VAMS™
MULTIMATRIX APPROACH FOR THE ANALYSIS OF SYNTHETIC DRUGS OF ABUSE

Laura Mercolini

Head of the Laboratory of Pharmaco-Toxicological Analysis
Department of Pharmacy and Biotechnology (FaBiT)
Alma Mater Studiorum - University of Bologna, Via Belmeloro 6 Bologna (Italy)

THE IMPORTANCE OF BIOSAMPLING FOR THE ANALYSIS OF DRUGS OF ABUSE (DoA)

DoA analysis should start with an accurate sample collection followed by a reliable pretreatment

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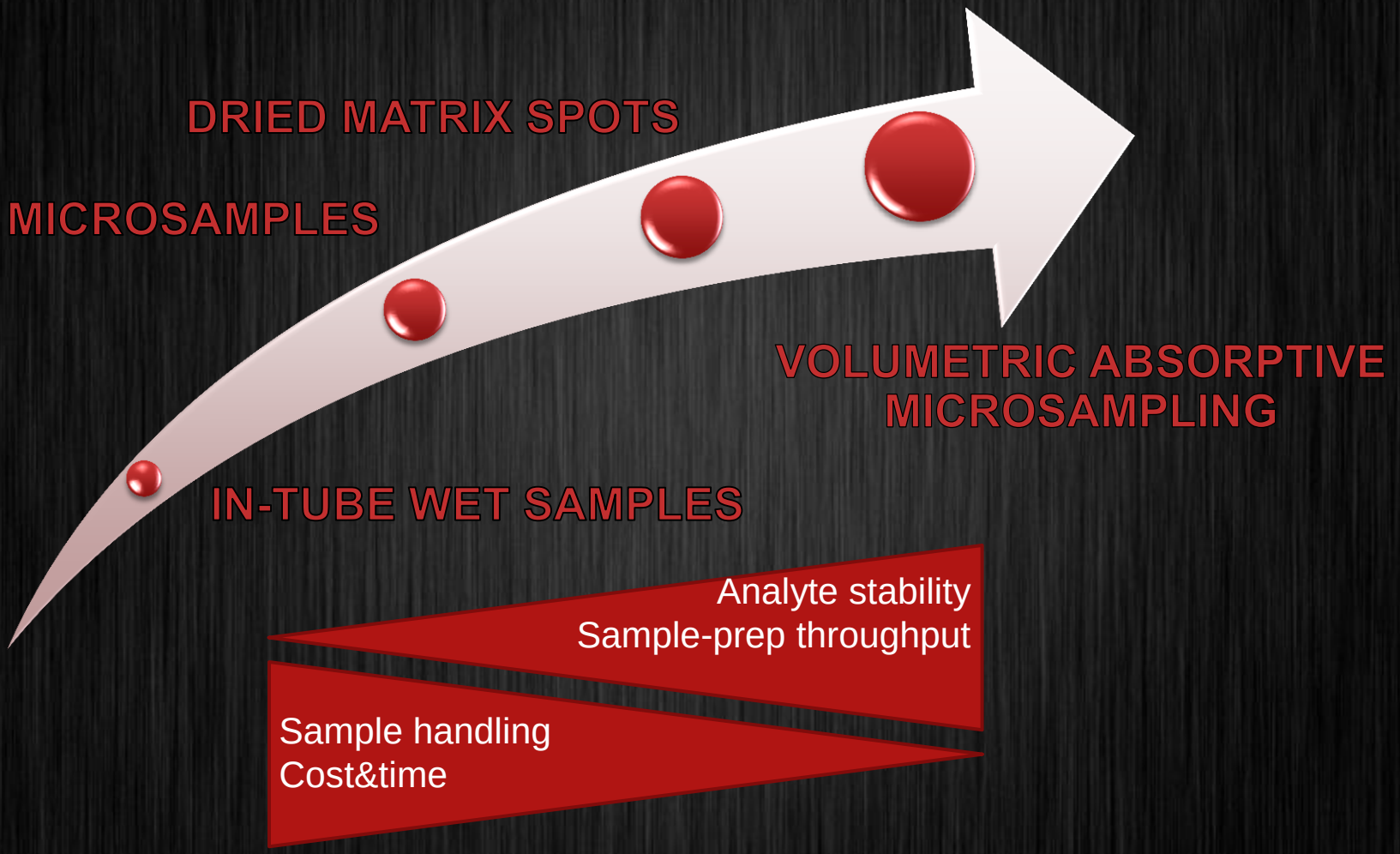
EVOLUTION OF BIOSAMPLING FOR DoA ANALYSIS



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"DOES IT EXACTLY WHAT IT SAYS ON THE TIN FOR DoA ANALYSIS?"

