

# **Manganese Health Research Program: Recent published literature**

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**June 2010 - August 2010**

**September 2010**

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# Introduction

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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

Deschamps, F. (2010) Health Impairments Induced by Occupational and Environmental Exposure to Emerging and Former Contaminants. *Toxicology Letters*, 196(Supplement 1), S70-S70. [Abstract presented at the XII International Congress of Toxicology, July 19–23, 2010, Barcelona, Spain].

Douglas, P.K., Cohen, M.S. & DiStefanoIII, J.J. (2010) Chronic Exposure to Mn Inhalation may have Lasting Effects: A Physiologically-Based Toxicokinetic Model in Rats. *Toxicological & Environmental Chemistry*, 92(2), 283-303.

Firestone, J.A., Lundin, J.I., Powers, K.M., *et al.* (2010) Occupational Factors and Risk of Parkinson's Disease: A Population-Based Case-Control Study. *American Journal of Industrial Medicine*, 53(3), 217-223.

Henn, B.C., Ettinger, A.S., Schwartz, J., *et al.* (2010) Early Postnatal Blood Manganese Levels and Children's Neurodevelopment. *Epidemiology*, 21(4), 433-439.

Johnsen, H.L., Hetland, S.M., Benth, J.S., *et al.* (2010) Dust Exposure Assessed by a Job Exposure Matrix is Associated with Increased Annual Decline in FEV1: A 5-Year Prospective Study of Employees in Norwegian Smelters. *American Journal of Respiratory and Critical Care Medicine*, 181(11), 1234-1240.

Laohaudomchok, W., Cavallari, J.M., Fang, S.C., *et al.* (2010) Assessment of Occupational Exposure to Manganese and Other Metals in Welding Fumes by Portable X-Ray Fluorescence Spectrometer. *Journal of Occupational and Environmental Hygiene*, 7(8), 456-465.

Moreno, M.E., Acosta-Saavedra, L.C., Meza-Figueroa, D., *et al.* (2010) Biomonitoring of Metal in Children Living in a Mine Tailings Zone in Southern Mexico: A Pilot Study. *International Journal of Hygiene and Environmental Health*, 213(4), 252-258.

Nunes, J.A., Batista, B.L., Rodrigues, J.L., *et al.* (2010) A Simple Method Based on ICP-MS for Estimation of Background Levels of Arsenic, Cadmium, Copper, Manganese, Nickel, Lead, and Selenium in Blood of the Brazilian Population. *Journal of Toxicology and Environmental Health - Part A*, 73(13), 878-887.

Sriram, K., Lin, G.X., Jefferson, A.M., *et al.* (2010) Dopaminergic Neurotoxicity Following Pulmonary Exposure to Manganese-Containing Welding Fumes. *Archives of Toxicology*, 84(7), 521-540.

Winder, B.S., Salmon, A.G. & Marty, M.A. (2010) Inhalation of an Essential Metal: Development of Reference Exposure Levels for Manganese. *Regulatory Toxicology and Pharmacology*, 57(2-3), 195-199.

## 2. HEALTH EFFECTS

Abdalian, R., Saqui, O., Fernandes, G., *et al* (2010) Manganese Toxicity in Patients on Long-Term TPN: Fact Or Fallacy. *Gastroenterology*, 138(5, Supplement 1), S-39. [Abstract presented at the 2010 DDW (Digestive Disease Week) Conference].

Aljarallah, B., Fernandes, G., Saqui, O., *et al* (2010) Canadian Home Total Parenteral Nutrition (HTPN): Prescription of Manganese in Parenteral Nutrition – Associated Liver Disease (PNALD). *Gastroenterology*, 138(5, Supplement 1), S-234. [Abstract presented at the 2010 DDW (Digestive Disease Week) Conference].

Bolea, R., Hortells, P., Martín-Burriel, I., *et al.* (2010) Consequences of Dietary Manganese and Copper Imbalance on Neuronal Apoptosis in a Murine Model of Scrapie. *Neuropathology and Applied Neurobiology*, 36(4), 300-311.

