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Comparison of efficiencies of selected sample extraction techniques for the analysis of selected antiretroviral drugs in human plasma using LC-MS

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Abstract

Introduction

Sample preparation in bio analytical chemistry poses a challenge because it can be compound dependent. We compared six sample extraction techniques i.e. QuEChERS (Q), liquid extraction (LE), protein precipitation (PPT), Q-PPT, Q-LE and LE-PPT for the extraction of antiretroviral drugs emtricitabine, tenofovir, efavirenz, lopinavir and rotinavir in human blood plasma.

Method

A multiple reaction monitoring liquid chromatography- tandem mass spectrometry method for the determination of the same antiretroviral drugs developed and validated in this laboratory was used. Comparisons were based on the efficiencies of extraction, the precisions and accuracies. Using United States Food and Drug Administration guidelines, analytical performance characteristics i.e. limits of detection, lower limits of quantification and upper limits of quantification were also compared.

Results

The percent mean recoveries ranged between 68.8 and 81.2% for single modes and 52.4–70.5% for mixed mode techniques. The precisions of all the extraction techniques were within the Using United States Food and Drug Administration guidelines acceptable range of < 15% at all concentration levels for all analytes. Accuracy ranged between 8.73 and 65.94% for single mode techniques and between 21.73 and 51.59% for mixed mode techniques.

Discussion

The mixed modes gave slightly lower recoveries but Q-LE compared well with the single modes at slightly higher spike levels. Limits of detection for all the six sample preparation techniques fell below the clinically relevant therapeutic range of approximately 3–8 ppm. Therefore all techniques can be employed for routine therapeutic drug monitoring studies.

Keywords

Antiretroviral drugs; Liquid extraction; LC-MS; QuEChERS; Methods; Multiple reaction monitoring