ACCURATE SAMPLING AND SOUND DATA ON PARACETAMOL

✓

P. Denniff, S. Parry, W. Dopson, N. Spooner
Quantitative bioanalysis of paracetamol in rats using volumetric absorptive microsampling
Journal of Pharmaceutical and Biomedical Analysis, 108 (2015) 61-69

DO VAMS CONCENTRATIONS REFLECT DoA CIRCULATING LEVELS?

?

VAMS vs. plasma
Capillary vs. venous blood

Possible ≠ distribution

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NATURAL AND SYNTHETIC CANNABINOIDS IN VAMS FROM WHOLE BLOOD

- ✓ **LC-MS/MS method for natural and synthetic cannabinoid analysis**
- ✓ **DBS & VAMS at different Hct values**
- ✓ **Capillary vs. venous VAMS**
- ✓ **VAMS vs. plasma**

M. Protti, J. Rudge, A.E. Sberna, G. Gerra, L. Mercolini.
Dried haematic microsamples and LC-MS/MS for the analysis of natural and synthetic cannabinoids
Journal of Chromatography B [paper submitted September 2016]

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LC-MS/MS ANALYSIS

Chromatographic system

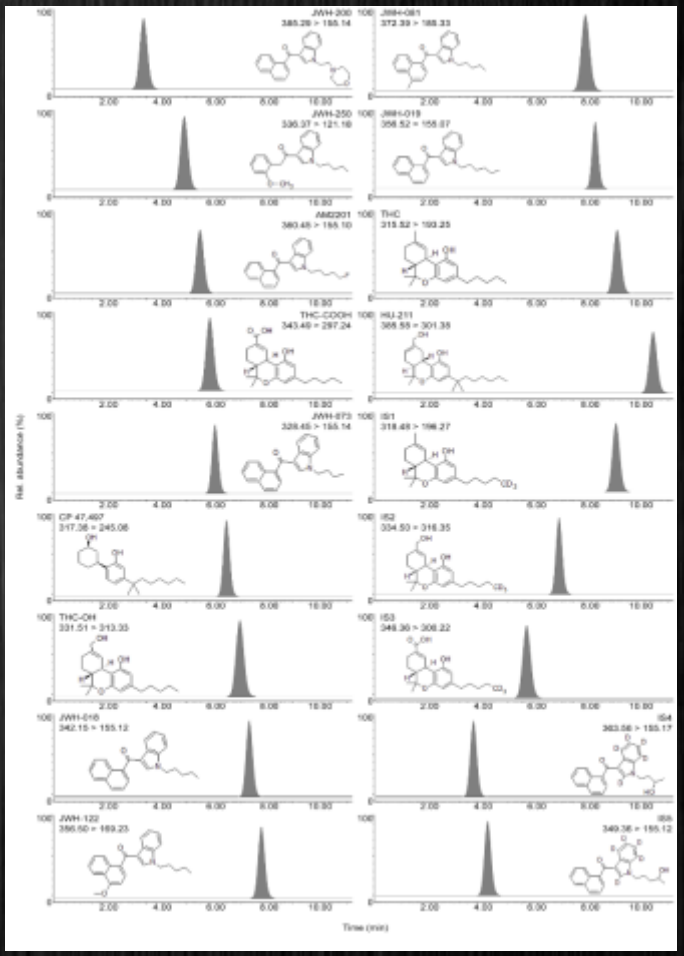
Column:	RP C18, 3.5 µm
Dimensions:	50 x 2.1 mm I.D.
Flow Rate:	0.3 mL/min
Mobile Phase:	0.1 % F.A. in ACN
	0.1 % F.A. in H_2O

Mass spectrometry

Triple quadrupole

MRM mode, ESI+/ESI-

THC	NC
THC-OH	NC
THC-COOH	NC
JWH-018	SC
JWH-073	SC
JWH-250	SC
JWH-200	SC
HU-211	SC
CP 47,497	SC
JWH-19	SC
JWH-122	SC
JWH-081	SC
AM2201	SC



