SERUM METAL ELEMENTS DURING THE EVOLUTION OF ALZHEIMER'S DISEASE.

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Introduction

Element profiling is an interesting approach for understanding neurodegenerative processes, considering that compelling evidences show that element toxicity might play a crucial role in the onset and progression of Alzheimer's disease (AD). In the present study we profiled 22 serum elements along the continuum from healthy subjects (HS), through patients suffering of subjective memory complaint (SMC) and/or mild cognitive impairment (MCI), up to those with AD. The purpose was double: to understand if the homeostasis of essential and toxic elements is implicated in the onset and progression of AD, and to evaluate the analyzed elements as possible diagnostic biomarkers for the disease.

Materials and methods

Thirty-four patients with probable AD, 20 with MCI, 24 with SMC and 40 HS were included in the study. Subjects were consecutively enrolled from the Centre for Research and Training in Medicine for Aging, University of Molise. The following elements were detected by inductively coupled plasma mass spectrometry (ICP-MS): 8Be, 27Al, 44Ca, 51V, 52Cr, 55Mn, 56Fe, 59Co, 60Ni, 63Cu, 66Zn, 75As, 78Se, 88Sr, 98Mo, 111Cd, 118Sn, 120Sb, 202Hg, 205Tl and 238U.

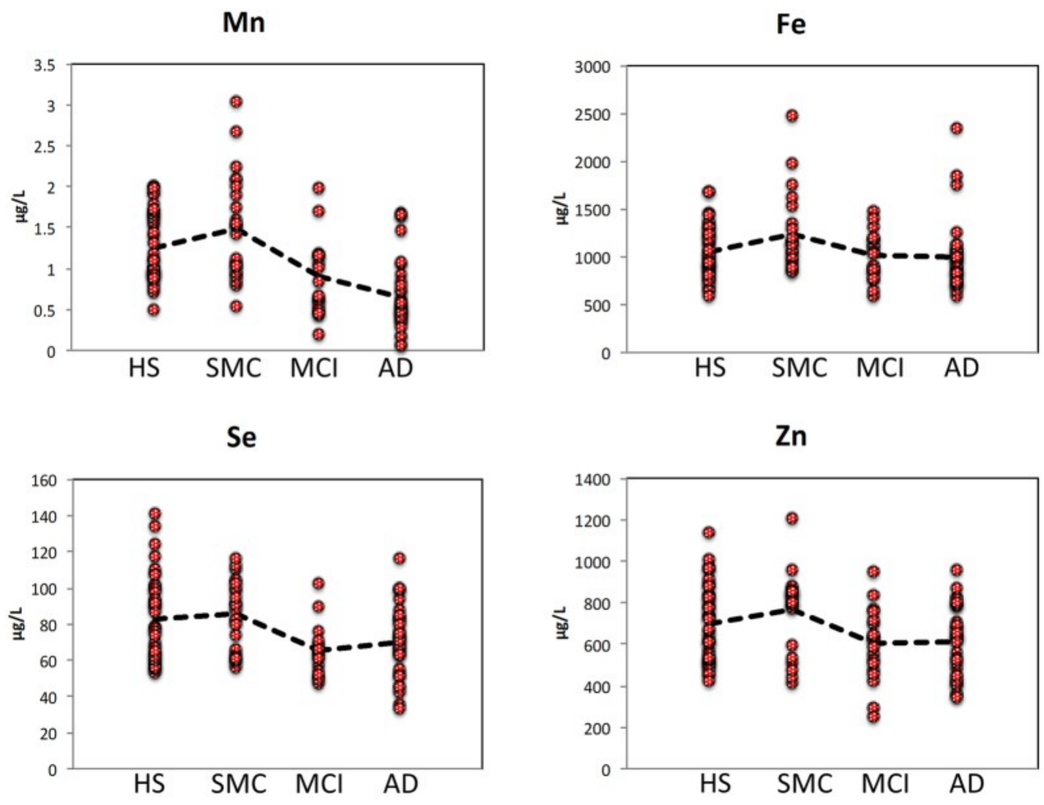

Figure 1. Profiles of selected essential elements. Essential elements show a similar profile with highest values in SMC samples and lowest values in AD samples. Dot line represents the average value.

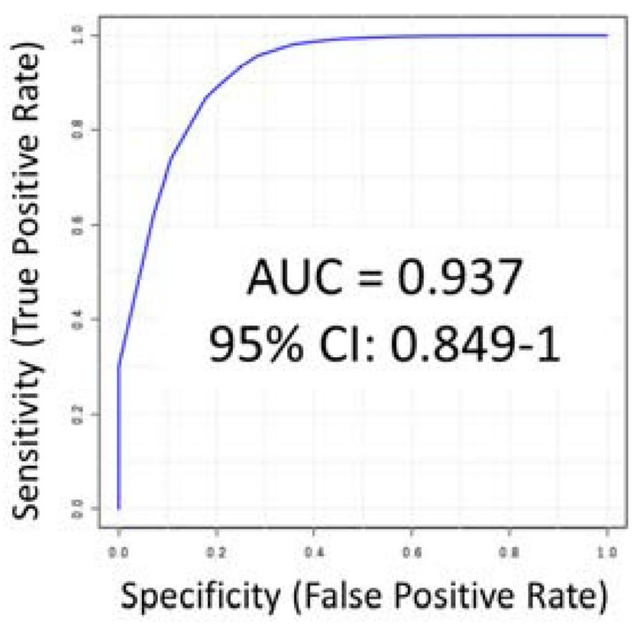

Figure 3. Multivariate ROC curves analysis discriminated AD patients from HS with over 90% accuracy.

