

had higher injury rates while older workers lost more days following falls. Rates of paid lost days associated with FFH decreased over time, but there was not a consistent decline in mean lost days per fall.

Conclusions Falls from height (FFH) continue to cause significant morbidity and mortality across the construction industry. The observed patterns are consistent with decreased FFH for several years surrounding the Washington Vertical Fall Arrest Standard (1991); the decline exceeds those seen in injury rates overall in this large construction cohort. While crude rates of FFH have continued to decline, they are not as substantial as the declines seen for other types of injuries. The patterns could reflect a variety of things including more global efforts designed to control risk (site planning, safety accountability) and changes in reporting practices.

230 A LONGITUDINAL STUDY OF THE OCCUPATIONAL TONER EXPOSURE ON INFLAMMATION AND ALLERGIC BIOMARKERS

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Objectives We have been conducting a cohort study since 2003 to examine the health effects caused by exposure to toner. The aim of this study is to evaluate the relationship between toner exposure and biomarkers from the results of a 7-year follow up.

Methods The subjects were 1,504 Japanese male workers aged below 50 in 2003. We divided toner-handling works into 5 categories, and then carried out personal exposure measurements on randomly selected workers in each category every year. We also surveyed the toner-handling work category through a self-administered questionnaire every year. Based on the results of the 1st personal exposure measurements, toner dust levels were classified into 3 toner-exposed groups: high ($> = 0.15\text{mg}/\text{m}^3$), medium ($= <0.02\text{mg}/\text{m}^3, 0.15\text{mg}/\text{m}^3<$), and low ($0.02\text{mg}/\text{m}^3<$). Individual workers were classified into 3 toner-exposed groups each year based on the measured toner dust levels and toner-handling work category answered in the questionnaire. Workers who were not engaged in toner-handling work were defined as the non-exposed group. We measured C-reactive protein (CRP) and Immunoglobulin E (IgE) in serum and 8-hydroxy-2'-deoxyguanosine (8-OHdG) in urine for biomarkers. Generalised Estimating Equations (GEE) was applied to examine the relationship between toner exposure and the biomarkers. The biomarkers were used as dependent variables and toner-exposed groups, smoking habits, allergic diseases, and age were used as independent variables.

Results None of the toner-exposed groups showed significant increases in any of the biomarkers in comparison with the non-exposed group. On the other hand, we found that IgE and 8-OHdG significantly increased in current smokers compared to never smokers.

Conclusions This study suggests that the health effects of occupational toner exposure may less than those of smoking, and that the possibility of toner exposure to induce inflammation and allergy is quite low.

231 INCREASED CARDIOVASCULAR MORTALITY AFTER METHYL CHLORIDE EXPOSURE

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Objectives Methyl chloride leakage from a refrigerator occurred on board an Icelandic fishing vessel in the year 1963. The exposure lasted four days and one man died during the fishing trip. Many of the crew members were hospitalised due to different neurological symptoms and signs, and had not recovered completely several years later. The aims were to study long-term mortality.

Methods This is a cohort study with external references. Five referents were randomly selected from registries of seamen and officers matched to each crew member according to age and employment status. Follow up was through record linkage of personal identifier with nationwide mortality registry. Hazard ratios (HR) and 95% confidence intervals (CI) were estimated in Cox proportional hazards model adjusted for age and employment.

Result The intoxicated crew eligible for follow up were 20 deckhands and 7 officers, the reference group counted 100 deckhands and 35 officers. Followed up to end of 2010, 14 of the exposed deckhands had died and 6 of the officers versus 49 deckhands and 26 officers among the reference group. The HR for all causes of death was 2.10 (95% CI 1.28–3.46). For all cardiovascular events HR was 2.06 (95% CI 1.02–4.15), for acute coronary heart disease HR was 3.12 (95% CI 1.11–8.78), for cerebrovascular diseases HR was 5.35 (95% CI 1.18–24.35), and for suicide HR was 13.76 (95% CI 1.18–160.07).

Conclusions The follow up of the methyl chloride exposed cohort showed increased mortality due to cardiovascular diseases after 47 years. After the intoxication the suicide cases had developed severe depressions that were considered to be related to the exposure. The use of the personal identifiers and the comprehensive population registries strengthen the study. Comparison to non exposed group of the same occupations indirectly control for potential confounders including social class, occupational experience, lifestyle factors, diet, smoking, and alcohol use.

232 STRIATAL PATHOLOGY ASSOCIATED WITH CHRONIC MANGANESE EXPOSURE

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Objective The purpose of this study was to investigate the neuropathology of chronic Mn exposure in South African Mn miners.

Methods We performed a neuropathologic study of eight deceased Mn miners and ten deceased, non-Mn reference miners, none of whom had a diagnosis of a Mn-related clinical syndrome. We compared mean cell density in the caudate, putamen, and globus pallidus interna and externa in Mn miners with non-Mn miners, using GFAP to immunostain astrocytes, CD68 to immunostain microglia, and MAP-2 to immunostain neurons.

Results There were no significant differences in age, race or gender between Mn and non-Mn miners. There was a trend toward a higher mean (standard error) pallidal index in the Mn miners