As such, the process of knowledge translation and exchange

(KTE) can be seen as having an immediate and profound effect on work-related morbidity and mortality. To date, however, our understanding of the factors that affect how occupational health research is translated to workplace policy and prevention activities is extremely limited. This research project investigated one occupational setting (small industrial machine shops) as an initial exploratory step towards developing a better understanding of KTE processes in occupational context.

Methods: Using the Mental Models methodological approach, scientists, machine shop workers, managers, policy makers and product representatives were interviewed to investigate the knowledge translation process around exposure to metal working fluids in machine shops. Influence diagrams were created for each group and these were compared and contrasted.

Results: Findings from this research suggest that there is only minimal transfer of scientific knowledge regarding the health effects of metal working to those at the machine shop level. A majority of workers did not perceive metal working fluids to be hazardous to their health. Of note was the finding that product representatives were rated highly as key sources of risk information

Discussion and conclusions: The translation of scientific knowledge to occupational settings may be poor, particularly in small workplace settings. This is due, in part, to lack of avenues through which communication could occur, lack of active promotion of health effects information and absence of accessible risk information.

Mo-P-58 WORKER UNDERSTANDING OF THE OCCUPATIONAL DISEASE PREVENTION AND CONTROL ACT OF THE PEOPLE'S REPUBLIC OF CHINA IN FOREIGN-INVESTED ENTERPRISES

*Lu R, Lin J, Xu Y, Liu Y, Schweigert M.

Background and aims: The Occupational Disease Prevention and Control Act (the ODPC-Act) of the People's Republic of China came into effect on May 1, 2002. The ODPC-Act identifies that employers are responsible for protecting their employees from exposure to occupational hazards. However, it is difficult to directly obtain information about employers' compliance with the ODPC-Act. It is generally accepted that improving workers' health requires worker understanding of applicable legislation in their workplace. Thus, an expected outcome of an employer being in compliance with the ODPC-Act is an understanding of employees regarding the existence and intent of the legislation. This understanding would be expected to occur with employer training. The purpose of this study was to assess workers' understanding of the ODPC-Act in the foreign-invested enterprises (FIE). Such information would be useful in evaluating implementation of the ODPC-Act in the FIEs and improving the role of workers in occupational health.

Methods: A total of 166 workers from three foreign-invested enterprises in Wuxi, China participated in this survey. The questionnaire asked for demographic information and included 25 questions related to the ODPC-Act.

Results: A majority of workers reported knowing the terms and purposes of the ODPC-Act and nearly half of respondents had knowledge of the concept of occupational disease hazards. Nevertheless, the level of understanding of occupational hazards in their working environments is low and many of the participants did not know the resources responsible for diagnostic tests and treatment of occupational disease(s). More than 20 % of workers did not recognize employers' violations of the ODPC-Act.

Discussion and conclusions: The knowledge of FIE workers regarding the ODPC-Act could be significantly be improved since many are not aware of their rights accorded to them under the ODPC-Act. FIE workers generally are uninformed of various parts of the Act. Workers also have knowledge of their

employers' violations of the ODPC-Act, but the percentage is much less. Increasing the FIE workers' knowledge of the ODPC-Act is needed.

Mo-P-59 ESTUDIO DE CASO PARA EL ESTABLECIMIENTO DE INSTRUMENTOS REGULATORIOS OCUPACIONALES Y AMBIENTALES PARA LA PRODUCCIÓN DE HORTÍCOLA

*Gonzalez Ruiz S, Chahede F, Roa R.

Background and aims: Evaluar el impacto de los sistemas de producción hortícola en la salud humana y en el ambiente, dentro su contexto social, para establecer instrumentos regulatorios ocupacionales y ambientales para la producción hortícola.

Methods: En el Distrito Municipal de Tireo-Constanza de la Republica Dominicana, un 36% de la población económicamente activa, 5,826 habitantes están involucradas en la agricultura. La población de estudio estuvo compuesta por 104 productores hortícolas de este distrito. Todos los escogidos participaron en el estudio y se les aplicó una encuesta socioeconómica y de salud.

Results: Un 98% de los productores hortícolas eran hombres y apenas un 2% mujeres. Las mujeres se dedican en su mayoría a las labores domesticas. Un 13.4% de los encuestados admitió que menores de 14 años manipulan agroquímicos sin la adecuada protección y supervisión. 88.5 % de los encuestados manifestó la manipulación del uso de agroquímicos sin ningún tipo de protección, mientras que el 11.5% indico lo contrario. Los agroquímicos más utilizados son los denominados organoclorados, or-ganofosforados, los carbamatos y el paraquat. Los tres primeros son insecticidas y el cuarto un herbicida. El 13% de los encuestados señaló que algún familiar que manipulaba agroquímicos había sido diagnosticado con alguna enfermedad asociada al uso de agroquímicos.

Discussion and conclusions: El actual modelo de producción agrícola del municipio de Tireo-Constanza está generando impactos y costos sobre el medio ambiente y la salud de las personas, principalmente que realizan labores agrícolas por el inadecuado uso y manejo de agroquímicos. Se recomienda desarrollar estrategias para eliminar el uso de los doce plaguicidas más tóxicos según el acuerdo 9 de la XVI Reunión del Sector Salud de Centroamérica y República Dominicana. Además es necesario reducir el uso de estos y otros plaguicidas usando técnicas como el manejo integrado de plagas y alternativas biológicas.

Mo-P-60 INDUSTRIAL EMISSION AFFECTING ENVIRONMENTAL POLLUTION, AND ITS CONTROL

*Lu Y, Lu JD.

Background and aims: This study was conducted due to complain of the community of skin and lung irritations from industrial emission from a manufacturing plant in the Philippines. The study tried to risk assessment for organic solvents in a printing industry; and to come up with control measures

Methods: The study was conducted in a printing industry with about 400 employees and in a highly populated community. Monitoring of ambient air for various organic solvents was done using detector tubes, sampling pumps and charcoal tubes.

Results: The industry as the target area uses solvents such as Ethyl Acetate (EAC), Methyl Ethyl Ketone (MEK), Ethanol, and Isopropyl Alcohol (IPA) for printing and lamination of plastics. The consumption of solvents is categorized as high with 40-60 tons of mixed solvents. Ambient concentration in the work area indicated the following measurements which were all above the thresholds limit value (TLV) set by OSHA. The results showed that workers were exposed to high concentrations of solvents that may cause adverse health effect. There is a need therefore to come up with a control device to clean the ambient air- both indoor and outdoor. To do this, an experiment was done using adsorbents- activated alumina and activated carbon. The results were as follows: After including the activated carbon, the effectivity of cleaning the polluted air with organic solventa was 91.9 % for EAC, 99.6% for IPA and 99.98% for MEK. For the activated alumina, it was 93.25% effective for MEK, 92.06% for IPA, and 93.25% for EAC. Both adsorbent tubes were effective in reducing concentrations of solvent fumes and that the activated alumina was more effective for both MEK and IPA.

Discussion and conclusions: The study showed that environmental and industrial pollution and health problems from solvents in factories can be reduced by using adsorbents in the ducting system as an air control device.

SOCIAL AND PSYCHOLOGICAL FACTORS IN THE WORKPLACE

Mo-P-61 EMPLOYMENT, WORK, AND HEALTH INEQUALITIES: A WORLDWIDE PERSPECTIVE

Benach J, Muntaner C, Santana V, *Vergara-Duarte M, Castedo A, Solar O, Chung H, Employment Conditions Knowledge Network

Background and aims: The Employment Conditions Network (EMCONET) is one of the nine Knowledge Networks established in 2005 under the auspices of the Commission on Social Determinants of Health (CSDH) of the World Health Organization. The CSDH will release its Final Report in May 2008 while a book by EMCONET will also be published later that year. The first aim of EMCONET is to provide a global understanding of employment relations as determinants of health inequalities. A second aim consists of using this new understanding to develop effective policies and interventions to reduce employment related health inequalities. The objective of this presentation is to summarise the main conclusions and recommendations contained in the forthcoming volume made by EMCONET.

Methods: Using a broad transdisciplinary approach, and including an extensive variety of methods, sources of information, and participants from all over the world, six employment “dimensions” are analysed (full time permanent employment, unemployment, precarious employment, informal employment, child labour, and slavery and bonded labour) through the lens of five axes (social class, gender, age, ethnicity/race, and migrant status).

Results: Main EMCONET products include: (1) a glossary with the key concepts developed by the network, for instance, “fair employment”; (2) a theoretical model showing the links between employment dimensions and health inequalities; (3) a novel empirical worldwide typology of countries, based on prevailing employment relations and labour market characteristics around the globe; (4) a worldwide estimate of the employment-related excess of deaths; (5); an analysis of the pathways and mechanisms linking employment, work, and health inequalities; (6) a typology of policies and interventions with policy “entry-points” aimed at reducing employment- and work-related health inequalities, and (7) the gathering of a large number of descriptive or analytical case studies, examples, and experiences, including some of the “voices” and “faces” of workers.

Discussion and conclusions: To our knowledge this is the first study to provide a rigorous and comprehensive analysis on how employment relations affect health inequalities worldwide, and how this understanding can help promote worldwide effective policies and institutional changes capable to reduce employment related health inequalities.

Mo-P-62 GLOBAL MEASURE OF SATISFACTION WITH PSYCHOSOCIAL WORK CONDITIONS VERSUS MEASURES OF SPECIFIC ASPECTS OF PSYCHOSOCIAL WORK CONDITIONS IN EXPLAINING SICKNESS ABSENCE.

*Munch-Hansen T, Wieclaw J, Agerbo E, Westergaard-Nielsen N, Bonde JP.

Background and aims: Attempts to identify particular components of psychosocial work conditions as predictors of sickness absence remain inconclusive. A global measure has previously been suggested to be an efficient way to measure psychosocial work conditions in questionnaires.

This paper investigates whether satisfaction with specific aspects of psychosocial working conditions explains sickness absence beyond its association with a global measure of psychosocial working conditions.

Methods: The participants were 13,437 employees from 698 public service workplaces in Aarhus County, Denmark. Six aspects of psychosocial work conditions were identified on the basis of 33 items through principal component analysis. The aspects were skill discretion, professionalism, management, decision authority, workload and cooperation. A global measure rating satisfaction with psychosocial work conditions on a scale from 0 to 10 was also included in the questionnaire. Individual ratings were aggregated to workplace scores. Analysis of variance was used to compare the average number of days of yearly short-, medium- and long-term sickness absence according to different levels of satisfaction with six components of psychosocial work conditions. The covariates included were gender, age, occupation, size of workplace, contact to somatic hospital, civil status and children below 13 living at home.

Results: Dissatisfaction with each of the six aspects of psychosocial work conditions was associated with an increase in sickness absence. When all aspects were simultaneously included in the model, only skill discretion and professionalism were negatively associated with sickness absence. When a global measure of satisfaction with psychosocial working conditions was also introduced in the model none of the specific aspects showed a significant association with sickness absence.

Discussion and conclusions: Low satisfaction with global psychosocial work conditions is associated with increased levels of sickness absence. Including specific aspects of psychosocial work conditions in the model does not provide further information regarding nature of this association.

Mo-P-63 UNDERSTANDING SICKNESS ABSENCE

*Haukenes I, Moen BE.

Background and aims: In Norway there has been a major focus on sickness absence the past years. Much research has been performed to understand the relationship between work and sickness absence. The main focus has been upon workers with long term sickness absence. Little attention has been given to factors that make a worker become a patient.

This project aims at understanding the interrelated factors that leads a healthy worker into sickness absence, by exploring the workers experiences with their own absence.

Methods: Short interviews of all workers in 19 car repair shops (n=719) have been performed, response 95%. We asked for background information, experiences of sickness absence past year and experiences of presence/absence decisions when feeling sick. The interview contained both standardized and free questions. Descriptive statistics and phenomenological analysis were used.

Results: 90% of the workers were men. Mean age was 37 years, mean education time after primary school was 3.6 years and mean period in present workplace was 10 years. Half of the workers had not experienced sickness absence the past year. Causes for self-reported absence were influenza, colds, gastroenteritis in 60% of the cases and musculoskeletal pain only 10%. 40% of the workers had experienced a sickness absence confirmed by a physician (when absence exceeds three days). Two major causes for absence were musculoskeletal pain (47%) and respiratory infection (23%). Workers without sickness absence experienced that good health, joy at work, responsibility for others and reluctance to be at home were main causes for going to work even when they felt sick.

Discussion and conclusions: Workers in car repair shops did not use short term sickness absence when experiencing musculoskeletal pain although the frequency of sickness absence caused by musculoskeletal pain (confirmed by a physician) was high (50%). Does this mean that working with pain is a common strategy and can this represent a risk for future sickness absence? This finding must be further analysed and discussed. Type of work seems of importance to presence at work.

Mo-P-64 HIDDEN WORK HAZARDS: DIRECT OBSERVATION OF CHILDREN AT WORK
*Nuwayhid IA, Saddik B.

Background and aims: Children work in hazardous and demanding jobs out of poverty and due to lack of economic or educational prospects. Their exposures are similar, but not necessarily the same, as adult workers in the same workplace. The objective of this paper is to document the hazards to which children working in industrial workshops are exposed.

Methods: Walkthrough surveys were conducted in 79 industrial shops in Tripoli, North Lebanon. A sample of 24 children (11-17 years) working in 10 autobody repair, 9 mechanical, and 5 furniture-painting shops were selected. Each child was observed for 4 continuous hours at work. Tasks were recorded by trained observers every 10 minutes using a checklist and free writing space in which they described what the child did. The data were analyzed quantitatively using the checklist and extracting information from the descriptions, as well as developing a summary description of the 4 hour period for each child.

Results: Out of the 24 children, 4 (17%) used at least once power tools, 4 (17%) vibrating tools, 14 (58%) slippery tools, and 21 (88%) tools with large handles. In addition, 18 (75%) applied high force and 23 (96%) sudden exertion. Four (17%) did work that required awkward postures, however 22 (92%) did work that required twisting/bending, 22 (92%) kneeling squatting, 19 (79%) stretching, and 18 (75%) wrist twisting. Six children (25%) used their hand in lieu of a hammer. No protective gloves or masks were provided. The shops had poor ventilation and most smelt of pungent solvent/paint odors. Furthermore, 7 children (29%) washed tools with solvents, 5 (21%) washed their hands with solvents, and 5 (21%) were seen siphoning gasoline. Children were also involved in general cleaning of the shops and bought cigarettes and other items for adult workers.

Discussion and conclusions: Children are exposed to many ergonomic, physical and chemical hazards in these workshops putting them at high risk of long-term health problems. Direct observation of children at work uncovers many hidden hazards where standardized questionnaires fall short. These exposures require focused intervention and should attract the attention of concerned civil society organizations.

Mo-P-65 OCCUPATIONAL INEQUALITIES IN MORTALITY AMONG MIDDLE-AGED POPULATION

*Reklaitiene R, Baceviciene M, Tamosiunas A.

Background and aims: Variations in patterns of cause of death between occupational categories provide valuable clues for the explanation of disparities in health because they point to the specific mechanisms linking low occupational position to ill health. The objective of this study was to assess the importance of occupational groups to mortality risk in 35-64 aged Lithuanian population.

Methods: The MONICA study was carried out in 1983-1993 in 3320 men and 3598 women aged 35-64. The study population was classified by occupation into five categories using the International Standard

Classification of Occupations: workers, professional workers, officers, drivers, others. During 20 years there were 980 deaths, 635 among men and 345 among women. Mortality rates (1000 person/yr) were calculated for deaths from all causes, cardiovascular diseases(CVD),coronary heart disease (CHD),malignant neoplasms and external causes by mean of death register. The estimates of hazards ratio (HR) and 95% confidence interval (CI)were based on the Cox's model.

Results: Controlling for age, the HR of mortality from all causes and from CVD was higher in all three occupational categories among men; from CVD, malignant neoplasms and external causes the hazards ratio was higher among manual skilled and manual low specialization categories as compared to reference group. Among manual skilled women HR from all causes was 1.7(95%CI, 1.28-2.48), from CVD was 2.9(95% 1.43-5.89) and from CHD 3.5(95% 1.23-9.99) higher as compared to non-manual skilled women.

Discussion and conclusions: The results of several studies reported the higher rates of total mortality, mortality of malignant neoplasms and CVD mortality among manual workers as compared to non-manual workers although the differences are more clear among men than among women. A variety of reasons could explain an excess risk of morbidity and mortality among manual workers: exposure to early life factors, social selection factors, current living conditions, smoking, dietary habits, some features of personality. Some studies estimated, that nearly one quarter of the difference in life expectancy between male manual and non-manual workers was due to alcohol-related deaths. Effective interventions should be developed and implemented to reduce exposure to death in low occupational groups.

Mo-P-66 CHANGES IN PRODUCTION AND OCCUPATIONAL HEALTH IN ECUADOR

*Harari R, Harari N, Harari H.

Background and aims: Last two decades dramatic changes have occurred in the production in Latin America, and in Ecuador. Globalization have pushed new rules in the market and produced a big impact in local production pressing for exportations. The new strategies for this production led to look for more quality and efficiency and modified the work organization and the working conditions.

Methods: Compilation of official and unofficial documentation from different sources as well as interviews with some key actors has been done. Information was organized, classified and analyzed from general to particular and specific aspects. Economical, social, labour and occupational safety and health aspects were the most important variables considered.

Results: Industries changed under different mechanisms, with common characteristics of costs reduction and increased work rhythms. A strategy of high productivity based on flexible work and under precarious conditions, produced high rotation of workers, no affiliation to social security, outsourcing and intermediation in the workforce, and workers exposed to multiple risks. Official Labour policies favour and benefit many production strategies but at the same time discourage the role of governmental agencies to control and regulate labour rights. Most of the companies adopted cheap personal protective equipment. Engineering controls and substitution of materials rarely were adopted. Professional diseases recognized rates are low, and work accidents increased in some activities in frequency and in severity, although still exists an underestimation.

Discussion and conclusions: In these production strategies, Occupational Safety and Health is one of the labour rights lost or scarcely accepted. Flexible work was intentionally misunderstood and used exclusively for production, to avoid workers organization and to elude respect of labour rights. Few quantitative data in workplaces is available, most of exposures are not measured. Under these conditions there is the need to analyze production and exposure and health consequences for the workers, to provide arguments to reinforce and update unions as well as governmental regulations in occupational and environmental health and safety, in order to regain the labour rights.

Mo-P-67 FACTORES DE RIESGO RELACIONADOS CON LA SALUD Y EL BIENESTAR DE LA COMUNIDAD EDUCATIVA DE LA COMARCA DE OSONA

*Molinero E.

Background and aims: El objetivo general era identificar y priorizar los factores de riesgo que se relacionaban con la salud y el bienestar de los miembros de la comunidad educativa y los específicos, identificar diferencias en la exposición entre etapas educativas, personal docente y no docente y escuela pública y concertada.

Methods: Se utilizó la Técnica Delphi de tres rondas con el fin de comprender el fenómeno a estudiar y facilitar el consenso en el momento de ordenar los problemas. La participación de los trabajadores era fundamental tanto desde un punto de vista metodológico como operativo. El estudio se llevó a cabo, entre marzo y mayo de 2006, en 10 centros escolares de la comarca de Osona de Catalunya que incluye áreas urbanas y rurales y participaron 296 de 533 trabajadores. Los datos se recogieron entre marzo y mayo de

2006. En la primera ronda se preguntaba “¿cuales son los factores de riesgo que afectan negativamente el bienestar y la salud del colectivo de profesores / personal de apoyo?”.

Results: En Infantil y Primaria los factores se relacionan con las exigencias psicológicas y las interacciones con las familias, en Secundaria con las exigencias emocionales y la falta de reciprocidad por el esfuerzo realizado por otros agentes. La falta de valoración por parte de los docentes es el factor más importante para el personal no docente. No se observan diferencias entre pública y concertada.

Discussion and conclusions: Los factores que afectan la salud de la comunidad educativa son de naturaleza psicosocial. Son distintos según etapa educativa y ocupación pero no independientes entre sí; los identificados en secundaria se expresan como consecuencia de situaciones existentes en etapas anteriores y los del personal no docente, una consecuencia de los que afectan a docentes.

Las altas tasas de respuesta, la gran homogeneidad intra-grupo – según etapas educativas y ocupación docente/no docente- y la gran heterogeneidad entre grupos, permiten profundizar en la comprensión de las condiciones de trabajo específicas. Las técnicas de consenso son un instrumento útil para identificar como se materializan los factores de riesgo psicosocial con el fin de orientar propuestas preventivas que cuenten con la participación de los trabajadores implicados.

Mo-P-68

(Author did not attend conference.)

Mo-P-69 WORKPLACE VIOLENCE IN ILLINOIS, USA

*Forst L, Friedman L, Hirter A.

Background and aims: Workplace assault is the fourth leading cause of occupational mortality in the US and a source of significant occupational morbidity, worldwide. Although there has been a decline in workplace assault in the US, the possibility of under-reporting and the relationship with overall violent crime have not been evaluated. The State of Illinois has a population of 12.5 million and a working population of around 6 million. The mix of economic sectors and the diversity of the working population is fairly representative of the US as a whole. The goal of this project is to describe numbers, rates and trends in workplace assaults in Illinois and their relationship with underlying violent crime.

Methods: Data was obtained from the Illinois Trauma Registry, the US Bureau of Labor Statistics, and the FBI Bureau of Justice Statistics for Illinois from 1995-2003. Numbers, rates, and trends in fatal and non-fatal assaults by age, race/ethnicity, and gender are calculated. The relationship of occupational crime with underlying violent crime was determined.

Results: Rates of violent crime, overall, are decreasing more rapidly than rates of death from occupationally-related violent crime in Illinois. Non-fatal workplace assault does not appear to be decreasing at all. African Americans are more likely to be the victims of workplace assault.

Discussion and conclusions: The difference in numbers and rates between the BLS and the Trauma Registry suggest under-reporting to the nationally accepted data repository for occupational injury. In addition, the rate of severe traumatic injury does not follow the trend of violent crime in society, overall. Our data suggest that current efforts to reduce workplace assault are not working in Illinois. This research cannot explain the finding of increased rates in African Americans.

Mo-P-70 MULTIPLE PARAMETERS OF ORGANIZATIONAL FACTORS AND ITS EFFECT ON WORKER'S HEALTH

*Lu Y, Lu JD.

Background and aims: The study aimed at looking into the problems caused by organizational factors such as job autonomy, content of job, nature of task, hazard exposure and management styles to mental health of women workers; and to look into the association between physical and psychological illnesses.

Methods: This was conducted in an export zone involving 31 industries and an interview with 613 women workers, using a stratified sampling technique according to size and type of industries. Workplace environment monitoring was done, as well as personal interviews and survey questionnaires.

Results: Workers who have autonomy in making use of their own strategy to accomplish their work are likely to have better level of physical health. Those under close monitoring are more likely to have low level of physical health. The study also showed that skin allergy among workers is commonly caused by exposure to dust and exposure to vapors. Moreover, workers who are under work pressure and work overtime are more prone to having skin allergies. Those who have the autonomy to make use of their own strategy in accomplishing their work are less likely to have skin allergies. Exposure to hazardous work and strict supervision and lesser participation in production benchmarking increases a worker's chances of having skin allergies. Other illnesses such as hypertension, low back pain respiratory problems were affected by the interaction of hazard exposures and organizational factors at work.

Discussion and conclusions: The study showed that there are various parameters of organizational factors that affect health of workers. All these interactions must be considered by occupational health practitioners to promote welfare and productivity of workers.

ABSTRACTS TUESDAY, JUNE 10, 2008

Oral Sessions

CANCER: MISCELLANEOUS SITES 1

Tu-O-1 OCCUPATIONAL EXPOSURE AND CANCER OF THE LARYNX: FINDINGS OF A GERMAN CASE-CONTROL STUDY

*Ahrens W, Ramroth H, Dietz A, Becher H.

Background and aims: Besides alcohol drinking and smoking occupational exposures are considered important factors in the etiology of laryngeal cancer, but their relevance is not yet fully assessed. This population-based case-control study was performed in the Rhein-Neckar region, Germany, to shed further light on a number of known and suspected occupational causes of this disease.

Methods: Between May 1998 and December 2000, 257 patients (236 males, 21 females), aged 37-80, with histologically confirmed laryngeal cancer, as well as 769 population control persons (702 males, 67 females), were recruited (1:3 frequency matched by age and sex). The complete individual work history, occupational agent exposures, as well as other risk factors (tobacco, alcohol) were obtained by face-to-face interviews using a detailed standardized questionnaire. Assessment of work conditions was obtained by job-specific questionnaires (JSQs) for selected jobs known to be associated with exposure to potential laryngeal carcinogens. Estimates for lifetime exposure hours by substance were calculated based on JSQs. A specific substance checklist (SCL) was used as second method for exposure assessment. Published occupational hygiene data were used to infer semi-quantitative estimates of exposure intensity for specific job tasks. Odds ratios (OR) and 95% confidence intervals (CI) adjusted for tobacco and alcohol intake were calculated by logistic regression.

Results: An OR of 2.42 was calculated for workers exposed to cement during their work as building and construction workers in the highly exposed subgroup (CI 1.14-5.15). Exposure to polycyclic aromatic hydrocarbons (PAH) was associated with an OR of 5.2 (CI 1.6-17.1) when concordantly classified by JSQs and SCL and showed a clear dose-effect relationship ($p < 0.01$ for linear trend) for duration. These findings are supported by elevated risks in occupational groups with likely exposure to PAH. Cumulative exposure to more than 1760 lifetime-hours to wood dust, derived from either the JSQ- or the SCL-method, resulted in an OR of 1.6 (95% CI: 0.96-2.7).

Discussion and conclusions: Our study shows elevated risks for exposure to cement dust, PAH and wood dust after adjustment for smoking and alcohol. Risks were particularly pronounced for exposures in the construction industry. The most suitable method of exposure assessment may differ between the agents considered.

Tu-O-2 INVESTIGATION OF A RENAL CELL CANCER CLUSTER IN A CHEMICAL FACTORY IN FRANCE

*Iwatsubo Y, Benezet L, Boutou Kempf O, Fevotte J, Garras L, GOLDBERG M, LUCE D, IMBERNON E.

Background and aims: In December 2002, a kidney cancer cluster was reported among the workers of a chemical plant manufacturing nutritional supplements for animal feed. The estimated standardized incidence ratio was 13.1. Nine out of the ten index cases were diagnosed after their enrollment in an ultrasonic abdominal screening program conducted since 1986 among some categories of workers. To investigate this cluster, two epidemiological studies were conducted: a retrospective cohort study to analyze cause specific mortality and a nested case-control study to examine the relation between exposure to occupational factors and the renal cell cancer among the employees of this plant.

Methods: All workers who had been employed at least six months in the plant between 1960 and 2003 were included in the cohort study. An extensive search for additional kidney cancer cases among the former or current employees of the plant was conducted in hospitals and pathological laboratories located in the region. Social Security data were also examined to identify other cases. Five controls per case matched on date of birth and gender were selected at random. A standardized questionnaire for work history and past medical history was completed by trained interviewers. Assessment of occupational exposures was realized by industrial hygienists.

Results: The cohort included 2°522 subjects. For the 1968-2002 period, no significant excess mortality was observed neither for all causes of death, all cancers or for kidney cancer. The case-control study included 18 cases and 82 controls. Attending the ultrasonic abdominal screening program (OR = 9.7, 95%CI = [2.4 – 39.8]), obesity (OR = 7.4; 95%CI = [1.3 – 40.4]), hypertension (OR = 2.9, 95%CI = [1.0 – 8.6]) and tobacco consumption (OR = 2.4, 95%CI = [0.6 – 10.4]) were associated with an increased risk of renal cell cancer. No significant excess was observed according to the different types of work activity performed in the plant. A total of about 70 work places within the plant were identified for the study period. A significant increase in OR was observed for two of these work places in the production area.
Discussion and conclusions: Analyses on selected chemical agents are being carried out to complete these results.

Tu-O-3 OCCUPATIONAL RISK FACTORS FOR HEAD AND NECK CANCER IN FRENCH WOMEN

*Luce D, Carton M, Cyr D, Schmaus A, Cénéé S, Menvielle G, Papadopoulos A, Stücker I.

Background and aims: Relatively few occupational studies have addressed head and neck cancer, and these studies have been predominantly conducted in men. Accordingly, our objective was to investigate the association between head and neck cancer and occupation in women.

Methods: As part of a large population based case-control study conducted in France between 2002 and 2007 (the ICARE study), 368 incident female cases with head and neck cancer and 713 female population controls were interviewed. Cases were identified in ten areas covered by a cancer registry; controls were selected by random-digit dialing, with frequency matching for age and region. In addition to detailed lifetime occupational histories, information was collected on other risk factors, particularly on smoking and alcohol consumption. A preliminary analysis based on job titles was performed. Odds-ratios (OR), adjusted for age, smoking and alcohol drinking, and 95% confidence intervals (CI) were estimated using unconditional logistic regression.

Results: The risk of head and neck cancer was significantly increased for charworkers and cleaners (OR: 1.5, 95% CI: 1.0-2.2), blacksmiths, toolmakers and machine tool operators (OR: 3.4, 95% CI: 1.2-9.2), electrical and electronic workers (OR: 3.4, 95% CI: 1.2-9.7), more specifically electrical and electronic equipment assemblers (OR: 8.4, 95% CI: 1.8-40.4), and food and beverage processers (OR: 2.3, 95% CI: 1.0-5.7). In addition, non-significantly elevated ORs were observed for hairdressers (OR: 1.6, 95% CI: 0.6-4.5), machinery fitters and machine assemblers (OR: 2.2, 95% CI: 0.8-6.1) and knitters (OR: 4.4, 95% CI: 0.6-29.8). Teachers, managers and clerical workers had a significantly decreased risk.

Discussion and conclusions: These first results suggest that occupational factors may play a role in the risk of head and neck cancer in women. Further analyses, by cancer site and taking into account employment duration are in progress. Occupational exposures to several substances will be assessed from the questionnaires, and future research will be seeking to identify specific causal agents.

Tu-O-4 BLADDER CANCER AND EXPOSURE TO DIESEL ENGINE EXHAUSTS: A CASE-CONTROL STUDY USING A NOVEL PROBABALISTIC EXPOSURE ASSESSMENT

*Albin M, Tinnerberg H, Broberg K, Björk J.

Background and aims: The impact on bladder cancer risk from exposure to polycyclic aromatic hydrocarbons, diesel engine exhausts, aromatic amines, and hair dye use, was investigated in a case-control study.

Methods: Cases (n=97, 64% participation) from two hospitals and two frequency-matched (sex, age/year if selection, geographical area) population controls per case (n=201, 52% participation) were included. A life-long history on employment and leisure-time exposures was obtained in face-to-face interviews. The probability of exposure to each agent at five different levels was assessed for each employment/leisure-time activity by an occupational hygienist. Associations were evaluated with logistic regression adjusted for the matching factors, and smoking.

Results: Duration of exposure to diesel engine exhausts was associated with bladder cancer risk (estimated increase 3.3% per year; 95% CI 0.8%, 5.8%) corresponding to an OR of 2.3 (95% CI 1.2, 4.1) for 25 years of exposure. An association was indicated also with probability of exposure (certain exposure 22% of cases and 12% of controls, respectively: OR=1.7, 95% CI 0.88, 3.2). The predominant estimated exposure level was 2-10 µg/m3 elemental carbon.

Exposure to aromatic amines was rare yielding imprecise estimates of risk (+3.0% per year, 95% CI - 3.6%, + 9.9%; certain exposure OR=1.5, 95% CI 0.33, 6.7). No effect was discerned from exposure to polycyclic aromatic hydrocarbons or hair dyes.

Discussion and conclusions: Consistent associations were observed between exposure to diesel engine exhaust and bladder cancer risk. The probabilistic approach to exposure assessment merits further development.

Tu-O-5 UNRECOGNIZED BURDEN OF OCCUPATIONAL DISEASE ASSOCIATED WITH ASBESTOS EXPOSURE

*Demers PA, McLeod CM, Kirkham T, Gan W, Tamburic L, Xu F, Koehoorn M.

Background and aims: Asbestos has long been recognized as a cause of both cancer and lung disease and over 30 years have passed since major control measures and restrictions came into effect in many countries. Many recent studies have focused on trends in mesothelioma incidence, which have still not peaked in many countries. However, few studies have tried to estimate the number of cases of asbestosis, lung cancer, and other cancers associated with asbestos exposure. This presentation will review recent efforts to do so in the Canadian province of British Columbia (BC), a region with approximately 4.25 million residents.

Methods: Data from the BC Cancer Agency (tumour registry) and WorkSafe BC (workers' compensation) were used to identify cases of mesothelioma. Data from the BC Ministry of Health (outpatient billings and hospital discharges) and WorkSafe BC were used to identify cases of asbestosis. The number of lung cancers was estimated based on the ratio of excess lung cancers to mesotheliomas observed in epidemiologic studies of asbestos-exposed workers, which have ranged from 1.5 to approximately 4. There are no established methods for other cancers.

Results: Based on tumour registry data there are approximately 65 new mesotheliomas diagnosed per year. Based on outpatient visits, hospital visits, or accepted workers' compensation claims there are approximately 100 new asbestosis cases per year. Approximately 50 would be identified each year using a much stricter asbestosis case definition of hospital records and workers compensation claims only. If we assume two asbestos-related lung cancers for every mesothelioma then there are approximately 130 new lung cancers per year. In addition, a small number of laryngeal and digestive cancers would also be expected. There are approximately 70 people with asbestosis, mesothelioma, or other cancers who receive workers compensation each year because of asbestos exposure.

Discussion and conclusions: Taken together, these data indicate that at least 250 to 300 new cases of asbestos-related disease are diagnosed each year. Few people with mesothelioma survive two years and 5-year survival for lung cancer in Canada is approximately 16%. Almost 30 years after major prevention initiatives the toll taken by asbestos remains substantial.

Tu-O-6 THE EFFECTS OF SMOKING AND COOKING EMISSIONS ON LUNG CANCER RISK AMONG CHINESE WOMEN IN HONG KONG

*Wang X, Chiu Y, Qiu H, Yu IT.

Background and aims: Lung cancer has been a top cancer killer in Chinese women since the last decade. Identifying causative factors is crucial to form an effective prevention strategy. This study is to evaluate the effect of smoking conditional on level of cooking emission exposure on lung cancer, and determine whether there is a joint effect of these two risk factors.

Methods: Data were obtained from a population-based case-control study conducted in Hong Kong Chinese females, which recruited 279 cases newly diagnosed primary lung cancer with histological confirmation, and 322 control subjects randomly sampled from the community, frequency matched by age group. Face to face interviews were administered using a standardized questionnaire. Unconditional logistic regression was applied to estimate lung cancer risk related to smoking, exposure to cooking fume that were quantitatively expressed as total cooking dish-years. Environmental tobacco smoking (ETS) was also considered along with residential radon exposure, dietary factors, and family cancer history.

Results: Current smoking was associated with four-fold increased risk, and ex-smoking with two-fold risk compared to nonsmoking, which was not much affected by cooking dish-years. No apparent effect of ETS was observed. In the analysis of the joint effect, the combinations of smoking and cooking dish-years tended to have a greater risk than exposure to cooking fume alone. Interestingly, a dose-response gradient with increasing total cooking dish-years was shown in nonsmokers, but not in smokers. Smoking was strongly associated with nonadenocarcinoma, whereas exposure to cooking fume appeared to be related to both adenocarcinoma and nonadenocarcinoma.

Discussion and conclusions: The study reconfirmed the important roles of smoking and cooking emissions from frying in lung cancer risk among the Chinese women. These two risk factors acted independently, and their joint effect on lung cancer appeared to be additive.

RESPIRATORY HEALTH 2

Tu-O-7 RESPIRATORY HEALTH OF STONECRUSHERS FROM THE INFORMAL SECTOR IN TANZANIA

*Naidoo RN, Kessy FM, Mlingi L.

Background and aims: The prevalence of dust-related respiratory problems and relationships between health endpoints and respirable dust were investigated among stonecrushers in an informal sector quarry in Dar-es-Salaam, Tanzania.

Methods: Exposure and respiratory outcomes were assessed in 200 workers, employed for at least one year. A randomly selected subset (n=60) had spirometric assessments. Associations were investigated between exposure and respiratory outcomes, based on questionnaires and spirometry.

Results: Area dust levels ranged from 7.5mg/m³ – 10.3mg/m³ (mean = 9.8mg/m³). The mean exposure duration of this sample was 7.5 years (range: 1 - 62 years). The average age was 36 years, with 48% women (n= 97) participating. Smoking was common – 19.5% were current and 1.5% were ex-smokers. Reported prevalences of doctor-diagnosed respiratory diseases were: asthma (3%), chronic bronchitis (3%), emphysema (0%) and tuberculosis (2%). This contrasted with the reporting of respiratory symptoms of chronic cough (13.5%), chronic phlegm (15%), wheeze (87%) and breathlessness (20%). Age and height adjusted mean forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) was 2.78L/min and 3.76L respectively, among the men and 2.18L/min and 3.00L respectively among women.

Although years worked in stonecrushing was not statistically significant, it contributed a small adjusted loss in FEV1 of 2ml per year worked. Doctor-diagnosed TB was a statistically significant predictor of adjusted FEV1 and FVC, accounting for a loss of approximately 600 ml and 800ml of FVC and FEV1 respectively. While the adjusted risk for symptoms outcomes due to high exposure (as compared to medium exposure) was consistently in the expected direction (with odds ratios ranging from 1.7 for frequent cough; 3.4 for frequent episodes of phlegm; 2.0 for symptoms of chronic bronchitis), this was only statistically significant for frequent phlegm production, after controlling for smoking status and doctor-diagnosed TB.

Discussion and conclusions: Stonecrushers in the informal sector of Dar-es-Salaam seem to be at increased risk for the development of adverse respiratory outcomes, in a dose-response manner. Cost effective interventions are necessary to protect these marginalised self-employed workers with little resources for engineering dust controls. The low levels of doctor-diagnosed diseases compared with the higher levels of symptoms suggests restricted access to health care.

Tu-O-8 EXPOSURE TO GASES AND FUMES INCREASE THE MORTALITY FROM PNEUMONIA

*Torén K, Bergdahl I, Ouarfordt I, Järholm B.

Background and aims: The aim of this study was to elucidate whether occupational exposure to gases, irritants or welding fumes increased the risk for pneumonia, especially lobar pneumonia.

Methods: The study population was a cohort of 52,511 occupationally exposed Swedish male construction workers and 41,063 unexposed male construction workers. Our definition of exposure to fumes (metal fumes and diesel exhaust) and gases and irritants (organic solvents and reactive chemicals) was based on a job-exposure matrix with focus on exposure in the mid-1970s. The cohort was followed from 1971 to 2002, and the analyses of mortality to pneumonia was adjusted for age, smoking and hypertension. Pneumonia was classified as 480-483, 485-486 and 487A regarding ICD9 and regarding ICD 10 it was J10-J16 and J18. Lobar pneumonia was defined as 481 (ICD 9) and J13 and J18.1 (ICD 10).

Results: Using the person-year method, stratifying for smoking, age and hypertension, exposure to fumes, gases and irritants was associated with an increased mortality from pneumonia (SRR=1.72, 95% CI 1.49-2.00, n=218). The risk was especially obvious regarding lobar pneumonia (SRR=5.71, 95% CI 3.75-8.70, n=20)

Discussion and conclusions: Occupational exposure to gases and fumes among construction workers increases the risk for pneumonia, especially lobar pneumonia.

Tu-O-9

(Author did not attend the conference.)

Tu-O-10 INFECTIOUS PNEUMONIA IN METAL WORKERS: A CONTINUING CAUSE OF EXCESS MORTALITY

*Palmer KT, Coggon D, Brown T, Rice S.

Background and aims: Analyses of mortality in England and Wales have repeatedly shown a clear excess of deaths from pneumonia in welders. During 1979-1990 the excess was attributable largely to deaths from lobar pneumonia and pneumonias other than bronchopneumonia, was limited to men below

retirement age, and was apparent in other occupations with exposure to metal fume. We extended analysis to 1991-2000 and compared the excess of deaths from metal fume with that from occupational asthma.

Methods: The Office of National Statistics supplied us with data on deaths by underlying cause among men aged 16-74 years in England and Wales during 1991-2000, including details of age, last occupation and social class. We estimated expected numbers of deaths by applying age-specific proportions of deaths by cause in the general population to the total number of deaths at each age in each occupational group. We abstracted data on pneumonia for occupations with exposure to metal fume (welders, moulders and coremakers, furnace operatives, sheet metal workers, other metal manufacturers), and on asthma for occupations commonly reported to European surveillance schemes as at particular risk of occupational asthma (e.g. workers in textiles, plastics, healthcare, agriculture, animal handling, baking, spray painting, woodworking, electrical assembly). Observed and expected numbers were compared for each cause of death.

Results: Among men aged 16-64 years who had worked in occupations with exposure to metal fume we found excesses of mortality from pneumococcal and lobar pneumonia (ICD-9 481: 54 deaths vs. 27.1 expected, including 32 deaths vs. 12.9 expected in welders) and from other pneumonias (ICD-9 480, 482-3, 486: 71 deaths vs. 52.1 expected). As previously, however, no excess was found from these causes at older ages, or from bronchopneumonia at any age (ICD-9 486). The attributable mortality from occupational metal fume (45.8 excess deaths) compared with an estimated 70.4 excess deaths from occupational asthma among men of similar age across the same time interval.

Discussion and conclusions: Exposure to metal fume is a material cause of occupational mortality. Only a minority of cases are fatal, but the increased risk also extends to non-fatal cases with substantial morbidity. The hazard deserves more attention than it presently receives.

Tu-O-11 BRONCHIAL HYPERRESPONSIVENESS, ENO, LUNG FUNCTION AND ISOCYANATE EXPOSURE IN SPRAY PAINTERS

*Heederik D, Pronk A, Preller L, Wouters I, Doekes G.

Background and aims: Associations have been observed between exposure to mainly hexamethylene diisocyanate (HDI) oligomers, (work related) respiratory symptoms and isocyanate specific sensitization in spray painters. The aim was to assess associations between exposure and bronchial hyperresponsiveness (BHR), baseline spirometry and exhaled NO (eNO).

Methods: Methacholine challenge and eNO measurements were performed in 229 workers. Questionnaires and blood samples were obtained. Specific IgE and IgG to HDI were assessed in serum using various assays. Personal exposure was estimated by combining more than 500 personal air measurements and time activity information.

Results: A strong and positive association was found between estimated isocyanate exposure and BHR. Exposure-related obstructive lung function changes independent of BHR were also found. Sensitized (specific IgE and IgG) workers were more often hyperresponsive. This was statistically significant for IgG positives assessed by ImmunoCAP only (PR (95% CI): 3.1 (1.1-8.2)). eNO was clearly associated with smoking and atopy but not with exposure. Only workers with IgG to the oligomeric HDI conjugates had slightly higher levels of eNO.

Discussion and conclusions: This study provides evidence of exposure-response associations for asthma-like effects. Several health endpoints were clearly exposure related but inter-relationships seemed weak. This also points towards chronic respiratory effects other than asthma, resulting from isocyanate exposure.

Tu-O-12 ALLERGY AND RESPIRATORY SYMPTOMS IN A SUGAR BEET PRODUCTION PLANT

*Littorin M, Kristiansen M, Karlsson J, Assarsson E.

Background and aims: Through the years, several cases of allergy, rhinitis and asthma from a sugar beet production plant have been seen at the Department of Occupational and Environmental Medicine in Lund. In 2007, a survey of allergy and respiratory symptoms among all employees at the plant was initiated. Exposed jobs were those in the factory and in the greenhouses, as well as outside working with the sugar beet plants. The exposure was both to pollen and seeds from sugar beet but also to moulds, mite and other agents. Most employees moved between several tasks.

Methods: Information regarding occupational and medical histories was obtained from a questionnaire distributed to all 210 employees, including factory and field workers, laboratory and administrative personnel as well as researchers. More than 90% agreed to participate. Blood samples were collected for analysis of IgE antibodies against pollen and seed of sugar beet and other allergenic agents. Further, the exposure to dusts was assessed by personal air measurements and the current pollen exposure for each task and workplace was estimated. Then, each job was categorized as having no/little, medium or high

exposure to pollen. Additionally, by information from the questionnaires and these measurements, an attempt was made to estimate the individual cumulative exposure to dusts and pollen.

Results: As many as 59% reported nose symptoms, compatible with rhinitis, during the 12 preceding months and 37% symptoms from the eyes. Coughing was present in 20% but dyspnea/wheeze/chest oppression was less common. This pattern was noted for strictly work-related symptoms as well. The prevalence of symptoms was associated with the estimated current exposure to sugar beet pollen but not with cumulative exposure. Out of all employees, 15% were sensitized to sugar beet pollen, a higher fraction, though, among those with current high exposure, and among atopics.

Discussion and conclusions: The prevalence of eye and nose symptoms was prominent and higher than in surveys of the general population. The sensitising power of beet pollen was probably underestimated due to a pronounced healthy worker selection. Further, other agents in the organic dusts are probably partly responsible for causing the symptoms.

PESTICIDE EXPOSURES AND HEALTH EFFECTS

Tu-O-13 DERMAL EXPOSURE TO PESTICIDES AMONG BRITISH COLUMBIA (B.C.) TREE PLANTERS

*Gorman MJ, Davies HW, Stjernberg E.

Background and aims: Reforestation in B.C. employs 5000 seasonal tree planters who plant 230 million trees annually. Work sites are remote and work is piece-rate with limited opportunities for hand washing, bathing, and laundry. Fungicides and/or insecticides are applied at nurseries to protect seedlings during growth and storage. Few studies have examined pesticide exposure among tree planters. Such studies are complicated by the large numbers of nurseries, variability in seedling storage times, and different climactic regions. We aimed to characterize current dermal pesticide exposure among a sample of B.C. tree planters.

Methods: Between May 2006 and April 2007, exposures were monitored among fifty-four tree planters at five geographically-disperse worksites in B.C. Bulk seedling samples were collected from each worksite. Post-shift hand and wrist wipes were taken using a cotton swab pre-moistened with 70% ethanol. Glove use and hand washing among subjects were recorded. Using nursery pesticide application records, analyses focused on known pesticides applied to the seedlings at the study sites. Carbamate pesticides were analyzed by HPLC/MS and other pesticides by GC/MS.

Results: At the sites visited from May to June (summer) no pesticide residues were detectable on skin or seedlings. At the sites visited in April (spring) chlorothalonil and iprodione were detected on the skin of 15 out of 21 (range 0.37 - 106.3 ng/cm²) and 8 out of 21 subjects (range 0.7 - 15.9 ng/cm²) respectively. Pesticides were detected on all bulk seedling samples collected in the spring (n = 8). Pesticides detected were chlorothalonil (range 0.26 – 1090 µg/g), iprodione (range 0.39 – 83.3 µg/g), permethrin (range 0.06 – 0.2 µg/g), captan (34.5 µg/g), and diazinon (1.59 µg/g). All workers wore gloves. Sixty-seven percent wore cotton gloves that provide no chemical protection, and may exacerbate exposure. None of the subjects reported hand washing during the workday or before eating.

Discussion and conclusions: Pesticide residues on seedlings and skin were highest at sites sampled earlier in the year. This is likely due to the decreased length of time since pesticide application and subsequent decreased degradation. The data demonstrate that these residues are being transferred to the skin. Improved hygiene practice and PPE program implementation are recommended.

Tu-O-14 MORBIDITY IN FORMER SAWMILL WORKERS EXPOSED TO PENTACHLOROPHENOL (PCP): A CROSS-SECTIONAL STUDY IN NEW ZEALAND

*McLean D, Eng A, Dryson E, Walls C, Wong K, Cheng S, Mannetje A, Ellison-Loschmann L, Slater T, Shoemack P, Pearce N.

Background and aims: From 1950 to 1990 fungicides containing pentachlorophenol (PCP) were widely used in the New Zealand sawmill industry. Workers who treated or handled wet timber experienced significant exposure, and concern remains about chronic health problems in these workers. We have conducted a cross-sectional morbidity survey in a random sample of surviving members of a cohort enumerated for a mortality study.

Methods: Demographic information, lifetime work history including tasks and exposures in sawmills, lifestyle factors and self-reported health and current neuropsychological symptoms were collected by interview. All participants had blood tests and a clinical examination by an occupational physician.

Results: Of 293 participants only 116 had been exposed to PCP, mostly at relatively low intensity or duration. Nevertheless, several associations between exposure and prevalence of symptoms were observed. These included associations between: (i) exposure level and risk of chronic respiratory disease

($p < 0.01$) and a deficit in cranial nerve function ($p = 0.04$); (ii) exposure duration and thyroid disorders ($p = 0.04$), and neuropsychological questions including 'often going back to check things' ($p = 0.04$), 'low libido' ($p = 0.02$) and 'having palpitations of the heart' ($p = 0.02$), and a dose-response trend for 'frequent mood changes without cause' ($p < 0.01$); and (iii) cumulative exposure and 'frequent mood changes without cause' ($p = 0.02$), 'low libido' ($p = 0.04$), and the total number of neuropsychological symptoms reported ($p = 0.03$). Associations were also observed for asthma and eczema, and for 'recurrent nausea and diarrhoea', 'unexplained persistent fevers' or 'sweating for no reason', and 'persistent fatigue'. No cases of chloracne were identified. Few participants had non-fasting glucose outside the reference range of 3–8 mmol/L. While an association between ever having been exposed and excess non-fasting glucose (OR=1.56, 95% CI 0.55 – 4.42, 15 cases) was observed, the small numbers precluded dose-response analyses.

Discussion and conclusions: Notwithstanding the small numbers with high exposure, associations were observed between exposure and chronic respiratory disease, and also 'unexplained persistent fevers', 'recurrent nausea and diarrhoea', 'having palpitations of the heart', 'sweating for no reason', 'reduced libido' and 'frequent mood changes without cause'. Similar findings have been observed in an earlier study of PCP-exposed workers in New Zealand.

Tu-O-15 A METHODOLOGICAL APPROACH FOR ESTIMATING THE NUMBER OF AGRICULTURAL WORKERS EXPOSED TO SPECIFIC PESTICIDES IN CANADA

*Garzia NA, Demers PA, Peters CE, Nicol A.

Background and aims: Canada's agricultural industry is very diverse, but information is limited on occupational pesticide exposure. The CAREX Canada project requires estimates of exposure to specific pesticides to investigate their contribution to the burden of cancer in Canada. The objective was to explore a methodological approach for obtaining necessary information to estimate the number of agricultural workers in Canada exposed to CAREX Canada preliminary priority pesticides (2,4-D, chlorothalonil, MCPA, MCPP, pentachlorophenol).

Methods: This approach will incorporate multiple sources of publicly available information from national, provincial, and Canada-specific scientific literature. We explored this approach by focusing on Ontario's agriculture and use of two phenoxy herbicides (2,4-D, MCPA) classified by the International Agency for Research on Cancer as possible human carcinogens. The data sources identified for providing estimates in Ontario included: Statistics Canada Agricultural Census, Survey of Pesticide Use in Ontario (2003), and epidemiological studies focused on agricultural pesticide exposure in Ontario.

Results: Ontario's Survey of Pesticide Use provided crop uses of 2,4-D and MCPA (e.g. soybeans, field corn) and corresponding quantities that totaled 87,261kg and 129,337kg for 2,4-D and MCPA respectively. Statistics Canada Agriculture Census 2001 information provided estimates for Ontario on number of farms reporting herbicide use (~31,500), number of farms producing crops of interest (~21,400) and number of census farm families that could be used to estimate number of farm workers (~47,200 families). One 2002 Ontario study provided estimates on percent of pesticide applicators with "detectable levels" of 2,4-D and MCPA from urine samples, 48% and 66% respectively. This would lead to an estimate of approximately 11,000 and 15,000 agricultural workers exposed to 2,4-D and MCPA respectively, assuming 2 workers per farm are exposed in Ontario.

Discussion and conclusions: This approach identifies gaps in the available information on agricultural workers exposed to pesticides in Canada. For example, extrapolation from unidentified sources within or outside of Canada is needed to determine total number of agricultural workers by farm type. However, this approach can be used to estimate the number of pesticide-exposed agricultural workers, but there will be challenges applying this nationally and for other pesticides. This approach will be developed further for other provinces and pesticides.

Tu-O-16 ROLE OF GENETIC POLYMORPHISMS OF METABOLIC GENES PON1, CYP1A2, GSTT1 AND GSTM1 ON SEMEN QUALITY AND DNA INTEGRITY IN FARMERS EXPOSED TO ORGANOPHOSPHOROUS PESTICIDES IN SOUTHERN MEXICO

*Quintanilla-Vega B, Pérez-Herrera N, Sánchez-Guerra MA, Guaderrama-Díaz M, Solís-Heredia Md, Polanco-Minaya H, Salazar-Arredondo E, Hernández-Ochoa I, Rojas-García E, Borja-Aburto VH, Alvarado-Mejía J, Elizondo-Azuela G.

Background and aims: Polymorphisms of metabolic enzymes have been implicated in different toxicity by exposure to environmental chemicals. Pesticides are an important group of contaminants, among them organophosphorous (OP) insecticides that are used worldwide in agriculture and urban pest control. OP exposure is associated with decreased semen quality and sperm DNA damage. Human paraoxonase (PON1), cytochrome-P450 (CYP) and glutathion-S-transferases (GST) enzymes participate on OP metabolism. Epidemiological studies suggest that polymorphisms on metabolic enzymes render

individual susceptibility to the toxicity of several contaminants. Thus, our objective was to evaluate the role of some polymorphisms on PON1, CYP1A2*1F, GSTT^{-/-} and GSTM^{-/-} as modifiers of OP toxic effects on sperm quality and sperm DNA.

Methods: A cross-sectional study was conducted in farmers from southern Mexico chronically exposed to pesticides; mainly OP. Fifty-four farmers (18-55 years old) volunteered and provided semen and blood samples. Exposure to pesticides was evaluated by questionnaire. Two OP exposure indexes were created: at month of sampling and during three months before sampling, as a reflection of exposure to spermatids and mature spermatozoa, and to cells during a complete spermatogenic cycle, respectively.

Polymorphisms of PON1 at positions -162, 55 and 192 and CYP1A2*1F were evaluated by real-time PCR, GSTT1^{-/-} and GSTM1^{-/-} by multiplex PCR and PON1C-108T by RFLP; sperm quality according to WHO and sperm DNA damage by in situ-nick translation (NT-positive cells). Multiple lineal regression analysis was done modulating OP exposure according to each genotype.

Results: Among PON1 polymorphisms, dose-effect relationships were observed between both OP exposure indexes and semen quality and NT-positive cells only in farmers with PON1192RR genotype. No association between sperm toxicity and OP exposure in subjects with CYP1A2*1F polymorphism was observed. A dose-effect relationship was observed between OP exposure index during three months before sampling and semen quality in GSTM1^{-/-} subjects.

Discussion and conclusions: Our results suggest that: cells at all stages of spermatogenesis are target of OP toxicity, PON1192RR genotype showed a role in modulating OP effects on sperm quality and DNA damage, CYP1A2*1F did not seem to participate on these effects, and GSTM^{-/-} genotype seems to be a risk factor against OP-related effects on semen quality.

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Tu-O-17 CASE-CONTROL STUDY OF RESIDENTS NEAR A WOOD TREATMENT PLANT IN SOMERVILLE, TX: AN EPIDEMIOLOGICAL STUDY

*Dahlgren JG, Takhar H, Klein J, Thornton JC.

Background and aims: The chemicals used as wood preservatives at a wood treatment plant in Somerville, TX have many well-known harmful health effects upon exposure to both animals and humans, including cancer. Creosote is a complex mixture that contains numerous polycyclic aromatic hydrocarbons and pentachlorophenol which is contaminated with dioxins. This study ascertained the self reported health effects of residents who live near a wood treatment plant with exposure to coal tar creosote and its constituents compared to control residents who do not live near a wood treatment plant.

Methods: We conducted a case-control study of residents exposed to coal tar creosote and residents who have no known exposure to coal tar creosote. Questionnaires were offered to all residents in both the study and control towns, both of which are home to approximately 1,700 residents each. Subjects in both the study and control towns were notified by advertising the study in the town.

Results: Descriptive statistics, sample size and percentage of the sample reporting the disease, were calculated for the adults (> 18 years) in both groups. The chi-square test was used to test the null hypothesis that the percentage reporting the disease for the CASE group was equal to the percentage reporting the disease for the CONTROL group. We report statistically significant increases for heart disease (0.001), stroke (0.003), myocardial infarction (0.045), asthma (0.003), chronic bronchitis (0.001), respiratory (0.001), kidney disease (0.009), arthritis (0.001), along with other diseases. Exposure testing from samples collected in residential attic dust revealed the following means: TCDD TEQ 188.81 ng/kg; BaP Eq 112.19 mg/kg; Arsenic 8.91 mg/kg; Chromium 30.58 (mg/kg); Chrome VI 0.45 mg/kg; and Copper 44.65 mg/kg.

Discussion and conclusions: The residents of Somerville, TX are experiencing statistically significant increases in various health effects (neurological issues, respiratory, cardiovascular and increased cancer rate) compared to the residents of the control town. The health effects have been shown to be associated with the chemicals used by the plant. The results of this study resemble the results of similar studies of wood treatment facilities. This study provides data of a public health concern requiring immediate clean-up and remediation efforts.

Tu-O-18 CAUSES AND TYPES OF HEALTH EFFECTS OCCURRING DURING THE USE OF CROP PROTECTION CHEMICALS: DATA FROM A SURVEY OF OVER 6300 SMALLHOLDER APPLICATORS IN 24 COUNTRIES

*Tomenson JA, Scott WD, Wilks MF.

Background and aims: Information on health incidents occurring during agrochemical use in developing countries is limited. The present investigation was designed to collect data concerning the health impact of agrochemicals and the behaviours of large groups of users from a wide variety of countries, including the developing world.

Methods: Conducted during 2005 and 2006, the survey included 6359 users in 24 countries and focused on the practices of users at each stage from purchasing agrochemicals to application and disposal and determined whether the user had experienced health problems. Prevalence and incidence (per spraying time) rates of agrochemical incidents were modelled using logistic and poisson regression to identify explanatory factors.

Results: In the 12 months prior to interview, the frequency of users reporting an agrochemical related incident requiring hospital treatment, medical treatment but not hospitalisation, or minor symptoms was 1.2%, 5.8% and 19.8% respectively. The proportions of users reporting incidents varied greatly between countries. Users who had experienced a machinery incident were 3.38 (95% CI 2.29-4.99) times more likely to experience an agrochemical related incident, but confident users who felt that they were using best practice while spraying were 0.60 (95% CI 0.44-0.84) times less likely to experience an incident. Over 80% of product-related incidents occurred during insecticide use and the incidence rate per spraying time for these incidents was significantly higher than those for fungicides or herbicides (5-10 times dependent on the severity grouping of incidents). Headache/dizziness was the most common symptom (53 %) followed by nausea/vomiting (38 %); in many cases these symptoms were smell related.

Discussion and conclusions: There was a high incidence of minor signs and symptoms in some countries, especially the African countries, but the incidence of more serious problems was comparable to that seen in more developed countries. A disproportionate number of incidents occurred during insecticide use. Users who sprayed insecticides more than the median number of hours were at an increased risk of an agrochemical-related incident, but lack of caution and lack of confidence in their practices were more important factors.

HEALTH CARE AND THE PUBLIC SECTOR

Tu-O-19 ADVERSE PREGNANCY OUTCOME AMONG DAY-CARE EMPLOYEES

*Riipinen AM, Sallmen MK, Taskinen H, Koskinen A, Lindbohm M.

Background and aims: Day-care employees are exposed to various infections and heavy lifting, which can lead to adverse pregnancy outcome. The objective of this cohort study was to investigate whether day-care employees are at an increased risk of adverse pregnancy outcome (perinatal death, pre-term birth, low birth weight) as compared to employees with no or only a few contacts with preschool children.

Methods: The source population was composed of day-care employees (children's nurses, nursery school teachers) and a reference group (physiotherapists, dispensers, opticians, masseuses, dental assistants, dental hygienists). They (n = 60 926) were identified from the files of trade unions and the National Authority for Medicolegal Affairs. Information on births (gestational age at least 22 weeks) in 1991–2004 was obtained from the Finnish Medical Birth Register. The final data consists of 17 905 and 16 679 single births in the study and the reference group, respectively. Pre-term birth was defined as birth before the 37th week of gestation. Perinatal death was defined as stillbirth or death during the first week of life. The term small for gestational age (SGA) was defined as below the 10th percentile birth weight for gestational age in the reference population. The findings were adjusted for register information on mother's age, smoking, socio-economic status, previous pregnancies and deliveries, and gender of the child. Outcomes in bivariate analyses were analysed using generalized estimating equations (GEE). Birth weight was analysed using linear regression. The models used accounted for dependence between births to the same woman.