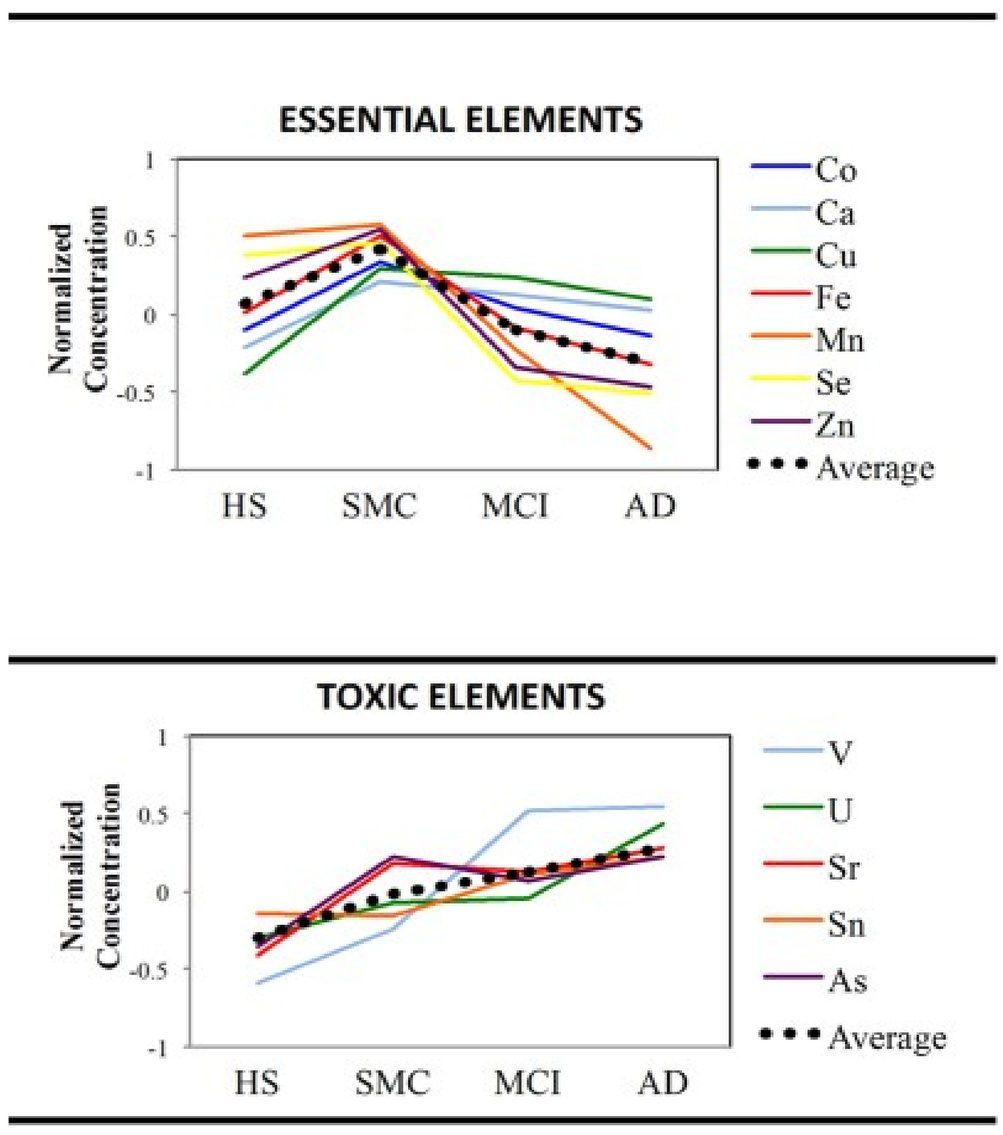

Figure 2. Essential elements showed a characteristic pattern, which was different from the one of toxic elements.

Results

Manganese, iron, copper, zinc, selenium, thallium, antimony, mercury, vanadium and molybdenum changed significantly among the 4 groups. Several essential elements, such as manganese, selenium, zinc and iron tended to increase in SMC and then progressively to decrease in MCI and AD. In contrast, toxic elements show a variable behavior, since some elements tended to increase, while others tended to decrease in AD. (Fig. 1 e 2) A multivariate model, built using a panel of six essential elements (manganese, iron, copper, zinc, selenium and calcium) and their ratios, discriminated AD patients from HS with over 90% accuracy (Fig. 3).

Conclusion

The findings of present study suggest that essential and toxic elements contribute to generate a distinctive signature during the progression of AD, and their monitoring in subjects at risk of dementia might help to detect preclinical stages of AD.

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