BAFS 2025

MODERN ANALYTICAL APPROACHES IN FORENSIC TOXICOLOGY FOR DRUG ABUSE DETECTION

Monica Moraru[1], Cozma Adina-Alexandra[2], Iuliu Fulga[1]
1 "Dunarea de Jos" University of Galaţi, Faculty of Medicine and Pharmacy, Galaţi, Romania
2 County Emergency Hospital Satu Mare, Romania

Introduction

According to the National Antidrug Agency – ANA, 2018 National Report, at the general population level, a lifetime prevalence of the consumption of any type of illicit drug of 7.6% was reported for 2017 In Romania, NPSs (new psychoactive substances) being the second consumed drugs after cannabis, with a 2.5 % lifetime prevalence. As NPSs are currently purchased online or on illegal market as drug of choice, their availability and use has been increased. NPSs are experienced mainly by the young population, 91% of consumers being within the age range of 15-24 years.

In the Romanian forensic network, 872 toxicological examinations aimed to identification of the presence of drugs in biological samples from deceased, respectively 1268 toxicological analysis in samples from alive people were conducted in 2017 (ANA 2018 National Report). Only 32 cases of deaths directly related to drugs use and 10 cases of death indirectly related to drugs usewere confirmed. "Classic" drugs as cocaine, opiates, amphetamines were confirmed in the reported cases. Due to the lack of analytical techniques, specialized personnel and conservatism, the NPSs drug related deaths or NPSs exposure were likely to be underestimated. The difficulties of NPSs analysis rely in the number and diversity of substances, transient nature, unknown pharmacokinetics, low concentrations in the biological samples and the lack of reference substances.

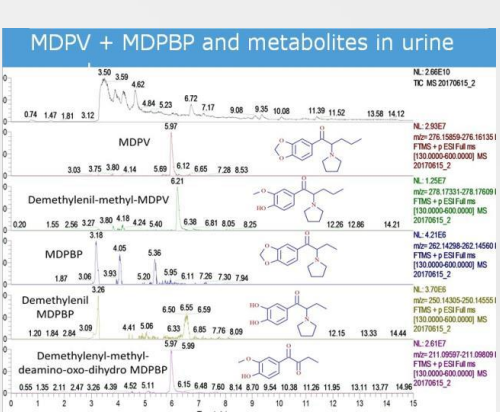
We present a "state of the art" technique that use high resolution mass spectrometry analysis (HRMS) for unknown compounds identification and characterisation. UHPLC-Q-Exactive Orbitrap HRMS technology was used in a specific method, developed and applied in a post-target approach for an in-house database based on comprehensive recent literature study. In addition to the full scan acquisition, a targeted fragmentation (MS-MS) analysis was performed.

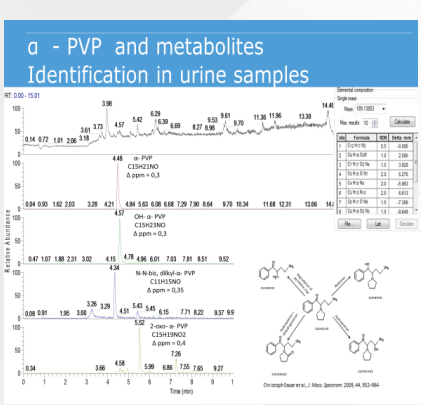
The fragmentation patterns and pathways of the available analytical standards were investigated in depth to further structure confirmation. MS/MS data was generated using HighChem Mass Frontier 7.0 software for the compounds with no reference standard available in order to pattern recognition of the product ions. Non-target approaches could be useful for the unknown compounds profiling using HRMS and software tools as Compound Discoverer.

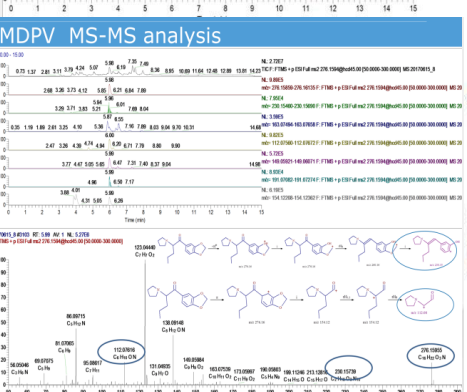
Analytical approach

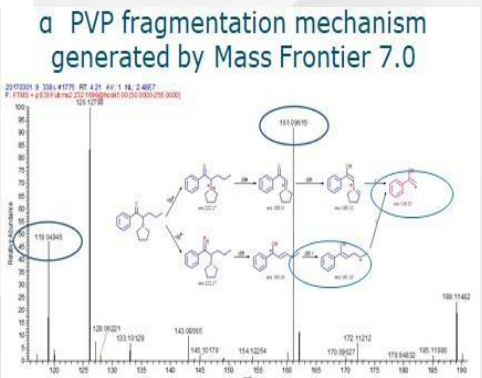
- Full scan screening in positive/negative ionisation using a post target analysis using an in-house data base, resolution 70 000 FWHM, identification of the compound using a mass tolerance window -5 ppm
- Metabolites identification according to available data from literature
- Fragmentation using a targeted MS-MS analysis
- Presumptive identification without having the reference without standards a priori by generating MS/MS data using HighChem Mass Frontier 7.0 software and fragmentation pattern recognition
- Fragmentation using a Variable Data Independent (*v*DIA) approach and "finding the unknown" using Compound Discoverer software workflow

Compound	Class	Formula	Exact mass	Monitored io
Metamphetamine	SNC stimulants	C10H15N	149.12045	150.12827 [M+H]+
MDMA (methylendioxymeth-amphetamine	SNC stimulans	C11H15NO2	193.11028	194.11810 [M+H]+
MDPV (methylenedioxypyrovalerone)	Cathinone	C16H21NO3	275.15214	276.15997 [M+H]+
α- PVP (α-pyrrolidinovalerophenone)	Cathinone	C15H21NO	231.16231	232.17014 [M+H]+
α - PPP (α-pyrrolidinopropiophenone)	Cathinone	C13H17NO	203.13101	204.13883 [M+H]+
α-PVT (α-pyrrolidinopentiothiophenone)	Cathinone	C13H19NOS	237.11874	238.12654 [M+H]+
MDPPP (3',4'-methylenedioxy-α-pyrrolidinopropiophenone)	Cathinone	C14H17NO	215.13101	216.13883 [M+H]+
Pyrovalerone	Cathinone	C16H23ON	245.17796	246.18579 [M+H]+
Prolintane	Cathinone	C15H23N	217.18305	218.19087 [M+H]+
3-CMC (3-chloromethcathinone)	Cathinone	C10H12ClNO	197.06074	198.06857 [M+H]+
Methylone	Cathinone	C11H13NO3	207.08954	208.09734 [M+H]+









Conclusions

- Comprehensive drug screening using liquid chromatography - high resolution mass spectrometry (LC-HRMS) have the potential of becoming a gold standard in drug analysis
- The overall information given by HRMS/MS-MS analysis (full-spectrum acquisition, accurate mass of the protonated molecule and fragment ions) together with predictive approaches using software tools, allow the presumptive identification of the unknown compounds without a reference standard *a priori*
- HRMS allow the identification and structural characterisation of the metabolites of common NPSs

BAFS 2025

Balkan Academy of Forensic Sciences

HEXAHYDROCANNABINOL – A CASE OF DRUG-RELATED DEATH

Ivo Ivanov[1,2,*], Diana Yaneva [2], Vasil Atanasov[1,2]

[1] Department of Analytical Chemistry, Faculty of Chemistry and Pharmacy, Sofia University "St. Kliment Ohridski"

[2] Department of Disaster Medicine and Toxicology, Military Medical Academy,

*** e-mail: ahidi@chem.uni-sofia.bg**

Background and aim

An 14-year-old boy had smoked several times from electronic device (vape) at party. After a few minutes, he began to show signs of psychosis, anxiety, agitation and dizziness. The boy began running around the building and eventually jumped out of a seventh-floor window.

