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Quantitative dried blood spot analyses: An aid to medicine optimization for heart disease patients

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Introduction: Over 355 million prescriptions were dispensed for cardiovascular diseases in the UK in 2013. Half of these, costing the NHS £2.3 billion, were wasted because patients do not take their medicines as prescribed. A method using dried blood spot (DBS) sample collection followed by liquid chromatography-high resolution mass spectrometry (LC-HRMS) was developed and validated for quantification of eleven commonly UK prescribed cardiovascular drugs: amlodipine, atenolol, atorvastatin, bisoprolol, diltiazem, doxazosin, lisinopril, losartan, ramipril, simvastatin and valsartan. Thus medication efficiency, adherence or drug/drug interactions can be assessed from reference pharmacokinetic data.

Methods: For the preparation of DBS calibration samples whole blood was spiked with eleven target analytes to produce 30 µl blood spots on specimen cards. 8 mm disc was punched out and extracted with methanol: water (70:30 v/v) containing the internal standard, atenolol D7. Chromatography analysis was performed using gradient elution with a run time of 2.5 min. MS detection was carried out in electrospray positive ion mode for all target analytes and internal standard.

Results: The LC-HRMS method showed good linearity and the accuracy (relative error) and precision (coefficient of variation) values were within the pre-defined limits of ≤15% at all tested concentrations for eight of the target drugs. Drug recoveries from spiked blood spots were ≥ 82% for atenolol, bisoprolol, diltiazem, doxazosin, losartan, ramipril and valsartan. Results from volunteers were within expected levels except where elevated levels indicated a recognised drug/drug interaction.

Conclusions: Quantitative DBS analyses can be used as a means to optimize medication for heart disease patients.

Biography

Dennis Bernieh is a PhD student in the Leicester School of Pharmacy at De Montfort University. His research interests lie in drug treatment optimization and dried blood spot analysis. He is researching into the quantification of therapeutic drugs from dried blood spots based on LC-MS and LC-MS/MS studies for medicine optimization. Prior to starting his PhD studies, he was a KTP Research Associate working for the Department of Chemistry of the University of Hull-UK, and Cobalt Light Systems Ltd in Oxfordshire UK.

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