



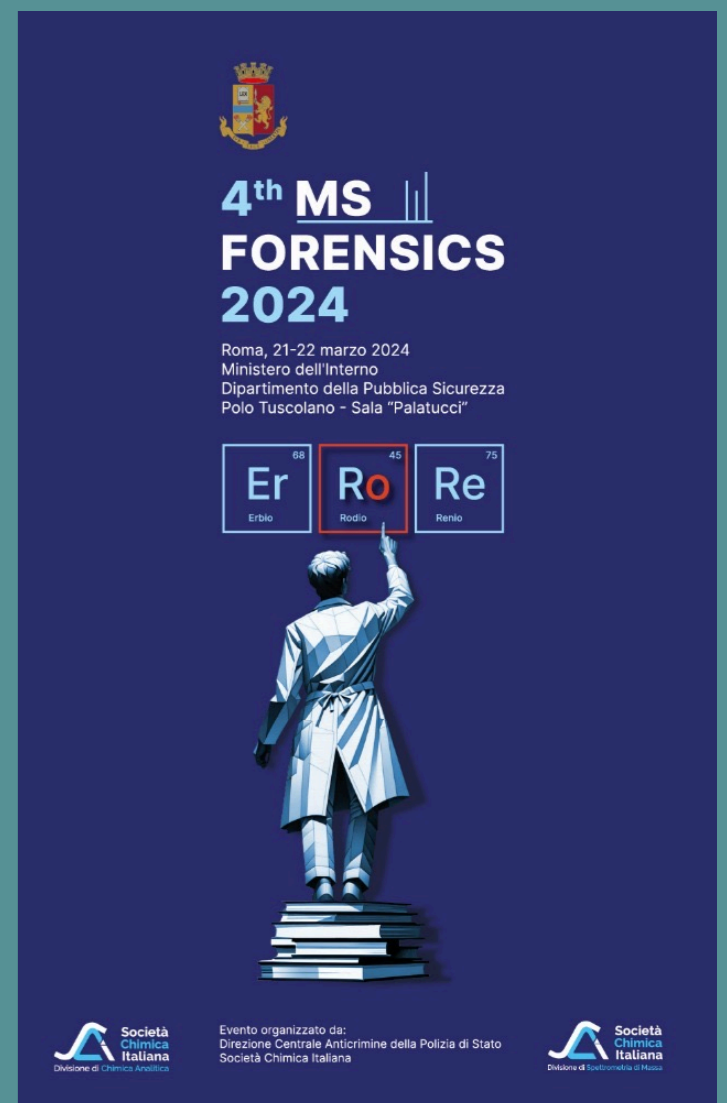
# Drug impaired driving: screening and confirmation analysis on the road using HPLC-MS/MS on a mobile laboratory

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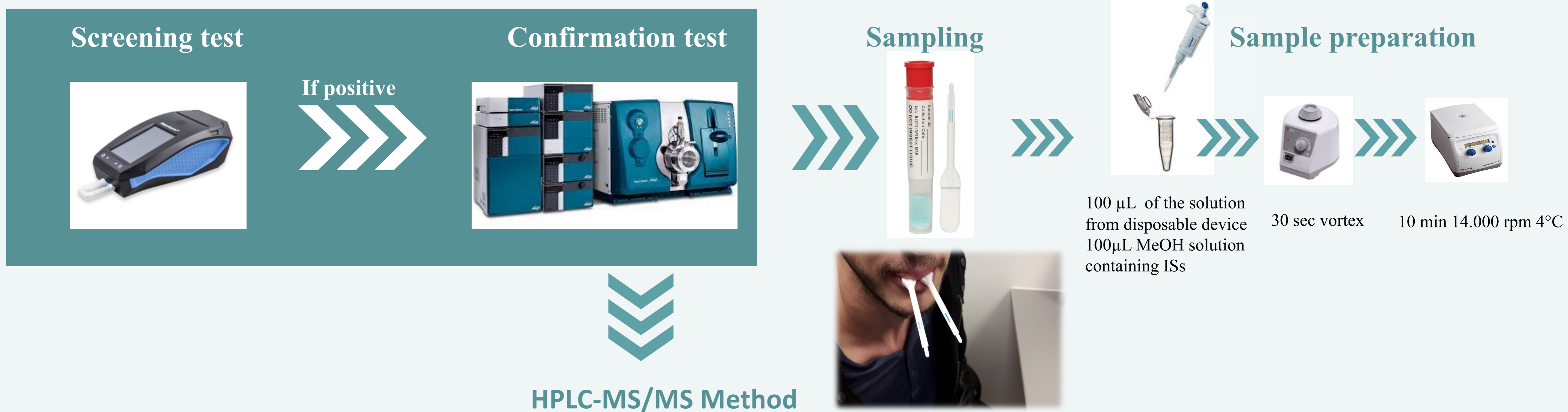
## 1 Introduction