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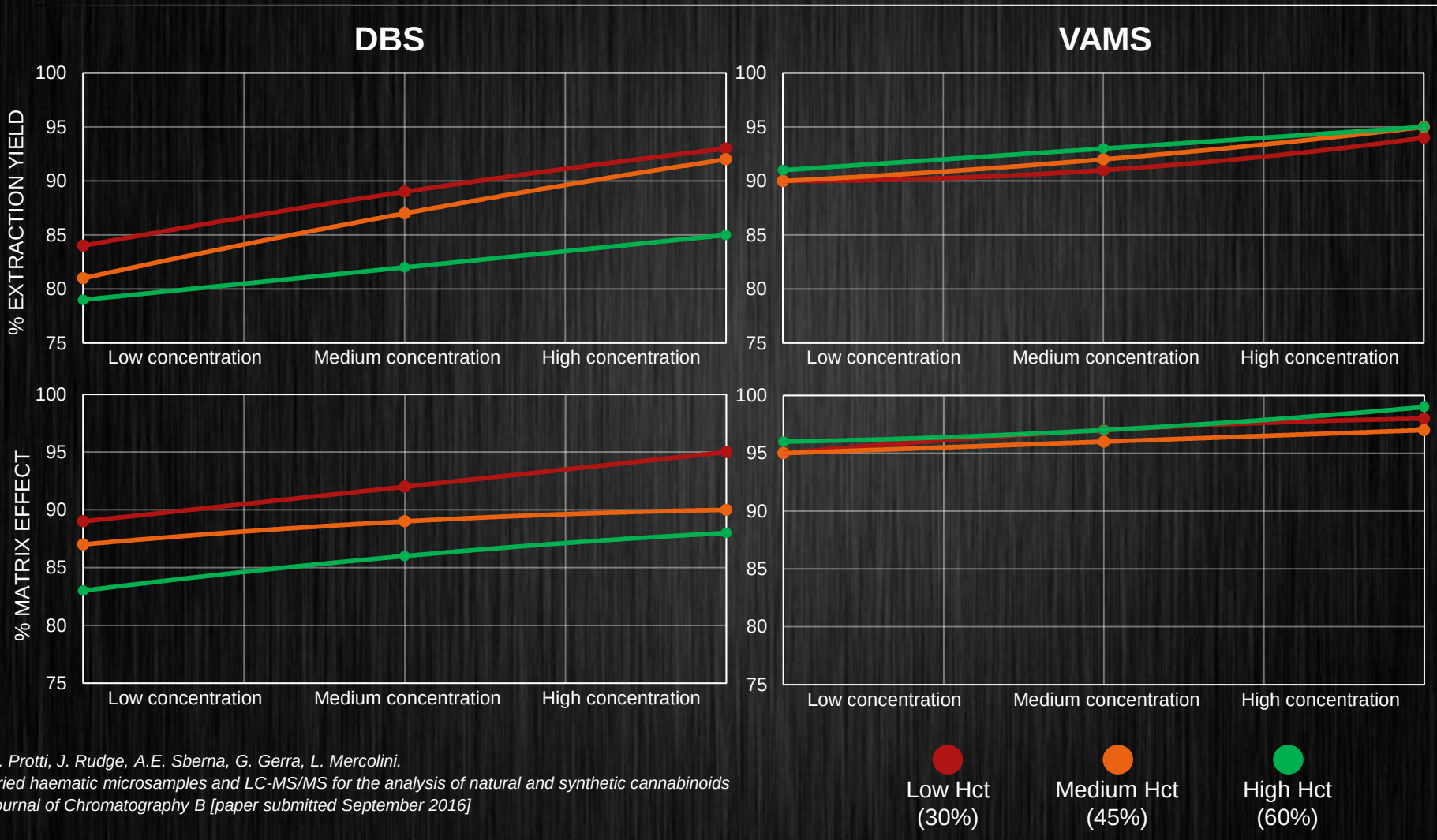
DBS & VAMS PERFORMANCES: Hct EFFECTS



