Iron in Alzheimer's and Parkinson's diseases

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The major proteins implicated in Alzheimer's disease (AD) and Parkinson's disease (PD) have important functions in metal transport, and particularly are components of an iron regulatory system that fails in aging. The amyloid protein precursor (APP), like ceruloplasmin (CP), facilitates the export of iron from cells by stabilizing cell surface ferroportin, and prevents iron from accumulating in the brain. Tau impacts on iron export by trafficking APP to the cell surface. Elevated CSF ferritin levels predict conversion of MCI to AD, and the major genetic risk factor for AD, Apolipoprotein E, has a striking relationship with CSF ferritin that implies a causal role for iron in AD. Knockout mice for both ceruloplasmin and APP develop iron-mediated PD pathology, remedied by iron chelators. A recent phase 2 trial of deferiprone in PD lowered nigral iron and improved clinical readouts. The involvement of all major proteins implicated in AD in metal trafficking raises the possibility that this major neurodegenerative disorder is caused by a collapse of metal homeostasis, and supports the adjustment of metal regulation as a pharmacological target.

Macro and microelements as Alzheimer's disease protein biomarkers in cerebrospinal fluid

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The homeostasis of macro and microelements is altered in the brain of patients suffering from Alzheimer's disease (AD). In this study we analysed 24 macro and microelements in cerebrospinal fluid (CSF) and correlated its concentration with AD protein biomarkers (AB1-42, t-tau, p-tau181, p-tau217 and VILIP-1) in CSF of 63 patients with AD, 31 with mild cognitive impairment (MCI), and 11 controls (HC). A significantly negative correlation was found between AB1-42 and Co, while significantly positive correlations were obtained between t-tau and Li, As, Se, Sr, p-tau181 and B, Na, Mg, S, K, Ca, Cr, Fe, Co, Mn, Ni, Cu, Zn, As, Se, Mo, Ti, Hg, p-tau217 and B, Na, Mg, S, K, Ca, Cr, Fe, Co, Mn, Cu, As, Se, Sr, Mo, Cd, Ba, Ti, Hg, p-tau412 and Li, B, Na, Mg, S, K, Cr, Fe, Co, Mn, Ni, Cu, Zn, As, Se, Sr, Mo, Cd, Ba, Ti, and Hg. The significantly higher Na, Mg, S, K, Ca, Cr, Fe, Mn, Cu, As, Se, Sr, Ba and Hg in AD (p<0.05) with mild cognitive impairment (MCI) and mild cognitive impairment (MCI) and significant increase in Ca and As was found in the MCI group with pathological p-tau412 levels, while the MCI group with pathological p-tau412 levels had increased Li, B, Na, Mg, S, K, Ca, Cr, Fe, Co, Mn, Ni, Cu, Zn, As, Se, Sr, Mo, Cd, Ba, Ti, and Hg. The MCI group with pathological VILIP-1 levels had significantly higher Na, Mg, S, K, Ca, Cr, Fe, Mn, Cu, As, Se, Sr, Ba, and Hg. Despite small cohort of MCI patients (n=31), result indicates potential of elements concentration as a diagnostic marker of disease progression. Funded by: CSF project IP-2014-09-9730.

Macro and microelements as biomarkers of mild cognitive impairment

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The influence of lead (Pb) on macrophage cellular membrane modification

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Lead (Pb) is common heavy metal, it can get into the body by various routes, pollution and the air so as water and soil is dangerous. The increasing numbers of people struggling with cardiovascular diseases, research on factors contributing to the development of these diseases, deserve special attention. This study aims to verify whether the Pb can result in a modification of the macrophage cell membrane by affecting the content of the various fatty acids (FA). The study was performed on human leukemic cell line. Profile of 16 FA was analyzed by gas chromatography. The correlation between the membrane FA content and the Pb was observed. Arachidonic acid (20:4n6) showed the greatest increase vs control and the concentration of gamma-linolenic (18:3n6) decreased significantly. The study shows that Pb affects on the lipid's profile of cell membranes of macrophages thus can induce changes in its properties. The results may indicate about atherogenic character of Pb.