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Chip-based magnetic solid phase microextraction coupled with ICP-MS for the determination of Cd and Se in HepG2 cells incubated with CdSe quantum dots

Xiaoxiao Yu, Beibei Chen, Man He, Han Wang, Bin Hu*

Key Laboratory of Analytical Chemistry for Biology and Medicine (Ministry of Education),

Department of Chemistry, Wuhan University, Wuhan 430072, P R China

*Corresponding author: Tel: 86-27-68752162, Fax: 86-27-68754067. binhu@whu.edu.cn

Abstract

The quantification of trace Cd and Se in cells incubated with CdSe quantum dots (QDs) is critical to investigate the cytotoxicity of CdSe QDs. In this work, a miniaturized platform, namely chip-based magnetic solid phase microextraction (MSPME) packing with sulfhydryl group functionalized magnetic nanoparticles, was fabricated and combined with inductively coupled plasma mass spectrometry (ICP-MS) for the determination of trace Cd and Se in cells. Under the optimized conditions, the limits of detection (LOD) of the developed chip-based MSPME-ICP-MS system are 2.2 and 21 ng L⁻¹ for Cd and Se, respectively. The proposed method is applied successfully to the analysis of total and released small molecular fraction of Cd and Se in Human hepatocellular carcinoma cells (HepG2 cells) incubated with CdSe QDs, and the recoveries for the spiked samples are in the range of 86.0-109%. This method shows great promise to analyze cell samples and the obtained results are instructive to explore the cytotoxicity mechanism of CdSe QDs in cells.

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