

$p=0.015$). Duration arm elevation $<30^\circ$ had a tendency to be associated with an improvement in NSP over the 2-year follow-up ($<30^\circ \times \text{time}$ ($\beta=-0.07$; $p=0.089$)). Neither duration $30-60^\circ$ nor ≥ 60 were associated with the course of NSP during follow-up. After adjusting for confounders, none of the durations of arm elevation were associated with the course of NSP over the 2-year period ($<30^\circ$ and NSP ($\beta = 0.20$; $p=0.126$); $<30^\circ \times \text{time}$ ($\beta=-0.06$; $p=0.097$)).

Conclusion Among construction and healthcare personnel, duration of working in awkward arm elevation postures was not associated with the course of NSP over a 2-year period. Arm elevation alone, without considering force exertion, may not be sufficient to influence the course of NSP.

Dermal Effects

05B.1 WORKPLACE EXPOSURE ASSESSMENT (WEA), SKIN BARRIER FUNCTION, AND OCCURRENCE OF HAND ECZEMA AMONG WORKERS HANDLING DRILLING WASTE IN NORWAY

¹Jose Hernan Alfonso*, ²Raymond Olsen, ²Pål Graff, ²Shan Zienolddiny, ²Kristine Haugen Anmarkrud, ²Thea Haugsten Johansen, ²med Dag G Ellingsen. ¹Dep. of Occupational Medicine and Epidemiology, National Institute of Occupational Health, Oslo, Norway; ²Dep. of Chemical and Biological Work Environment, National Institute of Occupational Health, Oslo, Norway

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Introduction Knowledge on skin exposure and the occurrence of hand eczema (HE) among workers handling drilling waste from oil and gas drilling is scarce.

M and M WEA included seven waste management plants. Samples of oil drilling waste were analysed with gas chromatography with flame ionization detection (GC-FID). Dry solids from thermal treatment of cuttings fluids were incubated in an artificial sweat solution and analysed with inductively coupled plasma mass spectrometry (ICP-MS). pH of dry solids in the sweat solution was measured with Panpeha™ pH indicator strips.

Sixty-eight workers got an invitation to participate in a structured interview and skin examination. The Nordic Occupational Skin Questionnaire 2002 assessed the occurrence of skin problems and HE. Transepidermal water loss (TEWL) and hydration of the stratum corneum (SC) were measured with Tewameter 300 and Corneometer CM 825 (Courage and Khazaka Electronic GmbH).

Results WEA identified scenarios for potential skin exposure. The profile of hydrocarbons in oil-based drilling waste was similar among the different plants. The soluble fraction of dry solids in artificial sweat solution contained bioavailable metals such as Cr (from 22 to 210 ng/g), Co (from 20 to 94 ng/g), Ni (from 0,13 to 0,72 µg/g). The pH ranged from 6.5 to 12.0.

The participation frequency was of 97%. The one-year prevalence for HE and work-related HE was 30.3% and 24.2%. Ninety-three percent of the workers reported glove use for two hours or more. TEWL values >25 g/h/m² on the dorsal side of the hands, indicating skin barrier disruption, were measured in 55% of the workers. TEWL and hydration of SC values were associated to the occurrence of HE.

Conclusion Potential skin exposure to irritants, allergenic metals, skin occlusion from gloves, skin barrier disruption and high occurrence of HE among workers handling oil and drilling waste are of concern.

05B.2 DERMAL EXPOSURE TO SOLVENTS: A NEED FOR QUANTITATIVE ANALYSIS

¹Radu-Corneliu Duca*, ²Horatiu Moldovan, ¹Matteo Creta, ¹Katrien Poels, ²Septimiu Voidazan, ^{1,3}Lode Godderis, ¹Jeroen Vanoirbeek. ¹Environment and Health, KU Leuven (University of Leuven), Leuven, Belgium; ²Occupational Medicine Department, University of Medicine and Pharmacy of Tirgu-Mures, Tirgu-Mures, Romania; ³Idewe, External Service for Prevention and Protection at Work, Heverlee, Belgium

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For many years, airborne exposure was considered as the main work-related exposure and efforts have been made both on air monitoring and reduction of respiratory exposure. Nevertheless, recent studies have shown that preventive strategies with an exclusive focus on airborne exposures may falsely indicate a 'safe' environment. In 2014, WHO highlighted the importance of dermal exposure and its potential impact on human health. Moreover, it stipulated that the current technical and knowledge gaps related to the assessment of skin exposure have major lacunae.

In this context, there is an increased demand for standardized methods and tools for measuring and assessing skin exposure to hazardous agents.

We have developed an analytical method to simultaneously identify and quantify 195 volatile organic compounds (VOC) in dermal patches with activated charcoal cloth (ACC). Furthermore, we have done several field studies in different industrial settings, by the simultaneous assessment of dermal exposure using the ACC patches (on the hand, arm and neck), together with assessment of the respiratory exposure and determining the actual internal dose via urinary biomonitoring. Toluene, acetone and styrene exposure was found in a thermoplastic panel factory, styrene exposure in a composites body parts manufacturer, limonene and 1-methoxy-2-propanol exposure in a company that produces and prints plastic cartridges, and acetone and toluene in a pharmaceutical company. The results obtained from the quantitative ACC patches have been compared to the data obtained using Riskofderm for skin exposure, and the penetration through the skin was further estimated using IH-Skinperm and correlated with biomonitoring results.

Based on the analytical development and the results of the different field studies, we can conclude that ACC patches represent a suitable technique to evaluate the deposition of VOCs on the skin. We further believe that assessing dermal exposure to solvents using ACC patches can substantially improve occupational health programs.

05B.3 SKIN HEALTH IN CROATIAN HAIRDRESSING APPRENTICES AT THE BEGINNING OF VOCATIONAL EDUCATION: A NEW COHORT STUDY

Zrinka Franic*, Zeljka Babic, Jelena Macan. Institute for Medical Research and Occupational Health, Zagreb, Croatia

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