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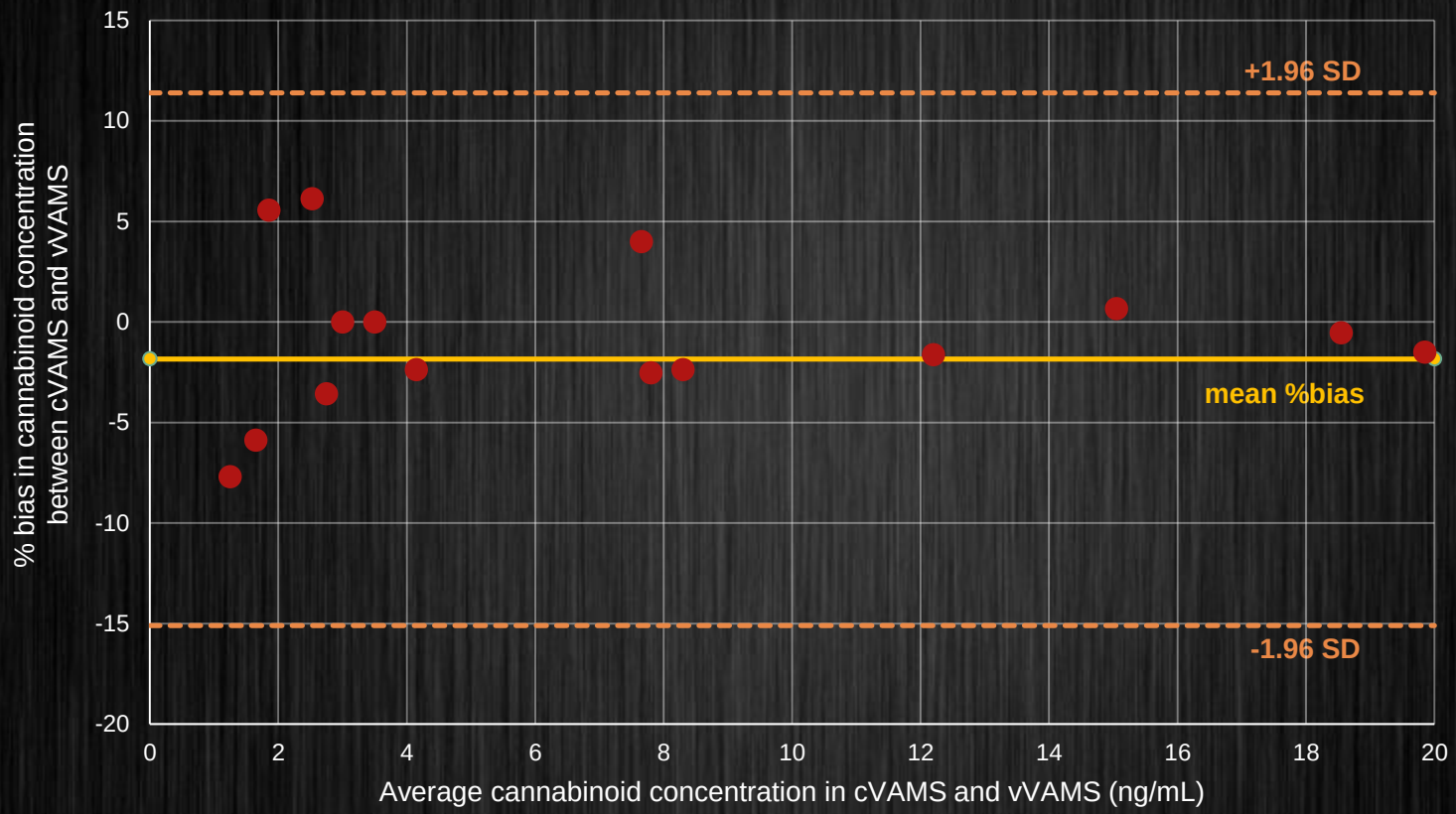
CAPILLARY vs. VENOUS VAMS



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VAMS vs. PLASMA

Subject	Compound	NC and SC concentrations (ng/mL)			
		cVAMS	vVAMS	Plasma (theoretical)	Plasma (measured)
1	THC THC-OH THC-COOH	3.6 1.9 12.4	3.5 2.0 12.2	9.1 3.6 33.1	9.0 3.8 33.5
2	THC THC-OH THC-COOH	2.7 1.7 15.2	2.6 1.6 15.0	6.8 3.0 40.9	6.5 2.8 40.4
3	THC THC-OH THC-COOH	7.9 3.0 18.8	7.8 2.8 18.6	20.0 5.4 50.4	19.7 5.2 50.0
4	THC THC-OH THC-COOH	8.5 3.2 19.9	8.3 3.0 19.9	21.4 5.8 53.5	21.4 6.0 52.9
5	JWH-081	7.7	7.5	13.5	13.5
6	JWH-122 JWH-250	4.2 1.3	4.0 1.1	7.6 2.1	7.6 2.1

