

Manganese Health Research Program: Recent published literature

June 2009 - August 2009

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Introduction

This report presents the bibliographic details of papers identified as being first published during the period June 2009 to September 2009.

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 Proquest Health. 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

Bostroem, F., Hansson, O., Gerhardsson, L., *et al.* (2009) CSF mg and Ca as Diagnostic Markers for Dementia with Lewy Bodies. *Neurobiology of Aging*, 30(8), 1265-1271.

Cowan, D.M., Zheng, W., Xou, Y., *et al.* (2009) Relationship between Blood Manganese-Iron Ratio and Early Onset Neurobehavioral Alterations. *The Toxicologist*, 180(1), 74. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Garey, J.D., Williams, M. & McClure, P.R. (2009) A New Chronic Minimal Risk Level for Inhaled Inorganic Manganese. *The Toxicologist*, 180(1), 168. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Joo, N.S., Kim, S.M., Jung, Y.S., *et al.* (2009) Hair Iron and Other Minerals' Level in Breast Cancer Patients. *Biological Trace Element Research*, 129(1-3), 28-35.

Kim, Y., Kim, B., Hong, Y., *et al.* (2009) Co-Exposure to Environmental Lead and Manganese Affects the Intelligence of School-Aged Children. *Neurotoxicology*, 30(4), 564-571.

Meyer-Baron, M., Knapp, G., Schaper, M., *et al.* (2009) Performance Alterations Associated with Occupational Exposure to Manganese--a Meta-Analysis. *Neurotoxicology*, 30(4), 487-496.

Monaghan, B., Norrish, J., Potter, J., *et al.* (2009) Self-Reported Health Symptoms, Cardiovascular Risk and Fume Exposure In welders. *Journal of Occupational Health and Safety - Australia and New Zealand*, 25(3), 223-230.

Nong, A., Taylor, M.D., Dorman, D.C., *et al.* (2009) Assessing the Influence of Dietary Manganese Variability and Inhaled Exposure by Pharmacokinetic Modeling. *The Toxicologist*, 180(1), 98. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Verschoor, L. & Verschoor, A.H. (2009) Work-Related Disease. *Nederlands Tijdschrift Voor Geneeskunde*, 153(20), B312. [Dutch]

2. HEALTH EFFECTS

Kim, Y., Kim, B., Hong, Y., *et al.* (2009) Co-Exposure to Environmental Lead and Manganese Affects the Intelligence of School-Aged Children. *Neurotoxicology*, 30(4), 564-571.

Meyer-Baron, M., Knapp, G., Schaper, M., *et al.* (2009) Performance Alterations Associated with Occupational Exposure to Manganese--a Meta-Analysis. *Neurotoxicology*, 30(4), 487-496.

Monaghan, B., Norrish, J., Potter, J., *et al.* (2009) Self-Reported Health Symptoms, Cardiovascular Risk and Fume Exposure Inwelders. *Journal of Occupational Health and Safety - Australia and New Zealand*, 25(3), 223-230.

Rudge, C.V., Röllin, H.B., Nogueira, C.M., *et al.* (2009) The Placenta as a Barrier for Toxic and Essential Elements in Paired Maternal and Cord Blood Samples of South African Delivering Women. *Journal of Environmental Monitoring*, 11(7), 1322-1330.

Slicker, J. & Vermilyea, S. (2009) Pediatric Parenteral Nutrition: Putting the Microscope on Macronutrients and Micronutrients. *Nutrition in Clinical Practice*, 24(4), 481-486.

Verschoor, L. & Verschoor, A.H. (2009) Work-Related Disease. *Nederlands Tijdschrift Voor Geneeskunde*, 153(20), B312. [Dutch]

Wood, R.J. (2009) Manganese and Birth Outcome. *Nutrition Reviews*, 67(7), 416-420.

3. MECHANISM

Anderson, J.G., Fordahl, S.C., Cooney, P.T., *et al.* (2009) Extracellular Norepinephrine, Norepinephrine Receptor and Transporter Protein and mRNA Levels are Differentially Altered in the Developing Rat Brain due to Dietary Iron Deficiency and Manganese Exposure. *Brain Research*, 1281, 1-14.

Babu, C.S. & Ramanathan, M. (2009) Pre-Ischemic Treatment with Memantine Reversed the Neurochemical and Behavioural Parameters but Not Energy Metabolites in Middle Cerebral Artery Occluded Rats. *Pharmacology Biochemistry and Behavior*, 92(3), 424-432.

Bostroem, F., Hansson, O., Gerhardsson, L., *et al.* (2009) CSF mg and Ca as Diagnostic Markers for Dementia with Lewy Bodies. *Neurobiology of Aging*, 30(8), 1265-1271.

Colosimo, C. & Guidi, M. (2009) Parkinsonism due to Ephedrone Neurotoxicity: A Case Report. *European Journal of Neurology*, 16(6), e114-5.