Symptoms of using HHC can be very diverse, such as psychosis, anxiety, agitation, palpitations, chest pain, tachycardia, gastrointestinal nausea, vomiting, dizziness, tremors, spatiotemporal disorientation, dyskinesia, convulsions, respiratory pause and discomfort.

Methods

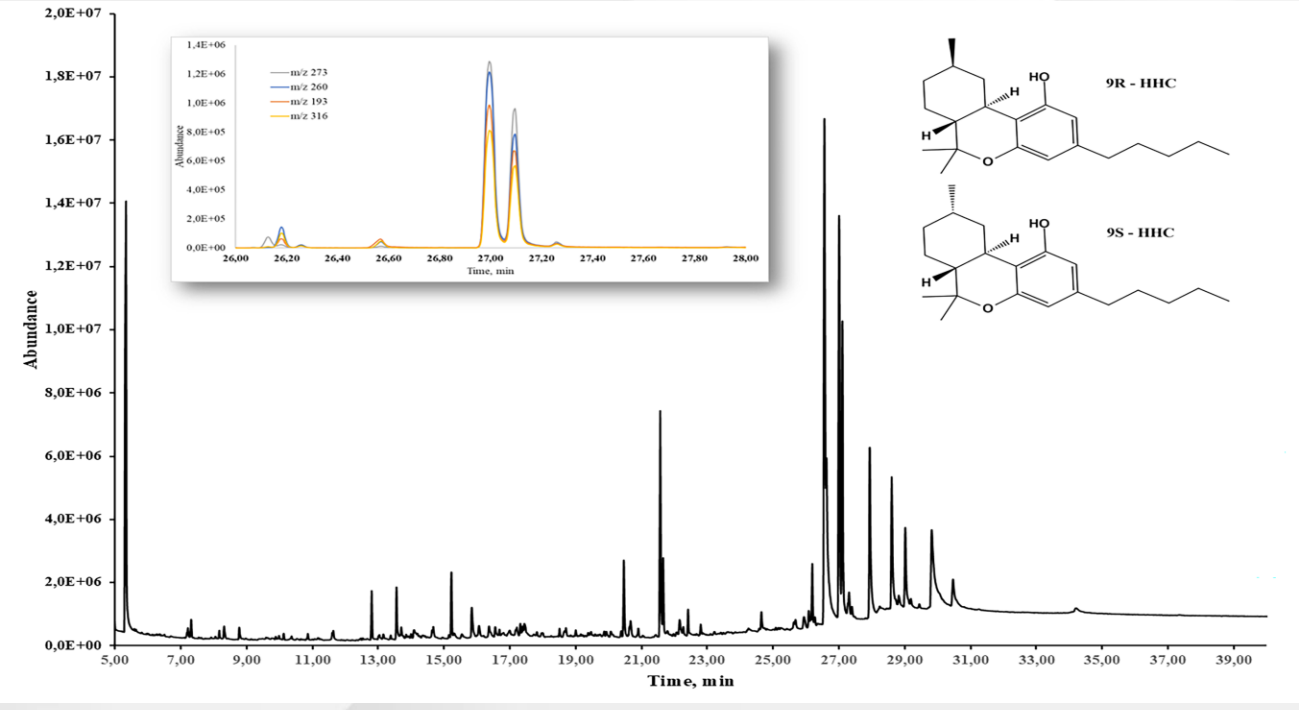
1 mL blood / 6 mL urine
100 µL 1 µg/mL COD-d_3
2 mL ACN
1 mL NaOH
2 × 3 mL EtOAc
Evaporation to dryness
Reconstruction in EtOAc

Gas chromatography-mass spectrometry (GC-MS; 1 µL of sample injected into Agilent 8890 / 5977B, equipped with a DB-1701 capillary column with 30 m x 0.25 mm x 0.25 µm). The oven temperature program: 50 °C (2 min), 50-90 °C (20 °C/min), hold on at 90 °C (1 min), 90-280 °C (8 min) and hold on at 280 °C (15 min). Carrier gas helium was used at flow rate of 1.5 mL/min. Front inlet – 250 °C, transfer line – 270 °C, ion source – 230 °C, respectively, and electron energy was 70 eV.

Results

Sample	*Immunoassay*	*General unknown screening*	*Quantitative analysis*
Blood	Negative	HHC, caffeine, nicotine	HHC – 45 ng/mL 9-carboxy-HHC – N.D.
Urine	Negative	caffeine, nicotine	HHC – N.D. 9-carboxy-HHC – N.D.
Vape resin	N.P.	HHC	HHC – 25 % (v/v)

N.P. – not performed; N.D. – not detected; HHC – Hexahydrocannabinol



Conclusion

There is no information in the scientific literature about the concentration ranges of HHC at which the various effects are induced. Our research reveals that the concentration of 48 ng/mL can cause a significant signs of psychosis.

BAFS 2025

DETECTION OF VALERENIC ACID IN VALERIANA OFFICINALIS BY TLC: COMPARATIVE EVALUATION OF EXTRACTION METHODS

Umut Kenduz [1], Reyyan Orgun [1], İrem Şahin [1]
1 Forensic Sciences Department, University of Uskudar, Istanbul, Turkiye
umut.kenduz@uskudar.edu.tr
reyyan.orgun@st.uskudar.edu.tr
irem.sahin8@st.uskudar.edu.tr

Background and Aims

Plant-derived psychoactive compounds are of great importance in forensic toxicology and criminal analysis due to both their traditional therapeutic use and their potential risk of abuse. Detecting central nervous system–active compounds in extracts obtained from legally accessible plants plays a critical role in the evaluation of both clinical and forensic cases.

In this context, Valeriana officinalis (valerian root), long known for its sedative and sleep-regulating properties, contains several pharmacologically active compounds, with valerenic acid being the most emphasized for its psychoactive effects in the literature [1].

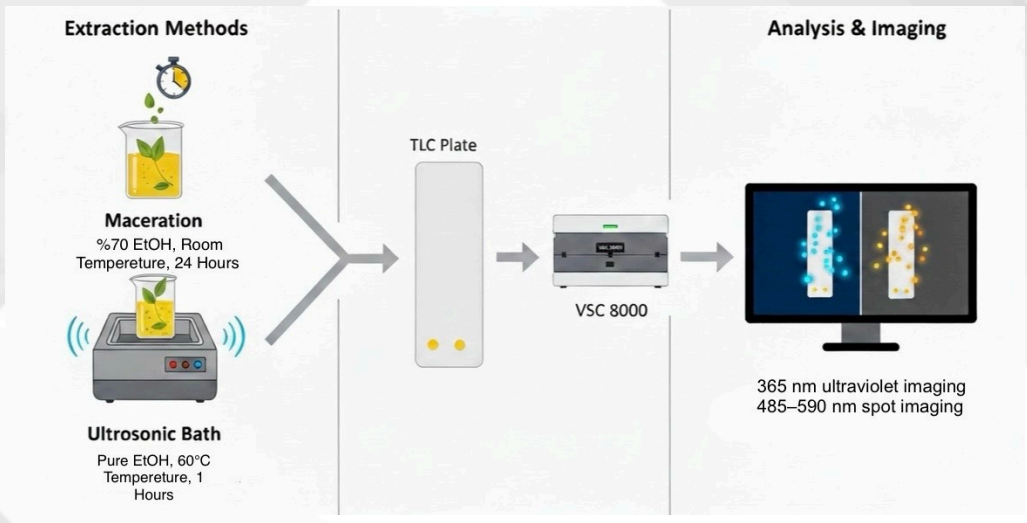
In this study, the analytical visibility of extracts obtained from V. officinalis roots was examined using thin-layer chromatography (TLC), with a particular focus on the detection of valerenic acid. Furthermore, the effects of different extraction techniques (maceration and ultrasonic bath) on the resulting chromatographic profiles were comparatively evaluated.

