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A NEW STRATEGY FOR PENTACHLOROPHENOL MONITORING IN WATER SAMPLES USING ULTRA-HIGH PERFORMANCE LIQUID CHROMATOGRAPHY - MASS SPECTROMETRY TANDEM

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Abstract

A novel sensitive and rapid analytical approach based on ultra-high performance liquid chromatography - mass spectrometry (UHPLC/MS/MS) tandem was developed for the monitoring of pentachlorophenol in water samples. Chromatographic separation was carried out on Acquity BEH C18 (100 x 2.1 mm, 1.7 μm) column under gradient mode using a mobile phase consisting of acetonitrile/ultrapure water/formic acid. Quantification of pentachlorophenol was performed on a triple-quadrupole tandem mass spectrometer under multiple reaction monitoring (MRM) mode, via a negative electrospray ionization (ESI). The limit of quantification of the developed instrumental method was 0.3 $\mu\text{g L}^{-1}$. The linearity was validated within the concentration range 0.1-100 $\mu\text{g L}^{-1}$ with a correlation coefficient (R^2) of 0.998. Intra-day and inter-day precision values were 99.78 and 99.12%, respectively. Moreover, for the application to real water samples, a solid phase extraction method (SPE) was proposed for the extraction and preconcentration of analyte. Some of the main factors involved in the SPE extraction process such as solid phase material, elution solvent and sample volume were investigated and optimized in order to maximize the extraction efficiencies. Oasis HLB cartridges showed the best results in terms of extraction recovery. High analyte recoveries (between 98.2% and 100.18%) were achieved with the proposed SPE procedure and the extraction RSD was less than 3.1%. In addition, the whole new analytical strategy (SPE-UHPLC/MS/MS) was then successfully applied for pentachlorophenol quantification in natural waters at low part per trillion levels.

Key words: pentachlorophenol, solid phase extraction, tandem mass spectrometry, ultra-high performance liquid chromatography, water analysis

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