Project Title: Identification of potential biomarkers related to manganese exposure in Puget Sound metalworkers

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Abstract

Manganese (Mn) is an essential trace element, but in cases of elevated or chronic exposures, such as in many occupational settings, Mn can serve as a neurotoxicant implicated in "manganism," which overlaps clinically with Parkinson's disease. Thus, identification of a reliable biomarker of exposure is of interest. We have been using metabolomics methods as a novel way of identifying biomarkers of inhalation exposure to Mn and its potential downstream physiological effect. Previously, we collected personal, full-shift air samples and end of day urine samples from 12 workers at a Mn-foundry in Seattle and 11 workers unexposed to Mn working as crane operators in a metal recycling facility in Tacoma. When comparing urinary metabolomics profiles between the exposed and unexposed groups, 19 ions were found to be significantly different (adjusted p-value <0.1) between the exposure groups, and nine of these ions were still found to be significantly different (adjusted p-value <0.1) when replicating the analysis in a validation set comprised of different workers from the same worksites. We now seek to use advanced mass spectrometry (MS) and nuclear magnetic resonance (NMR) methods to identify the chemical structure of these nine ions, and then further determine the biological pathways these ions are a part of. This information is critical for interpretation and application of these chemicals as potential biomarkers inhalation exposure to Mn. With identification of even one ion, a full R01 application could be developed that would study the dose-response relationship between Mn exposure at work, and the identified ion, in a cohort of Washington workers. Our proposed MA/AF project aligns with the Washington state priority area of understanding and preventing occupational illnesses and exposures in Washington state workers and workplaces.