Driving under the influence of drugs (DUID) is the cause of many accidents in Italy and in the world. Road control, together with prevention activities, are the most effective means of facing DUID. Article 187 of the c.d.s provides that stopped drivers carry out a screening analysis, a confirmation analysis and a medical examination assessing the alteration of the subject. Confirmatory analysis and associated medical examination are usually not performed on the street because they require specialized personnel and non-portable instrumentation (HPLC-MS or GC-MS). Normally the person, resulted positive to the screening test, is accompanied to the hospital to allow the execution of the confirmation analysis. This procedure usually takes a long time, which means that the medical examination (useful for ascertaining the state of alteration) is carried out even many hours after the moment of detention, resulting in a false result. In addition, the analytical result is also provided after days or weeks from the arrival of the sample, resulting in inevitable slowdowns in the closures of the practices. For these reasons, in 2019, a mobile laboratory was set up, equipped with equipment for screening analysis and an HPLC-MS for confirmatory analysis, allowing all the planned analyses to be carried out directly on site[1].

## 2 Analysis workflow

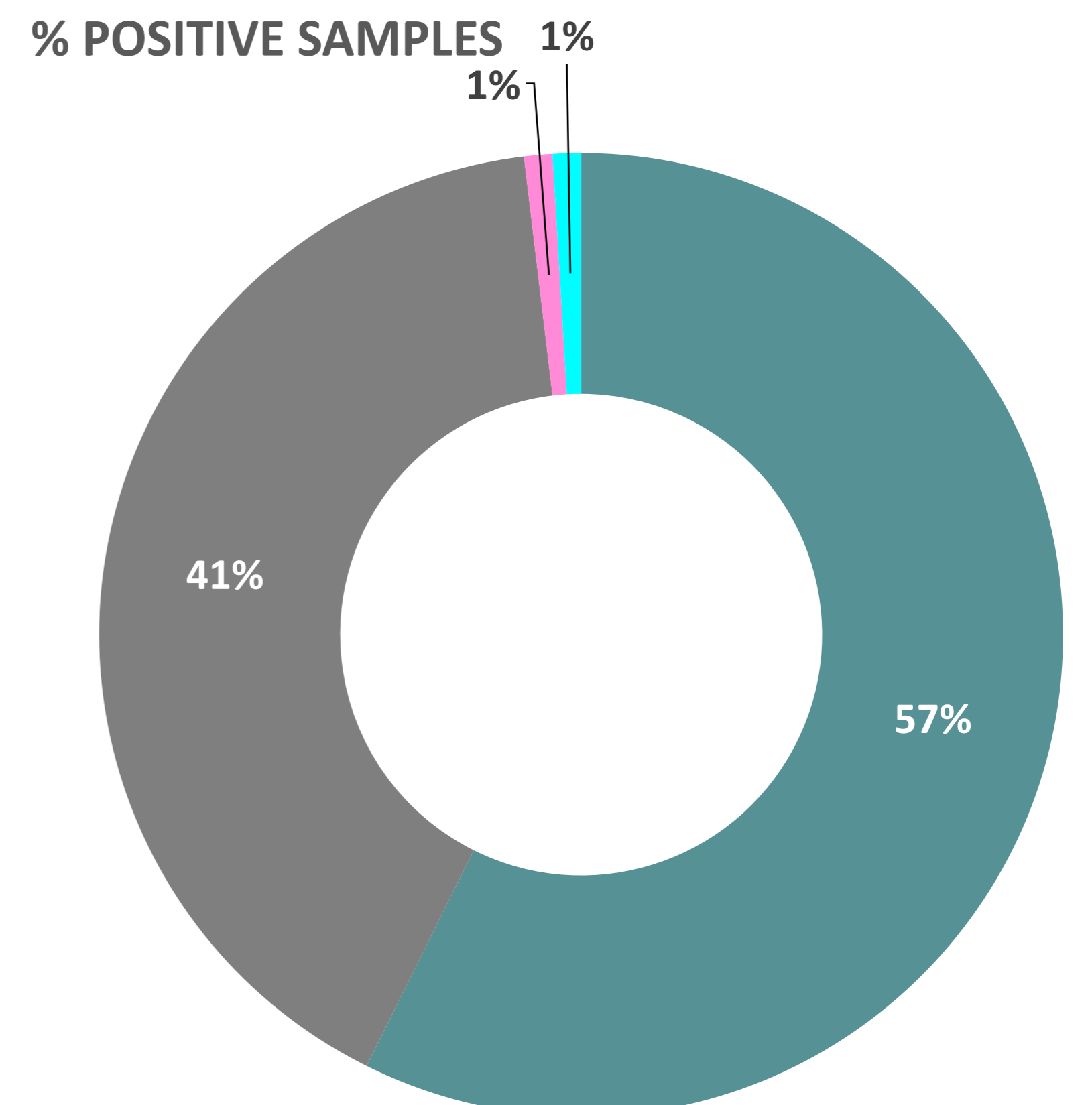
For this purpose, oral fluid (OF) is considered a premium matrix for drug-of-abuse testing [2,3]. The main advantages of OF are the simplicity and noninvasiveness of sample collection. Similarly to blood, OF can reflect recent drug use appropriately, in fact substances can be detected in OF for short periods of time, typically up to 12–24 h after the assumption.

