

parts of the body would reduce skin contamination, a major route of pesticide exposure.

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#### 1714 OCCUPATIONAL NEUROTOXICOLOGY – RECENT STUDIES

Markku A Sainio\*. *Work Environment, Finnish Institute of Occupational Health, Helsinki, Finland*

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**Aim of the special session** International researchers summarise their studies on adverse nervous system effects of occupational exposure to neurotoxic compounds.

Brad Racette<sup>1,2</sup>, Eric Amster<sup>3,4,5</sup>, Qiao NIU<sup>6</sup>

<sup>1</sup>Washington University School of Medicine, St. Louis, Missouri, USA

<sup>2</sup>University of the Witwatersrand School of Public Health, Johannesburg, South Africa

<sup>3</sup>University of Haifa, School of Public Health, Department of Occupational Health, Israel

<sup>4</sup>Harvard University, T.H. Chan School of Public Health, USA

<sup>5</sup>Meuhedet HMO, Occupational Health Department, Israel

<sup>6</sup>School of Public Health, Shanxi Medical University, Taiyuan 030001, Shanxi, China

#### 1714a PARKINSONISM PREDICTIVE MODEL IN MN-EXPOSED WORKERS

Brad A Racette. *Washington University School of Medicine and University of the Witwatersrand School of Public Health*

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**Introduction** Manganese (Mn) over-exposure in occupational settings is associated with basal ganglia toxicity and a movement disorder characterised by parkinsonism (i.e., the signs and symptoms of Parkinson disease). A simple test to help non-neurologists identify workers with clinical Mn neurotoxicity represents an unmet need.

**Methods** Using a cohort of 536 Mn-exposed workers, age  $\leq 65$  years, from welding worksites, with extensive clinical data, we developed a linear regression model to predict the Unified Parkinson Disease Rating Scale motor subsection part 3 (UPDRS3) score. We primarily considered factors easily obtained in a primary care or occupational medicine clinic, including timed motor task results and selected symptoms/conditions. Secondarily we considered other demographic variables and welding exposure. We selected the model based on simplicity for clinical application, biologic plausibility, and statistical significance and magnitude of regression coefficients.

**Results** The final model contained age, timed motor task scores for each hand, and indicators of action tremor, speech difficulty, anxiety, depression, loneliness, pain and current cigarette smoking. When we examined how well the model identified workers with clinically significant parkinsonism (UPDRS3  $\geq 15$ ), the receiver operating characteristic area under the curve (AUC) was 0.72 (95% confidence interval [CI] 0.67, 0.77). With a cut point that provided 80% sensitivity, specificity was 52%, the positive predictive value in our cohort was 29%, and the negative predictive value was 92%. Using the

same cut point for predicted UPDRS3, the AUC was nearly identical for UPDRS3  $\geq 10$ , and was 0.83 (95% CI: 0.76 to 0.90) for UPDRS3  $\geq 20$ .

**Conclusion** Since welding exposure data were not required after including its putative effects, this model may help identify workers with clinically significant Mn neurotoxicity in a variety of settings, as a first step in a tiered occupational screening program.

#### 1714b EVALUATION OF PARKINSONISM AMONG MANGANESE EXPOSED WORKERS

<sup>1,2,3</sup>ED Amster\*, <sup>3</sup>L Mazor. <sup>1</sup>University of Haifa, School of Public Health, Department of Occupational Health, Israel; <sup>2</sup>Harvard University, T.H. Chan School of Public Health, USA; <sup>3</sup>Meuhedet HMO, Occupational Health Department, Israel

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**Introduction** Accumulation of manganese in the brain may result in a neurological condition with cognitive, psychiatric, and movement abnormalities. The clinical and toxicological literature demonstrates that manganese accumulates in the basal ganglia which may result in parkinsonism. There is little published about the prevalence of Parkinsonism among manganese exposed workers. We present a case series of 6 workers from a single factory and discuss methods of neurological assessment of the manganese exposed worker for the occupational health provider.

**Methods** IH sampling of a large tire factory employing 527 production workers was conducted for heavy metals. A walk-through was performed assessing safety, hygiene, ventilation and use of personal protective equipment. Workers in the departments with manganese concentrations above NIOSH REL completed a symptoms survey and were assessed by occupational medicine physicians, with a specific focus on neurological assessments.

**Results** Environmental sampling of manganese concentration was above 1 mg/m<sup>3</sup> in three departments; highest measurement was 6.7 mg/m<sup>3</sup>. Walkthrough survey revealed inadequate ventilation in all three departments and improper PPE use among 72% workers. 27 exposed workers were evaluated with symptom questionnaire and clinical exam focusing on neuropsychologic and neuropsychiatric findings; 4 of those workers had evidence of parkinsonism on exam and symptom survey. Those workers were immediately removed from the worksite. Biomarkers were sent for evaluation and the workers were sent for neurological referral.

**Conclusion** Manganese exposure at work is associated with increased risk of Parkinsonism. We identified a cluster of manganese exposed workers with Parkinsonism in a factory with inadequate ventilation and poor hygiene practice. Based on the findings from this case study we are able to develop a simple neurological assessment tool for the exposed worker.

#### 1714c ASSOCIATION BETWEEN H3K4ME3/BDNF AND THE COGNITIVE FUNCTION OF WORKERS OCCUPATIONALLY EXPOSED TO ALUMINIUM

Hengying Qiu. *School of Public Health, Shanxi Medical University, Taiyuan 030001, Shanxi, China*

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