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## Application of quantitative metabolomics in human maternal, prenatal, and neonatal disease biomarker studies

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Metabolomics has shown significant promise for the discovery of new biomarkers for the detection of a number of complex clinical disorders. However, the use of metabolomics in obstetrics is a relatively new phenomenon. The Metabolomics Innovation Centre (TMIC), Canada's national metabolomics platform, specializes in performing quantitative metabolomics assays on human biofluids using a wide range of technologies. Recently, TMIC has participated in several maternal, prenatal and neonatal disease biomarker studies, including pre-eclampsia (PE), Trisomy 18 and 21, and HypoxicIschaemic Encephalopathy (HIE).

NMR based metabolomic analysis was performed on first trimester maternal serum between 11-13 6/7 weeks of gestation in a case-control study, including 30 cases each of early and late onset PE and 60 unaffected controls. The concentrations of 40 metabolites were compared between the two groups. In both studies significant differences in the first-trimester metabolites were noted in women who had subsequently developed early- and late-onset PE.

NMR based metabolomic analysis of maternal serum was also applied to determine whether the metabolomic profile is altered in Trisomy 18 and 21 pregnancies and whether these maternal serum biomarkers can predict Trisomy 18 and Trisomy 21. In both studies, NMR analyses of maternal serum showed an extensive group difference in metabolomic profile indicating the application of metabolomics as a novel tool for aneuploidy prediction.

A combined DI and LC-MS/MS approach was used for metabolomic profiling of umbilical cord blood in neonatal HIE. The study population was divided into those with confirmed HIE (n=31), asphyxiated infants without encephalopathy (n=40) and matched controls (n=71). Our results showed a significant alteration between study groups in 29 metabolites from 3 distinct classes (amino acids, acylcarnitines and glycerophospholipids). This study highlights the potential for metabolomic technology to develop a diagnostic test for HIE.

These applications will be presented in detail. Here we intend to show the potential that metabolomics holds in contributing to the understanding of maternal and neonatal health.

### Biography

David Wishart is the Director of The Metabolomics Innovation Centre ([www.metabolomicscentre.ca](http://www.metabolomicscentre.ca)) and a Professor at the University of Alberta in the Department of Chemistry and the NRC National Institute for Nanotechnology. He has published more than 250 scientific articles, and has successfully led many national and international research initiatives in biotechnology and nanotechnology, including the Human Metabolome Project (<http://www.metabolomics.ca>). His research interests are very broad, with the areas relating to nanobiology, genomics, proteomics, metabolomics, bioinformatics and systems biology. His particular interests lie in developing novel methods or improved experimental techniques to facilitate the understanding of biological systems at the molecular (or nano) scale.

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