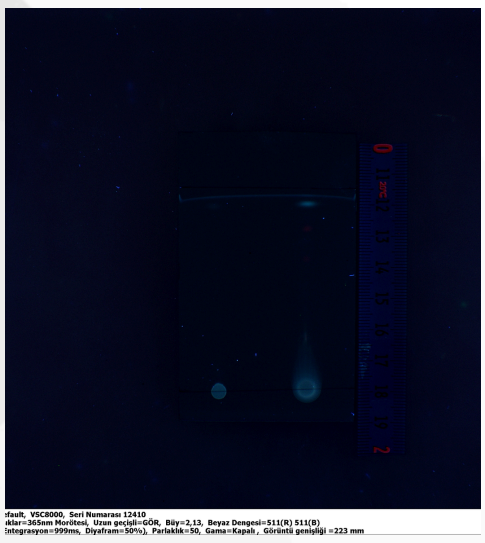
Methods

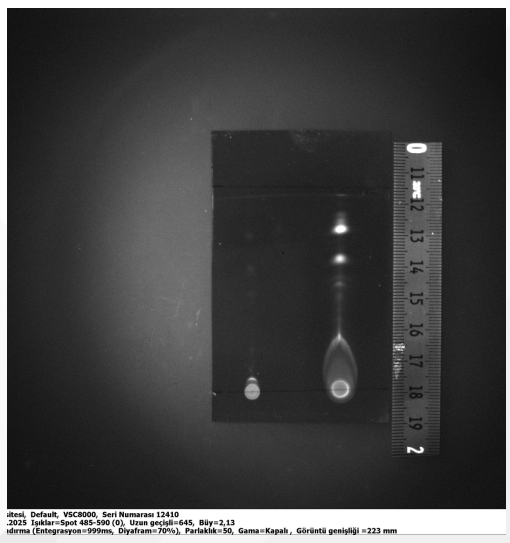
In this study, commercially obtained dried V. officinalis root samples were used. Extraction procedures were performed using two different methods:

1. Maceration method: Samples were soaked in 70% ethanol at room temperature for 24 hours, followed by filtration to obtain the extract.
2. Ultrasonic bath method: Samples prepared in high-purity ethanol were processed in an ultrasonic bath at 60 °C for 1 hour [2].

The resulting extracts were applied as spots onto silica gel-coated TLC plates and developed using an n-hexane:ethyl acetate (8:2, v/v) mobile phase system. After development, the plates were analyzed under UV light at 365 nm using the foster+freeman VSC8000 imaging system.







Results

- Distinct spots were observed in samples prepared with both extraction methods at Rf ≈ 0.30–0.35, consistent with the Rf range reported in the literature for valerenic acid.
- Although spots indicative of valerenic acid were detected in extracts obtained via maceration, their intensity remained limited.
- In extracts prepared using the ultrasonic bath, not only valerenic acid but also spots corresponding to other compounds were observed to be brighter, more intense, and more distinct.
- This suggests that ultrasonic extraction facilitates the efficient extraction of a larger number of compounds from the complex plant matrix, enhancing their visibility on TLC.

Discussion – Conclusions

The findings demonstrate that TLC is a useful technique not only for the preliminary detection of valerenic acid but also for identifying other psychoactive compounds present in Valeriana officinalis roots. In particular, the choice of extraction method directly affects the resulting analytical visibility.

- The maceration method, while simple and cost-effective, provided limited analytical visibility.
- The ultrasonic bath method enabled a richer compound profile in a shorter time and produced stronger signals on TLC.

In conclusion, this study highlights that TLC can serve as a rapid and effective screening method for investigating plant-derived psychoactive compounds in forensic toxicology and pharmacological research, and that optimization of extraction methods plays a critical role in analytical performance.

References

1. Orhan, I. E. (2021). A review focused on molecular mechanisms of anxiolytic effect of Valeriana officinalis L. in connection with its phytochemistry through in vitro/in vivo studies. Current Pharmaceutical Design, 27(28), 3084–3090. https://doi.org/10.2174/1381612827666210119105254
2. Mokhtari, A., Omidi, M., Ebrahimi, M., Alizadeh, H., Sobhani, A., & Azadi, P. (2024). Optimizing the extract yield of bioactive compounds in Valeriana officinalis root: A D-optimal design. Substance Use & Misuse, 59(7), 838–848. https://doi.org/10.1080/10826068.2023.2297709

"BRIDGING SCIENCE, JUSTICE, AND HUMANITY"

BAFS 2025

Balkan Academy of Forensic Sciences

ETHANOL QUANTIFICATION IN POSTMORTEM SPECIMENS: HOW TO PREVENT LOSS DUE TO VOLATILIZATION AND BIODEGRADATION

Martina Franzin[1], Simone Zaro[1], Elena Ruzzier[1], Rachele Ruoso[1], Rossella Del Savio[1], Petra Colomban[1], Stefano D'Errico[2,3], Riccardo Addobbati[1]

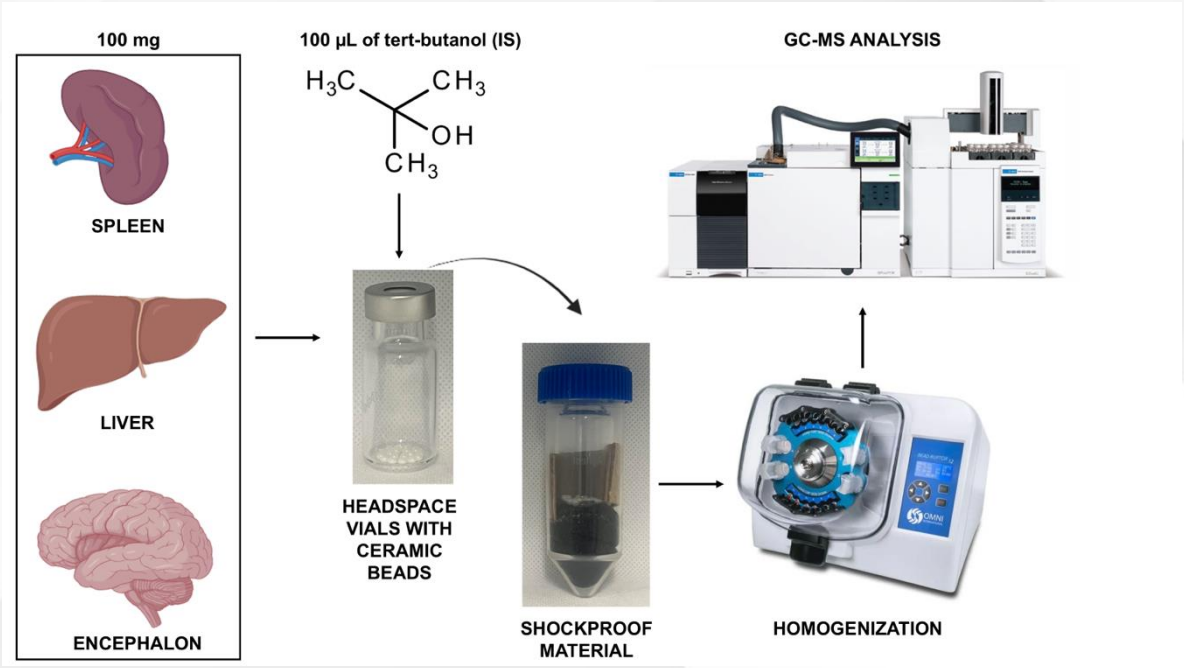
1 Institute for Maternal and Child Health, IRCCS "Burlo Garofolo", Via dell'Istria 65/1, 34137, Trieste, Italy; 2 Department of Medicine, Surgery and Health Sciences, University of Trieste, Strada di Fiume 447, 34129, Trieste, Italy; 3 Azienda Sanitaria Universitaria Giuliano Isontina, Strada di Fiume 447, 34129, Trieste, Italy.

