IEH Institute of Environment and Health

Cranfield UNIVERSITY

Manganese Health Research Program: Recent published literature

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Introduction

This report presents the bibliographic details of papers identified as being first published during the period June 2010 to August 2010.

The papers were selected because they address research areas that are considered of direct relevance to the health effects of manganese (Mn); in order to aid review, the papers are presented under the following categories:

Section 1 - EXPOSURE MEASUREMENT AND MODELLING: Papers relating to the measurements or modelling of environmental and occupational Mn exposure, the development of biomarkers of exposure or effect.

Section 2 - HEALTH EFFECTS: Papers on the influence of Mn on health, disease and dysfunction.

Section 3 - MECHANISM: Papers on the physiological, biochemical and cellular mechanisms underlying the toxic effects of Mn.

Section 4 - HUMAN SUSCEPTIBILITY: Papers relating to assessment of the influence of genetic and epigenetic factors on human susceptibility to the effects of Mn.

Section 5 - TREATMENT AND IMAGING: Papers on the development and implementation of new medical approaches to the treatment of excessive Mn exposure.

Section 6 - MISCELLANEOUS: Other papers considered of interest or potential relevance to the study of the health effects of Mn.

The papers presented herein were identified using a series of structured searches of the following on-line databases: Medline, Toxline, Biological Sciences and Scopus. The paper abstracts were reviewed and categorised by an experience Scientist to confirm their relevance before inclusion in this report.

1. EXPOSURE MEASUREMENT AND MODELLING

Antonini, J.M., Roberts, J.R., Chapman, R.S.*, et al.* (2010) Pulmonary Toxicity and Extrapulmonary Tissue Distribution of Metals After Repeated Exposure to Different Welding Fumes. *Inhalation Toxicology,* 22(10), 805-816.

Bouchard,M., Sauvé,S., Barbeau,B.*, et al* (2010) *Intellectual Impairment in School-Age Children with Long-Term Exposure to Manganese in Drinking Water*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Bowler, R.M., Kim, Y., Ngo,L .*, et al* (2010) *Methodological Aspects of an Epidemiologic Study of Adults Living Near a Manganese Point Source*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Chang, Y., Song, H., Ahn, J.*, et al* (2010) *Functional MRI Findings in Welders Exposed to Manganese*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Cherry, N., Shaik, K., McDonald, C.*, et al.* (2010) Manganese, Arsenic, and Infant Mortality in Bangladesh: An Ecological Analysis. *Archives of Environmental & Occupational Health,* 65(3), 148-153.

Harris,M. & Bowler,R. (2010) *Relationships between Mood and Neuropsychological Performance in Adults with Environmental Exposure to Manganese*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Haynes, E.N., Heckel, P., Ryan, P.*, et al.* (2010) Environmental Manganese Exposure in Residents Living Near a Ferromanganese Refinery in Southeast Ohio: A Pilot Study. *Neurotoxicology,* 31(5), 468-474.

Jones, E.A., Wright, J.M., Rice, G.*, et al.* (2010) Metal Exposures in an Inner-City Neonatal Population. *Environment International,* 36(7), 649-654.

Lee, C.K. (2010) Reversing the Negative Effects of Co-Inhaled Manganese and Iron on Dopamine Levels and Prolactin Production in the Rat Hypothalamus-Pituitary Axis. *Neural Regeneration Research,* 5(7), 525-530.

Lucchini, R. (2010) *Neurobehavioral Effects of Inhaled Manganese in Italian Adolescents*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Menezes-Filho, .A., de O. Novaes, ., Paes, .R.*, et al* (2010) *Elevated Manganese Affects*

Mothers' and Children's Cognition. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Oszlánczi, G., Vezér, T., Sárközi, L.*, et al.* (2010) Functional Neurotoxicity of Mn-Containing Nanoparticles in Rats. *Ecotoxicology and Environmental Safety,* 73(8), 2004-2009.

Oszlánczi, G., Vezér, T., Sárközi, L.*, et al.* (2010) Metal Deposition and Functional Neurotoxicity in Rats After 3-6 Weeks Nasal Exposure by Two Physicochemical Forms of Manganese. *Environmental Toxicology and Pharmacology,* 30(2), 121-126.

