

certificates were ascertained through December 31, 2007. Cancer diagnoses from 1988 through 2010 were identified by the Minnesota Cancer Surveillance System (MCSS). Standardised mortality ratios (SMRs) and proportional cancer incidence ratios (PCIR) were calculated using Minnesota as the reference population.

Results We identified 9,012 deaths, of which 2,693 were cancers, including 943 lung cancers, and 30 mesotheliomas. Mortality from all causes was near unity (SMR = 1.02, 95% Confidence Interval (CI): 1.00–1.04). Mortality from lung cancer and mesothelioma were higher than expected; SMR = 1.16 (95% CI: 1.09–1.24) and 2.79 (95% CI: 1.88–3.98) respectively. SMRs were elevated for all heart diseases (SMR = 1.10, 95% CI: 1.06–1.14), hypertension with heart disease (SMR = 1.79, 95% CI: 1.37–2.30) and ischaemic heart disease (SMR = 1.11, 95% CI: 1.07–1.16). A total of 6,189 incident cancers were identified by MCSS including 1016 lung cancers, and 51 mesotheliomas. PCIRs for mesothelioma and lung cancer were 3.02 (95% CI: 2.24, 3.98) and 1.22 (95% CI: 1.15–1.30) respectively. Other proportionally elevated cancers include oral, esophageal, stomach, laryngeal, and bladder cancers.

Conclusions This analysis indicates taconite workers have an increased risk for certain cancers and cardiovascular disease. Exposures from taconite operations include crystalline silica, respirable dust and elongated mineral particles, including non-asbestiform amphiboles and cleavage fragments. Exposure to commercial asbestos is also possible. The extent to which such exposures contribute to disease burden is being investigated. Lifestyle factors, such as smoking, could also contribute to disease burden.

343 A CASE-CONTROL STUDY OF MESOTHELIOMA IN MINNESOTA IRON ORE MINERS

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Objectives An excess of mesothelioma has been found in iron ore miners in northeastern Minnesota. Miners of taconite, the current form of ore mined, face a number of potentially hazardous exposures. The intensive processing of taconite ore combined with the unique and variable geology of the Mesabi Iron Range create the potential for exposure to natural amphibole fibres, cleavage fragments, and respirable dust. Exposure differed in natural ore (hematite) mining where minimal processing was required. We performed a case-control study to evaluate the risk of mesothelioma associated with taconite mining employment.

Methods Mesothelioma cases were identified through the Minnesota Cancer Surveillance System (MCSS) and death certificates from a cohort of 68,737 miners employed between the 1930s and 1982. Four controls of similar age were selected from the mining cohort for each case using an incidence density sampling protocol. Odds ratios and 95% confidence intervals were estimated with conditional logistic regression for years employed in all iron ore mining, taconite mining, and the earlier natural ore mining.

Results Eighty cases of mesothelioma were identified in this cohort. There is a slight elevation of mesothelioma risk for each additional year of work in iron ore mining (OR = 1.02, 95%CI 1.00–1.04) and taconite mining (OR = 1.03, 95%CI 1.00–1.07). No association was observed for years of employment in natural ore mining.

Conclusion These initial findings indicate a potential relationship between mesothelioma and employment in taconite mining and processing. The extent to which these cases are caused by exposure to taconite dust components, including cleavage fragments and non-fibrous amphiboles found in some zones of the Mesabi Range, or commercial asbestos will be explored in future analyses.

Session: 23. Biological agents

344 WHAT IS THE OCCUPATIONAL RISK FOR TRANSMISSION OF *HELICOBACTER PYLORI* TO HEALTHCARE WORKERS WORKING IN INSTITUTIONS FOR THE ELDERLY?

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Background and Objectives *Helicobacter pylori* was discovered in 1984, but its transmission is not yet clear. Direct person-to-person transmission is most likely and could be relevant to occupational transmission particularly in healthcare workers (HCWs) in institutions for elderly people (IEP). Prevalence of *H.pylori* increases with age, and studies have shown a prevalence up to 85% in people living in IEP.

Methods We compared the occupational risk for *H. pylori* in HCWs working in IEP (n = 198) to non-exposed controls (n = 250) in a cross-sectional study using serology. We calculated crude and age-adjusted prevalence; in bivariate analysis we compared both groups for a number of established general life-style and occupational risk factors. We applied logistic regression, Poisson regression with robust variance estimator and binomial regression, using established risk factors as covariates.

Results The crude prevalence of seropositivity was 14.6% (95% CI 9.7–19.6) in HCWs en 13.6% (95%CI 9.4–17.8) in controls. Age-standardised prevalence was 14.2% versus 14.9% (difference not significant) respectively. Univariate analysis of seropositivity showed no significant associations with frequency of faecal contact, washing and feeding of elderly persons, contact with vomit, handling nasogastric tubes or washing linen. Using logistic regression, OR was 0.9 (95% CI 0.5 - 1.6) in HCWs compared to non-exposed controls after adjusting for other risk factors; only age (OR 3.2 -95% CI 1.6–6.3) and travel to developing countries (OR 2.0 -CI 1.1–3.9) predicted seropositivity to *H. pylori*. In Poisson and log binomial regression, prevalence ratio (PR) was 0.9 (95%CI 0.6–1.5) and 0.9 (95%CI 0.6–1.4); only age and travel contributed significantly to *H.pylori* seropositivity in both models.

Conclusions In our study, using 3 multivariate methods (logistic regression, Poisson regression and binomial regression), the prevalence of *H.pylori* seropositivity was not significantly higher in HCWs compared to non-exposed controls. No significant associations between *H.pylori* seropositive status and occupational exposures were shown.

