

Objectives This study was conducted to compare the cancer incidence in inorganic lead exposed workers with the Korean general population, and to explore the relationship between cancer mortality and blood lead levels.

Method Using from the Korean annual medical surveillance for exposure to lead, a cohort comprising 74 659 inorganic lead exposed workers working between January 1st, 2000 and December 31st, 2004 was compiled. This cohort was merged with the Korea National Central Cancer Registry (KNCCR) and death registry of the Korea National Statistical Office (KNSO) in order to evaluate the cancer morbidity for these workers between 2000 and 2008.

Results There were 793 cases cancer and, the incidence of stomach cancer (SIR 1.17, 95% CI=1.01–1.36) was found to be elevated in lead chromate workers. Excesses were observed for kidney (2.15. 1.19–3.88) and bladder cancers (2.29. 1.149–4.58) in lead exposed workers ≥ 20 years of job duration., kidney cancer (2.25. 1.21–4.18) in workers with ≥ 10 ug/dl of blood lead level and lung cancer in female workers with ≥ 10 ug/dl. Workers with ≥ 40 ug/dl of blood lead levels had a significantly higher risk of overall cancer mortality (RR: 2.75; 95% CI: 1.06–1.98) compared with workers who had less than 10 ug/dl.

Conclusions Our study showed incidence excess of lung cancer in female workers, stomach cancer in lead chromate exposed workers and a possible dose-response relationship between d kidney cancers and lead exposure. Also overall cancer mortality excess was observed in high lead exposed workers.

0362 RENAL DISEASE INCIDENCE AMONG 58 000 MALE WORKERS WITH BLOOD LEAD MEASUREMENTS

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Objectives To determine whether adult lead exposure is associated with incidence of end-stage renal disease (ESRD) in a cohort with measured blood leads.

Method We studied 58 000 US male adults from 11 states with blood lead levels measured between 1980–2005. Most were exposed occupationally. One-third had a single blood lead test; the remainder had a median of three. Subjects were divided into five groups by highest blood lead (0–5, 6–24, 25–39, 40–51 ug/dl; 16%, 33%, 34%, and 17% respectively.

Results Median follow-up was 12 years; there were 302 ESRD cases. Among those with race information (31%), the ESRD standardised incidence ratio (SIR) (US referent) was 1.08 (0.89–1.31) overall. The SIR in the highest BL category was 1.47 (0.98–2.11), increasing to 1.56 (1.02–2.29) for those followed 5+ years. For the entire cohort (race imputed), the overall SIR was 0.92 (0.82–1.03), increasing to 1.36 (0.99–1.73) in the highest BL category (1.43 (1.01– 1.85) with 5+ years follow-up). RRs in internal analyses via Cox regression (entire cohort, 5+ years follow-up) across BL categories were 1.0 (categories 1 and 2 combined), 0.92, 1.08, and 1.96 (test for trend $p = 0.003$). The effect of lead was strongest in non-whites.

Conclusions Data were limited by lack of detailed work history and reliance on a few blood lead tests per person to estimate exposure. Data suggest current US occupational limits on blood lead levels may need to be strengthened to avoid renal disease.

0364 CANCER INCIDENCE AND MORTALITY IN AN AUSTRALIAN COHORT OF LEAD WORKERS WITH HISTORICALLY COLLECTED BLOOD LEAD DATA

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Objectives To measure cancer incidence and mortality in a retrospective cohort of Australian lead-exposed workers.

Method The cohort comprised male lead workers who had been participants in state government occupational blood lead surveillance programs conducted since the 1970s. Historically collected blood lead level data were accessed from surveillance records. Linkage was undertaken to the National Death Index and the Australian Cancer Database to identify causes of death and incident cancers.

Results 4114 male subjects were followed for an average of 16.2 years, giving 68 172 person years. All incident cancers were lower than expected (SIR 83, 95% CI: 73–95). The incidence of liver cancer was elevated (SIR 217, 95% CI 103–454), as was the incidence of oesophageal cancer (SIR 240, 95% CI: 129–447). Among those cohort members with at least one blood lead result in excess of 30 μ g/dL, oesophageal cancer incidence was elevated (SIR 755; 95% CI 314–1813). Other cancer types were not found to occur in excess. All cause mortality was greater than expected (SMR 111; 95% CI 101–123) based on 406 deaths. Non-malignant digestive system deaths (SMR 167; 95% CI 110–250) and deaths from external causes (SMR 135; 95% CI 105–174) were also elevated.

Conclusions The increase in gastrointestinal tract cancers is consistent with some previous studies of lead workers. Confounding from lifestyle factors, such as alcohol, could not be examined. It is planned to include this cohort in an international pooling study of lead exposed workers.

