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A new device for direct QuEChERS salts extraction: application to drugs of abuse in blood, urine and oral fluid

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Overview

- Pre-packed QueChERS salts
- Fast sample extraction

Introduction

Extraction procedures using QuEChERS consist of manually adding salts to the analyzed matrix, previously mixed in a polar solvent (acetonitrile, ACN). This approach is largely employed for pesticides residues but also for multiples classes of drugs.

- In this study, we explored the performance of a QuEChERS extraction based on a **new pre-packed kit containing 100 mg of salts** (Micro Volume QuEChERS; MVQ) and compared it to a previously validated procedure, routinely used in a clinical lab [1].

The example of an LC-MS method for the analysis of 44 **Drugs Of Abuse** (DOA) using this new device is presented.

Methods

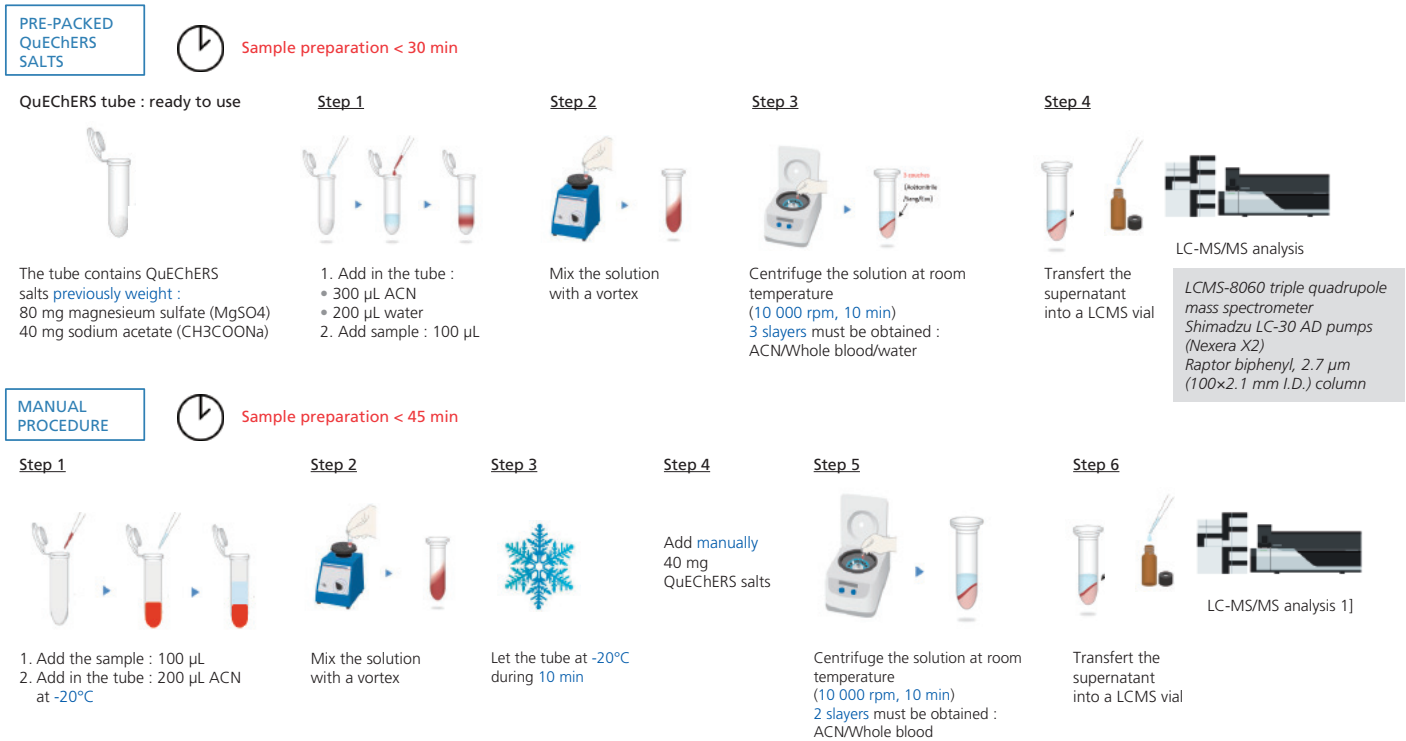

Figure 1: Pre-packed QuEChERS salts vs manual procedure

Results

Application to patient samples

The two procedures were applied to 18 real samples (14 urines and 4 oral fluids) from patients tested for DOA consumption.

79 molecules were detected by the two procedures : 6-acetylmorphine (2), amphetamine (1), anhydroecgonine methyl ester (1), benzoylecgonine (12), cocaethylene (4), cocaine (9), dihydrocodeine (3), EDDP (4), ecgonine methylester (11), hydrocodone (2), hydromorphone (4), MDA (3), MDMA (4), methadone (4), methamphetamine (1), methylmorphine (5),morphine (7), norbuprenorphine (2).

A regression analysis for concentrations measured from 3 to 500 µg/L (LOQ and ULOQ of the method, respectively) reported a R^2 greater than 0.98.

