6th YSS *(in collaboration with with the Universities of Bologna (It.) and Ghent)*

Future-proofing Bioanalysis - Contributing to a sustainable world

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

PTA Lab
Pharmaco Toxicological Analysis Laboratory

Unraveling details and potentials of VAMS technique: towards the raise of a new golden standard

Michele Protti

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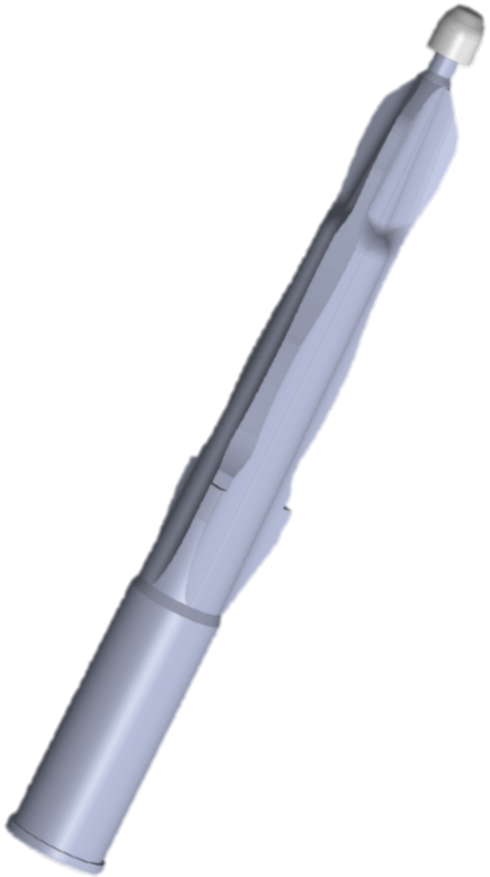
Alma Mater Studiorum - University of Bologna (Italy)

Presentation agenda

- VAMS: introduction
- Insights of VAMS technique
- Target compounds and analytical platform
- Testing VAMS performances/1
- Testing VAMS performances/2
- Advanced aspects and challenges
- Conclusion



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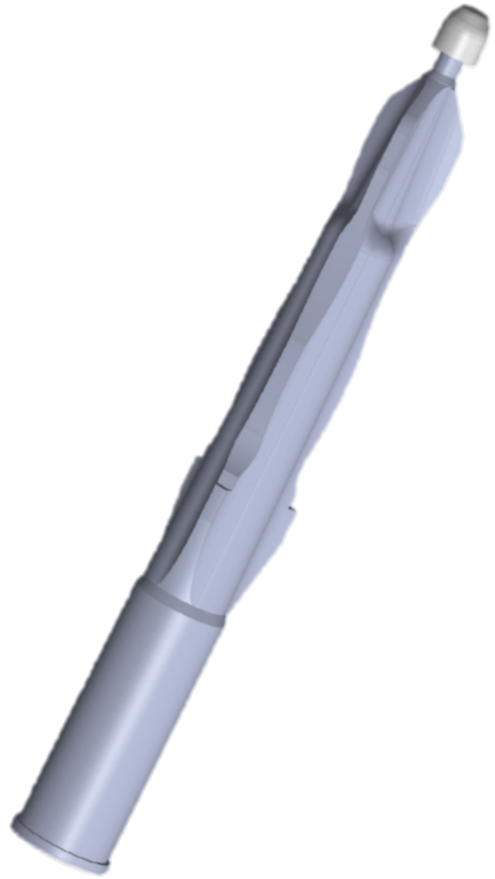

VAMS: introduction

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Features

- Polymeric porous tip absorbs a fixed-volume of sample
- Direct sampling from a fingerprick
- Blood collection not affected by HCT, density.
- Plastic handle similar to a pipette tip
- Tested for different biological matrices
- Amenable for automated processing

Advantages

- Reduction of biological fluid volumes
- Minimally invasive sampling
- Accurate sampling regardless of fluid density
- Transport and storage at RT
- Good compound stability
- Fast pretreatment procedure
- High-throughput analysis