Deschamps, F. (2010) Health Impairments Induced by Occupational and Environmental Exposure to Emerging and Former Contaminants. *Toxicology Letters*, 196(Supplement 1), S70-S70. [Abstract presented at the XII International Congress of Toxicology, July 19–23, 2010, Barcelona, Spain].

Henn, B.C., Ettinger, A.S., Schwartz, J., *et al.* (2010) Early Postnatal Blood Manganese Levels and Children's Neurodevelopment. *Epidemiology*, 21(4), 433-439.

Johnsen, H.L., Hetland, S.M., Benth, J.S., *et al.* (2010) Dust Exposure Assessed by a Job Exposure Matrix is Associated with Increased Annual Decline in FEV1: A 5-Year Prospective Study of Employees in Norwegian Smelters. *American Journal of Respiratory and Critical Care Medicine*, 181(11), 1234-1240.

Jones, N.C., Cardamone, L., Bouilleret, V., *et al.* (2010) Confounding Neurodegenerative Effects of Manganese for in-Vivo MR Imaging in Rat Models of Brain Insults. *Injury*, 41(Supplement 1), S54-S54.

Laohaudomchok, W., Cavallari, J.M., Fang, S.C., *et al.* (2010) Assessment of Occupational Exposure to Manganese and Other Metals in Welding Fumes by Portable X-Ray Fluorescence Spectrometer. *Journal of Occupational and Environmental Hygiene*, 7(8), 456-465.

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.

Sarkozi, L., Horvath, E., Konya, Z., *et al.* (2009) Subacute Intratracheal Exposure of Rats to Manganese Nanoparticles: Behavioral, Electrophysiological, and General Toxicological Effects. *Inhalation Toxicology*, 21(Suppl 1), 83-91.

Sriram, K., Lin, G.X., Jefferson, A.M., *et al.* (2010) Dopaminergic Neurotoxicity Following Pulmonary Exposure to Manganese-Containing Welding Fumes. *Archives of Toxicology*, 84(7), 521-540.

### 3. MECHANISM

Butterworth, R.F. (2010) Metal Toxicity, Liver Disease and Neurodegeneration. *Neurotoxicity Research*, 18(1), 100-105.

Carmona, A., Deves, G., Roudeau, S., *et al.* (2010) Manganese Accumulates within Golgi Apparatus in Dopaminergic Cells as Revealed by Synchrotron X-Ray Fluorescence Nanoimaging. *ACS Chemical Neuroscience*, 1(3), 194-203.

Choi, C.J., Anantharam, V., Martin, D.P., *et al.* (2010) Manganese Upregulates Cellular Prion Protein and Contributes to Altered Stabilization and Proteolysis: Relevance to Role of Metals in Pathogenesis of Prion Disease. *Toxicological Sciences*, 115(2), 535-546.

Fitsanakis, V.A., Zhang, N., Garcia, S., *et al.* (2010) Manganese (Mn) and Iron (Fe): Interdependency of Transport and Regulation. *Neurotoxicity Research*, 18(2), 124-131.

Fordahl, S., Cooney, P., Milatovic, D., *et al.* (2010) Effect of Manganese Exposure and Antioxidant Therapy on Oxidative Stress in the Rat Brain. *The FASEB Journal*, 24(1\_MeetingAbstracts), 921.7.

Gluck, G., Anguelova, T., Heimark, D., *et al.* (2010) Synergistic Effects of d-Chiro-Inositol and Manganese on Blood Glucose and Body Weight of Streptozotocin-Induced Diabetic Rats. *Current Bioactive Compounds*, 6(2), 90-96.

