

# **Uptake of Manganese Dioxide to the Rat Brain: Role of particle size in a nose-only inhalation exposure**

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## **ABSTRACT**

Through biliary excretion, the body achieves homeostatic control of manganese levels despite wide variations in dietary intake. Manganese absorbed through other routes such as intravenous, pulmonary or olfactory nerve bypasses homeostatic control mechanisms.

The transport of relatively soluble manganese salts via the olfactory nerve to the brain has previously been established in published reports by several investigators. These studies have generally involved direct instillation of solutions into the nasopharynx or exposure to small diameter manganese aerosols. In this study, we sought to determine how particle size and the use of a relatively insoluble form of manganese might influence net systemic absorption of manganese dust and the potential role of the olfactory nerve in transport of manganese dioxide. Respirable aerosol of mass median aerodynamic diameter (MMAD) approximately 1  $\mu\text{m}$  and inhalable aerosol of MMAD approximately 10  $\mu\text{m}$  were generated at target concentrations of 3  $\text{mg}/\text{m}^3$  as Mn. Subjects were exposed in a nose-only exposure system for 5, 10 and 15 days. Blood, lung, liver, and brain regions were harvested following treatment and assessed by graphite furnace atomic absorption. The kinetics of manganese uptake into the brain, blood, lung and liver are described for each sized aerosol over the time course of exposure. (supported in part by The Ferroalloys Association).