Costa, L.G., Pizzurro, D., Dao, K., *et al.* (2009) Manganese Impairs the Ability Of Astrocytes to Promote Neurite Outgrowth in Rat Hippocampal Primary Neurons. *The Toxicologist*, 180(1), 40. [Abstract]. Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Fan, Q., Zou, Y., Liu, J., *et al.* (2009) Decreased DMT1, Tf and Hpcidin Gene Expressions in Leucocyte of Manganese Exposed Workers. *The Toxicologist*, 180(1), 74. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Filipov, N.M., Pringle, R.B. & Bennett, L. (2009) Peripheral and Central Inflammatory Response to Lps Challenge is Potentiated By Exposure to Manganese in the Absence of Enhanced Brain and Liver Accumulation. *The Toxicologist*, 180(1), 71. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Guilarte, T.R. (2009) Increased Brain Amyloid Stains in Non-Human Primates Following Chronic Manganese Exposure: A Possible Relationship to Ad? *The Toxicologist*, 180(1), 140. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Gunter, T.E., Gavin, C.E. & Gunter, K.K. (2009) The Case for Manganese Interaction with Mitochondria. *Neurotoxicology*, 30(4), 727-729.

Hernández, A.F., Gil, F., Leno, E., *et al.* (2009) Interaction between Human Serum Esterases and Environmental Metal Compounds. *Neurotoxicology*, 30(4), 628-635.

Jensen, L.T., Carroll, M.C., Hall, M.D., *et al.* (2009) Down-Regulation of a Manganese Transporter in the Face of Metal Toxicity. *Molecular Biology of the Cell*, 20(12), 2810-2819.

Kalia, K., Zheng, W. & Jiang, W. (2009) Importance of Mitochondria in Manganese-Induced Cellular Toxicity. *Neurotoxicology*, 30(4), 727-727.

Kanthasamy, A., Choi, C., Anantharam, V., *et al.* (2009) Manganese Stabilizes Cellular Prion Proteins and Alter the Rate of Proteinase-K Dependent Limited Proteolysis. *The Toxicologist*, 180(1), 69. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

- Kwieciński, A. & Nowak, P. (2009) Effect of Prenatal Manganese Intoxication on [³H] Glucose Uptake in the Brain of Rats Lesioned as Neonates with 6-Hydroxydopamine. *Pharmacological Reports*, 61(558), 558-563.
- Lee, E.Y., Jiang, H., Yin, Z., *et al* (2009) Estrogen Attenuates Manganese-Induced Glutamate Transporter Impairment in Rat Brain Astroglial Cultures. *The Toxicologist*, 180(1), 76. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.
- Lee, E.S.Y., Yin, Z., Milatovic, D., *et al.* (2009) Estrogen and Tamoxifen Protect Against Mn-Induced Toxicity in Rat Cortical Primary Cultures of Neurons and Astrocytes. *Toxicological Sciences*, 110(1), 156-157.
- Liu, B., Lokuta, K.M., Turner, D.E., *et al* (2009) Glial Activation-Mediated Dopaminergic Neurotoxicity Induced by Manganese and Lipopolysaccharide: Role of Free Radicals. *The Toxicologist*, 180(1), 319. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.
- Liu, M., Cai, T., Zhao, F., *et al.* (2009) Effect of Microglia Activation on Dopaminergic Neuronal Injury Induced by Manganese, and its Possible Mechanism. *Neurotoxicity Research*, 16(1), 42-49.
- McGrath, S., Moreno, J. & Tjalkens, R. (2009) Estrogen Antagonizes the Pro-Inflammatory Effects of Manganese on Expression of Nitric Oxide Synthase 2 (Nos2) in Astrocytes. *The Toxicologist*, 180(1), 72. [Abstract] Poster presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.
- Milatovic, D., Yu, Y., Gupta, R.C., *et al* (2009) Oxidative Damage and Neurodegeneration in Manganese-Induced Neurotoxicity. *The Toxicologist*, 180(1), 76. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.
- Moreno, J., Streifel, K., Sullivan, K., *et al* (2009) Glial Inflammatory Responses and Age-Dependent Susceptibility to Manganese-Induced Neurotoxicity. *The Toxicologist*, 180(1), 39-40. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.
- Posser, T., Franco, J.L., Bobrovskaya, L., *et al.* (2009) Manganese Induces Sustained Ser40 Phosphorylation and Activation of Tyrosine Hydroxylase in PC12 Cells. *Journal of Neurochemistry*, 110(3), 848-856.
- Prabhakaran, K., Chapman, G.D. & Gunasekar, P.G. (2009) Expression of Alpha-Synuclein in Rat Dopaminergic Cells Increased Susceptibility to Manganese Linked to Oxidative Stress, Map Kinases and Nf-Kb Mediated Neuronal Injury. *The Toxicologist*, 180(1), 319. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.
- Rahman, M., Wang, J., Patterson, T.A., *et al* (2009) Manganese-30 And Aluminum-80 Nanoparticles Alter Expression of Oxidative Stress-Related Genes in Mouse Brain. *The Toxicologist*, 180(1), 54. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.
- Rosenfeld, L., Leung, E., Jensen, L., *et al* (2009) Manganese Toxicity in Cells that Hyper-Accumulate Phosphate Involves Protein Turnover Effects of the Proteasome. *The*

Toxicologist, 180(1), 411. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Saito, M. & Sawayama, T. (2009) Neurological Picture. Visualised Manganese Ion within the Basal Ganglia and Long Axonal Tracts. *Journal of Neurology, Neurosurgery, and Psychiatry*, 80(6), 695.