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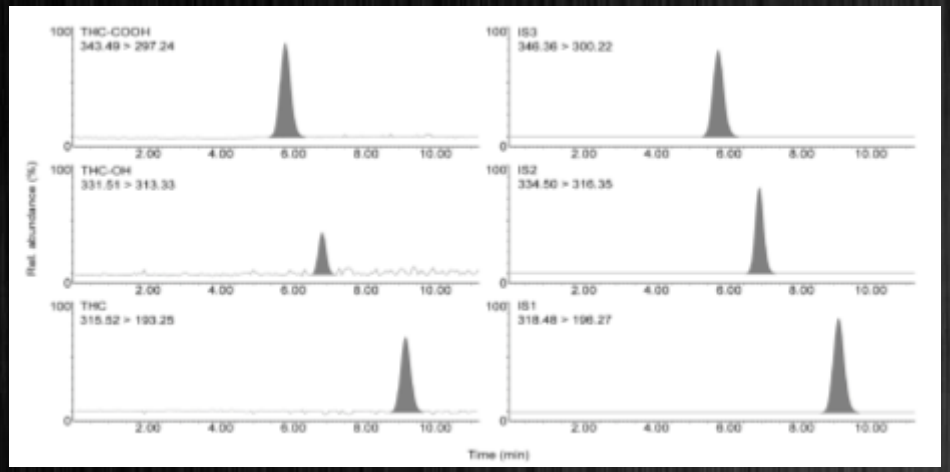
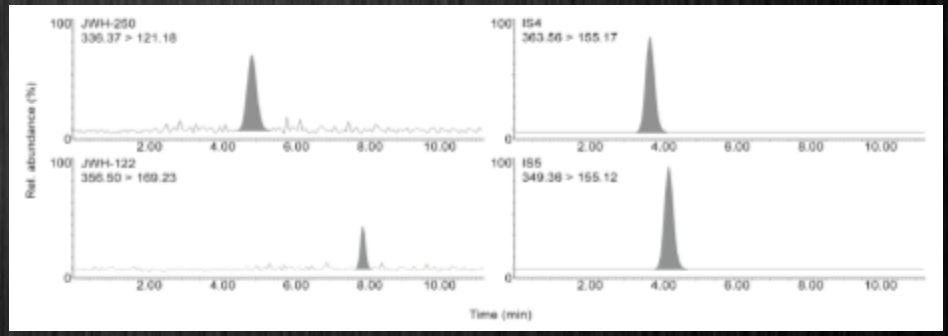
EXAMPLES FROM USERS



Subject 3: *Cannabis* smoker
THC: 7.7 ng/mL
THC-OH: 2.7 ng/mL
THC-COOH:18.5 ng/mL

Subject 6: Synthetic cannabinoid smoker
JWH-122: 4.2 ng/mL
JWH-250: 1.3 ng/mL



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ACCURATE SAMPLING OF 10/20 µL OF WHOLE BLOOD

✓

J. Rudge, S. Kushon, A. Bischofberger, A. Carpenter, P. Denniff, Y. Guo, P. Rahn, N. Spooner, S. Osborne, E. Welch, C. Cordova, J. Layne
Eliminating volumetric haematocrit bias associated with DBS sub-punch workflows using a novel microsampling device which absorbs a fixed volume of blood
Chromatography Today, Nov/Dec (2014) 38-40.

ACCURATE SAMPLING OF 10/20 µL OF OTHER BIOFLUIDS

?

Plasma
Urine
Oral fluid

→ ≠ density
≠ composition

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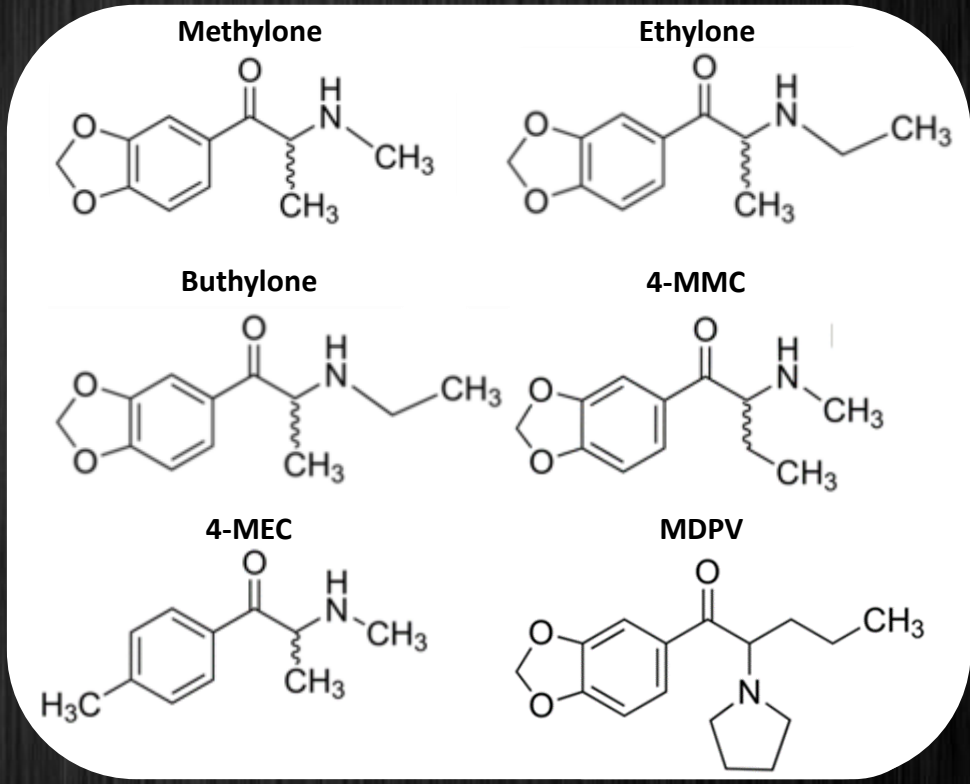
CATHINONE ANALOGUES IN VAMS FROM PLASMA, URINE, ORAL FLUID



L. Mercolini, M. Protti, M.C. Catapano, J. Rudge, A.E. Sberna
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Journal of Pharmaceutical and Biomedical Analysis 123 (2016) 123:186.

