Abstracts

Cardiovascular

161 VENTRICULAR ARRHYTHMIA EVENTS IN BOILERMAKER CONSTRUCTION WORKERS EXPOSED TO METAL-RICH FINE PARTICLES

Objectives: Epidemiological and toxicological studies suggest a link between metal-rich fine particulate exposures and cardiovascular autonomic responses such as heart rate variability, yet the occurrence of ventricular arrhythmias has not been investigated. We sought to investigate the occurrence of ventricular arrhythmias in a cohort of boilermaker construction workers exposed to metal-rich welding fumes.

Methods: Using a panel study, we monitored 36 male boilermaker construction workers by 24 h ambulatory electrocardiography (ECG) on both a workday during welding fume exposures and a non-workday. ECGs were analysed and the presence of an hourly ventricular arrhythmia (one or more ventricular event in a 1 h period) was reported. The hourly arrhythmia data was matched and summarised by workday and non-workday periods. The effect of previous workday exposure was investigated by stratifying the work and non-work periods. The frequency of arrhythmias between periods was compared using Fisher’s exact test.

Results: The 36 participants were monitored over 49 non-workday and 49 workdays. The 8 h TWA mean (SD) workday PM2.5 exposure was 0.73 (0.50) mg/m³. There were 153 h with a ventricular arrhythmia over the 999 monitored non-workday person-hours and 120 over the 999 monitored workday person-hours. When the data were stratified by whether the participant worked the day prior to being monitored, on non-workdays, participants who worked the previous day had an increased frequency (20%) of arrhythmias as compared to workers who were not working the previous day (14%) and this difference was statistically significant (p = 0.02). On workdays there was no statistically significant difference in hourly arrhythmias between those who worked and those who did not work the previous day. The exposure-response relationship between hourly ventricular arrhythmias and current and previous workday exposures will be presented.

Conclusion: Ventricular arrhythmia events may be influenced by longer term (previous day) exposures and the effect of concurrent exposure may be complex. Increased arrhythmias occurred in the day following exposure on a non-workday when exposure had ceased, yet not on a workday when exposures continued.

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Key words: fine particles; construction; cardiovascular

162 MORTALITY FROM MYOCARDIAL INFARCTION AMONG PULP AND PAPER MILL WORKERS

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Objectives: To study mortality by main mill pulping process, department and gender in a cohort of Swedish pulp and paper mill workers from four sulfate and four sulfite mills, with particular reference to diseases of the circulatory system. Some earlier studies, especially from Nordic countries, have showed increased mortality from ischaemic heart disease.

Methods: The cohort of 18,163 males and 2,291 females enrolled from 1939 to 1999 with more than 1 year of employment was followed up for mortality from 1952 to 2001 and for acute myocardial infarction from 1969 to 2001. Standardised mortality ratios (SMR) were used to compare mortality with the Swedish population. Exposure was assessed from personnel files in the mills.

Results: There were 8,988 deaths to analyse in the cohort. Total mortality for sulfate mill males was SMR 1.02 (95% CI 0.98 to 1.06) and for sulfite mill males, SMR 0.93 (95% CI 0.90 to 0.97). Mortality from acute myocardial infarction, but not from cerebrovascular disease or diabetes mellitus, was increased among males in both sulfate and sulfite mills, SMR 1.22 (95% CI 1.12 to 1.32) and SMR 1.11 (95% CI 1.02 to 1.21), respectively. Corresponding figures for females were SMR 1.29 (95% CI 0.85 to 1.76) and SMR 1.07 (95% CI 0.80 to 1.39), respectively. Mortality by department from acute myocardial infarction among males: in wood preparation SMR 1.04 (95% CI 0.86 to 1.24), sulfate pulping, SMR 1.29 (95% CI 1.07 to 1.54), sulfite pulping, SMR 1.16 (95% CI 0.98 to 1.37), paper production, SMR 1.26 (95% CI 1.06 to 1.49) and maintenance, SMR 1.16 (95% CI 1.02 to 1.30).

Conclusion: Death from acute myocardial infarction, but not cerebrovascular disease, was increased in this cohort of pulp and paper mill workers and was probably related to a combination of different occupational exposures such as dust, sulfur compounds, shift work and noise.

Key words: cohort; cardiovascular disease; sulfate pulping

163 PREDICTORS OF HYPERTENSION AND HEART DISEASE AMONG WHITE- AND BLUE-COLLAR EMPLOYEES IN THE ALCOA ALUMINIUM MANUFACTURING COHORT

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Objectives: A distinct gradient between socioeconomic position (SEP) and health is well documented. In a large cohort of white- and blue-collar employees, we explore the influence of work-related SEP indicators (job grade and hourly/salary status) on hypertension and ischaemic heart disease, and gender as a potential modifier of their effects.