martina.franzin@burlo.trieste.it
+39 0403785880

BACKGROUND AND AIM:

When blood is not available for investigation of postmortem ethanol content, unconventional matrices must be used and novel methods comprising sample preparation preserving ethanol content have to be introduced.

METHODS:



IS: internal standard
GC-MS: gaschromatography coupled with mass spectrometry

A headspace gas chromatography coupled with mass spectrometry (HS-GC-MS) method for ethanol quantification in postmortem matrices of spleen, liver and encephalon was developed. Sample preparation consists mainly in homogenization of tissues directly in headspace vials with 1.4 mm ceramic beads and addition of tert-butanol as internal standard (IS). Homogenization in non-hermetic vials was also tested to investigate analyte loss during the process (conventional preparation). A 70:1 split ratio with 2 mL/min column flow rate using helium as a carrier gas was adopted. Chromatographic run was obtained with a DB-BAC1 Ultra Inert column (30 m, 0.32 mm, 1.80 µm) and operates at 40 ° C for 13 min. Single reaction monitoring was selected (ethanol: *m/z* 31 for quantification and *m/z* 45 for qualification; IS: *m/z* 59 for normalization).

RESULTS:

1. Analytical method development and validation

Separation of analyte and IS (RT: 3.6 and 5.2 min for ethanol and IS respectively) and appropriate specificity, linearity, sensitivity (LOQ: 0.05 mg/g), accuracy (100 ± 20 %) and precision (< 15 %). Negligible matrix effect.

2. Analytical method applicability

LIVER	
Sample ID	Calculated concentration (mg/g)
1	0.61
2	0.46
3	0.50
4	2.33
5	0.07 (< LOQ)
SPLEEN	
Sample ID	Calculated concentration (mg/g)
1	1.43
2	1.06
3	0.55
ENCEPHALON	
Sample ID	Calculated concentration (mg/g)
1	0.11 (< LOQ)

3. Ethanol loss prevention

Postmortem material	Ethanol concentration (mg/g) after novel sample preparation	Ethanol concentration (mg/g) after conventional sample preparation	Decreasing variation (%) in ethanol content
1	2.69	2.64	2 %
2	1.26	1.18	6 %
3	0.96	0.77	20 %
4	0.83	0.76	9 %

DISCUSSION - CONCLUSION:

The proposed analytical method for ethanol quantification in postmortem specimens resulted applicable to forensic investigations. Presence of other volatile compounds would be evaluated to discriminate antemortem ethanol from postmortem generation. The proposed sample preparation turned out to be innovative and able to prevent ethanol loss due to volatilization and degradation.

BAFS 2025

Balkan Academy of Forensic Sciences

PSYCHOACTIVE SUBSTANCES IN ACUTE INTOXICATION - THE EXPERIENCE OF UNIVERSITY HOSPITAL "MOTHER TERESA" IN TIRANA

Linda Matua[1], Elizana Petrela[2]

1-Department of Pharmacy, Faculty of Medicine, University of Medicine, Tirana, Albania

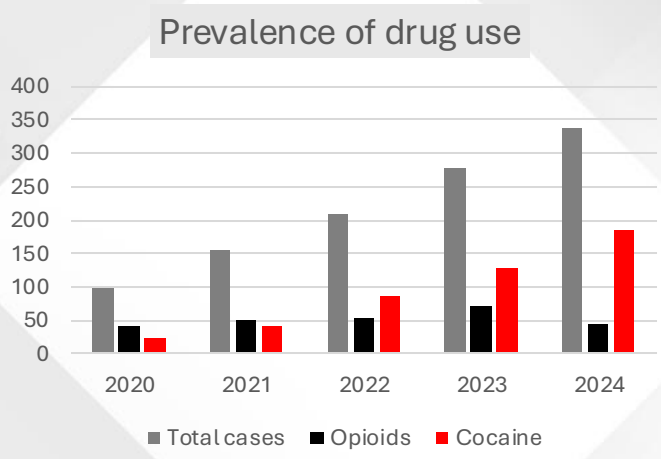
2-Head of Statistic Service, University Hospital Center "Mother Teresa", Tirana, Albania

Background and Aims: The use of psychoactive substances still remains a big threat to our society. It has increased over the years bringing forensic and clinical toxicologists together to prevent health damages and improve patient care.

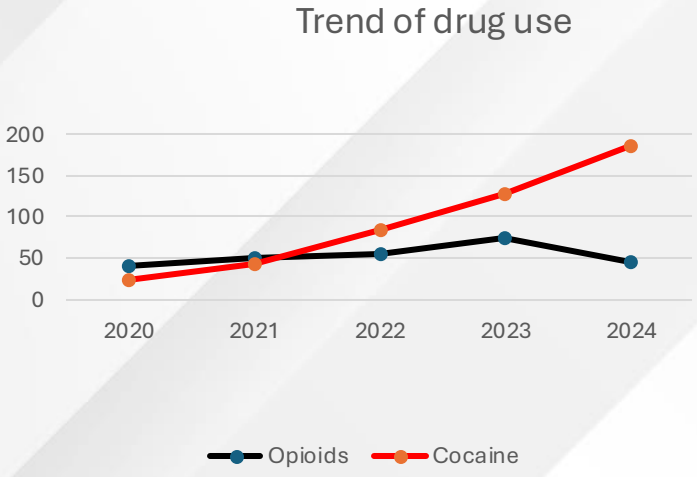
Time after time we have presented pictures of illicit drugs prevalence in Albania regarding different periods of time based into two source of information such as the Institute of Forensic Medicine in Albania as well as the Addictology & Clinical Toxicology Service (ACTS), University Hospital "Mother Teresa" Tirana.

We aimed to present the clinical picture of intoxication cases after ingestion of psychoactive substances of patients hospitalized in the ACTS during the last five years, to find the most frequently abused drugs.

Methods: In this presentation data was extracted from the database of the Statistic Service UHC "Mother Teresa" in Tirana. It`s a retrospective study including years 2020-2024. Hospital emergency data were collected from drug-related admissions. Age, gender, symptoms, and use of multiple drugs were collected for these cases.