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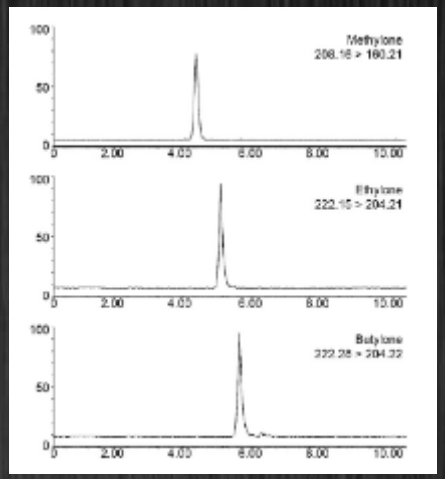
Mobile Phase:	0.1 % F.A. in ACN
	0.1 % F.A. in H_2O

Mass spectrometry

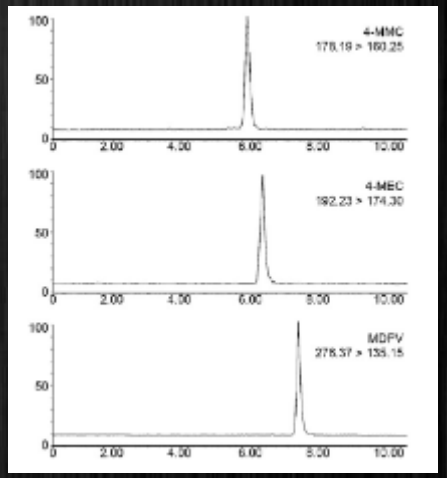
Triple quadrupole

MRM mode, ESI+

- Methilone
- Ethylone
- Butylone



- 4-MMC
- 4-MEC
- MDPV



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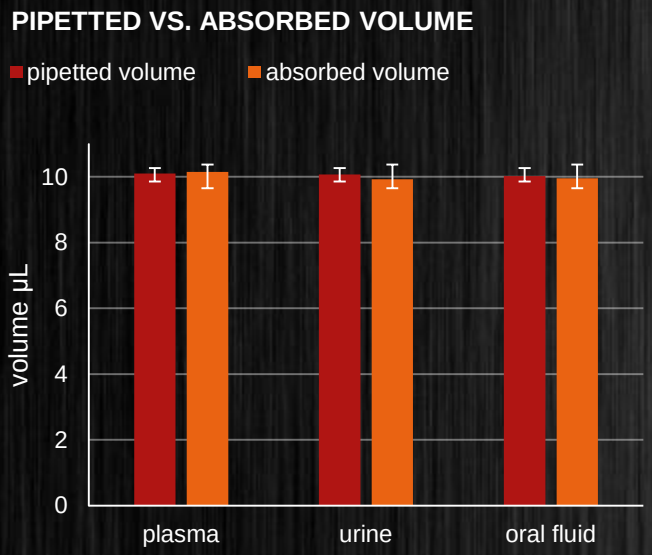
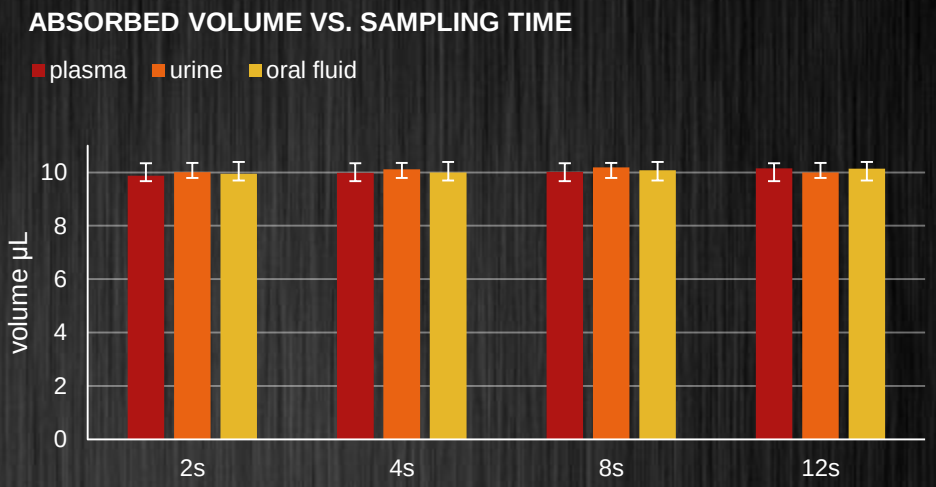
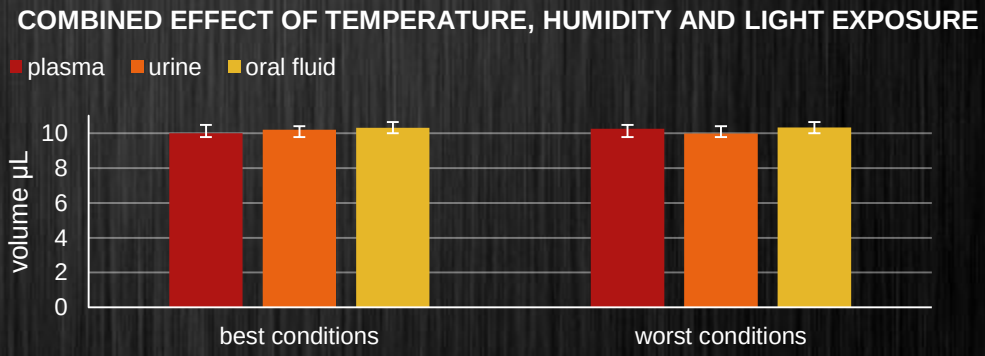
GRAVIMETRIC ASSAYS