Results: The occurrence of pre-term birth (OR 0.94, 95% CI 0.82–1.07), perinatal death (OR 1.06, 95% CI 0.77–1.46), or SGA infants (OR 1.01, 95% CI 0.92–1.11) was similar among the day-care employees and the referents. The adjusted mean birth weight of the children of day-care employees (3579 g) was slightly higher than the birth weight of the children born to the reference group (3564 g, p=0.006).

Discussion and conclusions: Day-care employees are not at an increased risk for pre-term birth or perinatal death. Also, the likelihood of having an SGA infant was not increased. Children of day-care employees tend to have a slightly higher mean birth weight.

Tu-O-20 PHYSICAL ASSAULT INJURIES AMONG NURSING CARE STAFF EMPLOYED IN ACUTE CARE.

*Rodríguez-Acosta RL, Lipscomb HJ, Richardson DB, Dement JM, Chen J.

Background and aims: Nursing staff are at risk of workplace violence given their close contact with patients, families, and visitors. Our objective was to identify and characterize injuries resulting from physical assault among hospital nursing staff and to identify associated risk factors.

Methods: A dynamic cohort of 6,510 nurse's aides and nurses employed in acute care units at a major healthcare system from 1997 to 2004 was enumerated. Injuries due to physical assault were ascertained

from workers' compensation reports. Information was also obtained on the cause of injury, affected body part, nature of injury, medical care and lost work time. Poisson regression was used to estimate rates (per 100 full-time-equivalents [FTE]) and rate ratios (RR) by occupation, age, gender, race, tenure of employment, and hospital unit of employment.

Results: Physical assault injuries (n=220) represented 7% of all reported injury/illness, equivalent to 1.65 events per 100 FTE (95%CI: 1.45-1.89). Rates were higher among those who were employed <5 years (RR=1.38, 95%CI: 1.17-1.62) than among those with longer tenure (≥ 15 years), among workers aged <30 years (RR=1.29, 95%CI: 1.08-1.54) than those 50+ years, and among white workers (RR=1.64, 95%CI: 1.46-1.83) than non-white workers. Rates differed markedly by hospital unit; rates were highest among those employed in psychiatry (12.65, 95%CI: 8.90-17.99), neurology (4.43, 95%CI: 3.17-6.20) and rehabilitation (3.63, 95%CI: 1.51-8.71) units. Most injuries (71.8%) resulted from being struck or bit (10.9%) and affected the upper extremities (45%) and head/face (27.3%). The relative risk of being bit was greatest in the rehabilitation and orthopedics units while the relative risk of being struck was greatest in the psychiatric and neurology units, all relative to women's/pediatric units.

Discussion and conclusions: Patterns of risk in this population suggest that preventive interventions should target newly-hired staff and those caring for patients with mental illness, neurological diseases, and undergoing longer-term rehabilitation. Differences in risk by race deserve further investigation. More detailed understanding of circumstances surrounding violence, and consequently preventive efforts, could be improved through active surveillance efforts. A standardized definition of violence-related events (regardless of outcome), and collection of detailed data, particularly circumstances surrounding these events and information on perpetrators are key in this process.

Tu-O-21 MORTALITY IN THE US HEALTH CARE AND SOCIAL ASSISTANCE SECTOR 1984-1998

Background and aims: The US Health Care and Social Assistance (HCSA) Sectors employed over 10 million workers in 2005 across a wide range of occupations; the majority is female. Three of the four health care sub sectors—hospitals, nursing and residential care facilities, and ambulatory health care services are ranked 1st, 2nd, and 12th in terms of total occupational illnesses and injuries reported by BLS in 2005.

Methods: Multiple cause mortality data from the National Occupational Mortality Surveillance Study (NOMS) from 28 US states, from 1984-1998, were used to assess the association of usual occupation and industry within the HCSA sector with cause-specific mortality. Based upon all deaths, the top ten significant associations for each of the 4 sub sectors and the top three associations for each of 18 HCSA occupations were assessed.

Results: Significantly elevated proportionate mortality ratios (PMRS) were observed among all sub sectors for HIV/AIDS (PMRs=176, 163, 148, 186), non-A non-B Hepatitis (PMRs=159, 121, 135, 190), and for drug-related deaths in three sub sectors (PMR= 143, 119,113). Asthma mortality was elevated in hospitals (PMR=118); polyarteritis nodosa was elevated in the social assistance sector (PMR=153) and ambulatory health care services (PMR=147). Significantly elevated mortality was observed for each of 18 major health care occupations, with AIDS being the most prevalent, accounting for thousands of deaths. A variety of causes were significantly elevated including air and space transport fatalities in registered nurses (PMR=211) and dentists (PMR= 643), cancer of the brain and nervous system in health diagnosing practitioners (PMR=201) and pharmacists (PMR=165), and asthma in health diagnosing practitioners (PMR= 218). Other cancer and lung diseases were observed across the 18 occupations.

Discussion and conclusions: AIDS/HIV and Non-A Non-B Hepatitis may be due to sharps injuries or exposures to body fluids occurring prior to the OSHA Blood-Borne Pathogen Standard, although assessment of mortality should be repeated during the current decade. Despite the limitations in interpretation of PMR analysis, the observation of these and other significantly elevated risks such as drug-related deaths, TB, asthma, cancer, and air and space transport fatalities, suggest further evaluation and prevention may be needed.

Tu-O-22 PSYCHOSOCIAL WORK FACTORS, PERSONALITY TRAITS, AND SLEEP QUALITY IN DANISH PUBLIC SERVICE WORKERS

*Kaerlev L, Kolstad HA, Thomsen JF, Kaergaard A, Hansen AM, Bonde JP.

Background and aims: Several studies indicate strong associations between perceived psychosocial job stress and insomnia. However, these associations may be biased by response style and psychological reactivity due to common method variance, because both the exposure and the outcome have been based on individuals' perceptions. We measured the association between job stressors according to three models and insomnia with the aim to explore the importance of personality traits.

Methods: The study base was a sample of Danish public service workers (hospital workers, office workers, teachers, social workers, blue collar workers) in Aarhus, Denmark. In January 2007 a total of 4,491 participants filled-in a mailed questionnaire assessing a wide range of work factors, physical and mental health, and personality factors by questions from the job demand model by Karasek, Siegrist ERI-10, Kivimäki Procedural and relational justice, CMDQ-scale for common mental disorders, and Eysenck Personality Questionnaire Revised-A. Subjective sleep quality during the previous 4 weeks (disturbed sleep, disturbed awakening) and overall sleep quality were measured by Karolinska sleep questionnaire (KSQ). Psychosocial responses were scored on Likert five-point frequency scales and sleep quality on dichotomised scales. A random sample of the study population and cases with high score on the questionnaire depression scale went through a diagnostic SCAN interview.

We calculated odds ratios (OR) with 95% CIs for the 20% highest psychosocial exposures adjusted for a) individual factors (age, gender, education) and b) adding neuroticism and the interaction product to the model.

Results: The prevalence of poor overall sleep quality was 25% (n=1,122). Neuroticism OR=4.0 (2.8-5.7), high job demands OR=2.4 (1.9-3.0), high effort-reward imbalance OR=5.2 (4.1-6.2), low procedural justice OR=2.0 (1.5-2.7) and relational justice OR=2.0 (1.6-2.6) showed increased odds ratios of poor sleep. For effort-reward imbalances an exposure-effect pattern were seen. After adjustment for neuroticism and the interaction product, the ORs for poor sleep did not decline. Among persons with poor sleep, 54.7% had symptoms on anxiety disorders or depression and 6.2% (n=70) had SCAN depression. Awakening problems was associated with SCAN depression (3.9%, n=96).

Discussion and conclusions: The associations between psychosocial work factors and insomnia in civil servants were not modified when adjusted for personality traits.

Tu-O-23 JOB CHARACTERISTICS AND WORK ORGANIZATION FACTORS ASSOCIATED WITH MUSCULOSKELETAL SYMPTOMS AMONG NURSING PERSONNEL

*Schoenfish AL, Lipscomb H.

Background and aims: Musculoskeletal symptoms (MSS) are prevalent among nursing personnel; however, clearly differentiating symptoms that define work-related conditions and associated risk factors can be difficult. We evaluated associations between work organization factors and musculoskeletal symptoms (shoulder and low back) among nurses and nurses' aides employed in inpatient acute care, stratifying results by whether symptoms were perceived to have been caused by a work incident.

Methods: Data come from baseline questionnaires (n=585) collected as part of an ongoing 4-year intervention-effectiveness evaluation. Questionnaires measured demographic variables, work history and MSS in the previous 6 months. The Job Content Questionnaire was used to measure work organization factors, including job strain (low decision latitude/high psychological demand). A different version of job strain (job strainPHYSICAL, defined by low decision latitude/high physical demand) was also measured. Log-binomial modeling identified factors associated with symptoms, stratifying on symptom cause ("work-incident," "non-work-incident") and job strain definition.

Results: Six-month shoulder and low back symptom prevalence were reported by 41.4% and 51.3% of nursing staff, respectively. Of those with shoulder and low back symptoms, 20.7% and 33.5% attributed their symptoms to an incident at work, respectively. Compared to those with non-work-incident symptoms, those with work-incident symptoms were more likely to report symptoms interfering with work and causing thoughts about changing jobs. In multivariate models, job strainPHYSICAL was the factor most strongly associated with work-incident shoulder [Prevalence Ratio (PR) 1.6; 95% CI (1.0, 2.4)] and low back [PR 1.8; 95% CI (1.3, 2.4)] symptoms. Other significant factors associated with work-incident symptoms included increased years worked in inpatient nursing, hazardous working conditions, and working as an aide. None of the independent variables were associated with non-work-incident symptoms in multivariate models.

Discussion and conclusions: These findings highlight the contextual nature of work organization factors. Because levels of decision latitude may directly affect physical job demands among nursing personnel, job strainPHYSICAL was a more intuitive measure than traditional job strain. Stratification by symptom attribution was helpful in discerning differences in strengths of association between symptoms and covariates of interest. While temporality could not be discerned in this cross-sectional analysis, work organization factors, regardless of temporality, are important to address in regard to staff retention.

Tu-O-24 JOB SATISFACTION AND HEALTH- JEOPARDIZING BEHAVIOR AMONG HOSPITAL-BASED PHYSICIANS IN GERMANY

*Rosta J.

Background and aims: Background: Investigation on job-satisfaction and health-jeopardizing habits is rare, although it is a vital issue. For dissatisfaction may result in health problems on the physicians' side which later on may also have an unfavourable impact on the quality of health care.

Aims: The study assesses the relationship between health-jeopardizing behaviour among hospital-based physicians and their perceived job satisfaction.

Methods: Materials and **Methods:** Data were collected via an anonymous mail survey in 2006 from a representative national sample of 1,917 (58% response rate) hospital physicians in Germany. Job satisfaction was assessed with the help of the Warr-Cook-Wall scale (1979) as sum score, rating from 10 (extremely dissatisfied) to 70 (extremely satisfied). Health-jeopardizing behaviour was defined by one of the following: hazardous drinking (≥ 5 points by AUDIT-C), smoking (occasionally or daily), no exercising, under- or overweight or frequent intake of medication (3-4 times a week or more of at least one medication with a high misuse potential).

Results: Hospital-based physicians reported an average job satisfaction of 44.3. Among all, 19.8% reported hazardous drinking, 24% said they smoked regularly, 14% had over- or underweight, 10% got no exercising, and 7.1% frequently took medication. In a linear regression model it could be demonstrated that the younger age group ($B=-4.1$; $p=0.0001$), hazardous drinking ($B=-1.8$; $p=0.005$), getting no exercising ($B=-2.1$; $p=0.009$), and frequent intake of medicine ($B=-5.5$; $p=0.0001$) correlated negatively with job satisfaction. Gender-separate analyses yielded differing results. Among female doctors, for instance, belonging to the younger age group ($B=-2.7$; $p=0.013$), getting no exercising ($B=-2.9$; $p=0.036$) and a frequent intake of medication ($B=-4.2$; $p=0.004$) was negatively associated with job satisfaction. Among male doctors, yet, the younger age group ($B=-4.6$; $p=0.0001$), a frequent intake of medication ($B=-6.4$; $p=0.0001$) and hazardous drinking ($B=-2.2$; $p=0.003$) was going along with less job satisfaction.

Discussion and conclusions: Conclusions: From the various health-jeopardizing behaviours, a frequent intake of medication had the strongest negative correlation with job satisfaction both for females and males. Any improvement of hospital physicians' job satisfaction – i.e. working conditions – may be the first step to improve physicians' overall health behaviour.

BIOMARKERS

Tu-O-25 OCCUPATION, APOLIPOPROTEIN E EPSILON2 ALLELE AND PARKINSON'S DISEASE RISK IN ISRAEL

*Peretz C, Bar-Shira A, Orr-Urtreger A, Giladi N.

Background and aims: Background: Parkinson's disease (PD) is currently considered as a multi-factorial disease resulting from the effect of genetic and environmental interaction. Several epidemiological studies have shown a moderate association between Parkinson's disease and farming as an occupation or exposure to pesticides. The role of Apolipoprotein E (APOE) polymorphism as a risk marker for PD is not clear.

Aim: To investigate, the relationship between APOE and farming as an occupation and the risk to develop PD (comparing to controls).

Methods: **Methods:** We designed a case-controls (1:2) study, on 150 PDs (cases) non-demented aged 50-75, 150 spouses (first control group) and 150 patients with osteoarthritis (OA) (second control group). APOE genotype was diagnosed from either blood or saliva which were taken from all participants

Results: **Results:** The present analysis is based on 142 PD patients, 107 PD patients' spouses and 121 patients with OA.

A borderline significant difference in APOE haplotypes (E2/E3, E2/E4, E3/E3, E3/E4) distribution was found between PDs and OAs ($p=.0803$). Especially, a lower E2 allele frequency was found among PDs compared to OAs (a significant difference, $OR=.4$, $p=.0259$) and compared to spouses (a non-significant difference, $OR=.5$, $p=.1306$), accounting for gender. We did not find any difference between PDs and the two control groups regarding APOE E3 or E4 allele's frequency. Farming (at least for 5y), was found to be more frequent among the PDs compared to the 2 control groups ($OR=8.5$, 3.3 $p=.0458$, $.0759$), accounting for the gender but we did not find an interaction effect between farming as an occupation and carrying the APOE-E2 haplotype.

Discussion and conclusions: Conclusions: Carrying the APOE-E2 haplotype might have a protective effect on PD motor onset while farming as an occupation may increase the risk for PD. However, the interaction between APOE haplotype and occupation should further be investigated due to insufficient power of this case-controls (1:2) study to examine this aspect.

Tu-O-26 OCCUPATIONAL EXPOSURE TO ELF MAGNETIC FIELDS AND NATURAL KILLER ACTIVITY IN PERIPHERAL BLOOD LYMPHOCYTES

*Gobba F, Borella P, Bargellini A, Scaringi M, Bravo G, Giacobazzi P.

Background and aims: Extremely Low Frequency-Magnetic Fields (ELF-MF) are classified as possibly carcinogenic to humans (Group 2B IARC). Some evidence exists that they can act as promoters or progressors rather than as initiators. Natural Killer cells (NK cells) play a primary role in inhibiting tumour growth. An effect of ELF-MF on NK activity has been hypothesized. In a preliminary study we observed a decrease in NK cytotoxic activity in peripheral blood lymphocytes (PBL) of a group of workers exposed to ELF-MF TWA levels exceeding 1 μ T. This study was performed to confirm preliminary results.

Methods: In 69 workers aged 39.1 ± 8.0 years (mean \pm S.D.) not exposed to chemicals interfering with the immune system, ELF-MF exposure was measured using personal dosimeters; results were expressed as Time-Weighted Average (TWA). NK cytotoxic activity was evaluated in PBL as % of lysis at different ratios between effector vs. target cells (E:T ratios) and as number of Lytic Units (L.U.) per 10⁷ lymphocytes.

Results: Subjects were divided in Low Exposed (no. 36; TWA ≤ 0.2 μ T) and Higher Exposed (no. 33; TWA > 0.2 μ T). NK activity was decreased in Higher Exposed, but the difference was not statistically significant. Then we selected the sub-group of workers exposed to ELF levels ≥ 1 μ T (no. 12), and compared NK activity to the Low Exposed: mean L.U. values resulted significantly reduced ($p < 0.01$) and the results were similar expressing NK activity as % of lysis at different E:T ratios.

Discussion and conclusions: Data show a reduced NK activity in workers exposed to higher TWA levels of ELF-MF and suggest 1 μ T as a possible threshold for this effect, in agreement with our preliminary observation. These results need replication, and the biological significance is still to be elucidated, but NK cells are part of the first line of the innate defence system that acts against various types of target cells, such as tumour or virus-infected cells. The reduction of NK activity observed in this study is coherent with the hypothesis that ELF-MF exposure may play a role in tumour progression.

Tu-O-27 URINE-BASED TUMOR MARKER TESTS AMONG WORKERS WITH HIGH BLADDER CANCER RISK – INTERIM DATA OF THE PROSPECTIVE STUDY UROSCREEN

*Taeger D, Pesch B, Feil G, Scheuermann B, Bontrup H, Wellhäußer H, Eberle F, Johnen G, Leng G, Pelster M, Horstmann M, Stenzl A, Nasterlack M, Bruening T.

Background and aims: UroScreen is a prospective study of active and former chemical workers in Germany on the early diagnosis of bladder cancer. The aim of this study is to evaluate the predictive values of urinary tumor markers for bladder cancer screening. Screening is performed with NMP22 (nuclear matrix protein 22), UroVysionTM, and survivin in addition to the investigation of cytology and micro-hematuria. In this interim analysis, methodological influences on tumor marker levels caused by inflammation, former urogenital cancers, benign prostatic hyperplasia, diabetes mellitus, urine creatinine, and cell yield were analyzed.

Methods: Since September 2003, a total of 1,507 active and former German chemical workers at age of 58 (29-86) years who had been formerly exposed to aromatic amines were examined. As of June 2007, 3,868 preventive medical checkups were performed. Urine samples were collected for cytology and detection of NMP22 by an immunoassay, chromosomal aberrations by the UroVysionTM test, and survivin by a quantitative mRNA assay. Former cancer and diabetes mellitus were assessed by questionnaire, inflammation by leukocytes or bacteria in urine, and urinary creatinine by the Jaffe method.

Results: NMP22 was determinable in all urine samples. With a cut-off of 10 U/ml 127 samples were classified as positive. Elevated levels were confirmed for urogenital diseases or inflammation. UroVysionTM could not be determined in 7.5% of the samples, especially in samples with creatinine < 0.5 g/L. On the other hand, a relevant fraction ($n=11$) of the positive results ($n=24$) was found in subjects who provided urines with creatinine < 0.5 g/L. Regarding survivin, 49 samples were above the cut-off of 40,000 copies. Inflammation and creatinine < 0.5 g/L were associated with a higher fraction of positive survivin findings.

Discussion and conclusions: Urine parameters like creatinine might indicate cell yield and composition. Accompanying urogenital diseases or inflammation can interfere with urine-based bladder cancer tests. Urine sampling and cut-offs should be optimized for the screening of asymptomatic subjects with respect to potentially false-positive results. The study was supported by the German Social Accident Insurance (DGUV), Sankt Au-gustin, Abbott GmbH & Co. KG, Wiesbaden, Germany, and Fujirebio Diagnostics Inc. (FDI), Malvern, PA. On behalf of the UroScreen Study Group

Tu-O-28 MODELLING BITUMEN EFFECTS ON INTERLEUKIN 8 CONCENTRATIONS IN INDUCED SPUTUM AND NASAL LAVAGE FROM GERMAN ASPHALT WORKERS

*Pesch B, Raulf-Heimsoth M, Kendzia B, Spickenheuer A, Bruening T.

Background and aims: The aim of this cross-shift study is to evaluate irritative and genotoxic effects of fumes of bitumen in asphalt workers, including high-exposure settings with mastic asphalt. Here we present the modelling of bitumen effects on the inflammatory biomarker interleukin 8 (IL8) determined in biological fluids obtained from the airways.

Methods: IL8 was quantified in induced sputum (IS) and nasal lavage fluid (NALF) from 280 asphalt workers and 74 construction workers before and after shift using a specific immunassay. Exposure to fumes of bitumen was measured by personal air monitoring during shift. A questionnaire documented age, smoking habits, nationality and other information. Atopy status was assessed with specific IgE against ubiquitous airborne allergens. Predictors of the mass, volume, cell count and protein content of IS and NALF were determined to assess measures for IL8 concentration. IL8 distributions were evaluated regarding potential outliers. Different regression models were applied to estimate the bitumen effect.

Results: IL8 was selected as inflammatory biomarker. IL8 could be quantified in most IS and NALF samples. IL8 was analysed in relation to parameters of IS and NALF sampling where exposed workers provided a lower mass of IS. IL8 was lognormally distributed in IS but not in NALF. Methodological problems can interfere IL8 concentrations in the lower range and outliers in the upper range. Therefore, regression models were applied in duplicate to the full and truncated dataset. Regression models comprised different approaches. Model building was performed to assess potential predictors of IL8 levels. Current smoking was a significant predictor of IL8. Exposure group but not bitumen concentration was found associated with IL8 in IS. In NALF all effects on IL8 were weaker. Already pre-shift IL8 concentrations showed an impact of exposure group indicating subchronic effects.

Discussion and conclusions: Biomonitoring studies sampling fluids like IS and NALF need careful analyses of reference parameters regarding suitable measures for biomarker concentration. The pre-shift results indicate subchronic effects on IL8. The lacking dose-response relation for IL8 was based on a single shift measurement of fumes of bitumen. Longitudinal studies would improve dose-response modelling.

Tu-O-29 LEAD AND CADMIUM, BIOMARKERS OF EXPOSURE IN A METALLURGICAL FACTORY

*Viragh E, Viragh H, Munteanu C.

Background and aims: In non-ferrous metallurgy workers are exposed to a cumulative effect of noxious metals, as Pb, Cd, Zn, As, etc. which may cause disturbances in their health status. In condition of exposure to the above mentioned metals, this study was designed to evaluate the relationship between the Biomarkers of Exposure (blood and urinary Pb and Cd) and the Biomarkers of Biological Effects (urinary-DALA, degree of anemia and urinary proteins) in workers from a metallurgical factory.

Methods: The Pb and Cd levels in the air of workplaces were monitored during a 7-year period. The Biomarkers of Exposure and of Biological Effects in male workers were also monitored during the above-mentioned period. A statistically representative exposed group was selected (N=170). The exposed group was matched with 170 control males of the same average age, length in work and socioeconomic status. Clinical examinations were done and an epidemiological computed questionnaire was conducted in both groups to find out the health status of the workers, as well as to collect their professional and non-professional data. Linear regression analysis was used to evaluate the relationship between the Biomarkers of Exposure and Biomarkers of Biological Effects in the workers.

Results: The Pb and Cd levels in the air of the workplaces were constantly high (Pb=1.5-39.3mg/mc; Cd=0.3-1.5mg/mc) during the studied period, as the Biomarkers of Exposure (blood-Pb=52.2ug/dL+/-4.1; urinary-Pb=196ug/l+/-7.3; blood-Cd=1.9ug/dL+/-0.7; urinary-Cd =11.2ug/l+/-1.1) and the Biomarkers of Biological Effects (urinary-DALA =25.1mg/l+/-4.6; medium degree of anemia and proteinuria) have shown. The mean age of the workers was =40.45+/-5.57 years and the mean length in work was =16.17+/-3.02 years. The clinical examination identified the classical aspect of chronic occupational intoxication with Pb and Cd. The aspect of the scatter and the linear regression analysis identify a close relationship between the levels of exposure and Biomarkers of Exposure, as well as between the Biomarkers of Exposure and Biomarkers of Biological Effects ($r>0.8$).

Discussion and conclusions: Quantitative determinations of Pb and Cd in humans (blood, urine) may be used as indicators for the estimation of a current or a former occupational Pb and Cd exposure. The measured levels of Biomarkers of Exposure simultaneously point out the degree of biological effects.

HEMATOLOGICAL DISORDERS

Tu-O-30

(Author did not attend conference.)

Tu-O-31 CHILDHOOD LEUKEMIA AND PESTICIDE EXPOSURE: EVIDENCE IN COSTA RICA COMPARED WITH INTERNATIONAL DATA

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Background and aims: Associations of childhood leukemia with parental or direct exposure to pesticides have been investigated in a number of epidemiological studies. We compared the results of our recent Costa Rican case-control study with other studies published 1978-2006.

Methods: Out of 27 previous studies, five presented data comparable with ours. Fixed-model crude meta risk ratios (MRR) with 95% confidence intervals (CI) were calculated for the previous evidence, and results of our study were added to yield the combined meta evidence. Data for mothers' exposures and highest-category exposure intensity were selected if reported. Our study encompassed 300 cases and 579 population control children, with considerably smaller numbers of pesticide exposed cases (NEC). The parents were interviewed for job and exposure histories and covariates. Parental occupational pesticide exposure was modeled and specified for pesticide groups, individual compounds and pertinent time windows of exposure.

Results: For insecticides, the odds ratio (OR) 3.0 for mothers (95%CI 1.0-8.4; NEC 9) obtained in our study combined with prior data (MRR 1.8; 1.5-2.3) to yield MRR 1.9 (1.5-2.3; NEC 330). This analysis combined 6 studies with study-specific RRs between 1.4 and 3.0 and lowest lower 95%CI 0.9. For herbicides, the prior (MRR 1.8) and our data (OR 1.4) yielded a consolidated MRR 1.6 (1.3-2.0). Fungicides were also in excess (combined MRR 2.1 [1.4-3.3]). Epidemiological evidence for organochlorine and organophosphate pesticides in relation childhood leukemia to remains insufficient. Lack of comparable data precluded analyses of individual compounds.

Discussion and conclusions: Compared with prior evidence, this study added relatively little, due to small/medium NECs in most comparisons. Based on global evidence, excess human risk of childhood leukemia is suggested for exposure to insecticides, herbicides and fungicides as groups. Available data for specific compounds are deficient and call for further epidemiological data.

Tu-O-32 HEMATOLOGICAL RESPONSES TO EXPOSURES ENCOUNTERED IN CORN FARMING

*Vermeulen R, Bakke B, Beane Freeman L, Blair A, Pinto L, Lynch CF, Allen RH, Alavanja MC, De Roos AJ.

Background and aims: When compared to the general population, farmers have an increased risk of non-Hodgkin's lymphoma (NHL). It has been hypothesized that altered immune function may be an indicator of increased potential for the development of immunologically-based diseases such as NHL. We launched a study to investigate changes in hematological parameters and lymphocyte markers in corn farmers in relation to farming activities and pesticide exposures.

Methods: We selected 30 corn farmers and 10 agricultural extension workers in Iowa, ages 40-60 years, who were non-smoking males. Farmers and controls were visited six times during the year (e.g. prior to, during, and after planting; prior to and after harvest; and in the off-season). Blood and urine specimens were collected at each visit: detailed information about farming practices, and pesticide use were recorded during the entire year. Exposure to pesticides was obtained by questionnaire and for atrazine, and 2,4-D through quantification of urinary metabolites. Hematological parameters assessed were complete blood count (CBC) and differential, major lymphocyte subsets and T-cell surface activation markers.

Results: Farmers reported the use of 97 different pesticide product names containing 61 different active compounds. Atrazine, Glyphosate, and 2,4-D were the most frequently used pesticides. Baseline information on available hematological parameters indicated an overall healthy population, as values were generally within the normal range. Most did not differ between farmers and controls. The exception were natural killer cells ($p=0.04$) and IL-2 receptor activated T-cells ($p=0.02$) which were lower in farmers. Strong variations of cell count and hematological parameters across the growing season were observed in both farmers and controls independent of pesticide application.

Discussion and conclusions: The detailed exposure information, the longitudinal design, and extensive hematological parameters provide a valuable opportunity to study the possible relation between farming, pesticide exposure and potential hematological effects. The initial analyses revealed differences in hematological parameters at baseline possibly suggesting an effect of farming-related exposures on the blood-forming system. Time specific analyses on the relation between specific pesticide exposures and hematological parameters and lymphocyte markers are ongoing.

Tu-O-33 ARE CLUSTER INVESTIGATIONS WORTH WHILE? STUDY OF A CANCER CLUSTER AT A UNIVERSITY LABORATORY

*Kristensen P, Hilt B, Svendsen K, Grimsrud TK.

Background and aims: Eight cases of leukaemias and lymphomas were detected in a small unit of biology and chemistry at a Norwegian university in the 1990s. A cluster caused by benzene or other carcinogens at laboratories of biology and chemistry was suspected. The main aim of the study was to clarify whether the cancers identified were just the tip of an iceberg, because several thousand had in addition been students there since 1960.

Methods: We established a historical cohort of students and employees (n=8153) based on university records dating back to 1960. Laboratory exposure categories were identified a priori according to use of benzene or fixating agents on basis of information from the university administration. Follow-up start was the entry year for studies or employment, and terminated on December 31, 2005, or at date of death or emigration. Participants were followed for cancer for 131 268 person-years in the Cancer Registry of Norway. Incidence of lymphoma or leukaemia and subgroups were calculated as rates per 100000 person-years. We analyzed standardized incidence rates (SIR) with the national population as reference, and rate ratios (RR) in internal analyses applying Poisson regression.

Results: Twenty-five cases of lymphohaematopoietic cancer were identified (SIR 1.1, 95% confidence interval (CI) 0.7-1.7). Distinct rate differences were observed in subgroups, and the strongest adjusted associations were found for employees (7 cases, SIR=2.8, 95% CI 1.1-5.8) and students who attended laboratory courses with use of benzene (16 cases, SIR=2.0, 95% CI 1.1-3.2). Lymphohaematopoietic cancer incidence rates were heterogeneous across subgroups: participants who neither had attended laboratory courses with benzene use or were employees had a rate of 7.5, as compared to 114.3 among participants who were both course participants and had been employees.

Discussion and conclusions: This is an observational and post-hoc study with several limitations. The heterogeneity across subgroups was remarkable, but caution is warranted concerning causal inferences. On the other hand, the total picture indicates that the initial cluster that was suspected was not the tip of an iceberg. Hence, the study provides an example that cluster investigations can answer questions of public importance despite a more limited value regarding causal inference.

Tu-O-34 APPLICATION OF GUIDELINES TO EVALUATE HUMAN OBSERVATIONAL STUDIES FOR QUANTITATIVE RISK ASSESSMENT ON STUDIES ON THE RELATION BETWEEN EXPOSURE TO BENZENE AND ACUTE MYELOID LEUKEMIA

*Vlaanderen J, Vermeulen R, Heederik D, Kromhout H.

Background and aims: Epidemiological studies can be highly relevant for quantitative risk assessment (QRA). However, due to ethical and practical considerations, most often only human observational studies (HOS) are available for QRA based on epidemiological evidence. The stringent requirements for evidence to be used in QRA in combination with the classic pitfalls of HOS require careful evaluation of HOS before inclusion into QRA. We have developed novel evaluation guidelines specific for the use of HOS in QRA. An important innovation of the guidelines is an extensive focus on the quality of quantitative exposure assessment. We will demonstrate an application of the guidelines for HOS in QRA focused on the relation between exposure to benzene and acute myeloid leukemia (AML).

Methods: The evaluation guidelines consisted of three tiers initial evaluation, categorization of study, and design specific evaluation. The tiers contained evaluation criteria that were used to decide whether a study was suitable for QRA and to assign weight of evidence to studies that were suitable for QRA. A priori to the evaluation minimal requirements for inclusion were defined and potential strong confounders of the relation between benzene and AML were identified.

Results: We identified seven HOS that focused on the quantitative relation between exposure to benzene and AML. Ionizing radiation was identified as a potential strong confounder, but was assumed not to occur in the evaluated studies. Five of the seven identified studies were found eligible for QRA. One study was excluded because the quality of the statistical analysis could not be assessed. The other excluded study did not use an acceptable exposure index. Included studies differed in weight of evidence mainly due to differences in the quality of exposure assessment. Additional aspects that contributed to differences in weight of evidence of the evaluated studies were study size and type of study design.

Discussion and conclusions: We have demonstrated that the guidelines we developed to evaluate HOS for QRA were able to discriminate HOS based on weight of evidence. Evaluation of studies was often difficult due to the limited amount of information that was provided, especially with regards to methods used for quantitative exposure assessment.

Tu-O-35

(Author did not attend conference.)

MUSCULOSKELETAL DISORDERS 2

Tu-O-36 HISTORY OF PHYSICAL WORK EXPOSURES AND CLINICALLY DIAGNOSED SCIATICA AMONG WORKING AND NON-WORKING FINNS AGED 30 TO 64 YEARS

*Kaila-Kangas L, Leino-Arjas P, Karppinen J, Viikari-Juntura E, Nykyri E, Heliövaara M.

Background and aims: Few studies have examined the relationship between physical aspects of work and sciatica, and the results have been inconsistent. We hypothesized that the association between workload and sciatica may be more pronounced among working-age persons who are not occupationally active, due to health-related selection.

Methods: The nationally representative Health 2000 survey sample comprised 8028 Finns aged 30 years or over. The diagnosis of sciatica was based on characteristic symptoms and a standardized clinical examination by physicians trained for the purpose. Analyses were restricted to working-age subjects, who were stratified into two groups based on working status during the preceding 12 months. Exposure to physically demanding work tasks was assessed retrospectively by interview. All multivariate models included age, body mass index, and smoking.

Results: Altogether, 3.8% of working subjects and 7.9% of non-working subjects had sciatica, men more often than women (4.2% vs. 3.5%). In the multivariate logistic regression models, a history of physically demanding work in general, handling of heavy objects, kneeling, and bending were associated with sciatica among both working and non-working men. Working with a vibrating tool, and frequent handling of objects heavier than 5 kilograms were associated with sciatica only among working men. Also the odds ratio for a occupational driving were above unity, although the difference was not statistically significant. None of the physical work exposures were associated with sciatica among working women, while a history of handling heavy objects, bending, working with a vibrating tool, and occupational driving were related to sciatica among non-working women. Prolonged standing or sitting, body height, self-reported history of fracture in the low back or hip, marital status, or physical exercise were not associated with sciatica among either gender.

Discussion and conclusions: Heavy physical work in general is a risk factor of sciatica among men. Sciatica may be an important cause of premature health-related selection outside the workforce among both genders.

Tu-O-37 INCIDENT AND RECURRENT BACK INJURIES AMONG UNION CARPENTERS

*Lipscomb HJ, Cameron W, Silverstein B.

Background and aims: Carpenters have known exposures to a number of recognized risk factors for occupational back disorders. They also have limited opportunities for modified work due to the predominantly heavy nature of their work. Our aims were to describe incident and recurrent work-related back injuries among a well defined cohort of union carpenters, to describe the hazard function for each and associated risk factors, and to explore predictors of a subsequent musculoskeletal back injury.

Methods: We identified a dynamic cohort of 18,768 carpenters who worked in the State of Washington, USA, 1989-2003, their hours worked each month, and their work-related back injuries and medical claims for treatment including ICD-9 codes. Poisson regression was used to calculate rates and rate ratios of incident and recurrent injury adjusting for age, gender, union tenure and type of carpentry work. Predictors of a subsequent musculoskeletal back injury were explored based on different definitions of the incident injury as were time periods of greatest risk following return to work.

Results: Recurrent back injuries occurred at a rate 80% higher than initial injuries. Survival curves were significantly different for incident and recurrent injuries, but patterns of relative risk were similar. Individuals with greatest union tenure were at lowest risk likely reflecting a healthy worker effect or lower physical exposures with seniority. Individuals with the longest periods of work disability with their first injury were at particularly high risk of a subsequent musculoskeletal injury when compared to those with no prior history (RR=2.3; 95% CI 2.0, 2.7), as were individuals who had diagnoses reflecting degenerative diagnoses (RR 2.0; 95% CI 1.5, 2.6). Risk for a second injury peaked between 1000 and 1500 hours after return to work and then gradually declined.

Discussion and conclusions: Carpenters with long periods of work disability following back injury warrant accommodation and perhaps better rehabilitation efforts to avoid re-injury. Challenges to workplace accommodation and limited ability to clearly define readiness to return to work following injury speak to the need for primary prevention of back injuries among these carpenters involved in strenuous work.

Tu-O-38 POSSIBLE INTERACTION BETWEEN JOB STRAIN AND BODY MASS INDEX IN THE ETIOLOGY OF SYMPTOMATIC DIP OSTEOARTHRITIS

*Solovieva S, Vehmas T, Leino-Arjas P.

Background and aims: The two current 1985 international classification systems for chronic solvent-induced encephalopathy (CSE) lack univocal criteria. Aim: contribute to an improved and internationally accepted classification for CSE.

Methods: Starting from the principles of these systems and based on 10 years of experience with 2373 patients, we developed explicit decision rules for the data obtained by the evaluation of patients who are suspected of CSE. The neuropsychological aspects are now under discussion in an international working group¹.

Results: The rules regarded the following components: (1) test-based neuropsychological impairment, (2) solvent exposure, the extent of which is estimated by a structured interview and using a single cell exposure model, (3) symptoms related to cognitive and somatic function, mood and well-being, obtained by questionnaire, (4) the combination of these three components with the potential non-solvent causes, to a final CSE diagnosis. The latter consists of three elements, i.e. stating the degree of cognitive impairment (no/mild/moderate/severe), the likelihood that solvents were causative (no/not excluded/possible/likely), and the severity of the symptoms. For practical reasons the two diagnostic teams specialized in CSE in the Netherlands use a diagnostic procedure comprising three stages. Referred patients with minimal abnormalities in stage 1 (intake interview) resp. 2 (7 NES-2 tests) are considered not to have CSE and are not examined further.

Discussion and conclusions: The study provides evidence for an interaction between job strain and BMI. Our findings suggest that the effect of overweight on symptomatic DIP OA is modified by job strain so that persons with high job strain are at an increased risk of symptomatic DIP OA particularly if they are overweight.

Tu-O-39 RELATIVE IMPORTANCE OF WORK EXPOSURE, LEISURE TIME EXPOSURE AND INDIVIDUAL CHARACTERISTICS IN THE ONSET OF MUSCULOSKELETAL SYMPTOMS AMONG OFFICE WORKERS

*Blatter BM, Ijmker S, van der Beek AJ, Knol DL, van Mechelen W, Bongers PM.

Background and aims: The main aim of this study was to determine the relative importance of work exposure, leisure time exposure and individual characteristics in the onset of arm-wrist-hand and neck-shoulder symptoms among office workers.

Methods: Data from a prospective cohort study among 1948 office workers with a follow-up duration of two years were used. Data on self-reported risk factors were collected by questionnaire, at baseline and after one year of follow-up. For a subgroup of workers, continuous registration of computer use at work was available. Outcome was assessed every three months. Cases were defined as regular or prolonged symptoms in the past three months, plus a pain intensity level of at least 6 on a Von Korff scale or usage of pain medication, preceded by three months of no / minor symptoms. Population Attributable Fractions (PAFs) were based on Rate Ratios obtained from Poisson regression using Generalized Estimation Equations.

Results: The work related risk factor for arm-wrist-hand symptoms that contributed most to the development of symptoms was self-reported computer use at work (PAF=0.46, CI:0.11-0.68). Firmly squeezing with hands (PAF=0.25; CI:0.00-0.52) and high task variation (PAF=0.22; CI:0.07-0.35) had a preventive effect. Individual risk factors for arm-wrist-hand symptoms with the highest PAFs were overcommitment (PAF= 0.24; CI:0.09-0.38) and disabling arm-wrist-hand and neck-shoulder symptoms during the previous year (PAF=0.33; CI:0.26-0.41). For neck-shoulder symptoms, work related risk factors that contributed most to the onset of symptoms were self-reported mouse use at work (PAF= 0.20; CI:0.07-0.31) and computer and telephone use at the same time (PAF= 0.20; CI:-0.03-0.38). Disabling neck-shoulder symptoms in the past year (PAF= 0.45; CI:0.39-0.51) was the most important individual characteristic. Leisure time exposure did not or did only marginally contribute to the onset of new musculoskeletal symptoms.

Discussion and conclusions: Work exposure and individual characteristics are the main contributors to the onset of new musculoskeletal symptoms among office workers. Preventive interventions should aim at reducing the (perceived) amount of computer and mouse use, computer and telephone use at the same time and overcommitment, and at increasing task variation and firmly squeezing with hands. It may, however, be questioned if exposure to these factors can be changed considerably.

Tu-O-40 LOCAL MUSCULOSKELETAL DISCOMFORT AT WORK PREDICTS MORE SERIOUS MUSCULOSKELETAL PAIN

*van der Beek AJ, Hamberg-van Reenen HH, Blatter BM, van der Grinten MP, van Mechelen W, Bongers PM.

Background and aims: In ergonomic studies interventions are often evaluated using musculoskeletal discomfort as an outcome, assuming that discomfort is an early sign of more serious musculoskeletal symptoms in the future. So far, however, this assumption has never been proven. This study aims to evaluate whether peak or cumulative musculoskeletal discomfort at work predicts low back, neck or shoulder pain among symptom-free workers.

Methods: This prospective cohort study among almost 1800 workers had three years of follow-up. At baseline, Localized Musculoskeletal Discomfort (LMD) was rated six times during a normal day of work, for each body region of interest. The LMD-method uses numbers and verbal intensity descriptors to facilitate the self-reports based on Borg's Category Ratio (CR-10) scale.

Peak discomfort was defined as an LMD-rating of 2 at least one time during a day; cumulative discomfort was defined as the sum of LMD-ratings during the day. Reference workers reported LMD-ratings of zero at each of the six measurements. Questionnaires on low back, neck and shoulder pain were sent out at baseline and three times during follow-up. Data were longitudinally analyzed using Poisson Generalized Estimation Equations (GEE).

Results: On average and for all body regions, the LMD-ratings increased during the morning, decreased after the lunch break, and increased again during the afternoon until the end of the working day. The average LMD-ratings were low, due to large percentages of workers reporting ratings of zero (76% for the low back, 86% for the right shoulder, and 88% for the neck and left shoulder).

Peak discomfort predicted low back pain (RR 1.79 (0.97-3.27)), neck pain (RR 2.56 (1.36-4.81)), right shoulder pain (RR 1.91 (1.02-3.57)), and left shoulder pain (RR 1.90 (0.81-4.46)). Workers in the highest tertile of cumulative discomfort had an increased risk of neck pain (RR 2.35 (1.64-3.36)), right shoulder pain (RR 2.45 (1.64-3.64)), and left shoulder pain (RR 1.64 (0.87-3.10)).

Discussion and conclusions: Peak discomfort predicted low back, neck and shoulder pain, and cumulative discomfort predicted neck and shoulder pain. These results suggest that both peak discomfort and cumulative discomfort during work are early signs of more serious musculoskeletal pain in the future.

Tu-O-41 OPTIMIZING SAMPLING STRATEGIES: COMPONENTS OF LOW-BACK EMG VARIABILITY IN FIVE HEAVY INDUSTRIES

*Trask CM, Koehoorn MW, Morrison J, Teschke K.

Background and aims: Direct measurement of work activities is costly, so researchers need to distribute resources efficiently in order to elucidate relationships between physical exposures and back injury. This study addresses decisions about sampling strategies that involve some tradeoffs between measuring more individuals or more repeats of individuals, as well as how to group measurements.

Methods: This study conducted 133 full-shift Electromyography (EMG) measurements in five different heavy industries at 50 companies, representing 34 different job titles. These EMG measurements yielded four exposure metrics: mean; 90th percentile; cumulative; and rate of change. For each metric, the components of variance were calculated within-subject, between-subject, and between one of the following four groupings schemes: industry; company; job; or a post-hoc exposure grouping. The components of variability were then used to estimate how sampling strategy might attenuate an exposure-response relationship. For mean and rate of change metrics, the number of subjects per group (k) required to achieve an attenuation factor no lower than 0.95 was also calculated for each of the grouping schemes. For these calculations the number of samples per subject was set to 1.25 (repeats on 25% of subjects), 1.5, or 2 (repeats on everyone).

Results: The bulk of EMG exposure variance for mean, 90th percentile, and cumulative EMG metrics was between-workers, but the rate of change metric had consistently high within-worker variance for all grouping schemes. Between-group variance was highest for the post-hoc grouping scheme. The post-hoc grouping also had the lowest estimated attenuation of exposure-response relationships. Achieving an attenuation factor of 0.95 for a mean EMG relationship required 2-3 workers per group for post hoc grouping, but 59-144 workers per group for company grouping.

Discussion and conclusions: While mean, 90th percentile, and cumulative EMG had high between-worker variance, EMG rate of change metric had high within-worker variance and requires a large sample size with multiple measures per subject for epidemiological studies. The post hoc grouping delivered the most efficient assessments of exposure-response relationships by maximizing the contrast between groups.

ACCIDENTS AND EPIDEMICS

Tu-O-42 WORK-RELATED DRIVER FATIGUE: DIFFERENT CAUSES SAME EFFECTS.

*Williamson A, Friswell R.

Background and aims: Fatigue is well-known to adversely affect safe driving performance especially for people who drive for a living. While long distance truck drivers are recognised to be at particular risk, very little is known about fatigue experiences for drivers of light trucks doing local work. This study aimed to compare fatigue experiences and effects and attitudes to fatigue management of short haul light truck drivers and long haul heavy truck drivers and by benchmarking against the experiences of long haul truck drivers to assess the relative importance of the experience of fatigue for short haul truck drivers.

Methods: Results of two surveys, one of long distance heavy truck driving (n=1007) and the other of short haul light truck driving (n=321) were compared. The two surveys contained the same or similar questions about the demographic characteristics and fatigue experiences and attitudes of each group of drivers.

Results: The comparison showed that the effects of fatigue while driving were very similar for short haul truck drivers and long distance drivers in terms of reported safety incidents and personal experiences of fatigue with nearly half of the drivers in both groups reporting falling asleep at the wheel at some time in the last 12 months. Despite these similarities, the causes of fatigue while driving were very different between the two groups. Where long distance drivers did night work and extremely long driving hours involving monotonous rural driving, short haul drivers worked daytime hours doing many delivery stops in heavy urban traffic. It was also notable that unlike long haul drivers, short haul drivers did not see fatigue as a problem for the industry, despite reporting significant effects of fatigue both personally and while driving.

Discussion and conclusions: Fatigue has been overlooked as an occupational hazard for short haul truck drivers. There is clearly a need for action to address the impact of the factors causing fatigue for these drivers however this research demonstrated that in order to do so it will be essential to raise awareness of the importance of driver fatigue within the short haul truck driving industry.

Tu-O-43 RISK FACTORS OF OCCUPATIONAL ROAD ACCIDENTS: A CASE-CONTROL STUDY BASED ON THE RHÔNE ROAD TRAUMA REGISTRY

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Background and aims: Road accidents sustained while the victim is at work on behalf of his or her employer represent between 20% and 40% of work fatalities in most industrialised countries, yet have been the object of only a few studies. The aim of the study was to identify and quantify the role of work-related risk factors in the occurrence of occupational road accidents

Methods: Subjects (drivers, cyclists and pedestrians) were recruited using the accident victim forms of the various official departments contributing to the Rhône road trauma registry (France). For each occupational road accident victim, 4 control subjects, in employment and accident-free for the previous year, were sought from the general population, using the electoral voting lists. A telephonic interview was performed to collect information on work and working conditions. Exposure to road risk was assessed and expressed as a percentage of work time.

Results: A total of 146 occupational road accident victims and 440 controls were included in the analysis. The participation rate was 45% among cases and 30% among controls. Most of the victims were young men. Cases had a generally lower educational level than controls. Occupational road accident victims worked in smaller sites than did controls. Adjusting for exposure (% of work time spent in trips), however, showed these differences to be non-significant. Overall, driving was associated with more difficult working conditions than found in jobs not involving driving. These difficulties, however, were not systematically associated with increased occupational road accident risk. Among factors which still emerge after adjustment for road risk exposure, there are: A low seniority in the activity, low educational level, lack of flexibility in work schedules, lack of flexibility in performing the work, difficulty of communication with superiors, and physical constraints at work. In this study lack of recognition in work and events occurring in private life were not significantly associated with increased risk of occupational road accidents.

Discussion and conclusions: This study highlighted certain occupational road accident risk factors. The findings may be considered as advancing our knowledge of the subject, but need confirmation by further epidemiological studies.

Tu-O-44 INSOMNIA AND WORKPLACE INJURIES: IDENTIFYING HIGH RISK GROUPS

*Kling RN, McLeod CB, Koehoorn M.

Background and Aims: In 2002, more than 3 million Canadian adults met the criteria for insomnia. The presence of sleep problems can interfere with daily functioning including work and driving leading to the potential for injuries. It is important to identify working groups at high risk for injury due to sleeping

disorders in order to implement prevention programs where they are most needed. This study aimed to investigate the association between sleep problems and the risk of occupational injuries among Canadian workers and to identify the working groups most at risk for injuries.

Methods: This study used data from the Canadian Community Health Survey (CCHS) Cycle 1.1 2000-2001 public use file. The population was defined as working age respondents (age 15-64) who indicated working part-time or full-time in the last 12 months (n= 76,458). Occupational injury was defined as injury in the past 12 months while working at a job or business, or if the injury occurred at a commercial, industrial or construction area or a farm. Respondents who reported trouble going to sleep or staying asleep most of the time or all of the time were defined as having insomnia. Stratified logistic regression models were used to calculate odd's ratios (OR) and 95% confidence intervals (CI) for the association of sleep problems and occupational injury adjusting for potential confounders.

Results: Females (OR=1.76, 95% CI 1.75-1.78) had a higher risk for occupational injuries due to insomnia than males (OR=1.40, 95% CI = 1.40-1.43). Among seven job classes ranging from management to trades, those designated as professionals and those in sales and service occupations had the highest increased risk for occupational injuries due to insomnia (OR= 1.83, 95% CI=1.79-1.86 and 1.81, 95% CI= 1.79-1.84 respectively) while management was found to have the lowest risk (OR=0.87, 95% CI= 0.84- 0.90). Workers age 30-34 had over a two fold risk (OR=2.34, 95% CI=2.30-2.38), while workers who work multiple jobs had over a four fold increased risk (OR=4.26, 95% CI=4.04-4.49).

Discussion and conclusions: Prevention or intervention efforts may have the greatest impact among certain work groups including females, professionals, workers age 30-34 and workers who are employed in multiple jobs.

Tu-O-45 REGISTRATION OF FATAL ACCIDENTS AT WORK IN COSTA RICA

*Mora AM, Wesseling C.

Background and aims: Fatal accidents at work represent one of the most important problems in occupational health around the world but also one of the less studied issues in Central America. Costa Rica lacks a national and unique register of occupational accidents and the only official source of information is the National Insurance Institute (INS), which covers the 73% of the formal economy workers or 56% of the total labor force. Our study identified potential sources for data on fatal occupational accidents and estimated the incidence in Costa Rica during 2005 and 2006.

Methods: Key informants of all potential data sources (INS, Social Security, Forensic Center, Ministries of Health and Labor, Red Cross) were interviewed about routinely collected data that would identify work-related fatalities and the feasibility for participation in future surveillance. Existing registries were examined and a database was created including all occupational accidents reported by the identified sources.

Results: Only the INS and Forensic Center had a usable registry. The INS register contained 80 and 89 fatalities in the formal economy during 2005 and 2006, respectively, but officially reported only 60 and 69. The Forensic Center register contained 125 and 112 fatalities for the same period, including also workers of the informal economy without counting 73 possibly work-related cases. None of the other registries had useful data at present. Combining data of INS and the Forensic Center and eliminating duplicates, 237 confirmed fatal occupational accidents occurred over the 2 years, with an average annual incidence rate based on the confirmed cases of 6.58 per 100,000 workers.

Discussion and conclusions: Two registries in Costa Rica provide readily available data on fatal occupational accidents. The resulting estimated accident mortality in Costa Rica is lower than expected based on ILO estimates (18.08 per 100,000 workers for 2001), suggesting possible underregistration in both registries. Nonetheless, it is possible to develop methods to detect these cases. SALTRA is also facilitating the involvement of other feasible data sources to establish a national surveillance system.

Tu-O-46 PREVALENCE OF CHRONIC KIDNEY DISEASE IN THE NORTH-WEST OF NICARAGUA

*Torres C, González M, Aragón Benavides A, Lundberg I, Wesseling C

Background and aims: In Central America, an epidemic of chronic kidney disease (CKD) has been reported among young agricultural workers, in particular sugarcane workers. This study determined CKD prevalence in five distinct communities in North-West Nicaragua, a region with high mortality from renal failure

Methods: The selected populations are from mining, sugarcane/banana, fishery, coffee and urban (services) communities. The coffee community is situated at 700 m altitude and the others at sea level. All inhabitants age 20-60 provided data on demographics and CKD risk factors. Serum creatinine, proteinuria, blood pressure, height and weight were measured. 1087 adults (78 – 386 per community) completed examinations (response 76% for men and 91% for women). Glomerular filtration rates (GFR)

were estimated with the simplified Modification of Diet in Renal Disease Study equation and categorized into CKD stage 1: GFR \geq 90 mL/min/1.73m with proteinuria; stage 2: GFR 60 – 89; stage 3: GFR 39 – 59; stage 4: GFR 15 – 29; and stage 5: GFR < 15, kidney failure). CKD prevalence was compared between communities, men and women, and different age groups.

Results: Between 11.7% and 28.7% of the community populations had CKD stage 1 and 2 without clear gender differences. Prevalence of CKD stage 3-5 was 14.7% of men and 4.8% of women in the mining community, 17.5% and 3.4% in sugarcane/banana, 10.7% and 2.2% in fishery, 5% and 0% in coffee and 0% for both sexes in urban. In the mining community 1.9% of men and 0.9% of women had CKD stage 5 (1 out of 5 cases under age 40) and in the sugarcane/banana community 1.3% of men and no women (1 out of 2 cases under age 40). In the fishery, coffee and urban communities there were no CKD cases stage 5.

Discussion and conclusions: The CKD epidemic in Nicaragua is heterogeneous with different economies and geography. CKD prevalence is higher among men. In the mining and sugarcane/banana communities, the most affected communities, CKD stage 4/5 occurred also among women and in younger age groups. Next is the identification of occupational or environmental factors contributing to the epidemic.

Tu-O-47 PREVALENCE OF CHRONIC KIDNEY DISEASE IN FIVE COMMUNITIES OF EL SALVADOR

*Peraza S, Aragón Benavides A, García-Trabanino R, Hogstedt C, Leiva R, Wesseling C.

Background and aims: An increase of cases of chronic kidney disease (CKD) has been observed in Central America over the last decade. The epidemic does not seem to be related to traditional causes such as diabetes or hypertension. Environmental or occupational etiologies are suspected, e.g. dehydration and contaminated water. This study compared the prevalence of CKD in five communities with different economies and geographic locations.

Methods: Of the studied communities (173-206 inhabitants/community) three produce sugar cane, two in coastal areas and one at 500 m above sea level. Another produces coffee at 1600 m. and one is urban at 500 m. All persons aged 20-60 years were invited for an examination of kidney function. 664 participated (response rate men 63% and women 77%). A questionnaire was applied. Height, weight, blood pressure, proteinuria and serum creatinine were measured. Glomerular Filtration Rates (GFR) were calculated with the formula Modification of Diet in Renal Disease study equation (MDRD), and classified into five CKD stages 1: GFR: \geq 90 mL/min/1.73m with proteinuria; 2: GFR 60-89; 3: GFR 30-59; 4: GFR: 15-29 and 5: GFR<15 or kidney failure.

Results: Normal GFR for males ranged between 8.5% and 37.5% and for females between 67.1% to 92.2% in the communities. CKD stages 3-5 concentrate in the sugar cane communities, in particular in those at sea level. In the coffee community at the highest altitude no cases stage 3-5 were found. All stages of CKD are more prevalent among men, in all communities.

Discussion and conclusions: CKD prevalence at initial stages is high, being most common among men. The most affected locations with stage 3 -5 are the sugarcane communities at sea level. The results indicate that environmental or occupational factors might play a role as contributors to the epidemic and should be further investigated.

METHODS AND MODELS

Tu-O-48 TIME-RELATED ASPECTS OF THE HEALTHY WORKER SURVIVOR EFFECT

*Nuru K.

Background and aims: Health is important for continued employment and therefore continued accrual of occupational exposure; furthermore, steady employment can benefit health. Consequently, bias can occur in estimates of cumulative exposure–mortality associations. This has been called the healthy worker survivor effect (HWSE). The processes associated with the HWSE tend to lead to variation in mortality rates with time-since-termination of employment, most notably a peak in mortality shortly after termination of employment. We use simulations and an empirical example to demonstrate that time-since-termination can be a confounding factor in analyses of occupational-exposure–mortality associations.

Methods: Simulation data were generated for 20,000 workers followed for 40 years under a model of no effect of employment duration (a proxy for cumulative exposure) on mortality. Proportional hazards regression methods were used to quantify exposure–mortality associations and evaluate methods to control for the HWSE. Results were derived after 100 iterations of the simulation. Relationships between employment duration and mortality were also investigated in a cohort of 122,247 male utility workers with adjustments for time since termination.

Results: Simulation data show a peak in mortality rates in the first year after termination of employment which declined in magnitude with continued time since termination of employment; average employment duration also declined with time since termination of employment. This led to confounding of cumulative-exposure–mortality associations, with spurious evidence of a positive association between cumulative exposure and mortality in the post-termination period. Adjustment for time-since-termination eliminated this spurious association; in contrast, adjustment for a binary indicator of employment status led to positively-biased relative rate estimates. A similar pattern was observed in analyses of utility worker data. The log relative rate of all cancer mortality is -0.12 ± 0.03 per decade of employment without adjustment for time-since-termination, and -0.01 ± 0.03 with adjustment for time-since-termination of employment.

Discussion and conclusions: The HWSE can lead to temporal variation in mortality rates that is correlated with cumulative exposure. Under these conditions, adjusting for time-since-termination of employment may reduce bias in estimates of cumulative-exposure–mortality trends more effectively than the commonly-used method of adjusting for a binary indicator of employment status

Tu-O-49 STRUCTURAL MODELS FOR HEALTHY WORKER SURVIVOR EFFECT AND PREVALENT HIRES

*Eisen EA, Applebaum KM.

Background and aims: We observed bias due to healthy worker survivor effect (HWSE) in a recent simulation study where mortal cases were forced to leave work at diagnosis. We also observed downward bias among subjects hired prior to start of follow-up and still at work when follow-up starts (prevalent hires). To better understand the sources of these biases, we explored the causal structures of (1) healthy worker survivor effect in a cohort study of new hires; and the impact of (2) adding prevalent hires, defined cross-sectionally at baseline, to the study population.

Methods: We used directed acyclic graphs (DAGs) to understand how HWSE, induced by leaving work, introduces bias in a dynamic cohort study of new hires. We also explored how including prevalent hires modifies the DAG, both in the presence, and absence, of HWSE.

Results: Assuming that exposure causes disease, we found that leaving work (L) is both a structural confounder (common cause of exposure and disease) and an intermediate variable in a cohort of new hires (inception cohort). For subjects who were hired prior to start of follow-up, remaining at work until baseline is a common effect of both past exposure and previous underlying health status. Thus by conditioning on active work status at baseline (L), prevalent hires create selection bias.

Discussion and conclusions: DAGs have clarified that HWSE and prevalent hires introduce different types of bias in occupational cohort studies. HWSE can be understood as confounding by leaving work, which is also on the causal pathway. Thus structural models are needed to correct for HWSE. By contrast, prevalent hires induce selection bias and we cannot condition on being at work at baseline without causing bias.

Tu-O-50 BAYESIAN METHOD FOR IMPROVING ODDS RATIO ESTIMATE UNDER GROUP-BASED EXPOSURE ASSESSMENT WITH ADDITIVE MEASUREMENT ERROR

*Burstyn I, Kim H.

Background and aims: Group-based exposure assessment has been used in occupational epidemiology when it is difficult or impossible to measure exposures on the full cohort, and the investigators are only able to measure exposures on a sample of the cohort stratified on exposure groups. The expected true values, given the sample mean, are estimated and assigned to workers in each exposure group. These quantities are used to estimate odds ratios in a logistic regression models. This procedure leads to attenuation in the estimate of odds ratio when the variability among worker in each group is “large” and group means are close together. We propose a Bayesian method aimed and reducing attenuation bias following the application of group-based strategy in the estimation of odds ratio when measurement error is additive, the between-worker variability is large and the number of workers sampled per group is moderate (>50 per group).

Methods: Group-based strategy, with normally distributed exposure metrics, leads to approximate Berkson error with error variance approximated by between-worker within-group variance. Consequently, we use a Bayesian method for Berkson-type error structure in de-attenuating odds ratio estimates. In a simulation study, we generate hypothetical occupational cohorts that employed group-based exposure assessment and compared estimates of odds ratios before and after Bayesian correction for attenuation due to between-worker within-group variance that was assumed to be known.

Results: The preliminary results show that the Bayesian correction method gives improved estimates, especially when between-worker within-group variance is large and group means are close together. This advantage in de-attenuating the estimates of exposure-response association is achieved at the expense of

loss of precision, but not to the extent that would alter conclusions about presence of statistically significant association. The new method we propose can be easily implemented and extended in freely available software: WinBUGS.