345 PATTERNS OF *S.AUREUS* AND MRSA COLONIZATION AND INFECTION IN US SWINE VETERINARIANS

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Objectives Determine the incidence and prevalence of nasal colonisation of swine veterinarians with *S. aureus* in the USA, and quantify associations between risks of *S. aureus* colonisation and infection and exposure to pigs.

Methods 1) Cross-sectional survey of swine veterinarians regarding general occupational health and safety. 2) Longitudinal bacteriological testing (nasal swabs) of 68 veterinarians sampled monthly for 18 months for *S. aureus* and MRSA carriage. Isolates are characterised of using spa typing (eGenomics and Ridom spa servers) and multilocus sequence typing. The veterinarians work in most major pig producing states of across the USA. Concurrent assessment of intensity of pig exposure, occurrence of skin and soft injuries, occurrence of *S. aureus* infections, and use of PPE is made monthly via survey.

Results Across the first 4 months of bacteriological testing, prevalence of both *S. aureus* (60–70%) and MRSA (7–10%) were above expected levels in the USA population (30%, 3% respectively). Prevalence is significantly higher in veterinarians sampled within 48 hours of pig contact than after longer periods. Three spa types (539/t034 - ST398; 2/t_unknown - ST 5; 1435/t337 - ST9) comprised 65% of all *S. aureus* isolates from swine veterinarians. The 3 spa/sequence types have been reported as 'livestock associated' MRSA in Europe (ST398), Asia (ST9) and North America (ST5), but the majority of isolates from US veterinarians were methicillin sensitive (MSSA). Although minor skin injuries have been a frequent occurrence (5% cumulative incidence monthly), clinical infections with MRSA or MSSA have not yet been reported.

Conclusions Swine veterinarians in the USA are frequently culture positive for *S. aureus* variants that are common in swine. Many exposure events appear to result in only transient colonisation. To date, risk of clinical *S. aureus* infection in this group appears to be modest, despite widespread exposure to the organisms and a high incidence of opportunity for infection via skin wounds.

346 ANTIMICROBIAL RESISTANT BACTERIA IN PIG FARMERS IN THE NETHERLANDS – A STUDY ON ESBLs

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Objectives Farm animals may serve as a reservoir for (multi) resistant bacteria, such as extended-spectrum beta-lactamase (ESBL) producing Enterobacteriaceae. Animal to man transmission may occur through (in)direct contact during work, which may thus pose an occupational health hazard. In humans, infections with ESBL producing Enterobacteriaceae are associated with high mortality, morbidity and costs. We investigated the prevalence of carriage with ESBL producing Enterobacteriaceae in pig farmers, their family members, and their employees and associations between presence of ESBLs among animals and humans.

Methods Rectal swabs were taken from pigs on 40 Dutch conventional pig farms (60 per farm) and stool samples were obtained from 142 humans living and/or working on 34 of these farms (farmers, family members and employees). Sampling was repeated after 6 months. Presence of ESBL-producing bacteria was determined by selective plating and ESBL genes were analysed by microarray analysis and gene sequencing.

Questionnaires were used to determine antimicrobial use, hygiene, contact with animals and/or meat, and other relevant determinants.

Results ESBL genes, mostly CTX-M-1, TEM-52 en CTX-M-14, were determined in pig isolates on 17 farms (43%) and in isolates from 8 participants (6%). ESBL genes determined in farmers corresponded to those detected in pigs on their farm. ESBL carriage was more likely in farmers working on ESBL positive farms (OR > 10). After 6 months ESBL genes were determined in isolates from 8 farmers (6%). Only 2 of these farmers carried ESBL genes in both stool samples obtained with a 6 months interval.

Conclusions We found a strong association between ESBL carriage in farmers and ESBL occurrence on the farm. Repeated sampling indicates that ESBL carriage is not persistent in this human study population.

347 DO CHANGES IN THE INCIDENCE OF OCCUPATIONALLY-ACQUIRED FOOD-BORNE ZOO NOTIC INFECTIONS PRECEDE CHANGES IN THE WIDER POPULATION?

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Objectives Recently the WHO estimated that up to 75% of emerging pathogens may be of zoonotic origin. Occupationally acquired zoonoses are of particular concern in food producing sectors because of the possibility of transmission through the food chain. We aim to investigate whether changes in incidence of occupationally-acquired zoonotic infections in agricultural and veterinary workers or food preparation and food retail workers are useful in predicting changes in the incidence of food-borne zoonotic infections in the wider population.

Methods In the UK infectious disease consultants report cases of occupationally acquired infectious disease to the Surveillance of Infectious Diseases at Work (SIDAW) scheme. Cases reported to SIDAW will be analysed using a 2 level negative binomial regression model adjusted for changes in the size of occupational group at risk as described elsewhere¹. Following a target set by the UK Health Protection Agency (HPA) in 2001 to reduce the incidence of *salmonella* in UK produced chicken there has been a declining trend in outbreaks of food-borne salmonellosis. In contrast there has been little change in the number of outbreaks of food-borne campylobacteriosis reported to the HPA over the same time. These trends reported to the HPA will be compared with SWORD data.

Results Between 1997 and 2010, 244 individual cases (209 outbreaks) of salmonellosis and 577 individual cases (522 outbreaks) of campylobacteriosis were reported to SWORD. Over the same time period 590 foodborne outbreaks of salmonellosis and 105 of campylobacteriosis were reported to the HPA. A simultaneous decline in the incidence of salmonellosis reported to SWORD and food-borne salmonellosis reported to the HPA was observed. These data will be analysed further to compare different occupational sectors.

Conclusion Reporting of occupational infectious diseases in some sectors may be a useful marker for changes in incidence occurring in the wider population.

REFERENCE

¹ Turner *et al.* Occup Env Med 2012; 69:12 925–931