Settivari, R., LeVora, J. & Nass, R. (2009) Pharmacogenetic and Biochemical Analysis of Parkinson's Disease-, Manganism, And Dopamine Neuron-Associated Proteins in C.Elegans: Effects on Mitochondria Function and Dopamine Neuron Vulnerability. *The Toxicologist*, 180(1), 320. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Sidoryk, M., Lee, E., Jiang, H., *et al* (2009) Manganese Modification of Glutamine Transport in Primary Astrocytes. *The Toxicologist*, 180(1), 74. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Sidoryk-Węgrzynowicz, M., Lee, E., Albrecht, J., *et al.* (2009) Manganese Disrupts Astrocyte Glutamine Transporter Expression and Function. *Journal of Neurochemistry*, 110(3), 822-830.

Slicker, J. & Vermilyea, S. (2009) Pediatric Parenteral Nutrition: Putting the Microscope on Macronutrients and Micronutrients. *Nutrition in Clinical Practice*, 24(4), 481-486.

Smith, T., Tantawy, N., Peterson, T., *et al* (2009) Brain Glucose Utilization Following Chronic Manganese Exposure in Male Sprague-Dawley Rats. *The Toxicologist*, 180(1), 69. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Stanwood, G.D., Leitch, D.B., Savchenko, V., *et al.* (2009) Manganese Exposure is Cytotoxic and Alters Dopaminergic and GABAergic Neurons within the Basal Ganglia. *Journal of Neurochemistry*, 110(1), 378-389.

Verina, T., Schneider, J.S. & Guilarte, T.R. Chronic Manganese Exposure Induces Microglial Dystrophic Changes, Inos Expression and Iron Accumulation in the Non-Human Primate Substantia Nigra. *The Toxicologist*, 180(1), 71. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Vural, H., Sirin, B., Yilmaz, N., *et al.* (2009) The Role of Arginine-Nitric Oxide Pathway in Patients with Alzheimer Disease. *Biological Trace Element Research*, 129(1-3), 58-64.

Williams, B.B., Vadodaria, B.K., Anderson, *et al* (2009) The Huntington's Disease Mutation Leads to an Alteration in Manganese Transport or Storage. *The Toxicologist*, 180(1), 449. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

4. HUMAN SUSCEPTIBILITY

Williams, B.B., Vadodaria, B.K., Anderson, *et al* (2009) The Huntington's Disease Mutation Leads to an Alteration in Manganese Transport or Storage. *The Toxicologist*, 180(1), 449. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

5. TREATMENT AND IMAGING

Dydak, U., Jiang, Y., Long, L., *et al* (2009) Assessment of Manganese Exposure by 3D High-Resolution T1-Weighted Mri. *The Toxicologist*, 180(1), 75. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

McGlothan, J.L., Barker, P.B., Schneider, J.S., *et al* (2009) Magnetic Resonance Imaging (MRI) and 1H-Magnetic Resonance Spectroscopy (MRS) in the Manganese-Exposed Non-Human Primate Brain. *The Toxicologist*, 180(1), 72. [Abstract] Presented at the 48th Society of Toxicology Annual Meeting and ToxExpo, 15 -19 March, 2009, Baltimore, MD.

Sitburana, O. & Ondo, W.G. (2009) Brain Magnetic Resonance Imaging (MRI) in Parkinsonian Disorders. *Parkinsonism & Related Disorders*, 15(3), 165-174.

Widerøe, M., Olsen, Ø., Pedersen, T.B., *et al.* (2009) Manganese-Enhanced Magnetic Resonance Imaging of Hypoxic-Ischemic Brain Injury in the Neonatal Rat. *NeuroImage*, 45(3), 880-890.

6. MISCELLANEOUS

Ferrara, J. & Jankovic, J. (2009) Acquired Hepatocerebral Degeneration. *Journal of Neurology*, 256(3), 320-332.

Garas, A., Webb, E., Pillay, V., *et al.* (2009) A Novel and Simple Method of Screening Compounds for Interaction with DNA: A Validation Study. *Mutation Research*, 678(1), 20-29.

George, J.L., Mok, S., Moses, D., *et al.* (2009) Targeting the Progression of Parkinson's Disease. *Current Neuropharmacology*, 7(1), 9-36.