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Monoamine oxidase activity in placenta and environmental manganese exposure

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Environmental exposures interfering with neurotransmitters metabolism in foetus can influence further psychomotor development of the child. The environmental exposure to manganese (Mn) poses a particular challenge: it is both an essential element and a potent cumulative neurotoxin. Considering the higher demand and increasing blood Mn levels during pregnancy, as well as its active transport across the placenta, there is a need for hazard assessment in regard to fetal exposure. In animal, Mn has been reported to disturb the dopamine metabolism via inhibition or up regulation of monoamine oxidase (MAO) activity in brain mitochondria. Both, activation and inhibition of MAO, were reported to be related to psychomotor skills in humans.

Thus, our objective was to examine the relationship between blood Mn concentrations and placenta MAO activity.

Method: The study was performed in 137 healthy pregnant women from a large French cohort. Maternal and cord blood samples were obtained at delivery for Mn determination by atomic absorption spectroscopy. Placental samples were stored at -80 °C immediately after expulsion and total MAO activity was measured by fluorometric method.

Results: MAO activity was significantly positively correlated with maternal and cord blood Mn concentrations.

Conclusion: This study is the first studying MAO activity as biomarker of effects of Mn in human pregnancy. Our results can be explained by compensatory activation of MAO following increasing neurotransmitters release related to Mn exposure at relatively low doses.