Riojas-Rodríguez, H., Solís-Vivanco, R., Schilmann, A.*, et al.* (2010) Intellectual Function in Mexican Children Living in a Mining Area and Environmentally Exposed to Manganese. *Environmental Health Perspectives,* 118(10), 1465-1470. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2957930/pdf/ehp-118-1465.pdf

Rose, M., Baxter, M., Brereton, N.*, et al.* (2010) Dietary Exposure to Metals and Other Elements in the 2006 UK Total Diet Study and some Trends Over the Last 30 Years. *Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment,* 27(10), 1380-1404.

Wilson, K., Gocheva, V . & Bowler, R. (2010) *Relationships between Obesity, Manganese, and Health in Adults with Enfironmental Exposure to Manganese*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

2. HEALTH EFFECTS

Bouchard, M., Sauvé, S., Barbeau, B., *et al* (2010) *Intellectual Impairment in School-Age Children with Long-Term Exposure to Manganese in Drinking Water*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Cherry, N., Shaik, K., McDonald, C., *et al.* (2010) Manganese, Arsenic, and Infant Mortality in Bangladesh: An Ecological Analysis. *Archives of Environmental & Occupational Health,* 65(3), 148-153.

Guilarte, T.R. (2010) Manganese and Parkinson's Disease: A Critical Review and New Findings. *Environmental Health Perspectives,* 118(8), 1071-1080. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2920085/pdf/ehp-0901748.pdf

Harris, M. & Bowler, R. (2010) *Relationships between Mood and Neuropsychological Performance in Adults with Environmental Exposure to Manganese*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Lucchini, R. (2010) *Neurobehavioral Effects of Inhaled Manganese in Italian Adolescents*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Menezes-Filho, J.A., de O. Novaes, C., Paes, C.R., *et al* (2010) *Elevated Manganese Affects Mothers' and Children's Cognition*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Oszlánczi, G., Vezér, T., Sárközi, L., *et al.* (2010) Metal Deposition and Functional Neurotoxicity in Rats After 3-6 Weeks Nasal Exposure by Two Physicochemical Forms of Manganese. *Environmental Toxicology and Pharmacology,* 30(2), 121-126.

Riojas-Rodríguez, H., Solís-Vivanco, R., Schilmann, A., *et al.* (2010) Intellectual Function in Mexican Children Living in a Mining Area and Environmentally Exposed to Manganese. *Environmental Health Perspectives,* 118(10), 1465-1470. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2957930/pdf/ehp-118-1465.pdf

Villalobos, V., Martínez, J.C., Castellano, A., *et al.* (2010) Ultrastructural Study of the Hypothalamus in Mice Chronically Treated with Manganese. *Revista Cientifica De La Facultad De Ciencias Veterinarias De La Universidad Del Zulia,* 20(2), 144-152. Available at: http://www.saber.ula.ve/bitstream/123456789/30741/1/articulo4.pdf

Wilson, K., Gocheva, V. & Bowler, R. (2010) *Relationships between Obesity, Manganese, and Health in Adults with Enfironmental Exposure to Manganese*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Zhang, J., Hu, Y-T., Sheng, X-L., *et al.* (2010) Evaluation of Toxicity of Manganese Ions to Rabbit Retina. *Chinese Journal of Ophthalmology,* 46(7), 597-603. [Chinese].

3. MECHANISM

Au, C., Benedetto, A., Yin, Z., *et al* (2010) *Novel Mechanisms of Manganese Transport*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Benedetto, A., Au, C., Avila, D.S., *et al.* (2010) Extracellular Dopamine P otentiates Mn-Induced Oxidative Stress, Lifespan Reduction, and Dopaminergic Neurodegeneration in a BLI-3-Dependent Manner in Caenorhabditis Elegans. *PLoS Genetics* [Online Journal], 6(8). Available at: http://www.plosgenetics.org/article/fetchObjectAttachment.action;jsessionid=BF777E6DE0D8C272F0AFF2AFC30A2108.ambra02?uri=info%3Adoi%2F10.1371%2Fjournal.pgen.1001084&representation=PDF

Bornhorst, J., Ebert, F., Hartwig, A., *et al.* (2010) Manganese Inhibits Poly(ADP-Ribosyl)Ation in Human Cells: A Possible Mechanism Behind Manganese-Induced Toxicity? *Journal of Environmental Monitoring,* 12(11), 2062-2069.