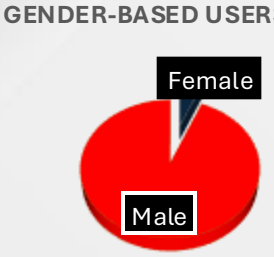


Results: The 1078 cases where men predominated, had an age range of 15-85 years old, average age 33.5. Most frequently abused drugs were: cocaine, heroin (approximately in 2:1 ratio), administrated alone or co-administrated with alcohol, as well as poly-drug combinations were found. Overdose and abstinence phenomenon were presented leading to toxicity. Compared to the previous years database, the trend of the most abused drug has changed and the number of clinical cases has increased.



Conclusion & Discussion:

Regarding the database of Addictology & Clinical Toxicology Service we find cocaine the most dangerous and the most prevalent drug of abuse during the last five years. Compared to the last decade where heroin and opioids were the leading group, regarding acute intoxication the trend has changed in favor of cocaine.



Keywords:
psychoactive substance, acute intoxication, toxicological findings

BAFS 2025

Balkan Academy of Forensic Sciences

FATAL CASE OF OVERDOSE INVOLVING NEW PSYCHOACTIVE SUBSTANCES (NPS) IN THE REPUBLIC OF MOLDOVA: FORENSIC TOXICOLOGY ANALYSIS

Diana Ciocoi [1], Victor Mocanu [1]

Forensic Toxicology Department, Forensic Medicine Center, Chisinau, Republic of Moldova

INTRODUCTION

Of the total population in the Republic of Moldova, almost 12,000 people are officially registered as having drug dependence. NPS often synthetically modified to circumvent legal restrictions, have become increasingly popular and dangerous. Methods of NPS use are mainly through smoking, injecting, and inhalation. Most often, new consumers and young consumers smoke or inhale NPS. Death from an overdose of NPS may occur either due to acute heart failure or acute cerebral edema.

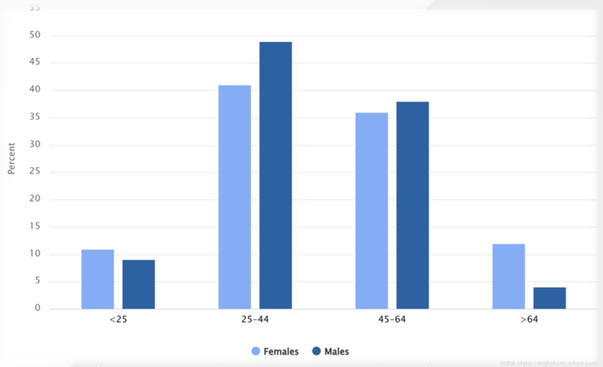


Figure 1. Drug-induced deaths in the European Union: age at death, 2023 or most recent available data (percent)

Case description: On the terrace of a bar in the center of Chisinau, a tragic incident was reported that led to the death of a 27-year-old man.

The incident happened in a place known for its popularity among young people. Eyewitnesses reported that the 27-year-old man was seen inhaling vapors from an electronic vape device provided by an acquaintance.

According to witness statements, after a few puffs, he began to show severe symptoms of intoxication: irregular and shallow breathing, convulsions, and finally loss of consciousness. One of his friends tried to revive him by applying first aid maneuvers and immediately calling an ambulance. The ambulance crew arrived within 10 minutes and continued resuscitation efforts, but without success.

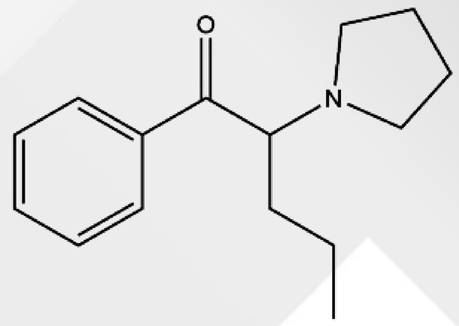
METHODS

Samples preparation: the specimen is added to the Toxitube A and B. Diphenylamine, serving as the internal standard, is then added. The mixture is agitated for 5 minutes, followed by centrifugation for an additional 5 minutes. The top layer is subsequently transferred to a new culture tube. This layer is evaporated under a stream of nitrogen at 40°C. The residue is then reconstituted with 1 ml of acetonitrile and was investigated at GC-MS .

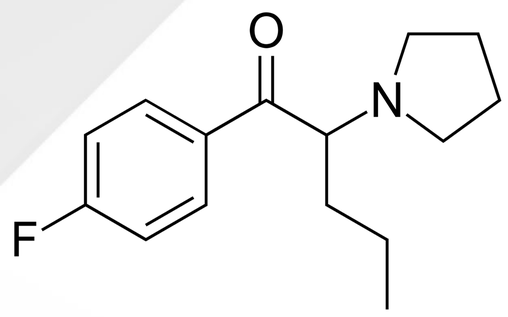
Figure 2. Agilent 8890 GC/5977B MSD

RESULTS

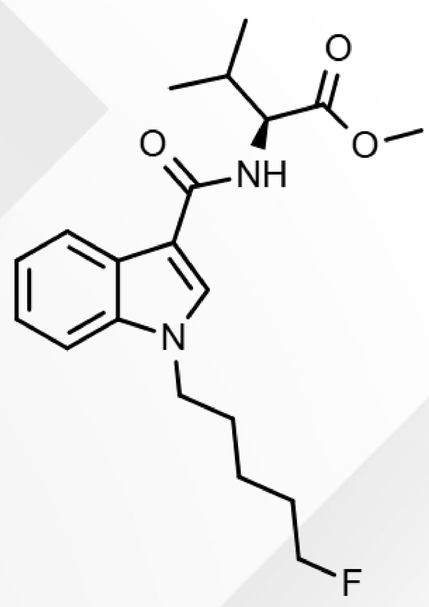
The results from the general unknown screening, provided by GC-MS, identified blood and lung samples substances such as:



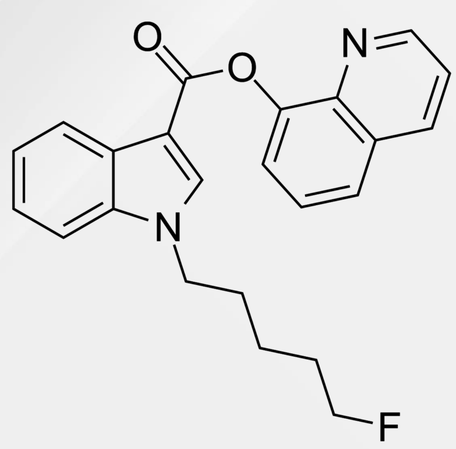
alpha-Pyrrolidinopentiophenone (α-PVP)



4'-Fluoro-alpha-pyrrolidinopentiophenone (4-Fluoro-α-PVP)



Methyl (1-(5-fluoropentyl)-1H-indole-3-carbonyl) valinate (MDMB(N)-2201)



Quinolin-8-yl 1-(5-fluoropentyl)indole-3-carboxylate (5-fluoro-PB-22)

CONCLUSION:

In the Republic of Moldova, there has been an increase in the use of NPS that are used as narcotics, psychotropic substances, and precursors.

This fatal case highlights the dangers associated with the uncontrolled use of vape devices containing synthetic narcotics. This tragic case is a wake-up call about the dangers of synthetic narcotics. It is necessary to adopt stricter measures to regulate and control these devices. In response to increased traffic and consumption illicit drugs, the Republic of Moldova has developed and continues to constantly improve its legislative and institutional framework.