Formats

- 10 µL
- 20 µL
- 30 µL

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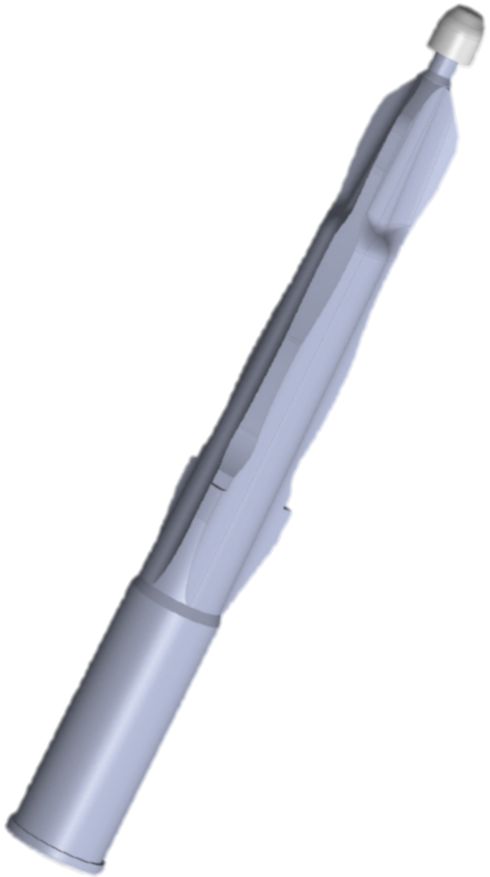

Insights of VAMS technique

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Main parameters (potentially) affecting VAMS performace

- Sampling time
- Blood HCT
- Drying time, temperature, humidity
- Forced drying
- Storage conditions
- IS addition
- Extraction means and solvents
- Biological matrices other than WB

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Tutorial

Tutorial: Volumetric absorptive microsampling (VAMS)

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HIGHLIGHTS

- VAMS is a novel dried microsampling approach for bioanalysis that promises to be more feasible and reliable than DBS.
- VAMS is increasingly used, but applications, limitations and best practices are still not widely studied and known.
- This tutorial aims to explain in detail all stages of VAMS procedure, with many real use cases.
- Notes on VAMS applications and automation are also included.

GRAPHICAL ABSTRACT

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ABSTRACT

Volumetric absorptive microsampling (VAMS) is a recent microsampling technique used to obtain dried specimens of blood and other biological matrices for application to a plethora of bioanalytical purposes. As such, it can be likened to dried blood spot (DBS) technique that has been in wide use for the last 40 years. However, VAMS promises to bring some significant advantages over DBS, related to sampling volume accuracy, haematocrit (HCT) dependence, pre-treatment and automation. Although some aspects still need to be investigated in depth, VAMS is increasingly recognised as a viable alternative to DBS and other dried microsampling techniques.

In this tutorial, different aspects of VAMS approach are described and discussed, presenting the procedures adopted and the results obtained by those authors who have developed this kind of analytical workflow in the last few years. Hopefully, this will help other scientists to find new solutions to old and recent problems related to microsampling and to produce new, sound and interesting science in this field.

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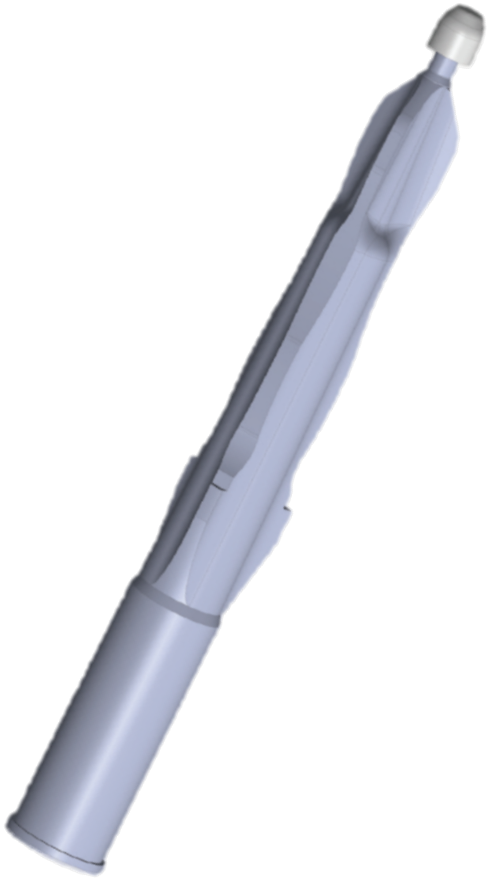

