

Biomarkers for Environmental Mn Exposure: Useful Ranges for Different Exposure Scenarios

Myers JE, Naik I, Thompson ML, Ramushu S. Esswein E

ABSTRACT

Objectives: To describe expected values for blood (MnB) and urine (MnU) in Mn exposed and unexposed subjects

Methods: Cross-sectional environmental and biological monitoring results were available for workers at a South African Mn smelting works comprising 9 production facilities with differing Mn exposures, and for unexposed external controls. A categorical environmental exposure variable for Current job exposures were categorized with cutpoints at the lowest observed effect threshold (0.1mg/m³), ACGIH TLV (0.2 mg/m³), SA OEL for Mn fume (1 mg/m³) and 2mg/m³ proposed by industry consultants. Non-parametric estimates for MnB and MnU are shown in the Tables.

Results:

MnB µg/l	n	Min	Max	Median	10 th centile	90 th centile
Unexposed	63	3.3	10.9	6.2	4.7	9.1
Total Exposed	415	3.3	44	11.4	7	19.4
Exposed at:						
>0 <=0.1	75	3.3	19.3	8.3	5.1	12.8
>0.1, <0.2	52	4.8	41.2	8.8	6.1	12.3
>0.2, <1.0	172	5.1	44	12.0	8.4	17.9
>1.0, <2.0	58	5.5	27.6	16.0	9.3	27.6
>2.0	58	8.2	38.7	13.9	10.4	24.3
Mg/m ³						
MnU µg/l	n	Min	Max	Median	10 th centile	90 th centile
Unexposed	63	0.5	6.5	0.5	0.5	1.3
Total Exposed	379	0.5	145.9	3.4	0.8	23.3
Exposed at:						
>0 <=0.1	65	0.5	54.6	2.1	0.6	23
>0.1, <0.2	46	0.5	125.9	1.9	0.7	11.8
>0.2, <1.0	161	0.5	106.7	3.6	0.9	17.4
>1.0, <2.0	53	0.6	67.7	6.1	1.4	37.4
>2.0	54	0.6	145.9	4.7	1.1	31
Mg/m ³						

Conclusions: Data from larger numbers of workers exposed across a greater range than previously studied show much better separation for MnB between currently unexposed and exposed, also between exposure categories, than does MnU (threshold at 1 mg/m³). Our results show that MnB is a sensitive surveillance tool for exposures over 0.2 mg/m³, and provide reference data for this purpose.