RENAL DISEASE INCIDENCE AMONG 58 000 MALE CANCER INCIDENCE AND MORTALITY IN AN OCCUPATIONAL COHORT

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 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 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 (2.23, 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 lead levels and cancer. Also overall cancer mortality excess was observed in high lead exposed workers.

RENAAL DISEASE INCIDENCE AMONG 58 000 MALE WORKERS WITH BLOOD LEAD MEASUREMENTS

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). RR 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.

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

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 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 30µg/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.

CHALLENGES TO OCCUPATIONAL CANCER EPIDEMIOLOGY IN QATAR

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
**Oral presentation**

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 6.20, 95% CI:1.41–6.98) compared to the low fume exposure group (33.55) and high exposure group (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.

**0370 Pooling case-control studies for enhanced evidence on occupational risk factors in lung cancer research – The Synergy Project**

1,2Ann Olsson, 3Hans Kromhout, 4Roel Vermeulen, 5Susan Peters, 6Beate Pesch, 7Thomas Behrens, 8Benjamin Kendza, 9Joachim Schüz, 10Kurt Strall. 1International Agency for Research on Cancer, Lyon, France; 2The Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden; 3Institute for Risk Assessment Sciences, Utrecht, The Netherlands; 4Institute for Prevention and Occupational Medicine of the German Social Accident Insurance – Institute of the Ruhr-Universität Bochum, Bochum, Germany

**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:1.27–22.55) 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.

**0371 The relationship between welding fume exposure and chronic obstructive pulmonary disease in shipyard welders in Korea**

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**0372 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
0365 Challenges to occupational cancer epidemiology in Qatar

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