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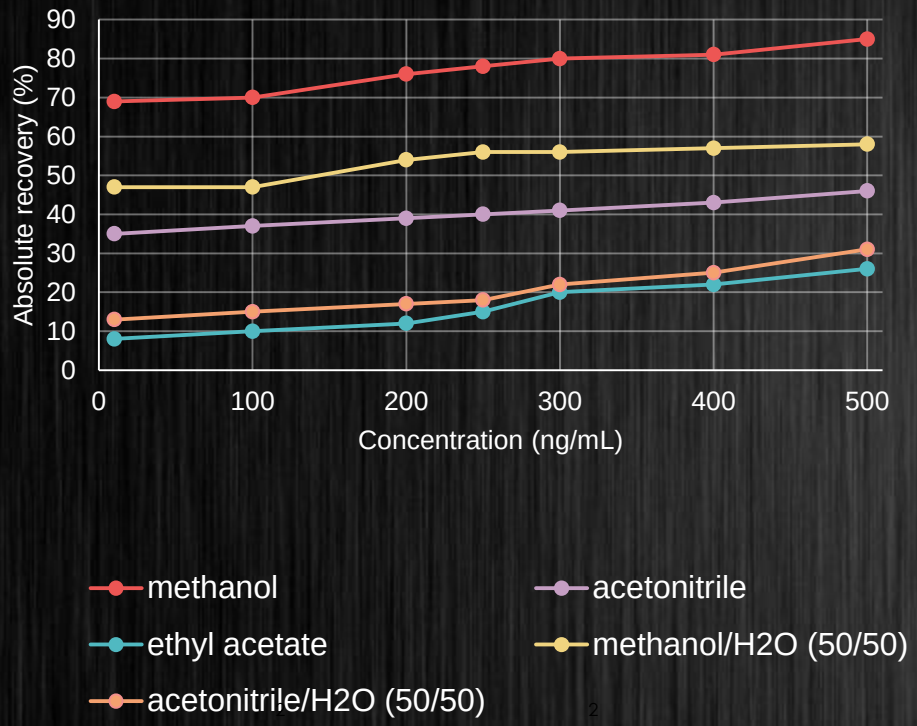
EXTRACTION PROCEDURE OPTIMISATION



Analyte	Concentration (ng/mL)	Absolute recovery (%)	Matrix effect (%)
Methylone	10	88.5	97.9
	250	87.8	98.9
	500	78.9	96.1
Ethylone	10	88.3	93.0
	250	85.1	102.7
	500	79.5	99.4
Butylone	10	86.3	99.0
	250	85.6	96.2
	500	80.9	99.3
4-MMC	10	80.5	104.9
	250	76.6	103.3
	500	75.8	102.3
4-MEC	10	75.5	103.9
	250	75.1	103.3
	500	76.3	99.4
MDPV	10	76.5	99.3
	250	77.4	99.7
	500	76.6	98.2
ISs	100	88.1	90.5

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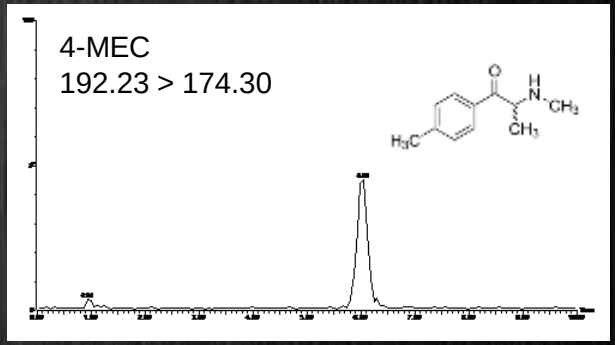
VAMS VS. IN-TUBE WET SAMPLES: QUANTITATION