Discussion and conclusions: The already successful group-based exposure approach in occupational epidemiology (semi-ecological study design) can mostly likely be further improved in the case of logistic disease model by correction for attenuation through Bayesian procedure that takes into account between-subject within group variance.

Tu-O-51 STATISTICAL METHODS TO COMPARE HEARING THRESHOLDS TO ISO-7029

*Boggess MM, Guest M, D'Este C, Attia J.

Background and aims: In order to determine if there was evidence to support the anecdotal reports of adverse health problems, including deficiencies in sensory functions, in aircraft maintenance technicians who undertook deseal/reseal activities on the Australian Air Force's F-111 aircraft at Amberley Air Base, a general health and medical study was undertaken. The deseal/reseal process required the personnel to enter the fuel tanks where there were excessive exposures to formulations containing solvents such as MEK, toluene (aromatic naphtha), thiophenol, and propylene glycol (monomethyl ether acetate). This would also apply to primers and sealants containing chromates, unreacted isocyanates and curing agents. The aim of this paper is to present the hearing threshold data, and to compare and contrast two methods of statistical analysis.

Methods: Hearing thresholds were assessed in both ears of 614 exposed personnel, 513 technical and 403 non-technical tradesmen using pure-tone audiometry (air conduction) at the frequencies of 0.1, 1, 2, 3, 4, 6, and 8 kHz. The results were compared with the otologically normal population quantiles published in ISO-7029-2003 using: t-test for each frequency and a quantile regression model, controlling for possible confounding variables.

Results: The multiple t-test method has a number of limitations, in part stemming from the fact that each frequency must be analysed separately. The quantile model estimates showed that median hearing thresholds were significantly lower than normal. The extent of the hearing loss is substantial, in that a 95% confidence band for the median lies below the 30th percentile of the normal population for most frequencies and ages. The largest loss occurs at 6 and 8 kHz for those under 30 years of age.

Discussion and conclusions: We demonstrate the enhanced modeling capabilities of quantile regression over the often used t-test.

Tu-O-52 ASCERTAINMENT BIAS FROM EARLY DETECTION IN EPIDEMIOLOGIC STUDIES OF OCCUPATIONAL HEALTH

*Church TR.

Background and aims: Early detection or screening is known to advance the date of diagnosis and can lead to differential ascertainment even for chronic diseases that have no effective screening method. An individual with undiagnosed but detectable disease who is screened and diagnosed within the ascertainment window will be in the study, but an identical person who is not screened may fail to be diagnosed within the study ascertainment window. Although workers may be differentially exposed to medical care compared to the reference population, and so more likely to be screened, most occupational studies ignore this potential. We investigate the magnitude of this potential through simulation of a typical occupational study design.

Methods: A recurrence-time screening model assuming progressive disease with a significant detectable, preclinical phase is used to simulate screening in occupational cohorts and assess the potential for differential ascertainment of cases via screening under various assumptions about the frequency of screening in the occupational cohort and in the general population. The bias in standardized mortality ratios (SMR) is evaluated for each scenario.

Results: In the simulated studies, the bias is related to the disease frequency, the frequency of early detection, and the lead-time by which diagnosis is advanced. Depending upon assumptions, bias in the SMR can range from a nearly 50% decrease in the SMR to a doubling for plausible scenarios. For equal screening or early detection rates, no bias resulted, suggesting that stratification by screening rate would eliminate bias from this source.

Discussion and conclusions: Early detection should be considered as a source of potential ascertainment bias in occupational cohort studies using general populations as reference and SMR as the parameter of interest. In cases where significant bias may result, investigators should consider adjusting the analysis for screening frequency.

Tu-O-53 TWO-PIECE LINEAR MODEL IN CANCER RISK ASSESSMENT

*Steenland K, Klein M.

Background and aims: A key goal of cancer risk assessment is to develop a quantitative exposure-response model from which excess risk of disease can be estimated for any given exposure. Increasingly human epidemiologic data are being used for risk assessment. Typically, permissible exposure limits for occupational exposures may be set such that the specific exposure results in an excess risk of disease of 1% or lower. The permissible exposure which results in this risk is often very dependent on the exposure-response model chosen. It is not uncommon in occupational epidemiology for exposure-response curves to tail off or plateau (attenuate) at higher exposures. A number of reasons for such a plateau effect have been advanced, including depletion of susceptibles in the population, saturation of biological processes, misclassification of exposure, and the healthy worker survivor effect. Typically the models fit to the data in this situation, such as the square root or log transformation, are supra-linear in the low dose region such that very low exposures will result in a 1% excess risk. On the other hand a (one-piece) linear exposure-response model will often underestimate risk in the low-dose region resulting in an excessively high permissible limit. Another proposed solution is the elimination of the high exposure region in conducting risk assessment, but this introduces an arbitrary decision of where to cut off high exposure.

Methods: We propose a two-piece linear model (a linear spline with one knot) for such situations. Such models fit "plateauing" data well and provide a linear exposure-response relationship in the low-dose region, while avoiding the problems of models mentioned above. We illustrate the use of the two-piece linear model with exposure-response data for breast cancer incidence due to exposure to ethylene oxide.

Results: The two-piece linear model fits the data better than the linear, square-root transformation, or log transformation model, and corresponds well to categorical analyses.

Discussion and conclusions: The two-piece linear model solves a number of problems frequently confronted by risk assessors. It has the added advantage of providing a straight line from the knot to the origin, which is useful for risk assessors who usually assume a linear low-dose extrapolation for carcinogens.

Tu-O-54 ESTIMATION OF ATTRIBUTABLE FRACTIONS FOR OCCUPATIONAL CANCER: COMPARISON OF METHODS AND RESULTS

*Straif K.

Background and aims: Estimates of attributable fractions (AF) for occupational cancer have often been controversial. More recently, several new global and national estimates have been published and come again to different conclusions.

Methods: Methods and results of global and national estimates recently published in peer-reviewed journals will be compared and explanations for differences will be sought.

Comparison of methods will focus on estimation of economically active population, included carcinogens, proportion of workers exposed and turnover of workers, and corresponding relative risks. Comparison of results will focus on overall occupational cancer and lung cancer.

Results: Due to stringent data requirements the WHO's Comparative Risk Assessment restricted the estimate of AF for occupational cancers to selected carcinogens for lung cancer, mesothelioma and leukaemia. National estimates of AF based on national exposure data and "best corresponding" risk estimates were available from the U.S., Finland and the UK. The UK report estimated asbestos-related lung cancers on the basis of mesothelioma cases. More than half of occupational cancer was due to lung cancer. The AF for occupational lung cancer from the WHO (estimates for U.S. and Western Europe), the U.S., Finland and UK were 5-6%, 6.3-13%, 24%, and 15%, respectively. More than half of these were due to asbestos.

Discussion and conclusions: Critical issues of the different methods include the availability of representative exposure data and the choice of the corresponding risk estimates. Efforts to improve the exposure assessment are needed for valid extrapolation of results to countries with limited exposure data. The two most detailed recent projects consistently conclude that 20 – 30% of today's lung cancers are due to previous occupational exposures and the majority of these are due to exposure to asbestos. The ongoing debate on AF should not be used as an excuse to postpone action to eliminate asbestos related cancers, particularly in developing countries with suboptimal occupational hygiene.

Poster Exhibition

BIOMARKERS

Tu-P-1 OBESITY AND OXIDATIVE STRESS AMONG POLICE OFFICERS

*Charles LE, Burchfiel CM, Slaven J, Hartley TA, Andrew ME, Browne RW, Fedekulegn D, Violanti JM.

Background and aims: Police officers are affected by the obesity pandemic. Obesity is associated with cardiovascular disease and the biological mechanism may involve oxidative stress. The authors investigated the association between several anthropometric measures (BMI, waist circumference, waist-to-hip ratio, waist-to-height ratio, and abdominal height) and biomarkers of oxidative stress (glutathione (GSH), glutathione peroxidase (GSH-Px), vitamin C, thiobarbituric acid reactive substances (TBARS), and trolox equivalent antioxidant capacity (TEAC)) among police officers.

Methods: This cross-sectional study included 110 randomly selected police officers (44 women and 66 men) from Buffalo, New York. Anthropometric measures were performed by clinic staff and standardized testing of the biomarkers was performed on fasting blood specimens. An oxidative stress score (OSS) variable was created as a composite of the biomarkers. Analyses of variance and covariance were used to compare mean levels of each oxidative stress marker across tertiles of the anthropometric measures.

Results: Officers ranged in age from 26 to 61 years, mean \pm SD = 39.6 \pm 7.6 years. GSH was inversely and significantly associated with waist circumference (trend $p = 0.002$) and waist-to-hip ratio (trend $p = 0.001$). These associations remained significant after adjustment for age, sex, education, smoking, alcohol, and physical activity. Additional adjustment for BMI did not attenuate the results. GSH-Px was inversely and significantly associated with BMI (adjusted trend $p = 0.002$) and with waist-to-height ratio (adjusted trend $p = 0.007$). Mean levels of vitamin C were inversely, but not significantly, associated with waist-to-height ratio. Mean levels of TEAC, TBARS, or OSS were not associated with any of the anthropometric measures. Significant interactions were observed for physical activity with (a) waist circumference and waist-to-hip ratio for GSH and (b) all anthropometric measures (except abdominal height) for vitamin C. The above associations were inversely related only among officers who reported engaging in some physical activity. Significant inverse associations were observed for waist circumference and waist-to-hip ratio with vitamin C, but only among never smokers; the interaction with smoking status was significant.

Discussion and conclusions: Obesity was significantly associated with several markers of oxidative stress and these associations showed significant interactions with physical activity and smoking.

Tu-P-2 TNF-A PRODUCTION IN MEXICAN WORKERS OCCUPATIONALLY EXPOSED TO BENZENE-TOLUENE-XYLENE MIXTURE (BTX)

*Haro-García L, González-Bonilla C, Chacón-Salinas R, Juárez-Pérez C, Aguilar Madrid G, Vélez-Zamora N, Muñoz-Navarro S, Borja Aburto VH.

Background and aims: Chronic occupational exposure to benzene is linked to immune response cell compounds count decrease but their functions have been scarcely explored. Relevance to analyze benzene mixture with toluene and xylene (BTX) is because these could determine the effects on bone marrow. Toluene-xylene gathered action may produce also additive results over the monocyte counts. In occupational environment BTX presence is the common. Our aim was to determine the relationship between TNF- α production and occupational exposure to BTX mixture.

Methods: We conducted an analytical transversal study in 54 workers employed at a paint manufacturing company. The following were explored in these workers: age; on-the-job seniority; smoking, and alcohol consumption; we also obtained lipopolysaccharide (LPS)-stimulated mononuclear cells from the workers to produce TNF- α . Quantification of this cytokine was performed with ELISA test and reported in pg/ml. BTX collection was carried out by personal monitoring and measured by gas chromatography. We structured an accumulated-BTX potential-dose estimator by airway and inhalatory route for a worker's 8-h workday in mg, considered per kg of worker weight and by a month's work. Two exposure groups were established: high dose $\geq 1,000$ mg of BTX, and low dose, $< 1,000$ mg of BTX. Thirty workers (55.6%) were assigned low-dose exposure, while the remaining 24 workers (44.4%) were adjudged to have high-dose exposure.

Results: In the low-dose BTX-exposed group, TNF- α concentration was 1,951.2 pg/mL, while in the high-dose BTX-exposed group this was 833.9 mg ($p = 0.01$). We conducted tobacco- and alcohol consumption-adjusted multiple linear regression analysis. High-dose BTX exposure and decrease in TNF- α production was significant ($p = 0.02$).

Discussion and conclusions: With high-dose BTX exposure, TNF- α production by mononuclear cells after stimulation with LPS diminished. The presence of smoking and alcohol consumption antecedents shows their participation in the effects on the production of TNF- α .

Tu-P-3 INFLAMMATORY BIOMARKERS IN ASPHALT WORKERS

*Barregård L, Ulvestad B, Randem BG, Ellingsen D.

Background and aims: Asphalt is a mixture of bitumen with crushed stone/gravel. It is put down hot on the road by asphalt pavers, who are exposed to dust, oil mist, polycyclic aromatic hydrocarbons and nitrogen dioxide. In the Nordic countries this kind of work is seasonal, carried out during the summer months. We have recently reported over-season increases of IL-6 and Clara cell protein (CC16) in serum of asphalt pavers (Ulvestad B et al. *Scand J Work Environ Health* 2007;33:114-122 and Ulvestad et al. *J Occup Environ med* 2007;49:1073-1078). We have performed additional analyses of an acute phase reactant (Amyloid A) in order to further assess inflammatory effects of such work.

Methods: Blood samples were collected just before (April-May) and in the end of (Sept-Oct) the paving season in 72 asphalt pavers and an internal control group of 51 low-level exposed asphalt plant operators (N=32) or engineers (N=19) from the same company. Serum was analysed for Amyloid A (S-AA) by ELISA (Anogen, Ontario, Canada). The within-subject differences over season were highly skewed (also after log-transformation) and examined by the Wilcoxon rank sum test.

Results: There was a slight but significant group difference with respect to S-AA, with a slight increase (median 0.1 mg/L) in the pavers vs. a slight decrease (median -0.25) in the control group (P=0.046). After exclusion of some outliers a t-test on ln-transformed S-AA levels showed a similar result (P=0.04). The effect was most pronounced in the non-smokers. S-AA levels were significantly correlated to S-CRP and S-IL-6.

Discussion and conclusions: S-AA is a proinflammatory adipokine and an acute phase reactant. S-AA levels seem to predict cardiovascular disease in humans (Ridker PM et al. *N Engl J Med* 2000;342:836-843), and animal studies indicate that it may also be a risk factor for atherosclerosis (Chait A et al. *J Lipid Res* 2005;46:389-403). It has been shown to be affected also in experimental exposure to combustion particles (Barregård et al. *Inhal Toxicol* 2006;18:845-853). S-AA may be a useful indicator in assessment of inflammatory effects of air pollution – in occupational as well as environmental settings.

Tu-P-4 PREDICTORS OF CLARA CELL PROTEIN (CC16) LEVEL: AN INVESTIGATION OF CC16 AS A SILICA EXPOSURE BIOMARKER.

*Wilson K, Murray J, Girdler-Brown B, Borm P, Donaldson K, Vallyathan V, Castranova V, Gulumian M.

Background and aims: Clara cell protein (CC16) is a protein that is mainly produced by Clara cells in the respiratory epithelium. CC16 can be measured in bronchoalveolar lavage specimens, serum, urine and sputum. Clara cells and CC16 may play a role in protecting the lung from oxidative stress. A change in CC16 reflects chronic damage to Clara cells and may therefore be a useful biomarker for crystalline silica induced lung damage. This paper presents an analysis of predictors of CC16 in gold miners exposed to silica and unexposed controls.

Methods: 118 African male volunteers participated in this cross-sectional study. They were recruited from a gold mine (silica exposed, n= 64), a blood donor service (silica non-exposed n= 37) and a hospital HIV clinic (silica non-exposed n= 18). Data were collected on age, work history, smoking habits and HIV status. CC16 was assayed in the serum using an ELISA kit. Multiple linear regression was performed with post-regression residuals analysis to identify the factors that might explain the observed variation in CC16.

Results: Arithmetic mean (AM), geometric mean (GM) and geometric standard deviation (GSD) for the whole group CC16 level were 6.0ng/ml, 5.27ng/ml and 1.67ng/ml. AM, GM, and GSD for the silica exposed group were 5.56, 4.87 and 1.69, and for the unexposed group were 6.49, 5.77 and 1.64. The CC16 results were log-normally distributed. T-tests for unpaired data with equal variance indicated a crude relationship between silica exposure and CC16 levels, $p = 0.074$; and smoking and CC16 levels, $p = 0.0001$. Multiple regression with the factors investigated in this study explained 20% of the variation (coefficient of determination $r = 0.19$) and the model identified exposure to silica as a significant risk for a lower level of CC16 ($p = 0.024$) smoking was no longer significant ($p = 0.082$).

Discussion and conclusions: CC16 levels were lowered in silica exposed subjects and were not affected by HIV status. CC16 is a suitable candidate for further research. Factors that further explain the variance in CC16 levels need to be identified before it can be confidently used as a biomarker for silica dust exposure

Tu-P-5 URINARY MERCURY AND BIOMARKERS OF EARLY RENAL DYSFUNCTION IN MERCURY EXPOSED CHLORALKALI WORKERS

*Sällsten G, Jarosinska D, Horvat M, Mazzolai B, Barregård L.

Background and aims: Exposure to elemental mercury can cause a variety of adverse health effects and the kidney is an important target organ. As part of an EU founded project, EMECAP, biomarkers of early

kidney damage and urinary mercury levels were analyzed in chloralkali workers (CA) from three different countries, Sweden, Italy and Poland. The aim was to study exposure-response relationships. **Methods:** Men (without diabetes, hypertension or known kidney disease) exposed to mercury vapor for at least one year were recruited from four different plants, in total 179 subjects. In Poland two plants were investigated, one of them with an older technology (CA1) as compared with the other three plants. Urine samples were analysed for mercury corrected for creatinine (U-HgC), alpha-1-microglobulin (A1M), N-acetyl- β -glucosaminidase (NAG) and albumin. Levels of kidney markers were compared in three U-HgC categories, and differences were tested taking age and other covariates into account.

Results: The highest U-HgC was found in the Polish CA1 plant employees, approximately ten times higher than in the Swedish or Italian workers (45.9 $\mu\text{g/gC}$ vs. 3.8 and 4.6 $\mu\text{g/gC}$ and the other Polish plant 6.0 $\mu\text{g/gC}$, $p < 0.0001$). There was a positive, statistically significant effect on U-NAGC of age as well as urinary mercury category ('high' U-HgC > 17.3 $\mu\text{g/gC}$ vs 'low' U-HgC < 5.4 $\mu\text{g/gC}$), also after adjusting for country and smoking. The proportion of subjects with detectable A1M increased with U-HgC categories in the Swedish and Polish men. In the Swedish men, the excretion of U-A1MC was statistically significantly higher in subjects in the 'high' U-HgC category as compared with 'low' U-HgC category, with a significant positive effect of age (also after controlling for smoking). In the Polish men with U-HgC > 5.4 $\mu\text{g/gC}$ the median U-AlbC was statistically significantly higher than in the subjects with lower U-HgC ($p = 0.05$). Subjects with U-HgC exceeding BEI (>35 $\mu\text{g/gC}$, $n = 29$) had statistically significantly higher U-NAGC and U-A1MC than workers with lower U-HgC (<35 $\mu\text{g/gC}$).

Discussion and conclusions: In workers occupationally exposed to mercury, U-HgC was positively associated with the kidney markers, especially with NAG, but to some extent also with A1M and albumin.

CANCER 2

Tu-P-6 ARE THERE TIME PERIODS ASSOCIATED WITH THE PREVENTATIVE EFFECT OF PHYSICAL ACTIVITY?

*Kling RN, Demers PA, Ostry AS, Davies HW.

Background and aims: Workplace physical activity has been associated with a decreased risk of colorectal cancer; however, there is little understanding of the time periods of exposure that most contribute to this protective effect. This study examined the effect of cumulative workplace physical activity, as well as different time periods of exposure and their effect on the risk for colorectal cancer in a cohort of Western Canadian Sawmill Workers.

Methods: This study was based on a larger cohort of sawmill workers. A nested case control methodology was used for this study. Cases were sawmill workers diagnosed with colorectal cancer, drawn from a larger cohort of sawmill workers. Healthy controls were matched to cases based on age and gender. Physical activity was assessed by expert reviewers who rated 54 job titles common to the sawmill industry. Based on the question 'the job required a lot of physical effort' the expert evaluators gave individual jobs a score of 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree. An internal comparison of cumulative as well as 10 and 20 year lagged levels of workplace physical activity and colorectal cancer was conducted using Logistic regression.

Results: The cumulative exposure analysis found that moderate activity (53.5-71.8 physical activity-years) was associated with the lowest decreased risk for colorectal cancer (OR=0.65, 95% CI=0.40-1.04) compared to the lowest level of activity whereas with a 10 and 20 year lag, lower activity levels (16.8-32.4 physical activity years) were associated with the lowest decreased risk for colorectal cancer (OR=0.72 in both analyses) compared to the lowest level of exposure. However, physical activity, lagged by 20 years was largely associated with a non-significant increased risk for colorectal cancer.

Discussion and conclusions: More recent workplace physical activity or lower levels of activity over a longer period of time may be most associated with a protective effect for colorectal cancer.

Tu-P-7 BENZENE AND CML: A SYSTEMATIC REVIEW OF CASE/CONTROL STUDIES

*Lamm SH, Joshi KP.

Background and aims: The evidence that benzene is a hematotoxicant and a causal agent for acute myelogenous leukemia is strong, while the evidence for benzene as a causal agent for chronic myelogenous leukemia (CML) is weak, primarily based on case-series and cohort studies.

Methods: A literature search was undertaken to identify studies examining the association of CML and benzene exposure, particularly of case/control design.

Results: Six case/control studies were identified, three nested in industrial cohort studies, two from cancer registries, and one from a hospital-based cytogenetics laboratory. The 410 cases in the studies

included 255 Philadelphia chromosome (+) CML cases from the cytogenetics laboratory study. Exposure classification were analyzed as cumulative exposures in the nested studies and as ever/never in the others, based on job titles or job tasks. Odds ratios for the nested studies were 0.9 (0.1-9.9), 1.0 (0.9-1.1), and 1.2 (0.1-11). Odds ratios for the other studies were 0.7 (0.3-1.8), 0.9 (0.4-1.8) and 1.2 (0.7-2.3). Thus, all studies had odds ratios in the range of 0.7-1.2 with no statistically significant findings. Appraisal of relevant cohort studies revealed that none contained measures of association between benzene and CML that were statistically significant. A meta-analysis using data from 17 US and 2 UK petroleum cohorts also showed no statistically significant association between benzene and CML.

Discussion and conclusions: Studies exploring the relationship between benzene exposure and CML do not reveal a significant association between benzene and CML. Recent case control studies have made this increasingly clear.

Tu-P-8 PROFILE OF THE OCCUPATIONAL EXPOSURES IN PATIENTS DIAGNOSED WITH LEUKEMIA AND TREATED ON THE NATIONAL CANCER INSTITUTE - (INCA-BRAZIL)

*Otero UB, Turci SR, Rebelo PA, de Souza MO, Brown GA, Guimarães PV.

Background and aims: Introduction: The crude incidence rates for leukemia in Brazil for the year of 2008 is 5.52/100.000 for men and 4.44/100.000 for women. In the country occupational cancer is a developing field, which still in its initial phase with few available studies. In the State of Rio de Janeiro (located in the Southeast region) the incidence rate is 6.72/100.000 in men and 5.44/100.000 in women. Findings in epidemiological studies suggest that environmental and occupational factors play a role in the pathogenesis of leukemia and workers exposed to benzene and other carcinogens agents, present excess risk. Objective: To estimate the occupational risk factors frequency in hospitalized patients with confirmed leukemia diagnosis (acute and chronic myeloid, acute and chronic lymphocytic and myelodysplastic syndromes).

Methods: Methodology: The data from 405 adult patients (18 years or more) of both sexes with leukemia diagnosis confirmed in the period of 2000 to 2006 was collected from September to December of 2007. The complete occupational history of each patient was recovered and indicated the substances that they were exposed during their working life. Concerning the exposures, it was also collected frequency and concentration data.

Results: Acute and chronic myeloid leukemia represented 59,3% from all analyzed cases. Most patients were men (59,3%) and they resided in Metropolitan Area of Rio de Janeiro (73,2%). Concerning race, 74,8% were white and patients aged up to 48 years old were 51% from total. The most frequently observed occupational exposures were to the clean products (removers and disinfectants), to the dyes, as well as to gasoline and other solvents.

Discussion and conclusions: Conclusion: The results indicate that the patients with leukemia (subtypes analyzed) were exposed during their working life to chemical agents with established potential carcinogens. Analytic studies of the type case-control are necessary to study the association between these agents and leukemia, and thus contribute with actions that may improve workers' health.

Tu-P-9 OCCUPATION AND INDUSTRY IN A NESTED CASE-CONTROL MORTALITY STUDY AMONG RADIO AMATEURS

*Cantor KP, Baris D, Inskip P.

Background and aims: Radio amateurs are employed in the electrical, electronics, broadcasting, and related industries far more frequently than the general population. Links to brain cancer, melanoma, and hematopoietic cancers have been suggested with some of these occupations or associated exposures. Taking advantage of information gathered for a retrospective cohort mortality study of radio amateurs, we conducted a nested case-control study to evaluate the possible association of these cancers with selected occupations and industries.

Methods: Using amateur radio licensing records, 94,610 male subjects with at least one residence in California in 1966-1995 were followed for vital status. In nested case-control analyses of decedents, we estimated occupationally-related risk of death due to brain cancer (N=156), malignant melanoma (99), leukemia (197), multiple myeloma (82), and non-Hodgkin lymphoma (NHL) (138), using 1,529 non-cancer controls frequency matched to cases by year and age at death. Usual industry and occupation (and duration in the occupation) were abstracted from death certificates and coded. Odds ratios (OR) and 95% confidence intervals (CI) were estimated by logistic regression for engineering, electrical, electronics, and technical broadcasting occupations (all other occupations/industries served as referent for each), controlling for year and age at death, and other factors.

Results: We found the following significant associations: brain cancer-engineers (N=40 'exposed' cases, OR=1.4, CI=1.0-2.1); melanoma-none; all leukemias-engineering services (N=11, OR=2.7, CI=1.3-5.4); chronic myelogenous leukemia (CML)-engineering services (N=3, OR=4.8, CI=1.4-16.6); acute

myelogenous leukemia (AML)-radio/TV broadcasting (>25 yrs: N=2,OR=4.7,CI=1.0-21.9); multiple myeloma-radio/TV broadcasting (N=3,OR=3.5,CI=1.0-12.4); >25yrs:N=3,OR=5.7,CI=1.5-21.1), NHL=none; all hematopoietic cancer-radio/TV broadcasting (N=10,OR=2.4,CI=1.1-5.4; >25yrs:N=9,OR=3.5,CI=1.4-8.7).

Discussion and conclusions: In this study, we found elevated risk for brain cancer, CML, and all leukemias associated with employment as an engineer or in engineering services. We also observed elevated risk for multiple myeloma, AML, and all hematopoietic cancers with technical occupations in the radio/TV broadcasting industry. Given the limitations of this study, these findings can only be suggestive. The associations for the broadcasting industry, however, have not been previously reported and are deserving of further investigation.

Tu-P-10

(Author did not attend the conferences.)

Tu-P-11 ENVIRONMENTAL EXPOSURE AND RISK OF GASTRIC CANCER

*Dregval L.

Background and aims: Human health depends on environmental factors. Gastric cancer is the second most common cancer in the world and the fourth in Europe. The importance of environment in etiology of gastric cancer is not clear.

The aim of this study is to assess the risk of gastric cancer in relation to environmental exposure.

Methods: A hospital based case-control study was carried out in Lithuania. The study included 379 cases aged 22-86 years who had histologically confirmed diagnose of gastric cancer and 1137 hospital controls that were cancer and gastric diseases free. Cases and controls were matched by gender and age (+5 yr.). Ratio of case and controls was 1:3. A structured questionnaire was used to collect information on possible risk factors of gastric cancer. Environmental exposure of different factors at work place such as dust, chemicals, radiation, low and high temperature, humidity, frequent stressful situation and etc. was estimated. Physical load used at workplace assessed according to work type. Data were analyzed using the logistic regression model.

Results: The higher risk for the gastric cancer was observed among people exposed to dust (OR=1.51, 95% CI=1.18-1.93), chemicals (OR=1.40, 95% CI=1.08-1.82) and humidity (OR=1.48, 95% CI=1.10-1.99) at their workplaces. The analysis of exposure to environmental factors has shown that significant difference in risk was estimated among those respondents who were exposed to dust, chemicals and /or humidity at their workplaces during 31-40 years in comparison with the unexposed persons (OR=1.74, 95% CI=1.09-2.79). The physical load at the workplaces was associated with the risk of gastric cancer, which has been increased with the hardness of work. The risk for the persons who reported that they had mostly had heavy manual job during their lifetime was twice as big as for those having very light mainly sitting job (OR=2.06, 95% CI=1.44-2.94).

Discussion and conclusions: Some environmental factors at work places associated with increased risk of gastric cancer. The relationship of environmental exposure of dust, chemicals, humidity, physical load and gastric cancer was observed. In order to reveal the mechanism of environmental exposure in gastric cancer pathogenesis the further investigations are needed.

Tu-P-12 POSSIBLE RELATIONSHIP OF GROSS DOMESTIC PRODUCT (GDP) AND INCIDENCE OF PROSTATE CANCER IN SINGAPORE FROM 1960 TO 2006: LIKELY OCCUPATIONAL & ENVIRONMENTAL FACTORS?

Chia S, *Mohamed Ali S.

Background and aims: Among countries with reliable cancer statistics, prostate cancer rates are highest in westernized countries and lowest in Asian countries. Migrant studies have demonstrated that emigrants from low-risk countries manifest some excess prostate cancer incidence by moving to a high-risk country. Could prostate cancer rate be related to economic growth/well-being? The incidence of Prostate cancer in Singapore has been rising; especially from 1990s. Singapore has also experience tremendous economic growth especially from 1970s. The aim of this paper is to study the possible relationship between the incidence of Prostate Cancer and GDP in Singapore from 1960 to 2006 and to postulate possible occupational and or environmental risk factors.

Methods: This retrospective population-based study included all incident prostate cancer cases reported to the Singapore Cancer Registry from 1968 to 2004. Per Capita GDP at current market prices were obtained from the Singapore Department of Statistics for 1960 to 2006.

Results: There was a gradual increase in the age-standardized incidence rates of prostate cancer over the years with a steeper increase since the 1990s. The percentage increase in the age-standardized incidence rate per year ASR was 5.0%, 5.6%, 4.0% and 1.9% for all residents, Chinese, Malays and Indians;

respectively ($p < 0.001$). There was a gradual increase in the GDP from 1970s with sharp rises from mid 1980s onwards. By shifting the ASR 10-year forward and plotting it together with GDP there is trend between increasing GDP and ASR.

Discussion and conclusions: Occupational factors are unlikely to contribute towards increase incidence of prostate cancer as Singapore has been moving from an industrial-base to service and financial base economy. Lifestyles factors viz. alcohol consumption, cigarette smoking, diets, physical activities, sexually transmitted infections have been reported, though not confirmed, risk factors for prostate cancer. Economic growths are known to affect changes in population lifestyle which may than alter the incidence of prostate cancer.

Tu-P-13 THE OCCUPATIONAL EXPOSURE AND THE RISK OF CANCER IN BRAZIL

*Ribeiro FS, Reis MM, Garbin H, Rubano S, Otero U.

Background and aims: Silicosis is probably the most ancient occupational illness. Silica exposure still persists as a worldwide problem and remains an important public health problem, not only for silicosis but also cancer and other diseases. The ILO/WHO Global Program for the Elimination of Silicosis was established in 1995. Brazil, China, Chile, India, Thailand, Vietnam, and South Africa have established their National Programs. As proposed in the second international meeting of International Plan for Americas in 2007, effectiveness of interventions requires the estimation of numbers and distribution of exposed. Exposure mapping may then be undertaken with a Matrix of Potential Exposure (MPE).

OBJECTIVE: The aim of the study was to estimate the numbers of workers exposed to silica in Brazil and Chile and to create a methodology compatible with MPEs in other countries of America.

Methods: n MPE was developed in Brazil, following the conception of the CAREX database, and applied also in Chile. The results were compared and the exposure situation of each economical section (industry) was analyzed. The main between-country differences are marked, and a model is being built considering variations in the work process. This methodology for the estimation of the number of exposed is being proposed for all countries in Latin America.

Results: There are about 2 million workers exposed to crystalline silica (5.3 % of the employed) in Brazil; in Chile, 374.843 workers (5.4% of the employed), in 2005. A rougher method applied in Costa Rica in 2000 resulted in 27.100 workers exposed (2.1%).

Discussion and conclusions: A map of occupational silica exposure in Americas is being constructed by the efforts of Brazil, Chile and Costa Rica through a compatible MPE. Recommended interventions for prevention include the complete elimination of the use of crystalline silica and substitution with less hazardous materials. Engineering control programs would be cost effective in both developed and developing countries for reducing silica exposure. Obligatory notification of silicosis is needed in all countries.

HEALTH CARE AND THE PUBLIC SECTOR

Tu-P-14 HAZARD EXPOSURES AND MULTIPLE BURNOUT INDICES AFFECTING NURSES

*Lu JD.

Background and aims: This is a cross sectional study, which aimed to determine the interaction between situational, factors, role stressors, hazard exposure and personal factors among 246 nurses consisting most of females (78.5%) from the different wards and units in the Philippine General Hospital (PGH). This is important since the exodus of Filipino nurses to other countries have depleted the health care service in the country.

Methods: Stratified sampling techniques were used based on ward and unit assignments. Survey questionnaires were given, as well as hazard exposure assessment using industrial hygiene equipments.

Results: Almost half (49.6%) of the respondents reported being ill due to work in the past year, and 56.1% missed work because of an illness. Correlation statistics using the Spearman's rho showed organizational role stressors was most significant in burnout among nurses in the Philippine's largest tertiary hospital. Organizational role stressors consisted of ten dimensions, namely: 1) Inter-role Distance (IRD); 2) Role Stagnation (RS); 3) Role Expectation Conflict (REC); 4) Role Erosion (RE); 5) Role Overload (RO); 6) Role Isolation (RI); 7) Personal Inadequacy (PI); 8) Self-role Distance (SRD); 9) Role Ambiguity; and 10) Resource Inadequacy (RI_n).

Discussion and conclusions: The contribution of the study is in advancing new concepts in the already existing framework of burnout, and thus, can assist nurses and hospital administration on how to control this problem.

Tu-P-15 ESTUDIO DE CARGA MENTAL DEL PERSONAL MÉDICO Y DE APOYO DEL HOSPITAL NACIONAL DE GERIATRÍA Y GERONTOLOGÍA DE COSTA RICA

*Campos A, Madriz CE.

Background and aims: En Costa Rica, el hospital Blanco Cervantes es el único hospital especializado en la atención del adulto mayor. La alta demanda de este hospital ha llevado a un aumento en la carga de trabajo del personal médico y de enfermería incidiendo en la salud de estos. Estadísticas proporcionadas por el Departamento de Salud Ocupacional del hospital muestran que el nivel de incapacidades del año 2007 fueron 2079 días, lo que equivale a un promedio 3.5 días de incapacidad por empleado. De estas incapacidades el personal de enfermería acumuló más de 889 días (4.65 días/persona), siendo los problemas de salud mental (15%) y osteomusculares (15,8%) las dos causas más importantes.

Methods: Este proyecto de investigación evaluará la carga mental del personal médico y de enfermería del Hospital Blanco Cervantes. El estudio consta de dos etapas, la primera etapa consiste en la observación y registro de las actividades realizadas por el personal y el tiempo invertido en cada una de ellas. La segunda etapa en la aplicación del cuestionario de contenido del trabajo (Job Content Questionnaire) al personal en estudio. Un total de 189 empleados del área de enfermería y 41 médicos serán considerados en el estudio. Se realizará el análisis estadístico para la determinación de las importancia y correlación de las variables en estudio.

Results: Como resultado principal se espera determinar el nivel de carga mental de trabajo en los médicos y enfermeras, así como los principales factores que inciden en la carga mental y la correlación con las características demográficas de los empleados.

Debido a que este proyecto se encuentra en la etapa de inicial los resultados finales no se tienen aun, sin embargo, para el congreso se podrá presentar los resultados de la primera etapa.

Discussion and conclusions: El estudio ayudará a determinar si existe o no un exceso de carga mental en la población en estudio. Lo que permitirá realizar el análisis integrado de la problemática que presenta el Hospital por tiempo perdido debido a las incapacidades. Esto con el objetivo de mejorar la calidad tanto del servicio como de vida de los doctores y enfermeras del hospital.

Tu-P-16 OCCUPATIONAL INJURIES AND ASSOCIATED FACTORS AMONG WORKERS FROM PRIMARY HEALTH CARE CENTERS IN BRAZIL

*Garcia LP, Facchini LA.

Background and aims: Health care workers face a wide range of occupational health and safety hazards. Occupational injuries are well documented among hospital workers. However, primary health care workers are also at risk. The aims of this study are to describe the occupational injuries, to estimate its rates and cumulative prevalence during an one-year period among workers from Primary Health Care Centers, and to identify its associated factors.

Methods: A cross-sectional study was conducted among all workers from Municipal Primary Health Care Centers in Florianópolis, Southern Brazil (n=1,249). Data were collected through interviews using standardized questionnaires. Injury rates per 100 workers-year and cumulative prevalences of occupational injuries during the previous 12 months were calculated. Multivariate analyses were conducted through Poisson regression.

Results: The cumulative prevalence of occupational injuries was 21.6%. The mean incidence rate of occupational injuries was 47.2 per 100 workers-year (95% CI: 39.4; 55.0). The most frequent types of injuries were blood and body fluid exposures (22.0%), followed by falls (15.5%). In the adjusted analysis, a higher incidence of occupational injuries was associated with occupation as cleaning staff (IRR: 2.20; 95%CI: 1.03; 4.69), nurse assistant (IRR: 2.52; 95%CI: 1.64; 3.87) or dental assistant (IRR: 3.68; 95%CI: 1.93; 7.01) compared to community health agents, length of employment of two years or less (IRR: 1.62; 95%CI: 1.14; 2.32), higher work load score (IRR: 1.58; 95% CI: 1.21; 2.07), inadequate work environment conditions (IRR: 1.35; 95% CI: 1.05; 1.74), previous occupational accident (IRR: 4.33; 95%CI: 3.28; 5.71), current smoking (IRR: 1.38; 95% CI: 1.07; 1.77) and job dissatisfaction (IRR: 1.55; 95% CI: 1.03; 2.32).

Discussion and conclusions: Primary Health Care Centers present a wide range of hazardous situations. The community environment also presents hazards in terms of infrastructure and violence. Previous occupational accident was the strongest predictor of occupational injury, supporting the assumption that workers who sustained previous injuries have greater risk for reinjuring themselves at the workplace. These findings have implications in the implementation of strategies to improve workplace health and to reduce occupational injuries.

Tu-P-17 OCCUPATIONAL INJURY AMONG FULL-TIME, PART-TIME, AND CASUAL HEALTHCARE WORKERS

*Alamgir H, Yu S.

Background and aims: Previous epidemiological studies have conflicting suggestions on the association of occupational injury risks with employment category across industries. This specific issue has not been examined for direct patient care occupations in the healthcare sector. This study investigated whether work-related injury rates differ by employment category (part-time, full-time, or casual) for registered nurses (RN) and care aides (CA) in long term and acute care facilities.

Methods: Incidents of occupational injury resulting in compensated time-loss from work, over a one year period within three health regions in British Columbia (BC), Canada were extracted from a standardized operational database. Detailed analysis was conducted using Poisson regression modeling.

Results: Among 8640 RNs in acute care, 37% worked full-time, 24% part-time and 25% casual. The overall rates of injuries were 7.4, 5.3, and 5.5 per 100 person years respectively. Among the 2967 CAs in long term care, 30% worked full-time, 20% part-time, and 40% casual. The rates of injuries were 25.8 among full-time, 22.9 among part-time, and 18.1 among casual workers. In multivariate models, having adjusted for age, gender, facility and health region, full-time RNs had significantly higher risk of sustaining injuries compared to part-time and casual workers. For CAs, full-time workers had significantly higher risk of sustaining injuries compared to their casual colleagues.

Discussion and conclusions: Full-time direct patient care occupations have greater risk of injury compared to part-time and casual workers within the healthcare sector.

Tu-P-18 ANÁLISIS DE RIESGOS PRESENTE EN PROCEDERES DE ENFERMERÍA

*Valdes-Fernández MV, Rodriguez Gonzalez M, Valdes Fernandez FJ.

Background and aims: Objetivo: 1. Identificar desde el punto de vista de Bioseguridad los riesgos implícitos en los procedimientos seleccionados; 2. capacitar al personal de enfermería en materia de Bioseguridad. Los riesgos de salud de quienes trabajan en el hospital constituyen un tema que cada vez cobra mayor importancia. Existen estudios que muestran la existencia de riesgos físicos, químicos, biológicos, ergonómicos y psicosociales que de modo abierto o en cubierto afectan a los profesionales que prestan servicios de salud, por el beneficio que aporta al personal de salud la identificación de los mismos hemos decidido realizar este estudio

Methods: Se realizó un estudio descriptivo utilizando como marco muestral 6 procedimientos de enfermería (Manipulación de pacientes con limitaciones motoras, Limpieza concurrente y terminal del salón de operaciones, Atención al paciente grave, Administración de medicamento por vía endovenosa, Manipulación de los autoclave y el material, Descontaminación y fregado del material), que se realizan indistintamente en las salas o departamento de Centro Internacional de Restauración Neurológica. Se utiliza el método de observación y se analizaron las siguientes variables. Procedimiento realizado. Factor de riesgo, Riesgo, Consecuencia, Agente o material implicado, Causas y medidas. Se elaboran tablas de vaciamiento.

Results: • En los procedimientos estudiados los riesgos que se ponen de manifiesto son el Riesgo de infección, riesgo de cortaduras, Riesgo de quemaduras, Riesgo biológico. • La magnitud de los riesgos de los procedimientos estudiados van de moderados a importantes.

Discussion and conclusions: Cuando hacemos un análisis de riesgo lo primero que tenemos que hacer es identificar los riesgos presentes en cada actividad laboral y la definición de todos los posibles riesgos vinculados a cada uno de ellos, ya sean riesgos al trabajador la comunidad o el medio ambiente.

Conclusiones: El riesgo cero no existe estamos expuesto a el en todo momento y este se incrementa por la falta de conocimientos de recursos y la negligencia. Por lo que es de suma importancia que nuestro personal de enfermería este capacitado en materia de bioseguridad protegiendo así su salud la comunidad y el medio ambiente.

Tu-P-19 UNDER-ESTIMATION OF SELF-REPORTED OCCUPATIONAL EXPOSURE BY QUESTIONNAIRE IN HOSPITAL WORKERS – PRELIMINARY RESULTS FROM THE EPIDEMIOLOGICAL STUDY ON GENETICS AND ENVIRONMENT OF ASTHMA (EGEA)

*Donnay C, Denis M, Magis R, Févotte J, Massin-Westphal N, Pin I, Choudat D, Kauffmann F, Le Moual N.

Background and aims: The aim of the study was to estimate whether self report of occupational exposure to cleaning and disinfecting agents in hospital workers is accurate taking expert estimate as a gold standard.

Methods: In the EGEA survey, subjects were interviewed on occupation with a specific questionnaire for hospital workers regarding tasks and cleaning and disinfecting agents. A structured assessment table has been constructed to estimate exposure to 21 chemicals. Two estimates were defined: (1) crude self-reported estimates, (2) an expert analysis of the selected occupation by 3 experts. A standardised expertise procedure was performed by job and decision rules were defined to estimate the intensity, frequency and probability of exposure. All experts' estimates will be reviewed at the end of the expertise.

Results: In the survey conducted in 2003-2007 in 1571 adults, 175 worked in a hospital, totalling 405 occupations. Preliminary results are based on 84 subjects and concern 188 expertised occupations (121 nurses, 41 auxiliary nurses and 25 cleaners).

	Self-reported exposure			Experts' estimates high probability of exposure	
	n	%	Missing (%)	n	%
Total (n=188 jobs)					
Formaldehyde	26	13.8	28 (14.9)	76	40.4
Glutaraldehyde	2	1.1	31 (6.5)	11	5.9
Bleach	77	41.0	7 (3.7)	106	56.4
Alcohol	84	44.7	16 (8.5)	160	85.1
Quaternary ammonium	14	7.5	26 (13.8)	144	76.6
Sprays	83	44.1	7 (3.7)	81	43.1
Latex gloves	106	56.4	25 (13.3)	116	61.7

Reported exposure was underestimated compared to the expert assessment, for most exposures considered and for the three types of occupations. The underestimation of exposure was high for formaldehyde and alcohol, and a failure to appreciate the nature of used products, especially for quaternary ammonium was observed. Further analyses will be conducted on the whole sample and taking into account the dependence of jobs in a subject job history.

Discussion and conclusions: Occupational exposure to disinfectant or cleaning agents is very high in hospital. Workers do not know or underestimate their exposure, which shows the relevance of expert assessment in epidemiological studies to limit measure bias. This preliminary work underlines the necessity to have a better training to improve workers' knowledge regarding their exposure and to develop the prevention of risks induced by this kind of products.

Tu-P-20 ABSENTEEISM OF HEALTH CARE WORKERS IN PUBLIC HOSPITAL OF LIMA DURING 2006-2007

*Riboty Lara A.

Background and aims: Objective. To determine the annual prevalence of the absenteeism in HCW of the HBA, during 2006-2007.

Methods: Design: Prospective, Cross Sectional. We collected the diagnostic CIE 10 of certificates of temporary inability for work (CTIW) emitted from January 1st, 2006 to December 31st, 2007, registering in a database age, occupation, type of activity, unit, duration, type of event, physician and his specialist unit. We excluded to internal of medicine and workers of third services. Population: 3115 HCW.

Results: We collected 8623 CTIW, corresponded to 3272 HCW of the HBA and 62145 days. The average duration was 7.2 days. The annual prevalence of absenteeism was 49.2 y 55% in 2006 and 2007 respectively. 55% of CTIW were of 3 or less days (9703 days), and it increased to 79% of the total if included all of 10 days or less (22113 days). However, 64% of the total of disable days (40032 days) were for CTIW of 10 days or more (20% of the total of CTIW, 1753 CTIW). For occupation, nurses had a high number of CTIW (2485) and the biggest proportion of disable days (16017 days; 25%); in continued by Nursing Assistant (1466 CTIW, 9197 days). According to diagnostic CIE 10, the Respiratory diseases (Group X) were the most frequent (20%, 1733 CTIW). Acute pharyngitis and Flu were the more common. 84% (1472) of the total of CTIW of this group were of infectious disease. In descending frequency, the Muscle Skeletal diseases (Group XIII) with 16 (1412 CTIW); 50% were dysfunctions in different spine segments, including radiculopathy; the lumbar segment was more commonly affected. In third place, Traumatisms (Group XIX) were 13% (1169 CTIW). These 3 groups CIE 10 were 50% (4314) of the total of CTIW during the period of study.

Discussion and conclusions: In the period of study, the prevalence of absenteeism in HCW of the HBA was 49 y 55% respectively, with a total of 62145 disable days. This is a high rate comparative to others reports. The Respiratory Diseases were the most frequent (20%), continued by Muscle-Skeletal disease (16%) and Traumatisms (13%).

Tu-P-21 EVALUATION OF CEILING LIFTS TO TRANSFER RESIDENTS IN LONG TERM CARE

*Alamgir H, Wei Li O, Yu S.

Background and aims: Growing evidence exists for the effectiveness of safe patient handling equipment in reducing the severity and number of musculoskeletal injuries to healthcare workers. The objective of this research was to measure and compare the time spent to perform various patient-transfer tasks by using ceiling lifts and floor lifts.

Methods: A prospective observational design was adopted to measure and compare three categories of patient-handling **Methods:** (1) Ceiling lifts (2) Floor lifts (3) Manual lifting. Three long-term care facilities in different stages of ceiling lift implementation were selected. Three types of frequent patient-handling tasks were observed at each facility: (1) transfers from bed to chair (2) transfers from chair to bed and (3) repositioning in bed/boosting patient up in bed. The time (preparation, actual and total time) to complete these tasks was measured by observers. Only residents requiring mechanical aides for transfer were included.

Results: A total of 119 patient transfers were observed (59 transfers were observed at facility 1, 16 at facility 2 and 44 at facility 3). Of these 78 were transfers from chair-to-bed, 32 were from bed-to-chair and 28 were repositioning/boosting. The average time for bed to chair transfers were longer for floor lifts compared to ceiling lifts for preparation (99s to 173s), actual transfer (57.9 s to 100.6s), and total time. For chair to bed transfers ceiling lifts also took shorter time compared to floor lifts for preparation (59.7s to 183.3s) and actual transfer (52.1s to 104.6s), and total time. With respect to repositioning tasks, ceiling lifts took significantly longer (59.5s to 24.9s) to complete the task when compared to manual techniques. Using the General Linear Model, the differences continued to exist for all the measures after adjustment for potential confounding factors such as facility, number of staff involved in the transferring/boosting, age, gender and weight of the residents.

Discussion and conclusions: Patient transfers required a shorter amount of time to complete when performed with ceiling lifts. This knowledge should be translated to staff to reduce the barriers to ceiling lift compliance and further research is needed to more thoroughly evaluate repositioning tasks.

Tu-P-22 EVALUACIÓN DE CONOCIMIENTOS SOBRE RIESGOS BIOLÓGICOS LABORALES EN EL PERSONAL DE ENFERMERÍA DE UNA INSTITUCIÓN HOSPITALARIA EN CIUDAD DE LA HABANA

*Rodríguez-González M, Valdes-Fernández mV.

Background and aims: El riesgo biológico es el derivado de la manipulación o exposición a agentes patógenos. Los microorganismos que más frecuentemente encontramos en el medio hospitalario son el virus de la Hepatitis B, el virus de la Hepatitis C, el virus de la inmunodeficiencia humana, y el mycobacterium tuberculosis. El objetivo fue evaluar los conocimientos sobre riesgos biológicos laborales en el personal de enfermería de una Institución Hospitalaria en Ciudad de La Habana, Cuba, Julio 2006-Marzo 2007

Methods: Se realizó un estudio de tipo descriptivo-transversal entre Julio 2006- Abril 2007, para lo cual se aplicó una encuesta a una muestra de 100 enfermeras(os) según criterios de inclusión y exclusión, los datos se procesaron en el paquete estadístico SPSS

Results: El sexo femenino predominó con el 79 %. La categoría de licenciadas en enfermería sobresalió con el 75%. La media de grupos de edades, tiempo de servicio y de permanencia en el centro fueron de 38,5, 17,6 y 10,7 respectivamente. El conocimiento sobre riesgos biológicos fue no satisfactorio en un 69,0 %. Los resultados no satisfactorios predominaron con el 70,7 % para las licenciadas y el 64,0 % para las enfermeras generales. Un 56 % sufrió un pinchazo o una herida. Recibieron capacitación sobre riesgos biológicos un 84 %. Un 93,8 % correspondió a los resultados no satisfactorios y a los que no recibieron capacitación. Relacionado a medidas de protección los resultados no satisfactorios y los que no recibieron capacitación alcanzaron un 81,3 %.

Discussion and conclusions: Los resultados obtenidos de alguna manera mantiene similitud con investigaciones realizadas tanto en nuestro país como en el extranjero donde se evidencia que existen dificultades relacionadas con la Bioseguridad, por lo que es una alerta a todos los que nos dedicamos a la atención de los pacientes. En cuanto a conocimiento general sobre riesgos biológicos laborales, sobresalieron los resultados no satisfactorios. Se determinó que no existió diferencia entre nivel de conocimiento sobre riesgos biológicos laborales y categorías profesionales. Se demostró que no ha sido efectiva la capacitación recibida, por los resultados no satisfactorios en más de una tercera parte de los encuestados

Tu-P-23 PROMOCIÓN DE LA SALUD DE LOS/AS TRABAJADORES/AS DEL HOSPITAL NACIONAL "PEDRO DE BETHANCOURT", ANTIGUA, GUATEMALA. Programa Salud y Trabajo en América Central (SALTRA)

*Velásquez M, Partanen T.

Introduction and aim: Los riesgos ocupacionales de los/as trabajadores/as en las instituciones prestadoras de servicios de salud (incluyendo los hospitales), son múltiples y relativamente difíciles de controlar. Los avances tecnológicos y organizativos pueden introducir nuevos riesgos. La Organización Panamericana de la Salud (2005) provee directrices concernientes a su prevención y a la promoción de la salud de los/as trabajadores/as en el Sector. Este estudio evaluó la factibilidad de un programa de promoción de la salud en un hospital en Guatemala.

Methods: De abril 2005 a noviembre 2006 se completó la fase diagnóstica sobre la percepción de los riesgos en los trabajadores del Hospital Nacional "Pedro de Bethancourt" en Antigua. Este hospital cuenta con más de 500 trabajadores/as, incluyendo profesionales y de servicio, además de estudiantes universitarios/as de carreras como medicina, psicología y nutrición. Se analizaron los riesgos percibidos por los/as trabajadores/as así como las prioridades y su posibilidad de intervención mediante una evaluación rápida utilizando un cuestionario dirigido al personal, y dos listas de chequeo dirigidas a los/as expertos/as, administradores/as, coordinadores/as o jefes/as de servicio del Hospital.

Results: Las actitudes hacia la promoción de la salud fueron predominantemente positivas, en especial entre las mujeres. A partir de los resultados obtenidos se seleccionaron los riesgos ocupacionales posibles de intervenir, incluyendo la adquisición de vacunas contra la hepatitis B, para ser aplicadas al personal que se mantenía en contacto directo con fluidos corporales. Simultáneamente, se ha capacitado a profesionales de diversas disciplinas (ergonomía, bioseguridad). Actualmente se realizan intervenciones como: a) Evaluación nutricional al todo el personal del hospital y b) Auto evaluación del nivel de ansiedad en todo el personal. Con base en estas evaluaciones, se diseñaron "Sesiones informativas" para todo el personal hospitalario, incluyendo recomendaciones para mejorar los aspectos que se encontraron necesitan reforzamiento. También se ejemplificó en cada reunión la posibilidad de consumir alimentos saludables con pocas calorías.

Discussion and conclusions: Después de la fase de evaluación de factibilidad se está implementando gradualmente un programa de promoción de la salud incluyendo factores de riesgo laborales y de estilo de vida.

MUSCULOSKELETAL DISORDERS

Tu-P-24 APPLICATION OF THE STRAIN INDEX (SI) METHOD FOR THE EVALUATION OF RISK FACTORS FEATURING DISTAL UPPER EXTREMITY (DUE) MUSCULOSKELETAL DISORDERS IN A TEXTILE FACTORY

*Moussavi Najarkola S.

Background and aims: The upper limb musculoskeletal disorders are a significant problem with respect to ill health and associated costs within the workplace; therefore, in order to protect workers from such disorders, there is a need to evaluate work situations and use the strain index method for the assessment of risk factors presented in different industries.

Methods: For achieving to this objective, the strain index (SI) method and Nordic Musculoskeletal Questionnaire (NMQ) were used. The research has been carried out in a major textile factory located in Qaemshahre city of Mazandaran province (the north of Iran country).

Results: All 320 male workers occupying in 8 various jobs (137 different tasks) were surveyed. The Results showed that the highest percents of inducing elbow, forearm, wrist, and hand disorders were allocated to the weaving job that were obtained 7.19%, 8.75%, 10.31%, and 11.56% correspondingly. On the other hand, there was a significant relationship between eight corresponding jobs and incidence rate of the upper limb disorders ($\chi^2=4.39, P=0.002$). Also means of strain indices between eight various jobs include: administrative (1.09), engineering room (1.26), primary of spinning (7.52), spinning (6.03) primary of weaving (8.18), weaving (8.18), weaving designing (3.74), and cloth meter (4.25) showed a significant different ($F=7.33, P=0.005$).

Discussion and conclusions: Thereby administrative and engineering room jobs were located in safe level, weaving designing and cloth meter jobs were lain in uncertain level, spinning and primary of weaving of weaving jobs were posed in some risk level, weaving and primary of spinning jobs were lain in hazardous level. It was concluded that the strain index can be used as an useful and applicable method for a textile factory. Eliminating or controlling or diminishing a set physical load factors factors for upper extremity disorders, designing the chair, the work table and the proportion of the work type to its height, and doing the ergonomic interventions in some jobs, rotating the jobs or the workers in clockwise, using anthropometrical principles in designing hand tools and work stations, using the work-shift programs and a proper ergonomic designing system, etc. can be utilized for preventing musculoskeletal disorders.

Tu-P-25 THE PERFECT EXPOSURE INDEX (PEI) MODEL FOR THE ASSESSMENT OF EXPOSURE TO RISK FACTORS OF UEMSDS

*Moussavi Najarkola S.

Background and aims: The upper extremity musculoskeletal disorders (UEMSDs) is a significant problem with respect to ill health and associated costs within the different industries; therefore, in order to protect workers from such disorders, there is a need to introduce a model for the assessment of workloads risk factors featuring work-related UEMSDs.

Methods: The PEI model has been utilized for evaluation of risk factors of UEMSDs by taking into consideration ten variables in repetitive tasks.

Results: Single and total percentage agreement for any item was obtained higher than 60% and all kappa analysis factor for strength of agreements were gained rather than 0.20. With emphasis on percentage agreement, it is cleared that most items were either close to or above 60%. The results indicated that all kappa statistical analysis factors for all assessment items gained higher than 0.60 and the test-retest agreements were all statistically significant. It is observed, in laboratory study, for all tasks and for all assessment items, the percentage agreements were reached close to and above 60%. In field study, for all assessment items, the percentage agreements were obtained and calculated higher than 70%. The Kappa analysis for all action levels were above 0.60 and percentage agreements for all action levels were reached to higher than 75%.

Discussion and conclusions: Inter-observer and intra-observer reliabilities and validity tests' agreement levels were obtained "acceptable" according to Landis and Koch and Baty et al. classifications and PEI's applicability was obtained significantly widespread. The proposed exposure index has been used for classifying tasks in four determined action levels, discriminating between safe and hazardous tasks and redesigning repetitive tasks by submitting engineering designing solutions and corrections. By increasing work experience and submitting training about assessment items, the both Cohen's Kappa analysis factors and percentage agreement were enhanced. The model was found to be sensitive for assessing the interventions and changes in exposure and assessment items before and after an ergonomic interventions. The model was also indicated to be highly reliable, validable and applicable for a vast range of tasks and jobs. Assessment reliability, validity and exposure index applicability would be improved with enhancing training and guide to use the PEI model.

Tu-P-26 EXPERIENCES WITH THE SPF-VAS TOOL FOR SELF-ASSESSMENT OF PHYSICAL FITNESS BY VISUAL ANALOGUE SCALES

*Strøyer J.

Background and aims: Contradictory results exist of low level physical fitness as risk indicator of LBP, despite plausible models. A valid instrument for self-assessment of physical fitness would increase the possibilities to investigate the importance of physical fitness in larger epidemiological studies

The aim of this study was to describe the basic characteristics of the SPF-VAS tool (distribution, means and inter-correlations), the convergent and divergent validity (in proportion to performance-based physical fitness), the test-retest reliability and the predictive validity in relation to aggravated LBP intensity.

Methods: Data from seven surveys were included. Six of the study populations comprised health care workers or students, with majorities of women (81-93%), while one comprised office workers (65% women). In all healthcare populations five components of physical fitness (Aerobic fitness, muscle strength, endurance, flexibility, and balance) were self-assessed according to peers using Visual Analogue Scales of 100 mm (SPF-VAS) with illustrations and verbal anchoring of the extreme situations. Among the office workers the VAS was replaced with 9 boxes due to an online registration system.

Results: The full length of the VAS was very satisfactorily utilised. The test-retest reliability was moderate to good (ICC=0.62-0.80). Among healthcare persons self-assessed aerobic fitness, muscle strength, and flexibility showed in general moderate convergent validity and satisfactory divergent validity. Additionally the convergence validity of balance was found satisfactory in another survey. Among office workers, moderate convergence for aerobic fitness in was found in both sexes, and for muscle strength among men only. Physical activity level and LBP status did not influence the convergence validity. Medium level of self-assessed aerobic fitness were found to lower the risk of aggravated LBP intensity compared to high level (OR=0.37, p=0.02) in a 30-month followup. This picture was not found in the one-year follow-up of the "The Danish Health Care Worker Cohort - Class of 2004" (n=5696) that showed a protective effect of high level self-assessed flexibility in relation to aggravated LBP intensity (sex and age adjusted).

Discussion and conclusions: SPF-VAS showed promising basic characteristics to be considered as a tool in larger epidemiological studies. However, more knowledge is needed before the applicability of SPF-VAS can be estimated.

Tu-P-27 DEVELOPMENT OF AN ERGONOMICS RISK ASSESSMENT TOOL FOR AGRICULTURAL OPERATIONS

*Madriz CE, Schulze L.

Background and aims: Agricultural work requires a specific approach due to the fact that agricultural work is not a static work; it is a dynamic work. Despite technological development in many areas of the industry, agricultural workers are still exposed to high workload demands which, in many cases, are higher than their worker capacity. This research effort consisted of the construction of a new ergonomic assessment tool which considered the following variables: oxygen consumption, weighted postures, exertion level, load, anthropometrics measurement and activity time.