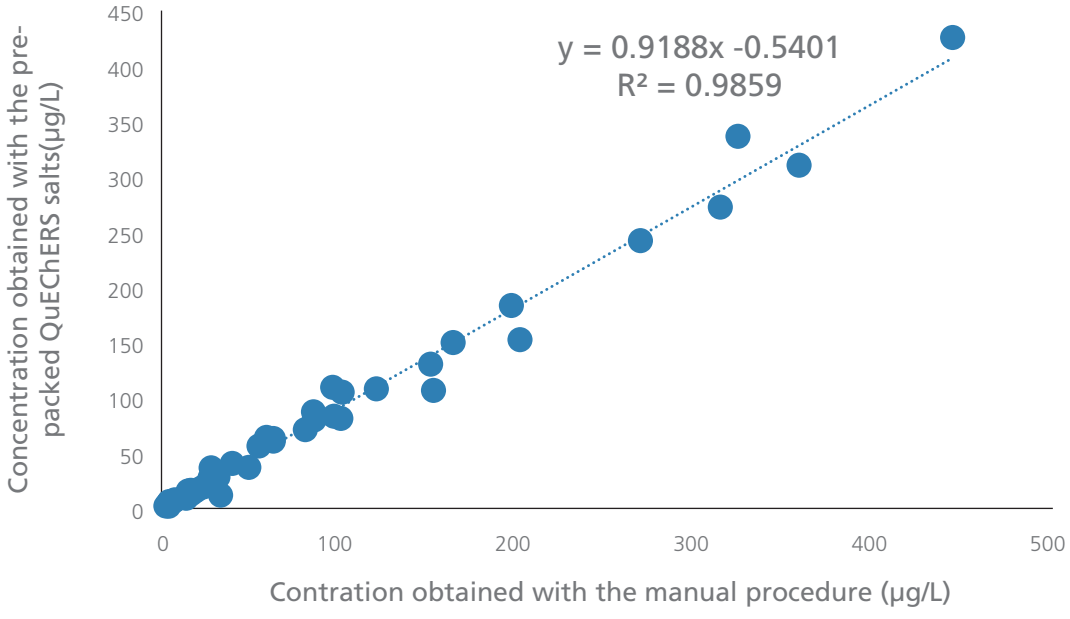

Figure 2: Real samples with the pre-packed QuEChERS salts and the manual procedure.

Application to Internal quality controls (IQC)

Repeatability (n=6) was explored using 2 different whole blood IQC containing 16 molecules at **low concentration** (QC A) and **intermediate concentration** (QC B). Similar CV and accuracy were obtained for the 2 procedures.

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Table 1: Repeatability study for the two procedures

		Reference interval	Manual Extraction		Pre-packed QuEChERS	
			CV	Accuracy	CV	Accuracy
Amphetamine	QC A	18.88 - 28.32	5.0	107.8	1.8	93.0
	QC B	55.52 - 83.28	5.2	104.5	3.1	91.9
Methamphetamine	QC A	19.04 - 28.56	2.9	111.7	2.4	93.6
	QC B	56.80 - 85.20	2.6	109.4	2.8	92.9
MDA	QC A	18.32 - 27.48	12.0	113.4	3.2	99.9
	QC B	56.00 - 84.00	4.7	106.1	3.5	91.0
MDEA	QC A	18.88 - 28.32	5.0	108.7	2.6	89.2
	QC B	55.76 - 83.64	2.8	105.2	2.8	87.0
MDMA	QC A	19.44 - 29.16	2.5	116.8	2.5	96.4
	QC B	55.76 - 83.64	0.9	116.4	1.8	93.3
Mephedrone	QC A	16.96 - 25.44	9.7	99.1	3.0	74.8
	QC B	46.24 - 69.36	6.6	99.9	2.7	75.7
Cocaine	QC A	11.68 - 17.52	1.6	102.1	1.4	95.0
	QC B	59.96 - 85.44	2.6	103.4	3.0	90.7
Benzoylecgonine	QC A	22.88 - 34.32	2.1	124.3	2.6	98.8
	QC B	93.60 - 140.40	2.4	118.0	3.6	95.0
Ecgoninmethylester	QC A	12.72 - 19.08	3.0	122.9	5.5	100.7
	QC B	45.60 - 68.40	1.8	121.4	3.1	96.6
Cocaethylene	QC A	10.72 - 16.08	1.6	104.4	2.8	98.7
	QC B	52.72 - 79.08	1.7	102.2	3.0	92.3
Morphine	QC A	7.76 - 11.64	9.8	139.4	5.2	100.7
	QC B	56.32 - 84.48	2.5	115.6	8.6	87.8
Codeine	QC A	7.52 - 11.28	4.2	113.0	10.9	97.3
	QC B	53.12 - 79.68	2.6	115.4	4.5	96.8
Dihydrocodeine	QC A	19.2 - 28.8	3.7	107.6	4.8	95.1
	QC B	54.00 - 81.00	2.5	110.5	3.9	95.2
6-MAM	QC A	8.08 - 12.12	6.6	118.6	4.1	91.9
	QC B	30.48 - 45.72	6.1	137.0	4.0	89.4
Oxycodone	QC A	16.56 - 24.84	3.0	100.1	2.7	96.7
	QC B	57.28 - 85.92	0.9	102.2	3.9	90.0
Pholcodine	QC A	17.44 - 26.16	15.5	123.4	3.1	97.3
	QC B	50.32 - 75.48	9.0	128.0	4.4	90.5
Min-Max CV			0.9 -15.5		1.4 -10.9	
Mean accuracy				112.8		93.0

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Conclusion

- Using the example of the preparation of samples for measurements of DOA, this preliminary study suggests that the MVQ kit has the same performance as the manual sample preparations based on QuEChERS salts. It avoids weighing the salts and having to put them into tubes, which obviously shortens the time required for extraction and reduces possible human errors.

Reference

1. Dulaurent S et al. Anal Bioanal Chem 2016

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