Oral Presentation

Burden of Disease

0470 COMPARISON OF OCCUPATIONAL CANCER BURDEN ESTIMATES

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The lung is the most common target for workplace carcinogens and burden of cancer projects have produced a range of attributable fraction (AF) estimates (6%–14.5%). Various approaches, available data, and contexts of these different studies contribute to sometimes incongruent final estimates.

We recently completed a Canadian burden project (CBD) and compared its results to burden studies from UK (UKBD), US (USBD), Finland (FinBD), and the Global Burden of Disease (GBD) to illustrate the impact of new epidemiologic data, availability of exposure data, differences in industry composition, inclusion of a broader set of carcinogens and/or cancer sites, and differences in the overall methodological approach on AF estimates.

The number of lung carcinogens considered by the different studies ranged from 8 in the GBD to 21 in the CBD and UKBD. More well-established carcinogens such as silica, which are driven by similar patterns of exposure (especially in construction) across countries, have more consistent estimates (2.4% in both the CBD and UKBD). Others such as asbestos have significant challenges in historical exposure assessment, as well as differences in exposure context between countries, leading to variability between estimates (5.9%–8.0%). Differing methods and assumptions regarding radon also led to variable estimates (0.6%–1.3%). Relatively recent epidemiologic evidence for diesel exhaust and lung cancer incorporated into the Canadian estimates led to higher AFs than previous estimates.

Changing evidence, differences in context, and variability in methods mean that burden estimates are not strictly comparable across projects, and continuing to assess the burden for different countries remains relevant.

Poster Presentation

Exposure Assessment

0471 EVALUATION OF AIRBORNE CHEMICAL EXPOSURES TO ALUMINIUM WORKERS

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Aluminium workers are exposed to a complex mixture of airborne chemicals. Workers in different stages of aluminium manufacturing are exposed to different mixtures of chemicals. At twelve US aluminium facilities, we used information from an industrial hygiene database containing 30 years of sampling results for 227 separate chemical agents to build job exposure matrices (JEMs). We selected chemicals that represented major exposures in the workplace (e.g., oil mist and fluorides) and those that have been associated with heart disease [e.g., polycyclic aromatic hydrocarbons (PAHs) and welding-related metals]. We used cluster analysis to empirically group the chemical agents and establish exposure profiles by job. For PAHs and welding-related metal exposures, we also built quantitative JEMs. There were 21 PAH chemical agents, including individual PAHs (e.g. benzo[a]pyrene) and groups of PAHs (e.g. coal tar pitch volatiles). For metals, there were 54 different chemical agents associated with welding tasks. The categorical JEMs have three categories of exposure: unmeasured, very low exposure, and moderate or higher exposure. The stage of the manufacturing process made a large impact on the distribution of exposures. While 62% of jobs in smelters involved PAH exposures, only 2% of jobs in fabrication facilities did. Conversely, oil mist exposure is more common in fabrication facilities, compared with smelters (24% and 7% of jobs exposed, respectively). We observed that the exposure profiles in smelters was very different to those observed in fabrication facilities or refineries. These chemical exposure JEMs will help clarify the role chemicals play in heart disease.

Poster Presentation

Cardiovascular Disease

0472 A GLOBAL PERSPECTIVE ON COAL-FIRED POWER PLANTS AND CARDIOVASCULAR DISEASES

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Background Cardiovascular disease (CVD) accounts for 31% of all global deaths. Some CVD mortalities can be attributed to environmental factors such as particulate matters (PMs). Coal fired power plant is one of the major contributors of PM. However, the short-term effect of coal fired power plant on cardiovascular disease is not well studied. In this study, we investigate an association between coal capacity and CVD mortality from a global perspective.

Method Age and Sex-adjusted CVD mortalities of 111 countries were followed from 1998 to 2012. Coal capacity was defined as total capacity of coal fired power plants in a given country in a given year, from Utility Data Institute World Electric Power Plants (UDI WEPP) Database while CVD mortality were obtained from WHO mortality data. We applied mix model and adjusted other risk factors for analysis.