Methods: A total of twenty (20) males were tested in the laboratory, simulated phase I in Bogotá, Colombia, SA and thirty (30) males in the actual, phase II in the banana plantations in Limón, Costa Rica, CA. The evaluation was performed mainly in three agricultural operations: Cutting, carrying and pulling bunches of bananas. Statistical significance as well as variable interactions was studied to determine the effect of the independent variables on the oxygen consumption level of participants at both phases. A multivariate analysis of variance and stepwise regression analysis were performed on the data for the different combinations and a set of prediction equations were developed.

Results: In general for all activities the anthropometrics' participant differences are less important as the physical level increase, and the level of oxygen consumed depend more in the posture, time, weighted posture, and level of effort. The weighted posture is a significant variable that influence the level of oxygen. As the muscle get in more extreme posture and the time in this posture increase the oxygen level also increase. The Colombian and Costa Rican group can be considered similar in their anthropometrics and in their maximal aerobic capacity. The models developed in the phase I are good predictor of the oxygen level in the workers in the field.

Discussion and conclusions: These equations predict the oxygen consumption level based on the most significant variables as part of the assessment tool. Therefore this research not only served as an ergonomic assessment tool but provided a basis for the protection of Costa Rican banana plantation workers from ergonomic related problems caused by cutting, carrying and pulling operations

Tu-P-28 WORK-RELATED ILLNESSES ACCORDING TO THE GENDER RELATIONS AND OCCUPATION IN METROPOLITAN BELO HORIZONTE, BRAZIL: A STUDY OF REPETITIVE STRAIN INJURIES

*Salim CA.

Background and aims: The purpose of this study is to understand, through theoretical analysis based on the nowadays work organization and industrial "restructuring", the evolution and the social and demographic aspects of repetitive strain injuries, sustained on a case study relating to Belo Horizonte Metropolitan Region (in Minas Gerais State, on southeast of Brazil), in the nineties of XXth century and beginning of this century.

Methods: In order to do that, and supported by different sources of data, the empirical investigation of these work-related illnesses is focused on three dimensions of the metropolitan area: the first one is the performance of its economy, mainly the service sector; the second one is the recent demographic and labor market dynamics, which the last one has been strongly characterized by the inconstant rates of employment and unemployment; and the last one is the inclusion of the gender category in the analyses, in order to identify and explain the specific conditions and effects on male and female health.

Results: Epidemiological data are shown, using comparative analysis, in order to get a better comprehension of repetitive strain injuries evolution, as well as their modalities, in the point of view of their damages resulting from the occupational condition of male and female workers according to their distribution in the different branches of economic activity of that region

Discussion and conclusions: Discussions are presented showing the necessity of including this type of analysis in the different fields of occupational health research as a condition to overcome the predominant medical paradigm, which makes difficult to comprehend the health-disease process related to the work conditions as well as to the gender relationships.

Tu-P-29 MULTI-SITE PAIN PREDICTS PERMANENT WORK DISABILITY

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Background and aims: Increasing amount of studies has shown that pain co-morbidity has an impact on well-being and functioning. Little is known of the effects of multi-site pain on permanent work disability.

Methods: A comprehensive health examination survey (The Mini-Finland Study) was carried out in 1979-80 among a representative sample of Finnish adults (n=8000). Information on prevalent musculoskeletal pain as well as lifestyle-related and other individual factors, and physical and psychosocial work load factors were obtained with an interview. Symptomatic subjects were also

examined by a specially trained physician. National registers were used to follow up the working-age subjects (30-64 years, n=5083) until disability pension, age of 65 years (general age of retirement in Finland), death, or the end of observation period (until 31.12.1994), whichever occurred first. Average follow-up was 12 years. The relationship between pain reported at baseline and disability pension at follow-up was analyzed using Cox proportional hazards models.

Results: During follow-up, 754 subjects received a disability pension, the primary diagnosis being a musculoskeletal disorder (MSD) for 262 subjects, psychiatric disorder for 105 subjects, and some other diagnosis for 387 subjects. Pain at multiple sites was a significant predictor of permanent work disability: compared with subjects without pain, having pain in 4 or more sites increased the risk of MSD-related disability with the relative risk of 5.8 (age- and gender-adjusted, 95% confidence interval: 3.9-8.6), and with the RR of 2.8 (1.8-4.4) after further adjustment for work-related and lifestyle factors and clinical diseases at baseline. The risk remained significantly elevated (RR 2.2; 1.4-3.6) after additional adjustment for psychosocial work load, mental capacity, mental well-being, and somatization. Multi-site pain also predicted disability due to other diagnoses than MSD's.

Discussion and conclusions: In this large prospective study with an objectively assessed outcome, multi-site pain significantly predicted the risk of permanent work disability. The effect was independent of clinically diagnosed MSD at baseline. This emphasizes the importance of pain experience as such, particularly when widespread, as an indicator of a high risk of future disability, not only MSD-related but also for other reasons. Focused efforts directed at these subjects might help decrease the burden of disability.

Tu-P-30 ESTUDIO DE SÍNTOMAS DE DESORDENES MÚSCULO-ESQUELÉTICOS EN SECRETARIAS DEL INSTITUTO TECNOLÓGICO DE COSTA RICA

*Campos A.

Background and aims: En la actualidad son muchas las personas que trabajan en una oficina utilizando una computadora, estudios han revelado que el trabajo con computadoras ha incidido en un incremento en la aparición de dolencias y lesiones por desordenes músculo-esqueléticos. Las secretarias, al trabajar la mayor parte de su jornada de trabajo con computadoras están identificadas como una población en riesgo a desarrollar este tipo de lesiones. Por lo tanto, se planteó el presente estudio para identificar las dolencias músculo-esqueléticas que presentan las secretarias de la sede central del Instituto Tecnológico de Costa Rica

Methods: La información fue recogida utilizando un cuestionario que consta de 4 secciones, la primera sección pregunta sobre información personal de las secretarias, la segunda sección recopila información del historial de trabajo, la tercera sección sobre el historial de salud y la última sección utiliza el Cornell Musculoskeletal Discomfort Questionnaires (traducción en español), donde la persona identifica las partes del cuerpo donde siente dolor y con qué frecuencia, qué tan intenso ha sido el dolor y si ha interferido con su trabajo. El cuestionario se aplicó al 100% de la población (68 secretarias). La información recopilada con el cuestionario se codificó, digitó y se analizó utilizando el paquete estadístico SPSS

Results: Con respecto al dolor que presentan las secretarias, se encontró que durante la última semana de trabajo, solamente 4 secretarias (5.9%) no presentaban ningún dolor en ninguna parte del cuerpo. Las 64 secretarias restantes (94.1%) presentaban algún tipo de dolor; las partes del cuerpo donde presentan más dolor son la espalda baja (64.7%), el cuello (63.2%), la espalda alta (58.8%), el hombro izquierdo (44.1%), hombro derecho (45.6), la mano/muñeca derecha (32.4%) y la mano/muñeca izquierda (27.9%)

Discussion and conclusions: Los resultados muestran que la mayoría de las secretarias presentan algún tipo de dolor, lo que podría ser el precursor de una enfermedad más severa como un desorden músculo-esquelético. La mayoría de las dolencias/molestias pueden ser remediadas aplicando los principios de la ergonomía en el diseño de las estaciones y el ambiente de trabajo, realizando descansos frecuentes y usando buenas prácticas de trabajo

Tu-P-31 PREVALENCE OF MUSCULOSKELETAL SYMPTOMS IN MANUFACTURING OF HYGIENIC PRODUCTS WORKERS

*Ghasemkhani M, Jabbari H, Mahmudi E.

Background and aims: Self-report measures of musculoskeletal discomfort are widely used and generally accepted as a proxy or risk factor for musculoskeletal disorders in epidemiologic research and workplace health surveillance. The aim of this study was to investigate the prevalence of musculoskeletal symptoms among a group of packing workers.

Methods: A cross-sectional study of 75 workers was carried out using a modified version of the Nordic questionnaire. Prevalence was determined by the percent of positive responses to musculoskeletal

symptoms questions. Odds ratios and 95% confidence intervals were the measures of association between prevalent musculoskeletal symptoms and demographic and were determined by logistic regression.

Results: The highest musculoskeletal symptoms were from the low back (44.0%), shoulders (33.3%) and neck (32.0%) in workers. Years worked in the workers were a strong significantly associated with MSD symptoms, neck, shoulders and wrists/hands pain, ($P < 0.001$ to 0.05).

Discussion and conclusions: The repetition movements with discomfort postures hazards could be reduced by instituting breaks, stretching exercises, rotation schedules, or through new engineering solutions.

Tu-P-32 WORK RELATED MUSCULOSKELETAL DISORDERS AND ERGONOMIC WORK POSTURE ANALYSIS OF OPERATING ROOM NURSES IN A CANCER HOSPITAL

*Roh J, Lee C, Ahn Y, Kim C, Won J.

Background and aims: This study was carried out to evaluate prevalence rate of musculoskeletal symptom and the work posture of the operating room nurses in a Cancer Hospital.

Methods: The job of operating room nurses was divided into 14 tasks for analyzing ergonomic work postures of the nurses. On the basis of that, a questionnaire survey and ergonomic work posture analysis are performed. Among 41 operating room nurses who responded to the self-administered questionnaire, 20 nurses were observed and video-recorded to apply REBA (Rapid Entire Body Assessment) for ergonomic work posture analysis

Results: The prevalence rate of musculoskeletal symptoms was 75.6% and its prevalence rates by part of the body are followings; lower back and leg/foot 43.9%, shoulder 36.6%, neck 34.1%, hand/wrist/ finger 22.0%, arm/elbow 14.6%. In accordance with the results of ergonomic work posture analysis, 4 tasks that have a REBA score of 8 have high-risk levels and require an immediate management. It shows there is a significant correlation with overall musculoskeletal symptoms and objective workloads that are estimated by REBA.

Discussion and conclusions: The work conditions of operating room nurses should be improved. It is also necessary that inappropriate work postures and ergonomic work conditions are improved to prevent musculoskeletal disorders of operating room nurses.

Tu-P-33 ANALYSIS OF COFFEE HARVESTERS' WORKDAY IN LOS SANTOS ZONE, COSTA RICA

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Background and aims: Observations were conducted during harvest workday for the identification of occupational hazards: inadequate or absent food and beverage intake; exposure to heat, solar radiation and rain; inadequate postures; extended hours; steep slope; terrain; and restricted possibilities for rest and basic needs. Identification of health hazards of coffee harvesters during workday.

Methods: Five coffee farms were visited. The workdays of over 80 subjects were observed during different hours and weekdays. Social and cultural differences were identified in eating arrangements, use of sanitary facilities, and type of clothing and footwear during work. During the season 2006-2007, interviews of 186 harvesters were conducted to identify work-related symptoms and musculoskeletal disorders. Included were boys and girls between 6 and 15 years of age and men and women over 15 years. Recommended Weight Limit (RWL), Rapid Upper Limb assessment (RULA) and Lifting Index (LI) were used to assess physical demands on upper limbs, waist and spine.

Results: Headache from solar radiation, stomach pains from eating and drinking habits, and limitations of food and beverage transport in large farms were observed. Absence or remoteness of sanitary facilities resulted in continence or use of field terrain for the purpose. Problems were more common in women, especially the pregnant and those that took care of children less than 5 years of age. A 60% reported physical symptoms. The most painful symptom was located in the waist (15.1%), spine (11.8%), head (10.8%), hands (4.8%), stomach (4.8%), arms (2.7%) and fingers (2.2%). Basket and sack weight posed demands on the spine and waist, while the picking task strained arms and hands.

Discussion and conclusions: Workers and employers need to acknowledge the importance of workers' adequate diet and food breaks, securing continuous beverage supply, sanitary facilities, rest breaks and protection in hazardous terrain. The reported symptoms may cause serous lesions such as tendonitis and bursitis. The calculated indices necessitate redesign of the basket and determination of optimal weights, supports and postures while carrying the basket or transporting coffee, considering differences in age and anthropometric dimensions.

Tu-P-34 LOW BACK PAIN, AGE AND OCCUPATIONAL EXPOSURES BEFORE AND AFTER RETIREMENT

*Plouvier S, Chastang J, La Noe J, Leclerc A.

Background and aims: Little information on the evolution of musculoskeletal disorders prevalence after retirement is available. This study aimed at describing the one year prevalence of persistent or recurrent low back pain (LBP) according to age, working status (working or retired) and past/current occupational exposures in middle aged and aging people.

Methods: The study population came from a national population based survey on health conducted in France in 2002-2003, the 'Enquête décennale santé 2002'. It comprised people aged 45 to 74 who were either employed or retired at the time of the survey. A French version of the Nordic questionnaire was used to assess LBP. Self assessed occupational exposures included past or present exposure to handling of heavy loads and tiring postures. Prevalence of LBP for more than 30 days in the previous year was computed separately for men and women, by 5-year age group, for workers and retired people, according to past/present occupational exposure.

Results: For men before retirement (aged 45-59), prevalence of LBP was significantly higher for those currently or previously exposed (n=1051) compared with those non exposed (n=1183): respectively 20.0% vs 10.1%, 22.1% vs 7.6%, 26.9% vs 10.6% for the three age groups. Among retired men (aged 55-74), with increasing age, the prevalence of LBP tends to become equivalent for those exposed (n=748) and unexposed (n=599): respectively 21.2% vs 20.9% for those aged 65-69 and 19.2% vs 17.2% for those aged 70-74. Patterns were quiet similar for women with a higher prevalence of LBP among exposed workers (n=741) compared with unexposed workers (n=1260): around 25% vs 16% in the three age groups. For retired women, differences between exposed (n=430) and non exposed (n=489) also tended to reduce with age, leading to prevalence of 29.4% vs 24.8% for those aged 65-69 and 29.2% vs 26.1% for those 70-74.

Discussion and conclusions: Recall bias especially among older subjects can not be ruled out in this study and exposure was self-assessed. It appears nonetheless in this national sample covering a broad variety of occupations, that effects of exposure in the working life are important in the active population and tend to reduce with increasing age among retired people.

Tu-P-35 REDUCTION IN WORK RELATED MUSCULOSKELETAL DISORDERS: TWO-YEAR ERGONOMIC-BASED INTERVENTION CASE STUDY

*Robinette Z.

Background and aims: Research conducted by the United States Department of Labor in 2004-2005 indicated that musculoskeletal disorders (MSDs) were the leading cause of injury and illness in every major industrial sector. More than four out of ten injuries reported in 2005 were MSDs. More than one third (34%) of the MSDs reported occurred in the trade, transportation and utilities industry sectors. This presentation will review empirical data gathered from a two-year, on-site ergonomics-based fitness and conditioning program, developed and implemented by the author in 2004 at four transportation sector facilities operated by a Fortune 100 company in Northern California.

Methods: This presentation will focus on how this successful pilot project benefited management, employees, and the overall corporation with cost savings, due to reduction in days away and lost time (DART) injuries. Detailed information is provided on methodology, implementation, and the effective use of benefit/cost analysis as a measurement tool.

Results: Despite the reported prevalence of MSDs in the transportation sector, the pilot program resulted in significant reductions in MSDs and workers' compensation costs. Injury rates and workers' compensation costs within this quasi-experimental control group dropped by over 50 percent in 2004 and by 85 percent in 2005.

Discussion and conclusions: The audience will leave with a greater understanding of, and a standard procedure for, implementing and justifying ergonomic-based intervention programs within the transportation industry and similar major industry sectors.

WORK-RELATED ACCIDENTS

Tu-P-36 SHIFT WORK AND OCCUPATIONAL ACCIDENTS

*Siha MS.

Background and aims: Shift work has become an integral part of labor. Good evidence shows that night shift causes disruption of circadian rhythm which leads to mal-adaptation symptoms. Objective: The aim of this study is to find the relation between type of occupation and accident rates, evaluate work related accidents among rotating shift workers and try to detect risk factors, among workers, leading to accidents.

Methods: Two hundred workers were selected; 100 were working on rotating shift system and another 100 on day shift (considered as control group). All these workers had experienced occupational accidents during the period 1991-1992.

Results: The most common cause of accidents was striking against objects. There was a statistically significant difference between accidents and environmental conditions. Upper and lower limbs were the most commonly affected parts of the body by accidents, fractures and fissures constituted the common type of injuries. Most of the injuries occurred in the morning shift among the rotator group with the peak time between 9-11 a.m., but the severity of the injury increased during the night shift. There was a statistically significant difference between shift work and sleep disturbance among workers

Discussion and conclusions: We recommend proper selection of workers for shift work, proper shift design, regular medical examinations and general measures of accident prevention especially house keeping

Tu-P-37 RETIREMENTS FOR WORKPLACE ACCIDENTS AND WORK-RELATED ILLNESSES ON THE CONSTRUCTION INDUSTRY IN MINAS GERAIS STATE, BRAZIL

*Arcioni AC, Salim CA.

Background and aims: In Brazil, epidemiological studies have shown that large scale construction work may be associated with an increased risk of hospitalization and disability retirement compared to construction work in general. On that account, as a contribution for health and safety protection at work, this study investigated trends and variations of retirements from 2000 to 2006 caused by workplace accidents and work-related illnesses on the construction industry sector in Minas Gerais State (located on the southeast of Brazil).

Methods: To find the frequency of retirements related to work on this sector, a retrospective study based on RAIS (An official annual social information record) data of the Ministry of Labor and Employment was conducted. Its database contains basic information on the workers – sex, age, schooling, salary, functions – as well as the companies size – activity sector, number of employees hired, and number of lay-offs/dismissals with their specific causes.

Results: Retirements caused by workplace accidents in respect to occupational illnesses are higher. However, both of these kinds of retirement have a great relative weight in the total number of retirements. In general, these retirements cause young workers to be laid off from work, still in the peak of their productive lives. There was some stability of retirements originated from occupational diseases among workers with less formal schooling. On the other hand, among workers with higher educational levels there was a continuous decrease of their participation. As to retirements due to workplace accidents, on the contrary, more nontypical trends were observed.

Discussion and conclusions: Although RAIS records present only a partial view of the job market, they can be a valuable tool for governmental planning in all nationwide, regional, state and city levels. In addition to that, it provides us with a contextualization of the events according to different criteria.

Tu-P-38 WORK-RELATED ACCIDENTS ON THE CONSTRUCTION INDUSTRY IN MINAS GERAIS STATE, BRAZIL, FROM 2000 TO 2005 - A CRITICAL APPRAISAL

*Salim CA.

Background and aims: The purpose of this study is to investigate the trends and differentials of workplace accidents registered on construction industry in Minas Gerais State, Brazil. In addition, intends to identify some restraints to more realistic quantifications and characterizations of workplace accidents, as well as to discuss possible alternatives to overcome them.

Methods: Thus, through a critical view of statistics about fatal and nonfatal occupational accidents originated from two sources: RAIS (Annual Relation of Social Information – Ministry of Labor and Employment) and AEAT (Yearly Workplace Accidents Records – National Institute for Social Security), it's intend measure differentials about the accident results – i.e., temporary incapacity, death and disability, conceive benefits, period moved away, accident description, ages, sex, instruction degree and occupation – by a selection of specific variables of both data sources, an a geographical cross-cut analysis separated in themes related to accidents' reality.

Results: From 2000 to 2005, workplace accidents in the construction kept a relatively high level. Except for 2001 and 2002, when it fell, this share remained practically unchanged in the period. Yet, this fall may not reflect larger outsourcing and/or an increase in informal work relations. Even so, its figures, when transformed into accident and death rates or, more specifically, in lethality rates, places the sector in an uncomfortable rank. Within the range of liquidated accidents, despite relatively decreasing in the cases of permanent disabilities due to workplace accidents, presented a larger relative share of such cases.

Discussion and conclusions: The data found in these records can be intrinsically improved and their cover range can be broadened. Even keeping the particularities of construction industry in a regional scale, this work shows a concrete analysis followed by propositions of intervention to achieve a better workplace accidents statistics in Brazil.

Tu-P-39 SEVERITY OF OCCUPATIONAL ACCIDENTS IN EMERGENCY ROOMS

*Santana VS, Xavier C, Moura MP, Espírito-Santo J.

Background and aims: Occupational accidents continue to be a major cause of disabilities and deaths all over the world. Recent studies shown estimates of the global burden and costs of occupational injuries, but data from developing countries are limited, particularly for informal workers who are not legally registered and are not included in official statistics. To evaluate the feasibility of a monitoring system of occupational injuries, and to analyse severity, disabilities and the pathway for labor market reentry, a state hospital-based prospective study was conducted.

Methods: All consecutive trauma and poisoning cases from emergency rooms of the two major hospitals of Salvador, the capital of the state of Bahia, were asked about the circumstances of the accident to verify whether they were causally related to jobs during the study period. Each case was invited to participate in the study that comprised an initial interview, followed by monthly household visits, until recovery. The Abbreviated Injury Scale (AIS) was used to calculate the Injury Severity Score (ISS) to assess severity.

Results: A total of 406 comprised the study population. ISS was coded minor for 39.4%, 38.7% moderate, 17.2% serious, 3.2% severe, and critical 1.5%. Mechanical forces (ICD-10: W20-W64) were the most common overall cause of injuries (55.2%), and also for severe/critical cases (38.2%). Severity was higher for thorax trauma (40.0%) and multiple lesions (36.2%). Transport (PR=2.20; 95% CI: 1.06-4.58) and retail (PR=1.85 95% CI: 1.14-3.00) hold highest proportion of severe/critical cases as compared to all other groups. Proportion of severe and critical cases does not differ for informal and formally hired workers.

Discussion and conclusions: Severity of occupational accidents is relevant information to assess the burden of this preventable health problem. However it is often missed in epidemiological studies and need to be recommended for inclusion in official statistics.

Tu-P-40 TENDÊNCIAS E VARIAÇÕES DOS ACIDENTES DO TRABALHO NA INDÚSTRIA MOVELEIRA BRASILEIRA SEGUNDO O TAMANHO DAS EMPRESAS

*Salim CA, Matos E.

Background and aims: Este trabalho pretende analisar as tendências e variações dos acidentes de trabalho na indústria moveleira brasileira, considerando o tamanho das empresas e os principais pólos moveleiros no País, a partir dos resultados de pesquisa nacional inédita realizada pela Fundacentro e SESI sobre os acidentes do trabalho nas indústrias dos ramos calçadista, moveleiro e de confecção.

Methods: A construção do banco de dados, com informações sobre os acidentes ocorridos no período 2002-2004, permitiram identificar, mensurar e caracterizar sociodemograficamente os acidentes, bem como seus fatores de riscos. Realizada nas agências do Instituto Nacional de Seguro Social (INSS), a investigação é baseada em informações contidas na Comunicação de Acidentes de Trabalho (CAT) e nos documentos que o acidente gera, como laudos médicos e registros policiais. No presente estudo, foram destacados cruzamentos envolvendo área geográfica, tamanho da empresa, sexo, faixa etária, ocupação, agente causador do acidente, parte do corpo afetada, diagnóstico médico e tempo de afastamento do trabalho.

Results: No geral, os acidentes concentram-se espacialmente. No entanto, as micros e pequenas empresas (MPE) responderam por 42,5% dos mesmos, enquanto que as empresas de porte médio e grande responderam por 40,24% e 17,3%, respectivamente. As principais características dos trabalhadores acidentados são as seguintes: a) a maioria é jovem com idade entre 20 a 24 anos; b) os equipamentos de trabalho foram responsáveis por 62,3% dos acidentes; c) os dedos da mão foram a parte do corpo mais afetada; d) o tempo médio de afastamento do trabalho foi de 19,3 dias, desconsiderando os casos não informados, etc.

Discussion and conclusions: Embora suportados em registros administrativos do INSS, estes resultados, inéditos no País, podem, dentre outros, fornecer importantes subsídios para a melhoria nos sistemas de gestão em saúde e segurança no trabalho, sobretudo em relação ao amplo e desassistido segmento composto pelas MPE industriais do ramo moveleiro.

Tu-P-41 AVALIAÇÃO DO IMPACTO NOS ACIDENTES DO TRABALHO NAS MICRO E PEQUENAS EMPRESAS DA INDÚSTRIA BRASILEIRA DE CALÇADOS

*Salim CA, Mota LS.

Background and aims: O objetivo deste trabalho é avaliar o impacto dos acidentes do trabalho na Indústria Brasileira de calçados, de acordo com sexo e parte do corpo atingida. O trabalho é baseado na pesquisa inédita no Brasil realizada pela Fundacentro e pelo Serviço Social da Indústria sobre acidentes do trabalho em micro e pequenas empresas dos ramos calçadista, moveleiro e de confecções, durante o período de 2002 a 2004.

Methods: Através dos registros da Relação Anual de Informações Sociais (RAIS) foram selecionados os municípios que participaram do estudo. Os dados foram coletados nas agências do Instituto Nacional de Segurança Social (INSS) por meio das Comunicações de Acidente do Trabalho (CAT). Para classificação do tipo de acidente foram utilizadas as três categorias desenvolvidas pelo INSS: acidente do trabalho típico, acidente do trabalho de trajeto e doença relacionada ao trabalho. As empresas foram classificadas pelo número de trabalhadores de acordo com as categorias do Serviço Brasileiro de Apoio às Micro e Pequenas Empresas (SEBRAE). Na indústria de calçados foram realizados cruzamentos entre as variáveis “gênero” e “partes do corpo atingidas”. Para o presente estudo foram considerados os registros de acidentes do trabalho em que apenas uma parte do corpo foi atingida.

Results: O Estudo mostra que os registros de acidentes envolvendo mulheres é de 36,8% e envolvendo homens é de 63,2%. A parte do corpo mais atingida em ambos os sexos foi o dedo da mão com 46% do total de acidentes nas Micro e Pequenas Empresas (MPÉs). Também chama a atenção o número de registros referentes à categoria membro inferior, com 13,5% da totalidade nas MPÉs.

Discussion and conclusions: O presente trabalho, enfocando a parte do corpo atingida e a relação de gênero, serve de base para novas pesquisas capazes de melhor qualificar as informações sobre os agravos à saúde do trabalhador, com o objetivo de reduzir os acidentes do trabalho, especialmente através de ações preventivas.

Tu-P-42 A SURVEY OF FUNDACENTRO ON THE HEALTH AND WORKING CONDITIONS IN THE INDUSTRIAL SMALL AND MEDIUM SIZE ENTERPRISES IN BRAZIL

*Salim CA, Freitas M, Gomes DL, Matos Ed, Mota LS.

Background and aims: This paper seeks to analyse, compare and debate the results from an unheard of survey carried out by Fundacentro (Brazilian Institute for Occupational Safety and Health) with a support of SESI (Social Service of Industry) on the occupational health and safety (OHS) conditions in three industrial branches of small and medium size enterprises (SMEs) in Brazil: furniture, shoes and clothes manufactures.

Methods: The research sought to identify and measure the occurrence of work accidents among the workers in these branches, through painstaking facts gathering over three years: 2002-2004. Carried out in the agencies of the National Social Security Institute (INSS), the research, including conditions of health and morbidity, is based in a thorough documentary research of the information contained in official forms of INSS and in the documents which the accident generates, such as police reports.

Results: Using selected demographic, socioeconomic and epidemiological variables, it was possible to measure differences according to marital status, consequences (i.e. temporary incapacity, permanent injury or death), time off work, classification of the accident, age group, detailed occupation, time of the accident, hours worked, causal agent and, finally, parts of the body affected.

Discussion and conclusions: This survey furnishes new and important insights for understanding the OHS performance of Brazilian SMEs. As a whole, its results indicated that general conditions existents did not help the improvement of injury prevention and safety promotion for SMEs, principally in face of the multitude of these enterprises distributed across the country. Anyway, a new paradigm is necessary for conformation a specific public policy for these important segments.

Tu-P-43 EL SUBREGISTRO DE ACCIDENTES DE TRABAJO EN UNA UNIDAD DE MEDICINA FAMILIAR DEL INSTITUTO MEXICANO DEL SEGURO SOCIAL

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Background and aims: Determinar el subregistro de los accidentes de trabajo en una Unidad de Medicina Familiar (UMFX) escogida, inicialmente atendidos en el servicio de urgencias de un Hospital General de Zona (HGZ), del Instituto Mexicano del Seguro Social (IMSS) en el año 2002.

Methods: Es un estudio transversal que utilizó información de la fuente original del HGZ que otorga la primera atención médica. Se elaboró una cédula de registro con las diversas fuentes de información, efectuando confrontación, seguimiento y análisis estadístico de las mismas.

Results: De 6551 probables accidentes de trabajo atendidos en el HGZ, se seleccionaron 821 casos adscritos a la UMFX escogida. Se conformaron tres grupos de acuerdo con su dictamen: Grupo I= SÍ de trabajo, 35.4% (290); Grupo II=NO de trabajo, 4.6% (38), y el Grupo III= no calificados y atendidos en urgencias, 60%(493); este último representa el subregistro de los accidentes de trabajo.

Discussion and conclusions: El subregistro del 60% es de los más altos reportado en la literatura, lo cual representa para el IMSS, los trabajadores y el país graves repercusiones económicas y sociales no cuantificadas.

Tu-P-44 CARACTERIZACIÓN DE LOS ACCIDENTES DE TRABAJO EN HONDURAS

*Carmenate-Milián L, Sánchez JF.

Background and aims: Cada año en el mundo ocurren millones de Accidentes de Trabajo (AT). Se estima que el promedio de AT a nivel global es de 42 por 1,000 trabajadore/as y de 8,3 por 100,000 trabajadore/as para Accidentes de Trabajo Fatales (ATF). En Honduras la información de que se dispone es escasa, incompleta, poco sistemática y con separación de las estadísticas entre el Instituto Hondureño de Seguridad Social (IHSS) y la Secretaria de Trabajo y Seguridad Social (STSS) lo que dificulta un análisis objetivo y generalizador de la situación a nivel nacional. Este estudio recolecta la información sobre accidentes de trabajo disponibles a nivel de las instituciones reguladoras y prestadoras de servicio en salud de los trabajadore/as, como base para establecer un método para la recolección sistemática de la información estadística sobre accidentes de trabajo.

Methods: Se realizó la revisión de los registros estadísticos disponibles en el IHSS entre 1963 y 2005 y la STSS entre 1996 y 2005.

Results: En el IHSS se reportaron entre 2003-2005 un promedio anual de 1,826 AT para una población asegurada promedio en el período de 423,533 trabajadore/as, lo que representa una tasa de 4.4 accidentes por 1,000 trabajadore/as. En la industria manufacturera ocurrió el 52.2 % de los AT. El costo económico de los AT para la institución en el año 2005 fue de 93,285 dólares. En igual periodo en la STSS se reportaron un promedio de 346 AT (promedio de 74 ATF) para una población de trabajadore/as no asegurados de 2,045,998, lo que representa una tasa de 1.7 accidentes por 10,000 trabajadore/as. En la industria manufacturera ocurrió el 42.5 % de los AT. El costo económico de los AT para la institución en el año 2005 fue de 932,675 dólares.

Discussion and conclusions: Los resultados evidencian el importante subregistro de casos, en especial dentro de la población dependiente de la STSS donde más del 50% se considera parte del sector no formal de la economía. Es necesario establecer mecanismos para la adecuada detección, notificación, registro, investigación y análisis de AT, como la manera más efectiva de establecer programas de intervención sobre las causas que los ocasionan.

Tu-P-45 REGISTRO DE LOS ACCIDENTE OCUPACIONALES EN NICARAGUA, AÑO 2005.

*López Bonilla IM, Flores L, Celiz T.

Background and aims: Los accidentes ocupacionales fatales (AOF) en Nicaragua son subestimados con deficientes sistemas de información y deficiente cobertura de las instituciones competentes. El objetivo de este estudio fue abordar el problema del subregistro de los AOF, estimar su incidencia y valorar la factibilidad de un sistema de vigilancia.

Methods: Se recolectaron datos de los AOF en la población económicamente activa ocupada de 10 años o más, ocurridos en el 2005, en fuentes oficiales (Ministerio de Trabajo y Seguro Social) y no oficiales (Instituto de Medicina Legal, Ministerio de Salud, Policía, Bomberos, Medios de comunicación, el Instituto de Seguridad Social y Derechos Humanos y la Asociación de Trabajadores del Campo). Los datos registrados incluyeron datos de la empresa, del trabajador y del accidente. Los casos obtenidos se cotejaron para evitar su repetición. Se calculó la tasa nacional de AOF por 100,000 trabajadores en el 2005, para la PEA y sectores, así como los años de vida potencialmente perdidos (AVPP).

Results: Se identificaron 173 casos de AOF con solo 53 (31%) registrados en las fuentes oficiales. La tasa de AOF fue de 8.3/100,000 trabajadores. La mortalidad es más alta en sector de la economía formal con 12.9 versus 5.9 en la informal, y en los hombres con 12.2 versus 1.7 en las mujeres. Los trabajadores entre 25 a 29 fueron los de mayor riesgo con 15.0/100,000 trabajadores. Los sectores económicos de mayor riesgo, por orden de frecuencia, son la explotación de minas (110.3/100,000), electricidad (76.0/100,000), (36.3/100,000) y construcción (26.9/100,000). Las AOF ocasionaron 6,221 AVPP, en promedio 35.9 años por cada accidente ocupacional fatal.

Discussion and conclusions: El estudio muestra subregistro importante de AOF en las fuentes oficiales. Los AOF identificados siguen siendo una subestimación, en particular para los sectores informal y agrícola. Sin embargo, el Ministerio de Salud reúne las condiciones para establecer un sistema de vigilancia; hay estructuras y, por ley, es la encargada de vigilar los AOF. Asimismo, hay anuencia de la mayoría de las fuentes consultadas de brindar información. Sin embargo, es necesario mejorar los instrumentos y la forma de captación de la información.

CARDIOVASCULAR DISORDERS

Tu-P-46 INFLUENCE OF HARMFUL LIFE HABITS AND WORK ENVIRONMENT FOR DEVELOPMENT OF MYOCARDIAL INFARCTION AMONG KAUNAS EMPLOYABLE AGE WOMEN

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Background and aims: To determine influence of the labor factors and lifestyle on the risk of first myocardial infarction among Kaunas women aged 35-64.

Methods: We conducted the population-based case-control study among 35-64 years old women in Kaunas, Lithuania. The study was conducted in 1997-2005 with the participation of all Kaunas hospitals. Cases of the first myocardial infarction (N=368) were recruited from the hospital register. Controls (N=848) were randomly selected from the study base. The group contained first hospitalized non-fatal myocardial infarction patients (code I21 according to the International Classification of the Diseases). Cases and controls were interviewed using a standardized questionnaire about the demographics, psychosocial characteristics, and behavioral, physiological risk factors, occupational and residential exposures. The obtained information on potential myocardial infarction risk factors through a personal interview using standardized questionnaires for both groups. We used SPSS 10.0 software for Windows for the statistical analysis. To adjust for potential confounding effects of the selected risk factors logistic regression analysis was performed. Potential confounders included in the models were factors, such as arterial hypertension, smoking, stress, obesity, education and employment duration. Crude odds ratios (OR) along with their corresponding 95 confidence intervals (CI) were calculated. The adjusted OR along with their 95 CI for each risk factor relative to the reference category was assessed, and the effect of the risk factors on MI risk among women 35-64 year old.

Results: We have determined: stress has the greatest influence on the risk of the first myocardial infarction among women aged 35-64 (OR 11.46; 95% CI 7.39-17.79).

Women included in the case group were older than those in the control group (OR 1.77; 95% CI 1.36-2.31). Vibration in the work environment increased by 58.0% the risk of the first myocardial infarction among women aged 35-64, increased blood pressure – 4 times, body mass index 54.0%. Total suspended particulate in the work environment increased the risk by 16.0% among women aged 35-64.

Discussion and conclusions: Low education, stress, smoking, increased blood pressure, body mass index significantly increased the risk of the first myocardial infarction among Kaunas employable age women.

Tu-P-47 DYNAMIC CARDIAC AUTONOMIC RESPONSES AND RECOVERY UNDER DIFFERENT WORK SHIFTS IN YOUNG WOMEN

*Lo S, Hwang J, Wang J.

Background and aims: Many studies had provided a significant relationship between heart rate variability (HRV) and cardiac mortality and morbidity. HRV profiles would be modified and represented the level of autonomic nervous system activity by work shift, but the recovery patterns in HRV after shift work are seldom reported.

Methods: We recruited sixteen young female nurses working rotating shifts and six working the regular day shift. All received repeated 48-hour ambulatory electrocardiographic (ECG) monitoring during their workdays and following day off.

Results: From a linear mixed effect model showed that increasing parasympathetic activities while on sleeping, on the day of night shift and on the working period of evening shift. Sympathetic activities were increasing while on workdays, on working period, and on night shift of work day, but decreasing activities while on sleeping, on night shift and on evening shift of work day. The recovery patterns in work day and consecutive off-duty day shown delay recover of night shift compared with day and evening shift.

Discussion and conclusions: Shift work significantly affects HRV in young female nurses. Except for those working night shifts, cardiac autonomic activities would return to baseline the off-duty day after day shift. Based on the findings of this study, at least two days off-duty days may be needed to completely recover from night shift, though further research is needed to confirm this.

Tu-P-48 GENDER DIFFERENCES IN PREDICTORS OF HOURLY WORK STATUS AND ITS INFLUENCE ON CARDIOVASCULAR HEALTH

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Background and aims: Studies have shown greater health risks associated with blue-collar manufacturing employment for women than for men. It remains unknown, however, whether these increased risks are largely attributable to sex-linked biological differences in susceptibility to workplace contaminants, or to more culturally determined gender differences, such as workplace harassment or socioeconomic circumstances.

Methods: We examined the influence of hourly employment status in predicting hypertension onset among men and women, using health claims data for a cohort of 14,950 white- and blue-collar aluminum manufacturing employees distributed across eight U.S. states. Sex-stratified propensity score models were developed to separately identify key predictors of blue-collar status and to correct for socioeconomic confounding. We then used time-weighted logistic regression with propensity

stratification to examine the sex-specific associations between blue-collar status and hypertension, after adjusting for SES and other risk factors.

Results: We found that education, age, marital status, and parity were the strongest predictors of employment status among women. Married women were less likely to hold blue-collar jobs, while women with children were more likely to do so (Adj OR for hourly status = 0.62 (0.45 – 0.87) and 2.12 (1.15 – 3.91), respectively). Among men, education, age, race/ ethnicity, marital status, and parity were significant predictors, with married men and those with children being less likely to hold blue-collar jobs (e.g., more likely to be white-collar) (Adj OR = 0.72 (0.59 – 0.87) and 0.78 (0.67 – 0.90)). After propensity restriction and multivariate adjustment, the effect of hourly status on hypertension risk was significant only among women (Adj OR = 1.99 (1.33 – 2.97) for women vs. 1.05 (0.94 – 1.17) for men).

Discussion and conclusions: We found that partnership conferred increased likelihood of salaried status, while parity had opposite effects on work status for men and women. After adjusting for socioeconomic predictors, hourly (blue-collar) work status confers greater risk to women.

Tu-P-49 ATYPICAL WORK HOURS, SLEEP DURATION, AND THE METABOLIC SYNDROME: A STUDY OF POLICE OFFICERS.

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Background and aims: Working atypical hours has been shown to have adverse effects on health outcomes. The objective of this study was to examine whether working such hours is associated with metabolic syndrome among police officers and whether this association is influenced by sleep duration.

Methods: A sample of 115 Buffalo, NY police officers was randomly selected. Shift work and overtime data were obtained from daily payroll records. Officers were categorized as working a day, afternoon or midnight shift based on the highest percent of hours worked on each of these shifts from 1994-2000. Sleep duration was measured as the average hours of sleep each day for the past seven days.

Dichotomous variables were created using median sleep duration (< 6 vs. ≥ 6 hours/day) and overtime (< 1.7 vs. ≥ 1.7 hours/week). Metabolic syndrome was defined using five components based on standard criteria: abdominal obesity, elevated blood pressure, reduced HDL cholesterol, elevated triglycerides, and elevated fasting glucose levels. 98 officers had complete data. Unadjusted and adjusted mean number of metabolic syndrome components and p-values for differences across three levels of shift work were determined using ANOVA and ANCOVA models. Multivariable models included adjustment for age, gender, education, marital status, smoking, drinking, physical activity and police rank.

Results: Officers working midnight shifts tended to have a slightly higher mean number of metabolic syndrome components compared to those who worked day or afternoon shifts (gender-adjusted mean = 1.51 vs. 1.15 and 1.12, respectively). Adjustment for gender and age (mean = 1.62 vs. 1.04 and 1.20) and multivariable adjustment (mean = 1.48 vs. 0.79 and 1.00) had minimal impact on the results. Stratification on sleep duration and overtime revealed statistically significant associations between midnight shifts and the mean number of metabolic syndrome components for both unadjusted and covariate-adjusted models among officers who had less sleep (p = 0.013) and worked more overtime (p = 0.007).

Discussion and conclusions: Results suggest that shorter sleep duration and more overtime combined with night shift work may be important contributors to the metabolic syndrome. These factors may provide useful targets for prevention.

Tu-P-50 AGE DIFFERENCES IN THE ADJUSTMENT OF CARDIOVASCULAR SYSTEM AMONG CONTROL ROOM SHIFTWORKERS

*Bobko NA.

Background and aims: Shiftwork including night shifts, long working hours as well as mental work are known as the risk factors for cardiovascular disease. Ageing is considered as the high risk factor in this respect. The objective was to reveal the age differences in the adjustment of cardiovascular system (CVS) to work among control room shiftworkers.

Methods: Heart rate (HR), systolic and diastolic blood pressures (BP) were registered in electricity distribution network controllers aged 31-63 each 2 hours during 12-hour working shifts over a 3 week periods under 2-day shift rotation (n=17 persons, N=1224 subject-observations). Group data analysis was performed for workers aged up to 40 years old and beyond 40 at the p-value of 0.05.

Results: The higher BP in the first and last hours of a working shift, HR – in the first hours compared to other periods of a working shift were found (Tukey's HSD test, p<.05) reflecting the increase in CVS activity while receiving and transmitting a shift. These changes were more pronounced in the older workers. Mainly normal type of bloodcirculation selfregulation was revealed in young workers during working shifts for the exception of some period of the 2nd consecutive day shift. Mainly unfavourable

types of bloodcirculation selfregulation were found in older workers during certain periods of the working shifts for the exception of the 1st day shift.

Discussion and conclusions: The break in bloodcirculation selfregulation is proved to be the predecessor of hypertonic disease [1]. More pronounced changes in CVS activity along with unfavourable changes of bloodcirculation selfregulation evidence more high physiological price of the professional duties performance. After 40 years old more pronounced changes in cardiovascular system efforts as well as unfavorable changes in bloodcirculation selfregulation were found. Aged control room shiftworkers need special rehabilitative regimes of work and rest to maintain good cardiovascular system state and longer time on the job.

Reference: 1. Arinchin N.I., Kulago G.V. (1969) Hypertonic disease as the break in bloodcirculation selfregulation. Minsk. Nauka i Tekhnika.

Tu-P-51 TRENDS IN HOSPITAL MORTALITY FROM ISCHEMIC HEART DISEASE IN KAUNAS MIDDLE-AGED POPULATION DURING 2000-2004

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Background and aims: The rates of morbidity of acute myocardial infarction (AMI) and mortality from ischemic heart disease (IHD) in Lithuania have been the moderate between Eastern European countries. The official mortality statistics suggest that morbidity of AMI and mortality from IHD was declining during the past 10 years. The aim of the study was to evaluate trends in 28-day hospital mortality from IHD in Kaunas population aged 25-64 years from 2000 to 2004, according to the ischemic heart disease register data.

Methods: The primary source of data was Kaunas population-based ischemic heart disease register. The main sources of information for registration of ischemic heart disease events were hospital records, death certificates, necropsy and medico-legal records. The data was collected according to the requirements of the WHO program MONICA. Deaths from IHD that occurred during 28 days in Kaunas hospitals were analyzed in this study. Trends in rates were analyzed using the method of linear regression on logarithms of the age-standardized by European population 28-day hospital mortality rates. The regression coefficient multiplied by 100 is given as an average yearly change.

Results: During 2000-2004, overall hospital mortality from IHD among Kaunas 25-64 aged men in average was 27.0/100000 and corresponding rate among women was 4 times lower – 6.0/100000 persons. In 2000-2004, hospital mortality rates among men with first and recurrent AMI was 16.8 and 10.2/100000 persons and among women 4.1 and 1.9/100000 persons respectively. During 2000-2004, 28-day overall hospital mortality from IHD trends among Kaunas men and women was without significant changes, respectively +7.0% per year, $p=0.5$ and -8.6% per year, $p=0.7$. During the analyzed period, hospital mortality from IHD trend among men with first AMI significantly increased (+21.4% per year; $p=0.0007$) and among women – significantly not changed, meanwhile hospital mortality from IHD with recurrent AMI among men and women remained without statistically significant changes.

Discussion and conclusions: During 2000-2004, the 28-days overall hospital mortality from IHD among Kaunas middle-aged men and women was without significant changes.

Tu-P-52 AN ASSOCIATION OF METABOLIC SYNDROME WITH OCCUPATIONAL STATUS AMONG MIDDLE AGE LITHUANIAN MEN

*Luksiene D, Cerniauskiene LR, Margeviciene L, Tamosiunas A.

Background and aims: The metabolic syndrome (MS), as the main risk factor of cardiovascular disease and other noncommunicable diseases, leads to serious health problems and has serious economic consequences for companies. The aim of the present study was to estimate an association of MS with occupational status in middle-aged men.

Methods: The epidemiological examination was carried out in Kaunas (Lithuania) according to the MONICA study protocol. Subject of this study 318 men aged 35-54 years were grouped oneself according to occupational status: 1) occupations to processing, manufacturing (134 men); 2) skilled management occupations (75 men); 3) skilled sales and service occupations (42 men); 4) skilled drivers occupations (50 men); 5) private business occupations (17 men). MS was defined using the International Diabetes Federation (IDF) definition (2006).

Results: Prevalence of MS among men was 28.3% and it was increased with age (OR=1.05; 95% CI 1.01-1.09). The prevalence of MS among men with different occupation status were (data adjusted by age): 1) among men with occupations to processing and manufacturing - 25.4%; 2) among men with skilled management occupations - 31.8%; 3) among men with skilled sales and service occupations - 22.3%; 4) among men with skilled driver occupations - 27.4%; 5) among men with private business occupations - 51.9%. The lowest rate of MS was among men with skilled sales and service occupations

(the 3rd group) and the highest rate of MS was among men with private business occupations (the 5th group) ($p=0.017$). Comparing the odds (OR) of MS among men with different occupational status (for men with skilled sales and service occupations (the 3rd group) $OR=1$), the highest odds of MS was determined for men with private business occupations ($OR=4.78$; 95% CI 1.20-19.7 ($p= 0.022$)); for men with occupations to processing and manufacturing (1st group) $OR=1.50$ ($p>0.05$); for men with skilled management occupations (2nd group) $OR=2.00$ ($p>0.05$); for men with skilled driver occupations (4th group) $OR=1.65$ ($p>0.05$).

Discussion and conclusions: 35-54 years men with private business occupations had a higher risk of MS than men with other occupational status. Public health strategies in Lithuania might need to focus on MS prevention among middle age working male population.

Tu-P-53 INFORMATIVE CONTENT OF SPACE RELATED PARAMETERS REGARDING HUMAN-OPERATOR RELIABILITY AND CARDIOVASCULAR SYSTEM ACTIVITY

*Bobko NA, Vasilik PV.

Background and aims: Literature data evidence the influence of space related parameters over the indices of human body functioning, including mental performance. Solar activity (SA), geomagnetic field (GMF) and weather influences have been considered as the effective factors. The objective was to reveal the prognostic informative content of space related data regarding the human-operator performance and cardiovascular system (CVS) activity.

Methods: Three data bases were used: (1) the efficiency of control room operator working at a heat power plant – specific fuel consumption per shift (7274 subject-shifts during a year), (2) accident rate in energetics of Ukraine caused by operative or management personnel (164 cases during 14 months), (3) memory and attention tests fulfilment by electricity distribution network controllers (384 subject-observations during a month) and CVS work testing (1826 subject-observations during 5 months) at the beginning and in the end of each 12-hour working shift. Everyday space related parameters were obtained from Internet and published data. Analysis was performed at $p<.05$.

Results: (1) Fluctuations in neutron component of cosmic rays (NC), Kp-index of GMF tension (Kp) and SA preceded the fluctuations in operator performance in 3 weeks ($r=0.7$), 1.5 ($r=0.7$) and 3 ($r=0.4$) months correspondingly to the more pronounced extent. (2) Accident rate correlated to the intensity of space related factors at the daytime synchronously, in the nighttime – a delay occurred of 2.5 to 6.5 months at the cross-correlation coefficients 0.4-0.5. (3) Variations in psychophysiological parameters could be synchronised or having lag up to 14 days (within 1 month analysis epoch) or 50 days (within 5-months epoch) regarding fluctuations in space related parameters ($r=0.3-0.6$).

SA and NC have been found as the most informative parameters regarding human-operator reliability, while SA, atmospheric pressure and GMF - regarding CVS activity.

Discussion and conclusions: Mainly not so high correlation evidence the relatively good human body resistance towards the incoming influences. But in some cases this correlation is substantial, showing the expediency of regular computer based monitoring of space related parameters to conduct investigations aiming prognostication the CVS state and performance of control room workers at the high reliability organisations where human mistake could cost too much.

WORK-RELATED ILLNESS

Tu-P-54 PROGRAMME DE SURVEILLANCE DES MALADIES À CARACTÈRE PROFESSIONNEL : RÉSULTATS DE L'ANNÉE 2006

*Valenty M.

Background and aims: Les maladies à caractère professionnel (MCP) sont les maladies ou symptômes susceptibles d'être d'origine professionnelle et n'entrant pas dans un tableau des maladies professionnelles indemnissables (MPI). Bien que leur déclaration soit une obligation légale, peu de médecins déclarent des MCP. De plus, ces signalements sont peu exploités, notamment faute de données sur la population d'où ils proviennent. L'objectif principal est d'explorer ces signalements pour une surveillance épidémiologique en milieu du travail.

Methods: Toutes les MCP rencontrées chez les salariés venus en consultation pendant deux semaines sont signalées par un réseau de médecins du travail volontaires, chaque semestre. Les médecins enregistrent aussi l'année de naissance, le sexe, la profession et le secteur d'activité de tous les salariés ayant bénéficié d'une visite médicale au cours de la quinzaine.

Results: En 2006, quatre régions ont participé : les Pays de la Loire, Midi-Pyrénées, Provence-Alpes-Côte d'Azur et Poitou-Charentes. Un peu moins de 700 médecins du travail ont participé (38%). Ils ont en charge la surveillance médicale de 33% des salariés de ces régions et ont vu pendant ces périodes près de

74 000 salariés. Les pathologies les plus fréquemment signalées étaient les troubles musculo-squelettiques (TMS) (55%) et la souffrance psychique (21%). Les principales localisations des TMS sont le dos (37%), l'épaule (21%), le coude et les syndromes canaux (16%). Le taux de signalement moyen est de 5,4%. Les taux les plus élevés sont retrouvés dans les secteurs de l'industrie et des activités financières (7%), ceux de la construction et de l'éducation-santé-social (7%). Le taux de signalement est de 6,7% chez les ouvriers et 5,7% chez les employés. Les prévalences des TMS et de la souffrance psychique sont respectivement de 3,1% et 1,3%. Les secteurs où la prévalence des TMS est la plus élevée sont le secteur industriel (4,8%) et le secteur de la construction (4,2%); le secteur des activités financières est particulièrement concerné par la souffrance psychique (3,9%).

Discussion and conclusions: Ce programme de surveillance des MCP permet de préciser leur prévalence. La constitution d'un réseau de médecins du travail volontaires permet de développer la culture du signalement et de l'alerte dans le domaine de l'évaluation des risques professionnels.

Tu-P-55 TOWARDS ADVANCES IN OSH FOR SME IN BRAZIL: A FUNDACENTRO SURVEY ON WORK RELATED ACCIDENTS AND ILLNESSES IN THREE INDUSTRIAL BRANCHES

*Salim CA, Trivelato GC.

Background and aims: This paper aims to present and discuss the results of an inedited survey carried out by FUNDACENTRO (Brazilian Institute for Occupational Safety and Health), with a support of SESI (Social Service for the Industry), in the small and medium enterprises of three Brazilian industrial branches - furniture, shoe and clothing production, in order to promote better work environments. The research tried to identify and measure the occurrence of work accidents and occupational illnesses, through a painstaking fact gathering over three years: 2002-2004.

Methods: The research was carried out in the worker compensation branch of the National Institute for Social Security (INSS) and it was based on a throughout content analysis of the official work accident reports and other documents which the accident can generate, such as the reports of the police. The data were analyzed considering the categorizations adopted by INSS; the characteristics of the accident and its consequences; the worker characteristics; and the size and the industrial branch of the enterprises.

Results: The data showed that the relative number of accidents was higher in the furniture-manufacturing branch, followed by the clothing and shoe industries. The furniture branch showed the higher relative number of typical accidents while the shoe industry showed the higher relative number of occupational illnesses and the clothing industry the higher relative number of trajectory accidents. Considering the size of the enterprises, it was observed the large and medium size enterprises, and not the very small industries, were responsible for the relative majority of the accidents.

Discussion and conclusions: As a whole, its results indicated that the general existing conditions in SME need to be improved for injury prevention and safety promotion, especially considering the multitude of these enterprises in the industrial sector, and the distribution in the vast Brazilian territory. Anyway, new paradigms is necessary for carrying out further researches and for the development of a specific public policy to SMEs achieve better performance on occupational safety and health.

Tu-P-56 MOLECULAR EPIDEMIOLOGICAL STUDY ON TRICHLOROETHYLENE-INDUCED ALLERGIC DERMATITIS

*Zheng Y, Dai Y, Li H.

Background and aims: Trichloroethylene (TCE)-induced allergic dermatitis has become one of the critical occupational health issues in China. The clinical manifestations of TCE-induced allergic dermatitis include generalized severe dermatitis, fever, abnormal liver function, nephritis, and lymphadenopathy. The aim of the study is to explore gene environment interaction in the chemical induced disease. To identify susceptible biomarker is one of critical requirement of the prevention.

Methods: A population-based case-control study was conducted. The polymorphisms of human leukocyte antigen (HLA) genes were analyzed. DNA samples of 113 cases with TCE-induced allergic dermatitis and 142 TCE-tolerant controls were collected. HLA alleles B, DRB1, DQA1 and DQB1, were determined by sequence-based typing. The frequencies of distributions of HLA-B13 alleles in population from six regions of China were compared.

Results: The allele HLA-B*1301 was present in 83 (73.5%) of 113 patients versus 13 (9.2%) of 142 tolerant workers. The odds ratio (OR) was extramel high among workers with the HLA-B*1301 allele [OR=27.5 (95% confidence interval, 13.5-55.7); corrected P=1.48×10⁻²¹]. In addition, the HLA-B44 alleles were present in 6.2% (7/113) of patients, but were absent in TCE-tolerant workers.

HLA-B13 is one of common allelic group in Oriental, especially in Chinese. In addition, the allele HLA-B*1301 as a major one of B13 group in southern Chinese is a specific allele in Asians, but rare in Caucasians and others. Antigen frequencies of HLA-B13 in population from six regions of China were

reported. The relative ratio of antigen frequencies of HLA-B*1301 and HLA-B *1302 alleles showed decreasing trends from south to north area: mobile workers in Guangdong Province (13.5% vs 3.0%, n=304), Hubei Province (11.0% vs 11.7%, n=163), Anhui Province (8.7% vs 19.7%, n=208), Shandong Province (11.3% vs 30.1% , n=186), Beijing (5.1% vs 13.2%, n=234), Liaoning Province (7.8% vs 12.1%, n=256).

Discussion and conclusions: Based on the large numbers of new TCE- exposed workers, the genetic feature of the population in southern China may be a major factor in the mass outbreaks of TCE-induced allergic dermatitis. The allele HLA-B*1301 is strongly associated with TCE-induced allergic dermatitis among exposed workers. HLA-B*1301 might be used as a biomarker to predict high risk individuals to TCE.

Tu-P-57 PREVALENCIA DE DERMATOSIS EN TRABAJADORES DE UNA FÁBRICA DE PINTURAS EXPUESTOS A SOLVENTES ORGÁNICOS.

*Sánchez-Escalante VC, Aguilar Madrid G, Juárez Pérez CA.

Background and aims: Las dermatosis ocupacionales representan una preocupación creciente, ya que existe una gran diversidad de actividades y puestos de trabajo con exposición a sustancias químicas que provocan enfermedad de la piel. Los trabajadores más afectados son: peluqueros, trabajadores de las artes gráficas , operadores de maquinas y herramientas, operadores de plantas químicas y petroquímicas, y ensambladores. En México existen 300 mil trabajadores expuestos a mezclas de tolueno, xileno y benceno. El propósito de este estudio fue determinar la prevalencia de las dermatosis probablemente relacionadas con los solventes orgánicos.

Methods: Se realizó un estudio transversal a través de un examen clínico minucioso de piel, para describir las lesiones y se aplicó una historia laboral para identificar los factores de riesgo, en un grupo de trabajadores de una fábrica de pinturas donde se utilizan mezclas con solventes.

Results: Participaron 67 trabajadores, el 98.5% (66) fueron hombres. El promedio de edad fue de 38.2 años (DE=10.15), y de antigüedad de 11.22 años (DE=10.15), El 41% fuma y el 19% ingiere bebidas alcohólicas, tienen buena higiene personal el 91.8% (56). El 4.9%(3) laboraban en ambiente húmedo. Las lesiones dermatológicas más frecuentes fueron: Hiperqueratosis con 59.7%(40), con predominio en ambas manos 60%(24), una magnitud moderada 53.8%(21), en promedio cada participante tuvo 5.6 lesiones de este tipo. Se observó liquenificación en un 22.4% (15) en ambas manos en un 66.6%(10), con una magnitud de leve 40%(6) a moderada 47%(7), simétricas; en promedio cada trabajador presento 2 lesiones de liquenificación. Se identificó la presencia de onicomicosis 55.2% (37) de predominando en ambos pies 78.3%(29) con una magnitud de moderada 51.3%(19) a grave 29.7%(11). Se observaron diferencias en la presencia de liquenificación, entre los trabajadores más expuestos y menos expuestos a los solventes, sin embargo estas diferencias no eran estadísticamente significativas.

Discussion and conclusions: Debido a que el proceso productivo esta automatizado, se reduce la posibilidad de tener contacto directo de la piel con los solventes, sin embargo se identifico la presencia de liquenificación, una lesión asociada al uso de los solventes. El no haber encontrado diferencias significativas entre los trabajadores más y menos expuestos, se debe a la muestra pequeña.

Tu-P-58 PHYSIOLOGICAL EFFECTS OF VOLATILE ORGANIC COMPOUNDS IN MULTIPLE CHEMICAL SENSITIVITY

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Background and aims: The following oral and poster paper presentation on Multiple Chemical Sensitivity (MCS) addresses the underlying physiological mechanisms, resultant symptoms, and diseases common in this disorder. MCS sufferers experience a hypersensitivity to low levels of Volatile Organic Compounds and solvents, such as ordinary household cleaning products, synthetic fragrances, and pesticides.

Methods: The Literature suggest Hypersensitivity leads to symptoms that can be diffuse at first, such as headaches and impaired concentration, followed by learning and memory problems. Continued exposure can precipitate persistent and progressive symptoms, such as chronic migraines, joint pain, body aches, muscle weakness, peripheral neuropathy, and neurological, cardiac and respiratory symptoms.

Results: This multi-system progressive disorder is usually brought on by toxic exposure which increases a person's toxic load, depletes nutrient stores and causes organ damage. When organ involvement increases, responses are more difficult to decipher and reverse.

Discussion and conclusions: Once the body has reached its saturation point, any exposure to neurotoxins will result in the symptoms of MCS, such physiological mechanisms of MCS are described.

Tu-P-59 ASOCIACIÓN ENTRE CYMAT Y ENVEJECIMIENTO PREMATURO: DESARROLLO DE METODOLOGÍA EPIDEMIOLÓGICA PARA RECONOCER VINCULACIONES.

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Background and aims: Si bien se admite corrientemente la multiplicidad de relaciones entre CyMAT y envejecimiento prematuro, es necesario aportar fundamentos objetivos para su contrastación. Con el propósito de correlacionar patrones de presentación de enfermedades con sitios o puestos laborales, se aplicaron procedimientos analíticos a un conjunto de registros diagnósticos clínicos asociados con ausentismo laboral con información sobre sitios laborales. Los objetivos serán presentar un desarrollo metodológico para reconocer vínculos entre CyMAT y envejecimiento prematuro y obtener información a partir de datos de enfermedades comunes asociadas con ausentismo laboral.

Methods: Se aplicaron los siguientes procedimientos: Relevamiento presencial de riesgos para la salud en sitios de trabajo. Análisis de 53.999 registros de cinco años de enfermedades en 5.372 trabajadores azucareros, definiendo “expuestos” a grupos de sectores laborales con capacidad de daño a la salud y/o presencia de factores de riesgo comunes y “afectados” a grupos diagnósticos con origen compatible en las CyMAT, excluyéndose registros de eventos ajenos al trabajo.

