

# Abstract

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## Influence of Essential Trace Minerals and Micronutrient Insufficiencies on Harmful Metal Overload in a Mongolian Patient with Multiple Sclerosis.

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**BACKGROUND:** Parkinson's disease and other neurological disorders are prevalent in Mongolia. Our previous studies revealed a significant correlation of these diseases with high oxidative stress due to a high body burden of harmful metals, such as manganese, iron, lead, cadmium, and aluminum.

**OBJECTIVE:** This report describes a 37-year-old male Mongolian patient with multiple sclerosis and essential micronutrient deficiency.

**FINDINGS:** This patient demonstrated high oxidative stress, as shown by high urinary 8-hydroxy-2'-deoxyguanosine levels of 14.7 and 14.3 ng/mg creatinine (crea), although his hair levels of these toxic metals were markedly lower than other Mongolians. In addition, this patient was deficient not only in various essential minerals, including selenium, magnesium, copper, cobalt, vanadium, and nickel, but also in micronutrients such as vitamin B6, C, E, folic acid, niacin, and  $\beta$ -carotene. Furthermore, after taking 2,3-dimercaptosuccinic acid, a chelating agent, urinary excretion of lead, cadmium, manganese, aluminum, iron, copper, and lithium were increased 156-, 8.4-, 7.6-, 4.3-, 3.3-, 2.1-, and 2.1-fold, respectively.

**CONCLUSIONS:** These results suggest that this patient suffered from a deficiency in micronutrients such as essential minerals and vitamins, which resulted in a disturbance in the ability to excrete harmful metals into the urine and hair. It is possible that a deficiency of micronutrients and a high burden of heavy metals play a role in the pathogenesis of multiple sclerosis. Nutritional treatment may be an effective approach to this disease.

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