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INTRODUCTION

The past few years occupational practitioners, scientists and environmentalists have witnessed an increase in the concerns around the toxicity of metals. Toxic metals have become a serious concern for our health. Metals like aluminium (Al), arsenic (As), beryllium (Be), cadmium (Cd), chromium (Cr), lead (Pb), mercury (Hg), nickel (Ni), palladium (Pd), platinum (Pt), silver (Ag), thallium (Tl), tin (Sn), thorium (Th) and uranium (U) can destroy important enzyme systems and may cause preliminary ageing, sickness and even cancer and ultimately death.

The air we breathe, the water we drink and the food we consume, all contain higher amounts of toxins than at any other time in human history. Essential metals sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), iron (Fe), manganese (Mn), copper (Cu) zinc (Zn) etc. generally are not considered toxic. However, in a few cases, like manganese, a mineral element is both nutritionally essential and potentially toxic. The Greek's direct translation of the word manganese meaning "magic" is appropriate since the varied effects of manganese deficiency and toxicity in living organisms are still not well understood.^{1,3}

FUNCTION OF MANGANESE

Manganese (Mn) has an important role as a component of some enzymes and an activator of others in a number of physiological processes.^{1,2,4} Anti-oxidant function, metabolism, bone development and wound healing are some of the known functions of manganese.^{1,2,5-7}

MANGANESE – NUTRIENT INTERACTION

Despite the fact that the specific mechanism for absorption and transport of Mn is unknown, there is some indication that the absorption and transport pathways of iron and manganese are common.¹ Thus, it is suggested that an individual's iron status can affect manganese's bio-availability. A decreased MnSOD activity in white blood cells, which started a reduction in manganese nutritional status was associated with supplementation of 60 mg of iron per day over a four month period.⁸

MANGANESE – DEFICIENCY

Animals with manganese deficiency have signs of impaired growth, impaired reproductive function, skeletal abnormalities, impaired glucose tolerance and altered carbohydrate and lipid metabolism.¹ In humans these deficiencies are less clear.^{1,4,6}

MANGANESE AND CHRONIC DISEASES

Certain chronic diseases (osteoporosis, diabetes mellitus and epilepsy) have been associated with low dietary intake of manganese and low blood or tissue levels.^{1,2} However, there is currently no evidence that low manganese causes disease or whether low manganese nutritional status contributes to certain disease progress.¹

MANGANESE TOXICITY

Inhaled manganese: Multiple neurologic problems can occur as a result of manganese toxicity.^{1,3,5} Inhaled manganese dust is a well-known occupational hazard.^{1-3,5} Before being metabolised by

the liver, the inhaled manganese is transported to the brain, unlike ingested manganese.^{1,9} Manganese toxicity usually appears slowly over months or years.^{1,2} Permanent neurological disorders following extreme exposure can result. The symptoms, such as tremors, difficulty walking and facial muscle spasms, are similar to those of Parkinson's disease.^{1,2,10} They are usually preceded by psychiatric symptoms that include irritability, aggressiveness and hallucination.^{1,2,10}

Indigested manganese: Limited evidence is available that ingested manganese may lead to the same symptoms as for inhaled manganese.¹

Individuals with increased susceptibility to manganese toxicity

Chronic liver disease: Eliminated of manganese from the body is mainly via bile. Impaired liver function may lead to decreased manganese excretion and thus contribute to neurological problems and Parkinson's disease-like symptoms.^{1,2}

CONCLUSION

Manganese is an essential metal that may have life-threatening consequences at low levels of absorption and potentially toxic consequences with irreversible damage at high levels. It is a metal that for years has been studied and underestimated in its function in the human body. There is no specific diagnostic test for manganese poisoning and the diagnosis depends on a combination of characteristic neurological features and an occupational history of exposure measurements.

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