Target compounds and analytical platform

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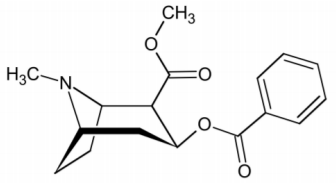
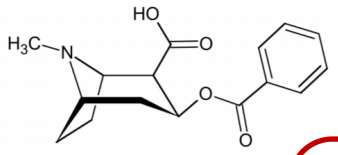
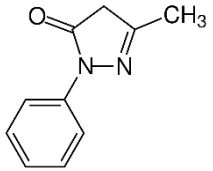
Target analytes



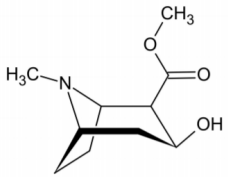
Cocaine
COC



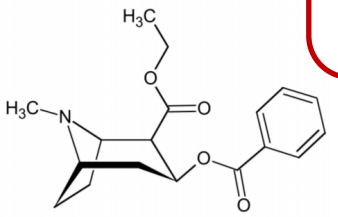
Benzoylecgonine
BEG



Edaravone
EDV



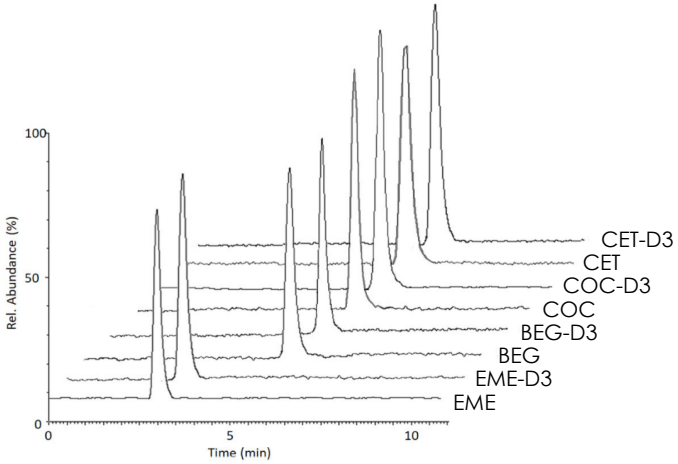
Ecgonine methyl esther
EME



Cocaethylene
CET

LC-MS/MS parameters

- RP C8 stationary phase + guard column
- H_2O + FA / ACN + FA, composition gradient
- Triple Quad, MRM, ESI+



Analyte	Q1 (m/z)	Q3 (m/z)
COC	304.27	82.1
		182.0
BEG	290.16	82.1
		168.1
EME	200.13	182.0
		82.1
CET	318.24	196.1
		150.1
COC-D3	307.26	185.1
BEG-D3	293.25	85.1
EME-D3	203.25	185.1
CET-D3	321.26	199.0

Blood microsampling & cocaine assessment

- **Forensics**
- **Anti-doping**
- **Clinical toxicology**

Sensitivity	LOD 0.3 - 0.8 ng/mL	LOQ 1.0 - 2-5 ng/mL
Linearity	LOQ-500 ng/mL	r^2 >0.9990
Recovery	> 86%	
Matrix effect	3-11%	
Precision	RSD% < 6.0	