REFERENCES:

1.New psychoactive substance use in Moldova and Belarus: research results from the Republic of Moldova. School of Law, Swansea University & Eurasian Harm Reduction Association, Swansea, Wales. 2019

2.Recommended methods for the Identification and Analysis of Synthetic Cathinones in Seized Materials (Revised and updated). Laboratory and Scientific Section united nations office on on drugs and crime. Vienna, 2020

3.Illegal drug consumption and trafficking annual report 2022, Republic of Moldova, 2023.

"BRIDGING SCIENCE, JUSTICE, AND HUMANITY"

Transilvania University of Brasov
FACULTY OF MEDICINE

BAFS 2025

Balkan Academy of Forensic Sciences

EPIDEMIOLOGICAL AND MORPHOPATOLOGICAL ASPECTS IN A RETROSPECTIVE STUDY ON DEATHS CAUSED BY FIRE OR CARBON MONOXIDE, BETWEEN 2015-2020, IN THREE LEGAL MEDICINE INSTITUTIONS IN ROMANIA

Daniel Tabian[1,2], Gabi Drochioiu[3], Mihaela Badea[1], Sebastian Ionut Toma[1], D.C. Mereu[1,2], F.I. Dragomir[1,2], Diana Bulgaru Iliescu[4] daniel.tabian@unitbv.ro

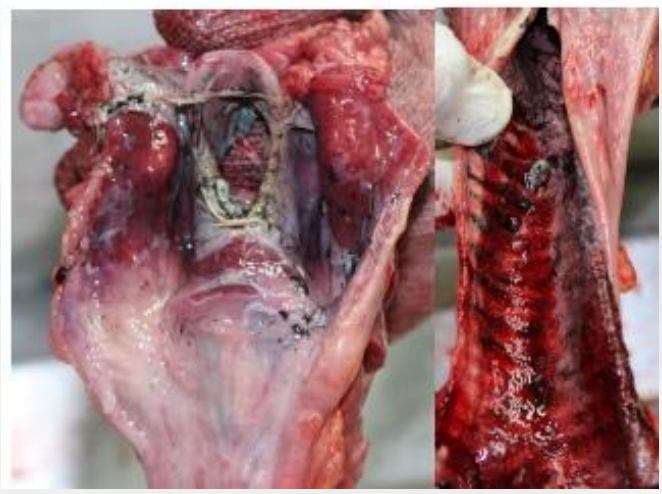
[1]Fundamental, Prophylactic and Clinical Department, Faculty of Medicine, Transilvania University of Brasov, Brasov, Romania
[2]Brasov County Legal Medicine Service, Brasov County Emergency Clinical Hospital, Brasov, Romania
[3]Faculty of Chemistry, "Alexandru Ioan Cuza" University of Iasi, Iasi, Romania
[4] Faculty of Medicine, "Grigore T. Popa" University of Medicine and Pharmacy, Iasi, Romania

Background

The epidemiological aspects of deaths caused by fires or carbon monoxide exposure, as well as morphopathological findings at necropsy, are important in the field of forensic medicine.

Material and method

A retrospective, descriptive study was conducted in three legal medicine institutions in Romania, between January 2015 and December 2020. The inclusion criteria were death caused by fire or carbon monoxide (CO) exposure, with survival time <48 hours.



Soot in respiratory tract

Results

Of the **316 selected cases**, **75.0% occurred in the months when heating is used in Romania** (October-March). Male gender was the majority (63.61%). The mean age of women (62.97 y) was significantly higher than that of men (55.16 y, p=0.0038).

Results

In 65.19% of cases the exposure was accidental, while among men, suicide was statistically significantly more frequent (Z=1.6, p= 0.049). Most events occurred at home, while heating equipment represented the most frequent source of toxic environment production.
Burns were described in 65.51% of cases, while 39.24% of subjects presented soot particles in the lower respiratory tract.

COHb≥50% was documented in 41.77% of the 248 measured samples.
Toxic values of blood hydrogen cyanide **(HCN>0.5 µg mL^{-1}) were documented in 26 of 39 subjects.**
Blood alcohol concentrations ≥0.5 g‰ were measured in 27.53% of subjects.

The medical cause of death **was flame burns in 37.02% of cases**, followed by **CO poisoning in 34.18%,** while approximately **28% of deaths were due to a combination of causes. HCN poisoning was the cause of death in 5.06%** of the cases, in association with other causes.

Conclusions

We conducted a retrospective study of deaths due to fire or CO exposure. Most cases were accidental and were due to the use of heating equipment and flammable liquids. Toxic concentrations of COHb and HCN were determined. The medical cause of death was most commonly burns, CO poisoning, or a combination of causes, including HCN poisoning.

Table 7.11. The presence of soot and upper respiratory tract burns

	Skin burns		URT soot		ACRS		LRT soot	
	n	%	n	%	n	%	n	%
Yes	207	65.50	114	36.07	72	22.78	124	39.24
Not	109	34.50	202	63.92	244	77.21	192	60.76

(Legend: n= number of cases; %= percentage expression; URT= upper respiratory tract; ACRS= upper respiratory tract burns; LRT= lower respiratory tract)

"BRIDGING SCIENCE, JUSTICE, AND HUMANITY"

Keywords: fire deaths, carbon monoxide, hydrogen cyanide

BAFS 2025

MEDICAL-LEGAL CHALLENGES IN ELDER ABUSE

Oana-Maria Isailă (1,2), Bianca Hanganu (3,4), Sorin Hostiuc (1,2)

1- Legal Medicine Department, National Institute of Legal Medicine "Mina Minovici", Bucharest
2-Legal Medicine and Bioethics Department, University of Medicine and Pharmacy "Carol Davila", Bucharest
3- Legal Medicine Department, Institute of Legal Medicine, Iași
4- University of Medicine and Pharmacy "Grigore T. Popa", Iași

Introduction:

- Elderly individuals are a vulnerable population due to declining capacities, making them prone to abuse (psychological, physical, financial, neglect, and sexual)
- 1 in 6 people over 60 experience abuse (WHO)
- It is predicted that by the year 2050, the global population of people aged 60 years and older will more than double, from 900 million in 2015 to about 2 billion, with most older people living in low- and middle-income countries (WHO)
- Physicians- key role in identifying, managing, and preventing abuse.

Aims: to analyze the limitations of identifying, managing, and preventing elder abuse in medical-legal practice.

Methods:

Case studies in routine medical-legal practice

Literature review

Perspectives:
- Medical
- Medical-legal
- Social

Results:

-medically and medical-legally identifiable forms: physical abuse, sexual abuse, and neglect.
-physical abuse was the most common elder abuse subtype in medico-legal practice.
- abuse and neglect blur when caregivers withhold care.

- emotional abuse was the most prevalent elder abuse subtype according to recent studies on this topic.

Main (individual) risk factors identifiable by physicians

Levels for identifying risk factors and protective factors

Discussion-Conclusions:

•Effective identification and management of elder abuse require the active involvement of medical and medico-legal services, which play a key role in detection, prevention, and awareness-raising.
•However, the absence of standardized protocols and limited inter-institutional collaboration reduces the effectiveness of current strategies.
•Developing clear guidelines and fostering cooperation between institutions are essential to improve prevention, assessment, and intervention in cases of elder abuse.

