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EVALUATION AND VALIDATION OF MANGANESE EXPOSURE BIOMARKERS IN ITALIAN CHILDREN LIVING IN THE VICINITY OF INDUSTRIAL FERROALLOY EMISSIONS

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Rationale: The absence of well-validated biomarkers of manganese (Mn) exposure in children remains an obstacle for human studies of Mn toxicity.

Approach: A cross-sectional epidemiological study of environmental Mn neurotoxicity in children living in the vicinity of ferroalloy plant activity is underway in Italy. Mn exposure is characterized via 24hr personal air samplers, Mn in soil, settled dust, tap water, and dietary Mn intake using FFQ. Candidate biomarkers collected concurrent with environmental measures include blood, urine, hair, fingernails, and saliva (teeth analyses will be reported separately by Arora). Because of the susceptibility of hair to Mn contamination, cleaning/processing methodologies to minimize contamination risk were developed. A sub-set of subjects (n~120) were used to investigate the relationship(s) between exposure and resultant candidate biomarker Mn levels.

Results: The three study regions of active ferroalloy activity (Bagnolo Mella), past ferroalloy activity (Valcamonica), and the reference region (Garda Lake) exhibited significantly different levels of soil and airborne Mn levels consistent with current or past ferroalloy emissions. Blood Mn levels were not associated with exposure region. In contrast, hair Mn levels were elevated in children from Bagnollo Mella compared to the Garda Lake reference group; hair levels in children from the Valcamonica region were intermediate. Associations of all candidate biomarkers with environmental exposure measures will be presented and discussed.

Conclusion: These data suggest that hair Mn correlates with environmental Mn exposure in children, while blood and urine Mn do not. Furthermore, rigorous cleaning of hair is sufficient to remove external Mn contamination from dust.

Keywords: Manganese, biomarkers, ferroalloy emissions, children