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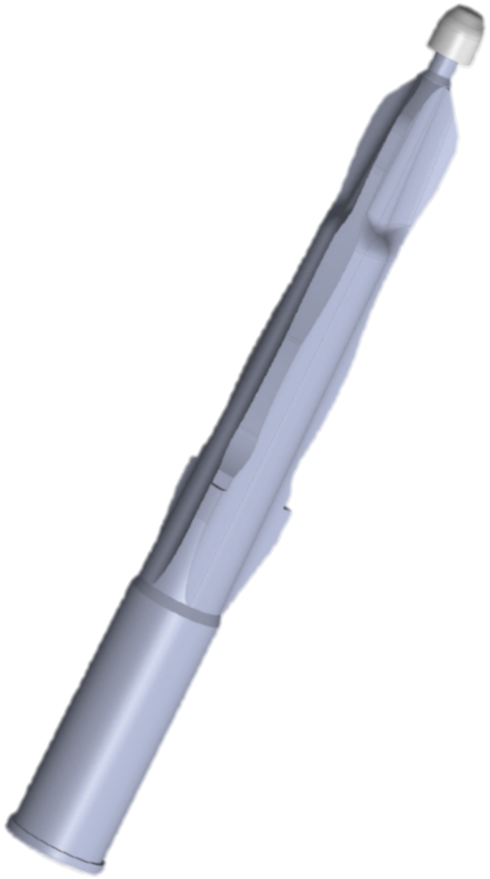

Testing VAMS performances/1

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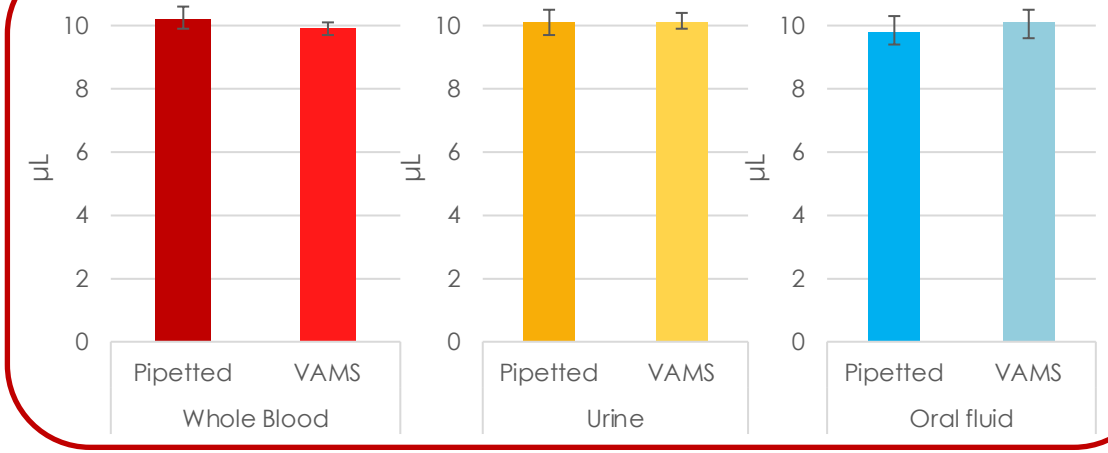
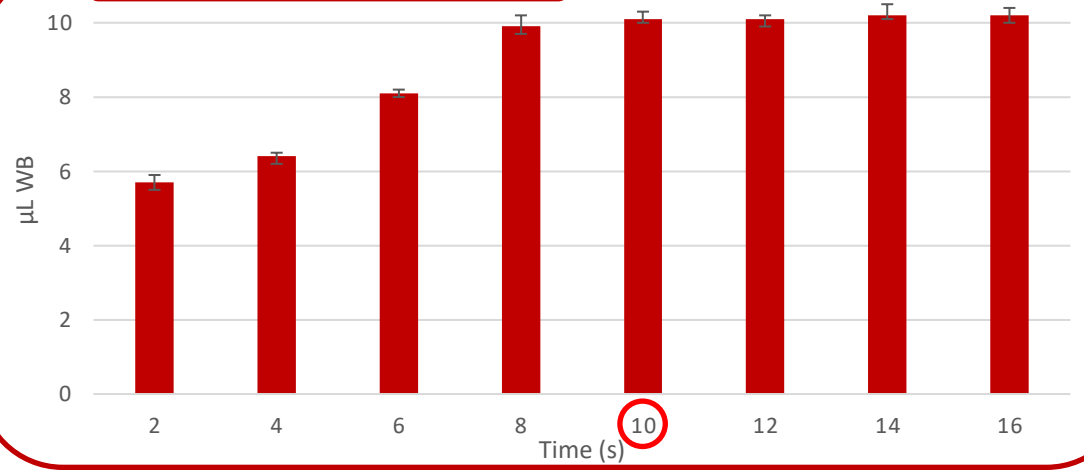
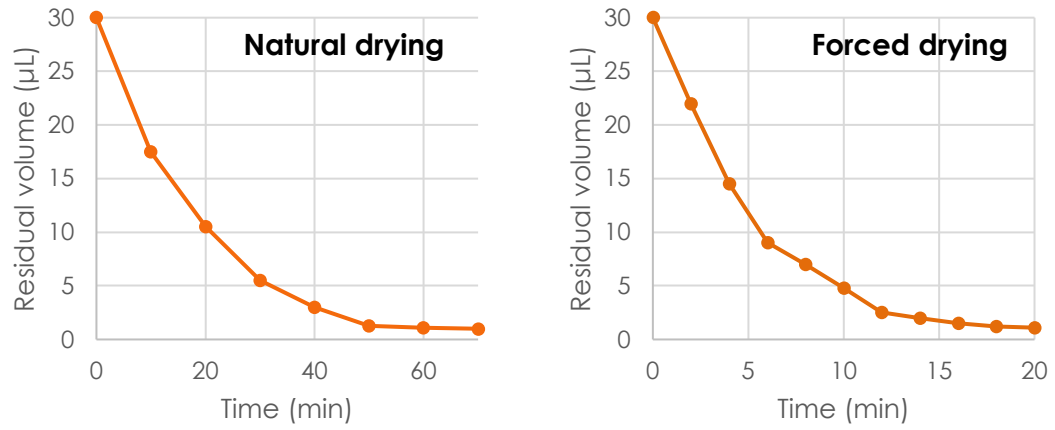
Volumetric accuracy



