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Objectives Brain tumors are a serious, often highly disease with few established risk factors. Although ionizing radiation has been clearly linked with brain tumors, there are a number of other environmental and occupational agents suspected. There may also be interactions between occupational agents for brain tumors however the epidemiological literature is sparse. Only one previous epidemiological study examined potential interactive effects between occupational exposure to extremely low frequency magnetic fields (ELF-MF) and chemical agents with various interactive effects observed. The objective of this paper was to examine the possible joint effects of occupational agents for brain tumors (specifically glioma and meningioma) including occupational ELF-MF and chemicals in the large-scale INTER-OCC study.

Methods The INTEROCC study is formed by seven participating countries (Australia, Canada, France, Germany, Israel, New Zealand, United Kingdom) from the parent INTERPHONE study. Cases of primary brain glioma and meningioma aged at least 20 years were recruited between 2000 and 2004. Detailed occupational history data was collected for jobs held at least six months. Job titles were coded into standard international occupational classifications and estimates of ELF-MF and chemical exposure were assigned based on job exposure matrices. Odds ratios (and 95% confidence intervals) for single and joint occupational exposures were calculated according to a common reference category. Interactions on both the additive and multiplicative scale were assessed.

Results Data on a total of 3,978 brain tumor cases, including 2,054 gliomas and 1,924 meningiomas, were analysed with 5,601 control subjects. A number of interactions were observed, varying according to exposure time window, exposure metric, and included subjects. Results also varied according to tumour type.

Conclusion Interactions between occupational agents for brain tumors were observed however further research examining possible joint effects of occupational agents for brain tumours with refined assessments of occupational exposure in other large-scale studies is warranted.

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104 ASSOCIATION BETWEEN OCCUPATIONAL EXPOSURE TO ENGINE EMISSIONS AND LUNG CANCER

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Objective To analyse the associations between life-time occupational exposures to diesel, leaded and unleaded gasoline engine emissions and lung cancer.

Methods Our case-control study enrolled 1503 lung cancer cases and 1198 population controls between 1996 and 2001 in Montreal. Occupational exposure to diesel, leaded and unleaded gasoline engine emissions was assessed using a combination of subject-reported job and tasks history and expert assessment. Exposure status "Ever or never exposed", duration, frequency and concentration of exposure based on qualitative assessment were assigned to each participant. Lifetime average exposure and cumulative exposure were derived as semi-quantitative indices. Using multivariate logistic and generalised additive logistic regression analyses, we evaluated the association of lung cancer with the mentioned exposures. Odds ratios (OR) were calculated for an index increase between exposure to environmental levels and exposure levels at the 90th percentile of the entire population.

Results In models including only one type of engine emissions at a time, only diesel showed an association with lung cancer (OR for average exposure: 1.19, 95% CI: 1.03, 1.37). When restricting the analysis to participants exposed to one of the three types of engine emissions exclusively, cumulative exposure to leaded gasoline, unleaded gasoline, and diesel engine emissions were associated with odds ratios of lung cancer of 2.11 (95% CI: 1.25, 3.56), 0.66 (95% CI: 0.25, 1.72) and 1.09 (95% CI: 0.95, 1.24), respectively. The inclusion of the three types of engine emissions in one model, using either multivariate logistic or generalised additive logistic regression, yielded similar estimates to those obtained for segments of the population with increased exposure to only one type of engine emissions.

Conclusion Exposure to diesel and unleaded gasoline engine emissions confounded the association of leaded gasoline engine emissions and lung cancer. Increases in cumulative exposure to leaded gasoline were associated with an increased risk of lung cancer.

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105 POOLED ANALYSIS OF TWO CASE-CONTROL STUDIES OF POLYCYCLIC AROMATIC HYDROCARBONS AND RISK OF LUNG CANCER

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PAHs are ubiquitous compounds formed during incomplete combustion of organic material. IARC recently classified benzo (a)pyrene and several occupational circumstances involving PAH exposure as carcinogenic, though human evidence remains limited.

Objectives To examine the effects of occupational exposure to PAHs arising from different combustion products on risk of lung cancer.

Methods Data was provided from two case-control studies conducted in Montreal. Study 1 (1979–1986) included 857 men with lung cancer, 533 controls from electoral lists, and 1346 controls with other cancers. Study 2 (1996–2001) included 738 men with lung cancer and 899 controls selected from the electoral list. Occupational histories were obtained and lifetime chemical exposure was derived by hygienists for benzo (a)pyrene and profiles of PAHs, according to source (wood, petroleum, coal, or other, which included rubber, plastic, and food). Data were pooled across studies.