Results The average coal capacity around the world is increasing globally, but coal percentage used has been fairly constant (8555.18 MW (15.99%) in 1998–2002, 12071.11 MW (16.71%) in 2003–2007 and 16394.05 MW (16.58%) in 2008–2012. One log coal capacity (unit: log MW) was associated with an increase in CVD mortality by 22.98 ($p=0.076$) to 55.74 ($p<0.0001$) per million males and 4.83 ($p=0.373$) to 28.71 ($p<0.0001$) per million females, during 1998–2002 in different regions.

Conclusion The result of the current study indicated that after adjusting for commonly known risk factors of cardiovascular disease, coal fired power plants emission is correlated with country specific short term cardiovascular mortality.

Oral Presentation

Cancer

0473 SINONASAL CANCERS AND OCCUPATIONAL EXPOSURES, A POPULATION-BASED CASE-CONTROL STUDY

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Carcinogenic agents for nasal cavity and paranasal sinuses cancers (hereafter sinonasal cancers, SNC) with sufficient evidence in humans include nickel compounds and wood and leather dusts. Still limited evidence is available for carpentry and joinery, hexavalent chromium compounds, formaldehyde, and textile manufacturing. We studied occupational risk factors for SNC in a population-based case-control study nested in the SNC Registry of the Lombardy Region (10 million people), North-West Italy. SNC cases (or their next-of-kin) were interviewed using a standardised questionnaire. Controls (141 men, 64 women), taken from a recent population-based case-control study on mesothelioma, had been sampled among Lombardy residents (2014) and interviewed with the same questionnaire. We calculated odds ratios (OR) adjusted for the matching factors, smoking, and history of nasal polyps. We identified 386 SNC cases (2008–2014) with interview (256 men, 130 women). Among 105 adenocarcinoma cases we found ORs >30 for wood and leather dusts. Among 108 cases with mixed morphologies, we

found elevated risks for wood (OR=2.2) and leather (OR=6.0) dusts. For both morphologies ORs for nickel, chromium, and formaldehyde were high but based on a few cases. Relative risks of adenocarcinoma and mixed morphologies were high in several sectors, including textile, construction, metal-mechanics, motor vehicle production, and agriculture and livestock. ORs for squamous cell carcinoma were elevated in agriculture and livestock only. In conclusion, we confirmed the strong associations between adenocarcinoma and wood and leather dusts, found elevated risk for mixed morphologies, and identified risk excesses in several sectors.

Oral Presentation

Other

0474 RISK ASSESSMENT FOR NON-CANCER OUTCOMES

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Objective Risk assessment for non-cancer outcomes is often based on a synthesis of epidemiological and toxicological data. As with carcinogens a decision has to be made if these effects occur via a stochastic mechanism of action or if a 'safe' occupational exposure limit can be derived based on observed lower of no effect levels within the experimental or observational data. If a stochastic mechanism is assumed (e.g. allergens) than it is assumed that every level of exposure to such substances, no matter how low, entails a certain risk of developing an adverse outcome and risk-based limits could be calculated.

Results Within the Dutch Expert Committee on Occupational Standards (DECOS), and other similar bodies in the EU, more and more evaluations are based on epidemiological data indicating the importance of the field of occupational epidemiology. While in 1995 0% of the evaluations of the Dutch DECOS were based on epidemiological evidence, currently this is more than 30%.

Discussion In this presentation, we will discuss recent evaluations on benzene (based on a non-cancer outcome), and wheat and other cereal flour dusts as to explore how occupational epidemiologic studies provide important information about the risks associated with exposures encountered by workers and the public at large.

Oral Presentation

Other

0475 OCCUPATIONAL EXPOSURE TO RESPIRABLE CRYSTALLINE SILICA AND LUNG CANCER RISK IN THE SYNERGY PROJECT

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Objective Within the SYNERGY project, we evaluated the exposure-response relation between occupational exposure to

respirable crystalline silica (RCS) and the risk of lung cancer in pooled analyses of community-based studies.

Methods RCS was estimated using a quantitative general population job-exposure matrix ('SYNJEM') for 16 786 lung cancer cases and 20 818 matched population or hospital controls. 34.2% of the men were ever exposed to RCS, while 8.6% of the women were ever exposed. Odds ratios (ORs) and 95% confidence intervals (95% CI) were estimated stratified by gender using unconditional logistic regression models adjusted for age, study centre, cigarette pack-years, time-since-quitting smoking, and ever employment in an occupation with known lung cancer risk.

