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Relative quantitation of diverse classes of lipids using a single step extraction protocol and targeted LC-MS/MS

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Plasma, erythrocyte and HDL concentrations of sphingomyelins (SM), ceramides (CER), glucosyl/lactosyl ceramides (GluCer/LacCer) and phosphatidyl choline (PC) reflect mechanisms that may lead to myocardial infarction and other cardiac diseases. Together, these lipid classes provide a model system for understanding the role of lipids in cardiovascular events and for potential development of biomarkers for the prediction of cardiovascular events.

Analytically, the task of co-extracting these lipid species from any of these matrices is challenging because of the wide heterogeneity in their polarities, which, traditionally necessitates the use of lengthy and multiple extraction techniques and chromatographic conditions. Currently, there exists no method for co-extraction and co-analysis of these classes of lipids in a single analytical workflow that is suited for targeted exploration of the lipidome and for routine clinical analysis of the markers. We identified a solvent formulation that facilitates one-step extraction of all five lipid classes and a chromatographic condition that allows separation of all species in a single LCMS run. For targeted metabolomics applications we created an MRM transition list consisting of 271 lipids that can be analyzed by this approach and modified “Skyline” software for data analysis and reporting.

We have characterized the assay performance in clinical setting and applied the assay to a retrospective study where we compared the lipid profiles from patients that have undergone sudden cardiac death with that of a control population. Our data clearly show that Cer (18:0/16:0) and SM (18:0/16:0) were markedly elevated in the patients who underwent sudden cardiac death.

Biography

Hari Nair has completed his Ph.D in mass spectrometry from Virginia Commonwealth University and a NRC post-doctoral fellowship from the US Army Research and Development Centre at Aberdeen Proving Grounds, Maryland. Hari has since worked in the biotechnology and clinical industry for over a decade and recently completed a clinical chemistry fellowship from the University of Washington, Seattle. Hari is currently a consultant for clinical and bio analytical laboratories, has 8 publications, a patent and is currently co-editing a text book for medical technology program and a book on implementation of mass spectrometry in clinical lab for Elsevier.

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