Results Prevalence of any PAH was 68% in the Study 1 population and 55% in Study 2. Adjusting for confounding due to smoking and common demographics, exposure to any PAH

resulted in an odds ratio of 1.14 (95% CI of 0.95–1.35) compared to individuals unexposed to PAHs; results were similar at substantial levels of exposure. Considering workers exposed to only a single profile of PAH depending on the combustion product, results were: PAH from wood [0.88 (0.35–2.21)], from coal [0.96 (0.52–1.78)], from petroleum [1.04 (0.86–1.25)], and from other sources [1.84 (1.04–3.25)]. Exposure to benzo (a) pyrene resulted in an odds ratio of 1.31 (1.06–1.63).

Conclusions Results suggested excess risk associated with exposure to benzo (a)pyrene and to PAHs arising from cooking fumes, plastic, and rubber; but not for PAH exposures derived from wood, coal, and petroleum combustion products. These results are partly in line with previous reports of highly exposed workers, though exposure levels would not have been as high in our population-based study.

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Objectives Farmers have different cancer incidence and mortality patterns than the general population, with excesses of some cancers (e.g., lymphoma, multiple myeloma, brain, skin and prostate), and lower risk of others (e.g., lung). AGRICOH, a consortium of 27 cohort studies in agricultural populations, was formed to investigate the impact of specific occupational, environmental and lifestyle factors on health outcomes in farming populations. This study aims to describe the cohort-specific cancer incidence and mortality rates in AGRICOH studies with cancer information.

Methods Outcome data have been obtained from linkage to cancer and mortality registries. Person-years of follow-up contributed by each participant will be calculated and grouped into 5-year age intervals and calendar years. Crude and age- and gender- standardised incidence and mortality rates will be estimated for each cohort, for all cancers, individual cancer sites and, where possible, specific histological subtypes. Rates will be stratified by participant's relationship to the farm (farmer, spouse) and primary commodity produced (crop, livestock or both).

Results Seven AGRICOH cohorts with cancer data have agreed to participate (n = 315,298). These cohorts represent Australia (Pesticide Exposed Workers & Victorian Grain Farmers), France (Agriculture & Cancer), Korea (Korean Multi-Center Cancer), Norway (Cancer in the Norwegian Agricultural Population), and USA (United States Agriculture Health Study & The Marshfield Epidemiology Study Area Farm Cohort). Target populations vary between studies and include active and retired agricultural workers, farm owners and their families, and agricultural groups exposed to specific agents.

Conclusions Comparing and contrasting patterns of cancer incidence and mortality in studies from around the world with different agricultural practices and populations will generate hypotheses for future data-pooling projects. In particular, the study will identify cancers of high priority in agricultural workers and provide hypotheses on potential causes for differences in rates between populations, or on common exposures that might contribute to similarities.

Session: N. Noise & hearing

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Objectives In a questionnaire conducted by The Royal Norwegian Navy in 2002/2003, 38% of the personnel reported to be much/very much exposed to noise and 24% reported reduced hearing. Based on these findings, further investigation on the working conditions on board naval vessels and mapping NIHL among the personnel on board was initiated. A part of this study is to compare noise levels and occurrence of hearing loss on large vessels like frigates and smaller vessels like coastal corvettes.

Methods Noise levels in areas were measured on three costal corvettes (CC) and three frigates (F) using Brüel & Kjær Hand-held Analyzer Type 2250. All personnel working on frigates and coastal corvettes were invited to audiometric testing, using Interacoustics AD226. NIHL was classified as ≥ 25 dB in at least one ear at 3000, 4000 or 6000 Hz. They completed a questionnaire concerning noise exposure and background information.

Preliminary Results Noise levels in cabins range from 68.5 dB (A) to 85.5 dB(A) in CC and from 42.1 dB(A) to 80 dB(A) in F. 157 persons were currently or previously working on F and 91 persons were currently or previously working on CC. The prevalence of NIHL among personnel in CC was 40.7% and 28.7% among personnel in F (Pearson Chi-Square test, P = 0.053). Mean age for CC was 32 and for F 28 years. When adjusting for age using logistic regression no differences in NHIL among the two vessel groups were found.

Conclusions The CC has higher measured noise levels than the F. Our analysis shows a higher prevalence of NIHL among personnel currently or previously working on CC compared to F. When adjusting for age the effect disappears. This may indicate that the NIHL found was not related to vessel group.

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Background Noise is one of physical hazards found in forklift drivers, especially with diesel engine. Thailand's 2010 regulation on the control of noise at work is not more than 85 dBA per 8 hour-TWA.