References:

1.World Health Organization, Abuse of older people, https://www.who.int/news-room/fact-sheets/detail/abuse-of-older-people, accessed at 22.07.2025
2. Kitaw, T.A., Baylie, A., Tekle, B.A. *et al.* Elder abuse without borders: a systematic review and meta-analysis. *BMC Public Health* **25**, 2268 (2025). https://doi.org/10.1186/s12889-025-23548-9
3. Dyer CB, Connolly MT, McFeeley P. The clinical and medical forensics of elder abuse and neglect. In: Bonnie RJ, Wallace RB, editors. *Elder mistreatment: Abuse, neglect, and exploitation in an aging America*. Washington (DC): National Academies Press; 2003. p. 339–381, https://www.ncbi.nlm.nih.gov/books/NBK98800/, accessed at 17.09.2025
4. Bonnie W.Y. Wong, Elsie Yan, The effectiveness of educational intervention in improving healthcare professionals' knowledge and recognition towards elder abuse: Systematic review and meta-analysis of randomised controlled trials, Aggression and Violent Behavior, Volume 78,2024,101952,ISSN 1359-1789,https://doi.org/10.1016/j.avb.2024.101952.
5. Ho, C. S. H., Wong, S. Y., Chiu, M. M., & Ho, R. C. M. (2017). Global prevalence of elder abuse: A meta-analysis and meta-regression. *East Asian Archives of Psychiatry, 27*(2), 43–55.

BAFS 2025

EXAMINATION OF BACKSPATTER IN SHOTS FIRED WITH SEMI-AUTOMATIC PISTOLS

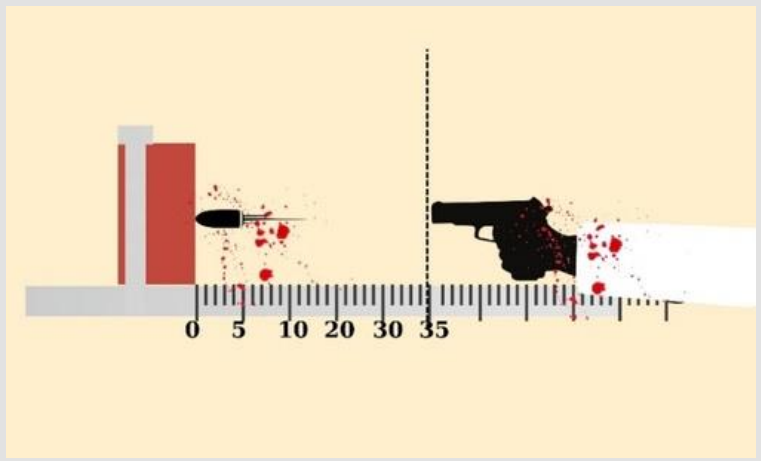
Aylin Yalçın Sarıbey[1], Tahide Saray [1]
1 Forensic Sciences Department, University of Uskudar İstanbul Turkey
aylin.yalcinsaribey@uskudar.edu.tr
tahide.saray@st.uskudar.edu.tr

Introduction

The aim of this study is to demonstrate the possibility of determining whether the shooter was present at the crime scene, the shooting distance, and the type of firearm used, through backspatter pattern analysis. This experimental analysis, which is expected to contribute to the identification of perpetrators who may have changed their clothing after the incident or whose clothing was found at the crime scene, will provide insights at the intersection of forensic ballistics and bloodstain pattern analysis (BPA).
The findings will reveal the contributions of backspatter pattern analysis to forensic science applications.

Objective

This project aims to reconstruct shooting incidents through backspatter bloodstain analysis. The study focuses on determining the shooting distance, examining the effects of different firearms, and identifying the regions with the highest concentration of backspatter.
By analyzing backspatter traces on garments that were worn, discarded, concealed, washed it investigates how they contribute to crime scene reconstruction.



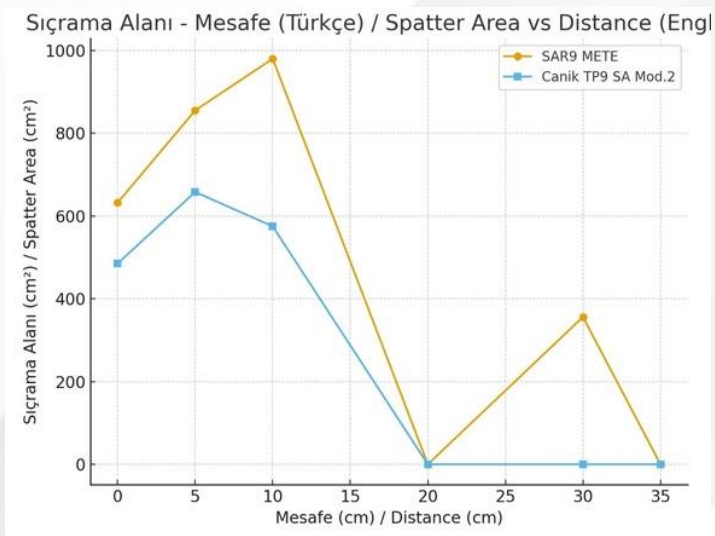
Meteorology

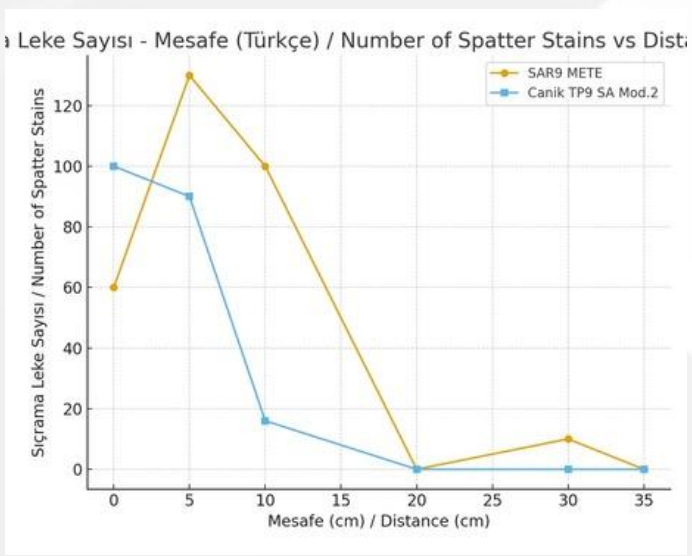
A total of 3,200 mL of bovine blood was collected with 5% EDTA to prevent coagulation and mixed before use. Seat sponges (18 × 14 × 7 cm) were cut into 12 equal pieces, each absorbing 150 mL of blood evenly. During shooting, white sleeves (92% cotton, 8% elastane) were worn on the right arm. Sponges were placed in a frame and each shot was aimed at the center of the sponge. Sarsılmaz SAR9 METE and Canik TP9 SA pistols were used from distances of 0, 5, 10, 20, 30, and 35 cm, with each shot photographed using a Canon EOS 700D. After each shot, sponges were replaced and prepared with 150 mL of blood. Sleeves were positioned starting from the wrist, using the middle finger tip as reference.

Analysis

•Weapon comparison: Canik TP9 SA the backspatter pattern consistently decreases with increasing distance. Sarsılmaz SAR9 METE Irregular backspatter patterns observed.
Clothing with backspatter stains (collected at the scene or discarded by the suspect) can provide valuable evidence for crime scene reconstruction.

•0–20 cm distance: Area ↑, droplet count ↓ (consistent with Kunz et al., 2015).
•Anatomical distribution: Highest density on the wrist, fewer stains on the lower arm.
•Droplet size: Largest droplets observed at 5 cm.
•Farthest backspatter: SAR9 METE → 5 cm; Canik TP9 SA → 10 cm.
•Contact shot (0 cm): SAR9 METE ≈60 droplets;
Canik TP9 SA ≈100 droplets.





