International Research Journal of Biotechnology Vol. 14(3) pp. 1-3, June, 2023
Available online http://www.interesjournals.org/IRJOB

Mini Review

Uses of Micro Sample and Micro Extraction for Evaluation of Drug Abuse

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Received: 02-Jun-2023, Manuscript No. irjob-23-101012; **Editor assigned:** 06-Jun-2023, PreQC No. irjob-23-101012 (PQ); **Reviewed:** 20-Jun-2023, QC No. irjob-23-101012; **Revised:** 23-Jun-2023, Manuscript No. irjob-23-101012 (R); **Published:** 30-Jun-2023, DOI: 10.14303/2141-5153.2023.56

Abstract

96-well liquid solution micro-extraction and ultra-high-performance liquid chromatography tandem mass spectrometry analysis were used to evaluate a novel approach that combined micro-sampling of whole blood containing drugs of abuse. The most promising configuration was confirmed after being tested with various donor solutions, supported liquid membranes, and acceptor solutions. Opioids, cocaine, amphetamines, benzodiazepines, and z-hypnotics, among others, were included in the approach. 13 of the compounds had extraction recoveries greater than 70%, while the final four compounds had recoveries between 10 and 58%. The current method did not extract THC. Except for morphine, a linear calibration model was discovered for all drugs. For all compounds, except for morphine and zopiclone, which had a CV of 25% at LOQ, limits of quantitation were between 1 and 5 ng/mL, and inter-day precision and accuracy were within 20%. All framework impacts were inside 78-123%. Except for zolpidem and zopiclone, the samples remained stable for 14 days. The proposed method adheres to green chemistry principles due to its low cost, high sample throughput, semi-automated miniaturized sample preparation, use of dried blood micro samples, and Eco-Scale score of 78.

Keywords: Micro extraction, Chromatography, Drug abuse, Cocaine, Morphine, Zopiclone

INTRODUCTION

A set of principles is used in green chemistry to reduce or eliminate the use or production of hazardous substances. The key elements of adhering to green chemistry principles in the field of analytical chemistry are the miniaturization and automation of the sample preparation procedure. For sample preparation, both liquid-based and sorbent-based micro extraction methods have been highlighted as promising tools for greener Bioanalysis. For handling complex biological samples, membrane-based methods like hollow-fiber liquid solution micro extraction, 96well LPME, or electro membrane extraction are recommended for liquid-based micro extractions. When compared to conventional LLE, which operates in the mL range, these methods require less than 10 L of organic solvents (Agarwal V et al., 2010).

An important subfield of Bioanalysis is drug abuse analysis. This kind of examination is important in many fields: to control drivers who are suspected of being under the influence of drugs, to conduct drug testing in the workplace, to monitor inmates, pain patients, or patients in opiate maintenance treatment programs, or for epidemiological studies of various populations. Blood analysis is required to determine whether a driver is under the influence of drugs or whether a patient has taken their opiate maintenance medication as directed (Shah N 2001). For short-term storage, blood should be cooled, and for long-term storage, it should be frozen. Reduced energy consumption for storage and lower operating costs could be included in a more holistic approach to sustainable Bioanalysis, and the costs of facilitating the testing process ought to include those associated with specimen collection. The utilization of dried blood micro-samples, which can be delivered and put away, for a brief time, at room temperature and named non-unsafe could definitely decrease expenses and energy use, as well as empowering drug observing nearer to the place of care (Pandve HT 2009).

METHODS

Since Guthrie and Susi demonstrated its suitability for

phenylketonuria screening, conventional blood micro-samples, also known as dried blood spots, have been utilized worldwide for neonatal drug testing. They were first proposed for the purpose of monitoring glucose levels **(Table 1)**. Dried blood spots are known to generally dislike homogeneity of the examples because of various haematocrit content and a few gadgets have been made to conquer this issue. Outlines of strategies utilizing VAMS have been distributed; strategies for helpful medication checking of antiepileptic drugs, resistant suppressants or anti-infection agents have been the most well-known. A couple of strategies for VAMS testing of medications of misuse have up until this point, as far as anyone is concerned, been distributed (Sharda A et al., 2010).

Green chemistry drug analysis would be provided if micro-sampling and micro extraction were combined for the purpose of analyzing drugs of abuse. The interest in liquid micro-extraction techniques for drug abuse analysis has been confirmed by a number of recent articles and a recent review of micro-extraction methods for drugs of abuse. A new paper presents a strategy joining micro-sampling with VAMS and scaled down pre-treatment by dispersive pipette extraction, this gives an exceptionally quick example readiness utilizing just 125 µL of natural solvents. Another intriguing article portrayed the utilization of 96-well LPME for the extraction of model fundamental and acidic medication substances from regular DBS. The six model analytes—amitriptyline, quetiapine, ketoprofen, fenoprofen, flurbiprofen, and ibuprofen-had recoveries ranging from 63 to 85% thanks to the one-step extraction method that was found to encourage the analytes' release into the desorption solvent from the DBS (Dasgupta U et al., 2013). In addition, a straightforward procedure for cleaning samples of phospholipids was demonstrated, as was its high efficiency. Another advantage of this method is the low cost of PALME-less than 1 euro for each sample.

Therefore, the purpose of our investigation was to investigate the possibilities for a robust and effective green chemistry analysis method by combining micro-extraction with PALME and VAMS micro-sampling of whole blood containing drugs of abuse.

