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Ultrasound–Assisted Emulsification Microextraction Followed by Gas Chromatography–Flame Ionization Detection for Urinary Methylmalonic Acid Determination

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Abstract

An efficient microextraction technique followed by gas chromatography–flame ionization detector (GC–FID) analysis was developed for the determination of methylmalonic acid (MMA) concentration in human urine samples. This method was based on ultrasound-assisted emulsification microextraction followed by derivatization with a low density alcoholic solvent which performs both as an extraction solvent and as a derivatization agent, simultaneously. In this procedure, 80 μL of 1–heptanol was injected slowly into a 10 mL acidified aqueous sample of MMA placed inside an ultrasonic water bath. The resulting emulsion was centrifuged and after derivatization, 2 μL of the organic phase was injected into a GC–FID. Several factors affecting the derivatization and the extraction were optimized. Under the optimal conditions, linearity was in the range of 1 to 250 and 3 to 200 μmol/L corresponding to the limits of detection (LOD) 0.8 and 2.4 μmol/L in water and urine samples, respectively. The inter–day and intra–day precision of the proposed method were evaluated in terms of the relative standard deviation (RSD), which were <11% (n = 4). The proposed method presented an acceptable LOD for urinary MMA analysis with satisfactory RSD.

Keywords: Methylmalonic Acid; Ultrasound-assisted Emulsification Microextraction; Gas Chromatography-Flame Ionization Detection; Urine Analysis

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