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Application of dispersive liquid–liquid microextraction combined with liquid chromatography for the determination of aldehydes in cigarette smoke

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Background and Aims: The aldehydes are ubiquitous products produced from natural and industrial sources. These compounds exhibit potentially adverse health effects and are also recognized as biomarkers of cancer disease. Thus, a number of studies have focused on the presence of aldehydes in different samples. Recently, a novel microextraction method named dispersive liquid–liquid microextraction (DLLME) has been developed, which is based on the use of an appropriate extraction and dispersive solvent. In this study, DLLME was combined with liquid chromatography (LC) to determine aldehydes in cigarette smoke.
Methods: Firstly 2,4-dinitrophenylhydrazine and sulfuric acid were injected into the sample solution in the test tube. After heating at water bath, the volume made up to 10 mL. Then, 300 µL ethanol (as dispersive solvent) containing 50 µL CCl4 (as extraction solvent) was rapidly injected into the aqueous sample. Thus, the formed hydrazone was rapidly extracted into fine dispersed droplets. After centrifugation, the supernatant aqueous phase was readily decanted. Remained organic phase was diluted to 500 µL and a volume of 25 µL was injected into the LC system.
Results: The effects of various experimental parameters on derivatization and extraction conditions were studied. Under the optimum conditions, calibration curves were linear in the range of 0.05 to 1.0 µg mL–1 with correlation coefficients of 0.998 to 0.999. Limit of detections were found to be 0.013-0.015 µg mL–1. The relative standard deviations (RSDs) for inter– and intra–day assays were lower than 9%. Average recoveries for spiked samples were in the range of 86 to 110%.
Conclusions: In the proposed method, sample preparation time as well as consumption of toxic organic solvents was minimized. The proposed method gives a very rapid, simple, sensitive and low-cost procedure for the determination of aldehydes in cigarette smoke.

Keywords: Dispersive liquid–liquid microextraction; Liquid chromatography; Aldehydes; Cigarette smoke