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Analysis of multiple pesticide and endocrine disruptor residues in drinking water using SPE and GC–MS/MS

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Abstract

Background: The presence of pesticide residues and endocrine disruptors in sources used for drinking water abstraction has become a significant concern nowadays [1,2]. These substances pose risks to the environment, biodiversity, and public health. Consequently, monitoring these compounds in drinking water is crucial to maintaining their quality and safety. Therefore, there is a need to develop sensitive analytical methods that can detect these compounds even at very low concentrations [1-3]. **Objective:** This study aims to optimize a solid-phase extraction (SPE) and gas chromatography-tandem mass spectrometry (GC–MS/MS) method for determining a specific group of pesticides (alachlor, atrazine, chlorofenvinphos, isoproturon, pentachlorophenol, methiocarb, and simazine) and endocrine disruptors (bisphenol A, estradiol, estrone, ethynylestradiol, nonylphenol, and octylphenol) in drinking water. **Methods:** Sample preparation processes such as extraction and preconcentration procedures (i.e., SPE sorbent, conditioning solvent, clean-up, elution solvent and volume, as well as adjustment of derivatization procedure) were optimised to reliably monitor these residues in aqueous matrices. In addition, GC-MS/MS chromatographic conditions were optimized for analyte analysis using multiple reacting monitoring. Recovery rates were assessed using ultrapure water spiked with known concentrations of analytes. Performance was evaluated based on signal response, method sensitivity, and recovery efficiency. **Results:** The optimized SPE-GC-MS/MS method demonstrated high selectivity and sensitivity for the target compounds. Pesticides and endocrine disruptors exhibited recoveries above 64% and 70%, respectively, demonstrating the method's reliability. **Conclusions:** The developed method proved effective for analyzing pesticides and endocrine disruptors in ultrapure water samples, with satisfactory analyte recovery (average of 67%). Further analysis using drinking water matrix will be conducted to assess matrix effects and validate the analytical method before sample analysis. The use of GC-MS/MS provided improved selectivity and lower detection limits compared to gas chromatography-mass spectrometry (GC-MS). Subsequently, this method could be applied for routine drinking water quality monitoring, ensuring compliance with regulatory standards.

Keywords: water quality assessment; environmental contaminants; chromatographic analysis

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