

Development of green(er) cost-effective solvent-based method coupled to thin layer chromatography imaging system for the determination of allethrin in blood and urine

Sakshi Pandey¹, Lalit P. Chandravanshi^{2*}, Mahak Malviya³

^{1,3}Ph.D. Scholar, Department of Forensic Science, Sharda School of Allied Health Science, Sharda University, Greater Noida, Uttar Pradesh, India,

^{2*}Associate professor, Department of Forensic Science, Sharda School of Allied Health Science, Sharda University, Greater Noida, Uttar Pradesh, India

Email: lalit.chandravanshi@sharda.ac.in

ABSTRACT

Introduction: In the current work, a new solvent-based, environmental friendly (greener), and economically viable method was developed to detect allethrin in blood and urine samples. Allethrin is a synthetic pyrethroid insecticide, commonly used in household products to control flying and mosquito species. Regulatory bodies like Environmental Protection Agency (EPA) thoroughly evaluate a product's safety before to approval, taking into account factors such as efficacy, formulation safety, human toxicity. Approval guarantees that goods fulfil safety requirements, instilling trust in their efficiency and appropriate usage. It's poisoning can occur on purpose in many circumstances, including accidental, suicidal incidents. **Methodology:** The aim of the research was to establish a green(er), budget-friendly, solvent-based method based on Vortex assisted dispersive liquid-liquid micro extraction method combined with thin layer chromatography imaging system. After the extraction process, a 20 μ l extract obtained from VA-DLLME method and was spotted on TLC plate, and put into saturated TLC chamber using ethyl acetate: benzene as a developing solvent (1:1 v/v). The developed plate was then kept under UV chamber at 254 nm radiation and photographed by using an android phone. **Results:** The method was optimized for many variables including linearity, limit of detection (LOD), limit of quantification (LOQ), accuracy, precision, recovery, and enrichment factor in urine and blood samples. The method was found to be linear ranging from 1-8 μ g/spot in blood sample and 8-16 μ g/spot in urine with R^2 of 0.9977 in blood 0.9926 in urine, respectively. Under the optimized condition, the Limit of detection and Limit of quantification were found to be in the range of 0.521- 0.079 μ g/spot respectively. **Conclusion:** The novel method VA-DLLME coupled to TLC imaging system was successfully developed and further this method was validated and this developed method can help resource-limited laboratory for determining urine and blood samples. Also, the proposed method was successfully evaluated for its greenness.

Keywords: Allethrin poisoning, UA-DLLME, VA-DLLME, Forensic toxicology, ImageJ software, Thin layer chromatography, Greenness,