Se aplicó metodología observacional analítica, asimilable al diseño de casos y controles, determinándose OR para la asociación estadística con IC 95%; la probabilidad según prueba Chi2.

El procesamiento estadístico se hizo mediante software STATA, Versión 9.

La significación estadística entre proporciones se estableció con Chi2 según Pearson $p/a < 0,05$. Se consideraron factores de confusión (edad, antigüedad), aplicando análisis estratificado. Se buscaron variaciones comparando los cinco años de la serie.

Results: Se observó incremento de afecciones vinculables con sectores laborales determinados: alérgicas OR=2,28; IC95% (1,93–2,7); oftalmológicas OR 2,46 (1,96-3,10); con mayor expresión en el segmento de 29-36 años OR>3; osteo-artículo-musculares OR 1,5 (1,39-1,61); dermatológicas OR 1,64 (1,16-2,31); cardiovasculares OR>2,47. (2,22-2,74). Se observó incremento del riesgo con la antigüedad, independiente de la edad (20% respiratorias a 100% cardiovasculares).

Para cardiovasculares se observó aumento del riesgo con la edad OR=21,9 (17,07-28,15).

Discussion and conclusions: El riesgo de adquirir enfermedades causales de envejecimiento prematuro, sea en forma aislada o como polipatología, es significativamente mayor en determinados sectores: cosecha, cañaveral, calderas, molienda, fabricación de papel y de alcohol; se incrementa con la antigüedad para todas las patologías evaluadas y para las cardiovasculares se decuplicaron los valores de referencia de publicaciones nacionales e internacionales.

Tu-P-60 DENTAL DISORDERS AMONG 58,849 CHINESE RESTAURANT COOKS COHORT: RESULT FROM THE NATIONAL HEALTH INSURANCE DATA

*Yang Y.

Background and aims: When cooks cook, they need to taste food, however, the studies in the occupational disease of teeth were few. In Taiwan, there were approximately 341,620 Chinese restaurant cooks; therefore, the cooks' occupational dental disease is an issue of concern. We examined the incidence of dental disorders among Chinese restaurant cooks in Taiwan.

Methods: To investigate the incidence of dental disorders to which Chinese restaurant cooks are most at risk in Taiwan, National Health Insurance Data from 2001 to 2005 were used to identify dental disorders for study populations, including 58,849 certified cooks and 118,206 references matched for age and sex.

Results: The 5-year cumulative incidence of dental disorders was significantly higher in the cooks than in the references (83.1% vs. 76.4%, $p < 0.001$). We investigated further the relation between the work years and sex in cooks. By logistic regression, in terms of dental caries, pulpitis and periodontosis, incidences in females or work year elder were significantly higher than in males or work year younger.

Discussion and conclusions: The occupational exposures may have an effect on Chinese restaurant cooks. These findings suggest the need to promote the occupational safety education for Chinese restaurant cooks.

Tu-P-61 HEARING LOSS IN OCCUPATIONALLY EXPOSED RADIO FREQUENCIES (RF) AND MICROWAVE (MW) NON-IONISING RADIATION.

*Szanto CI.

Background and aims: In this study the auditory system was compared between subjects exposed to RF and MW electromagnetic radiation and a control group not exposed to such radiation or other physical or chemical noxes with influence on the ear.

Methods: The exposed group with irradiation of RF or MW or both (RF : 160-180 MHz; MW : 2,6-3,1 GHz) was constituted of 73 radar operators (men). The subjects of the control group were selected from those who had never been exposed to occupational ear-toxic noxes. The traditional audiometric measurements (250, 500, 1000, 2000, 3000, 4000, 6000 and 8000 Hz) of hearing threshold level (HTL) were performed in both exposed and control group. The radiation level of non-ionising radiation (NIR)

was measured with an EMR-200 instrument, according to a currently used method in developed countries.

Results: In the workplaces of the radar operators, radiation levels exceed by many times the mean value of flux density of electric and magnetic field reference value used in the European countries. The mean value of flux density measurements varied between 3,8 and 25,4 mW/cm² for the group exposed to NIR. The mean exposure time for the radar operators was 9,7+/-6,2 years, their mean age was 33,7+/- 8,7 years. These figures were 9,1+/- 5,8 years and 34,2+/-8,2 years for the control group, accordingly. The mean hearing threshold level showed a statistically significant decrease of the hearing threshold in the exposed, as compared to the non-exposed subjects; the decrease amounted 7,1; 8,9 and 9,1 dB for 4, 6 and 8 kHz frequencies.

Discussion and conclusions: These results indicate that occupational exposure to NIR of radar systems may increase the risk of hearing loss at high frequency region (4, 6 and 8 kHz).

Tu-P-62 CASE CONTROL STUDY ON THE HEARING LOSS IN THE MALE SUBWAY WORKERS

*Hong J, Kim Y, Kim H, Lee S, Koo J, Myong J.

Background and aims: Subway workers are exposed to various noise level by working type. The workers complained of hearing loss and discomfort, audiometry shows sensorineural type hearing loss among some workers. We performed case control study and aimed to identify the risk factors of hearing loss.

Methods: We reviewed work and concurrent noise level in the working environment measurement, and the next step in exposure reconstruction is to develop a Job-Exposure matrix in which exposure levels are estimated by work details and time. 6323 subway workers' annual health screening results was used for classification of case and control groups. The case group is defined as □hearing threshold shifts are <30 dB on 1kHz and □ ≥40dB on 4kHz , □ air-bone gap <10dB in the Pure tone audiometry (PTA) and the control group is defined as normal range hearing level and age, tenure are matched. And we limited both group by age from 40 to 51 years old for the control of age effect. Of the workers, 191 workers was participated. And 101(52.9%) and 90(47.1%) workers are case and control group, respectably. The occupational factor (work type, work tenure, entry year) and the non-occupational risk factors (age, smoking, otorhinolaryngology past history) are considered. Questionnaire, physical examination by otoscope, tympanometry are performed for the identification of those risk factors.

Results: According to PTA result, the workers are re-classified to case and control group. Between risk factors, smoking, otorhinolaryngology past history and the year that enter to company before 1990(especially train engineer work type) are significantly increased in the case group(p<0.05). Of the Job-Exposure matrix, conductor and work tenure (in the train crew work type) are significantly increased in the case group(p<0.05).

Discussion and conclusions: we cannot certainly improve what cause of their hearing loss, because they work in permissible work environment at present and there are not enough noise measurement result to assume past period. But we suggest that past exposure influenced their hearing level and each work type has different work characteristics related to hearing loss.

Tu-P-63 ESTIMATION OF MEDICAL-CARE COSTS FOR OCCUPATIONAL ACCIDENTS AND DISEASES IN THE MEXICAN INSTITUTE OF SOCIAL SECURITY

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Background and aims: Occupational accidents and diseases have an impact on the quality of life of workers, their families, and company productivity. This study determined the associated costs of their medical care in Mexican Institute of Social Security.

Methods: To quantify the total cost per injuries and illness, a group of medical experts devised treatment algorithms to quantify resource utilization in occupational injuries, to which they applied unit costs. Total costs were estimated as the product of the cost per illness and the weighted incidence of occupational accidents and diseases.

Results: Average medical care cost for occupational accidents was \$2 150 USD per case. Finally, the total cost of the health care of 373 239 IMSS workers in 2005 was \$770 335 020 USD.

Discussion and conclusions: Occupational accidents and diseases costs are high in comparison with those destined for prevention and inspection of work center conditions by occupational health, safety, and hygiene institutions.

Tu-P-64 EXPOSURE TO LEPTOSPIRA SPP. IN DAIRYMEN FROM COSTA RICAN DAIRY FARMS

*González Barboza RA, Romero Zúñiga JJ.

Background and aims: Leptospirosis is a zoonotic disease caused by *Leptospira interrogans*, which comprises at least 250 serovars grouped in 36 serogroups. This disease is distributed all over the world producing individual cases or outbreaks. It has been related to the occupation of the people, particularly those working on sanitary sewerage and rice or sugar cane fields, but especially in veterinarians and dairymen. The aim of this study was to characterize the exposure to *Leptospira* spp. in dairymen from specialized Costa Rican dairy herds.

Methods: A descriptive study was carried out in 42 dairy farms, located in four geographical areas of Costa Rica -San Carlos, Zarcero, Cartago and Tilarán- during 2001-2002. All farms involved had more than 20% of seropositive cows to *Leptospira* spp. The study included the depiction of the infrastructure and the sources of the water used for hygienic and operational procedures like handling and caring for the animals. At each farm, the cattle were bled to detect anti-*Leptospira* antibodies. Simultaneously, each dairyman was surveyed to determine his/her potential exposure to the *Leptospira* spp. infection, according to farm characteristics and the use of protective measures while handling the cattle, which were verified by observation. The statistical analysis was performed by the calculation and comparison of frequencies with a 95% confidence interval. The study population included 177 dairy workers, 87% male; their ages ranged from 11 to 78 years, with an average of 35.

Results: Sixty-eight percent of dairymen were between 20 and 50 years old, while younger than 20 and older than 50 years old represented 14.0% and 16%, respectively. Eighty eight percent of dairymen were highly exposed to *Leptospira* spp. due to laboring at the dairy for a year or more, 85.0% for carrying out three or more activities with the animals and 79.0% because of the presence of rodents.

Discussion and conclusions: Dairymen from Costa Rican farms are significantly exposed to the leptospirosis agent as they undertake their duties. This increases on account of environmental conditions and could become a serious health problem if corrective measures are not taken for the exposure factors identified in this research.

Tu-P-65 EVALUACIÓN DE LAS DEFINICIONES OPERATIVAS DEL PROTOCOLO PARA LA PREVENCIÓN Y CONTROL DE LA LEPTOSPIROSIS, VIGENTE EN COSTA RICA

*RODRIGUEZ MORENO V, ROMERO ZUÑIGA J.

Background and aims: La leptospirosis es la zoonosis de mayor distribución a nivel mundial, con mayor incidencia en zonas tropicales húmedas. Se considera como una enfermedad re-emergente, en la que el humano es un hospedero accidental. Este estudio evalúa las definiciones operativas y el cumplimiento del "Protocolo para la prevención y control de la Leptospirosis" del Sistema de Vigilancia Epidemiológica de Leptospirosis (SVE-Lepto) de Costa Rica.

Methods: Se realizó un estudio observacional (transversal) en dos etapas. En la primera parte se analizó el efecto de los resultados serológicos sobre la clasificación de los casos de acuerdo al protocolo vigente. En la segunda parte se intentó validar las definiciones establecidas por el Protocolo; asimismo, proponer, mediante un modelo clínico-predictivo, definiciones operativas aplicables a nivel nacional, así como una definición de "caso probable". Los datos se obtuvieron del Centro Nacional de Referencia de Virología y *Leptospira* del Instituto Costarricense de Investigación y Enseñanza en Nutrición y Salud (INCIENSA) en el período de enero de 2001 a junio de 2003.

Results: De 568 registros, se eliminaron 154 debido a la ausencia de datos requeridos. De los 414 registros analizados, ninguno cumplió con los criterios de "caso confirmado", por lo que se utilizó una "definición ampliada" obtenida en la literatura. Así, se trabajó con un total de 52 casos "confirmados" y 368 casos sospechosos. No fue posible validar las definiciones establecidas por el Protocolo. Tampoco fue posible generar, mediante el modelo propuesto, definiciones operativas aplicables a nivel nacional, ni proponer la definición de "caso probable".

Discussion and conclusions: Según los resultados, es necesario replantear el SVE-lepto en Costa Rica y modificar las definiciones operativas del Protocolo, de forma que mejore su sensibilidad y su valor predictivo positivo. Además, revela que, en la práctica, no se aplica lo establecido en el Protocolo, pues la información no llega a quienes deben aplicarlo. Se hace entonces fundamental que, ante la publicación de cada norma o protocolo, se garantice la educación al personal de salud, su aplicabilidad, su cumplimiento y se verifiquen los resultados del mismo mediante un proceso de seguimiento y evaluación constante del sistema de vigilancia.

Tu-P-66 CONSTRUCTION AND VALIDATION OF DIFFERENT BRUCELLA ABORTUS MUTANT STRAINS EXPRESSING GREEN FLUORESCENT PROTEIN.

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Background and aims: Epidemiologically brucellosis it's considered to be a high risk zoonosis. Vaccinate strains may cause infections in cattle that are difficult to distinguish serologically from those caused by field strains. The expression of green fluorescent protein (GFP) in attenuated *Brucella abortus*

strains; in particular, the S19 strain expresses GFPs in a stable form that could be used as a target protein for diagnostic purposes. This would allow distinguishing wild strain infected animals from vaccinated ones. Moreover, its use would permit to quickly diagnose in situ abortions being caused by fluorescent vaccinate strains. GFP was cloned in various plasmids and transformed into eight strains: wildtype 2308, the vaccine S19 and RB51, the non polar virB10 strains, as well as bvrS, bvrR, polar virB10, and strain per.

Methods: GFP cloning fragment was obtained by restriction enzyme digestion. *B. abortus* competent cell production and plasmid electroporation were realized according to manufacturer's instructions. *B. abortus* strains internalization assays were performed in HeLa cells at a multiplicity of infection (MOI) of 500 bacteria per cell.

Results: *B. abortus* strains were transformed with a plasmid that has the capacity to make them fluorescent. The first step was to produce competent cells which were transformed successfully by means of electroporation with the plasmid pBBR-2-gfp. Since plasmid transformation did not interfere with the bacterial growth, in vitro validation assays with all fluorescent strains were performed throughout internalization experiments. For this matter, HeLa cells were infected with different fluorescent and non-fluorescent strains and recovered CFUs were compared

Discussion and conclusions: Eight strains of the fluorescent *B. abortus* and two new constructors were obtained. No significant differences in growth, internalization and replication in cells were observed between the green fluorescent GFP-*B. abortus* strains and the respective counterparts. Among these eight strains, the fluorescent S19 strain could be used in future as a novel fluorescent vaccine that has similar protection properties than the present vaccinate S19 strain, but with the capacity to fluoresce, a feature that could easily permit the detection of fluorescent strains in the field and in the laboratory.

Tu-P-67 ALCANCES DE UN PROGRAMA DE CONTROL Y ERRADICACIÓN DE LA BRUCELOSIS BOVINA EN LOS HATOS LECHEROS DE UNA COOPERATIVA DE PRODUCTORES DE LECHE EN COSTA RICA

* Oviedo Guzmán M, Romero Zuñiga J.

Background and aims: La brucelosis bovina (*Brucella abortus*) es una enfermedad zoonótica de distribución mundial de importancia en salud pública, que afecta especialmente a trabajadores de lecherías y sus familiares, así como a comunidades que consumen leche o derivados no pasteurizados. En Costa Rica, la brucelosis bovina se reporta desde 1950, y hasta los años 90 no fue posible erradicar la infección, llegando a un alto número, pero desconocido con exactitud, de hatos infectados con la bacteria. Por esto, el Ministerio de Agricultura y Ganadería y la Cooperativa de Productores de Leche Dos Pinos R.L. establecieron un programa de declaración y certificación de hatos libres de brucelosis. El objetivo de este reporte es describir el desarrollo e implementación y los logros de dicho programa, que llevó a declarar libre de la infección a cerca del 100% de los hatos lecheros de la cooperativa.

Methods: La Dos Pinos recibe leche de 1564 hatos. El promedio de las vacas en ordeño por hato es de 60 (rango: 35-800). El programa inició en setiembre de 1999 con el tamizaje del 100% de los hatos mediante la prueba de anillo en leche (PAL). En los hatos reaccionantes a la PAL, se sangró los animales mayores de 1 año y se aplicó la prueba de Rosa de Bengala (RB), seguida de un c-ELISA a los positivos, como prueba confirmatoria. Los reactores positivos fueron marcados y eliminados de los hatos. El programa continuó con vigilancia activa en el 100% de los hatos aplicando el protocolo: PAL – RB - c-ELISA; asimismo, el muestreo trimestral a los animales mayores de 1 año en los hatos positivos en el primer tamizaje, hasta lograr 100% de animales negativos. Simultáneamente, se implementó la vacunación con la vacuna RB51.

Results: Las medidas implementadas desde el 2003 permitieron disminuir el número de hatos reaccionantes a 20 en octubre de 2006, respecto a los 165 reaccionantes en 1999 (seroprevalencias entre 1.0% y 48.0%).

Discussion and conclusions: Es necesario que este tipo de programas sean adoptados por las otras empresas agroindustriales de la leche en Costa Rica, así como por los productores de los sectores informales.

Tu-P-68 RISK OF LYME BORRELIOSIS FOR FORESTRY WORKERS IN HANNOVER (NORTHERN GERMANY)

*Montenegro VM, Epe C, Romero-Zuñiga JJ.

Background and aims: Lyme Borreliosis (LB) is the most frequent tick-transmitted zoonotic infection in the northern hemisphere, caused by *Borrelia burgdorferi* s.l. spirochaetes. Almost all known *Borrelia* spp. circulate between ticks (Acari, Ixodoidea) and a wide variety of vertebrates. The spirochaetes are acquired by ixodid ticks as they feed on the blood of an infected animal. Once infected, the tick transmits it to another animal in its next stage. Human infection can result in neurologic, cardiovascular, or

musculoskeletal disorders. In the early stages, patients can be asymptomatic or have erythema migrans (EM) with general aches, or fever. Currently there is a special interest in the epidemiology of LB in urban areas, forests surrounding cities.

Aims: To determine the behaviour of ticks during the year at public greens of recreational areas. The development of diagnostic tests based on molecular biological bases

Methods: 12 places in the city of Hannover and its surroundings, used by the public as an amenity and with three different biotopes (forest, bush and green). Each place was visited eight times between March and October in 2005. Ticks were collected by flagging. At every visit the presence and activity of humans was recorded. The collected ticks were classified as species and stages, and a subpopulation was evaluated by Real Time PCR, for detection of *B. burgdorferi* s.l. DNA. The positive ticks were tested for species specific PCR.

Results: 8802 ticks were collected. *Borrelia* spp. genus-specific (ITS)-qPCR revealed overall prevalence of 23%. Species-specific rpoB PCR shows *B. afzelii* as predominating species, but also shows large variations between sampling dates and locations. At different places was normal to find people working, especially in forest or greens, where they clean or fix tables and chairs used for amenity.

Discussion and conclusions: The highest tick's activity takes place at the spring and first months of the summer, in the forest there were more active ticks. qPCR is a good and sensitive method for detection of *B. burgdorferi* s.l. from field collected ticks. The distribution of *B. burgdorferi* s.l. species in Hannover is similar to other places in north Europe. Ticks activity and the prevalence (23%) make Lyme Borreliosis a risk for forestry workers.

Tu-P-69 LABOUR CONDITIONS AND HEALTH STATE OF WORKERS OF BIOPREPARATIONS PRODUCTION ENTERPRISES AS BIOLOGICAL HAZARD

*Stereňbogen M, Tsapko V.

Background and aims: The purpose of the research was to study working conditions among employees of enterprises for production of biological preparations - lysine, catalase and carotene by the method of microbiological synthesis, and the health state of workers of these enterprises, to develop prophylactic measures for risk prevention and hygienic requirements

Methods: All studies have been carried out among workers of three enterprises for production of biological preparations isin, catalasa and carotin by the method of microbiological synthesis. The level of bacterial and fungi contamination, content of dust aerosol, parameters of microclimate, chemical agents were defined out at the main working places. The study of workers health state was emanated by medical examination.

Results: The study showed that at all stages of the technological process of obtaining biological preparations, the employees were exposed to a variety of occupational factors which may exert a hazardous effect on their health. These factors are: high or low temperature, high or low air humidity, chemical agents, gases and aerosols, the levels of which in the air of working areas exceed the regulations, as well as concomitant bacterial and fungal microflora, dust and noise. Microorganism-producers were detected in all enterprises of microbiological synthesis; however, the standard regulations were exceeded 1.5-2.5 times only at production of catalase at individual technological sections. The qualitative composition of microflora generally did not exceed the hygienic standards, with the prevalence of cocci, spore-forming microorganisms and fungi.

Discussion and conclusions: The comparison between working conditions in the three inspected enterprises of microbiological synthesis confirmed similar tendencies concerning the causes and origin of occupational diseases among workers of this industry. The employees most often suffered from cardiovascular diseases, followed by respiratory system diseases, diffused chronic bronchitis and chronic inflammatory diseases of the upper airways, as well as neurocirculatory dystonia, allergic diseases of the skin and mycoses. Based on the results of the studies clinical and hygienic recommendations were developed biased towards the optimisation of the working environment and morbidity due occupational diseases.

ABSTRACTS WEDNESDAY, JUNE 11, 2008

Oral sessions

LUNG CANCER

We-O-1 OCCUPATIONAL EXPOSURE TO DIESEL AND GASOLINE EMISSIONS AND RISK OF LUNG CANCER IN CANADIAN MEN

*Villeneuve PJ, Parent M, Sahni V, Johnson KC.

Background and aims: Meta-analyses of studies that have investigated diesel engine emissions and lung cancer have found that those occupationally exposed to diesel have an approximate 30-40% increased risk of lung cancer. However, across these individual studies, statistically significant associations have not been consistently observed, few have evaluated gasoline emissions, and recent reviews have suggested that methodological limitations of these studies preclude drawing conclusions.

Methods: To provide additional insights, we conducted an analysis of a population-based case-control study carried out in eight Canadian provinces. Analyses were restricted to men 40 years of age and older, and in total, there were of 1,681 incident cases and 2,053 controls. Questionnaires were administered to obtain a detailed lifetime job history as well as relevant data on potential confounders including cigarette smoking. Occupational exposure to diesel and gasoline emissions, along with that of silica, and asbestos, was assigned by industrial hygienists blind to case-control status. A variety of exposure metric were derived including: ever, cumulative, and highest concentration. Logistic regression was used to estimate odds ratios and their 95% confidence intervals.

Results: After adjusting for age, and smoking, those in the highest tertile grouping of cumulative exposure, relative to the lowest, had odds ratios of lung cancer of 1.11 (95% CI=0.90-1.39) and 1.06 (95% CI=0.99-1.14) for diesel and gasoline emissions, respectively. When analyses were restricted to squamous cell carcinoma, the corresponding relative risks for diesel and gasoline emissions were 1.46 (95% CI=1.08, 1.97), and 1.13 (95% CI=0.80-1.61). However, the elevated risk for diesel emissions was strongly attenuated with adjustment for other occupational exposures, particularly silica. For instance, the risk in the upper tertile of cumulative diesel exposure decreased to 1.16 (95% CI=0.82-1.63), once occupational covariates were taken into account.

Discussion and conclusions: Our findings, taken together, highlight the need to consider multiple occupational exposures when evaluating lung cancer risks associated with engine emissions.

We-O-2 DIESEL MOTOR EXHAUST AND LUNG CANCER INCIDENCE – PRELIMINARY FINDINGS OF UPDATED EXPOSURE ESTIMATES IN A POPULATION-BASED CASE-CONTROL STUDY IN STOCKHOLM, SWEDEN

*Gustavsson P, Lewne M, Alderling M, Pershagen G, Bigert C, Plato N.

Background and aims: Diesel motor exhaust (DME) is classified as probably carcinogenic to humans by the International Agency for Research on Cancer. Little is known about exposure-response relations that could form a basis for occupational TLVs. The aim of this study was to provide such a basis.

Methods: An extensive hygienic measurement program investigated current exposure levels in occupations involving exposure to DME in Stockholm. Over 500 full-shift samples were obtained for 90 workers. Findings based on NO₂ -measurements are presented here, although particles of various sizes and elemental carbon were also investigated. Historical exposures levels were estimated by modeling. A Job-exposure matrix (JEM) was developed based on the exposure measurements, as well as on other exposure investigations. The JEM was applied to the personal work histories of over 1 000 male cases of lung cancer and 2 300 controls, using a method of refining the JEM by a case-by-case ascertainment, developed for this study.

Results: The risk of lung cancer increased by cumulative exposure to DME, using NO₂-years as a proxy for cumulative exposure. Risk estimates were adjusted for age, tobacco smoking and occupational exposure to asbestos or PAH (from other sources than DME), as well as for residential exposure to traffic-related air pollution and radon. The relative risks for quartiles of increasing cumulative exposure to DME were 0.83 (95% CI 0.56-1.24); 1.12 (0.77-1.64); 1.29 (0.91-1.82); 1.37 (0.96-1.96). The increase in risk per 1 000 µg-years of NO₂ was 1.11 (1.01-1.21).

Discussion and conclusions: The study showed a statistically significant trend in lung cancer incidence with cumulative exposure to DME. The data, although still preliminary, indicate that one year of occupational exposure to DME at a level of 1 000 µg NO₂/m³ is associated with a relative risk of lung cancer of around 1.11. A prolonged exposure at this level (half the Swedish TLV) will produce a substantial and unacceptable addition to the individual risk of lung cancer. Future analyses will focus on risk in relation to other exposure indicators like particles and elemental carbon, and also investigate the influence of lag, latency and time-windows in calculation of risk.

We-O-3 LUNG CANCER IN CADMIUM SMELTER WORKERS EXPOSED TO CADMIUM AND ARSENIC

*Stayner LT, Park RM, Finley M, Hornung R, Petersen M.

Background and aims: Previous studies of this cadmium smelter cohort demonstrated excess lung cancer. However, questions remain as to whether this excess was attributable to cadmium or to arsenic which was a contaminant in the feedstock used in this plant. This study was designed to address whether cadmium exposure has an effect on lung cancer mortality independent of arsenic.

Methods: The study population included 601 males who worked at least 6 months in a production area between 1940 and 1969. Followup of the cohort was updated to 2002. Detailed daily work histories were coded, which had not been available for previous studies of this cohort. Job exposure matrices were developed to estimate cadmium and arsenic exposures for the study. Life-table and Poisson regression analyses were used to examine the association between cadmium and arsenic exposure and lung cancer mortality.

Results: Lung cancer mortality was elevated among non-hispanics (SMR=1.43) but not in hispanics (SMR=0.50) based on comparisons with the U.S. white male population. Lung cancer mortality increased with cumulative exposure to cadmium and arsenic exposure in both life-table and Poisson regression analyses. Neither cadmium nor arsenic were found to be individually significant predictors of lung cancer in models including both variables. A highly significant exposure-response relationship for cadmium and lung cancer was observed in models that fixed the parameter for the arsenic-lung cancer association based on estimates from previous published studies.

Discussion and conclusions: This study provides support for cadmium having an independent role from arsenic in the excess of lung cancer in this cohort of cadmium production workers. However, a firm conclusion on this issue was limited by the high correlation between these two exposures in the study population.

We-O-4 EXCESS RISK OF LUNG CANCER AMONG SHORT TERM WORKERS IN THE NORWEGIAN SILICON CARBIDE INDUSTRY

*Bugge MD, Kjuus H, Martinsen J, Kjaerheim K.

Background and aims: An increased cancer risk among workers in the Norwegian silicon carbide industry has previously been reported. The present study is a 53-year follow-up of cancer incidence, with an emphasis on employment duration, period of first employment, and department affiliation.

Methods: The study population consisted of 2631 men with a working history of more than 6 months, and with first employment ranging from 1913 to 2003. Cancer diagnoses for the period 1953-2005 were obtained from the Cancer Registry of Norway.

Results: The short-term workers (< 3 years employment duration) had an overall excess incidence of cancer (standardized incidence ratio (SIR) = 1.36, 95% confidence interval (CI): 1.18-1.57), compared to the long-term workers (≥3 years employment duration), (SIR 1.19, 95% CI 1.07-1.32). The excess cancer risk was mainly due to an excess incidence of lung cancer, which was higher among short-term workers (SIR 2.57, 95% CI 1.91-3.47) than among long-term workers (SIR 1.68, 95% CI 1.30-2.16). The excess risk of lung cancer among short-term employees was stable over all periods of employment, and was also significant in departments with high dust exposure.

Discussion and conclusions: Many authors have addressed the issue of short-term workers as a vulnerable group with regard to both cancer incidence and mortality. We have shown that short-term workers in the Norwegian silicon carbide industry have an excess risk of lung cancer. Selection bias, confounding and higher exposed work among short-term employees may have contributed to these results.

We-O-5 MODELLING LUNG CANCER RISK ASSOCIATED TO RADON EXPOSURE IN THE FRENCH COHORT OF URANIUM MINERS

*Vacquier B, Rogel A, Acker A, Caër S, Laurier D.

Background and aims: Radon is classified as a known lung human carcinogen. A better understanding of the effect of low exposure and factors modifying the lung cancer risk is of continued interest. The

French cohort is characterised by a high quality of exposure assessment and low levels exposure. We present here a new analysis which allowed to study of such effects among the French cohort followed up to 1999.

Methods: The cohort includes men employed for at least one year between 1946 and 1990. The vital status and the cause of death were obtained for each miner. Exposure to radon was estimated individually for each year. Before 1956, the exposure was reconstructed retrospectively by a experts group and since 1956, the exposure was recorded individually. Standardized mortality ratios (SMRs) were computed using national mortality rates as references. The relationship between radon exposure and risk of lung cancer was estimated using relative risk models, which allow investigation of time dependent modifying factors such as the period of exposure, time since exposure, duration of exposure and exposure rate.

Results: The cohort comprises 5,086 miners with a mean duration of follow-up of 30.1 years. The number of radon exposed miners is 4,133 with an average cumulative radon exposure of 36.5 Working Level Month (WLM). Mean positive annual exposure before 1956 and since 1956 was 21.3 and 1.7 WLM respectively.

A total of 1,471 deaths is observed among miners. The analysis confirms a significant excess risk of lung cancer death ($n=159$; $SMR=1.4$) and a significant increase of risk with cumulative radon exposure ($ERR=0.58$ per 100 WLM). The main modifier is the period of exposure: the excess relative risk is ten times higher after than before 1956. The decrease in risk with time since exposure and exposure rate disappears when period of exposure is taken into account.

Discussion and conclusions: This analysis confirms that lung cancer risk differs according to period of exposure. Better precision in exposure estimates after 1956 may explain this difference. Continuation of this work is included in a European collaborative research project, aiming to a synthesis of the effects of radon at low levels of exposures and rates.

We-O-6 MESOTHELIOMA SURVEILLANCE: VALIDATION OF DIAGNOSES FROM A CANCER REGISTRY

*Labreche F, Ostiguy GL, Case B, Chalaoui J.

Background and aims: Mesothelioma is a rare cancer associated with occupational exposure to asbestos fibers in 70 to 90% of cases. However, only 22% of mesothelioma cases from the Quebec Tumour Registry (QTR) were found in the provincial workmen's compensation board files between 1982 and 1996. This study was set up to explore part of the discrepancy between these two data sources, as a preliminary step toward mesothelioma surveillance.

Methods: Clinical information, with medical imaging and pathology reports, were extracted from medical charts of incident mesothelioma cases identified through the QTR in 2001 and 2002; consent was sought from families to have access to biopsy material and medical imaging media. A panel of 3 specialists reviews the available information and evidence, and makes a decision according to 5 categories of mesothelioma (certain/probable, possible, unlikely, not a mesothelioma, impossible to classify). The pathologist first works from the pathological material, using additional immunohistochemistry (IHC) staining if necessary and possible. The chest physician and the radiologist reach a common decision from the chart summary and films. A consensus "revised diagnosis" is finally obtained with the entire panel.

Results: The QTR reported 208 incident cases of mesothelioma (79% males) for the period. The mean age ($\pm SD$) at diagnosis was 68.9 years (± 10.4) for males, and 65.8 (± 14.0) for females. Medical charts were summarised for 205 cases (3 charts not found). Families were located for 167 cases (81%), and 129 of them (77%) authorised our access to medical imaging and biopsy specimens and slides. The chart review is underway, but preliminary analyses show that around 50% of charts reviewed are "certain/probable" mesotheliomas, with an additional 20% rated as "possible". However, new IHC staining will be necessary on several pathological samples to validate the results.

Discussion and conclusions: The validation of 2 years worth of data from the QTR will enable us to assess its overestimation (unfortunately not its underestimation) of mesothelioma numbers so as to improve the surveillance of this asbestos-related cancer. A comparison of diagnostic procedures between "confirmed" cases and those not likely to be mesotheliomas might also be of some use to standardize diagnostic practices across the Province.

MINISYMPOSIUM: HEALTH EFFECTS DUE TO ENDOCRINE DISRUPTION BY DDT

We-O-7 REPRODUCTIVE HEALTH EFFECTS DUE TO LONG TERM DDT OCCUPATIONAL EXPOSURE IN SOUTH AFRICA

*Dalvie MA, Myers JE.

Background and aims: The study hypothesis was that male vector control workers highly exposed to DDT in the past should demonstrate clinically significant exposure-related anti-androgenic and/or estrogenic effects reflected in abnormalities in hormone levels, semen, sexual function and fertility.

Methods: A cross-sectional study of 60 workers from 3 camps situated near the Malaria Control Center (MCC) in Tzaneen was performed. Tests included a questionnaire, a physical examination, semen analysis (produced via coitus interruptus or masturbation) and blood sampling before and after a gonadotropin releasing hormone (GnRH) challenge (100 µg). Semen count, density and motility using the World Health Organisation's criteria, and morphology using the Tygerberg criteria, were determined. Serum DDT metabolites and basal and post GnRH challenge hormone levels were measured.

Results: Forty-eight (81.0%) out of 60 participants produced a semen sample, and 31 (51.8%) completed all tests in full. The mean age of the participants was 45.3 years (SD = 9.1); mean years of education was 6.9 (SD = 2.7). The mean number of years worked at the MCC was 15.8 (SD = 7.8 years & mean serum DDT, 94.3 (SD = 57.1) µg/g of lipid. Mean baseline E2 (62.4, SD = 29.9 pg/ml) levels exceeded the normal reference range. The mean sperm count was 93.8 (SD = 130.3) million, density 74.6 (SD = 85.1) million/ml, normal morphology 2.5 (SD = 1.8) percent, using strict Tygerberg criteria. Associations between DDT exposure measures (years worked at MCC and DDT metabolites) and reproductive outcomes were weak and inconsistent. The most important finding was a positive relationship of baseline E2 and testosterone with DDT metabolites, especially with p'p' DDT and DDD. The strongest association was a linear regression relationship between baseline estradiol and p'p' DDT (beta = 1.14, SD = 0.33 pg/ml/ug/g lipid, p = 0.001, R² = 0.31, n = 46; adjusted for age and SHBG).

Discussion and conclusions: An overall anti-androgenic mechanism best explains the results, but with a number of inconsistencies. Associations might have been due to chance as multiple comparisons were made (n = 175). However, subsequent studies by others in highly exposed non-occupational communities living in DDT contaminated areas, have found adverse effects on semen quality.

We-O-8 OCCUPATIONAL DDT EXPOSURE AND REPRODUCTIVE EFFECTS IN MEXICO

*Borja-Aburto VH.

Background and aims: In order to assess occupational exposure to DDT and reproductive effects we conducted a series of epidemiological studies of sprayers working in vectors-control campaigns in Mexico. 1. In a study in the 90's we examined the accumulation of DDE in human fat. 2. Later we conducted a study of 70 workers to evaluate the relationship between DDT serum levels with pituitary and testes hormones levels and evaluation of the frequency of DNA damage in peripheral lymphocytes. In a third study, we evaluated the reproductive history of 2033 workers in the anti-malaria campaign from the Pacific region of Mexico.

Methods: 1. Exposure was directly estimated in a group of 40 workers by measuring DDT metabolites in adipose tissue samples. 2. In the second study, blood and urine samples were collected to measure serum levels of DDT and metabolites as well as levels of LH, FSH, prolactin, and testosterone. 3. In the third study data on occupational exposure to DDT and reproductive outcomes were gathered through a questionnaire. Workers provided information about 9192 pregnancies.

Results: 1. The mean concentrations of extractable lipids found in adipose tissue samples were very high: p,p'-DDE, 60.98 micrograms/g. 2. DDT increased the concentration of luteinizing hormone (LH) and decreased concentration of testosterone. A significant difference on the frequency of chromosome translocation was observed when compared to that of a reference occupationally unexposed group. 3. The risk of birth defects was associated with DDT exposure. Compared to the lowest quartile of estimated DDE in fat, the odds ratio was 2.47 (IC95%: 0.76, 8.11), 4.10 (IC95%: 1.38, 12.46) and 3.76 (IC95%: 1.24, 11.44) for quartiles 2, 3 and 4, equivalent to p,p'-DDE in fat of 50, 82 and >103 µg/g fat respectively.

The risk of spontaneous abortion and sex ratio (male/female) were similar among all exposure categories.

Discussion and conclusions: Our findings contributed to the debate on DDT. The Mexican program has shown that malaria can be effectively controlled without the use of DDT. The operation of a comprehensive malaria control program has reduced the incidence of this disease substantially, while gradually decreasing the reliance on DDT, which was last used in 1999.

We-O-9 DDT AND FEMALE REPRODUCTIVE HEALTH

*Perry M.

Background and aims: This presentation will summarize the female reproductive health findings to date from our prospective study of DDT exposure among nulliparous women of reproductive age.

Methods: We have explored how DDT (1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane) exposure interacts with body mass index (BMI), and whether DDT is associated with menstrual cycle characteristics and

reproductive hormone profiles characterized by urinary hormone metabolites. Serum DDT/DDE was analyzed in nonsmoking, nulliparous women recruited from China's Anhui province between 1996-1998 as part of a reproductive health study of textile workers. The women in the sample were born between 1963 and 1977, 8 to 21 years before China's 1984 DDT ban.

Results:

Despite limited variability in BMI, there was a consistent inverse relationship between BMI and serum DDT. After adjustment for important covariates including age, BMI, and occupational exposures, serum total DDT exposure was associated with decreases in PdG levels across the menstrual cycle, and with decreases in E1C specifically during the peri-ovulation and luteal phases. o,p'-DDE also was also consistently associated with decreased E1C and PdG production mid-cycle and p,p'-DDD was associated with decreased PdG across all menstrual cycle days.

Discussion and conclusions:

These findings give insight into the hormone pathways DDT may disrupt to adversely affect human female reproduction. The methods and findings of our studies to date will be discussed further and interpreted in the broader context of measuring DDT female reproductive health effects globally.

We-O-10 PRENATAL EXPOSURE OF P,P'DDE AND INFANT NEURODEVELOPMENT AT 24 MONTHS OF AGE. PRELIMINARY REPORT

*Torres-Sanchez L, López-Carrillo L, Schnaas L, Cebrian ME, Hernández M, Osorio E, García-Hernandez RM.

Background and aims: p,p'-DDE (DDE) is an antiandrogenic compound, which has shown adverse effects on early infant neurodevelopment; however the persistence of its long-term effect is controversial. The objective of this study was to evaluate the effect of prenatal DDE exposure on infant neurodevelopment at 24 mo, according to the sex of the child.

Methods: As part of a perinatal cohort study conducted in Morelos, Mexico, we assessed the first 166 infants (58.4% male) with the Bayley Scales of Infant Neurodevelopment (BSID-II) at 24 mo of age. Maternal DDE levels (ng/ml) were measured during each trimester of pregnancy. The HOME Scale and family composition were considered as potential confounders.

Results: A marginal negative effect of DDE exposure at the third trimester of pregnancy on infant neurodevelopment at 24 mo of age was detected among male infants ($\beta=-1.8$; $p=0.07$) but not among females ($\beta=1.6$; $p=0.20$).

Discussion and conclusions: Our results suggest that due to its antiandrogenic activity, the effect of DDE exposure on infant neurodevelopment is modified by gender. A further analysis will include a larger sample size of this population.

We-O-11 DDT AND NEURODEVELOPMENT IN A MEXICAN-AMERICAN COHORT: THE CHAMACOS STUDY

*Eskenazi B.

Background and aims: Dichlorodiphenyltrichloroethane (DDT) is a pesticide which has been used to control insects as vectors of disease and in agriculture. Considered a Persistent Organic Pollutant (POP), DDT breaks down slowly in soil (2- to 15-year half-life) and bioaccumulates in plants and in fatty tissues of animals. DDT was banned in the U.S. in 1972 and was phased out in Mexico, where it was banned in 2000, but it continues to be used in many malaria-endemic areas of the world. In spite of substantial evidence in animals, there are few studies on neurotoxicity of DDE in humans and even fewer of DDE. The purpose of the present study is to investigate the relationship of /in utero/ exposure to DDT/DDE on the neurodevelopment of children from primarily Mexican farmworker families living in the Salinas Valley, California, enrolled in the CHAMACOS study.

Methods: CHAMACOS (Center for the Health Assessment of Mothers and Children of Salinas) is a longitudinal birth cohort study of the effects of pesticides and other environmental exposures on the health of pregnant women and their children. 601 women were enrolled, and 538 were followed to delivery. We include in this study singletons who had /in utero/ exposure measured in blood taken at 26-weeks gestation (n=394) or delivery (n=34), and a valid neurodevelopmental assessment at 6 (n=330), 12 (n=329), or 24 (n=309) months. p,p-DDT, p,p-DDE, and o,p-DDT were measured in serum by gas chromatography high-resolution mass spectrometry at 10,000 resolution.

Results: p,p-DDT and p,p-DDE were detected in 100%, and o,p-DDT in 95.8% of samples. Geometric mean and 95% confidence intervals (CI) for lipid-adjusted values (excluding outliers) were: p,p-DDT = 19.7 (16.7, 23.2); p,p-DDE = 1360.9 (1201.4, 1541.6); and o,p-DDT = 1.6 (1.4, 1.8). Mean standardized (mean=100, SD=15) scores for the Bayley mental development index (MDI) and psychomotor development index (PDI) were, respectively, 95.7 ± 7.4 and 96.6 ± 10.7 at 6, 100.9 ± 9.0 and 106.8 ± 12.3 at 12, and 86.4 ± 11.7 and 98.0 ± 10.6 at 24 months. We found an approximately 2-point decrease in

Psychomotor Developmental Index scores with each 10-fold increase in p,p'-DDT levels at 6 and 12 months (but not 24 months) and p,p'-DDE levels at 6 months only. We found no association with mental development at 6 months but a 2- to 3-point decrease in Mental Developmental Index scores for p,p'-DDT and o,p'-DDT at 12 and 24 months, corresponding to 7- to 10-point decreases across the exposure range. Even when mothers had substantial exposure, breastfeeding was usually associated positively with Bayley scale scores. We will also present the results of follow-up of these same children at 42 and 60 months. Prenatal exposure to DDT, and to a lesser extent DDE, was associated with neurodevelopmental delays during childhood, although breastfeeding was found to be beneficial even among women with high levels of exposure. Results of multivariate analysis will be presented.

Discussion and conclusions: In summary, we find evidence for an association between DDT and neurodevelopment. Countries considering the use of DDT should weigh its benefit in eradicating malaria against the negative associations found on DDT and human neurodevelopment as well as other health outcomes.

MINISYMPOSIUM: NEUROBEHAVIORAL IMPACT OF OCCUPATIONAL AND ENVIRONMENTAL EXPOSURE TO MANGANESE

(Abstracts removed because they were part of NEUREOH conference rather than EPICOH.)

PESTICIDES EXPOSURES, SYMPTOMS AND NEUROBEHAVIORAL OUTCOMES IN WORKERS

We-O-17 ACUTE SYMPTOMS FOLLOWING EXPOSURE TO PESTICIDES IN SHEEP-DIPPING

*Cherry NM, Povey A.

Background and aims: Sheep-dippers commonly complain of an acute flu-like syndrome within hours of dipping sheep. It is unknown whether this is a cholinergic effect from the sheep-dip or due to some other exposure, perhaps endotoxins. It was hypothesized that if flu were caused by pesticides it would be more common in those with susceptibility polymorphisms and/or handling concentrates; if it were due to other exposures it would be related only to the total number of sheep dipped.

Methods: Cases, sheep dippers with chronic neuropsychological symptoms, and referents, sheep dippers without, were recruited for a study of genetic susceptibility to organophosphates (previously reported). Subjects also recorded whether or not they had experienced acute symptoms after dipping (flu). Polymorphisms at positions 192 and 55 on the PON1 gene were determined from venous blood. Flu ever/never was examined in relation to genetic susceptibility and dipping exposures. A case-crossover analysis was designed to identify variable features of the dipping process within subject, with exposures compared in the first year flu was reported and in the previous, flu-free, year.

Results: Among cases 156/175 (64.2%) reported flu, compared with 87/234 (35.8%) referents (OR=13.87; 95%CI 8.04-23.93). The report of flu was not significantly related to either of the polymorphisms previously shown to be related to chronic neuropsychological illness, although for position 192 the odds ratio for an R allele was raised slightly (cases; OR=1.44; 95%CI 0.55-3.75; referents OR=1.36; 95%CI 0.79-2.33). In cases flu was related to having worked as a plunger (OR=5.09 95%CI 1.43-18.17) but not to handling concentrates (OR=1.01 95%CI 0.27-3.70). In referents, flu was related to a life-time total of dipping more than 50,000 sheep (OR= 1.94 95%CI 1.10-3.43) but again not significantly to handling concentrates (OR=1.36 95%CI=0.64-2.91). In the case-crossover study the number of sheep dipped/day was greater in the flu year (mean flu 575; no flu 536: p=0.006): however the proportion handling concentrates was also higher in those with flu (86.3%v 82.0%).

Discussion and conclusions: The weak relation to susceptibility genes and concentrates together with the greater number of sheep handled suggests that factors other than pesticides may account for at least some flu-like symptoms.

We-O-18 COMMUNITY-BASED MONITORING OF PESTICIDES IMPACT IN NGARENANYUKI, TANZANIA

*Ngowi AV, Lossini JS.

Background and aims: Community-based monitoring of pesticides impact enable communities to determine whether the chemicals they are in contact with pose hazards to their health and environment. In 2006/2007 more than 25 community representatives in Ngarenanyuki ward were trained to monitor pesticides use, health and environmental impacts and to make decisions that reduce the risks of pesticide use on themselves and their environment.

Methods: Data collection tools developed and pre-tested at Mlangarini were used; Training conducted in seminars/meetings with community representatives; pesticides monitoring teams establishment with trained farmers forming the core, and observations and data collection initiated.

Results: Initial data showed use of class 1b (chlorfenvinfos) and banned/ restricted pesticides such as DDT in Ngarenanyuki. Pesticides were locally available and a considerable proportion of farmers could afford to buy. Non of the local pesticide vendors were authorized dealers. Majority of farmers mixed more than one pesticide in a single application. At least 2 out of 3 farmers had pesticides poisoning in the previous farming season, much of which occurred more than 3 times to a single farmer. Fenon C and Selecron were mostly associated with poisoning. It was observed that majority had skin and eye irritation, symptoms normally missed in surveillance studies.

Discussion and conclusions: This initiative enabled the building of farmers' capacities to assess their own realities as far as pesticides were concerned, analyze the situation, develop a plan of action and work toward improving their condition. To improve the health of rural communities, community-based surveillance play an important role, since studies by researchers is not sufficiently done in many parts in developing countries.

We-O-19 OCCUPATIONAL CHLORPYRIFOS EXPOSURE AND NEUROBEHAVIORAL FUNCTIONING IN PESTICIDE MANUFACTURING WORKERS

*Berent S, Albers JW, Garabrant DH, Giordani B, Richardson RJ.

Background and aims: Chlorpyrifos (CPF) is an organophosphorus (OP) anticholinesterase insecticide. Exposure typically occurs in settings where multiple agents are present (e.g., agriculture), allowing few opportunities to study potential neurobehavioral effects of CPF alone. A number of studies have reported adverse behavioral effects from OP exposure, but they can be criticized for weaknesses in research design, failure to control important confounders, and other factors that interfere with causal determination. We studied the relationship between CPF exposure and behavioral functioning in a cohort of CPF manufacturing workers. The industrial setting for this study allowed for identification and measurement of exposure and important non-exposure variables that potentially could have causal roles in findings.

Methods: We used a prospective cohort study design to compare neurobehavioral functioning over a one-year period in 53 CPF workers and 60 referent workers. Quantitative and qualitative measures were used to determine if exposed workers showed adverse neurobehavioral effects. Potential confounders were identified and entered into our statistical model as appropriate.

Results: CPF workers had significantly greater exposures during the study period than did referents, with higher 3,5,6-trichloro-2-pyridinol (TCP) excretion ($p < 0.01$) and lower average butyrylcholinesterase (BuChE) ($p < 0.01$). Mean test scores remained within normal limits. No psychometric or qualitative evidence for impaired neurobehavioral functioning by either group of workers was observed at baseline, on repeat examination, or in terms of change between examinations. The CPF workers did show higher verbal learning and memory than the referents, but there were no significant changes over time in primary functional domains. Confounding variables were identified and tested for possible inclusion in statistical analyses. These included those that are familiar to most, e.g., age and education, and others that might appear to be less obvious, e.g., family and financial stresses.

Discussion and conclusions: No adverse neurobehavioral effects were observed in workers exposed to CPF at levels where physiologic effects on BuChE activity were observed. Aside from providing important information about CPF exposure in the workplace, this study emphasizes the critical roles played by study design and other non-exposure factors.

We-O-20 NEUROBEHAVIORAL PERFORMANCE IN ADOLESCENT AND ADULT FARMWORKERS

*Rohlman DS, Anger WK, Muniz J, Ismail A, Lasarev M, McCauley L.

Background and aims: Adolescent farmworkers are exposed to the same risks as adult farmworkers. Previous research has shown that farmworkers, both adolescents and adults, demonstrate impaired performance on neurobehavioral tests compared to control participants. However, only one study, a preliminary report of the current data, has examined the performance of both adolescents and adults and no difference between the adolescents and adults was found. However, this preliminary analysis revealed that years working in agriculture in both adolescents and adults was associated with worse performance on the neurobehavioral test battery. The current study presents the findings the previous sample in addition to an additional 195 participants tested the following year.

Methods: Adolescent and adult farmworkers and controls (N= 409) working in the strawberry fields were recruited during two harvesting seasons. Participants completed a questionnaire about work practices, a

neurobehavioral test battery and provided urine samples for analysis of biomarkers of organophosphate pesticides and the fungicide, Captan.

Results: Neurobehavioral data from a battery of 10 tests measuring attention, response speed, coordination and memory was analyzed, adjusted for the impact of age, gender, and years working in agriculture. These variables were found to impact performance on the neurobehavioral tests. Biomarkers of organophosphate exposure were low in both groups.

Discussion and conclusions: These data provide information on environmental exposures and health effects in adolescent and adult farmworkers. Future research examining workers over time will allow us to determine if early onset of agricultural work results in increased deficits as the cohort ages.

We-O-21 BIOMONITORING OF CONTEMPORARY-USE PESTICIDES IN A SWEDISH POPULATION

*Littorin ME, Lindh C, Amilon Å, Assarsson E, Jönsson B.

Background and aims: General populations are exposed to contemporary-use pesticides, i.a., from the diet. This has been corroborated by biological monitoring in some countries. No such activity has been performed in Scandinavia earlier. At present, however, Swedish EPA supports a biological monitoring study in southern Sweden, a part of the country where cultivation of 'pesticide-demanding crops' is relatively intense.

Methods: Between year 2004 and 2007, 300 adult volunteers from various workplaces and activities were recruited. The first 100 subjects delivered 24-h composite urine samples, the next 200 first morning voids. All answered a questionnaire concerning diet and other habits of life. LC-MS/MS methods were set up for the analysis of biomarkers in urine reflecting chlorinated phenoxy acetic acids, pyrethroids, vinclozolin and other dicarboximides, some urea-derived pesticides, and mancozeb and other ethylenebis dithiocarbamates. The methods have been validated by human experiments in which two volunteers consumed low doses of each pesticide, and, then, all the urinary excretion was followed for three to four days.

Results: Preliminary results show that all biomarkers could be retrieved in the urine samples from the population, for 2,4-D in 80% of them and for the dicarboximides, in almost every sample. Further, among the first collected 100 urine samples, those from winter/early spring season, from women (who, in Sweden consume more fruits and vegetables than men), from those aged >40 yrs, or those NOT preferring ecological food stuff if available, contained slightly higher concentrations of 2,4-D than the others. Moreover, being vegetarian or playing golf seemed to have some impact on the levels of pesticides in urine.

Discussion and conclusions: Low levels of pesticide residues, in the same range as has been observed in some other industrialised countries, were found in the urine of volunteers from southern Sweden. The main, but not the only, exposure route is through diet. Pesticides are potentially harmful and we do not know if these low levels, maybe in combination with other chemical exposures, can give rise to adverse effects. Focus should probably be on risk groups, in Sweden as well as in other parts of the world.

We-O-22

(Author did not attend the conference.)

MINISYMPOSIUM: MIGRATION AND OCUPATIONAL HEALTH

We-O-23 AN OVERVIEW OF OCCUPATIONAL HEALTH AND GLOBAL IMMIGRATION

*Schenker M.

Background and aims: Health studies of immigrants have classically focused on infectious and chronic diseases. More recent attention has addressed behavioral change (acculturation) among immigrants. Little research has focused on occupational health among immigrant workers, despite the magnitude of global migration and data that immigrants perform more hazardous work with higher injury, illness and fatality rates than non-immigrant populations.

Methods: Demographics and epidemiologic studies of global migration and occupational health will be reviewed. There are an estimated 190 million global migrants, nearly half of whom are women and 80% who migrate for work. Worldwide remittances are ~\$300 billion. Global migration is increasing, involving more smuggling networks, and is more female.

Results: Health hazards of migrants involve the migration process and work in the receiving countries. Exacerbating factors include lack of legal status, lack of adequate housing, lack of safety training, hazardous jobs (e.g. mining, agriculture, construction), hesitancy to report unsafe conditions, limited education and language skills, limited or absent healthcare, and discrimination and racism. Health statistics are limited because of absent surveillance systems for immigrants, difficulties of studying

marginal populations, and the return of immigrants to sending countries after injury or disability. Limited studies have shown increased health and safety risks compared to non-immigrant populations. Occupational fatalities among Hispanic immigrants to the US have doubled in the last decade and are 50% or more above rates for non-Hispanics. Sexual abuse, rape, slavery-like labor conditions, and discrimination of all kinds are common among female migrants in domestic situations.

Discussion and conclusions: Epidemiologists should pay attention to occupational and non-occupational hazards of migrant workers. This is a very large and growing population with increased occupational and non-occupational health risks. Unfortunately they are uncommonly studied because of a lack of standard surveillance systems and other barriers. Studies of easier to reach non-immigrant populations, often in less hazardous jobs, are failing to meet our ethical obligation to improve the occupational health of immigrant workers.

We-O-24 WORK-RELATED INJURIES AMONG US IMMIGRANT WORKERS

*Stallones L, Xiang H.

Background and aims: The purpose of the study is to compare the prevalence of work-related injuries between foreign-born and US born workers in the United States

Methods: National Health Interview Survey data from 1997-2005 were used to calculate work injury prevalence. Logistic regression was used to compare results between US-born and foreign-born workers.

Results: Overall injury prevalence odds ratios were lower among foreign-born workers compared to US-born workers (0.68). Even in the highest risk industries foreign born workers had lower work related injury prevalence rates compared to US-born workers: construction with US-born rate 206 per 100,000 compared with foreign born rate 97 per 100,000; agriculture, forestry and fishing with US-born rate of 164 per 100,000 compared with foreign born rate of 84 per 100,000; and manufacturing with US-born rate of 129 per 100,000 compared with foreign born rate of 82 per 100,000.

Discussion and conclusions: Findings are consistent with other reports of lower injury rates among foreign-born workers compared to native born workers in China, however given legal, cultural and economic pressures it is possible lower rates were due to underreporting. Injuries reported in the data set only reflect medically attended injuries. Lack of knowledge about legal rights related to workers compensation insurance may influence care seeking behaviors among foreign-born workers.

We-O-25 MIGRANT WOMEN AGRICULTURAL WORKERS: BURDENS AND VULNERABILITIES

*Habib RR, Fathallah FF.

Background and aims: Throughout the world, agricultural workers suffer high prevalence of musculoskeletal disorders. Women working in the agricultural sector are at an increased risk of musculoskeletal disorders due to the additional exposure to physical risk factors such as housework and childcare tasks. In many countries, agricultural work is commonly performed by women migrant/seasonal workers. A host of psychosocial factors, especially those related to migration, may also contribute to the reporting of musculoskeletal disorders among migrant women.

Methods: Case studies from Lebanon and California are presented to highlight the musculoskeletal risks encountered by women migrant workers in the agricultural sector.

Results: It is apparent that women migrant workers tend to perform jobs that are highly repetitive, which exposes them to a host of cumulative trauma disorders of the upper limbs, neck, and shoulders. Moreover, maintenance and harvesting of low growing crops require migrant women workers to assume stooped postures, which have been well identified as major risk factor of occupational low back disorders. For instance, migrant women olive pickers in Lebanon spend over eight hours a day in a stooped and/or kneeling posture during the olive harvest season.

Discussion and conclusions: These women live in substandard housing units with limited services, and tend to have many children, which increase the musculoskeletal and psychosocial burdens. Due to their migratory status, these women have very limited access to health care facilities and services, hence, limiting the treatment of their musculoskeletal problems to home remedies and other primitive coping mechanisms. Intervention strategies that have been developed to reduce the musculoskeletal burden among migrant women workers in the agricultural sector have not reached a large segment of this population. Culture specific prevention approaches are required to effectively reduce the harmful effects of work in this vulnerable population.

We-O-26 OCCUPATIONAL HEALTH AND IMMIGRATION IN SOUTHERN AFRICA

*Rees D.

Background and aims: The most important form of immigration in southern Africa is oscillating migration by workers from rural areas and neighbouring countries to South African farms, factories and

mines. This immigration is characterised by lengthy periods in South Africa interspersed with brief returns to the labour sending area and then a final return “home”, often disabled. To illustrate how this immigration has damaged the health of workers, this paper describes its contribution to the intertwined epidemics of silicosis, pulmonary TB and HIV in southern African gold miners, an important matter given the extremely high diseases burdens: silicosis prevalence is about 20% in current miners; active TB rates reach 3 000-5 000/100 000/annum; and HIV prevalence is not uncommonly 25-30%.

Methods: A review of industry statistics and the health and sociological literature to describe the size of the migrant gold mining work force over recent decades and to identify migrancy-associated risk factors for the diseases

Results: Although reduced from about 400 000 in the 70s and 80s to nearer 130 000 today, vast numbers of migrant workers have entered the gold mining industry. All three epidemics have been worsened by migrancy: Silicosis is a progressive disease; over 50% of cases may manifest in retirement in resource-poor communities distant from the mines. Under-ascertainment is thus substantial resulting in failure to identify and compensate cases (only 1/3 compensated in one study). This reduces financial penalties to the mines and shifts costs to the public. These factors plus distant sufferers all reduce motivation to control dust. Oscillating migrancy is associated with a breakdown of family structure and risky sexual behaviour. Migrancy has been shown in formal investigation to increase the risk of HIV infection, thus spreading the disease among miners and in rural home communities. Silicosis and HIV are potent risk factors for tuberculosis. The rapid rise since the early 90s in TB rates in gold miners has coincided with the HIV epidemic and very high prevalences of silicosis.

Discussion and conclusions: Oscillating immigration in gold mining, typical of many industries in the southern African region, has significantly contributed to major disease epidemics in workers and the community.

We-O-27 OCCUPATIONAL HEALTH AMONG ASIAN IMMIGRANTS

*Xiang H, Frentz C.

Background and aims: There are 10 million Asians living in the US and the majority of them (69%) are foreign-born. Approximately three quarters of the foreign-born Asian population entered the US in the past 20 years. Asian workers are employed in a variety of industries and their occupations vary by their country of birth, education level, and immigrant status. Most occupational health surveillance data do not capture the real hazards and health problems faced by Asian immigrant workers. In this presentation, we aim to identify major occupational health issues among Asian immigrant workers and discuss the implications of cultural and social factors on health protection among Asian immigrants.

Methods: We conducted a systematic review of published literature on the occupational health of Asians living in the US. Major occupational health issues among different Asian workers were identified. Cultural and social factors that influence the occupational health behaviors of Asian workers were discussed in the unique culture context of the Asian population.

Results: Compared to 34% of the general US population, 45% of Asian workers are employed in management, professional, and related occupations. However, a significantly higher proportion of Cambodians, Hmong, and Laotians are employed in service industry professions such as production, transportation, and material moving jobs. Common occupational health issues among Asians include chronic musculoskeletal pain among Chinese garment workers, exposure to hazardous materials among Asian production workers, and farm-related injuries among Hmong farm workers. Mental health issues are common among all Asian immigrants but are often underreported because of the stigma associated with mental health problems. Cultural differences and language barriers are major factors that prevent Asian workers from obtaining relevant occupational health materials and seeking worker’s compensation.

Discussion and conclusions: Occupational health issues faced by Asian immigrant workers are significantly underreported and most occupational health surveillance data do not adequately capture these issues. Occupational health epidemiologists should work closely with Asian communities to address their culture-specific occupational and non-occupational health concerns. Special household surveys targeting the Asian population and discussions with key informants in the local Asian community can help identify potential occupational health issues and assist in the development of culturally sensitive health promotion programs.