RESULTS AND DISCUSSION

A set of principles is used in green chemistry to reduce or eliminate the use or production of hazardous substances. The key elements of adhering to green chemistry principles in the field of analytical chemistry are the miniaturization and automation of the sample preparation procedure. For sample preparation, both liquid-based and sorbent-based micro-extraction methods have been highlighted as promising tools for greener Bioanalysis. For handling complex biological samples, membrane-based methods like hollow-fiber liquid solution micro-extraction, 96well LPME, or electro membrane extraction are recommended for liquid-based micro-extractions. When compared to conventional LLE, which operates in the mL range, these methods require less than 10 L of organic solvents (Vadiakas G et al., 2011).

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Table 1. Some techniques used for the evaluation of drug abuse using micro samples and micro extraction.

Technique	Description	Application
Micro Sampling	Collection and analysis of small-volume samples (e.g., blood, urine, saliva)	Detection of drugs in small biological samples
Micro Extraction	Extraction of target compounds from small sample volumes using minimal solvent and reduced sample size	Concentration and purification of drug analytes
Solid Phase Micro extraction (SPME)	Extraction of analytes from samples onto a solid sorbent phase for subsequent analysis	Analysis of volatile and semi-volatile drugs in various biological matrices
Micro extraction by Packed Sorbent (MEPS)	Extraction of analytes using a small packed column containing a sorbent material	Analysis of drugs and metabolites in blood, urine, and other biological samples
Micro Liquid Phase Extraction (µLLE)	Extraction of analytes using a small volume of organic solvent in a liquid-liquid extraction setup	Analysis of drugs and metabolites in biological samples
Paper Spray Ionization	Direct ionization of compounds from a paper substrate via electrospray ionization	Rapid screening and detection of drugs in samples such as urine or blood
Microchip Electrophoresis	Separation of analytes based on their charge and size	Quantitative analysis of drugs in small sample sizes

phenylketonuria screening, conventional blood micro-samples, also known as dried blood spots, have been utilized worldwide for neonatal drug testing. They were first proposed for the purpose of monitoring glucose levels. Dried blood spots are known to generally dislike homogeneity of the examples because of various hematocrit content, and a few gadgets have been made to conquer this issue. A device known as volumetric absorptive micro-sampling, which has been found to overcome issues with homogeneity and area bias, is one of the most promising. Outlines of strategies utilizing VAMS have been distributed; strategies for helpful medication checking of antiepileptic drugs, resistant suppressants or anti-infection agents have been the most well-known. A couple of strategies for VAMS testing of medications of misuse have up until this point, as far as anyone is concerned, been distributed (Shenoy RP et al., 2010).

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CONCLUSION

For the first time, the combination of micro extraction by PALME and micro sampling with VAMS was investigated. Validation results within common criteria for linearity, reproducibility, and matrix effects were found, demonstrating the method's applicability to the majority of major drug classes that are relevant for determining drugs of abuse. For two weeks, most compounds remained stable at room temperature. The method complied with green chemistry principles for analytical chemistry by combining VAMS samples with a low-cost, high-throughput, semi-automated miniaturized sample preparation that required only 4 L of organic solvent for each sample.

ACKNOWLEDGEMENT

None

CONFLICT OF INTEREST

No conflict of interest declared.

REFERENCES

1. Agarwal V, Khatri M, Singh G, Gupta G, Marya CM, et al (2010). Prevalence of periodontal Diseases in India. J Oral Health Community Dent. 4: 7–16.
2. Shah N (2001). Geriatric oral health issues in India. Int Dent J. 51: 212–218.
3. Pandve HT (2009). Recent advances in oral health care in India? Indian J Dent Res. 20: 129–130.
4. Sharda A, Sharda S (2010). Factors influencing choice of oral hygiene products used among the population of Udaipur, India. Int J Dent Clinics. 2: 7–12.
5. Dasgupta U, Mallik S, Naskar S, Choudhury K, Paria B, et al (2013). Dental problems and its epidemiological factors- a study on adolescent and adult patients attending dental OPD of a tertiary care hospital in Kolkata, India. J Dent Med Sci. 5: 1–7.
6. Vadiakas G, Oulis CJ, Tsinidou K, Mamai-Homata E, Polychronopoulou A (2011). Socio-behavioural factors influencing oral health of 12 and 15 year old Greek adolescents. A national pathfinder survey. Eur Arch Paediatr Dent. 12: 139-145.
7. Sharma N, He T, Barker ML, Biesbrock AR (2013). Plaque Control Evaluation of a Stabilized Stannous Fluoride Dentifrice Compared to a Triclosan Dentifrice in a Six-Week Trial. J Clin Dent. 24: 31-36.
8. Shenoy RP, Sequeira PS (2010). Effectiveness of a school dental education program in improving oral health knowledge and oral hygiene practices and status of 12- to 13-year-old school children. Indian J Dent Res. 21: 253-259.
9. Strydonck DAC, Demoor Ph, Timmerman MF, Van Der Velden U, Van Der Weijden GA (2004). The anti-plaque efficacy of a chlorhexidinemouthrinse used in combination with tooth brushing with dentifrice. J ClinPeriodontol. 31: 691-695.
10. Sharma NC, Goyal R, Qaqish JG, Cugini MA, Thompson MC, et al (2005). Single-use plaque removal efficacy of three power toothbrushes. J Dent. 33: 11-15.