Methods: Using weighted logistic regression, we estimated odds ratios for work-related SEP factors and job strain (demand/control), adjusted for individual risk factors (age, race/ethnicity, sex, smoking) on hypertension and heart disease onset among 14,999 aluminum manufacturing employees in 11 plants across the eastern USA. Propensity scores were explored to differentiate employment from selection effects.

Results: Traditional risk factors (age, sex, race, smoking) were the strongest predictors of hypertension and heart disease among white-collar employees. In contrast, years on the job was the strongest predictor among blue-collar workers. Among male employees, age and race were predominant risk factors, whereas, among women, the strongest predictor for both outcomes was employment status (blue-collar vs white-collar). Results were supported after adjustment by propensity scores; analyses matched by propensity scores are in progress. Preliminary job strain analyses suggest that higher levels of control are protective against hypertension after controlling for SEP, while jobs at mid-range demand increase risks of hypertension relative to low- or high-demand jobs. For IHD, higher levels of control and lower levels of demand were protective, although differences between tertiles were not statistically significant.

Conclusion: Years on the job may be a surrogate for hazardous workplace exposure (physical, chemical, psychosocial), which may magnify traditional risk factors in predicting hypertension among manufacturing employees. Further analyses will examine the elevated risks observed for female blue-collar employees, which may be due to underlying workplace exposures or residual confounding by individual attributes associated with job assignment; analyses matched by propensity score may help to distinguish these effects. Preliminary analyses suggest risks associated with lower-control or mid-range demand jobs.

Key words: gender; propensity score analysis; job strain

164 HYPERTENSION IN NOISE-EXPOSED SAWMILL WORKERS: A COHORT STUDY


Objectives: Using a cohort exposed to excessive noise, we investigate the hypothesis that the risk of hypertension is increased.

Methods: Upon linkage with provincial hospital discharge and medical billing systems, our study population consisted of 10,872 subjects employed for at least 1 year in one of the 14 participating sawmills. Hypertension was captured according to the ICD-9 classification codes 401–405. Cases were male that either died from hypertension, had one visit at the hospital, or had three doctor visits in 70 days, which ever event occurred first. Noise exposure was quantitatively assessed and we used
two metrics: cumulative exposure (intensity*years) and duration of exposure above thresholds of 85, 90, and 95 dBA, for the period of the study whose follow-up started in April 1991 and ended in July 1998. Relative risks were estimated using Poisson regression with low-exposure group as controls and adjusting for age, ethnicity and calendar period. 

Results: 828 cases were identified. The results showed a monotonic increase with cumulative exposure, and the risk in the highest exposed population was 32% higher than baseline. Age and ethnicity were statistically significant predictors. Similar results were found using duration of exposure above given thresholds. The highest relative risk was 1.5 in workers exposed for more than 30 years at 85 dBA. Trends were statistically significant. 

Conclusion: We showed that the risk of hypertension was positively associated with noise exposure using both metrics. These results were robust to different case definitions found in the literature.

Key words: occupational noise; hypertension; cohort study

CARDIOVASCULAR DISEASE AND EXPOSURE TO PAHS AMONG ALUMINIUM SMELTER WORKERS

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Objectives: Elevated cardiovascular disease (CVD) rates have been observed among some groups occupationally exposed to polycyclic aromatic hydrocarbons (PAHs). As part of a 14-year update of a cohort study of Western Canadian aluminium smelter workers, we examined the relationship between CVD and exposure to PAHs in coal tar pitch volatiles. 

Methods: All men employed 3+ years between the years 1954 and 1997 were included (n = 6423). Exposure to coal tar pitch volatiles was measured as benzene soluble materials (BSM) and benzo(a)pyrene (BaP) based on an extensive quantitative exposure assessment. Smoking status was obtained via questionnaire from cohort members or their survivors. Standardised mortality ratios (SMR) analyses were conducted using British Columbia rates. Poisson regression was used to examine risk within the cohort by cumulative exposure level.

Results: There were 1079 deaths during the follow-up period (SMR 0.87); 412 were due to all CVD (SMR 0.90), 184 due to acute myocardial infarction (AMI, SMR 1.00) and 97 due to other ischaemic heart disease (SMR 0.78). The relative risk of AMI increased monotonically with level of exposure to BaP, but only reached 1.35 in the highest exposure category (95% CI 0.83 to 2.19, 80+ μg/m³-years, trend: p = 0.20). Although the dose–response pattern was less consistent for IHD, the relative risk was elevated in the highest BaP exposure category (RR 2.75, 95% CI 1.24 to 6.10, trend: p = 0.06). Analyses by level of exposure to BSM produced much weaker results.

Conclusion: We found limited evidence of an association between exposure to BaP and both IHD and AMI. The limitations included crude smoking data and reliance on death certificates for cardiovascular disease.

Key words: cardiovascular disease; polycyclic aromatic hydrocarbons; aluminium smelter workers