LC-MS Lipid Profiling of the Blood Plasma of Alzheimer's Patients from Two Communities: African American and Nigerian Populations

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Introduction

This work is part of the Indianapolis-Ibadan Dementia Project, which is a comparative epidemiological study examining risk factors for Alzheimer disease (AD) and dementia in two community dwelling elderly populations, Yoruba living in Ibadan Nigeria and African Americans living in Indianapolis. Previously, a significant relationship between cholesterol and apolipoprotein E genotype and the risk for AD in both populations had been found.
We report in this study the use of liquid chromatography mass spectrometry to profile lipids in the blood plasma of 63 subjects from the two populations. The differences in lipid profiles between AD and healthy individuals among the two populations were found using statistical analysis tools and the identities of the variant lipids were elucidated.

Method

The MicroTOF instrument (Bruker Daltonics) was coupled to a Dionex UltiMate 3000 LC system. A Hypersil silica column (Thermo Electron) (150 mm × 2.1 mm, 5 µm particle) and guard column were used for the separation of plasma lipids followed by ESI-mass spectrometric detection in both positive and negative ion modes. 5-µL of a 10 ng/µL internal standard mixture were added to 20 µL of blood plasma lipids and extracted using the Folch method.[1] Lipids were separated using normal-phase gradient conditions. Mobile-phase A was 5 % methanol in chloroform containing 5 mM ammonium acetate and mobile-phase B was 10 % H_2O in methanol containing 5 mM ammonium acetate. The column temperature was 20 ºC and the flow rate was 300 µL/min.

Preliminary Data

Depending on the lipid type and the head group present, plasma lipids were observed in positive ion mode as either $[M+H]^+$ or ammonium adducts $[M+NH_4]^+$, and in negative-ion mode as either their deprotonated species $[M-H]^-$ or as acetate adducts $[M+CH_3COO]^-$. 63 plasma lipid samples were profiled consisting of 31 samples from Indianapolis African Americans (15 incident AD and 16 disease-free samples) and 32 samples from Ibadan Nigerians (16 incident AD and 16 disease-free samples). Initially, Principal Component Analysis (PCA), which is a chemometric tool commonly employed to establish the differences among sample sets, was applied to display and rank the variance in the collected chromatograms. PCA score plots (PC1 vs. PC2) in both positive and negative ion modes showed two clearly separated clusters representing the original geographical difference between the samples. The lipid species that contributed most to the variance within the data sets were identified. Based on the mass accuracy, and retention time, these lipids were found to consist of various phosphocholines, and phosphoethanolamines lipids.

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References

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