0365 CHALLENGES TO OCCUPATIONAL CANCER EPIDEMIOLOGY IN QATAR

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Objectives Assess exposures to occupational carcinogens in Qatar

Method IARC conducted a review of environmental carcinogens (IARC Group 1 and 2A) in Qatar 2013. Information was ascertained from ministries and a survey among Qatar Petroleum associated companies

Results Major parts of the population are migrant workers; male migrant workers are primarily recruited for the construction and the oil-and gas industry, while female migrant workers mostly do domestic work. The predominant material for construction is lime stone with increasing use of gabbro containing low silica levels compared to quartz. Only small quantities of asbestos have been used. The technologies used for natural gas extraction in Qatar are mostly closed processes.

Conclusions Workers in construction and in the oil and gas sector are mainly migrant workers who remain in the country for short

periods. Migrant workers are a particularly healthy group from within their home countries and if they develop cancer, it is likely to occur when they are older and have left Qatar. The impact of occupational exposures on cancer risk among industrial workers in Qatar can therefore not be estimated. It is however possible to measure exposures in these settings and establish adequate national regulations. Information on carcinogenic exposures in occupational settings from the European CAREX database is likely of limited use in Qatar and other Middle Eastern countries, due to use of different materials, processes and technologies.

0369 BREAST CANCER INCIDENCE AMONG FLIGHT ATTENDANTS

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Objectives Previous studies suggest that flight attendants have a higher incidence of breast cancer than the general population; however, the reason remains unclear. We evaluated the relation of breast cancer incidence with estimates of cosmic radiation dose and metrics of circadian rhythm disruption among a cohort of 6092 female former US flight attendants.

Method Cohort members (or their proxy) completed a computer assisted telephone interview that collected data on incident cancers and non-occupational risk factors for breast cancer. Incident cancers were also identified through linkage with state cancer registries. Life table analyses were conducted to compare breast cancer incidence among the cohort to that in the general population and to evaluate exposure-response relations.

Results Breast cancer incidence was increased compared to the general population (observed 343; standardised incidence ratio 1.37; 95% confidence interval 1.23, 1.52). Among flight attendants, breast cancer was not significantly associated with ten-year lagged cumulative estimates of absorbed cosmic radiation dose, time spent working during normal sleep hours, or time zones crossed in the cohort overall or in women who gave birth two or fewer times. A significant positive association was observed between breast cancer incidence and these exposures only in the small subset of women who gave birth three or more times.

Conclusions Our data suggest that the effect of occupational exposures on breast cancer risk among flight attendants may be modified by non-occupational risk factors for breast cancer. Future modelling analyses will further evaluate the role of occupational exposures and non-occupational risk factors.

0371 THE RELATIONSHIP BETWEEN WELDING FUME EXPOSURE AND CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN SHIPYARD WELDERS IN KOREA

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Objectives Welding fume is suspected to accelerate the decline of lung function and development of chronic obstructive pulmonary disease (COPD). The aim of this study was to examine the relationship between welding fume exposure and COPD in Korean shipyard welders.

Method 240 male welders who were working at two shipyards and took the annual health examination including pulmonary function test in 2010 participated in this study. A questionnaire about smoking habits and occupational history was administered. PFT was carried out with strict quality control measures. Exposed fume concentrations were estimated using 884 welding fume measurements taken 2002–2009 in one of the shipyards. Linear multiple regression was employed to evaluate the association between cumulative fume exposure and lung function parameters. Logistic regression was employed to test the excess risk of COPD by cumulative fume exposure. Age, height, the smoking amount, and cumulative fume exposure were incorporated as independent variables in those models.

Results Mean age was 48, and mean work duration was 18 years. The mean cumulative fume exposure was 7.7 mg/m³. The prevalence of COPD was 14.6%. FEV₁ and FVC showed negative correlations with cumulative fume exposure, but statistically non-significant. Odds ratios of COPD were significantly elevated for middle (5.02, 95% CI:1.27–33.55) and high exposure group (6.20, 95% CI:1.41–44.98) compared to the low fume exposure group.

Conclusions Our findings suggest a potential association between metal fume exposure and COPD. Further study with a prospective design is needed to investigate the excessive decline of lung function by welding fume exposure.

0373 POOLING CASE-CONTROL STUDIES FOR ENHANCED EVIDENCE ON OCCUPATIONAL RISK FACTORS IN LUNG CANCER RESEARCH – THE SYNERGY PROJECT

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Objectives Explore quantitative exposure-response association for exposure to asbestos, crystalline silica, nickel, chromium and polycyclic aromatic hydrocarbons in the general population; further study effects on specific cell types and potential interaction with smoking and co-occurring occupational exposures.

Method Fourteen studies from Europe and Canada were pooled including 17 700 lung cancer cases and 21 800 controls with detailed information on tobacco habits and lifetime occupations. A quantitative job-exposure-matrix (SYN-JEM) was developed based on more than 350.000 exposure measurements from the participating countries. Different model specifications were compared to predict historical job-, time-, and region-specific exposure levels. Individual exposure levels were calculated for each subject by linking the SYN-JEM with the individual occupational histories. Unconditional logistic regression models were fitted to estimate odds ratios, 95% confidence intervals, and trends.

Results We observed exposure-response relationships with increasing duration and cumulative exposure for all agents and