Cai, T., Yao, T., Zheng, G., *et al.* (2010) Manganese Induces the Overexpression of α-Synuclein in PC12 Cells Via ERK Activation. *Brain Research,* 1359, 201-207.

Cai, X-L., Wang, G-X. & Guo, H. (2010) Effect of Manganese on Caspase-3 mRNA Regulation in Spermatogenic Cell and the Expression of Vimentin on Sertoli Cell in Rats. *Acta Anatomica Sinica,* 41(3), 400-404. [Chinese].

Guilarte, T.R. (2010) Manganese and Parkinson's Disease: A Critical Review and New Findings. *Environmental Health Perspectives,* 118(8), 1071-1080. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2920085/pdf/ehp-0901748.pdf

Guilarte, T.R. (2010) APLP1, Alzheimer's-Like Pathology and Neurodegeneration in the Frontal Cortex of Manganese-Exposed Non-Human Primates. *Neurotoxicology,* 31(5), 572-574.

Rao, K.V.R., Jayakumar, A.R., Reddy, P.V.B., *et al.* (2010) Aquaporin-4 in Manganese-Treated Cultured Astrocytes. *Glia,* 58(12), 1490-1499.

4. HUMAN SUSCEPTIBILITY

No relevant papers identified.

5. TREATMENT AND IMAGING

Chtourou, Y., Fetoui, H., Sefi, M.*, et al.* (2010) Silymarin, a Natural Antioxidant, Protects Cerebral Cortex Against Manganese-Induced Neurotoxicity in Adult Rats. *Biometals,* 23(6), 985-996.

Lee, C.K. (2010) Reversing the Negative Effects of Co-Inhaled Manganese and Iron on Dopamine Levels and Prolactin Production in the Rat Hypothalamus-Pituitary Axis. *Neural Regeneration Research,* 5(7), 525-530.

Rao, K.V.R., Jayakumar, A.R., Reddy, P.V.B.*, et al.* (2010) Aquaporin-4 in Manganese-Treated Cultured Astrocytes. *Glia,* 58(12), 1490-1499.

6. MISCELLANEOUS

Eybl, V. & Kotyzová, D. (2010) Protective Effect of Manganese in Cadmium-Induced Hepatic Oxidative Damage, Changes in Cadmium Distribution and Trace Elements Level in Mice. *Interdisciplinary Toxicology,* 3(2), 68-72. Available at: http://www.intertox.sav.sk/ITX_pdf/03_02_2010/10102-Volume3_Issue_2-07_paper.pdf

Gunter, T.E., Gerstner, B., Lester, T.*, et al.* (2010) An Analysis of the Effects of Mn^{2+} on Oxidative Phosphorylation in Liver, Brain, and Heart Mitochondria using State 3 Oxidation Rate Assays. *Toxicology and Applied Pharmacology,* 249(1), 65-75.

Huang, G.-., Gao, H., Meng, X.-*., et al.* (2010) Primary Analysis of Risk Factors Related to Dilated Cardiomyopathy. *Chinese Journal of Endemiology,* 29(4), 371-374. [Chinese].

Kwakye, .F., Li, . & Bowman, A.B. (2010) *High-Throughput Assay to Assess Manganese Transport Kinetics in a Striatal Cell Model of Huntington's Disease*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Lin, C., Doyle, P., Wang, D.*, et al.* (2010) The Role of Essential Metals in the Placental Transfer of Lead from Mother to Child. *Reproductive Toxicology,* 29(4), 443-446.

Ogunniyi, A.D., Mahdi, L.K., Jennings, M.P.*, et al.* (2010) Central Role of Manganese in Regulation of Stress Responses, Physiology, and Metabolism in Streptococcus Pneumoniae. *Journal of Bacteriology,* 192(17), 4489-4497. Available at: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC135132/pdf/0131.pdf

Rasalan, R. & Bowler, R. (2010) *The Influence of Dietary Consumption and Iron Stores on Manganese in Blood*. Abstract presented at the 26th International Neurotoxicology Conference, Portland Marriott Downtown Waterfront, Portland, Oregon, 6-10 Jun 2010.

Williams, B.B., Kwakye, G.F., Wegrzynowicz, M.*, et al.* (2010) Altered Manganese Homeostasis and Manganese Toxicity in a Huntington's Disease Striatal Cell Model are Not Explained by Defects in the Iron Transport System. *Toxicological Sciences,* 117(1), 169-179.