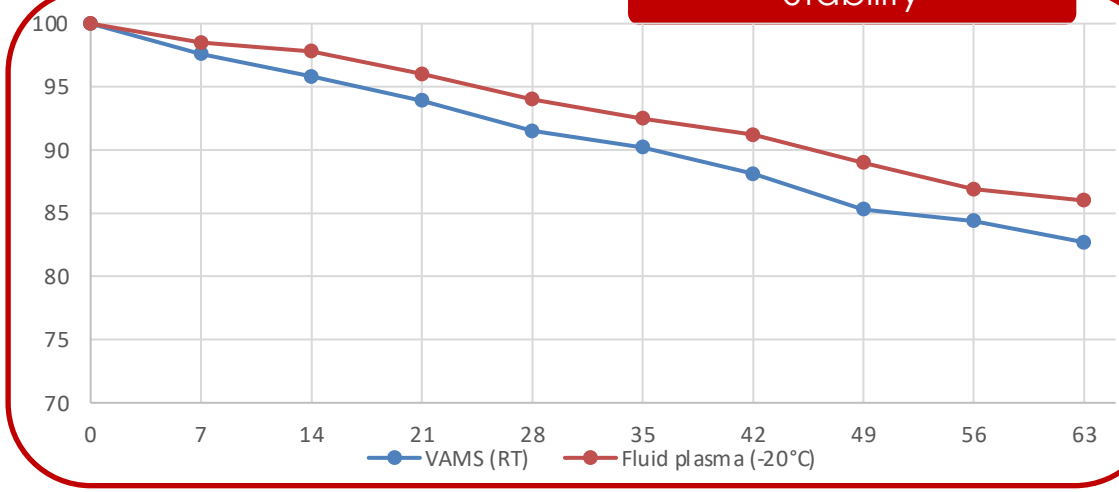
Sampling contact time



Drying time



Stability



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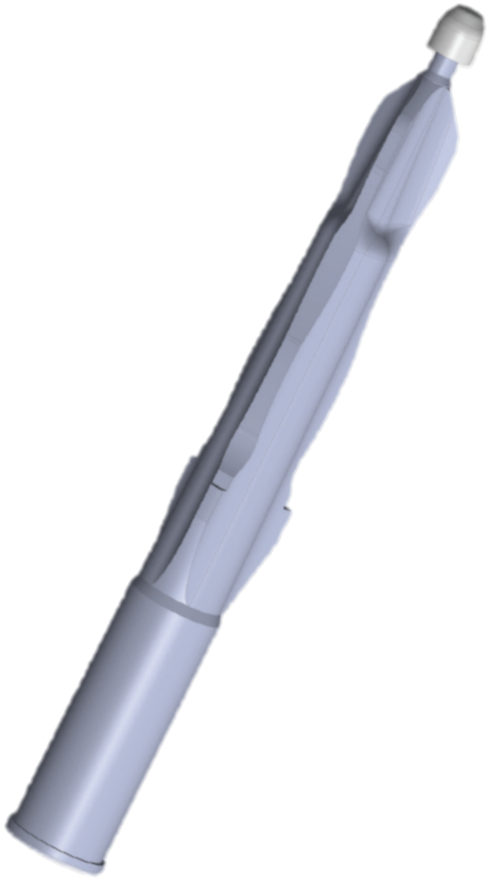

