

Determination of Malathion Pesticide in Human Blood Using Solid Phase Extraction Coupled with Gas Chromatography-Mass Spectrometry

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Structured Abstract

Background: Cases of toxic pesticide poisoning pose significant legal and ethical challenges, particularly in determining the cause of death in victims. Traditional extraction methods like liquid-liquid extraction (LLE) and matrix solid-phase dispersion (MSPD) introduce drawbacks, hindering accurate pesticide quantification in biological samples and potentially compromising exposure and toxicity assessments. These methods may lack sensitivity, be time-consuming and require large solvent and sample volumes.

Methods: Addressing these limitations, this research aims to develop an improved analytical method, focusing on a solid phase extraction (SPE) approach for efficient extraction and quantification of the malathion pesticide in human blood samples using gas chromatography-mass spectrometry (GC-MS). SPE is becoming a prominent alternative method due to its simplicity, solvent, and time savings and gas chromatography, with analyte detection using mass spectrometry (MS/MS), has proven highly beneficial due to its excellent selectivity and extremely low detection limits. Additionally, the extraction process was optimized by using the type of cartridge, eluting solvent and the volume of supernatant to improve the extraction procedure.

Results: The optimal condition for detecting malathion in blood involves using a C18 cartridge, a conditioning solvent mixture of chloroform and isopropanol and a supernatant volume of 6 mL. These optimal conditions produce the highest concentration at 96.48 ppm, but the percentage of recovery is low at 24%.

Conclusion: The resulting data serve as valuable forensic evidence for future cases of malathion pesticide poisoning. Moreover, the research has the potential to raise public awareness about pesticide safety and associated risks, contributing to educational initiatives promoting safe agricultural practices and enhancing awareness of malathion-related hazards. The study may also advance malathion toxicity detection methods, ultimately contributing to improved public health and safety. Findings indicate that the determination of malathion in human blood was successfully conducted using SPE and GC-MS analysis. Recommendations of optimization should be studied to achieve a better percentage recovery and increase the performance of the extraction procedure due to the complex matrix of sample blood.

Keywords: Pesticide, blood, solid phase extraction, gas chromatography-mass spectrometry

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