

Manganese Health Research Program: Recent published literature

September - November 2007

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Introduction

This report presents the bibliographic details of papers identified as being first published during the period September to November 2007.

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.

For the sake of completeness, this report also presents a number of papers that, although published before 2007, have not previously been identified in the databases routinely searched, and therefore that were not included in previous updates.

Future reports will present literature published during subsequent 3-monthly (quarterly) intervals.

1. EXPOSURE MEASUREMENT AND MODELLING

Chuang, H., Kuo, C., Chiu, Y., *et al.* (2007) A case-control study on the relationship of hearing function and blood concentrations of lead, manganese, arsenic, and selenium. *The Science of the Total Environment*, 387(1-3), 79-85.

Hovde, C.A. & Raynor, P.C. (2007) Effects of voltage and wire feed speed on weld fume characteristics. *Journal of Occupational and Environmental Hygiene*, 4(12), 903-912.

Lucchini, R.G., Albini, E., Benedetti, L., *et al.* (2007) High prevalence of parkinsonian disorders associated to manganese exposure in the vicinities of ferroalloy industries. *American Journal of Industrial Medicine*, 50(11), 788-800.

Mai, J-P. & Luo, B-D. (2007) Graphite AAS determination of urine manganese. *Industrial Health and Occupational Diseases -Beijing-*, 33(4), 248-249.

Marriott, L.D., Foote, K.D., Kimber, A.C., *et al.* (2007) Zinc, copper, selenium and manganese blood levels in preterm infants. *Archives of Disease in Childhood - Fetal and Neonatal Edition*, 92(6), F494-497.

Mishra, S., Ramteke, D.S. & Wate, S.R. (2007) Quantification of transition metals in biological samples and its possible impact on ferro-alloy workers. *Journal of Environmental Biology*, 28(4), 851-856.

Taneja, S.K. & Mandal, R. (2007) Mineral factors controlling essential hypertension-a study in the Chandigarh, India population. *Biological Trace Element Research*, 120(1-3), 61-73.

Teeguarden, J.G., Dorman, D.C., Covington, T.R., *et al.* (2007) Pharmacokinetic modeling of manganese. I. Dose dependencies of uptake and elimination. *Journal of Toxicology and Environmental Health - Part A*, 70(18), 1493-1504.

Teeguarden, J.G., Dorman, D.C., Nong, A., *et al.* (2007) Pharmacokinetic modeling of manganese. II. Hepatic processing after ingestion and inhalation. *Journal of Toxicology and Environmental Health - Part A*, 70(18), 1505-1514.

Teeguarden, J.G., Gearhart, J., Clewell, H.J., *et al.* (2007) Pharmacokinetic modeling of manganese. III. Physiological approaches accounting for background and tracer kinetics. *Journal of Toxicology and Environmental Health - Part A*, 70(18), 1515-1526.

2. HEALTH EFFECTS

Bouchard, M., Mergler, D., Baldwin, M., *et al.* (2007) Neurobehavioral functioning after cessation of manganese exposure: A follow-up after 14 years. *American Journal of Industrial Medicine*, 50(11), 831-840.

Chuang, H-Y., Kuo, C-H., Chiu, Y-W., *et al.* (2007) A case-control study on the relationship of hearing function and blood concentrations of lead, manganese, arsenic, and selenium. *The Science of the Total Environment*, 387(1-3), 79-85.

Ellingsen, D.G., Chashchin, V., Haug, E., *et al.* (2007) An epidemiological study of reproductive function biomarkers in male welders. *Biomarkers*, 12(5), 497-509.

Gerber, G.B., Léonard, A. & Hantson, P. (2002) Carcinogenicity, mutagenicity and teratogenicity of manganese compounds. *Critical Reviews in oncology/hematology*, 42(1), 25-34.

Ljung, K. & Vahter, M. (2007) Time to re-evaluate the guideline value for manganese in drinking water? *Environmental Health Perspectives*, 115(11), 1533-1538.