Testing VAMS performances/2

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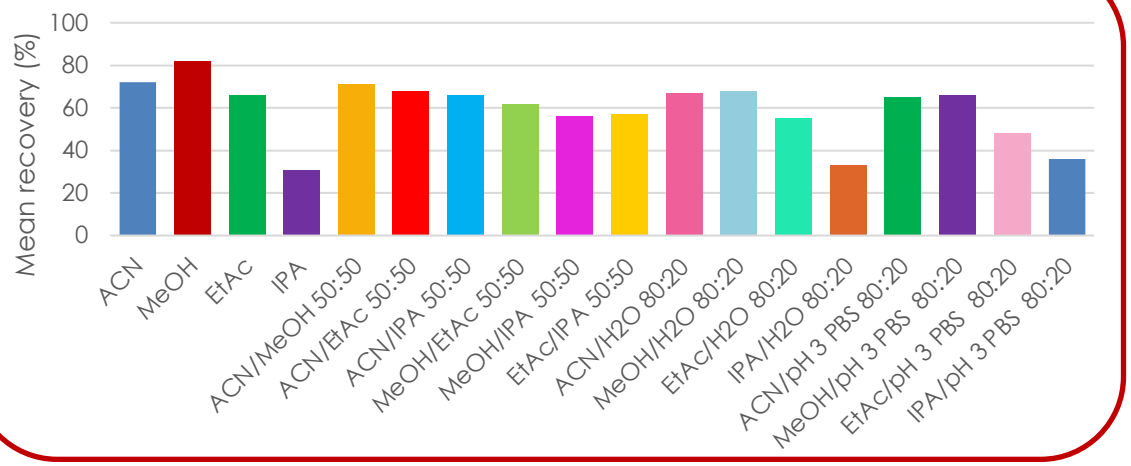
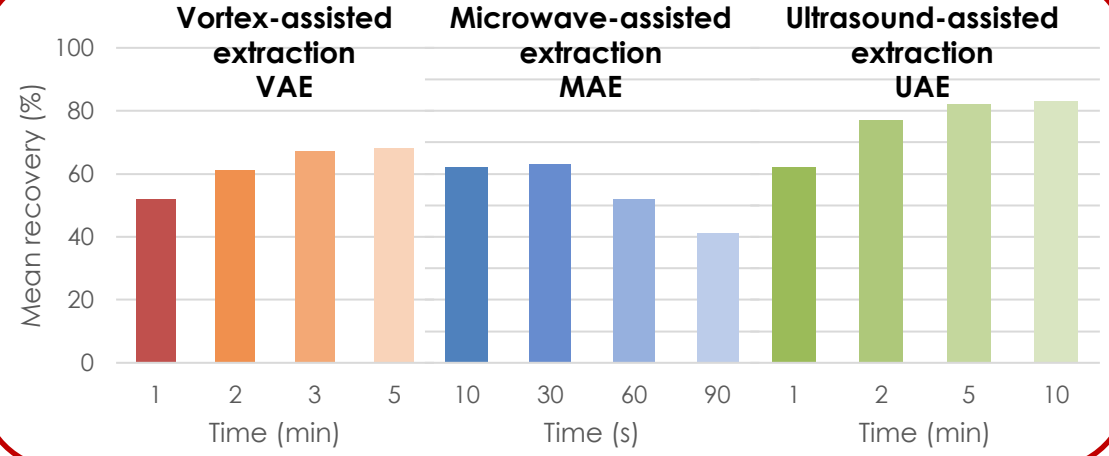
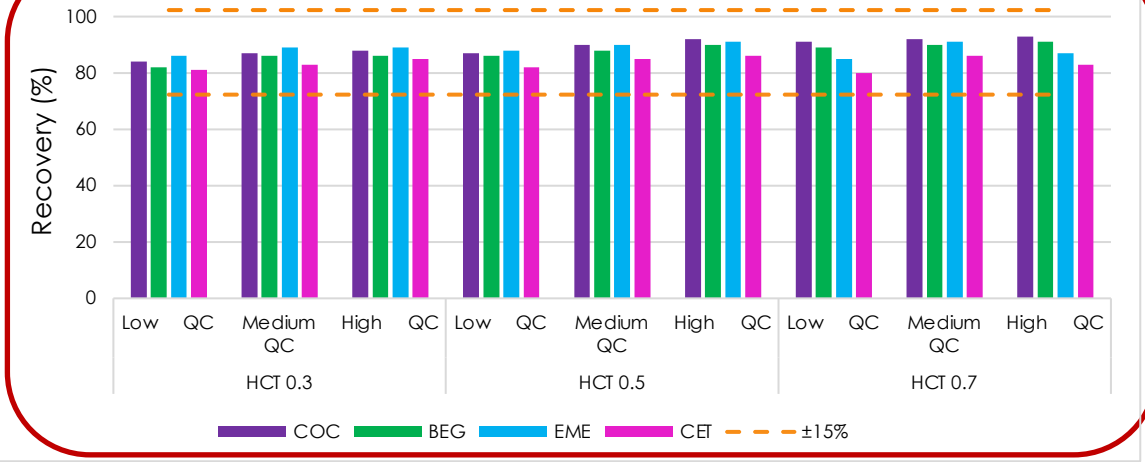
Extraction solvents