CHOLINESTERASE BIOMONITORING

We-O-28 SERUM CHOLINESTERASE INHIBITION IN RELATION TO PARAOXONASE STATUS AMONG ORGANOPHOSPHATE-EXPOSED AGRICULTURAL PESTICIDE HANDLERS

*Hofmann JN, De Roos AJ, Furlong CE, Farin FM, Fenske RA, Checkoway H, Keifer MC.

Background and aims: Studies in animal models have clearly demonstrated that low paraoxonase (PON1) activity is associated with an increased risk of neurotoxic effects resulting from exposure to various organophosphate (OP) insecticides. However, thus far few human studies have investigated the relationship between PON1 activity and intermediate endpoints such as serum cholinesterase (BChE) inhibition among OP-exposed individuals. In this presentation we will characterize the relationship between PON1 status and BChE inhibition among OP-exposed agricultural pesticide handlers. The goal of this ongoing epidemiologic study is to validate the role of PON1 as a determinant of susceptibility to neurological effects of OP exposure.

Methods: Agricultural pesticide handlers in Washington State were recruited during the 2006 and 2007 spray seasons when they were seen by collaborating medical providers as part of a statewide ChE monitoring program. Blood samples were collected from 163 participants and tested for PON1 Q192R functional genotype and level of PON1 expression as determined by arylesterase (AREase) activity. Percent change in BChE activity from baseline levels was evaluated in relation to PON1 status.

Results: Participants with low AREase activity experienced a significantly greater degree of BChE inhibition than participants with high AREase activity (mean BChE inhibition of -8.44% and -3.27%, respectively; $P=0.017$). Greater BChE inhibition was also observed among PON1 Q192 homozygous individuals relative to PON1 R192 homozygous individuals (mean BChE inhibition of -8.08% and -3.80%, respectively); this difference was statistically significant after adjustment for AREase activity ($P=0.028$).

Discussion and conclusions: Preliminary results suggest that individuals with low AREase activity and individuals who are homozygous for PON1 Q192 are at greater risk of BChE inhibition following OP exposure. These results support the hypothesis that PON1 status is a determinant of susceptibility to OP-related effects. Further analyses accounting for the degree of OP exposure among study participants are currently being performed.

We-O-29 PARAOXONASE (PON1) STATUS OF CHLORPYRIFOS MANUFACTURING WORKERS FAILS TO PREDICT SERUM BUTYRYLCHOLINESTERASE (BUCHE) ACTIVITY

*Albers JW, Garabrant DH, Berent S, Richardson RJ.

Background and aims: Chlorpyrifos (CPF) is an organophosphorus (OP) anticholinesterase insecticide. PON1 is a serum enzyme that hydrolyzes a number of OP compounds, including chlorpyrifos-oxon (CPO), the active metabolite of CPF. PON1 polymorphisms include a glutamine (Q)/arginine (R) substitution at position 192 (PON1Q192R), and the PON1192Q allotype hydrolyzes CPO less efficiently than PON1192R. This variation is potentially important in determining susceptibility to CPF. We postulated that CPOase activity would be inversely associated with BuChE inhibition and that the PON1192Q alloform would be underrepresented among long-term CPF manufacturing workers relative to referents.

Methods: We evaluated 53 CPF workers and 60 referents (plastic film manufacturers) over a one-year period. Industrial hygiene and employment records were used to estimate historic CPF exposure (from first employment to study onset) and interim CPF exposure (from study onset to one-year later). Interim exposure also was assessed by a urinary CPF metabolite, 3,5,6-trichloro-2-pyridinol (TCP). Serum BuChE activity, which may be inhibited by CPF exposure, was measured monthly. Plasma samples were assayed for paraoxonase (PONase), diazoxonase, and CPOase; PON1 inferred genotypes were determined from two-dimensional plots of CPOase or diazoxonase activity versus PONase activity. Linear regression analyses modeled BuChE activity as a function of CPF exposure and covariates. These analyses were repeated to determine whether PON1 status modified the effect of CPF exposure on BuChE activity.

Results: Although CPF workers and referents had a 100-fold difference in cumulative CPF exposure, the CPOase activity was similar in both groups ($p = 0.63$). The inferred allele distribution and the inferred functional genotype distribution showed a slight overrepresentation of PON1192Q in the CPF group (PON1192QQ, 51% CPF, 40% referent; PON192QR, 43% CPF, 40% referent; PON192RR, 6% CPF, 20% referent, $p = 0.08$). In multiple linear regression analyses, BuChE activity was significantly inversely associated with measures of interim CPF exposure, but the relationship was not modified by PON1 status.

Discussion and conclusions: Contrary to our hypotheses, PON1192Q was not under-represented among CPF workers compared to referents, and the biological effects of CPF exposure at levels in a range where physiological effects on BuChE exist were not modified by PON1 inferred genotype or CPOase activity.

We-O-30 CHLORPYRIFOS EXPOSURE, INHIBITION OF BUTYRYLCHOLINESTERASE, AND PARAOXONASE (PON1) ACTIVITY IN PESTICIDE MANUFACTURING WORKERS

*Garabrant DH, Albers JW, Berent S, Richardson RJ.

Background and aims: Chlorpyrifos (CPF) is an organophosphate pesticide whose toxicity is dependent on the balance between oxon formation and inhibition of B-esterases by oxons versus detoxification by cytochrome P450 and paraoxonase (PON1). Exposure typically occurs in settings where multiple agents are present (pesticide application, agriculture), allowing few opportunities to study the toxicity of CPF alone. We studied the relationship between CPF exposure, serum butyrylcholinesterase activity (BuChE), and red blood cell acetylcholinesterase activity (AChE) in a cohort of CPF manufacturing workers who had no other exposure to organophosphates.

Methods: We studied 53 CPF workers and 60 unexposed referents. Industrial hygiene records were used to estimate ambient (airborne) CPF exposure. Urinary 3,5,6-trichloro-2-pyridinol (TCPy) was measured four times to estimate CPF internal dose, AChE was measured twice, and BuChE was measured monthly, over a 1-year period in all subjects. Linear regression was used to estimate the relationship between outcome variables (BuChE and AChE) and measures of exposure (TCPy, ambient CPF). PON1 activity and PON1 polymorphisms were evaluated to determine whether they altered the relationship between outcome variables and exposure.

Results: Creatinine corrected TCPy (TCPy/Cr) was inversely associated with BuChE activity ($p < 0.001$, $R^2 = 0.38$). However, there was no relationship ($p = 0.42$) among subjects whose TCPy/Cr measures were below 12 ug TCPy/g Cr. Ambient CPF exposure was inversely associated with BuChE at exposure levels above 0.011 mg/m³ ($p < 0.001$). There was no relationship between AChE and any measure of exposure. Neither PON1 activity nor PON1 polymorphisms was a predictor of any outcome, nor did these factors alter the relationship between any outcome variable and exposure.

Discussion and conclusions: Chlorpyrifos exposure is inversely associated with serum BuChE inhibition at exposure levels above 0.11 mg/m³ and serum concentrations above 12 ug TCPy/g Cr. CPF workers were exposed at levels at which physiologic effects on BuChE activity were observed, but effects on AChE activity were not seen. This study provides dose-response information on CPF toxicity in the absence of confounding by other organophosphate exposure.

We-O-31 FOUR YEARS OF CHOLINESTERASE MONITORING FROM THE WASHINGTON STATE MONITORING PROGRAM: RESULTS AND IMPLICATIONS

*Keifer M.

Background and aims: In 2000, the Washington Supreme Court handed down a decision on *Rios v Department of Labor and Industries*, directing the Washington department to begin rulemaking on cholinesterase (ChE) monitoring for agricultural workers.

Methods: A collaborative stakeholder panel crafted the main features of the 2003 (since modified) Washington Cholinesterase Monitoring rule, which stipulates that workers with exposure to category I or II organophosphates or organophosphates and n-methyl-carbamates for more than 30 hours in 30 days must be offered ChE monitoring. Baselines and periodic testing are expected. A scientific panel analyzed three years of data from the statewide system, finding about 6-10% Plasma ChE depression to the 20% level each year.

Results: Acetylcholinesterase (AChE) showed less depression and while few workers were removed for ChE depression of either enzyme, data show a broad, albeit mild downward shift in PChE activity in the overall population. In 2006 there was a 7% mean decrease in PChE levels and a 1.7% decrease in AChE activity levels.

Discussion and conclusions: Changes in laboratories presented challenges in interpreting data in year 2007. However several points suggest the decrease is a true (non-artifactual) downward shift. Several practices and conditions were observed frequently among handlers with depressed levels that may have contributed to overexposure. Changes in the rule adopted in 2007 will weaken the ability of the public health sector to use data from this system for prevention purposes.

We-O-32 LEVELS OF PLASMA AND RED BLOOD CELL CHOLINESTERASE ACTIVITY AS EFFECT BIOMARKERS IN ACUTE AND CHRONIC CHLORPYRIFOS POISONING

*Wesseling C, Aragón-Benavides A, Blanco L, van Wendel de Joode B, López L.

Background and aims: Organophosphates (OP) inhibit cholinesterase enzymes by serving as alternative substrate. When OPs inhibit acetylcholinesterase (AChE), an enzyme present throughout the nervous system, the neurotransmitter acetylcholine accumulates in the nerve junctions resulting in poisoning. For surveillance of OP exposed workers, AChE activity is measured in red blood cells as an effect indicator. Butyryl cholinesterases (BChE) are formed in the liver and possibly function as scavengers protecting AChE in the nerve system. BChE is determined in plasma and used in surveillance as an exposure indicator. However, some OPs markedly reduce BChE without depression of AChE. In a study on neurobehavioral effects among OP exposed banana workers in Honduras, we examined AChE and BChE activity in relation to acute and chronic poisoning symptoms.

Methods: BChE activity was measured in 48 chlorpyrifos exposed workers and 46 referents, and AChE in 25 exposed and 40 referents. We used the EQM Test-Mate OP Cholinesterase kit, placed in an air-conditioned room at 23°C. Workers were administered a questionnaire for typical acute poisoning symptoms, a Spanish modified Q-16 for chronic neurotoxic symptoms and the Brief Symptom Inventory (BSI) assessing neuropsychiatric symptoms. Differences in cholinesterase activity between groups were analyzed with t-test for independent samples. Among the exposed workers only, differences in log-normalized symptom scores were examined with cholinesterase activity as independent exposure variables adjusting for age, alcohol, solvents and other pesticides.

Results: Mean BChE (range 0.77 - 2.56 UI) and mean AChE (range 21.8 - 37.8) were significantly lower among exposed (-0.32, $p < 0.0001$ and -2.02 $p = 0.01$, respectively) representing 18 and 7% depression among exposed workers. A significant inverse correlation with acute symptoms scores was observed for BChE ($B = -0.76$, 95% CI -1.29, -0.23, $R^2 = 0.36$), but not for AChE ($B = -0.03$, 95% CI -0.16, 0.11, $R^2 = 0.28$). BChE activity did not predict Q-16 and BSI scores after adjustment for acute symptom scores. AChE significantly predicted BSI scores ($B = -0.15$, 95% CI -0.26, -0.04, $R^2 = 0.80$).

Discussion and conclusions: In our study population, plasma cholinesterase activity was associated with acute chlorpyrifos poisoning symptoms in the absence of important depression of AChE. Declining AChE activity was related to increasing chronic neuropsychiatric symptoms.

We-O-33 ERYTHROCYTE CHOLINESTERASE ENZYME ACTIVITY AND HAEMATOLOGICAL PROFILE IN CACAO FARMERS OF SOUTHWESTERN NIGERIA AS RELATED TO INSECTICIDE EXPOSURE

*Sosan MB, Akingbohunbe AE, Durosinmi MA, Ojo II.

Background and aims: The study investigated the risks of applying insecticides for mirid pest control in cacao plantations in southwestern Nigeria. Cacao, *Theobroma cacao* L., is regarded as the backbone of the economy of people of the region.

Methods: Blood from 76 cacao farmers was monitored for erythrocyte cholinesterase enzyme activity (AChE) using a Test-mate ChE field kit. The farmers were grouped into four exposure periods based on their years of involvement in insecticide control of cacao mirids on their farms as 5-9 years, 10-14 years, 15-19 years and > 20 years. The relationship between AChE and the exposure periods was analyzed.

Results: Baseline AChE activities were determined between February and June, 2005, about three months after the last insecticide spraying was carried out by the farmers. The results showed that eight of the farmers had relatively low values ranging from 33% to 50% normal (N) which is indicative of poisoning due to the use of organophosphate insecticides. Post-insecticide AChE activities were also determined in October and November, 2005 which marked the end of the spraying season for insect pest control on cacao. The post-insecticide application AChE activities were weighted with the baseline activities to determine the percent AChE inhibition. The results showed that 25% of the farmers had AChE activity inhibition ranging from 20% to 30% which is indicative of occupational exposure; while another 10% manifested 30-50% inhibition which is indicative of hazard. It was also observed that farmers in the over 10 years of exposure periods, manifested significantly higher AChE activity inhibitions than those in less than 10 years exposure period.

Discussion and conclusions: It is concluded that occupational exposure hazard due to organophosphate and carbamate insecticide application for the control of cacao mirids is real among cacao farmers in Southwestern Nigeria; and there is a need for regular biomonitoring of their blood for AChE activity.

CANCER: MISCELLANEOUS SITES 2

We-O-34 RISK OF LIVER CANCER AND EXPOSURE TO ORGANIC SOLVENTS AND GASOLINE VAPOURS AMONG FINNISH WORKERS

*Lindbohm M, Sallmén M, Kyyrönen P, Kauppinen T, Pukkala E.

Background and aims: Epidemiologic studies suggest that trichloroethylene is a human liver carcinogen, but the evidence is limited for other solvents. We investigated the association between exposure to various groups of solvents and gasoline vapours and liver cancer.

Methods: A cohort of all economically active Finns born 1906-1945 was followed up during 1971-95. The incident cases of primary liver cancer (1692 men and 783 women) were identified in a record linkage with the Finnish Cancer Registry. Occupations from the Population Census in 1970 were converted to exposures to four groups of solvents and gasoline vapours with a job-exposure matrix (FINJEM). Cumulative exposure (CE) was calculated as the product of the prevalence, level, and estimated duration of exposure. Poisson regression was used to calculate the relative risks (RR) and 95% confidence

intervals (CI) of cancer for exposure categories. Age, period, social class, smoking, and use of alcohol were adjusted and a time lag of 10 years was used.

Results: Among the occupations with exposure to organic solvents, an elevated liver cancer incidence was observed in male printers, painters, varnishers and lacquerers, metal platers and coaters, and service station attendants as well as in female printing workers. The relative risk of liver cancer among men was increased in the highest exposure category of each solvent group: aromatic hydrocarbons (RR 1.77, 95% CI 1.30–2.40), aliphatic/alicyclic hydrocarbons (RR 1.47, 95% CI 0.99–2.18), chlorinated hydrocarbons (RR 2.65, 95% CI 1.38–5.11), and other solvents (RR 2.14, 95% CI 1.23–3.71). For gasoline exposure, the increase in the risk was slight (RR 1.24, 95% CI 0.70–2.20). Among women, the risk was increased for the group 'other solvents', which included mainly alcohols, ketones, esters, and glycol ethers (RR 2.73, 95% CI 1.21–6.16).

Discussion and conclusions: Our finding of an increased liver cancer risk among workers exposed to halogenated hydrocarbons is in line with earlier studies. The results also suggest a link between exposure to other types of solvents and the risk of liver cancer. Exposures to different groups of solvents were, however, highly correlated with each other, making it difficult to determine their independent effect.

We-O-35 PARENTAL OCCUPATION AND RISK OF TESTICULAR CANCER IN DENMARK

*Hansen J.

Background and aims: Danish men have worldwide the highest risk of testis cancer. The incidence has been increasing over the past 50 years, and the causes of this disease remain almost unknown. It has been hypothesized that pre-conception and in utero exposures may play an important role in the etiology of testicular cancer. We conducted a nationwide registry based case-control study to elucidate the associations of fathers and mothers occupation before and during pregnancy and testicular cancer.

Methods: In total 1073 cases born in 1965-2003 were retrieved from the Danish Cancer Registry. For each case, 15 males born in the same year and free of cancer were randomly selected from the Central Population Registry (CPR) and individually matched. Based on the unique identification number fathers, mothers and siblings were identified from the CPR, including their socio-economic status (SES).

Information about the fathers and mothers employment held longest one year before the birth of cases and controls was obtained from the Pension Fund, for which membership has been compulsory since 1964. Relative risks were estimated by odds ratios (OR) by conditional logistic regression, and adjusted for age of father and mother, SES of index persons and parents, and the sequence and sex among siblings.

Results: Significantly increased OR's were found if the mother had been working in nursing homes (1.5; 95% C.I: 1.1-2.1), or if the fathers were employment in a slaughter houses (1.7; 1.1-2.8), in iron and metal industry (1.2; 1.0-1.6) or in construction industry (1.4; 1.0-1.8). Increased associations were also found for men for whom the mother (1.1; 1.0-1.2) or the father (1.2; 1.0-1.4) have had no employment the year prior to the birth compared to if the parent had been employed. The OR of low SES of respectively the mother and father was 1.2 (1.0-1.4) and 1.1 (0.9-1.2) compared to parents of high SES. No major differences in OR were seen for seminomas and non-seminomas.

Discussion and conclusions: Given multiple testing, this study does not support that fathers or mothers occupation during pregnancy play a major role in the aetiology of testicular cancer.

We-O-36 REPRODUCTIVE CANCERS AMONG WOMEN EXPOSED TO CROCIDOLITE AT WITTENOOM

*Reid A, Heywroth J, de Klerk N, Musk AW.

Background and aims: Animal studies have suggested a causal association between asbestos and ovarian cancer and asbestos fibres have been detected in human ovaries. Occupational cohorts have reported excess mortality from ovarian and cervical cancer, but exposure-response relationships have not been consistent. We examine the incidence and exposure-response relationships of these cancers among 3000 women and girls exposed to blue asbestos at Wittenoom, Western Australia (WA).

Methods: 2552 women were residents of the town and 416 women worked for the Australian Blue Asbestos Company (ABA). Quantitative asbestos exposure measurements were derived from periodic dust surveys. Cancer incidence records were obtained for the period 1982 to 2006. Standardised Incidence Ratios (SIRs) compared the Wittenoom women with the WA female population. Incidence rates per 100,000 person years were calculated for categories of asbestos exposure.

Results: Ovarian (SIR 1.27), cervical (SIR 1.44) and uterine cancer (SIR 1.23) were increased, but not statistically significantly among the Wittenoom women, compared to the WA population. There was no excess breast cancer. Among the former ABA workers the incidence of cervical cancer was twice that of the WA population (SIR 2.38), but ovarian cancer was less (SIR 0.65). Incidence rates per 100,000 person years for ovarian and cervical cancers were greater among women first exposed to asbestos at age

40 years or more. Cervical cancer increased among former ABA workers and those residents who washed the clothes of an ABA worker. There were three cases of choriocarcinoma and three partial hydatidiform moles.

Discussion and conclusions: Asbestos fibres have been found in the ovaries of women exposed domestically elsewhere. Particulate matter can reach the peritoneal cavity via the transvaginal route. Sexual contact may introduce asbestos fibres into the vagina and to the cervix and ovaries. Among the Wittenoom women we found that the incidence of cervical cancer was higher among those who reported washing the clothes of an ABA worker. These women were more likely to be sexual partners of an ABA worker. The incidence of gestational trophoblastic disease warrants further investigation.

We-O-37 UPDATED CANCER MORTALITY IN NUCLEAR WORKERS OF THE FRENCH ELECTRICITY COMPANY

*Rogel A, Joly K, Metz-Flamant C, Laurier D, Tirmarche M, Hubert D, Garcier Y.

Background and aims: We conducted a cancer mortality study on a cohort of French nuclear workers employed at Electricité de France (EDF). A first cancer mortality analysis relied on the period 1968-1994. Present results consider an update including 9 additional years of follow-up and then rely on 1968-2003 period.

Methods: The cohort includes 22,393 workers, 96% of them are males. Employment data were updated using Personnel EDF file. Vital status was ascertained using the French National Registry of individual identification, and further completed using EDF personnel and pension files. Causes of death were obtained through the National file of causes of death. The observed mortality was compared with national rates by indirect standardisation and expressed by Standardised Mortality Ratios (SMR). All causes and all cancers SMRs were detailed according to sex, age and calendar year. Variations according to date of entry into cohort, duration of employment and socio-economic status (SES) were studied. Comparison with the earlier follow-up is presented.

Results: At the present study end point (31/12/2003), 74 % of workers are still in active service. Only 0.3 % of workers are lost to follow up. The total number of person-years is nearly 450,000. Causes were ascertained for 96% of deaths. The total number of deaths is 874: 307 are cancer deaths. SMRs for all cancers show a significant deficit compared to the French national mortality. Significant variations of SMRs according to SES were observed. No significant excess compared to French national mortality was observed for any of the 30 different cancer sites studied. Borderline significant excess were observed however for pancreatic, pleural, kidney and brain cancer.

Discussion and conclusions: There is a significant deficit of cancer mortality compared to the general population. Although 9 years of follow-up were added, this cohort is constituted by relatively young workers, most of them being still in active service. Regular update of the follow up of this cohort together with inclusion of newly employed workers is planned. This project contributes to a better occupational health surveillance. In this frame, individual radiation exposure data will be updated very soon in order to allow an updated exposure-risk analysis.

We-O-38 ESTIMATION OF SMOKING CONTRIBUTION IN CANCER MORTALITY DIFFERENCES BY INDUSTRY IN A COUNTRY: EXAMPLE OF RESULTS IN FRANCE

*Marchand J, Lauzeille D, Geoffroy-Perez B, Ferrand M.

Background and aims: Use data on tobacco smoking by occupation and industry in France in population to interpret results of occupational studies.

Methods: The French latest decennial health survey conducted in 2003 in general population included questionnaires on smoking habits and occupation. These data were used to produce systematic estimations of smokers and ex-smokers prevalence by occupation and industry. These estimations are useful to estimate the expected rate ratio for a tobacco-linked pathology in an occupational cohort, compared to a reference population, due to tobacco consumption differences. Methods used were developed by other authors and are based on the knowledge of smokers prevalence in studied population and of the relative risk of pathology associated with tobacco. If an excess is actually observed in the studied population and is above the rate ratio, the plausibility of other contributing factors – among which occupational exposures – is higher. These methods were applied to produce rate ratios of lung and bladder cancer by industry in France, which were compared to systematic mortality data by industry previously produced.

Results: Expected excesses of lung and bladder cancer due to high smoking prevalence were identified and quantified in several industries. Comparison with mortality data shows that many of these expected excesses are below the relative risks actually estimated previously. For example, smoking prevalence in construction is 5% higher than in other industries, the expected lung cancer excess is 9%, but the actual risk excess is greater: 28% in this industry.

Discussion and conclusions: It is common in occupational epidemiology to analyze studies where individual data on smoking are not available. Indirect methods exist to take into account the potential role of tobacco in observed excesses, if data on tobacco consumption in population are available. Systematic data on smoking prevalence by industry were produced recently in France, allowing exploring smoking contribution in lung and bladder cancer mortality differences by industry. The statement that tobacco seems not to explain excesses observed in many cases – orienting the discussion on other risk factors including occupational factors – is not new but this kind of analyze gives a quantitative view on potential magnitude of respective contributions.

We-O-39 THE UPPER MIDWEST HEALTH STUDY: GLIOMAS AND FARM CROPS, ANIMALS, AND ACTIVITIES

*Ruder AM.

Background and aims: Several studies have found excess brain cancer in farmers despite generally lower cancer incidence. The National Institute for Occupational Safety and Health Upper Midwest Health Study previously evaluated farm pesticide exposure and glioma risk and found no increased risk for ever vs. never exposed. This analysis focuses on other farm activities to determine possible associations with risk of glioma.

Methods: The study included 798 glioma cases and 1175 population-based controls, adult (18-80) non-metropolitan residents of Iowa, Michigan, Minnesota and Wisconsin. Multiple logistic regressions controlled for farm residence, age, age group, sex, state, and education.

Results: There were no strong associations between farm crops, animals, or activities and risk of glioma. Prudent practices in handling farm chemicals (washing after pesticide use, not storing pesticides in the house, applying solvents by brushing or dipping rather than spraying) were associated with decreased risk.

Discussion and conclusions: No specific farm exposures or activities that we asked about were associated with increased glioma risk. Farmers' increased risk of glioma may be due to other activities or to intrinsic rather than extrinsic factors.

PSYCHOSOCIAL FACTORS IN THE WORKPLACE

We-O-40 INTERRELATION BETWEEN WORK-RELATED STRESS, BURNOUT AND DEPRESSION IN A WORKING POPULATION: CROSS SECTIONAL RESULTS FROM THE DANISH PRISME-STUDY

*Kaergaard A, Kolstad H, Kaerlev L, Thomsen JF, Hansen A.

Background and aims: PRISME is a longitudinal study with the object of investigating how work-related psychosocial strains impact on the risk of developing stress, burnout and depression (incident cases). Stress and burnout are also looked at as mediators of an association between job strain and depression. To succeed in doing that it is necessary initially to analyze the overlap of the three outcomes. The aim of the present study is to explore the overlap of the three entities: stress, burnout and depression.

Methods: The study population comprises 4491 civil servants (22% men, 78% women, age 19-66 years) employed in a Danish city community. In a self-administered questionnaire stress was measured with Cohen's Perceived Stress Scale, personal burnout (as a state of prolonged physical and psychological exhaustion) was measured with Copenhagen Burnout Inventory and depression with Symptom Checklist, SCL-DEP6. For selected individuals in PRISME the questionnaire is followed by a structured face-to-face interview, anthropometric measurements and measures of cortisol and genetic variation.

Results: The correlation (Pearson's r) between burnout and stress is 0.547, between burnout and depression $r=0.558$ and between stress and depression $r=0.583$. All correlations are significant at the 0.01 level. If arbitrary cut-offs are made on the three scales to dichotomize into cases and non-cases we illustrate an example where approximately half of the participants (2210) fulfilled the criteria for being a case on minimum one of the outcomes. The overlap between stress, burnout and depression in this group shows that 54% of cases with stress also have depression, 53% of cases with burnout also have depression and 55% of cases with stress also have burnout. However, we also found that 18% solely fulfilled the criteria for stress, 18% solely for burnout and 12 solely fulfilled the criteria for depression.

Discussion and conclusions: We found a high correlation between self-reported stress, burnout and depression. Still, studying the actual overlap between the three outcomes leaves us with relatively large groups of individuals who fulfill only the criteria for one outcome. This is important and makes it possible in the longitudinal design of the PRISME-study to study possible developmental sequence of the outcome in relation to work-related strains.

We-O-41 PREVALENCE AND COMPARISON OF BIPOLAR DISORDERS IN COAL MINER AND GENERAL POPULATION; SPECIAL EMPHASIS ON SHIFT WORK

*Kiran S, Konuk N, Gümüş M.

Background and aims: Circadian rhythms might be involved in psychiatric disorders, particularly bipolar disorders. Individuals such as miners who have circadian disruption due to shift work might be at risk to develop affective disorders. In addition coal worker may expose the circadian rhythm shift due to their nature of work. Therefore, in this study we aimed to investigate prevalence of bipolar disorders in coal worker and compare them with different occupational settings.

Methods: The MDQ, a brief self-report instrument designed to screen for all subtypes of bipolar disorder (BP I, II and NOS) was voluntarily administered to the 604s subjects which consisted of 298 miners and 304 general population. The MDQ was scored using a standard algorithm requiring endorsement of 7/13 mood items as well as two items that assess whether manic or hypomanic symptoms co-occur and cause moderate to severe functional impairment. (cutt of value accepted 7 for MDQ, including bipolar subtypes). We calculated the risk (odds ratio) for shiftwork related mood disorders for miners and general population in male gender.

Results: The prevalence of bipolar disorders was 11.9% in whole study sample, 14.4% for general population, 9.4% for miners. There were no significant differences between miners and general population. Although mood disorder prevalence increased with shiftwork, from 9.1% to 12.5%, difference was not statistically significant. After logistic regression analyse with related variables including the model

Discussion and conclusions: This study was performed as a pilot study to estimate prevalence of shiftwork related bipolar disorders. Although there is abundance of the literature that investigating relationship between shift work and affective disorders, association of bipolar disorders and working as a miner has not been systematically investigated. Gender differences might explain our interesting results of the study that prevalence of bipolar disorders lower than the general population. Since the miners expose always darkness whatever the shift it was, constant illumination conditions of miner might be differs the results from other shift worker. This findings needs to be evaluated in larger samples and further studies.

We-O-42

(Author did not attend the conference.)

We-O-43 DEPRESSION, PSYCHOSOCIAL WORK CONDITIONS AND COMMON METHOD BIAS

*Kolstad HA, Kaerlev L, Hansen ÅM, Thomsen JF, Kaergaard A, Bonde JP.

Background and aims: Associations between strenuous psychosocial work conditions and depression that rely on individuals' perceptions of exposure and outcome is expected to be biased towards erroneously high values. We examine if work unit based analysis strategies may be a way forward towards more valid causal inference.

Methods: A total of 297 depressed and 4113 non-depressed workers, classified according to a case finding questionnaire for mental disorders, who were employed within 446 different public work units (on average 6 workers/unit) participated in this cross sectional study. The participants reported psychological job demands, decision authority and skill discretion according to the job strain model. We compared self-reported exposures with the average levels among the non-depressed colleagues of the same work units and estimated the within and between work unit variance components of exposure.

Results: Odds ratio of depression increased by decreasing levels of decision authority and skill discretion (p values, tests for trend < 0.01), but not by increasing level of job demands. The depressed workers reported levels of decision authority and skill discretion that were 10% below the work unit averages (p values <0.01). These estimates were not weakened by restricting analyses to work units with low exposure variability. No associations were seen between decision authority, skill discretion and depression if workers were classified by their work-unit average. The between work unit exposure variance components varied between 10% (skill discretion) and 21% (decision authority) of the total variance.

Discussion and conclusions: The strong association observed between self reported decision latitude (decision authority and skill discretion) and depression may reflect causality or common method bias. The fact that the depressed workers consistently reported lower levels of decision latitude than the non-depressed colleagues with high agreement in their reporting, speaks in favour of the latter interpretation. This stresses the need for independent exposure estimates and group based analyses are a straightforward solution. The work units of this study captured a significant but smaller part of the total exposure

variability and identification of groups with homogenous work conditions will be a major challenge and should be defined by any work information robust to response style or psychologic reactivity.

We-O-44 BIOMARKERS OF CHRONIC PSYCHOSOCIAL STRESS AT WORK PLACES

*Fatkhutdinova LM, Amirov NK.

Background and aims: The aim of the study was to investigate the possible effects of job stress factors on different biomarkers of chronic stress, including saliva cortisol, serum cholesterol, and free radicals levels as well.

Methods: Psychosocial factors were measured by use of the Russian versions of the Job Stress Questionnaire (JCQ) and the Effort-Reward Imbalance Questionnaire (ERI). Workers collected saliva samples four times a day (a wakening level, 30 minutes after wakening, 8 hours after wakening, and before going to bed) twice a week - on a weekend and a workday; totally 432 saliva samples from 54 workers were analyzed. Blood samples were collected in 166 workers.

Results: In the job stress group (either iso-stress, or job strain, or effort-reward imbalance) the most unfavorable changes were observed: after statistically significant morning rise, the cortisol levels quickly fell, reaching the minimum in evening time, both on a weekend (15,2, 21, 10,8, and 7,2 ng/ml) and a workday (12,9, 22,1, 10,5 and 9,4 ng/ml). Hence, the state of this group was described as perceived chronic stress and decreased functional capacities. The link between job stress levels and serum cholesterol was not revealed. Blood hydroperoxides levels were higher in the job strain group (high demand and low control) compared with non-strained workers: 11 (SD 4,6) vs 9,0 (SD 4,0) relative units.

Discussion and conclusions: Saliva cortisol and free radicals can be regarded as useful indicators to monitor the chronic stress appearance in workers.

We-O-45 RELATIONSHIP BETWEEN SOCIAL SUPPORT, WORK INTENSITY AND THE PREVALENCE OF DEPRESSION IN TEXAS FUNERAL WORKERS

*Delclos GL, Hinojosa CZ.

Background and aims: Licensed funeral directors and embalmers may be at increased risk for depression due to the nature of their jobs, yet information is sparse. We conducted a postal survey in a representative sample of this worker population to examine associations between depression, workload, and social support.

Methods: The study population consisted of a probability systematic random sample (n=450) of the approximately 4000 funeral directors and/or embalmers licensed by the Texas Funeral Services Commission as of 2005. Where possible, previously validated scales were used in the development of the survey questionnaire, designed for completion in under 15 minutes. Depression was measured through the Center for Epidemiologic Studies–Depression Scale (CESD); social support through the Social Support–Friends and Family instruments (SS-Fr and SS-Fa, respectively). Workload was determined through a list of multiple choice options regarding a typical self-reported work week, including number of hours worked and total time spent with bereaved families; responses were collapsed into a summary work intensity score.

Results: 266 completed surveys were received (response rate, 59%); 82% were male and 85% worked as both funeral directors and embalmers. Eighty-nine percent of respondents worked more than 40 hours per week, and over 75% spent from 1 to 30 hours per week in direct interaction with bereaved families. Based on a CESD score of ≥ 16 , 38% of the survey population was depressed, 13% were currently taking an antidepressant, and 17% had consulted a physician for depression in the previous year. Multiple linear regression analysis showed that depression was not significantly associated with work intensity ($p=0.74$), but there was a very strong and inverse association with age ($\beta=-2.08$, $p=0.004$), and presence of social support [SS-Fa ($\beta= -0.52$, $p<0.00001$) and SS-Fr ($\beta= -0.57$, $p<0.00001$)], after adjusting for ethnicity, gender, education, marital status and number of children (final model $R^2=0.32$).

Discussion and conclusions: Funeral workers, a much understudied occupation, have a high prevalence of depression, which is significantly associated with the absence of social support systems but not with the intensity of their work.

MINISYMPOSIUM: MULTIPLE EXPOSURES: MULTIPLE TRANSDISCIPLINARY EVALUATION METHODS

(Abstracts removed because they were part of NEUREOH conference rather than EPICOH.)

MINISYMPOSIUM: AFFECTIVE ILLNESS, DEPRESSION AND SUICIDE AS A NEUROTOXIC OUTCOME OF PESTICIDE EXPOSURE

We-O-51 COHORT STUDY OF THE ASSOCIATION BETWEEN PESTICIDE POISONING AND DEPRESSION

*Stallones L, Beseler CL

Background and aims: The purpose of this study is to describe the association between pesticide poisoning and symptoms of depression over three-years in a cohort of farm residents from Colorado.

Methods: Farm operators and their spouses were recruited in 1993 and enrolled in an annual survey from 1993-1996. Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression (CES-D) Scale. A cut point of 16 or greater was used to identify depressed individuals. Self reported pesticide poisoning at baseline was used as the exposure of interest. Generalized estimating equations (GEE) analyzes were conducted.

Results: After controlling for age, gender, health status, income reduction and increase in debt, pesticide poisoning at baseline was significantly associated with depression (OR 2.32, 95% CI 1.12, 4.84). After controlling for the same variables the following symptoms of depression were associated with a pesticide poisoning: feeling depressed (OR 2.14, 95% CI 1.21,3.78); feeling sad (OR1.88, 95% CI 1.10, 3.21); being bothered by things that usually didn't (OR 3.98, 95% CI 2.35, 6.76); feeling like everything was an effort (OR 2.39, 95% CI 1.42, 4.03); feeling could nor get going (OR 1.79, 95% CI 1.05, 3.08); and feeling disliked by others (OR 2.50, 95% CI 1.28, 4.87).

Discussion and conclusions: History of pesticide poisoning was associated with depression and with symptoms of depression associated with depressed affect (feeling depressed and sadness), somatic and retarded activity (feeling bothered, feeling everything was an effort, and problems getting going), and with interpersonal problems (feeling disliked). These associations were consistent over three years in a cohort of farm residents.

We-O-52 POTENTIAL OCCUPATIONAL PESTICIDE EXPOSURE AND SUICIDE DEATH: FINDINGS FROM A NATIONALLY REPRESENTATIVE UNITED STATES COHORT

*van Wijngaarden E.

Background and aims: Several epidemiological studies have indicated that occupational exposure to pesticides, some of which may affect the function of neurons and the transmission of information through the central nervous system, may be a risk factor for suicide and other psychiatric disorders. We evaluated the association between potential occupational pesticide exposure and the risk of suicide death in the National Longitudinal Mortality Study (NLMS). This is a prospective census-based cohort study of mortality among the non-institutionalized United States population (1979-1989).

Methods: The present study was limited to White, Black and Hispanic individuals aged 15 years and older for whom information on occupation was available (n = 307,820). Jobs were classified into three exposure groups: probable (e.g., agricultural workers, gardeners), possible (e.g., food and food service workers, cleaning service workers) and no exposure. Hazard ratios (HR) for the impact of potential occupational pesticide exposure on suicide mortality were computed using Proportional Hazards regression techniques, adjusting for the effects of age, gender, race, marital status, education, income and geographic location.

Results: The estimated prevalence of any potential pesticide exposure on the job was about 17% in this cohort. A total of 360 completed suicides occurred during follow-up, 5.3% (n = 19) and 9.7% (n = 35) of which were probably and possibly exposed to pesticides, respectively, at the start of follow-up. Suicide mortality rates were not greater among individuals in jobs potentially involving pesticide exposure as compared to the unexposed, with an adjusted HR = 0.9 (95 percent confidence interval (CI) = 0.6-1.3) for probable exposure and HR = 0.8 (CI = 0.5-1.2) for possible exposure.

Discussion and conclusions: Potential occupational exposure to pesticides was not associated with suicide mortality in this prospective study, which is limited by the lack of more refined measures of exposure, the focus on completed suicides rather than suicidal behavior or mental disorders, and the inability to account for a number of key suicide risk factors in our statistical model. These findings will be discussed in the context of previous death-certificate based epidemiological studies reporting on the relationship of occupational pesticide exposure with suicide and mental disorders.

We-O-53 PESTICIDES AND MENTAL HEALTH AMONG SOUTHERN BRAZILIAN FARMERS

*Faria NM, Fassa AG, Facchini LA.

Background and aims: Many studies showed that pesticides are neurotoxic, mainly organophosphates insecticides. However pesticides occupational exposure could also be involved in behavioral problems

such as depression, suicides and others. Here are summarized two studies that evaluate the association between pesticides and mental health. It also presents data from two poisoning information systems.

Methods: An ecological study about suicide accomplished in southern Brazilian region evaluated, through linear multiple regression, the standardized rates of suicides. A descriptive study compared data regarding pesticides poisoning information system in Brazil and in a municipality of Bento Gonçalves. A cross sectional study of 1282 family farmers collected information such as agricultural activities, pesticide usage, socio-demographic data, characteristics of the work process and mental health indicators. Minor Psychiatric Disorders (MPD) were measured through Self-Reporting Questionnaire (SRQ-20). Factors associated with mental health indicators were identified using logistic regression.

Results: The standardized rates of suicides were higher among males, older people and in agricultural workers. It was verified a lack of official data about pesticides usage and many limitations regarding pesticides poisoning information. Due to these limitations it was not possible to test the association between pesticides usage and suicides rates.

In a region with better poisoning information system, Bento Gonçalves, annual coefficient was 61.5 poisonings/ 100.000 inhabitants and most pesticides poisonings were occupational. The prevalence of MPD among farmers was 37.5%, being lower in places with higher technology and schooling. Multivariate analyses did not show associations between MPD and pesticide occupational exposure. On the other hand, pesticides poisoning was associated with MPD and with most of SRQ-20 variables, including suicides thoughts.

Discussion and conclusions: Despite the difficulty to disclose what is cause and what is effect, pesticide poisoning was strongly associated with most of mental health indicators. The results suggest that pesticides can play an important role in farmer's mental health and highlight the need of adopting new policies for the protection of agricultural workers' mental health.

We-O-54 PESTICIDE EXPOSURE AND DEPRESSION IN THE AGRICULTURAL HEALTH STUDY COHORT

*Beseler CL.

Background and aims: Depression is a neurological sequelae resulting from high exposures to pesticides, The purpose of this study was to evaluate the relationship between diagnosed depression and pesticide exposure using information from private pesticide applicators and their spouses enrolled into the Agricultural Health Study between 1993 and 1997 in Iowa and North Carolina.

Methods: A nested case control study was conducted. Cases were defined as those ever diagnosed with depression requiring medication. There were 2,051 cases and 27,023 controls in among spouses. Farmer applicators included 644 cases and 19,909 controls. Lifetime pesticide exposure in spouses was categorized as never mixed/applied (reference group), low exposure (up to 225 days), high exposure (> 225 days), and ever diagnosed with pesticide poisoning. For farmer applicators, lifetime pesticide exposure was categorized as low (< 226 days, the reference group), intermediate (226-752 days), high (> 752 days), unusually high exposure (HPEE), and ever diagnosed with pesticide poisoning. Logistic regression analyses were performed relating pesticide exposure to depression.

Results: In spouses, after adjustment for covariates including state of residence, age, race, working off the farm, alcohol, smoking, doctor visits and solvent exposure, depression was significantly associated with a history of pesticide poisoning (OR 3.26; 95% CI 1.72, 6.19). In farmer applicators, after adjusting for state of residence, age, education, marital status, doctor visits, alcohol, smoking, solvent exposure, not having crops or animals and working off the farm, pesticide poisoning was more strongly associated with depression (OR 3.83; 95% CI 2.63, 5.60) than high exposure (OR 1.46; CI 1.11, 1.91) or an HPEE (OR 1.95; CI 1.55, 2.45). Results were consistent in North Carolina and Iowa in both farmer applicators and their spouses.

Discussion and conclusions: These findings suggest that both acute high-intensity and high levels of cumulative pesticide exposure may contribute to depression in pesticide applicators and their spouses.

We-O-55 LONG-TERM OCCUPATIONAL CHLORPYRIFOS EXPOSURE AND SUICIDAL IDEATION AMONG BANANA WORKERS IN HONDURAS

*Wesseling C, Aragón-Benavides A, *Rojas-Garbanzo M, López L, Soto A, van Wendel de Joode B.

Background and aims: Increased suicide rates have been associated with exposure to cholinesterase inhibiting organophosphates (OP). An earlier Central American study among Costa Rican banana workers showed a relation between previous OP poisoning and suicidal ideation. This study evaluated suicidal ideation among banana workers in Honduras, whose job it is to cover the banana fruit with plastic bags impregnated with chlorpyrifos for insect control.

Methods: In this cross-sectional study, baggers (n = 48) were compared to randomly selected unexposed referent workers (n = 46). All were male active workers, under age 50. Baggers worked with full personal

protective equipment. Two thirds had performed the job between 12 - 15 months and one third during less than a year. All but two baggers had detectable levels of 3,5,6-trichloro-2-pyridinol (TCP) in urine (LOD = 19µg/g) vs one referent worker, and plasma and erythrocyte cholinesterase activities were slightly but significantly lower in the exposed group. Questionnaires assessed typical acute OP poisoning symptoms, chronic neurotoxic symptoms (amplified Q-16) and neuropsychiatric symptoms (BSI). The BSI provided a total score, scores for nine different psychiatric domains and the answer to one specific question on suicidal ideation (thoughts of ending one's life).

Results: Baggers had significantly higher symptom scores than referents on the three questionnaires. Among the baggers, acute symptom scores increased significantly with decreasing plasma cholinesterase activity and the BSI score with decreasing red blood cell activity. The baggers had significantly higher BSI scores on the domains of somatization, obsessive-compulsiveness, anxiety, psychoticism and additional symptoms. Eleven baggers vs two referent workers answered positively to the question on suicidal ideation (PR = 5.2, 95% CI 1.2-21.9). Suicidal ideation did not relate to cholinesterase or TCP urine levels. Insufficient variability did not allow the assessment of a possible relation between long term exposure and suicidal ideation.

Discussion and conclusions: Banana workers with daily exposure to the organophosphate chlorpyrifos had evidence of acute as well as chronic poisoning, including important mood alterations. Suicidal ideation was significantly more prevalent among exposed workers. This study adds to evidence on association between organophosphates and suicidal ideation.

NEURODEGENERATIVE DISEASES

We-O-56 PREDICTORS OF DIAGNOSIS AT 30 ALZHEIMER DISEASE RESEARCH CENTERS IN THE US

*Steenland K, Macneill J.

Background and aims: Diagnostic criteria for mild cognitive impairment (MCI) and mild dementia vary widely, even among experienced clinicians. US Alzheimer's Disease Research Centers (ADRCs) have recently created a Uniform Data Set allowing analysis of data across 30 US ADRCs.

Methods: We created a polytomous logistic model with 11 key demographic and cognitive test variables which predicted a diagnosis of normal, MCI, or mild Alzheimer's disease (AD)(CDR Rating<=1). We determined the accuracy of prediction based on the full model, and also based on 2 cognitive tests alone.

Results: Complete data were available for 7576 subjects (mean age 75); 50%, 26%, and 24% of subjects were diagnosed at normal, MCI, or mild AD. The five most predictive cognitive tests were, in order, the Functional Assessment Questionnaire (FAQ, given to an informant), the Mini-Mental States Exam (MMSE), logical memory, category fluency, and Boston Naming tests. The model including these five tests and demographic variables accurately classified 77% of subjects, based on predicted probabilities. After choosing optimal joint cutpoints, two tests alone, the FAQ and the MMSE, accurately classified 75% of subjects. Patients diagnosed by consensus (73%) were 2.7 times more likely to be classified as MCI vs normal than patients diagnosed by a single clinician, while they were half as likely to be diagnosed as AD vs MCI. Given cognitive scores, patients were significantly more likely to be classified as MCI (vs. normal) if they were younger, better educated, male, depressed, or had a first degree relative with dementia. There were substantial differences between centers in the weight given to different cognitive tests, with the most variation seen for the FAQ.

Discussion and conclusions: There are significant differences in the criteria for making diagnoses across different AD research centers in the US. The data suggest that using two simple tests (FAQ and Minicog) with optimal joint cutpoints can just as accurately predict diagnostic category as a full set of demographic variables and five cognitive tests. Consensus diagnosis increases the likelihood of an MCI diagnosis.

We-O-57 ELECTROMAGNETIC FIELD EXPOSURE AND NEURODEGENERATIVE DISEASE

*Gustavsson P, Feychting M.

Background and aims: The prevalence of neurodegenerative diseases is increasing worldwide, partly as a result of an ageing population. A number of environmental exposures have been discussed in the etiology of neurodegenerative diseases. The aim of this study was to summarize the knowledge on exposure to electromagnetic fields and the development of neurodegenerative diseases, especially Alzheimer's disease and Amyotrophic Lateral Sclerosis (ALS).

Methods: Review of published papers with regard to strength of observed associations, consistency and potential confounders.

Results: An association between work in occupations involving contact with electricity and the development of ALS has been noted in a number of studies. This finding is fairly consistent across studies. Exposure to electromagnetic fields has been offered as a potential explanation, but several other mechanisms may be possible, like electric shock.

Some studies of Alzheimer's disease indicate an association with exposure to electromagnetic fields, but this finding is not consistent across studies.

Discussion and conclusions: In conclusion, several studies indicate that work in occupations in contact with electricity may be associated with an increased risk of developing neurodegenerative disease, but mechanisms are unknown and confounding from unidentified coexposures can not be ruled out.

We-O-58 IMPACT OF PRENATAL AND POSTNATAL EXPOSURE TO FOOD CONTAMINANTS ON THE RISK OF PARKINSON'S DISEASE

*Grandjean P, Petersen MS, Halling J, Nielsen F, Brosen K, Bech S, Weihe P, Jorgensen PJ, Wermuth L, Choi AL, Budtz-Jorgensen E.

Background and aims: Due to a doubled risk of Parkinson's disease in the Faroe Islands, we examined the possible importance traditional intake of whale meat and blubber, which contain high concentrations of methylmercury (MeHg) and persistent organic pollutants (POPs).

Methods: We identified a total of 100 prevalent idiopathic PD cases and 72 previously verified cases deceased during the previous ten years. Six controls were matched to each case by age and sex.

Assessment of prenatal exposure was based on detailed records of local whale catches prior to each subject's birth. Examinations in regard to postnatal exposures were carried out for 79 PD cases and two matched controls for each of them.

Results: Calculated prenatal exposures - all of which occurred before the advent of major POP pollution - did not show any difference between cases and controls, despite wide variations in whale availability between districts. However, dietary questionnaire data showed greatly increased odds ratios for consumption of whale meat and/or blubber during adult life. This association was less clear in regard to childhood consumption and absent in regard to recent intake. Mercury concentrations in hair and blood did not differ between cases and controls. However, POP concentrations in serum were increased in the cases, with beta-hexachlorocyclohexane showing the largest and significant difference.

Discussion and conclusions: A history of high intake of whale meat and blubber, both of which contain neurotoxic contaminants, was significantly associated with the development of Parkinson's disease, thus supporting the notion that exposure to such substances may promote the development of neurodegenerative disease.

We-O-59

(Author did not attend conference.)

We-O-60 TRICHLOROETHYLENE: PARKINSONISM AND COMPLEX I MITOCHONDRIAL NEUROTOXICITY

*Hudson NL, Gash DM, Rutland KT, Sullivan P, Bing G, Cass WA, Pandya J, Liu M, Choi D, Hunger R, Gerhardt GA, Smith CD, Slevin JT, Prince TS.

Background and aims: Several environmental toxins have been associated as risk factors for Parkinson's disease (PD). Some environmental toxins have been implicated to induce mitochondrial dysfunction in the substantia nigra dopamine neurons. Trichloroethylene (TCE), is one such chemical, commonly used as a degreasing agent for metals, and a common household product ingredient in items such as spot removers and was also used in dry cleaning. TCE is an environmental contaminant found in at least 852 of 1,430 Superfund priority sites. A cluster of PD patients were found that were exposed to TCE. A cohort study was then conducted of 31 industrial workers that were also exposed to TCE and worked closely with those from the PD cluster. The aim of this study was to determine if TCE played a role in the participants developing PD.

Methods: The participants in the study received a physical and neurological exam, and were also rated on the Unified Parkinson's Disease Rating Scale. The participants fine motor movement was also tested using a Movement Analysis Panel, and an occupational history survey was conducted. Animal studies were also conducted to determine if TCE was toxic to the nigrostriatal dopamine system. The experiments analyzed mitochondria Complex I toxicity, since other environmental toxins, such as MPTP, have used this mechanism.

Results: The three workers in the cohort study, which had PD, were adjacent to the TCE source and were exposed via inhalation and dermal contact. Those more distant from the source who only experienced chronic respiratory exposure had many features of parkinsonism, including significant motor slowing.

The animal studies showed mitochondria impairment in the midbrain, striatonigral fiber degeneration, and loss of dopaminergic neurons after being given trichloroethylene orally for six weeks.

Discussion and conclusions: These studies imply that trichloroethylene is a mitochondrial neurotoxin and could be a risk factor for PD, thus warranting further investigation.

We-O-61

(Author did not attend conference.)

COMMUNITY INTERVENTION AND POLICY

We-O-62 INTERVENTION METHOD FOR ACCIDENT PREVENTION AT HARBOR AUTHORITY, LA HABANA, CUBA

*Robaina-Aguirre C, Ávila-Roque I.

Background and aims: To develop an educative intervention method for worksite accident prevention

Methods: The method was developed in three stages: diagnosis, intervention and evaluation. During the diagnosis the accident related behavior was evaluated at the Harbor Authority AGEMPORT. This was done in two enterprises with the highest accident rate in the past five years. One (Haiphong) was selected for intervention, the other (Juan Manuel) as the control. Target group was stevedores (122 + 105), based on their high accident rate. Intervention was focused in actions to reduce human error. Quantitative and qualitative techniques were applied. The activities involved the occupational health and safety unit (OHSU), the employers, and the stevedores. The employers received training in safety and health at a workshop and a training course before and during the intervention. The stevedores were offered a questionnaire of accident perception, a system of safety observation during work, a Colombian self-training package on accident prevention (Momento Sincero), a poster, group discussions and a video presentation

Results: During the first year of intervention, the perception at risk of accidents, safety behavior and preventive work organization improved significantly in the intervention group, relative to the controls. Prevented fraction of accident rate at the intervention group was 46%

Discussion and conclusions: Intervention was evaluated as effective. Such interventions should be reinforced by passive strategies in order to further improve the impacts

We-O-63 COMMUNITY-BASED PARTICIPATORY RESEARCH FOR PREVENTION:

*Garside L, Anger WK.

Background and aims: This report describes the community-based participatory research conducted in Oregon's vineyard industry, focus a grant application on training that melded vineyard work skills and safety, with special emphasis on training that would improve their promotion potential (employee basics, supervisor skills, pesticide applicator skills).

Methods: A community-based participatory research was conducted in Oregon's vineyard industry by a University and a Salud clinic (the community partner) to focus a grant application on training that melded vineyard work skills and safety. The methods involved agreements between the community partner and a University and guidance by an advisory committee consisting of vineyard executives, vineyard managers, vineyard workers, academics and community partners. The process of developing this community-based participatory research will be described.

Results: Eight training topics have been developed and pilot tested in vineyard workers. The Advisory Committee has guided and supported this development by providing information on the training topic and arranging for the piloting to take place at their vineyards. The community partner has ensured recruitment for the piloting and participation by the vineyard organizations.

Discussion and conclusions: The Community-Based Participatory Research process allows the development of projects that foster cooperation and trust between the research participants who recognize their needs and the research scientists who know the methodology to conduct the research.

We-O-64 THE IMPORTANCE OF QUALITATIVE TECHNIQUES FOR IDENTIFYING DETERMINANTS OF EXPOSURE IN EPIDEMIOLOGICAL STUDIES

*Barraza D, Sosa L, Gutiérrez M, Córdoba L, Rojas M, Jansen K, Wesseling C, van Wendel de Joode B.

Background and aims: The aim was to study the social, cultural and gender context of environmental pesticide exposure.

Methods: Key actors helped us to identify two communities located in Talamanca, Costa Rica, nearby, either banana (multinationals) or plantain (small scale) plantations. Eight focus groups were held among mothers and fathers (separately) of children aged 7, to learn about their perception of pesticides. Children

(n=42) aged 6-8 were informally interviewed about activities performed during leisure time. Also non-participatory observations were made, and villagers were interviewed during casual meetings.

Results: Parents from both communities considered pesticides as a something good for plantations, but dangerous for people's health. Parents from both communities identified several routes of exposure, which were considered similar for boys and girls. The small farmers were used to take their children to plantations to teach them how to work. House-wives recognized fewer routes than the rest. While the Focus Groups discussion were progressing, participants were asking themselves many questions about pesticide use and its possible adverse effects on their children. Parents from communities were eager to learn more about pesticide exposure and its health effects. In general, villagers were more willing to speak during Focus Group discussions than during casual, one-to-one meetings.

Nine children (45%) from the banana, and 21 children (88%) from the plantain community, commented to enter plantations, with or without their parents. They mentioned several reasons such as: to help their parents, to play, to bring their father's lunch, to pick-up bananas, or to go fishing.

Although forbidden, children were observed to bath themselves in the irrigation canals of the banana plantations.

Discussion and conclusions: The focus groups, informal interviews, and observations gathered information on exposure determinants that would not have been identified with traditional epidemiological methods for data collection, such as structured questionnaires. Preferably, several qualitative methods are used, since they supplied different information. Exposure was related to poverty and cultural aspects. Qualitative techniques should be used more often in epidemiological studies to reveal social, cultural, and gender-related determinants of exposure.

We-O-65 EFFECTIVENESS OF OCCUPATIONAL INJURY PREVENTION POLICIES IN SPAIN

*García A.

Background and aims: After a serious accident occurred in a shipyard of Valencia's city (Spain) in 1997, with a result of 18 dead workers, some regions were prompted to develop specific preventive interventions against occupational injuries (called preferential action plans) focused on those companies with high number of occupational injuries. In this study we examine the effectiveness of these plans.

Methods: We included 3,252,028 occupational injuries with sick leave occurred between 1994 and 2004 at company premises by mechanical types and in manufacturing and private service companies in Spain. Time trend for occupational injury rates were estimated for each region before and after preferential action plans were developed, defining also as a control group those regions where no plans were carried out during the study period. Annual change percentages and their 95% confidence intervals were obtained through negative binomial regression model. Regions were further grouped in three categories according to formal quality of their preferential actions plans (PAP). Regions of Galicia, Madrid and Cataluña were the reference group.

Results: The group of regions with the best PAPs (Andalucía, Aragón, Valencia and Murcia) increased occupational injury rates by 2.3% (95%CI -2.5% +7.4%) annually before started PAP. Conversely, after PAP started, rates of this group decrease significantly (-7.4%, 95%CI -10.2% -4.5%). But similar results were also found for good, fair, and even control group. A pattern that was very similar by sex, age group, type of contract and length of employment of the injured workers.

Discussion and conclusions: The first conclusion was that PAPs were not effective. However, the question about what explains the descending trend of occupational injury rates since 2000 remains. An alternative hypothesis could be that social agreement between central government and social agents (trade unions and employees), reached in 1998, mobilized health and safety inspection and enforced regulations and penalties in all Spanish regions, without forgetting an increase of union representatives in occupational hazard prevention activities

We-O-66 A TRAINING INITIATIVE FOCUSED ON VINEYARD SKILLS AND SAFETY IN OREGON (USA)

*Anger WK, Patterson L, Fercho H, Fuchs M, Rohlman DS, Garside L.

Background and aims: A community-based participatory research project was conducted in Oregon's vineyard industry to improve the work skills and safety promotion potential of worker. The goal was to develop a prevention program that would appeal to employers, improve the lot of the workers and also reduce the danger of work hazards including exposure to pesticides.

Methods: Computer-based training developed through piloting with Latino agricultural workers with limited education served as the study method. Topics included seasonal skills, employee basics, pesticide applicator training, supervisor skills, and stretch and flex. Training was developed through discussions with vineyard managers and observation of employees working in the vineyards. Each topic was then

piloted with 5-50 workers to obtain feedback that led to revisions of the training. The training was then administered to workers during their work year at the beginning of the season for which it was appropriate, and acceptability, knowledge, and observation of skills and safety performance in the vineyards was observed before and after the training.

Results: Participants reported that they liked the training and demonstrated improved knowledge that was statistically significant, after taking the training. Field observations are in progress.

Discussion and conclusions: The training improved basic knowledge of vineyard workers about important skills and safety procedures that related to hazards including pesticides, and it led to increased self-confidence among trained workers based on subjective observations.

We-O-67 PESTICIDE EXPOSURE AMONG SOUTH INDIAN FARMERS: ADDRESSING GAPS FOR EFFECTIVE RISK COMMUNICATION

*Chitra GA, MURALEEDHARAN VR.

Background and aims: The aim of the paper is to assess the extent of pesticide usage and to understand pesticide application practices among betel vine farmers of Thanjavur District in South India. As sources of information about pesticide usage can be an important link between farmers' behaviour and undesirable health impacts, important policy decisions on pesticide risk communication can be made by studying the factors mentioned above.

Methods: 141 betel vine farmers were interviewed during a cross sectional survey. Trained interviewers administered pre-tested interview schedules to farmers, in their place of work. Data analysis was done with SPSS statistical package.

Results: All the betel vine farmers sprayed pesticides (141), of which 15 (10.6%) were professional sprayers and were directly exposed to pesticides. Prevalent handling and spraying practices suggest an increased risk of exposure to pesticides which comprise practices like the use pesticides of either "moderately" or "highly hazardous" category (75% of farmers), non-use of any protective gear while handling pesticides (89.4%), mixing of different brands of pesticides with bare hands (31.9%), chewing of gum or tobacco while spraying (33.3%) etc. As an offshoot of such practices, many farmers reported at least one sign or symptom of pesticide exposure. However, risk communication for safe use of pesticides through credible sources was minimal. Public agricultural extension network was considered to be a source of information only by 6% of the farmers. 56% of farmers obtained information from private retail shop owners.

Discussion and conclusions: The farmers are being exposed to different pesticides in varying concentrations. Multiple exposures can lead to multiple health effects; either acute or chronic. Assessment of pesticides used and related practices helps in understanding the exposure pathways. The perception of risk with respect to pesticide exposure and its environmental and health impacts affects the pesticide application practices. The non-use of personal protective equipment could suggest the lower perceived risk to pesticides. Effective risk communication through IEC campaigns and incentives are required to influence pesticide usage and increase in use of protective gear.

Poster Exhibition

BIOMONITORING

We-P-1 BLOOD LEAD LEVELS IN A LEAD-ACID BATTERY FACTORY FROM 2000-2004

*Dozva RN.

Background and aims: This study reports on the blood lead levels amongst employees of a lead-acid battery plant in Zimbabwe employing 250 workers for the period 2000-2004 by year and activity. It also examines the trend in comparison to the national guideline, regional and international standards for blood lead. Zimbabwe does not have a national standard but uses 70µg/dl as a guideline.