Lucchini, R.G., Albini, E., Benedetti, L., *et al.* (2007) High prevalence of parkinsonian disorders associated to manganese exposure in the vicinities of ferroalloy industries. *American Journal of Industrial Medicine*, 50(11), 788-800.

McMillan, G. & Spiegel-Ciobanu, V.E. (2007) Manganism, parkinson's disease and welders' occupational exposure to manganese - part 2: Manganese as a neurotoxicological risk to welders. *Welding and Cutting*, (4), 220-222.

Rohling, M.L. & Demakis, G.J. (2007) Potential neuropsychological profiles in welders occupationally exposed to manganese: An examination of effect size patterns. *Journal of Clinical and Experimental Neuropsychology*, 29(8), 813-822.

Santamaria, A.B., Cushing, C.A., Antonini, J.M., *et al.* (2007) State-of-the-science review: Does manganese exposure during welding pose a neurological risk? *Journal of Toxicology and Environmental Health - Part B*, 10(6), 417-465.

Taneja, S.K. & Mandal, R. (2007) Mineral factors controlling essential hypertension-a study in the chandigarh, india population. *Biological Trace Element Research*, 120(1-3), 61-73.

Zoni, S., Albini, E. & Lucchini, R. (2007) Neuropsychological testing for the assessment of manganese neurotoxicity: A review and a proposal. *American Journal of Industrial Medicine*, 50(11), 812-830.

3. MECHANISM

Crossgrove, J.S. & Yokel, R.A. (2004) Manganese distribution across the blood-brain barrier III. The divalent metal transporter-1 is not the major mechanism mediating brain manganese uptake. *Neurotoxicology*, 25(3), 451-460.

Dick, F.D., De Palma, G., Ahmadi, A., *et al.* (2007) Gene-environment interactions in parkinsonism and parkinson's disease: The geoparkinson study. *Occupational and Environmental Medicine*, 64(10), 673-680.

Dobson, A. & Aschner, M. (2007) "Manganese-induced oxidative stress" in: G.A. Qureshi & S.H. Parvez, eds. *Oxidative stress and neurodegenerative disorders*, Amsterdam, Elsevier Science B.V. pp. 433-450.

Domico, L.M., Cooper, K.R., Bernard, L.P., *et al.* (2007) Reactive oxygen species generation by the ethylene-bis-dithiocarbamate (EBDC) fungicide mancozeb and its contribution to neuronal toxicity in mesencephalic cells. *NeuroToxicology*, 28(6), 1079-1091.

Finkelstein, Y., Milatovic, D. & Aschner, M. (2007) Modulation of cholinergic systems by manganese. *Neurotoxicology*, 28(5), 1003-1014.

Garrick, M.D., Dolan, K.G., Horbinski, C., *et al.* (2003) DMT1: A mammalian transporter for multiple metals. *Biometals*, 16(1), 41-54.

Golub, M.S., Hogrefe, C.E., Germann, S.L., *et al.* (2005) Neurobehavioral evaluation of rhesus monkey infants fed cow's milk formula, soy formula, or soy formula with added manganese. *Neurotoxicology and Teratology*, 27(4), 615-627.

Guilarte, T.R. & Chen, M. (2007) Manganese inhibits NMDA receptor channel function: Implications to psychiatric and cognitive effects. *NeuroToxicology*, 28(6), 1147-1152.

Higashi, Y., Asanuma, M., Miyazaki, I., *et al.* (2004) Parkin attenuates manganese-induced dopaminergic cell death. *Journal of Neurochemistry*, 89(6), 1490-1497.

Jadhav, S.H., Sarkar, S.N., Patil, R.D., *et al.* (2007) Effects of subchronic exposure via drinking water to a mixture of eight water-contaminating metals: A biochemical and histopathological study in male rats. *Archives of Environmental Contamination and Toxicology*, 53(4), 667-677.

Jadhav, S.H., Sarkar, S.N., Ram, G.C., *et al.* (2007) Immunosuppressive effect of subchronic exposure to a mixture of eight heavy metals, found as groundwater contaminants in different areas of india, through drinking water in male rats. *Archives of Environmental Contamination and Toxicology*, 53(3), 450-458.