For confirmation test (second level) the saliva samples are analyzed using chromatographic methods coupled with mass spectrometry (HPLC-MS/MS). The developed method is characterized by a rapid and easy sample-prep and can detect and quantify 17 analytes in 15 minutes.



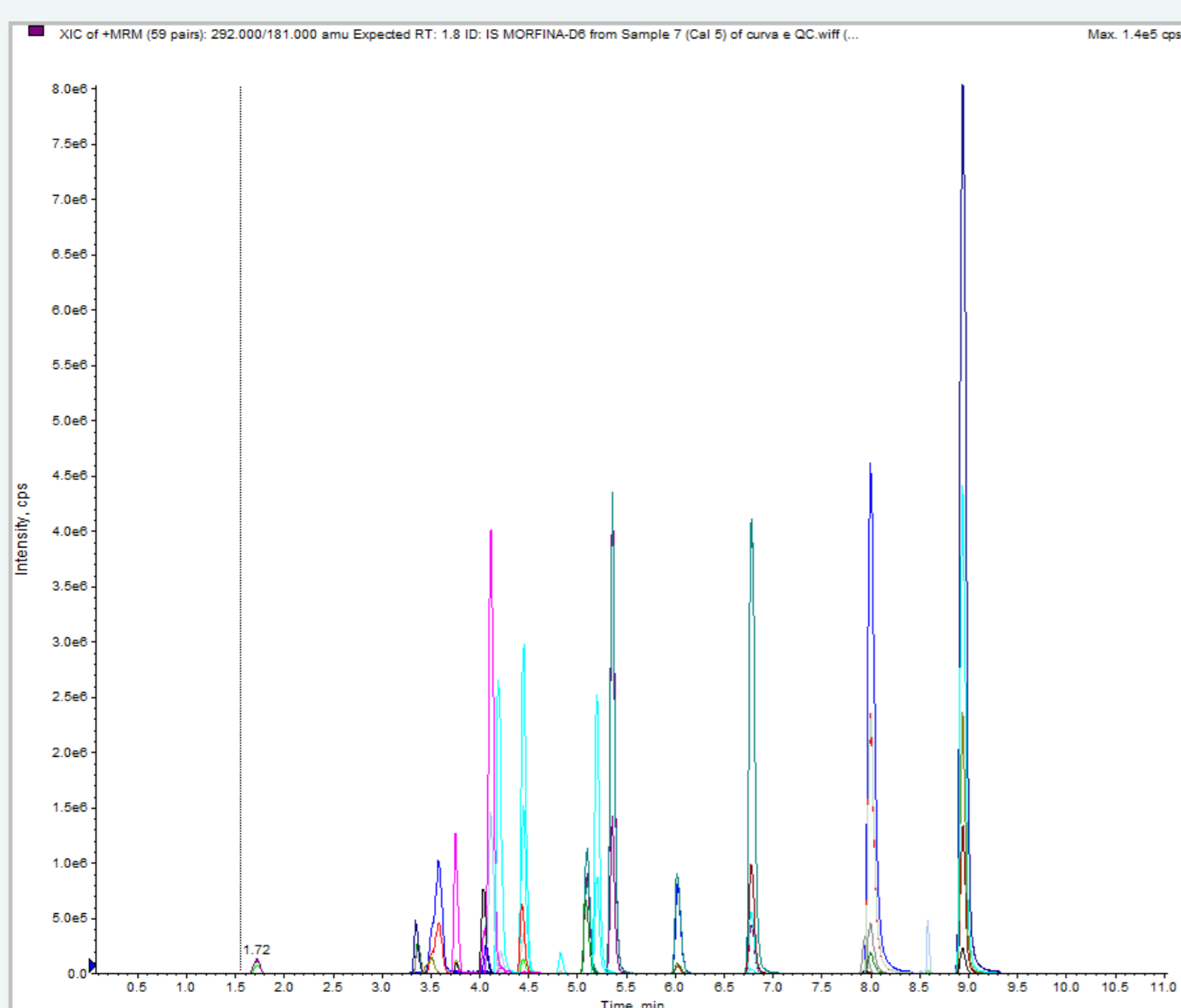
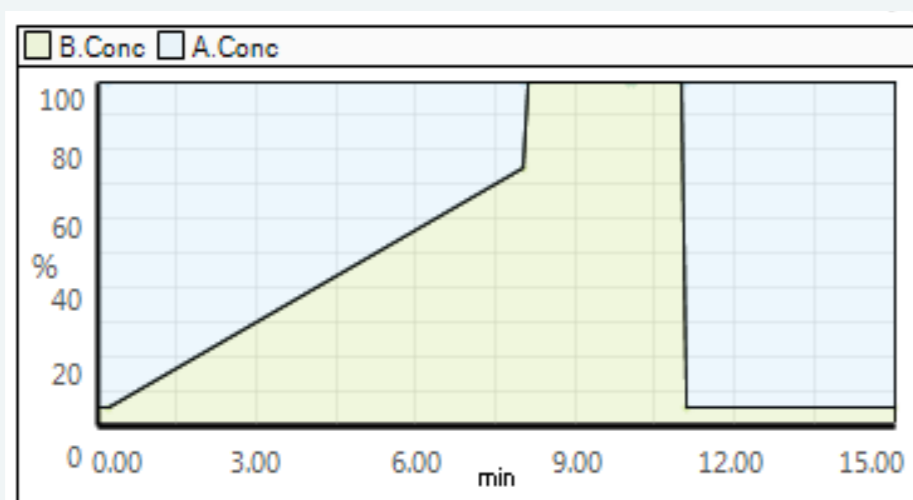
## 3 Results