Hermenean, A.O., Tudor, C., Postolache, L., *et al.* (2010) Manganese (II) Induced Oxidative Stress is Counteracted by Hsp 27 and Hsp 70 in HepG2 Cell Line. *Toxicology Letters*, 196(Supplement 1), S307-S307. [Abstract presented at the XII International Congress of Toxicology, July 19–23, 2010, Barcelona, Spain].

Hernandez, R.B., Farina, M., Suñol, C., *et al.* (2010) Manganese-Induced Development Neurotoxicity is Mediated by Chemical Speciation and Probably by Mitochondrial Impairment. *Toxicology Letters*, 196(Supplement 1), S307-S307. [Abstract presented at the the XII International Congress of Toxicology, July 19–23, 2010, Barcelona, Spain].

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

Tontson, L., Parkel, S. & Rinken, A. (2010) Manganese Enhances Agonist Binding to 5-Ht<sub>1a</sub> Receptors by Inhibiting Guanosine Nucleotide Binding to Receptor-Coupled G-Proteins. *Basic and Clinical Pharmacology and Toxicology*, 7(Suppl. 1), 619. [Abstract for the 16th World Congress of Basic and Clinical Pharmacology, 17-23 July 2010, Copenhagen, Denmark].

## **4. HUMAN SUSCEPTIBILITY**

No relevant papers identified.

## 5. TREATMENT AND IMAGING

Bertin, A., Michou-Gallani, A-I., Gallani, J-J., *et al.* (2010) In Vitro Neurotoxicity of Magnetic Resonance Imaging (MRI) Contrast Agents: Influence of the Molecular Structure and Paramagnetic Ion. *Toxicology in Vitro*, 24(5), 1386-1394.

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.

Noordin, S., Winalski, C.S., Shortkroff, S., *et al.* (2010) Factors Affecting Paramagnetic Contrast Enhancement in Synovial Fluid: Effects of Electrolytes, Protein Concentrations, and Temperature on Water Proton Relaxivities from Mn Ions and Gd Chelated Contrast Agents. *Osteoarthritis and Cartilage*, 18(7), 964-970.

Zhang, J., Hu, Y-T. & Sheng, X-L. (2010) Effect of Manganese as Image Intensifier on the Function of Nervous System. *International Journal of Ophthalmology*, 10(5), 905-907. [Chinese].

## 6. MISCELLANEOUS

Abernethy, D.R., DeStefano, A.J., Cecil, T.L., *et al.* (2010) Metal Impurities in Food and Drugs. *Pharmaceutical Research*, 27(5), 750-755.

Catalán-Vázquez, M., Schilman, A. & Riojas-Rodríguez, A.H. (2010) Perceived Health Risks of Manganese in the Molango Mining District, Mexico. *Risk Analysis*, 30(4), 619-634.

Gann, H., Glaspell, G., Garrad, R., *et al.* (2010) Interaction of MnO and ZnO Nanomaterials with Biomedically Important Proteins and Cells. *Journal of Biomedical Nanotechnology*, 6(1), 37-42.

Hoover, S.E., Xu, W., Xiao, W., *et al.* (2010) Changes in DnaA-Dependent Gene Expression Contribute to the Transcriptional and Developmental Response of *Bacillus Subtilis* to Manganese Limitation in Luria-Bertani Medium. *Journal of Bacteriology*, 192(15), 3915-3924.

Hortells, P., Monleon, E., Acin, C., *et al.* (2010) The Effect of Metal Imbalances on Scrapie Neurodegeneration. *Zoonoses and Public Health*, 57(5), 358-366.

Puri, S., Hohle, T.H. & O'Brian, M.R. (2010) Control of Bacterial Iron Homeostasis by Manganese. *Proceedings of the National Academy of Sciences of the United States of America*, 107(23), 10691-10695.

Yang, Y., Sun, J., Gervai, P., *et al.* (2010) Characterization of Cryoinjury-Induced Infarction with Manganese-and Gadolinium-Enhanced MRI and Optical Spectroscopy in Pig Hearts. *Magnetic Resonance Imaging*, 28(5), 753-766.