Liang, Q. & Zhou, B. (2007) Copper and manganese induce yeast apoptosis via different pathways. *Molecular Biology of the Cell*, 18(12), 4741-4749.

Mani, U., Prasad, A.K., Suresh Kumar, V., *et al.* (2007) Effect of fly ash inhalation on biochemical and histomorphological changes in rat liver. *Ecotoxicology and Environmental Safety*, 68(1), 126-133.

Morello, M., Zatta, P., Zambenedetti, P., *et al.* (2007) Manganese intoxication decreases the expression of manganoproteins in the rat basal ganglia: An immunohistochemical study. *Brain Research Bulletin*, 74(6), 406-415.

Oikawa, S., Hirose, I., Tada-Oikawa, S., *et al.* (2006) Mechanism for manganese enhancement of dopamine-induced oxidative DNA damage and neuronal cell death. *Free Radical Biology & Medicine*, 41(5), 748-756.

Park, J.D., Chung, Y.H., Kim, C.Y., *et al.* (2007) Comparison of high MRI t1 signals with manganese concentration in brains of cynomolgus monkeys after 8 months of stainless steel welding-fume exposure. *Inhalation Toxicology*, 19(11), 965-971.

Soldin, O.P. & Aschner, M. (2007) Effects of manganese on thyroid hormone homeostasis: Potential links. *Neurotoxicology*, 28(5), 951-956.

Struve, M.F., McManus, B.E., Wong, B.A., *et al.* (2007) Basal ganglia neurotransmitter concentrations in rhesus monkeys following subchronic manganese sulfate inhalation. *American Journal of Industrial Medicine*, 50(10), 772-778.

Vezér, T., Kurunczi, A., Náráy, M., *et al.* (2007) Behavioral effects of subchronic inorganic manganese exposure in rats. *American Journal of Industrial Medicine*, 50(11), 841-852.

Xianping, Z., Qianxing, W. & Xiulian, C. (2007) Effect of manganese on testis antioxidative capacity and apoptosis in spermatogenic cell of rats. *Chinese Journal of Family Planning*, 15(7), 408-410.

Zhang, P., Hatter, A. & Liu, B. (2007) Manganese chloride stimulates rat microglia to release hydrogen peroxide. *Toxicology Letters*, 173(2), 88-100.

Zwingmann, C., Leibfritz, D. & Hazell, A.S. (2007) Nmr spectroscopic analysis of regional brain energy metabolism in manganese neurotoxicity. *Glia*, 55(15), 1610-1617.

4. HUMAN SUSCEPTIBILITY

Dick, F.D., De Palma, G., Ahmadi, A., *et al* (2007) Gene-environment interactions in parkinsonism and Parkinson's disease: the Geoparkinson study. *Occupational and Environmental Medicine*, 64(10), 673-680.

5. TREATMENT AND IMAGING

Fabiani, G., Rogacheski, E., Wiederkehr, J.C., *et al.* (2007) Liver transplantation in a patient with rapid onset parkinsonism-dementia complex induced by manganism secondary to liver failure. *Arquivos De Neuro-Psiquiatria*, 65(3A), 685-688.

Uchino, A., Noguchi, T., Nomiya, K., *et al.* (2007) Manganese accumulation in the brain: MR imaging. *Neuroradiology*, 49(9), 715-720.

Zwingmann, C., Leibfritz, D. & Hazell, A.S. (2007) Nmr spectroscopic analysis of regional brain energy metabolism in manganese neurotoxicity. *Glia*, 55(15), 1610-1617.

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6. MISCELLANEOUS

Alessio, L., Campagna, M. & Lucchini, R. (2007) From lead to manganese through mercury: Mythology, science, and lessons for prevention. *American Journal of Industrial Medicine*, 50(11), 779-787.

Lina, Z. (2007) Research progress of manganese and its toxicity. *Meat Research -Beijing-*, 7(101), 38-42.