Three plasma metabolites in elderly patients differentiates mild cognitive impairment and Alzheimer's Disease: a mass spectrometry study

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Introduction

The lipids and related molecules comprise 60% of the nonaqueous portion of the brain and are major constituents of neuronal membrane. Therefore brain lipids play an important role in neuronal function and plasticity influencing cognition, perception, mood and behavior.

Figure 1. Plasmatic membrane. Font: www.asbmb.org/asbmbtoday/201409/LipidNews/

Objective

To investigate whether the lipids plasma levels may provide a tool for differential diagnosis among Alzheimer's disease (AD), Mild Cognitive Impairment (MCI) and healthy controls (HC).

Material and Methods

Subjects

Table 1. Socio-demographic characteristics and clinical assessment

Diagnosis	AD (n=34)	MCI (n=20)	HC (n=25)	p
Gender (M/F)	10/24	3/17	7/18	0,47
Age (mean ± sd)	75,0 ± 6,7	73,9 ± 6,2	74,4 ± 5,8	0,81
Education (mean ± sd)	6,2 ± 3,8	7,8 ± 4,4	13,2 ± 5,7	0,01
MEEM (mean ± sd)	19 ± 5	27 ± 2	29 ± 1	<0,01
CAMCOG (mean ± sd)	57 ± 18	86 ± 9	95 ± 6	<0,01

M=male; F=female; sd=standard deviation; MMSE=Mini-Mental State Examination; CAMCOG=Cambridge Cognitive Test; p=significance of Chi-square test.

Sample preparation

After 8h fasting, blood samples were collected in EDTA-coated tubes. Samples were centrifuged at 20°C and 1800 x g for 15 min.

Metabolites quantification

Plasma 142 metabolites were analyzed by AbsoluteIDQ p180® kit (Biocrates Life Sciences AG, Innsbruck, Austria). The metabolites determination was performed by mass spectrometry (flow injection analysis) in the Waters® Xevo TQ-S.

Results

Statistical analyzes were performed using a Classification And Regression Tree (CART) method

Diagnosis

Cut-offs in nM

AD	C12-DC < 0.079 + C12 ≥ 0.154 C12-DC ≥ 0.079 + PC aa C26:0 ≥ 1.495
MCI	C12-DC < 0.079 + C12 < 0.154
HC	C12-DC ≥ 0.079 + PC aa C26:0 < 1.495

PC=Phosphatidylcholines; aa=diacyl bond; C12-DC=Dodecanedioylcarnitine; C12=Dodecanoylcarnitine.

Conclusions

- Our results suggest that alterations of the three plasma metabolites may differentiate AD and MCI individuals from healthy controls with an accuracy of 74,7%
- Further studies should clarify the clinical relevance of these findings as biomarkers