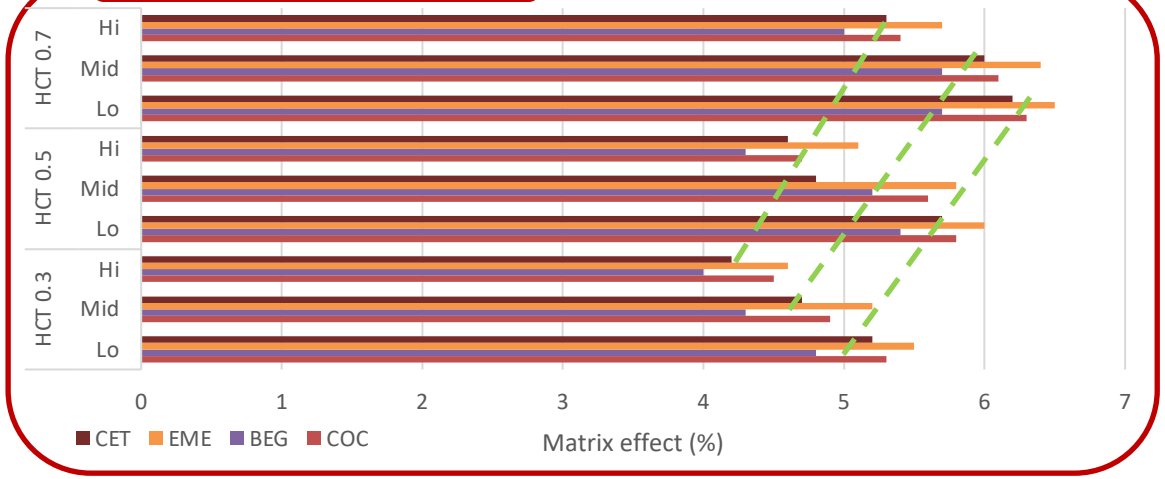
Extraction mode



HCT and recovery



HCT and matrix effect



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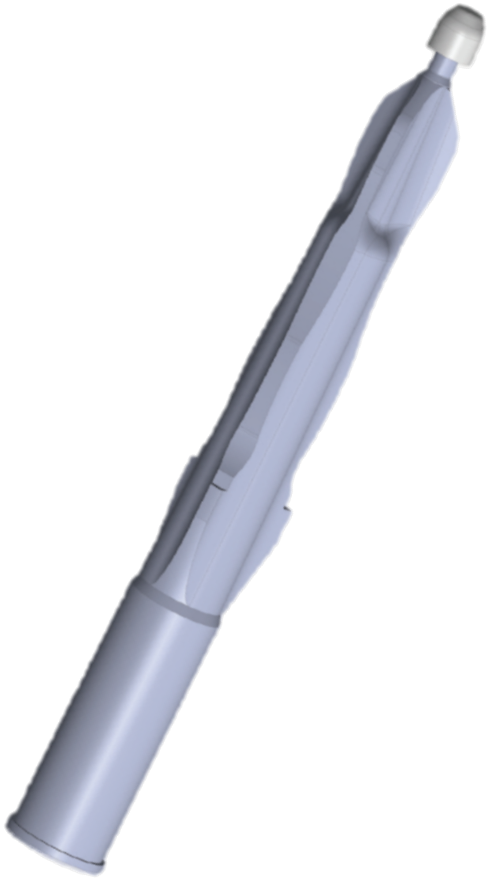

Conclusion

- VAMS technology for the microsampling of biological fluids in dried form represents a promising approach for bioanalysis.
- Especially suitable for implementation in high-applicability methods with potential for use in the field, out of the lab: forensics, anti-doping, home-samplig etc.
- The potential as an alternative to the classic sampling of "in-tube" biofluids must be verified through in-depth studies taking into account the parameters influencing all the pre-analytical and analytical phases.