In 2023, 2168 screening tests were carried out in 92 days. About 9% of the screening is positive for at least one substance and confirmed by LC-MS analysis. Thanks to this project, it was possible to provide an important contribution by analyzing data regarding drug consumption in Italy and identifying which substances are more used.



Analyte	Q1	rT	Q1	DP	EP	Q3	CE	CXP
Morphine	Morphine-D6	1.8	286.1	120	10	165 181 165.1	60 48 64	12 12 12
Codeine	Codeine-D6	3.4	300.1	120	10	153.1 91 119	62 27 13	12 12 12
Amphetamine	Amphetamine-D5	3.7	136.1	45	10	165 211.2	53 38	12 12
6-MAM	6-MAM-D6	3.9	328.0	140	10	133.1 135.1	25 27	12 12
MDA	MDA-D5	4.1	180.2	50	10	119.1 91	16 29	12 12
Methamphetamine	Methamphetamine-D5	4.2	150.1	60	10	168.1 105 163	25 44 18	12 12 12
BEG	BEG-D3	4.3	290.1	95	10	105 163.1	25 29	12 12
MDMA	MDMA-D5	4.5	194.2	65	10	135.1 125	27 38	12 12
MDE	MDE-D6	5.1	208.2	62	10	179.1 135.2	25 31	12 12
Ketamine	No-IS	5.3	238.0	65	10	177 182.2	15 27	12 12
MBDB	MBDB-D3	5.4	208.2	60	10	105.2 196.1	34 28	12 12
Cocaine	Cocaine-D3	6.0	304.2	120	10	150 396.1	35 53	12 10
Cocaehtylene	Cocaehtylene-D3	6.8	318.1	100	10	234 249.1	42 33	12 12
Buprenorphine	Buprenorphine-D4	7.8	468.2	90	10	193.2 123.2	33 45	12 12
EDDP	EDDP-D3	8.0	278.1	120	10	265.1 223.1	22 30	12 12
THC	THC-D3	8.6	315.2	50	10			
Methadone	Methadone-D9	8.9	310.2	80	10			

HPLC parameter:  
Column: C18 50x2.1 ID mm – 5 µm particles  
Column Temperature: 40°C  
Phase A: H<sub>2</sub>O + 0,1% FA  
Phase B: Methanol + 0,1% FA  
Injection volume: 2µL



## 4 Conclusion

As innovative and unique feature of the presented study, all the steps of the DUID control take place on a mobile Lab, from screening to confirmation and quantitative analysis. Thanks to this project comprehensive and certified response is possible and is provided in about 30 min. The HPLC-MS/MS method was validated according to international guidelines showing very good value of precision, accuracy, matrix effect, LOD and LOQ. This project is still active thanks to several national collaborations. International collaboration will be taking place in the next period.

### References

1. Ariana Soledad Poetto et al. Forensic Science International 355 (2024) 111929.
2. European Monitoring Center for Drugs and Drug Addiction (EMCDDA), Publications Office of the European Union (2021)
3. A.M. Projektvorstellung. The "Driving under the Influence of Drugs, Alcohol and Medicines" (DRUID) project of the European Commission]. Dtsch Med Wochenschr. (2008) 133- 2: 45-46.