Methods: The company's records of routinely collected blood lead samples were utilised. These are analysed by an accredited occupational hygiene laboratory. Nine sections of the plant were grouped into 3 departments based on the potential for exposure to lead: Low or no exposure (Finance+.); Moderate exposure (Engineering+.) and High exposure (Furnace+.). Data were analysed by department but limited

to workers who have worked for at least 6 months at the company. An annual sample of 150 was selected using the stratified sampling method and proportionate stratified samples obtained. Data were analyzed using Excel and SPSS packages.

Results: The average blood lead levels over 5 years was 29.56µg/dl for the Low exposure, 48.34µg/dl for the Moderate and 56.98µg/dl for the High exposure departments. The differences were statistically significant between departments ($P = 0.001-0.004$) and less significant between Moderate and High exposure departments especially years 2001 -2003. This might be associated with frequent plant breakdowns. Overall there was a general decline in blood lead levels over the study period which can be attributed to the introduction of some elements of a safety and health management system in the plant. Workers with blood lead levels at or above 70µg/dl were relocated to low exposure areas for periods not less than 3 months where they underwent a clinic-counselling programme. Workers with blood lead levels at or above 80µg/dl are removed from work.

Discussion and conclusions: Although 90% of the blood samples complied with the national guideline of 70µg/dl, only 58% of the samples complied with the regional standards and 39% with international standards. The World Health Organisation recommends a limit of 40µg/dl implying that the current national guideline does not provide acceptable worker protection. There is thus an urgent need to address these issues in this industry.

We-P-2 LEVELS OF SANGUINE LEAD IN NEWLY BORN OF OROYA, 2004-2005

*Villa-Becerra H, Salazar GP, Ticona O, Yanque G, Cervantes Acosta G.

Background and aims: Since 1922, adults and children in La Oroya, Perú-a mining town in the Peruvian Andes and the site of a poly-metallic smelter-have been exposed to the toxic emissions and wasters from the plant. The objective is to know the lead levels in blood of the newly born, in the city of Oroya.

Methods: Study descriptive, transverse, prospective with analytic components, carried out among June from the 2004 to June of the 2005, of a representative sample of newly born of Oroya (93 RN). The lead levels were determined in veined blood, using the spectrofotometry for atomic absorption with flame air of acetylene.

Results: 93 were evaluated newly born; the level lead average in blood was of 8.84 ug/dl, with a D.S 0.57; 70 newly born (75.3%) had lead levels in blood of 6,0 - <10 ugr/dl, and 23 newly born (24.7%) more than 10 ugr/dl.

Discussion and conclusions: The newly born of the city of Oroya present lead levels in elevated blood. It's necessary to begin programs of prevention in the gestating mothers to avoid futures and probably damages to the health of the newly born.

We-P-3 METALS IN PEOPLE EXPOSED TO TOXIC SUBSTANCES AT THEIR WORKPLACE, CHILE

Cortes S, *Fortt A.

Background and aims: In Chile, there is no published data on biologic monitoring of metals in the general population nor in workers, except for urinary arsenic. In the general population it is possible to identify people exposed to metals at their workplace. The results of the determination of total arsenic, inorganic arsenic, copper, mercury, nickel and lead in people that reported various economic activities of possible contact with metals are presented. The objective is to measure the concentration of toxic metals in a sample of adults that perform various economic activities in which contact with metals occur.

Methods: Transectional study done in 2006 at Chañaral, Third Region, Chile. A questionnaire for exposure was used and concentration of metals (As, Cu, Ni, Hg and Pb) were determined on urine samples (ICP-MS) provided by adults.

Results: Only 28 persons from the total sample (200) reported being exposed at their workplace to dangerous substances. Those who melt car batteries to prepare weights for artisan fishery present high total arsenic concentrations (69,8 µg/L), copper (34,85µg/L) and mercury (5,65 µg/L), with significative differences with the non-exposed group. Workers of printing shops showed the highest nickel concentrations (6,80 µg/L). Other economic activities, related to motors, gasoline sale, handling of vehicle batteries and pesticides did not show high levels of urinary metals.

Discussion and conclusions: Measured concentrations, despite the simple size, show that even when people believe not being exposed to metals at their workplace, identify activities in which metal exposure occurs. Other sources of exposure are not ruled out (fish or seafood consumption, or tobacco use). Total arsenic and mercury levels are below the biological reference values ruled for workers in Chile. There are no such values for inorganic arsenic, copper nor lead for workers.

We-P-4 USE OF MANGANESE-IRON RATIO IN BLOOD FOR ASSESSMENT OF MN EXPOSURE AMONG SMELTING WORKERS

*Zheng W, Cowan DM, Zou Y, Shi X, Chen J, Fan Q.

Background and aims: Reliable biomarkers for manganese (Mn) exposure are not available at present. The purpose of this cross-sectional study was to establish a distinct value that allows distinguishing Mn-exposed subjects from the general, Mn-unexposed healthy population.

Methods: The study was conducted in Zunyi city, Guizhou, in China. Mn-exposed ferroalloy smelters (n=95), power distributing and office workers (122), and unexposed control subjects (106) were recruited to the high, low and control group, respectively. Biological matrices (saliva, plasma, erythrocytes, urine, and hair) were obtained from participants. Concentrations of Mn and Fe in bio-matrices were determined by AAS.

Results: Airborne Mn levels were 0.003 mg/m³, 0.03 mg/m³ and 0.18 mg/m³ for control, low and high exposure groups, respectively. Mn concentrations in all bio-matrices were significantly higher in both exposure groups than those in controls. Fe concentrations in plasma and erythrocytes, however, were significantly lower in Mn-exposed workers than in controls. A concept of Mn/Fe ratio (MIR) was then developed with the numerator (Mn) to reflect Mn exposure and the denominator (Fe) to indicate a biological alteration. The MIR for erythrocytes (eMIR) and plasma (pMIR) exhibited a significant exposure-group related increase. Linear regression revealed that the airborne inhalable Mn level was significantly associated with eMIR (r=0.77, p<0.01) and pMIR (r=0.70, p<0.01). Among all determinants, only eMIR and pMIR were significantly associated with smelter's years of employment. The cut-off value (COV), above which workers are considered to be Mn-exposed, was established using the receiver-operator characteristic analysis. At the eMIR COV of 8.8, about 88% of the high exposure smelters had an eMIR above the COV, while 87% of controls had an eMIR below the COV.

Discussion and conclusions: Our data suggest that chronic occupational exposure to Mn in smelters increases Mn and decreases Fe in erythrocytes and plasma. The eMIR exhibits a good correlation with airborne Mn levels and worker's employment years. With a cut-off eMIR value of 8.8, we have confidence to distinguish Mn-exposed workers from unexposed, control population. Mn exposed workers, by our own definition, are those who have been chronically exposed to high levels of Mn in environment, yet who have not developed the clinical syndromes of manganism.

We-P-5 EFECTIVIDAD DIAGNÓSTICA DE LOS ANTÍGENOS OBTENIDOS A PARTIR DE HONGOS UTILIZADOS COMO BIOPLAGUICIDAS PARA LA DETECCIÓN DE ANTICUERPOS ESPECÍFICOS EN TRABAJADORES EXPUESTOS

*Díaz Padrón H, Pauste Ruiz H, Linares Fernández E, Guevara Andreu E, Villalba L, Novas AJ.

Background and aims: Actualmente, el uso de bioplaguicidas en la agricultura es cada vez mayor por considerarse altamente selectivos, ambientalmente inofensivos y de utilización segura para el hombre. Entre estos se destacan los producidos a partir de los hongos *Beauveria bassiana* (Bb), *Metarhizium anisopliae* (Ma), *Trichoderma* spp (T), y *Verticillium lecanii* (VI). Nuestro objetivo fue demostrar la efectividad del antígeno elaborado por nuestro centro para poder hacer el diagnóstico específico de la Neumonitis por hipersensibilidad ocasionada por inhalación de las esporas de los hongos utilizados como bioplaguicidas.

Methods: Se realizó un estudio transversal a 84 trabajadores expuestos, provenientes de los Centros de Reproducción de Entomófagos y Entomopatógenos (CREE) de las provincias Guantánamo y Santiago de Cuba. El grupo referente constituyó 40 trabajadores de otras entidades no expuestos a este factor de riesgo. Los sueros de los trabajadores fueron analizados por el Ensayo Inmunoenzimático (ELISA), utilizando para ello los antígenos específicos, obtenidos en Cuba por el INSAT con la colaboración del BIOGEN, a partir de los hongos *Bauveria bassiana* (Bb), *Metarhizium anisopliae* (Ma), *Trichoderma* sp(Tsp) y *Verticillium lecanii*(VI) usados como bioplaguicidas. La efectividad del diagnóstico se determinó según los valores de Sensibilidad y Especificidad y los valores Predictivos del resultado positivo y negativo respectivamente de acuerdo a la definición de Galeno y Gambino.

Results: Los procedimientos empleados en esta investigación nos permitió ratificar la efectividad diagnóstica de los Antígenos de Bb, Ma, Tsp y VI elaborados por el INSAT. La probabilidad de que un individuo expuesto sea clasificado como expuesto expresado en términos de sensibilidad fue de 80.9 %, la probabilidad de que un individuo no expuesto sea clasificado como tal de acuerdo a su especificidad fue de 95 %. Los valores predictivos positivos y negativos fueron del 97 y el 71.4 % respectivamente, los cuales son considerados niveles adecuados de acuerdo al método de diagnóstico del Test ELISA empleado.

Discussion and conclusions: El antígeno obtenido a partir de los hongos utilizados como bioplaguicidas tiene efectividad diagnóstica de acuerdo a lo que está establecido en estos casos y se requiere realizar la extensión de la prueba a los restantes CREE del país para obtener una mejor confirmación.

We-P-6 PARAOXONASE (PON1) ACTIVITIES AND GENOTYPE DISTRIBUTION AMONG CHINESE, MALAY AND INDIAN WORKERS IN SINGAPORE

*Chia S, Mohamed Ali S, Ong Y.

Background and aims: Organophosphates (OPs) are widely used as pesticides and even in chemical warfare. OP exposure may cause detrimental health effects mainly through inhibiting acetylcholinesterase (AChE). We investigated the exposure of pesticide workers in Singapore who use OPs and established the PON1 Q192R genotypic distribution locally.

Methods: The study population consisted of 103 pesticide workers and 91 workers from a lead stabilizer factory as controls. Each worker was interviewed by a trained interviewer. The exposed group was interviewed for symptoms of OP exposure. Blood was taken for measurement of PON1 levels and activities, and AChE levels; and genotyping of a common PON1 polymorphism, Q192R.

Results: The total study population consisted of 38% Chinese, 89% Malays and 17% Indians. There were more Malays in the exposed group (64 vs. 22) and less Indians (2 vs. 31) and these differences were significant ($p < 0.001$). Since PON1 activity has been shown to vary widely between ethnic groups, our analysis was stratified into the different ethnic groups. PON1 activity towards paraoxon and diazoxon was 250.1 U/L (range: 4.9 - 626.5 U/L) and 1677.7 U/L (522.7 - 4186.2 U/L) respectively. There were significant differences of PON1 levels between the ethnicities ($p = 0.025$). Among the ethnic groups, the Chinese and Malays had similar means and these were significantly higher than that found in the Indians ($p = 0.001$). Exposed Chinese and Malay workers had significantly higher PON1 levels than their unexposed counterparts ($p < 0.001$). This difference was not found among Indian subjects. Stratified by ethnicity, the distribution of the different PON1 Q192R genotypes did not differ significantly between exposed and unexposed groups. A plot of paraoxonase vs diazoxonase activities which shows "PON1 status" classified the genotypes of the subjects into QQ, QR and RR clusters, which was verified by genotyping. Regression of PON1 activity and genotype gave an R^2 of 58.2% ($p < 0.001$).

Discussion and conclusions: There were obvious differences in genotypic distribution of the PON1 Q192R allele between ethnicities. These differences have an effect on paraoxonase and diazoxonase activities of PON1 and should be considered when studying OP exposure.

We-P-7 CRITICAL EVALUATION OF ACETYLCHOLINESTERASE AS A SCREENING INDICATOR OF CHRONIC LOW-DOSE PESTICIDE EXPOSURE IN FLORICULTURE WORKERS IN ECUADOR AND PROPOSAL OF AN ALTERNATIVE TEST BATTERY FOR CHEMICAL EXPOSURE ASSESSMENT

*Straka NC.

Background and aims: Depressed erythrocyte acetylcholinesterase (EACHe) activity is frequently used as a tool to assess the health of agricultural workers in both low- and high-income countries. EACHe activity can accurately detect cases of acute pesticide poisoning but its use as an indicator of low-dose chronic OP and carbamate exposure is questionable. This study examines the sensitivity of EACHe activity to detect individuals experiencing effects of low-dose chronic pesticide exposure. We propose a low-cost test battery combining a series of neurobehavioral, symptomological, hematological and other biological examinations for use to effectively evaluate the health of agricultural workers.

Methods: 160 floriculture workers in Cayambe, Ecuador, occupationally exposed to OP and carbamate pesticides, were examined for neurobehavioral deficits and were compared to a non-exposed control group. Selected tests from the Neurobehavioral Evaluation System 2 (NES2) were performed to evaluate response speed, coordination, complex functioning, attention and memory. Dexterity and grip strength tests were conducted along with several questionnaires which profiled mood, symptoms, stress and work history. Tests to detect deficits in neurotransmission, renal, hepatic, hematological, immune, fine motor and genetic functioning were also completed. These tests were used a standard to calculate the sensitivity, specificity and predictive value of EACHe in detecting those experiencing symptoms of low-dose chronic OP and carbamate exposure.

Results: Significant differences between control and exposure groups were detected on the series of NES2 tests including finger tapping, hand-eye coordination, simple reaction time, symbol digit substitution and pattern memory ($p < 0.01$) after correcting for age and education variables. EACHe activity was not significantly correlated to poor performance on neurobehavioral tests nor to increased neurotoxic symptom prevalence. It was found that EACHe was insensitive in detecting true positive cases of individuals experiencing neurotoxic effects (<60% sensitive and specific).

Discussion and conclusions: EACHe should not be used as the sole public health measure to detect individuals suffering from low-dose chronic OP and carbamate exposure. We address the need to develop alternative test methods to assess the health of agricultural workers which can be readily used in developing countries. We propose a low-cost test battery which we prove to be highly sensitive and specific in identifying these symptoms.

ECOHEALTH

We-P-8 EXPOSICIÓN AL MERCURIO ASOCIADA AL CONSUMO DE PESCADO PROCEDENTE DEL RÍO SAGUA LA GRANDE: UN ENFOQUE ECOSISTÉMICO.

*De La Rosa Medero D, Rodriguez La Rosa Y, Olivares Rieumont S, Lima Cazorla LA, García Céspedes D, Garrido ME.

Background and aims: El trabajo se enmarca en el estudio de la exposición al mercurio por el consumo de pescado procedente del río Sagua la Grande. Para el estudio se tomó en cuenta el contexto social en que se enmarcan en dos pequeñas vecindades de la ciudad de Sagua la Grande, Villa Clara, Cuba.

Methods: La estimación del consumo de pescado fue realizada utilizando un cuestionario de frecuencia de alimentación (CFA) a 127 pobladores. Para la estimación de la ingesta semanal del mercurio se utilizaron los niveles de mercurio total (THg) encontrados en tres especies de peces que consume la población en la zona de estudio.

Results: El promedio de THg y MeHg en peces del río fue de 0.33 ± 0.05 $\mu\text{g/g}$ y 0.28 ± 0.06 $\mu\text{g/g}$, respectivamente, para un 84 % del contenido de THg.

En general, los resultados preliminares muestran que el consumo semanal promedio de pescado de 482 g, la ingesta semanal (IS) de THg y MHg de 2.72 $\mu\text{g/kg pc}$ y 2.28 $\mu\text{g/kg pc}$ respectivamente. IS de MHg estimada es superior al valor establecido para la ingesta semanal tolerable provisional (ISTP) por OMS/FAO. El estudio de género arrojó que las mujeres en edad reproductiva y en específico las mujeres embarazadas presentan una exposición superior que los hombres, lo que pudiera constituir un riesgo a la salud de la población estudiada.

Discussion and conclusions: Utilizando los criterios del enfoque ecosistémico a la salud humana y partiendo de la dosis de referencia recomendada por la EPA (1997), los autores proponen a las autoridades sanitarias y ambientales un diseño de una estrategia donde se aplique un “consumo saludable” de pescado procedente de la zona de estudio para disminuir los riesgos al mercurio y sus efectos de salud asociados al consumo de pescado, sobre todo en los grupos vulnerables (niños y mujeres en edad fértil).

We-P-9 WATER AND HEALTH: AN ECOSYSTEM APPROACH TO HUMAN HEALTH IN AN UNDERSERVED TOWN IN LEBANON

*Hojeij S, Nuwayhid I, Habib RR, El-Fadel M, Zurayk R.

Background and aims: A transdisciplinary research team has worked closely with an underserved community in North Lebanon over the last 3 years to understand access to water, its quality and impact on health specifically enteric diseases. This paper presents the strengths, challenges, and limitations of the Ecohealth approach in this project funded by IDRC-Canada.

Methods: The town was approached in 2005 to study the exposure of agricultural families to pesticides. However, the municipality reoriented the research objectives due to local concerns about water quality and enteric diseases. Hence, new members were added to the multidisciplinary research team to include experts in health, agricultural sciences, environmental engineering, community development, and public policy. An advisory committee of active and esteemed men and women in the town and researchers' representatives was established to oversee and guide the project. This committee held monthly meetings, and closely organized its activities with a field coordinator who visited the town on a daily basis. Project activities included three household surveys (2005, 2006, 2007), a detailed GIS map, monitoring water quality on a monthly basis in 20 sources and twice in a sample of households before and after the first rain, and a series of town meetings, workshops, and focus groups. The advisory committee had a strong input into all activities and data were collected by well-trained community women.

Results: Fecal contamination is one but not the only cause of enteric diseases in the town. Hygiene and overall sanitation are important contributors. Evidence guided our interventions such as installing a water disinfection unit and developing relevant health messages. The municipality and the advisory committee are keen on further collaboration.

Discussion and conclusions: Community participation was instrumental for the success of this project despite the political upheaval that shook the country since 2005. Nonetheless, applying transdisciplinarity and community participation are challenging. The town remains reluctant to play a leading role in addressing the problems. Sustainability of the achievements necessitates further intervention by the research team. Women and other marginalized groups are heard but are not yet influential in impacting their current situation. The biggest challenge remains translating these findings to policy changes in and beyond the town.

We-P-10 CONTAMINACIÓN AMBIENTAL POR METALES PESADOS Y LOS IMPACTOS EN LA SALUD DE LOS NIÑOS EN LA CUENCA DEL RIO PUYANGO, ECUADOR

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Background and aims: La investigación realizada en el Suroeste del Ecuador se relaciona con la pequeña minería del oro y los impactos en el ambiente y en la salud humana.

Methods: Se aplicó la triangulación metodológica y el trabajo transdisciplinario, combinando técnicas cuantitativas y cualitativas, con enfoque ecosistémico

Results: 1. En la cuenca del Puyango se encontraron cantidades importantes de metales pesados (mercurio, plomo, manganeso) y arsénico, especialmente en los suelos, material particulado y sedimentos. Estos estuvieron en menor cantidad en la fracción disuelta en el agua. 2. Uno de los resultados innovadores de esta investigación es la ausencia de metilmercurio en el río Puyango, a pesar de existir niveles nada despreciables de mercurio inorgánico, las características particulares de este ecosistema explica las razones de este fenómeno que contrasta con múltiples estudios realizados en la Amazonía, especialmente del Brasil. Esta es la razón por lo que no se encuentra metilmercurio en los peces y en el organismo de los habitantes de la cuenca. 3. Algunas especies de peces tienen metales en su organismo, especialmente plomo. 4. En la muestra de niños de 8-12 años tienen metales en su organismo, determinado por el examen del cabello. 5. Se encuentran alteraciones en las funciones del sistema nervioso, detectado con la aplicación de una batería de pruebas neuroconductuales. La aplicación de estas pruebas ha servido, además, para determinar en los niños las bondades y limitaciones de las mismas. 6. Los resultados de los distintos estudios han permitido llevar a cabo varias intervenciones para precautelar la salud de las comunidades ribereñas, a través de una amplia participación de los distintos actores sociales. 7. Se identificó roles inequitativos de hombres y mujeres en el trabajo de la minería en la cuenca alta del Puyango.

Discussion and conclusions: La contaminación por metales pesados y metaloides (Hg, Mn, Pb y As) se debe a la minería. Es casi inexistente el metilmercurio en el eje central del río, en contraste con resultados de estudios en ríos y lagos de América. Varias funciones de los dominios cognitivo, motor, cognitivo-motor, afectivo-emotivos y conductuales se encuentran relacionadas con la presencia de los metales pesados en el organismo y con los eventos de exposición de los niños.

We-P-11 EVALUACIÓN DEL ESTADO DE SALUD Y DE EXPOSICIÓN A METALES Y AGENTES VIRALES EN NIÑAS, NIÑOS Y ADOLESCENTES (NNA) QUE TRABAJAN, O TRABAJARON EN EL BOTADERO DE TEGUCIGALPA Y UNA POBLACIÓN DE REFERENCIA.

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Background and aims: El rápido crecimiento de la Ciudad de Tegucigalpa, ha incrementado la generación de residuos sólidos. Estos son dispuestos inadecuadamente en el botadero municipal, el cual es frecuentado, dependiendo de la época del año, por unos 172 NNA menores de 18 años, quienes recuperan materiales informalmente y se exponen a agentes biológicos, físicos y químicos peligrosos contenidos en los residuos sólidos sin ningún tipo de protección personal. Objetivos: evaluar el estado de salud y de exposición a metales y agentes virales, en NNA que trabajan en el botadero municipal de Tegucigalpa y una población de referencia, a fin de identificar los riesgos para la salud y los posibles efectos derivados de sus condiciones de trabajo, en un sitio considerado como fuente potencial de contaminación ambiental.

Methods: El grupo de estudio estuvo constituido por 100 NNA (11-19 años) de Tegucigalpa, clasificados en tres subgrupos: a) 14 NNA que trabajan en el botadero; b) 36 NNA que trabajaron en el botadero; c) población de referencia de 50 NNA no trabajadores residentes cerca del botadero. Del 16 al 18 de agosto de 2005, en el Centro de Salud "Villa Madrid" se tomó signos vitales, peso y talla, aplicándose además un formulario estandarizado y la toma de muestras biológicas de orina y sangre, transportadas al laboratorio de análisis del policlínico Universitario G.B. Rossi de Borgo Roma, Verona, Italia. Los metales fueron analizados con el método ICP-MS.

Results: La fatiga, dolor muscular, insomnio, apatía, tos, dolor abdominal, lesiones de piel fueron más prevalentes en los NNA trabajadores. De los 13 metales analizados, destacó el plomo en sangre con niveles (mediana) de 3.94 ug/dL en los NNA trabajadores, 2.91 ug/dL en los NNA que trabajaron y 2.00 ug/dL en los no trabajadores. Además, 14% de los NNA que trabajadores o ex trabajadores, resultaron con marcadores virales positivos de la hepatitis B y C, contra 4% del grupo de los que no trabajan.

Discussion and conclusions: El estudio demostró que el trabajo informal que realizan los NNA en el botadero municipal de Tegucigalpa, es factor de riesgo de exposición a agentes biológicos, físicos y químicos peligrosos con potenciales efectos nocivos para la salud.

We-P-12 AN ECOHEALTH APPROACH IN A COMMUNITY-BASED STUDY: SOCIAL AND LIFESTYLE FACTORS IN RELATION TO DIARRHEA AMONG CHILDREN

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Background and aims: A multidisciplinary research team applied the Ecosystem Approach to Human Health to determine the prevalence of childhood diarrhea and assess the associated risk factors in a disadvantaged community in North Lebanon. Along with transdisciplinarity, community participation and gender sensitive methods guided the research approach in this study funded by IDRC-Canada.

Methods: A cross-sectional study of 460 children (≤ 5 years) was carried out in September 2006. Community stakeholders and researchers formed an advisory committee that met regularly to discuss the research agenda. A questionnaire was designed taking into consideration the community's concerns vis-à-vis diarrheal diseases. Men and women from the community provided feedback on the questionnaire; accordingly questions were modified to suit the local context. Female interviewers were recruited from the local community, and were trained to administer the questionnaire through face-to-face interviews with female homemakers. The studied variables included socio-demographic, environmental, social and lifestyle factors and diarrhea as the health outcome. Indicators on women's knowledge, beliefs and perceived health were also included following discussions with a group of local women. Multivariate regression analysis was used to study the association between diarrhea and the risk factors.

Results: Twenty percent of interviewed women were illiterate and 90% were not economically active. The analysis showed a prevalence of diarrhea among 21% of the studied children, and an inverse relationship between age and diarrhea. Children, who were not breastfed, walked barefoot, whose mother perceived diarrhea as non-preventable and had negative self perceptions of health, were significantly more likely to suffer from diarrhea.

Discussion and conclusions: The town suffers from underdevelopment and lack of basic services. The low educational level, the inadequate hygiene practices and the lack of knowledge on diarrheal diseases reported by the interviewed women, had direct impact on diarrhea in children less than 5 years. Women's perception and value to health played an important role in predicting diarrhea among children. The study emphasized community participation and a close collaboration with stakeholders, an approach that assisted in building trust and responded to the community's concerns. Further research, preferably qualitative, is needed to understand the role of women in household decision making with regard to child-care practices.

We-P-13 OCCUPATIONAL HEALTH IN CATALONIA (SPAIN)

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Background and aims: Occupational health report is a useful tool to plan and to evaluate public and private policies involving safety and health issues. This report aimed to help the Catalonia Government to assess its occupational health policies.

Methods: The study population was the catalonian active working people. Information was collected from several sources including administrative registers and health and working surveys covering the period 2001-2006. Occupational injuries and diseases, work-related diseases, socio-demographic characteristics, health survey, working conditions, and preventive and clinical services data were analysed to estimate percentages and incidence rates, some of them were adjusted by age and economic activity. Attributable-work mortality and cancer estimations were calculated based on percentages previously defined.

Results: Active working people in Catalonia has increased between 2001 ($n=3,092,800$) and 2006 ($n=3,660,300$) a 18.3%. Estimations of the total number of workers exposed to occupational risks show that mechanical vibrations ($n=424.813$), repetition strain injuries ($n=1.010.881$), and future job insecurity ($n=1.064.976$) are the highest perceived risks. When analyzing health-related behaviour, it is observed that unemployed and temporary workers show higher percentages for smoking, sedentarism and lack of sleep. Regarding morbidity, unemployed workers, workers in nonqualified occupations, temporary job workers, and evening, night or rotating shift workers show a greater perception of poor health status compared to the rest. The incidence of occupational injuries has been reduced 22.3% in the last six years (2001-2006), especially on-the-job fatal occupational injuries (20.6%). Occupational diseases incidence shows an unexpected descending trend while work-related diseases have increased during the same period. It was estimated that 2,607 deaths (86.6% men) in 2005 were work-related, and that 58.2% of these were cancer.

Discussion and conclusions: Though the descending trend of occupational injuries, there are still 182,089 occupational injuries per year, a fatal one every two days, and we estimate that a high number of workers still perceive risk in their workplace, especially those in non-qualified jobs. Among other conclusions, being unemployed or holding a temporary job seems to promote non-healthy habits, and rotating shift work seems to have influence on health status perception. These findings point out the most vulnerable worker groups and should be used to guide occupational health policies.

We-P-14 SERVICIO PREVENTIVO COMUNITARIO EN SALUD OCUPACIONAL Y SU VIGILANCIA: UN ENFOQUE ECO-SISTÉMICO

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Background and aims: Conducir en Cuba el Programa Nacional de Salud Ocupacional de un modo más eficiente y efectivo es un reto. Se realizó un proyecto piloto, que permita desarrollar y evaluar un “Modelo de Servicio Preventivo en Salud Ocupacional a nivel de área de salud (comunitario) con un enfoque eco-sistémico, donde se integren las ciencias de la salud, sociales y naturales y que permite vigilar la salud de los trabajadores en el tiempo.

Methods: El ambito de estudio es el área de salud “Managua”, Municipio Arroyo Naranjo, Ciudad de La Habana. La población “comunitaria” es de +/- 20000 habitantes, distribuidos en 3 asentamientos poblacionales. Es una zona semi-rural, donde los sectores de la industria de materiales de la construcción, la agropecuaria y los servicios son los más importantes.

El modelo con enfoque ecosistémico, consistirá de tres etapas. Primero el diagnóstico, con la caracterización de la situación actual, valorando las potencialidades de los servicios de salud, y la vigilancia de la salud de los trabajadores en el área.

Se evaluará por sector los aspectos de salud, ambientales, sociales, culturales y de género de sus poblaciones y se definirá los momentos de seguimiento. Segundo se procederá a la intervención propiamente dicha, orientándose a dos aspectos fundamentales: la capacitación de los recursos humanos y la puesta en marcha de un nuevo servicio asistencial con carácter preventivo en salud de los trabajadores a nivel del área. Por último se procederá a la evaluación de las acciones emprendidas durante la ejecución del proyecto y su impacto a través de la vigilancia de indicadores de salud.

Results: En este momento se está realizando el diagnóstico en la industria de materiales de la construcción. Se está capacitando a los trabajadores y realizando una evaluación clínica en todos ellos. Además se está ejecutando un estudio ambiental en la empresa, evaluando su impacto en la comunidad y el área.

Discussion and conclusions: Durante el congreso se presentarán los datos del modelo de proyección y extensión de los servicios de salud de los trabajadores de la industria de materiales de la construcción a la comunidad, y las posibilidades para vigilar la salud de estos trabajadores.

We-P-15 EVALUACIÓN DE LA INVALIDEZ LABORAL POR CÁNCER CON ÉNFASIS EN LOS DETERMINANTES DE SALUD PARA UN ENFOQUE ECO SISTÉMICO

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Background and aims: La exposición a sustancias químicas como fuentes de cancerígenos en el ambiente puede producir inestabilidad laboral, y lo mismo afecta al hombre que a la mujer y además ocasiona nuevos padecimientos traducidos, en algunos casos, incapacidad para el trabajo. Nos propusimos determinar la magnitud de la invalidez laboral por cáncer de mama, su relación con la ocupación en los diferentes sectores industriales y determinantes de salud que puedan incidir en la misma.

Methods: Se realizó un estudio a 285 sujetos dictaminados por cáncer procedentes de sectores industriales y servicios. Se realizaron entrevistas personales y visitas a los centros laborales para tomar la información general, estilo de vida, ambiente laboral, antecedentes familiares, servicio de salud, entre otros

Results: El 67% (N 191) de la muestra correspondió al sexo femenino, de ellas un 45,5% (N 87) con cáncer de mama. Un 49% (N 94) usó desodorante transpirante, y fue significativo el hábito de fumar; un 72% (N 137) fuma más de una caja de cigarrillos diaria. La mitad de las mujeres estuvieron expuestas en su historia laboral al menos a un cancerígeno y 115 (60%) no cumplieron con el autoexamen de mama, en especial los de nivel cultural medio.

Discussion and conclusions: Los resultados de esta investigación permitirán hacer intervenciones con énfasis en los determinantes de salud tales como en la educación, condiciones de trabajo para mejorar el ambiente, prácticas de salud personales, servicios de salud, género, entre otros para lograr una prevención primaria y temprana detección, utilizando para ello las redes de apoyo social en la comunidad, como medio para una mayor promoción de la salud, para de esta forma reducir la morbi-mortalidad por esta causa.

LUNG CANCER

We-P-16 DEVELOPMENT OF A QUANTITATIVE GENERAL POPULATION JEM ON SELECTED LUNG CARCINOGENS

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Background and aims: Synergistic effects of occupational carcinogens on the development of lung cancer are largely unknown. Due to low joint exposure prevalence in the general population, a large study population is needed for a sound scientific basis to assess the synergistic lung cancer risk. Hence a pooled analysis of European lung cancer studies will be conducted (Synergy), covering about 15,000 cases and at least the same amount of controls. Occupational exposure assessment in general population studies is however an extremely difficult task, given the numerous potential workplaces. Current methods are often based on expert ratings or job-exposure-matrices (JEMs). Scores are usually dichotomous or semi-quantitative, where a quantitative approach would be preferable. Present aim is to develop a quantitative general population JEM, to enable quantitative exposure assessment within Synergy.

Methods: An exposure database will be developed for five IARC group 1 carcinogens with the lung as established target site and with highest joint exposure prevalence, i.e. asbestos, silica, PAH, chromium and nickel. Quantitative measurement data will be extracted from existing databases. Additional information will be collected by addressing local experts. Consequently, a 'data driven' JEM will be created based on the measurement database. Gaps in the JEM will be filled in by extrapolation, executed based on rules rather than on pure expert-judgment. Rules will be defined by using temporal and spatial trends in the database or literature.

Results: A first inventory resulted in an estimated 80,000 personal and 180,000 stationary measurements of the selected agents available in European databases. Crystalline silica measurements appeared to be most prevalent (54%), followed by nickel and asbestos, 18% and 12% respectively. The majority (>90%) of measurements were collected after 1980. As the latency for lung cancer is quite long, most influential exposures will have taken place in the 60s and 70s, so considerable (back) extrapolation will be required. The envisioned Synergy-JEM will contain at least the following axes: industry (ISIC), job (ISCO), country and time period.

Discussion and conclusions: There is a need for quantitative exposure assessment in general population case-control studies. Measurement-based JEMs might enable studies of health effects of occupational exposures in the general population in a more quantitative way.

We-P-17 ASSESSMENT OF OCCUPATIONAL EXPOSURE TO LUNG CARCINOGENS IN THE SHANGHAI WOMEN'S HEALTH STUDY

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Background and aims: We aim to assess occupational exposure to known and suspected lung carcinogens in a population-based cohort study of women in Shanghai, China by refining traditional methods based on general occupational titles or type of industry.

Methods: Lifetime occupational histories were obtained from 73,366 participants in the Shanghai Women's Health study at enrollment (1997-2000). The women were permanent residents of urban Shanghai and over 99% had worked outside the home for 26 years on average. The work histories contained 171,818 jobs, an average of 2.3 jobs per subject. The jobs were coded by both industry and occupation using Chinese census codes. The codes were matched to two lists of industries and occupations; one list with exposure to known lung carcinogens, and a second list with exposure to suspected lung carcinogens as identified in IARC monographs. Two criteria were used for matching with the lists: (1) one criterion based on both the industry and occupation; and (2) a second criterion that also included blue collar jobs in the same industry or the same occupation in other industries.

Results: Using the first more specific criterion, 0.7% of the women worked in jobs with potential exposure to known lung carcinogens. Using the second less specific criterion, 11.1% of women worked in jobs with potential exposure to known lung carcinogens. Including the suspected carcinogens increased the prevalence to 3.4% of the women using criterion 1 and 19.4% using criterion 2. Some of the more common jobs with exposure to lung carcinogens included painters in the construction and automotive industries, and various occupations in the metal, chemical and rubber industries.

Discussion and conclusions: The estimated prevalence of women who held jobs with potential exposure to lung carcinogens is 0.3-11.1% for known carcinogens and 3.4-19.4% for known or suspected carcinogens. These estimates will be used in epidemiological analyses to determine whether women that held exposed jobs have increased risk of lung cancer.

We-P-18 OCCUPATIONAL RISK FACTORS FOR RESPIRATORY CANCERS (THE ICARE STUDY): DESIGN AND DESCRIPTION OF THE STUDY POPULATION

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Background and aims: A large population-based case-control study (the ICARE study) was set up in France to investigate occupational risk factors for lung and head and neck cancers. The objectives of this presentation are to describe the study design, methods and the main characteristics of the study population.

Methods: The study is a multi-center, population-based case-control study. Cases were identified in collaboration with cancer registries, in 10 French départements, which overall gather about 13 % of the French population (7,6 millions inhabitants). Controls were selected using random digit dialing, in the same départements as the cases, with stratification for age and sex. Subjects were interviewed face to face, using a standardized questionnaire collecting particularly information on tobacco and alcohol consumptions, residential history and a detailed description of occupational history. Biological samples (buccal cells for constitutional DNA) were also collected for study subjects. The main occupational exposures of interest are asbestos, man-made vitreous fibers, formaldehyde, polycyclic aromatic hydrocarbons, some chromium and nickel compounds, arsenic, wood dust, textile dust, solvents, strong acids, cutting fluids, silica, diesel fumes, welding fumes. The complete list of exposures of interest includes about 60 substances. Exposure assessment will be conducted in collaboration with industrial hygienists.

Results: The study includes 3225 lung cancer cases, 2707 head and neck cancer cases, and a common control group of 3591 subjects. Subjects reported on average 4.8 jobs. DNA samples were obtained for 2510 lung cancer cases, 2047 head and neck cancer cases and 3067 controls. Factors related to participation and their potential impact on study results will be presented.

Discussion and conclusions: The large number of subjects should allow to uncover exposures associated with low to moderate increase in risks, and to evaluate risks associated with infrequent and/or widely dispersed exposures. It will be possible to study joint effects of exposure to different occupational risk factors, to examine the interactions between occupational exposures and tobacco smoking and alcohol drinking, to study interactions between genetic risk factors and occupational exposures, and to provide estimates of the attributable risk to occupational exposures for the cancer sites of interest in the French population.

We-P-19 LUNG CANCER MORTALITY AND EXPOSURE TO BIOCIDES IN THE AUTO INDUSTRY

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Background and aims: Exposure assessment studies suggest that airborne endotoxin is highly correlated with mass particulate of synthetic metalworking fluids. Biocide is added to waterbased fluids to limit microbial growth, but may only reduce airborne endotoxin in the short term. Limited occupational epidemiologic evidence also indicates endotoxin is protective against lung cancer. Using biocide as a surrogate measure of endotoxin, we investigated whether lung cancer mortality was inversely associated with biocide exposure in an updated follow-up of autoworkers exposed to metalworking fluids.

Methods: We performed a nested case-control analysis from a retrospective cohort study of 46,399 hourly workers employed in three auto manufacturing plants. Period of follow-up was from 1941 to 1995. Each case was matched by age with 20 controls. Using Cox regression, we estimated mortality rate ratios (MRR) for lung cancer as smoothed functions of cumulative exposure to synthetic fluids (mg/m³-years) and years exposed to biocide using penalized splines in separate models. Models were adjusted for cumulative exposure to soluble and straight fluids, race, gender, and year of follow-up.

Results: There were 1,137 lung cancer deaths at the end of follow-up. A non-linear exposure response was observed for synthetic fluids; with a MRR that decreased to a minimum of 0.54 (95% CI: 0.40-0.87) at the 97.4% percentile (6.0 mg/m³-years) of exposure before rising with wide confidence bands overlapping the null. For biocide, the MRR decreased in a linear fashion with narrow confidence bands down to 0.58 (95% CI: 0.43-0.87) at the 99th percentile of exposure (11.3 years of exposure).

Discussion and conclusions: We have found evidence of inverse risk for lung cancer mortality in association with years exposed to biocide. The less consistent findings for synthetic fluids suggest that exposure to biocide may be a better surrogate for endotoxin exposure in this study.

We-P-20 MESOTHELIOMA MORTALITY AMONG MALE GERMAN ASBESTOS-EXPOSED WORKERS

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Background and aims: To examine the mesothelioma risk of asbestos exposure and pleural thickenings in a subgroup of German workers of the national surveillance program after the asbestos ban in 1993.

Methods: About 110,000 Germans with former asbestos exposure were enrolled in a mandatory surveillance program. A subgroup of 576 formerly exposed males was selected for an advanced health examination with high-resolution computer tomography (HRCT) of the chest between 1993 and 1997. Pleural thickenings and cumulative exposure to asbestos were quantified by expert judgment. A mortality follow-up was conducted through 2007. Standardised mortality ratios (SMRs) were calculated using German mortality rates and death-certificate information. For internal comparisons, information from the German mesothelioma register was included. Poisson regression was performed for mesothelioma

regarding level, duration and time since last exposure, recognized asbestosis, pleural thickenings, and other factors.

Results: Every other worker had pleural thickenings according to the HRCT results at baseline. The follow-up was conducted from median age of 63 until 76 (range 67-84) years in survivors. Overall, less persons (N=128, 22%) died than expected (SMR 0.59, 95% CI 0.49-0.70), including 60 deaths from cancer (SMR 0.85; 95% CI 0.65-1.10). Fifteen mesothelioma deaths were observed in comparison to 0.5 expected cases (SMR 28.1, 95% CI 15.7-46.4). More mesothelioma deaths occurred in workers with pleural thickenings at baseline (RR 2.2, 95% CI 1.0-5.1) or recognized asbestosis or asbestos-related pleural changes (RR 6.2, 95% CI 2.5-15.4). Mesothelioma risk decreased after cessation of exposure (RR 0.1; 95% CI 0.1-0.7 for >30 vs. ≤ 30 years).

Discussion and conclusions: After asbestos ban, mesothelioma mortality was still in excess among formerly exposed workers under medical surveillance but decreased by time since last exposure. Pleural thickenings were a predictor of subsequent mesothelioma.

We-P-21 CASE-CONTROL STUDY OF PLEURAL MESOTHELIOMA IN WORKERS WITH SOCIAL SECURITY IN MEXICO

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Background and aims: Environmental and occupational exposure to asbestos in Mexico in the past has been the cause of deaths and damage to health and its magnitude is unknown to date. Our objectives were to identify the proportion of cases of malignant pleural mesothelioma (MPM) that can be attributed to environmental and occupational exposure to asbestos.

Methods: We carried out a case-control study of MPM in 472 workers insured by the Instituto Mexicano del Seguro Social (IMSS), all Valley of Mexico residents, with 119 incident cases and 353 controls. Cases were confirmed histologically. Surveyees were questioned concerning their occupational history and sociodemographic data. Assignment of exposure was performed qualitatively in 4 categories by an expert hygienist. Odds ratios (ORs) were calculated with non-conditional logistic regression model, as well as attributable risk (AR).

Results: A total of 80.6% of cases and 31.5% of controls had occupational exposure to asbestos. ORs were adjusted by age and gender and by each exposure category, and exhibited an increase with probability of exposure as follows: 3.7(1.3-10.4) for the probable category and 14.3(8-26) for the definitive category, and the AR in occupational asbestos-exposed was 83.2%, and in population AR was 44%

Discussion and conclusions: Our results demonstrate that relationship between industrial uses of all forms of asbestos is generating an increase in mesothelioma-related diseases and deaths among Mexican workers. As a public health policy, Mexico should prohibit the use of asbestos in all production processes with the aim of controlling the epidemic and preventing the presence of new cases of MPM.

Key Words. Pleural mesothelioma, Insured workers, Social Security, Cases and controls, Mexico.

We-P-22 A CASE-CONTROL STUDY OF MALIGNANT MESOTHELIOMA IN SUBJECTS WITH NO KNOWN EXPOSURE TO ASBESTOS

*de Klerk N.

Background and aims: Malignant mesothelioma (MM) is a rare and usually fatal cancer, generally caused by asbestos. However, in many series, up to a third of cases appear to have had no asbestos exposure. This study aimed to identify sources whereby people have been unknowingly exposed to asbestos and to identify other materials which may lead to MM.

Methods: A matched case-control study design was used. Cases were selected from the Western Australian Mesothelioma Register with occupational and environmental histories but with no known exposure to asbestos. Two sets of 2 controls per case were selected from patients hospitalised for conditions unrelated to asbestos: (a) specific cancers (mainly breast and lymphomas), and (b) general medical conditions (mainly accidents and orthopaedic), matched for age, sex, postcode, and year. Occupational and environmental histories were obtained by questionnaire and coded by an expert industrial hygienist as to nature, likelihood, quantity and duration of exposure to 57 substances. Data were analysed using conditional logistic regression.

Results: Eligible cases without asbestos exposure were far fewer than anticipated. After 9 years there were 39 MM cases, 71 cancer and 76 medical controls recruited. Risk of MM was elevated, but not significantly so, after any exposure (probable or definite) to asbestos, silica, pesticides, welding fumes, other fumes, toxic metals, and other substances. There were also increasing risks (again not significant) with increasing quantity and duration of exposure to asbestos, wood dust, silica, pesticides, other fumes, synthetic mineral fibres, and toxic metals.

Discussion and conclusions: Very few people have never been exposed to asbestos and careful elucidation of occupational and environmental histories usually uncovers exposures sufficient to cause MM. It seems likely that most cases of MM in people with no known exposure to asbestos occur, at a very low rate, among the huge numbers of people who have had small amounts of asbestos exposure.

MISCELLANEOUS

We-P-23 ENVIRONMENTAL HEALTH DISPARITIES AFFECTING ASIAN AND PACIFIC ISLANDERS AMERICANS

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Background and aims: Little is known about the differential effect environment has on health among Asian and Pacific Islanders Americans (APIAs). Furthermore, the lack of national data and organized research on environmental health disparities affecting APIA subgroups make it increasingly difficult to create culturally appropriate intervention in this group. The aim of this review paper is to investigate factors (environmental exposure, socio-cultural position, and workplace) that may leave APIAs more susceptible to the burden of disease.

Methods: A review of the literature was conducted using peer reviewed journal articles and publications from health advocacy groups and government agencies to examine environmental exposures and environmentally-mediated outcomes among APIAs.

Results: Segregation of APIAs in U.S. Chinatowns and other ethnic enclaves appear to be correlated with higher exposure to ambient pollution. The promotion of tobacco internationally, the use of traditional herbal medicine product's and dietary practices appear to place APIAs at higher risk of exposure to environmental tobacco smoke and toxic metals. APIA women appear to be at higher risk of exposure to occupational hazards. APIAs appear to suffer disproportionately from certain types of Cancers and have a high prevalence of chronic disease.

Discussion and conclusions: APIAs are comprised of over forty ethnic subgroups. The results suggest there is heterogeneity of exposure within APIA subgroups. More research is needed at the national and local level to uncover the variability of exposure to environmental hazards among APIAs. Identifying within group variation can be significant in characterizing both elevated exposure and risk.

We-P-24 ENVIRONMENTAL AND SOCIAL CERTIFICATIONS IN ECUADORIAN FLOWERCULTURE: WHAT IS THE COLOR BEHIND THE GREEN LABEL?

*Harari HC, Harari RE, Touma G, Arcos M.

Background and aims: Ecuador is one of the most important roses' producer in the world. The permanent growth of this industry and the heavy use of pesticides brought as consequences continuous pesticides exposures to workers and communities. The awareness of groups of consumers and unions of buyer countries sought for labels that ensure fair social and environmental conditions in crops where especially cut-roses are produced. Results of these initiatives have not been enough evaluated yet. The aim of this overview is to provide some examples of how flowers certification works in Ecuador and which have been the advantages and disadvantages, what do they certified for, and why consumers actually buy certified flowers.

Methods: After some interviews with actors, visits and studies in some Ecuadorian flower plantations, three environmental labels that mentioned among their certification guidelines occupational, environmental and social issues were selected and analyzed.

Results: It was found that many flower plantations were certified before getting the environmental license. Also even when one of the guidelines of the labels mentioned the ILO Conventions 87 and 98, of over 40 flower plantations certified, only 1 flower plantation have a labor union. Anyway, the plantations keep the label. Environmental certifications are voluntary and paid agreements between flower plantations and certifiers, where in some cases, reported by the control agencies and unions, seems that the compliance of their own guidelines is also voluntary as well as the compliance with national laws.

Discussion and conclusions: Environmental certifications cannot substitute the role of government for the control and they can not avoid the compliance of the national laws. They also can not be used to elude the social control. There is not control for certifiers and in these cases government, unions, local organizations and consumers are not part of the certification process and approval. The active and critical role of unions and consumers in developed countries is important to protect their health and their rights and could also help to ensure the care of working and environmental conditions in developing countries.

We-P-25 ESTADO DE LA SEGURIDAD Y SALUD OCUPACIONAL EN HONDURAS: ACTUALIDAD Y PERSPECTIVA.

*Carmenate Milián L.

Background and aims: Datos sobre seguridad y salud ocupacional en Honduras provienen de diferentes fuentes con importantes vacíos y contradicciones. Este estudio proporciona información sistemática y oportuna de SSO para efectos de planificación y regulación de la acción.

Methods: Se realizó una revisión a nivel de instituciones gubernamentales y no gubernamentales y a nivel de informantes claves. Se diseñaron y construyeron indicadores sobre la situación actual.

Results: En el año 2007, la Población Total (PT) era 7.529.403 personas: 5.680.998 integrando la Población en Edad de Trabajar (PET), 2.860.866 la Población Económicamente Activa (PEA) y 2.773.492 la Población Ocupada (PO) con 66% niños, adolescentes y adultos hombres y 34% niñas, adolescentes y adultos mujeres. Las principales actividades económicas de la PO son agricultura (35.3%), comercio (21.6%), industria manufacturera (14.9%) y servicios (14.5%). De manera congruente, entre las ocupaciones hay predominio de agricultores, ganaderos y trabajadores agropecuarios (38.7%), trabajadores de la industria textil, albañiles y mecánicos (15%), comerciantes y vendedores (13.5%) y ocupaciones en los servicios (10.3%). Existen 1.285.806 personas con problemas de empleo: 6.8% desocupado/as, 82.7% subempleado/as, 4.6% potencialmente activo/as y 5.9% de desalentado/as. La población desocupada (87.375 personas) representa el 1,2% de la PT y el 3,1% de la PEA, el 54% son adolescentes y adultos hombres, con predominio en el área urbana (64%). En el año 2007, el Instituto Hondureño de Seguridad Social (IHSS) tiene una cobertura del 21% de la PO. La cobertura de población de asegurados directos más sus beneficiarios (conyugue e hijos menores de 11 años) es de 29,5% de la PT. A nivel de empresas la cobertura es aproximadamente un 20% del total de establecimientos económicos del país. La población laboral es una de las de menos nivel educacional en Centroamérica. Existen grandes problemas en la formación y capacitación continua en las áreas de salud y seguridad en el trabajo debido a la insuficiencia de los mecanismos institucionales y a la falta de personal especializado en el área. La legislación laboral en el país es poco actualizada, frecuentemente transgredida y en muchos casos con evidente impunidad.

Discussion and conclusions: Datos de SSO en Honduras son escasos y dispersos. Se necesita crear un sistema sistematizado de indicadores en SSO como base para políticas.

We-P-26 THE EFFECT OF CHRONIC LEAD EXPOSURE ON BRAIN MAGNETIC RESONANCE SPECTROSCOPY

*Chuang H, Chen Y, Hsieh T, Chen H.

Background and aims: Lead had been known as a human health hazard for a long time. In particular, damages to brain and nervous system are a main issue in the lead toxicology. The goal of this study is to investigate the brain metabolism using a 3 T magnetic resonance spectroscopy (MRS) in a group of chronic lead-exposed workers and matched non-exposed controls.

Methods: The lead-exposed subjects were from a lead paint factory, 22 workers were all included. They did not have any clinical syndromes. 18 age and sex matched non-exposed healthy controls were voluntarily participated. Blood samples were send to KMU hospital for blood lead concentrations and other biochemistry tests. Bone lead levels were measured by a KXRF equipment. A 3T MRS was used to measure their brain N-acetyl aspartate (NAA), Choline (Cho), and creatine (Cr) levels. In addition, a structural questionnaire was used to collect their working and health histories, as well as smoking, alcohol consumptions.

Results: In comparisons of Cho/tCr, the frontal gray and white matters of Lead-exposed group had significantly lower Cho/tCr ratio, comparing to the non-exposed group. In the occipital lobe, all Cho/tCr ratios of gray, sub-cortical white, and white matters in the lead-exposed group were significant lower than those of non-exposed group. The Cho/tCr ratio of basal ganglions was also lower in the exposed group than those of non-exposed group, but not significantly. Similarly, in comparison of NAA/tCr ratio, all the data of frontal lobes in exposed group were lower than those of non-exposed. In occipital lobe, only whit matters in the exposed group had significantly lower NAA/tCr ratio than those of non-exposed. In the basal ganglion, the NAA/tCr ratio of lead exposed was significantly lower than those of non-exposed.

Discussion and conclusions: The lead toxicity to human brain is complex, and not well recognized. However, this study found that brain metabolism, especially NAA/Cr and Cho/Cr, may be disturbed by lead. Brain NAA and choline were negative correlated to blood and bone lead levels, which may mean that lead may induce a neuronal and axonal damage or loss.

We-P-27 GENOTOXICITY OF OCCUPATIONAL EXPOSURE TO EMF: COMPARISON OF WORKERS EXPOSED TO DIFFERENT LEVELS OF EXTREMELY LOW FREQUENCY - MAGNETIC FIELDS (ELF-MF) AND CO- EXPOSED TO ELF-MF AND VLF-MF.

*Scaringi M, Gobba F, Temperani P, Bravo G, Gobba F.

Background and aims: The Extremely Low Frequency – Magnetic Fields (ELF MF) are suspected carcinogens based on epidemiological data, but to date there is no agreement on the possible biological mechanism.

We investigated the direct genotoxic effect related to occupational exposure.

Methods: We examined 45 workers exposed to ELF-MF and 36 exposed to both ELF –MF and VLF-MF. ELF-MF exposure was measured during 2 complete work-shifts using personal meters, exposure levels were expressed as Time Weighted Average (TWA); VLF-MF were also measured. In all subjects, information on general characteristics, working activity, current and previous diseases were collected by a questionnaire.

Criteria for eligibility to the study were no known occupational or avocational exposure to chemicals. Genotoxicity was evaluated using multiple genotoxicity endpoints: Chromosomal Aberration (CA), Sister Chromatid Exchanges (SCE) and Micronuclei (MN) in peripheral blood lymphocytes (PBL).

Results: According to personal monitoring results workers were divided in 3 different groups: low exposed (Exposure to ELF only; $TWA \leq 0.2 \mu T$ n. 22 subjects); higher ELF exposure (n° 23 workers) and higher ELF +VLF exposure (n° 36). The results of genotoxicity indices in the groups were compared: no significant difference was observed. Then, we considered the subgroup of the highest exposed workers (TWA levels exceeding $1 \mu T$): n° 8 exposed to only ELF, 19 exposed to ELF + VLF. The results obtained in these groups were compared to the low exposed: again, the values of the examined genotoxicity endpoints were not significantly different. The results were confirmed at multivariate regression analysis: the values of cytogenetic biomarkers were not significantly correlated with exposure to MF.

Discussion and conclusions: To our knowledge this is the first study considering workers with exposure to ELF, and a co-exposure to ELF and VLF. Our results do not support the hypothesis of any direct genotoxic effect of ELF-MF, at least at the environmental levels currently found in occupational settings.

We-P-28 IMPLICATIONS OF INGESTED SEAFOOD ORGANIC ARSENIC SPECIES ON THE URINARY INORGANIC ARSENIC METABOLITE LEVELS

*Hwang Y, Yao W, Hsu C.

Background and aims: This study was conducted to explore the seafood organic arsenic species on the urinary inorganic arsenic metabolites.

Methods: Twelve volunteers were invited to participate in this one-week dietary control study. All study subjects ate the designated amounts of shrimp, seaweed, clam, and oyster, respectively, on the third day. All urine samples were collected on the day prior to seafood intake, and on the following 3 consecutive days.

Results: Food arsenic species were detected with HPLC-ICP-MS for arsenite, arsenate, monomethylarsonic acid (MMA) and dimethylarsinic acid (DMA), arsenobetaine, arsenocholine, trimethylarsine oxide and tetramethylarsonium, while total arsenic was detected by ICP-MS. Meanwhile, urinary inorganic arsenic metabolites were detected with HPLC-HGAAS for arsenite, arsenate, MMA and DMA. The predominant arsenic species in seafood were arsenobetaine for shrimp, DMA for seaweed, and arsenosugars for oyster and clam. For urine, DMA constituted more than 80% of the inorganic arsenic metabolites. Compared to the background levels, elevations varying from 5 to 28 ug/L in total urinary inorganic arsenic metabolite level were found after eating 80~200 g of the study seafood. Average urinary DMA concentrations in the first day after seafood ingestion were 24.56 ± 8.15 ug/L, 13.55 ± 1.50 ug/L, 20.14 ± 8.16 ug/L and 17.51 ± 3.39 ug/L for the subgroups ingesting clam, oyster, shrimp, and seaweed, respectively. Through a modeling comparison, this study illustrates a more significant transfer of arsenosugars, compared to arsenobetaine and DMA, into various forms of inorganic arsenic metabolites in urine, i.e. DMA, MMA, As5+, and As3+ ($p < 0.005$). Furthermore, decomposition of seafood DMA is also demonstrated during the metabolic processes for seafood. Meanwhile, seafood containing higher concentrations of carbohydrates was found to have stronger influence and longer affect on the urinary arsenic species levels than seafood mostly composed of protein.

Discussion and conclusions: In general, this study closely scrutinizes the impact of dietary arsenic intake from seafood on the background urinary inorganic arsenic metabolite levels, and raises the concern of potential adverse health effect resulting from seafood arsenic intake, either in organic or inorganic forms.

NEUROBEHAVIORAL STUDIES IN WORKING POPULATIONS

We-P-29 NEUROBEHAVIORAL PERFORMANCE AMONG WORKERS AT WATER-BASED PAINTS FACTORY

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Background and aims: Water-based paints have beneficial effects towards occupational and environmental health when compared to traditional paints that contain large amounts of organic solvents. Paint manufacturers have reduced the amount of volatile solvents by switching to water-based paints. However, most still contain a proportion of volatile solvents, thus retaining the potential to affect the central nervous system with special emphasis on the neurobehavioral performance of the exposed workers. Objectives: To assess neurobehavioral performance among workers occupationally exposed to water-based paints.

Methods: This study was conducted at small scale water-based paints factory in Sadat city, Egypt. Sixty-eight workers (mean duration of exposure was 6.5 years) were selected as an exposed group. Control group (n=68) was recruited among workers' relatives. Both exposed and control groups were excluded if they reported previous work in painting industry, exposure to other neurotoxic agents (e.g. pesticides, lead pigment) or have medical diagnosis of neuropsychiatric disease. Neurobehavioral test battery was administered to all participants. The battery included tests of Similarities, Letter Cancellation, Trail-making part A and B, Digit Span, Symbol Digit and Spielberger's State-Trait Personality Inventory (STPI). Ambient air samples were collected during regular working hours and analyzed for detection of toxic chemicals.

Results: After adjustment for potential confounders (i.e., age, education, smoking and anxiety as assessed by Spielberger's State-Trait Personality Inventory), exposed workers showed lower performance in all administered tests as compared to the control group. However, significant differences were found only in tests of Symbol Digit (B= -2.16, 95% CI= -2.89, -1.43; R2= 0.77) and Trailmaking B (B= 24.3, 95% CI= 16.3 – 32.2; R2= 0.30). Ambient air monitoring showed presence of acrylates (1.8 mg/m³), formaldehyde (0.5 mg/m³) and ammonia (0.04 mg/m³).

Discussion and conclusions: This study indicates that long term exposure to water based paints may have adverse effects on the neurobehavioral performance of exposed workers, but the question still there about the actual causative agents. This study recommends reviewing of the PELs of the ingredients of water-based paints industry as well as a more comprehensive study should be conducted to evaluate other chemicals (e.g., solvents) that are still in use in the manufacturing process and may contribute to the study findings.

We-P-30 SIMPLE REACTION TIME DELAY AMONG PROFESSIONAL DRIVERS

*Won J, Kwack W.

Background and aims: Long driving hours and fatigue often result in lack of concentration. Taxi and bus drivers have had long working hours and they have experienced high traffic accidents in Korea. Taxi and bus transportation system has been reformed since 2000. Some drivers work on shifts and they drive shorter than the others. This study was performed to measure drivers' simple reaction time according to their driving hours in order to evaluate the relationship between long driving hours and lack of concentration.

Methods: Factors affecting fatigue or concentration related to driving such as, regular driving hours, break time, traffic condition, shift or not, were assessed. The simple reaction time, choice reaction time, color word vigilance, symbol digit substitution, and finger tapping speed were measured before driving and after driving to evaluate their concentration. The time difference was calculated and paired t-test and multiple regression was performed.

Results: Two taxi companies and two bus companies participated in this study. One taxi and one bus companies were operated in shift work and the others company were operated in all day long work. and 66 taxi drives, 27 shift work drivers and 39 all day long drivers, and 55 bus drivers, 36 shift work drivers and 19 all day long drivers, participated in this study. Shift work taxi drivers work at the large city and all day long taxi drivers work at the medium sized city. All day long taxi drivers and shift work bus drivers showed significantly delayed simple reaction time with 41.0 and 31.1 milliseconds respectively. Other tests were not significant. Only operating system affected the simple reaction time.

Discussion and conclusions: According to the results long driving hours was considered to be related to delayed reaction time among taxi drivers, however, traffic condition was related to delayed reaction time among bus drivers. So, both long driving hour and traffic condition could affect simple reaction time or drivers' concentration.

We-P-31 NEUROTOXIC EFFECTS DURING ARSENIC EXPOSURE

*Fat L, Gyorffy L.