Results

- Shooting distances could be distinguished as close and distant; however, no visible backspatter stains were observed beyond 30 cm.
- With the Canik TP9 SA, backspatter decreased consistently as distance increased, whereas the Sarsılmaz SAR9 METE showed irregular patterns.
- Careful examination of backspatter patterns on clothing found at the scene or discarded by the perpetrator can provide practical insights for event reconstruction.

- Kunz, S. N., Brandtner, H., & Meyer, H. J. (2015). Characteristics of backspatter on the firearm and shooting hand — An experimental analysis of close-range gunshots. Journal of Forensic Sciences, 60(1), 166–170. https://doi.org/10.1111/1556-4029.12572
- Karger, B., Rand, S., Fracasso, T., & Pfeiffer, H. (2008). Bloodstain pattern analysis — Casework experience. Forensic Science International, 181(1-3), 15–20. https://doi.org/10.1016/j.forsciint.2008.07.010

"BRIDGING SCIENCE, JUSTICE, AND HUMANITY"

BAFS 2025

INVESTIGATION OF FLUORESCENT BEHAVIOR OF SOME PHARMACEUTICAL DRUGS ON DIFFERENT SURFACES BY SUPERSPECTRAL IMAGING

Umut Kenduz[1], Seyma Avci[1]

[1]Forensic Sciences Department, University of Uskudar; Istanbul, Turkiye

Introduction

In forensic science, the detection and analysis of pharmaceutical residues on textile surfaces play a significant role in crime scene investigations, suspect profiling and evidence evaluation. Pharmaceutical powders are often encountered in various forensic scenarios, such as illegal drug trafficking, pharmaceutical misuse or hidden substance transfer. However, the identification of these residues on fabrics is challenging due to their absorbent nature and the limitations of conventional visualization techniques [1,2].

ForenScope SuperSpectral Imaging technology offers a non-destructive, rapid, and highly sensitive approach to detect spectral variations in pharmaceutical powders under different wavelengths. This technique enhances visualization, improves detection accuracy and contributes to a more detailed forensic interpretation of evidence.

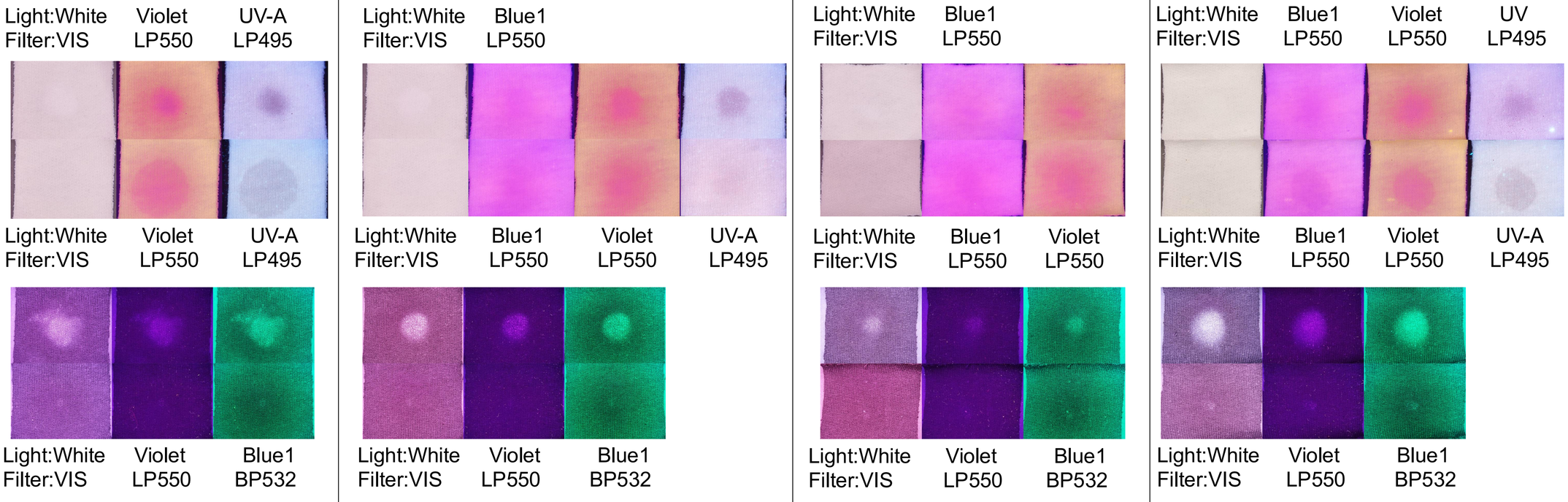
Aim

This study aims to analyze the fluorescence responses of different pharmaceutical powders applied to various fabric types using the ForenScope SuperSpectral Imaging Device. By comparing the spectral reactions of Aferin, Parol, Atarax and Xanax across cotton fabrics, the research seeks to evaluate the effectiveness of superspectral imaging in detecting and differentiating pharmaceutical residues for forensic applications.

Materials-Methods

Step	Description
Fabric Selection	3 cotton fabrics (3 towel-type)
Drugs Used	Aferin, Xanax, Atarax, Parol
Powder Application	Tablets ground into powder and transferred to fabrics by friction
Solution Application	Drugs dissolved in ethanol and applied to fabrics with a syringe
Imaging	Fluorescence responses examined using the forensic imaging device

Results



- **White and cream fabric:** Both powder and solution were best detected under **UV-A and Violet light.**
- **Black fabric:** Powder form was visible under all light sources; solution form was difficult to detect, best result under **Violet and Blue1 light**.

- **White fabric:** Both powder and solution form were best detected under **Blue1 light**.
- **Cream fabric:** Powder form was distinct under **Violet and UV-A light**; solution form was difficult to detect.
- **Black fabric:** Powder form was distinct; solution form was difficult to detect, best result under **Violet and Blue1 light**.

- **White fabric:** Powder form was not distinct; solution were best detected under **Blue1 light**, but not clearly.
- **Cream fabric:** Powder form was difficult to detect; solution form showed streaked fluorescence under **Blue1 and Violet light**.
- **Black fabric:** Powder form was visible under all light sources; solution form was difficult to detect, best result under **Violet and Blue1 light**.

- **White fabric:** Both powder and solution form were best detected under **Blue1, Violet and UV-A light**.
- **Cream fabric:** Powder form was best detected under **Violet and UV-A light**; solution form was best detected under **Blue, Violet, and UV-A light**.
- **Black fabric:** Powder form was visible under all light sources; in solution form was difficult to detect, best result under **Violet and Blue1 light.**

Discussion and Conclusion

The fluorescence responses of the tested pharmaceuticals varied by both fabric color and physical form. Generally pharmaceutical residue was difficult to detect on white fabric; it was quite noticeable on cream fabric; on black fabric, the powder residue was visible in all light, including white light.

Superspectral imaging is a fast and non-destructive way for detecting pharmaceutical residues in forensic investigations.

References

1. Zapata, F., Ortega-Ojeda, F. E., & García-Ruiz, C. (2022). Forensic examination of textile fibres using Raman imaging and multivariate analysis.
2. Calero-Cañuelo, C., Lucena, R., & Cárdenas, S. (2025). Quantitative determination of drug residues in surfaces, analyzing cotton-swabs by on/off thermal desorption-plasma based ionization-mass spectrometry

"BRIDGING SCIENCE, JUSTICE, AND HUMANITY"