

Dopaminergic Dysfunction Following Long-term Occupational Exposure to Manganese

Raffn E, Arlien-Søborg P, Thomsen C, Friberg L,
Clinic of Occupational Medicine Hillerød, Dep. Neurology and Radiology Rigshospitalet
State University Hospital, Copenhagen, Dep. Clinical Physiology and Nuclear Medicine
Bispebjerg Hospital, Copenhagen

ABSTRACT

Workers from a danish stealwork long-term exposed to silico-and ferromanganese dust and fume have increasingly complained of impaired memory and concentration ability, increased fatigue and need of sleep as well as emotional instability. Several had intermittent pain in muscles and joints and experienced dyscoordination and tremor of the hands and instability in gait.

Measurement of manganese levels in the production area in 1996 showed for dust 9,4 - 4076 $\mu\text{g}/\text{m}^3$ and fume 4,1 - 60 $\mu\text{g}/\text{m}^3$.

52 male workers with chronic symptoms were examined by a specialist in occupational medicine and a neurologist. Of these 10 were selected for SPECT examinations of the monoamine re-uptake sites distribution by I -123- β CIT or I -123-FP-CIT. Furthermore regional cerebral blood flow (rCBF) was recorded with Tc-99m -HMPAO iv. Magnetic resonance imaging (MRI) of the brain was performed in 8 of the workers in order to disclose morphological changes and to precisely localize the uptake sites during SPECT examinations.

Results: mean age 46,4 years (range 39-64 y). Exposure duration mean 16,1 years (range 8-25 y). General intellectual impairment was seen in 9 workers and one had suspected impairment, 8 had extrapyramidal findings in mild degree. 7/8 MRI were normal and 1 showed increased number of white matter lesions. 1 CT was normal.

5/10 had increased striatal (striatal-occipital/occipital) ratios of dopamine reuptake receptor sites. The remaining had ratios within normal range. 5/10 showed mild to moderate abnormal rCBF distribution with bifrontal hypoperfusion as a common finding.

Discussion: No competitive neurological disorders were disclosed in these 10 manganese exposed workers most of whom had to give up working or spare time activities or both due to the chronic symptoms. The clinical picture was not as severe as described in workers from the Manganese mines i.e. Chile.

Previous 6-fluorodopa PET scan and ^{11}C -Raclopride PET have failed to show significant changes while fluorodeoxyglucose PET showed global reduction in cortical glucose metabolism.

The present SPECT findings indicate increased dopamine re-uptake sites presynaptically or increased affinity in dopaminergic neurones.

This is in contrast to the findings in patients with Parkinson's disease in whom a reduced uptake of I -123 β -CIT and I -123 FP - CIT in the basal ganglia is seen.