Results We observed a monotonic increase in risk of lung cancer associated with occupational exposure to RCS among men (unexposed versus 4th quartile among exposed 1.45 (95%CI, 1.31–1.60). Result did not differ by smoking status and remained significantly elevated among non-smokers. The association was stronger in squamous cell carcinoma and small cell lung cancer as compared to adenocarcinoma of the lung especially among former and current smokers. The effect of RCS on lung cancer in women was not detectable likely related to small numbers.

Conclusions The SYNERGY results show that occupational silica exposure is associated with an increased risks of all lung cancer types in a pooled analyses of community-based studies.

Poster Presentation Cancer

0476 THE BRAZIL-ITALY PROJECT ON ASBESTOS-RELATED DISEASES IN CURITIBA

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Brazil is one of the major producers of chrysotile worldwide, but few studies evaluated its effects on the health of Brazilians. Moreover, there are concerns of miscoding of mesothelioma cases. A joint project was started between the Federal University of Paraná (UFPR), Curitiba, Brazil, and the Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy to evaluate effect of chrysotile exposure. The project, supported by CAPES, Brasilia, include two main areas of research. The first is a cohort mortality study among asbestos-cement workers. From the Ministerio Público do Trabalho, Curitiba, we recently received lists of about 10 000 workers employed since the beginning of production (1974, 1974, and 1993) in three asbestos-cement factories in Curitiba and its Metropolitan Region. Data editing and evaluation of sources of information to perform the mortality follow-up are in progress. The second area involves the implementation of a registry of malignant mesothelioma cases in Curitiba based on the Italian model. For this reason, two post-docs are in Milan to study procedures of the Italian and Lombardy Region Mesothelioma Registry, to translate the Italian standardised questionnaire on asbestos exposure, and to

adapt the database. As a complementary study, we are analysing the records (1998–2012) related to mesothelioma of the Curitiba Population-Based Cancer Registry. Clinical documentation of 269 adult subjects with ICD-10 codes C45 (mesothelioma), C38 (mediastinal and pleural cancers), and C48 (peritoneal cancers) will be examined to identify potential false negatives (i.e., primary pleural/peritoneal cancers classified under incorrect cancer sites like mediastinum and retroperitoneum).

Poster Presentation Exposure Assessment

0478 INHALATION AND DERMAL EXPOSURE TO TOLUENE AMONG PRINTING WORKERS IN A PLASTIC BAG FACTORY

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Introduction The study was conducted in a plastic bag factory to explore the inhalation and dermal exposure to toluene of the printing workers who wore no PPE and the potential of a charcoal cloth pad (CCP) as a dermal sampler to assess the skin permeation of liquid toluene.

Methods Twenty-seven stationary air samples were collected on the same 9 days with the urine and dermal samples from 11 printing workers. The CCPs were wrapped on each of the workers' fingers. Air samples were collected and analysed according to NIOSH # 1501 and 65 post-shift urine samples were collected and analysed for toluene using GC-HS/FID. Multiple linear regression was employed to analyse the association of the variables.

Result T three urine samples contained toluene exceeding the BEI of 30 mg/L. Toluene on the CCP (TolCCP) is a meaningful predictor for the UTol (p-value=0.027), with r and r² of 0.441 and 0.195 respectively. The absorbed dose of toluene determined from TolCCP ranging in between 1.05–91.94 mg and counting for the maximum of 12.3% TLV.

Discussion The mean of TWA was above the TLV while that of the UTol was well below the BEI. This indicated that the TWA concentrations could be overestimated due to the size of the room and good general ventilation. The dermal exposure was not significant if the workers wear respirators, but if not the dermal absorption could contribute to the overall uptake and may cause the exposure above the TLV.

Oral Presentation Dusts and Fibres

0480 MEASUREMENT OF ASBESTOS FIBRE RELEASE DURING REMOVAL WORKS IN A VARIETY OF DIY ASBESTOS REMOVAL SCENARIOS

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