- Some parameters are ubiquitous and can be taken for granted, some must be verified case by case.
- The experimental design must take into consideration the objective of method application, the biological matrix, the target analytes and the required performances.
- The current interest of the bioanalytical community regarding VAMS technology is a good driving force for its deepening and consolidation as a potential future reference approach.

The PTA Lab at Unibo

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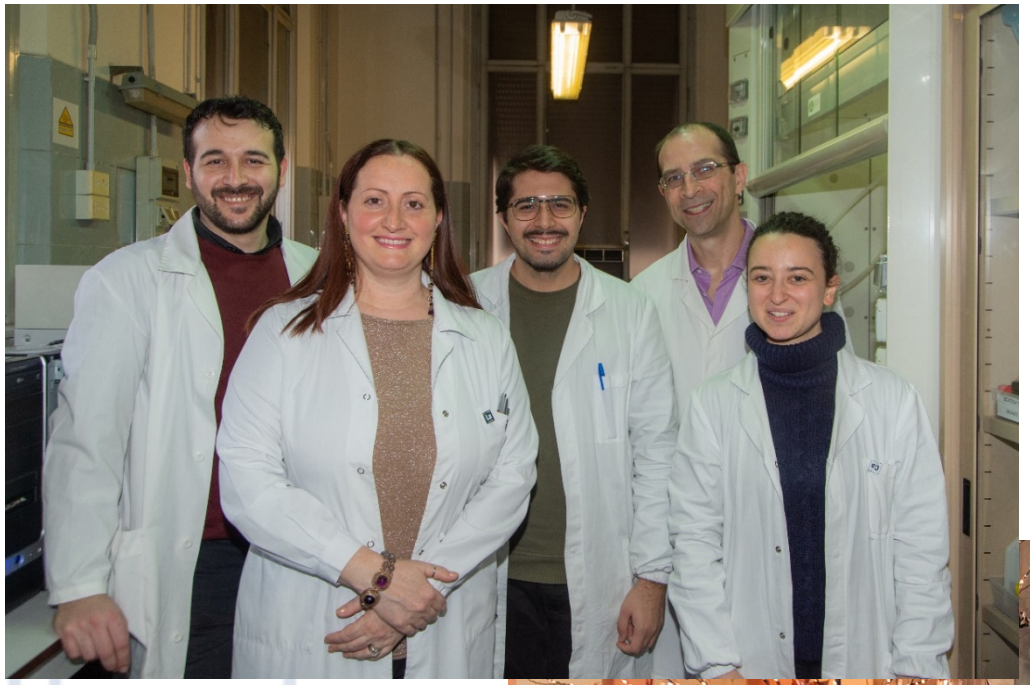

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