Background and aims: The scientific literature shows that in the acute and chronic exposure to arsenic the most common neurological manifestation is the peripheral neuropathy, initial with symmetrical stocking-and-glove paresthesias and pain accompanied by distal weakness and then with proximally

progression of sensory and motor deficits. The objective of this study was to analyze the presence of the neurotoxic effects on workers chronically exposed to arsenic.

Methods: We investigated biotoxicological and neurological a group of 83 exposed workers from the melting sector of a non-ferrous metallurgical plant where the concentration of arsenic at the workplaces exceeded 7-15 times the admissible concentration. The workers' mean age was 31.8 ± 8.1 years and their mean time of exposure 9.03 ± 6.6 years. We made clinical and complete neurological exams and biotoxicological investigations: urine, hair and nail arsenic. A group with minor signs of clinical neuropathy was selected for electromyography (EMG) and nerve conduction velocity registering.

Results: Values of urine and hair-nail arsenic over the physiological values were found in 69.87% workers; 13.25% had polyneuropathy with symmetrical stocking and glove distribution (pains, paresthesias, hypesthesias); 50% were alcohol drinkers. The specific clinical syndromes in long term arsenic exposure were presented in 15-75% of the investigated people: astenovegetative syndrome 75%, pseudoreumatic syndrome 42.5%, dyspeptic syndrome 15%. Family history of high blood pressure: 27, 5% cases.

The nerve conduction study showed a delayed motor conduction velocity in 3 cases both on the ulnar and sciatic popliteal extern nerves (SPE). The detection exam showed a gradual record that suggests a pathological troncular neurological compensated registration.

Discussion and conclusions: Workers with greatest and long-term arsenic exposure had the most frequently neurological signs and symptoms. All the selected cases with neurological complaints proved to be real sensitive toxic polyneuropathy, more or less severe, in connection either with the length of the toxic exposure or the alcohol consumption. Electromyography being able to detect subclinical polyneuropathy, we could extend this examination to exposed persons without clinical manifestations.

We-P-32 EXPOSURE TO MERCURY AMONG DENTAL PERSONNEL-COMPARING ASSESSMENTS BASED ON DIFFERENT SOURCES

*Svendsen K, Hilt B.

Background and aims: Working on a retrospective study on possible late effects from previous exposure to mercury among dental personnel, we developed a questionnaire-based model to calculate an exposure score. The model accounted for the various factors supposed to be of significance for exposure. The aim of this part of the study was to test that model by use of exposure information from other sources.

Methods: The testing was done by comparing information from pairs of people that had worked together during the same time periods, by comparing the estimated exposure score with the degree of exposure assessed by an occupational physician during a consultation, with the subjects self assessment given at the consultation, and by comparison with urinary mercury values that were available for the time of exposure.

Results: Regarding the year for starting and ending use of the different treatment methods the differences between pairs of dental assistants or one dentist and one dental assistant were approximately the same. For questions about the handling of the amalgam the concordance between pairs of two dental assistant was better than between an assistant and a dentist. The calculated score had no agreement with the dental personnel's subjective rating (self assessment) at the consultation, but a weak statistically significant agreement with the physicians rating tested by Cohen's kappa statistics ($\kappa=0.154$, $p=0.009$). The rating by the physician and the self assessment had good agreement ($\kappa=0.510$, $p<0.001$). The rather few ($n=28$) urinary levels available from a particular subgroup showed the strongest correlation with the self assessment rating (Corr.coef = 0.319, $p=0.098$).

Discussion and conclusions: In our study a great effort was made to develop an extensive questionnaire to obtain as exact information on the mercury exposure as possible and to try to estimate an exposure score. The results show that the exposure assessment will be different using different assessment methods. This has to be taken into consideration when interpretations are made.

We-P-33 NEUROPSYCHOLOGICAL INVESTIGATIONS OF DENTAL PERSONNEL WITH PREVIOUS OCCUPATIONAL EXPOSURE TO ELEMENTAL MERCURY

*Hilt B, Sletvold H, Svendsen K, Syversen T, Qvenild T, Aas O.

Background and aims: Several studies have focused on possible late cognitive effects in dental personnel. The aim of the present study was to investigate whether dental personnel with previous exposure to mercury had cognitive impairments which could be related to exposure to metallic mercury.

Methods: A subgroup of 90 persons was selected from a group of 1,192 dental personnel identified in a larger study. The selection criteria included a questionnaire assessment of previous exposure. Various neuropsychological tests were performed for a group of 45 females who had estimated exposure values above the 80 percentile (high exposure group) and 45 who had exposure below the 40 percentile (low exposure group). For 28 of the subjects we also had mercury urine values sampled during the exposure period. The relationship between estimated previous exposure and the results of the neuropsychological

tests was analyzed with a multiple linear model adjusting for age and education. For urine mercury values multiple linear regression was used adjusting for the same covariates.

Results: There was no relationship between estimated previous exposures to mercury and the neuropsychological performance of the participants. When using the urine mercury values available there was a statistically significant correlation between urine values and reduced visual memory ($p=0.002$) and a relationship of borderline significance for working memory ($p=0.08$).

Discussion and conclusions: In the hindsight of other parts of our study and other studies, it is probable that late cognitive effects from previous mercury exposure have a relatively low prevalence even among exposed dental personnel, and that the occurrence of such effects is dependent on many factors. Thus, we were not able to show that subjects with presumed high exposures had weaker neuropsychological test results than subjects with presumed low exposure. From the present study it appears that urine mercury levels taken at time of exposure is an appropriate indicator of exposure as well as an indicator of possible future neuropsychological defects.

We-P-34 COGNITIVE SYMPTOMS AND PREVALENCE OF COGNITIVE MALFUNCTION IN DENTAL PERSONNEL

*Hilt B, Aas O, Svendsen K, Qvenild T, Syversen T, Sletvold H.

Background and aims: Several studies have suggested late cognitive effects in dental personnel. The aim of the present study was to investigate whether dental personnel with previous exposure to metallic mercury have more cognitive symptoms and/or an increased prevalence of cognitive malfunction.

Methods: The study group consisted of 1,192 dental personnel and 662 controls from the general population who had responded to a mailed standardized questionnaire (Euroquest) inquiring about seven symptom groups with regard to neurology, psychosomatics, memory, concentration, mood, sleep disturbances, and fatigue. A score for each symptom group was calculated based on 4 to 15 single questions graded on a scale from 1 (seldom or never) to 4 (very often). A participant was considered to have different degrees of cognitive malfunction when he/she had rated three or more of the seven symptom groups as "often" (value 3) or "very often".

Results: Dental assistants reported more cognitive symptoms (on a scale from 1-4) than both dentists and the controls, but on average they reported to have each symptom "now and then" (grade 2) or less frequent. As for the prevalence of cognitive malfunction, three or more of the seven symptom groups was reported "often" or "very often" by 5.0 % of the dental assistants, 1.1 % of the dentists, and 2.6 % of the controls. The prevalence of five or more of the seven symptom groups "often" or "very often" was 1.1 %, 0.7 %, and 0.4 %, respectively.

Discussion and conclusions: The occurrence of cognitive malfunction may be increased in both dental assistants and dentists, but considerably less among the latter group. For dental assistants there was a relative risk of having three or more symptoms groups "often" or "very Often" of 1.9, and of having five or more symptoms as frequently of 2.8. When applying our criteria, it can thus be calculated that the prevalence of possibly work related cognitive malfunction among dental assistants is between 0.7 % and 3.2 %, dependent on severity.

We-P-35 CHEMICAL HAZARD IN DENTAL PRACTICE, CHILE: A PILOT STUDY.

*Caballero C, Terrazas S, Cortés S.

Background and aims: Occupational exposure and consumption of contaminated food, especially fish, are the two main sources of mercury contamination in humans. Mercury exposure can cause alterations of the central nervous system, behavior alterations and renal, immune and reproductive damage among others. Despite its known toxic properties, mercury is widely used in dentistry in the repair of damaged teeth by cavities with dental amalgams. Dental staff is exposed daily to mercury intoxication, either by direct contact with the skin during its manipulation or through the inhalation of mercury vapors. Mercury exposure has been measured on different biological materials urine determination is considered the best biomarker to measure low-level long-term exposure to inorganic mercury. In Chile, the use of dental amalgams is very common due to its free cost for molar and premolar treatment in dental services supported by the government. There is no published data on occupational mercury exposure presently in Chile. The purpose of this study is to evaluate the occupational hazard of inorganic mercury exposure as a consequence of dental practice in a sample of primary care services in the Metropolitan Region of Santiago, Chile. Specific objectives include the evaluation of occupational exposure to mercury thru a self-administered questionnaire and determination of mercury concentration in urine.

Methods: A cross-sectional pilot study was done on a convenience sample of dentists and dental surgery staff of both sexes, recruited at dental services of primary care level of the Metropolitan Region, Chile. Data was collected during the first trimester of 2008 by a previously trained team. A questionnaire designed to obtain information on parameters that influence occupational exposure to mercury was used.

Urine samples were collected for determination of mercury concentration by cold vapor atomic absorption spectrometry (CV-AAS) at an authorized laboratory of the public health network.

Results: Study results are under evaluation and will be available on March 2008.

Discussion and conclusions: The effective use of adequate hygiene procedures in dental clinics could reduce the hazard of mercury exposure of dental staff.

We-P-36 THE NEUROBEHAVIORAL EFFECTS OF OCCUPATIONAL MERCURY VAPOR EXPOSURE IN FLUORESCENT LAMPS FACTORIES WORKERS

*Wang Y, Tsai S, Hsieh C, Liou S.

Background and aims: To assess the of occupational mercury vapor exposure in fluorescent lamps factories workers in Taiwan, and to investigate the dose-response relationship between mercury exposure concentration and neurobehavioral effects.

Methods: The study population was recruited from two fluorescent lamps manufacturing factories in Taiwan. 166 Subjects (99 male, 67 female) were asked to provide urine samples for mercury concentration measurement, to answer a health questionnaire, to perform a postural sway test "Neuro-test" and a neurobehavioral test with "Neurobehavioral Evaluation System 2, Chinese Version"

Results: With the cut-off point of urinary mercury concentration set at 5µg/g Creat., the study subjects were classified as high exposure group (n=36, >5µg/g Creat.) and low exposure group (n=130, <5µg/g Creat.). There are 30 subjects (25 male, 5 female) and 136 (74 male, 62 female) subjects separately in high exposure and low exposure groups. The mean age were 37.8±10.5 years and 37.4±10.3 years, the average length of education were 12.7±3.2 years and 12.2±3.5 years and the mean urinary mercury concentrations were 11.38±18.25 µg/L and 1.77±1.31 µg/L in high and low exposure groups, respectively. After adjusted for age, gender, and height, the postural sway with eyes open was positively associated with urinary mercury concentration (UHg) in multiple regression analysis. The response time of Simple Reaction Time and Symbol-Digit tests were positively associated with UHg, and the correct counts of Visual Digit Span was negatively associated with UHg after adjusted for age, gender, education level, alcohol consumption, computer use, and caffeine drinking within 24 hours before testing.

Discussion and conclusions: The findings suggest that postural sway as well as neurobehavioral performance might be affected by low-level occupational mercury vapor exposure.

We-P-37 THE EFFECT OF OCCUPATIONAL EXPOSURE TO METALS ON THE NERVOUS SYSTEM FUNCTION IN WELDERS

*Wang X, Yang Y.

Methods: We explored the relationship between metals exposure and nervous impairment in welders. The metals exposure in 82 welders and 51 operators were appraised with blood Pb, Cd and Mn via AAS, and the nervous system impairment was evaluated with neurobehavioral core test battery and electromyography.

Results: Pb(geometric mean: 117.31µg/L, range: 0.5-327.6µg/L) and Cd(geometric mean: 3.54µg/L, range: 0.2-12.5µg/L) in welders were significantly higher than those in operators. Welders had higher prevalence of nervous system symptoms and worse standard scores of 8 items such as depression-dejection than operators. Significant difference of nervous performance in welders only existed in different groups of Pb and Mn. The standard scores of fatigue-inertia et al had negative correlation with Pb exposure and the standard scores of digit span had negative correlation with Mn exposure.

Discussion and conclusions: Accordingly, nervous system impairment in welders could be attributed to occupational co-exposure of Pb and Mn.

PESTICIDE EXPOSURE

We-P-38 SIGNIFICANCE OF VALID EXPOSURE ASSESSMENT TO INDIVIDUAL PESTICIDES

*Pallapies D, Burns CJ, Pallen C, Swaen GM, Wilks MF.

Background and aims: Epidemiological studies have suggested an association between long-term / cumulative exposure to pesticides and several non-acute health endpoints. By reviewing some specific areas we intend to point out how a much more robust evaluation of potential associations with long-term health effects can be achieved.

Methods: We identified several diseases with pertinent publications in the scientific literature associated with pesticide exposure. Following extensive reviews and identifying key studies we characterized the most relevant methodological limitations that prevented any firm conclusions.

Results: We identified childhood cancer, reproductive effects, Parkinson's disease, non-Hodgkin's lymphoma, and prostate cancer as health issues that were important to both lay and scientific audiences. The major shortcoming of most of the published studies is the assessment of exposure. Often working as a farmer or using pesticides are classified as having exposure to pesticides. If exposure to pesticides has been assessed, it is often not quantified and doesn't relate to specific pesticides or groups of pesticides. One exception is the Agricultural Health Study with information on specific pesticides used and exposure of individuals. Even this study which relies on self-reports using questionnaires may underestimate the misclassification of exposure and the true uncertainty of results. Pesticides are a very diverse group of chemicals designed to protect plants and crops. Thus, it is unlikely that pesticides in general are related to a specific endpoint. If specific pesticides cannot be considered in the analyses, they at least need to be formed into groups based on a common mechanism of action or structure-activity relationships. Expert assessment based on measurements would be desirable. In studies on reproductive endpoints exposures may only be critical if they occur during a specific time window. Genetics, nutrition, lifestyle, medication, concomitant diseases are other potentially relevant factors to be addressed as covariates.

Discussion and conclusions: Despite a large body of epidemiological research on pesticides and health effects the evidence is limited. Improvements to the research could be made with more precise assessment of exposure such as through biomonitoring or expert assessment, limiting analyses to specific pesticides or groups of pesticides while including relevant covariates.

We-P-39 CUMULATIVE RISK OF PYRETHROID INSECTICIDES: ANALYSIS OF DATA GAPS

(Author did not attend the conference.)

We-P-40 PESTICIDES PACKAGING INDUSTRY AND ENVIRONMENTAL EXPOSURE IN A NEIGHBOUR IN QUITO, ECUADOR

*Harari R, Harari H, Freire R, Harari F, Aprea C.

Background and aims: Pesticides are not produced in Ecuador. Most of the agrochemicals come from developed countries, but sometimes, local industries buy high packages out of Ecuador and distribute it in small bags to be sold. This industry was packaging different pesticides (organophosphates, carbamates, pyrethroids) using a ventilation system that send the dust of the process outside of the plant without control. The plant is situated in a neighbour where there are many buildings and people are there permanently.

Methods: A study was conducted in the population around the plant looking for exposure to pesticides and health effects. A questionnaire was applied to all the subjects (39 subjects). Erythrocyte Acetyl Cholinesterase (AChE) was measured in this population. Urine samples of a subsample (16 subjects) were collected among the population. Urine samples were analyzed in the Laboratorio di Sanità Pubblica, Azienda USL No.7, Siena, Italy, identifying pesticides metabolites.

Results: Results showed different neurological symptoms associated with organophosphates pesticides exposure. Children showed more symptoms than adults. AChE inhibition, under the reference values, was found in 20 persons. Presence of different levels of some metabolites (alkylphosphates –DMP, DMTP, DMDTP, DEP, DETP, DEDTP -, and Etilenbisditiocarbamates –ETU -, Chlorpyrifos - 3,5,6-TCP-, Pyrethroids - 3-PBA -) was identified in a group of this subjects. ETU was high in 7 subjects, DMP was above the reference value in 9 subjects, DEP was higher than references values in 3 persons and DMDTP was high in 7 persons. 3, 5, 6 -TCP, DMTP, DETP and DEDTP were under the reference values. Confounding for other sources of exposure (domestic pesticides use) and food consumption were considered.

Discussion and conclusions: This study shows the connection between work environment and general environment when safety and hygienic programs are not taken in account in this kind of industries. Authorities must look for a control of these industries and to prevent health effects inside and around the industries.

We-P-41 EXPOSICIÓN AL HERBICIDA PARAQUAT EN PEQUEÑOS PRODUCTORES DE HORTALIZAS DE LA ZONA NORTE DE CARTAGO, COSTA RICA.

*Ramírez-Muñoz F.

Background and aims: Las intoxicaciones con plaguicidas son un problema de salud pública especialmente en los países con economías en desarrollo y con clima tropical, sobre todo por la falta de

disponibilidad o el uso totalmente incómodo e impráctico de equipo de protección. Esto hace que los trabajadores se expongan a severos riesgos agudos y crónicos para la salud al estar en contacto con plaguicidas, especialmente de alta toxicidad. El paraquat es una sustancia de alta toxicidad y es el plaguicida causante de las mayores intoxicaciones agudas en Costa Rica y en Centroamérica. No posee antídoto, puede ser absorbido por la piel, heridas, por mucosas, al inhalar o respirar por la boca y posee efectos agudos y crónicos. Su nombre comercial más común es Gramoxone. Es uno de los herbicidas más usados en la parte Norte de Cartago, Costa Rica, región productora de hortalizas. El objetivo de la investigación fue evaluar la forma de uso y aplicación de paraquat en pequeños agricultores.

Methods: Se evaluó por medio de encuestas, un grupo de 38 pequeños agricultores usuarios de paraquat, que lo aplican varias veces al año en diferentes cultivos.

Results: Se encontró que utilizan paraquat en dosis de 60 a 780 gramos de i.a./ha por ciclo de producción. El 71% lo usa para desecar las plantas de papa antes de cosecharlas, el 68% lo aplica con mochilas de espalda manuales y un 12% con bombas de motor. En cuanto a equipo de protección se encontró que la mayoría de usuarios de paraquat no utiliza para aplicar más que la ropa normal de trabajo: el 80% no usa mascarilla al asperjarlo y los que la usan utilizan mascarillas desechables (20%); el 89% no se protege con anteojos y solo el 31% usa guantes y camisa de manga larga.

Discussion and conclusions: Esta situación de escaso e inadecuado uso de equipo de protección crea zonas de alta exposición dérmica y respiratoria, sobre todo cuando se usan equipos de aspersión de motor que producen gotas más pequeñas, además de que la solución asperjada puede entrar bajo la ropa o empararla.

We-P-42 PESTICIDE EXPOSURES IN THE COTTON FIELDS OF MENOUFIA GOVERNORATE, EGYPT

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Background and aims: Farahat et al. reported in 2003 what are to date the most extensive behavioral deficits, compared to controls, that have been associated with exposure to organophosphorous (OP) pesticides in the human research literature, excluding frank poisonings. The population studied by Farahat et al. was Egyptian pesticide workers who apply pesticides in the cotton fields, and the aim of this study was to examine work practices, dermal exposures and urinary pesticide biomarkers of Egyptian pesticide applicators, technicians and engineers during the pesticide application season.

Methods: The work practices, personal protective equipment (PPE), dermal exposure and urinary OP pesticide measures were examined in (1) pesticide applicators, (2) technicians who accompany applicators while applying in the field but at a distance from the applicators, and (3) engineers who periodically follow the applicators in the field during applications. In addition, a sample of the pesticide solution was collected and compared to the predicted concentration based on label recommendations and observed mixing procedures, and a sample of airborne exposures were taken in a second sample of the applicators.

We observed work practices that would be predicted to lead to high exposures (eg, walking through plants wet with pesticide spray with no shoes, short pants and short sleeve shirts), ineffective PPE for the application task (dust masks) and other PPE that were not worn in a manner that would block exposures (eg, glasses worn on foreheads not over eyes).

Results: Engineers were in the fields for approximately 40 minutes per day while the applicators and investigators spent approximately an hour per day applying pesticides and 30 minutes touching the pesticide solution during mixing and loading. These differences should lead to exposure differences in the urine biomarker and dermal samples that are in analysis at this writing but will be presented at the meeting.

Discussion and conclusions: The estimated pesticide application concentration (based on the label recommendation for cotton plants) was only slightly above the recommended concentration for cotton in industrialized countries (eg, ACGIH TLV), suggesting that the application work practices would be the likely cause of the effects previously reported. The work practices observed clearly supported our hypothesis that they would lead to high pesticide exposures. This further suggests that the extensive behavioral effects reported in Farahat et al., 2003, may have been due to high OP pesticide exposures, and the work practices are implicated, suggesting further confirmatory research and prevention steps to change the work practices.

We-P-43 AGROQUÍMICOS EN ECOSISTEMAS HORTÍCOLAS Y PECUARIOS EN CARTAGO, COSTA RICA.

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Background and aims: La horticultura al noreste del Valle Central hace un uso intensivo de la tierra y es dependiente de agroquímicos; por la fragilidad ambiental del área representa un riesgo elevado para el

ecosistema. El objetivo es diagnosticar el uso de agroquímicos en las actividades de 70 productores en 550 hectáreas en Plantón-Pacayas y, analizar la calidad de las aguas, suelos y productos hortícolas.

Methods: Por tres años y mediante encuestas, se investiga el uso y manejo de desechos de agroquímicos en productores de la microcuenca. También la calidad del agua en las dos quebradas y una naciente de aprovechamiento municipal. En las parcelas con mayor aplicación de plaguicida, se muestreó hortalizas y suelo durante la cosecha.

Results: En el primer año de estudio se encontró gran disparidad en el uso de plaguicida entre agricultores; para papa se calcularon valores desde 7,2 a 86, en zanahoria de 11 a 77 y en brócoli de 0,9 a 78,5 kg i.a./ha. Los fungicidas son más usados y se aplican 37 productos distintos, así como 26 insecticidas. El manejo de desechos de envases de plaguicida es deficiente; solo el 19 % de los agricultores los devuelven al proveedor. Las concentraciones de nitratos son medias y altas en las quebradas (5-30 mg/L) y en la naciente municipal (10-19 mg/L). En las aguas se encontraron varios plaguicidas, entre otros clorpirifos (0,03-0,08 µg/L), fungicidas como flutolanil, quintozeno, pencicuron y herbicidas como linuron y diuron; en una ocasión en una muestra de agua se analizaron hasta quince plaguicidas distintos. En los suelos se detectaron además metabolitos de quintozeno y, en las hortalizas, residuos de clorotalonil y metabolitos de quintozeno.

Discussion and conclusions: Existe una carencia de asesoría técnica en la región; el 17% de los encuestados aplica por recomendación y solo el 27% hace observaciones para decidir aplicar; el resto lo hace por costumbre, experiencia y prevención. La quema de envases de plaguicida por el 54% de los agricultores, es una actividad generadora de dioxinas a la atmósfera, varias de las sustancias de mayor uso contienen cloro. Se encontró contaminación en ambas quebradas y es preocupante la situación de la naciente, rodeada de parcelas agrícolas.

We-P-44 WORKERS EXPOSURE TO CAPTAN

*Grimbuhler S.

Background and aims: One of the major disadvantages of the generalized use of the pesticides is their diffusion in all the compartments of environment. Beyond the environmental aspects, the pesticides are likely to have harmful effects on human health. This project aims to determine occupational exposures operators to pesticides by contact and inhalation, in order to address the lack of data on exposure and contamination of orchards applicators.

Methods: The telephone surveys were conducted with 250 operators in order to ascertain their practice and risk perception in relation to the use of products. Based on the different types identified, scenarios have been constructed taking into account the practices of the most common and most contaminants. The potential exposure of the operator by contact or inhalation is characterized during the various phases of handling starting from the technical ways identified at the time of the investigation and the levels of contamination of the air in operator neighbourhood, the measurement of the quantity of active matter deposited on clothing and the skin and the real exposure studied by biomonitoring.

Results: Types of equipment and types personal protective equipment are correlated with the amount of captan deposited on the body. Most of the contamination was observed on the hands. The contamination increased with the number of equipment cleaning.

Discussion and conclusions: These results contribute to: (1) define the minimum level of protection of the operators during the various stages of intervention and (2) develop an awareness program for professionals.

We-P-45 USO DE DATOS DE IMPORTACIÓN DE PLAGUICIDAS EN AMÉRICA CENTRAL COMO INDICADOR DE PELIGROS EN SALUD

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Background and aims: En América Central cada año se importan unas 30.000 toneladas de 600 ingredientes activos de plaguicidas, cada uno con diferentes efectos agudos, tópicos y crónicos. La toxicidad y la cantidad de estos plaguicidas indican un grado de riesgo para el ser humano y el ambiente. El objetivo de este estudio fue vincular cantidades importadas de plaguicidas específicos en América Central con clasificaciones de toxicidad para evaluar su uso en vigilancia de peligros en salud.

Methods: Se recopilaron bases de importaciones de plaguicidas en los siete países de América Central (2000-2004), con variables de registro, acción biocida, nombre comercial, ingrediente activo, cantidad importada, importador y exportador. Las bases fueron depuradas para calcular la cantidad importada por ingrediente activo. Se revisaron datos de toxicidad aguda (DL50 oral, dérmica y respiratoria en la OMS y EPA), tóxica (irritación dérmica, ocular y potencial alérgico) y crónica (carcinogenicidad IARC y EPA, neurotoxicidad, mutagenicidad, teratogenicidad, genotoxicidad y disrupción endocrina). Se crearon indicadores de peligro vinculando categorías de los tres tipos de toxicidad con las cantidades importadas.

Results: En 2000-2004 se importaron en América Central 163.917 toneladas de plaguicidas. El desglose por país en toneladas es: Belice 1782, Costa Rica 52.732, El Salvador 7.576, Guatemala 51.254, Honduras 29.968, Nicaragua 9.825 y Panamá 10.779. Los principales plaguicidas importados en la región fueron: mancozeb, glifosato, 2,4-D, paraquat, bromuro de metilo, clorotalonil, atrazina, tridemorf, terbufos y metamidofos. Los tres plaguicidas más importados según tipos de toxicidad fueron 1) con toxicidad aguda de alta a extrema: paraquat, bromuro de metilo y terbufós; 2) con al menos dos efectos tópicos en grado de moderado a severo: 2,4-D, paraquat y bromuro de metilo; y 3) con cuatro o más efectos crónicos: mancozeb, 2,4-D y paraquat. Estos datos existen también desglosados por país y por año.

Discussion and conclusions: Importaciones de plaguicidas pueden ser la base para construir un sistema de vigilancia de peligros para la salud. Los esfuerzos para llegar a tener bases de datos confiables fueron grandes. Sería deseable que organizaciones internacionales pertinentes apoyaran la construcción de este recurso a nivel de los países.

PESTICIDE EXPOSURES AND HEALTH EFFECTS

We-P-46 OCCUPATIONAL PESTICIDE EXPOSURE AND HEALTH EFFECTS IN FLORICULTURE FARMERS

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Background and aims: Yunnan province is the major producer of cut flowers in China, accounting for about 50% of the nation's cut flower sales. Approximately 60% of the flower-growing land consists of family farms and pesticides are widely used. In order to evaluate occupational pesticides exposure and its health effects on the farmers, we had this investigation.

Methods: 211 farmers (male 118 and female 93) who worked in floriculture were chosen as the exposure group. The control group was another 46 farmers (male 16 and female 30) living in the same village but had not worked in the floriculture at least 5 years. A questionnaire was used to evaluate pesticide exposure and the knowledge, attitude, practice of self-protection and self-reported symptoms. A physical examination was carried out for the health effects.

Results: The farms cultivated flowers by families and the pesticides were stored at house. Most farmers worked in greenhouse more than 200 days every year. The major flowers were roses and half of them planted also vegetables. 74.4% farmers reported that they used pesticides more than 40 days in one year. 26 kinds of pesticides were used in the floriculture and more than half of farmers mixed over five kinds of pesticide together each time. Although more than 80% farmers agreed that protection was needed when using pesticides, but fewer had protection and someone mixed pesticides even by naked hands. 72.6% smokers were smoking while using pesticides. 70.6% farmers reported some toxic symptoms. After adjusting for sex, age, smoking and alcohol drinking by logistic regression, the numbers of mixed pesticides was associated with the symptoms (OR=1.971, 95% CI: 0.993 ~3.915). The physical examination showed that indexes of many systems between the two groups had no significant differences, but the heart rate of exposure group was significantly lower than that of the control group (P<0.01). Meanwhile, the ECG abnormality was much higher in the exposure group than that of the control group (P<0.01, OR=2.39, 95% CI: 0.809 ~10.747).

Discussion and conclusions: The floriculture farmers had high risk of pesticide exposure and their cardiovascular system had affected. We need to pay more attention to this occupational group.

We-P-47 OCCUPATIONAL HEALTH IN RELATION TO PESTICIDE DISTRIBUTION IN WESTERN TANZANIA (KIGOMA)

*Lekei EE.

Background and aims: A survey was conducted in Kigoma region to investigate health hazards among workers dealing with selling and distribution of pesticides.

Methods: The survey was conducted in August - September 2006 and data was collected using a special semi structured questionnaire and inspection checklist. The data collected was analyzed by SPSS Version 10.0. In total there were 19 firms located n Kasulu (n=5), Kigoma (n=9), Kibondo and Ujiji (n=5).

Results: Majority of the firms were lacking standard safety facilities. There were 25 pesticide dealers amongst the firms visited involving females (n=10) and males (n=15). Majority of the respondents had primary school education level (52%) and had working experience of 1 year or less (60%). All the respondents reported to have been poisoned by pesticides in their life time with the majority (60%) reporting over 3 poisoning symptoms. Majority of the respondents reported a lifetime poisoning symptoms including skin irritation, headache, coughing, dizziness, throat irritation and eye irritation. In terms of general knowledge on pesticides, the majority failed to identify pesticide chemical groups, WHO

pesticide hazard classes and pesticide pictograms. In total a minimum of 32 active ingredients were distributed in the region, the majority being WHO Class II (47%). Most of the products found in the area were Wettable powders (26.7%) and Pyrethroids or Organophosphates (46.9%).

Discussion and conclusions: The proportion of highly poisoned respondents was much higher in females (80%) than in males (46.9%). The study indicates that there was higher proportion of dealers with little knowledge on first aid measures amongst respondents with low education level (66.4%) than those with high education level (42.9%). The study further revealed that high risk products including WHO Class I and II were higher among cholinesterase inhibiting products (OP and Carbamates) (79.6%) as compared to other chemical groups. The respondent's most common disposal options of unwanted pesticides and empty pesticide containers was through dumping in town disposal sites. The study demonstrates a serious occupational health hazards among workers involved in the distribution of pesticides and it call for immediate intervention.

We-P-48 AGRICULTURAL ACTIVITIES, CROP PRODUCTION AND PESTICIDE USE AMONG WOMEN WORKING IN SMALL SCALE FARMING IN TWO AREAS OF NORTHERN KWAZULU-NATAL, SOUTH AFRICA

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Background and aims: Agriculture remains a major contributor toward developing economies globally. Agricultural intensification, migration of men toward the industrial sector and growing female empowerment, has increased female participation in agriculture. In South Africa new land redistribution policies have further increased female participation in agriculture. The aim of this study was to describe the agricultural activities and pesticide use among women in small scale farming on the Makhatini Flats, Northern KwaZulu-Natal, South Africa, in order to predict workplace risks for health outcomes.

Methods: A questionnaire based cross-sectional study conducted in 2006 collected data from 911 volunteers working in small-scale farming in both the Irrigated and Dry-lands of the Makhatini Flats. Data was collected on demographics, agricultural activities, crop production and pesticide use.

Results: A total of 376 (41%) women from the Irrigation Scheme and 535 (59%) from the Dry-lands participated in the study. Irrigation Scheme workers were significantly younger (40.6 years, compared to 42.8 years; $p=0.02$) and longer educated (7.3 years versus 6.6 years; $p<0.02$) than Dry-land workers. Forty-four percent of all participants were illiterate. Maize was the crop most frequently planted ($n=517$; 56.8%), followed by cotton ($n=402$; 44.1%). Other crops planted on a smaller scale included cabbages, tomatoes, peppers, mangoes and sugar cane. Women participated in physically demanding agricultural activities such as ploughing, planting, weeding and harvesting. Most agricultural activities were significantly associated with Dry-land work after adjustment for age, educational level, duration of residence, farm ownership, distance of residence from farm and duration of employment.

Forty-five percent ($n=415$) of women did most of the pesticide spraying on their farms. World Health Organization class I and II pesticides were reportedly used. Only 30.6% ($n=279$) of women could name the pesticide used on their crops. Farm ownership, being less than 30 years of age, and being a sprayer were predictors of having knowledge of the pesticides sprayed.

Discussion and conclusions: The significantly greater involvement of Dry-land women in agricultural activities suggests they may be at greater risk for adverse ergonomic health outcomes while women from both areas are equally at risk for adverse pesticide related health outcomes. Interventions should be developed to address these occupational health issues.

We-P-49 LOW LEVEL AND LONG TERM EXPOSURE TO MULTIPLE PESTICIDES AND CLASTOGENIC EFFECTS, IN A FLOWER PLANTATION IN ECUADOR

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Background and aims: Mutagenic effects, including clastogenic changes are well known related with some kind of pesticides. Many studies report important changes like Sister Chromatid Exchange (SCE) and Chromosomal Aberrations (CA) associated with pesticide exposure. Also, Chromosomal Aberrations are considered as predictive indicators of cancer.

Flower plantations in Ecuador use different kind of pesticides intensively. Organophosphates, carbamates, pyrethroids and sometimes also chlorinated pesticides are used two or three times weekly, mixing different products. Application is done with centralized system or manual system but always people is exposed in cultivated areas, post-harvest, fumigation and other areas close to the workplaces. Doses used are low because if there are too many health effects it could affect the production. So, low levels but long term use of different pesticides together is very common, and greenhouses are workplaces with microclimate problems such as low ventilation, high temperature and humidity. Workers are not enough provided with personal protection.

Methods: Pesticides used in a flower plantation were listed and 99 workers exposed to those pesticides and 50 non exposed were studied with a questionnaire, Erythrocyte Acetyl Cholinesterase test, and blood samples were taken looking for Chromosomal Aberrations. Blood samples were cultivated in RPMI 1640 medium with bovine fetal serum and phytohaemagglutinin by 72 hours and results were reported.

Results: Sex and age did not show significant differences between groups. Time of residence in the area, congenital malformations in the family, cancer cases in the family, X Rays in the last three months, smoke, and alcohol intakes were analysed and no differences were found between exposed and non exposed. Only in medicine intakes it was found more consumption in the exposed groups. It was found a statistical significant difference between exposed and non exposed groups for all the Chromosomal Aberrations. ($p < 0,05$).

Discussion and conclusions: Multiple exposure to pesticides, low dose and long term, could produce mutagenic effects in the flower plantations workers. Safety and hygienic measures must be taken immediately to control exposure and monitoring workers, to avoid chronic diseases and in particular to prevent carcinogenic impacts in this population.

We-P-50 EFFECTS OF PESTICIDES ON HUMAN CELL MEDIATED IMMUNITY AND THEIR RELATIONS WITH VIRAL HEPATITIS

*Amr MM.

Background and aims: Pesticides exposure may play a great role in suspected fragile immune system, and may result in altered disease susceptibility.

AIM: Our aim is to illustrate the effects of occupational exposure to pesticides on human cell mediated immunity and to assess this relation with the prevalence of viral hepatitis (HBV&HCV) among the workers.

Methods: This study was conducted on 80 subjects in one of the major companies formulating pesticides in Egypt. All subjects were males. Workers in the production sectors were 55 subjects (Group A), their age ranged between 26-55 years (mean \pm SD : 44.26 \pm 5.33), they were exposed to different types of organophosphates and carbamates insecticides. Their working 60 hours or without overtime (12 hours) and they mostly did not use the administered protective equipment during work hours. The control subjects were (Group B) 25 adult men without occupational exposure in production of pesticides. They were chosen from other departments of the company, their age, sex and socio-economic standard were matched with the exposed group. Investigations done for the examined groups (A & B) were abdominal ultrasonography and blood examination for Hb, WBCs, Lymphocytes, sALT, HbsAg, Anti HCV, CD4, CD8, CD4 / CD8, CD56 and IL-2.

Results: The most significant results were alteration of the cell mediated immunity among the exposed group and increase in the prevalence of Hepatitis B virus (HBV) and Hepatitis C virus (HCV) which confirmed by ultra-sonographical examination. The relation between different liver diseases as bilharzial liver, liver cirrhosis and mixed liver disease and cell mediated immunity, had been illustrated. However, there was no significant difference between duration of exposure to pesticides and different immunological parameters.

Discussion and conclusions: It was concluded that occupational exposure to pesticides may cause modulation and / or derangement of the immune system. Modulation of the immune system among the exposed group to pesticides may be due to the high percentage of HBV and HCV. Further studies on a large scale and studying the whole immune system of those subjects is mandatory as well as early detection of such changes recommended.

We-P-51 CAMBIOS NEUROCONDUCTUALES EN TRABAJADORES AGRÍCOLAS DE YUCATÁN

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Background and aims: En el sureste de México existe poca información de las intoxicaciones crónicas entre trabajadores agrícolas expuestos permanente a plaguicidas, daños neurológicos y en particular alteraciones neuroconductuales. El objetivo fue identificar alteraciones neuroconductuales en trabajadores agrícolas expuestos de manera continua a plaguicidas.

Methods: Estudio descriptivo, prospectivo, longitudinal y observacional. Se realizaron reuniones en la comisaría ejidal de Muna, Yucatán con los representantes de la unidades agrícolas que formaron el universo del estudio, se tomó una muestra por conveniencia de 102 agricultores expuestos a plaguicidas que aceptaron participar y cumplieron los criterios de inclusión, se aplicó un cuestionario precodificado y examen médico orientado a la búsqueda de signos y síntomas de alteraciones neuroconductuales.

Results: Todos fueron masculinos, el rango de edad fue de 18 años a 81 años, una media de 48.9 años; 67.6% con menos de 6 años de escolaridad, 65.6% refirieron cultivar Maíz y fríjol, 18% Naranja y limón;

86% con más de 10 años de exposición, aplican sin equipo de protección personal; 94% usan Organofosforados(Metamidofos, Clorpirifos, Malathión, MetilParathión).38.2% tienen al menos una intoxicación previa; el 35% al 62% sufrieron cefalea, decaimiento, dificultad para memorizar, irritabilidad, intranquilidad, tristeza, pérdida de concentración, insomnio, temor y desorientación.

Discussion and conclusions: Los síntomas referidos por los trabajadores, son compatibles con alteraciones neuroconductuales, encontrados en estudios realizados en otras poblaciones y países. Se subestiman los casos de intoxicación crónica entre los agricultores y personal de salud, es necesario investigaciones longitudinales con grupos más grandes.

We-P-52 NEUROBEHAVIORAL EFFECTS DURING EXPOSURES TO PROPIONIC ACID

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Background and aims: Propionic acid (PA) is a naturally-occurring chemical that is used as an antifungal agent and to produce synthetic materials and pesticides. PA is a local irritant with an unpleasant odor. The chemosensory effects of PA in humans have not been conclusively studied and thus in Germany no occupational exposure limit (OEL) could be derived yet. In addition to sensory irritation caused by PA it was hypothesized that the annoying odor of PA might interfere with performance in neuropsychological test of executive functioning. Therefore, the present study investigates such distractive odor effects in an experimental exposure study.

Methods: After written informed consent was obtained, 23 healthy volunteers (12 females, 11 males) were exposed for 4 hours to PA in concentrations of 0.3, 5 and 10 ppm in a cross-over design. During these exposures performance was recorded with four cognitive tests measuring response inhibition, working memory, set-shifting, and divided attention. Odor annoyance and other chemosensory perceptions were assessed before, during, and after exposure with standardized rating scales.

Results: Moderate odor annoyance and weak sensory irritation were reported during the 5 and 10 ppm exposure conditions. Odor annoyance was strongest at the beginning of these exposures and declined over time. The results of the four behavioral tests were not affected by the different exposure conditions. While, for instance, the difficulty of the working memory task influenced significantly the percentage of correctly memorized digits (76% during 2-back vs. 63% during 3-back working memory task), the moderately annoying odor of PA had no interfering effect on performance.

Discussion and conclusions: The odor annoyance elicited by PA was lower than expected from previous experiments and the reported sensory irritations were low. Therefore, unsurprisingly, this weak olfactory stimulation had no interfering effects on cognitive task performance. Not even in very challenging working memory task. In conclusion no distraction effects due to the odor of PA in concentrations as high as 10 ppm could be found. However, for other more annoying substances such an indirect mechanism of a neurobehavioral effect is still conceivable.

We-P-53 A SEASONAL ANALYSIS OF ACUTE SYMPTOM REPORTS FOLLOWING EXPOSURES TO HERBICIDES AND INSECTICIDES IN AN OCCUPATIONAL COHORT OF PESTICIDE APPLICATORS

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Background and aims: Professional pesticide applicators may be exposed to toxic amounts of pesticides during their workday. In the United States, poisoning incidents may be more likely to occur in the summer, during the heaviest use of insecticides. The objectives of this work were to measure self-reported symptoms of acute insecticide exposures and sensitivities, and to evaluate variation in reports based on season and self-reported insecticide use.

Methods: A national biomonitoring study of TruGreen Chemlawn turf and tree and shrub technicians was conducted in 2004 with employees (n=113) from five locations across the United States (Virginia, Texas, Utah, Illinois and Washington). Each location was visited three times for one week periods in the spring, summer and fall, with the exception of Plainfield, Illinois (two visits). Each sampling week, employees completed a questionnaire regarding pesticide use, spraying practices, protective clothing worn and equipment used, personal behaviours and hygiene, and risk perceptions. Exposure symptoms (coughing, shortness of breath, chest pain, rash, blisters, abnormal facial sensation, salivation, fatigue, diarrhea, mental confusion, memory loss, wheezing, runny or stuffy nose, difficulty breathing, itching, eye irritation, dizziness headache, vomiting, irritability to sound or touch, burning sensation in the nose, inability to concentrate), health conditions, including allergies, prescription medication use, smoking, and alcohol consumption also were reported. Data were analysed in SAS using chi-squared analyses and multiple logistic regression.

Results: Headache (32%), runny or stuffy nose (30%) and fatigue (29%) were the most commonly reported symptoms. No statistically significant differences in symptom reports were observed between the three seasons, or consistently found for self-reported insecticide use. Multiple regression analyses

revealed strong associations between smoking and the following variables: coughing (Odds Ratio(OR)=4.2; $p<0.001$); shortness of breath (OR=3.2; $p=0.01$); chest pain (OR=3.5; $p=0.02$); memory loss (OR=10.7; $p=0.004$); wheezing (OR=5.7; $p=0.005$); and inability to concentrate (OR=2.8; $p=0.037$). Self-reported allergies were related to runny or stuffy nose, itching and eye irritation, and alcohol consumption was significantly related to fatigue (OR=2.1; $p=0.02$).

Discussion and conclusions: The prevalence of reporting of potential symptoms of insecticide poisoning or sensitivity was low and did not vary by season or self-reported insecticide use. Most symptoms reported were associated with seasonal allergies and smoking.

We-P-54 INTOXICACIONES AGUDAS POR PLAGUICIDAS EN TRABAJADORES AGRÍCOLAS DEL LA REGIÓN BRUNCA, COSTA RICA

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Background and aims: Los plaguicidas han ofrecido un importante servicio a la humanidad; sin embargo, han tenido impacto negativo, principalmente por los numerosos casos de intoxicaciones agudas y los efectos crónicos en personas y animales, así como sobre el medio ambiente. En Costa Rica se registra un número importante de intoxicaciones anualmente. El objetivo de este estudio es describir el comportamiento de las intoxicaciones agudas por plaguicidas en trabajadores agrícolas de la Región Brunca, para el período 2002-2007.

Methods: Se utilizan los registros de intoxicaciones de la Dirección Regional Brunca del Ministerio de Salud, entre enero 2002 a octubre 2007. Se calculó frecuencias según: cultivo, sexo, edad, grupo químico, acción biocida, manifestaciones clínicas, gravedad y condición de egreso. Asimismo, se realizaron pruebas de diferencias de porcentajes dentro de cada variable mediante los IC 95%.

Results: Durante el período hubo 982 intoxicaciones agudas por plaguicidas incluyendo accidentes no laborales e intentos de suicidio, siendo 300 las laborales; 95.7% en pacientes masculinos. Los grupos etarios de 18 a 30 y de 31 a 60 años involucran 256 casos (85%). Las manifestaciones digestivas (37,6%) y las sistémicas (33,67%), fueron las más frecuentes. La mayoría correspondió a intoxicaciones leves (85%). Se registró una letalidad de 0,7%. Los caficultores y los pequeños agricultores tienen mayor probabilidad de intoxicaciones versus trabajadores de plantaciones extensivas ($P < 0,01$); no se encontró diferencia significativa entre trabajadores de piñeras vs plantas ornamentales. Las intoxicaciones por insecticidas fueron las más frecuentes (48.0%) mostrando diferencia con las intoxicaciones por herbicidas (36.0%). Se observó una tendencia decreciente en los casos de intoxicaciones laborales a través de los 6 años analizados.

Discussion and conclusions: A pesar del aumento en el uso de plaguicidas, se observó una disminución gradual del número de intoxicaciones laborales por año. Las labores agrícolas formales y supervisadas, como las efectuadas en cultivos extensivos, conllevan a un menor riesgo. El hecho de que más de la mitad sean accidentes no laborales, pero relacionados con plaguicidas de uso laboral, impone la necesidad de implementar medidas y programas de educación a los trabajadores agrícolas y a sus familias respecto a manejo de plaguicidas y medidas de protección.

We-P-55 IS THE LIVELIHOOD OF SOUTH AFRICAN INFORMAL PESTICIDE SELLERS' POISONING POOR URBAN CHILDREN?

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Background and aims: Poverty related pests plague peri-urban dwellers in the high density townships of Cape Town South Africa. Rats are a particular menace and health risk. In response to the demand for means to control these rats, street sellers sell illegal highly toxic pesticides cheaply. The highly hazardous carbamate insecticide, aldicarb, is sold in small unlabelled sachets with no or little safety information made available to the sellers or customers. Aldicarb's LD50 is .93 mg/kg and the sachets contain around 50mg - 60mg potentially lethal for a small child. The aim of the pilot study was to assess whether children were being poisoned by street pesticides sold by street sellers and to ascertain how sellers could play a role in poison prevention.

Methods: A record review (from 2004-2006) was conducted of 80 cases of children (ages three months to 12 years old) treated for suspected pesticide poisoning at Children's Red Cross Hospital in Cape Town, South Africa. Ten pesticide sellers partook in informal interviews.

Results: The results showed that 83.6% of the pesticide poisoning cases reviewed were under the age of four years old. In 76.3% of the cases the pesticide was unknown by the carer of the child. Of these, 70.5% were described in the child's record as "poison bought on the streets or at the station". This indicates that 53.7% of the poisoning cases were due to exposure to unlabelled pesticides sold by street sellers.

Discussion and conclusions: The practice of selling aldicarb for rat control is a global public health problem reported in developing and developed countries. The high demand for aldicarb, easy access to

this cheap product and ready market make this pesticide a prized item to sell. Not only does selling this product present an occupational hazard, but sellers also become a link in child poisonings. Health policy needs to address the rat problems in poor urban areas to break the demand for toxic and illegal pesticides. Furthermore, health risk communication campaigns need to be developed and non-toxic alternative products for streets sellers to sell need to be promoted.

PSYCHOSOCIAL FACTORS IN THE WORKPLACE

We-P-56 SENSE OF COHERENCE, MENTAL HEALTH STATUS AND JOB STRESS

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Background and aims: Sense of Coherence (SOC) scale is a questionnaire which is used to assess stress coping ability. The study presented here was conducted to clarify the relationships of stress coping ability measured by SOC scale to perceived job stress measured by Job Content Questionnaire (JCQ), and mental health status assessed by General Health Questionnaire (GHQ-12), and daily habit in a factory workers.

Methods: Self-administered questionnaires containing above scales were distributed 740 workers in a manufacturing industry. Complete answers were recovered from 466 workers (63%), consisting of 387 males and 79 females, with average age of 45.1 with SD of 12.0 years, and used for the analysis.

Results: GHQ scores were less than 4 points (a cut-off point) in 369 workers; among them, SOC scores were significantly higher than in the remaining 97 workers (SOC = 131.63 ± 19.35 and 107.34 ± 21.22 , respectively, $p < 0.001$). SOC scores were significantly correlated with GHQ scores and ages in all workers combined ($r = -0.548$ and 0.132 , respectively, $p < 0.01$). The multiple regression analysis controlling for life style, BMI and job stress indicated that SOC scores are related negatively to GHQ, and positively to habitual exercise and age ($p < 0.05$). In Low-strain, Active, Passive, and High-strain groups categorized by JCQ scores based on Karasek's job-demand and -control model (80, 140, 169, and 77 workers, respectively), SOC scores were 130.15 ± 18.64 , 130.66 ± 22.37 , 120.92 ± 20.30 , and 127.83 ± 25.94 , respectively ($p < 0.001$, one-way analysis of variance). Multiple comparison test showed that the scores in Passive group were significantly lower than in Low-strain and Active groups ($p < 0.05$). SOC scores were significantly different between the workers who take exercise every day (130.55 ± 23.38), some times (129.97 ± 20.76) and never (122.29 ± 22.16) ($p < 0.001$, one-way analysis of variance).

Discussion and conclusions: It is suggested that workers with higher stress coping ability are in better mental health status, as they showed GHQ scores less than the cut-off point. Also, the coping ability seems to be increased by age and habitual exercise. SOC scores were higher in Low-strain and Active groups with high job control than Passive groups, indicating that job control is essential in the stress coping.

We-P-57 CORRELATIONS OF PERSONALITY QUALITIES WITH OBJECTIVE AND SUBJECTIVE EVALUATIONS IN YOUNG PEOPLE

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Background and aims: Personality qualities are often used to prognosticate the efficiency of professional performance. The most widely spread professions of human-operator type in modern society including shift or not usual working hours is shown to be the most sensitive to the anxiety, neuroticism, extraversion and morningness. The purpose was to reveal the correlations of personal qualities with some objective and subjective evaluations in the body activity.

Methods: 171 students (aged 16-24) were observed using tests on the anxiety, neuroticism and extraversion), objective and subjective health, psychological age and work ability evaluations (SWAE)), tests on attention switching and concentration), velocity of moving reactions by the tapping test (VMR), cardiovascular system work.

Results: Increases in cognitive anxiety by Schwartz and anxiety by Spilberger-Khanin were accompanied with the decreases in systolic volume, increase in somatic anxiety by Schwartz – with the decrease in pulse pressure and subjective age felt. High anxiety by Schwartz was noted with the worse velocity and attention concentration and switching and the most low VMR. Increase in neuroticism was accompanied with the decrease in physical SWAE, health self esteem, decrease in systolic volume. Women showed higher neuroticism and anxiety as compared to men. Increased extraversion was coupled with an improvement in velocity and quality of rings cancellation, in VMR, tendency to the improvement of the attention switching velocity, decrease in the desirable age, increase in communication SWAE and subjective estimation of the health state.

Morningness was related on better velocity and worse quality of attention concentration, increase in systolic blood pressure, age, mental and physical SWAEs (that could be influenced by morning-day time of the observations period).

Discussion and conclusions: Revealed results could be used for solving tasks of professional selection and orientation.

We-P-58 ANXIETY PREVALENCE IN ADOLESCENTS: DIFFERENCE BY GENDER, SOCIO-DEMOGRAPHICAL, OCCUPATIONAL, FAMILY AND SCHOOL RELATED CHARACTERISTICS IN AN URBAN AREA

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Background and aims: Factors that can be associated to adolescent's anxiety in Brazil include paid work, unpaid family work, number of working hours, socio-economic class, family type, psychological factors related to school, family relationships and social support. In this paper, anxiety prevalence in teenagers was estimated. This prevalence is also presented by gender, taking into consideration socio-demographical, occupational, family-related and school-related characteristics.

Methods: We analyzed data from the first wave of a longitudinal study carried out in Salvador, Brazil, in 2000. The study population included 904 subjects aged 10 to 21 years old who declared to have at least one job (paid or unpaid). Prevalences by gender were compared using Mantel-Haenszel method to adjust by family-related variables.

Results: Anxiety global prevalence was higher in girls. In particular, this prevalence was eminent in older girls with medium socioeconomics status, without social support, having both paid work and unpaid family housework, and with problematic family relationships. For boys, the prevalence was higher among those who have nuclear family, work burden of more than 20 hours per week, and problems in family relationships. For students's adolescents higher anxiety prevalence was found, particularly, for girls who think that their academic performance is unsatisfactory. Moreover, there was a significant difference in anxiety prevalence by gender when adjusting for socio-demographical, occupational, family-related and school-related characteristics.

Discussion and conclusions: In poor urban areas adolescents's girls have more anxiety compared with boys. Some possible explanations are that they have multiple labor activities more frequently, more concerns about their performance at school and seems to profit less from social support than men (Stansfeld et al., 1998; Schwarzer & Gutiérrez-Dona, 2005). Such complexity may not be successfully administered by some girls. On the other hand, teenager's boys suffer more with the opinion of their colleagues about their performance. Boys seems to be more concern about the acceptability of their social groups. In this exploratory study, we discussed some potential risk factors to assess the anxiety disorders in teenagers in a urban context. Further research is needed to fully understand the role of the associated factors to anxiety in developing countries.

We-P-59 DEPRESSION/ANXIETY PREVALENCE AND EVALUATION OF PSYCHOSOCIAL FACTORS IN HEALTH CARE WORKERS

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Background and aims: To evaluate the level of exposure of health care workers in a university hospital, to various psychosocial factors. And retrospective risk assessment for diagnosed depression/anxiety.

Methods: The study was cross-sectional. Risk assessment was performed retrospectively by Job Exposure Matrix (JEM) for diagnosed depression/anxiety.

After being stratified according to occupation and unit, 508 people were chosen systematically from a complete list of personel, in order to represent whole workers of the hospital. A total of 423 people were recruited (83.2%). Face to face interview technique was used with a mean duration of 27.8±6.7 minutes. Among the psychosocial factors; conflicts and competition with colleagues, inability to give breaks during working hours, pressure of responsibility, absence lack of occupational insurance, anxiety of not being promoted, monotony, verbal/physical violence/annoyance were evaluated. The exposure levels were considered as 0:absent, 1:mild, 2:moderate and 3:high. JEM was constituted according to exposure, intensity and probability related to the occupation and unit. At the same time diagnosed depression and anxiety disorders of health care workers were evaluated. The relations of depression and anxiety disorder with personality, working conditions and exposure to psychological factors were evaluated with logistic regression model.

Results: Psychosocial factors, that were confronted with high intensity and probability were: pressure of responsibility (52.4%), working hard(48.1%), monotony(35.4%), conflicts(31.8%) and verbal/physical violence/ annoyance (30.1%). The mean JEM scores were highest for; working without breaks (5.4±3.7), pressure of responsibility (4.6±4.1), conflicts(4.2±3.5). The highest scores in doctors and nurses respectively were, pressure of responsibility (6.7±3.2) and working without breaks (5.9±3.7). The

frequencies of depression and anxiety were found to be 14.9% and 13.0% respectively. Logistic regression model studies revealed that, the most remarkable factors for depression and anxiety were working without breaks (OR:3.3 95%GA:1.2-9.5) and competition(OR:2.2 95%GA:1.1-4.4) respectively. **Discussion and conclusions:** Psychological factors of health care providers differ according to their profession and units. In our study, conflicts and working without breaks came out to be the most frequent factors overall. The high prevalence of depression and anxiety disorders were also striking.

We-P-60 MENTAL HEALTH IN DENTAL STAFF, CHILE: A PILOT STUDY.

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Background and aims: Dental practice brings along occupational hazards to the mental health of dentistry personnel. Burnout Syndrome is considered a response to chronic occupational stress, and occurs in professionals whose work involves assisting other people. This syndrome has personal, family, social, and job-related repercussions, and is considered a precursor of depression. Dental personnel present occupational risk factors that make them more vulnerable than the general population to suffer Burnout. In Chile, publications regarding occupational conditions and their association with mental health and psychological affections in dental professionals are very scarce.

The objective of this study is to assess risk factors that may influence in occupational mental health as a consequence of dental practice in a sample of dentists and dental surgery staff of the primary care services of the Metropolitan Region of Santiago, Chile. Specific objectives include the evaluation of mental health status thru the application of two self-administered questionnaires broadly used to assess Burnout Syndrome and depressive symptoms.

Methods: A cross-sectional pilot study was done on a convenience sample of dentists and dental surgery staff of both genders, volunteers, recruited at primary care dental services of the Metropolitan Region of Chile. Data collection was done during the first trimester of 2008 by a previously trained team. Two validated self-administered questionnaires were used to assess risk factors and frequency of psychological alterations to determine professional wear-out and depressive symptoms.

The validated Spanish version of the Maslach Burnout Inventory-Human Services Survey (MBI-HSS) was used to evaluate Burnout and the CIDI-SF (Composite International Disease Instrument-Short Form) validated in Chile was used for depressive symptoms.

Results: Study results are under evaluation and will be available on March 2008.

Discussion and conclusions: The evaluation of occupational mental health of dental professionals may enable the prevention of the main psychosocial occupational hazards, improving work conditions and life quality for this workforce.

We-P-61 WORK ORGANIZATION AND OCCUPATIONAL STRESS AMONG SUPERVISORS IN INFORMATION TECHNOLOGY-DOMINATED ELECTRONIC AND GARMENT INDUSTRIES

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Background and aims: Subcontracting work in subsidiary plants in developing countries have been heavily pursued by multinational companies of first world countries. Also, the issue of psychosocial health in the workplace is of growing interest in the field of occupational health and ergonomics. The objectives of the study were: 1) to investigate organizational processes in affecting occupational stress of supervisors in electronic and garment industries in the Philippines; and 2) to differentiate health risk factors among various industry types and sizes.

Methods: A total 13 electronics industries and 10 garment industries were included. Among the 47 supervisors, 51% were from garments industry while 49% from the electronics. Stratified sampling technique was used according to industry size and industry type.

Results: Among the 47 supervisors, 51% were from garments industry while 49% from the electronics. The electronics industry used relatively more information technology-based devices and programs. However, the application of CAD among the garments industry was higher, accounting for 52.4%. The industries focused more on component parts production (58.3%) which affirms the new international division of labor where the back-end processing of the production is located in developing nations while the more skill- and technology- integrated processes are done in the industrial countries. Work among supervisors was reported to be challenging and stimulating (50% in electronics and 81.8% in garments) but regular upgrading of skills was needed (50% in electronics and 40.9% in garments). The two industries differed in the extent of their IT use; the electronics sector was 4.45 times more likely to use IT in the production process. It was seen that supervisors employed in large industries used more IT in the production process and had more challenging and stimulating work.

Discussion and conclusions: The findings of this study imply that strategies aimed at curbing occupational stress among supervisors must focus on regulating organizational factors and the impact of

information technology. Ergonomic and health guidelines and regulations should be crafted not only for workers, but for supervisors as well. This should be done in order to protect the health of supervisors who have been somehow neglected in occupational health and ergonomics research.

We-P-62 THE RISK FACTORS ASSOCIATED WITH FATIGUE AMONG BUS DRIVERS

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Background and aims: Driver fatigue is an important issue to mass transportation drivers. The objectives of this study is to survey the work shift patterns, workload, job stress and other lifestyle and habits among the 1147 bus drivers and to investigate the association between shift work and fatigue.

Methods: 1147 drivers were recruited from a bus company. The information were collected by a structured questionnaire. Swedish occupational fatigue index (SOFI) was used to measure severity and profiles of fatigue. In addition, Pittsburg sleeping quality questionnaire was used to measure sleep quality and Epworth daytime sleepiness questionnaire was used to severity of sleepiness.

Results: The mean SOFI scores among bus drivers were from 1.95 to 2.91. The results imply that the level of fatigue in the bus drivers was not high. Among the five profiles of fatigue, lack of energy had the highest mean score, followed by lack of motivation, sleepiness, and physical fatigue. These results imply that psychological fatigue is the main source of fatigue among bus drivers.

The association between shift work and fatigue was analyzed by multiple regression. The results found the local municipal bus drivers had the highest score of fatigue, followed by 24 hours-shift drivers, 8 hours-shift drivers, and short-distance drivers. In addition, we also detected important risk factors affecting fatigue among bus drivers. The significant risk factors associated with fatigue can be classified into 3 categories: 1). Work load: including lack of adequate rest, unscheduled driving, driving time over records, driving more than 10 hours per day, and high job stress; 2). Sleep-related factors: including sleep quality in the home, severe snoring during sleep, and daytime sleepiness; 3). Physical discomfort factors: including pain or discomfort of musculoskeletal system. The levels of fatigue were correlated with cumulative number and degree of these risk factors.

Discussion and conclusions: Drivers with night shift schedule were expected to have higher fatigue score than without. But our findings were conflict with the expectation. Therefore, in addition to shift schedule and work load, more attention should be paid to the sleeping quality of the bus driver.