	Quali-quantitative results (ng/mL)					
	VAMS sampling			Classical wet matrices		
Subject	Urine	Plasma	Oral fluid	Urine	Plasma	Oral fluid
1	N.A.	Mephedrone 86	Mephedrone 40	N.A.	Mephedrone 86	Mephedrone 38
2	Mephedrone 113	N.A.	Mephedrone 18	Mephedrone 121	N.A.	Mephedrone 15
3	4-MEC 46 MDPV 148	4-MEC 75 MDPV 56	N.A.	4-MEC 44 MDPV 145	4-MEC 81 MDPV 62	N.A.
4	MDPV 114	MDPV 160	N.A.	MDPV 115	MDPV 160	N.A.
5	4-MEC 126	4-MEC 49	4-MEC N.D.	4-MEC 125	4-MEC 53	4-MEC N.D.



Subject 5: “bath salts” user
VAMS from urine
4-MEC: 126 ng/mL

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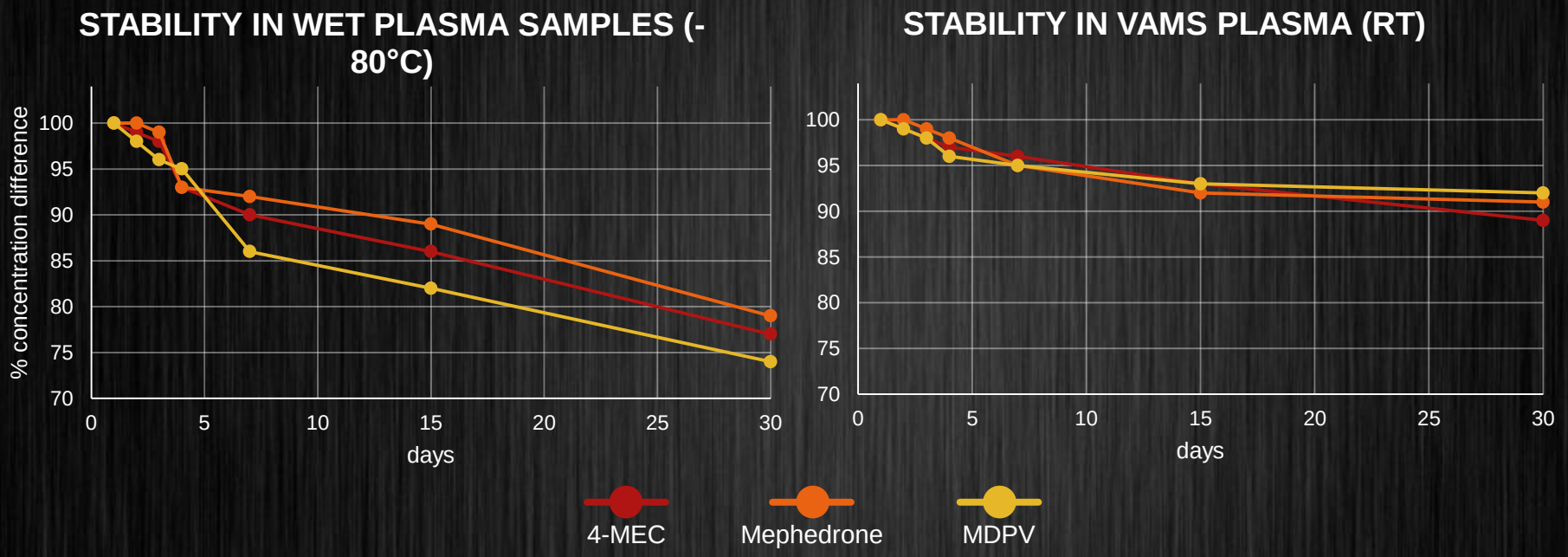
VAMS VS. IN-TUBE WET SAMPLES: STABILITY



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MORE APPLICATIONS UNDER VALIDATION

MITRA™ FOR ANTI-DOPING ANALYSIS

- S0. NON-APPROVED SUBSTANCES
- S1. ANABOLIC AGENTS
- S2. PEPTIDE HORMONES, GROWTH FACTORS, RELATED SUBSTANCES AND MIMETICS
- S3. BETA-2 AGONISTS
- S4. HORMONE AND METABOLIC MODULATORS
- S5. DIURETICS AND MASKING AGENTS
- S6. STIMULANTS
- S7. NARCOTICS
- S8. CANNABINOIDS
- S9. GLUCOCORTICOIDS

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